

T H E  
**F L O W**  
C O U N T R Y



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**THE PEATLANDS OF CAITHNESS AND SUTHERLAND  
MANAGEMENT STRATEGY  
2021 – 2030**

# Foreword

It is sixteen years since the original Peatlands of Caithness & Sutherland Management Strategy was published. It identified both need and opportunity for people to learn, enjoy and engage with peatlands, and the Peatlands Partnership was established shortly afterwards to oversee its delivery.

Since this time, our understanding of the role of peatlands in carbon storage, climate change and in ecosystem services more generally has grown vastly, which has been reflected by recent changes in attitudes and in national and international policy. This presents us with previously unrivalled opportunities not only to further protect and enhance the special qualities of our peatlands, but also to engage with local communities and businesses, to facilitate greater awareness, understanding and enjoyment, and to support and promote best practice through our monitoring and research work.

The original Strategy recognised the challenges brought about by decades of policy shifts, varied standards of stewardship and uncertainties facing land managers in the peatlands. It was the first time that a clear, shared vision for the future where land uses complement rather than compete with each other was attempted. Our new Strategy recognises the huge strides made by successive projects in recent years to restore the blanket bog habitat and engage with local people and encourages partners to work together to continue with this important work.

Recent developments in public sector policy including the Scottish Government's declaration of a Climate Emergency, the Biodiversity Crisis, and 'green recovery' opportunities emerging from the global Covid-19 pandemic, have led to huge changes in the levels of funding available for peatland work. Through capitalising on initiatives such as the Peatland ACTION Fund and opportunities associated with sensitively planned renewable developments, we have an unprecedented opportunity to affect the landscape-scale change needed to transform the Flow Country into a global example of best practice where new developments can complement improved land management practices to support peatland habitats and wildlife as well as carbon capture and the reduction of emissions.

Our new Strategy also includes the aspiration to secure inscription of the Flow Country as a UNESCO World Heritage Site, and we plan to help local people to benefit from this and other opportunities.

As with the original Strategy, we aim to embed the relationship between people and peatlands at the heart of our approach, and one of our first actions will be to broaden our membership to include further representatives from local community, business and land management interests.

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Chairman, The Flow Country Partnership**

The Peatlands Partnership was set up following the publication of the first Management Strategy for the Peatlands of Caithness and Sutherland to oversee delivery of the Strategy and subsequent revisions. Its members include NatureScot (formerly SNH), Scottish Forestry (formerly Forestry Commission Scotland), Forestry and Land Scotland (formerly Forest Enterprise / Forestry Commission), The Highland Council, RSPB Scotland, Plantlife International, The Environmental Research Institute (University of the Highlands and Islands), Highlands and Islands Enterprise, the Flow Country Rivers Trust, the Northern Deer Management Group and the Highland Third Sector Interface. In 2021, the members of the Peatlands Partnership agreed to expand its membership and change its name to the Flow Country Partnership.

This is the third edition of the Peatlands of Caithness and Sutherland Management Strategy. The first edition of the Strategy (2005-2015) can be downloaded [here](#).



This document was revised and updated by Janet Bromham of Lochside Associates under contract from NatureScot (on behalf of the Flow Country Partnership).

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# PART ONE: MANAGEMENT STRATEGY

## CHAPTER 1: INTRODUCTION

### 1.1 Background

Caithness and Sutherland contain one of the world's most extensive areas of blanket bog. This peatland resource supports a wide range of wildlife, provides significant ecosystem services such as clean water and climate regulation, and is a vitally important store for carbon. This area requires careful management at the landscape scale to ensure that it remains healthy. The communities and businesses that depend on the peatlands all have a stake in this, co-ordinated through this Strategy.

The Peatlands Partnership was formed in 2006, shortly after the production of the first Management Strategy (2005). Now referred to as the Flow Country Partnership, it comprises a range of organisations involved in the management of the peatlands, who work together to implement the Strategy.

This is the third edition of this Management Strategy. In the fifteen years since the original Strategy was published there have been significant changes in the policy and guidance that influence land use in the peatlands. These changes have been driven largely by growing concerns in relation to climate change and sustainability, and an increasing recognition of the role of both peatlands and forestry as carbon stores. The first Strategy and its 2015 revision (unpublished) have served to direct and guide policy in relation to the balance between forestry and peatland, as well as provide a reference point and influence a range of other strategies, documents, programmes and projects.

In practical terms, there have been major strides in peatland restoration and related research since 2005. Research into the impact of forestry on adjacent peatland has led to the removal of some 3,965 hectares (ha) of forestry without restocking since 2014, and a further 2,300ha have been approved for clearance over the next ten years to enable peatland restoration and address forest edge effects. Research on restoration techniques has guided the blocking of drains and furrows to raise the water table and facilitate bog re-creation, and over 10,500ha of peatland in Caithness and Sutherland have been restored in this way.

The original Strategy identified an opportunity for people to learn, enjoy and engage with the peatlands. In 2014, following several years of planning, the Peatlands Partnership began a major project to address this. The five-year £11 million Heritage Lottery funded 'Flows to the Future' Project delivered a wide range of activities to engage people both locally and remotely, and improved facilities for interpretation and engagement as well as enabling further peatland restoration over a large area.

This 2021 revision provides an update on what has been delivered by the Flows to the Future Project, as well as ongoing efforts to get The Flow Country inscribed as a World Heritage Site. It recognises more recent changes in Government and public sector policy, changes in public attitudes, and how the individual sectors are responding to the Scottish Government's Climate Emergency and Biodiversity Crisis, as well as how they might respond to the green recovery from the global COVID-19 pandemic. The Scottish Government has set new ambitious targets to end our contribution to climate change by reducing emissions to net zero by 2045<sup>1</sup> with renewable energy, woodland creation and widespread peatland restoration forming key elements of this Plan. This policy framework presents tremendous opportunities for the peatlands of Caithness and Sutherland, and the Action Plan in Part Two identifies a number of priority projects and work areas for the ten-year period to 2030.

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<sup>1</sup> [Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/2018-2032-climate-change-plan-update/pages/100.aspx)

## 1.2 Why the peatlands?

The peatlands of Caithness and Sutherland are a special place, of national and international importance. Nowhere else in Britain, and possibly the world, is there such an extensive area of this type of peatland (c400,000ha). Together with associated areas of moorland and open water, large areas of the peatlands are protected as Sites of Special Scientific Interest (SSSI). They are recognised to be of national importance for conservation both as a habitat in their own right and because of the diverse range of rare and unusual breeding birds they support. Approximately 145,000ha are also designated as a Ramsar Wetland of International Importance and part of the Natura 2000 series of sites (Special Areas of Conservation - SAC and Special Protection Areas - SPA).

In addition to the natural heritage designations, parts of the peatlands contain many sites and areas of archaeological and historic significance (Scheduled Monuments), as well as thousands of sites of regional and local significance that are more widely spread across the area.

In recent years the huge importance of the UK's peatlands as a carbon store of national importance has also been recognised, with the peatlands of Caithness and Sutherland being a major component of that national resource.

## 1.3 Why a Strategy?

Within the Caithness and Sutherland Peatlands SAC/SPA, the Scottish Government is committed to avoiding the deterioration of qualifying habitats and the habitats of qualifying species, and the disturbance of species. It must also ensure the site's integrity and maintenance in the future. Outside the designated site is a still bigger area of peatland, which is also of importance for nature conservation and to which the Scottish Government has commitments under the Scottish Biodiversity Statement of Intent.

Although this is primarily a strategy to promote the natural heritage interest of the peatlands, there are many ways in which this can go hand in hand with supporting the needs of local communities, the historic environment and the economy. In addition to the socio-economic benefits provided by the peatlands (e.g. carbon store, clean water, spawning habitat, tourist attraction) the Strategy recognises that this is a place where people live and work, and that the support of local communities is key to its survival.

## 1.4 What area does it cover?

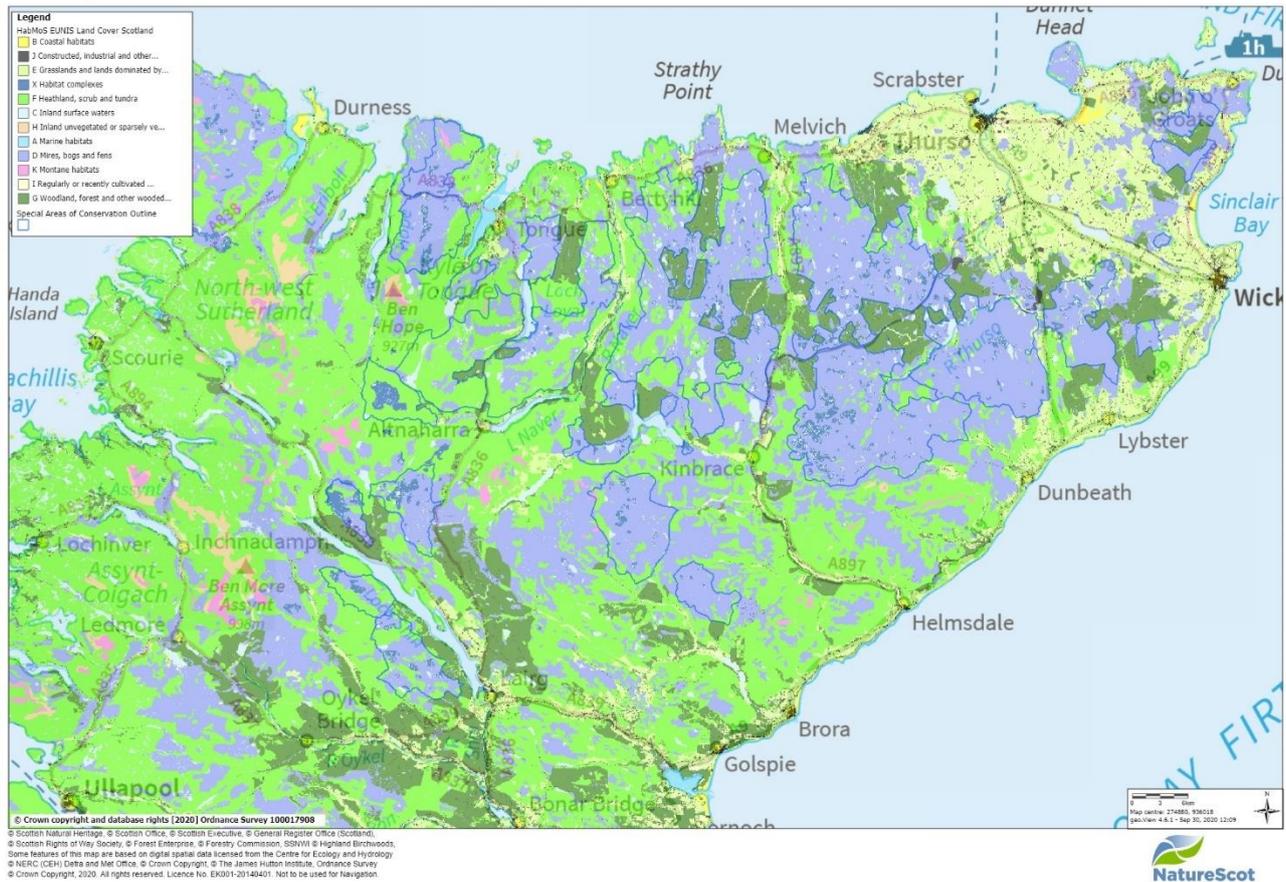
The starting point for this Strategy is all those areas of Caithness and Sutherland with peat soils. Many people are aware of the 'Flow Country', the name now often used for the central part of the counties, but in fact the peatland is much more extensive, stretching from the west coast of Sutherland across to the far east of Caithness.

Much of this peatland supports blanket bog and wet heath vegetation, some of which is designated for its nature conservation interest. Elsewhere agriculture, peat extraction or forestry have significantly altered the character of the peatlands. Within this wide area, the highest priority peatland is that carrying UK and European designations. The map below shows the extent of the Caithness and Sutherland Peatlands SAC.

The peatlands cannot be considered in isolation, as they are intimately linked through hydrology, bird and animal movements, and land management (both recently and during the preceding millennia of human occupation) to a much wider area. The Strategy looks at the whole landscape in which the peatlands sit.

The habitat map below shows the extent of bog (purple) and wet & dry heath (bright green) in Caithness and Sutherland. Woodland and forest are coloured dark green, however some of the plantations shown have now been felled for peatland restoration and wind farms.

Habitat Map



### 1.5 Who is it for and what will it be used for?

This Strategy is a shared vision for everyone with a direct interest in the peatlands, for example whether running a croft, managing a sporting estate or working for a public agency with statutory duties. Its uses will include the following:

- As a statement of a shared vision and objectives for the peatlands.
- As an action plan which can be used for promoting and prioritising activities.
- As a reference document for land managers considering future land management options.
- As a source document when policies or plans that affect the area are being prepared.
- As a means of guiding investment in nature, ecosystem services and biodiversity across the area.

### 1.6 How has it been prepared?

The first Strategy was published under the European Union LIFE funded Peatlands Project in 2005, following an extensive development process and public consultation. It was updated but never published in 2015. This second revision includes much of the original text but brings all the information up to date and includes a revised, more targeted action plan.

Since the publication of the original Strategy there have been significant changes in the policy and guidance that influence land use in the peatlands. These have been driven largely by growing concerns in relation to climate change and sustainability, and an increased recognition of the role of both peatlands and forestry as carbon stores. The 2015 revision was prepared in the context in particular of the Climate Change (Scotland) Act 2009, with other key developments including the development of Scotland's National Peatland Plan, Scottish Government's Land Use Strategy and National Planning Framework, the United Nations Convention on Biodiversity in 2010 (and the European, UK and Scottish responses to that), and the Community Empowerment and Land Reform (Scotland) Acts.

This 2020 revision provides an update on what has been delivered in the fifteen years since the original Strategy was published and the Peatlands Partnership formed, as well as outlining how recent changes in Government policy and public attitudes might impact on the peatlands of Caithness and Sutherland. Priorities for future action are identified, and it is hoped that the action plan in part two will provide a rationale to support future work. The 2020 Scottish Programme for Government makes explicit references to peatland as a major resource for addressing carbon sequestration and halting biodiversity loss, whilst also encouraging and guiding investment in nature to aid the green recovery from COVID-19. This document follows a similar structure to the previous Strategies. It was drafted with input from stakeholders and Partnership members, and the draft Strategy underwent a public consultation in late 2020.

## 1.7 How to find your way around the Strategy

The Strategy starts with a vision, aim and four overarching objectives. Then comes an introduction to why the peatlands are special and to the various accolades they carry. The four objectives are addressed in Chapters 4-7. Each of these chapters begins with the relevant objective and a summary of the key issues, before going into more detail on the issues and summarising progress made to address them in the 15 years since the first Management Strategy was produced. There is inevitably some overlap as some themes, such as economic development and deer management, underlie the whole Strategy.

Part Two contains a progress report and action plan for future work. It is divided into four chapters pertaining to the Strategy's four objectives, and each chapter contains a table summarising progress made in the five years since the 2015 revision, and a second table proposing actions for delivery in the ten years to 2030.

## CHAPTER 2: VISION, AIM & OBJECTIVES

### The vision:

Our vision for the peatlands is one of a revitalised, sustainably managed landscape, with extensive sweeps of hill and bog intersected by fertile straths and forests. These straths and coastal strips support a mosaic of productive crofts and farms, rivers, forestry and native woodland. Above and between the straths lies the open landscape of the world-renowned peatlands of Caithness and Sutherland, which, together with their lochs and lochans, support a spectacular assemblage of birds, plants and other wildlife, including internationally important numbers of raptors, waders and waterfowl. The straths, bogs, hills, lochs, rivers, woodlands and forestry are managed together for the wide range of services they provide and interests they support. Different land management objectives and uses are integrated and support each other, with everything underpinned by a healthy environment, at the centre of which is the great peatland of the north. Everyone who lives, works in or visits the area values the peatlands, which are an exemplar of good management and an inspiration to all.

### Overall aim:

To enhance and promote the special values of the peatlands of Caithness and Sutherland, through the promotion of sustainable land management, the encouragement of sustainable community and economic development, and through co-ordinated action.

### Strategy objectives:

**Objective 1: To promote and carry out sustainable land management that maintains and enhances the nationally and internationally important areas of peatland, the associated habitats and species and the wide range of services they provide.**

**Objective 2: To encourage sustainable community and economic investment that is compatible with safeguarding those features that make the peatlands important.**

**Objective 3: To promote greater awareness, understanding and enjoyment of the special wildlife, carbon store, landscape, water environment, historical and cultural values of the peatlands.**

**Objective 4: To support and promote the value of the area for best practice management and research and as an exemplar and inspiration for others working on peatland management and restoration, to the benefit of peatlands here and elsewhere.**

## CHAPTER 3: WHAT'S SO SPECIAL ABOUT THE PEATLANDS?

### 3.1 The habitat

Caithness and Sutherland are home to the largest and most intact area of blanket bog of its type in Europe and possibly the world, with 4% of the world's resource. Blanket bog develops where a cool wet climate allows the growth of vegetation dominated by Sphagnum bog mosses over extensive areas of sloping ground, hollows and flat areas. Where rainfall levels are high it can develop on slopes up to 30°. It typically overlies deep peat and receives all its nutrients through rainfall. In addition to bog mosses, other widespread plants of blanket bogs are heather, cross-leaved heath, deer grass and cotton grass.

For blanket bog to form, water levels need to be near the surface. Where the ground is not so waterlogged, other habitats occur. Wet heath is found on thinner, better drained peat or where management has caused the peat to dry out. This community has many of the same plants as blanket bog, but the bog mosses are less dominant, cotton grass is absent, and heather is more widespread. Dry heath and acid grassland are found on drier ground with mineral soils or occasionally very shallow peat.

The terms peatland and blanket bog may appear to be used interchangeably in this document, but there are some differences between them which can be important. Peatland is a general term for any area with a naturally accumulated peat layer at the surface<sup>2</sup>, regardless of the vegetation or land use. Blanket bog is one type of peatland, where the vegetation is only supplied with water and nutrients from the atmosphere<sup>3</sup>, and the peatland surface largely follows the underlying geology (on a landscape scale). When drained, it will normally still be called blanket bog, although it may no longer be peat forming, or 'active'. Peat formation can only take place where waterlogging slows the decomposition of dead material, which then accumulates as peat. Once the key species (particularly Sphagnum bog mosses) are no longer present or only very rare, such as under closed canopy forestry, it ceases to be blanket bog but remains a peatland. *Note: In other countries, blanket bog exists with natural forest cover.*

To the non-specialist, the diversity of the bogs of Caithness and Sutherland may not be immediately apparent. There is however great variation in form and vegetation, thanks to the differences in climate, geology and underlying landform from west to east and north to south. Water is a critical ingredient of the bogs and a particularly special feature is the patterning of pools often found on level and gently sloping ground. Lochs of all sizes and with a diversity of chemical make-up are abundant throughout the area. The clean waters of the peatlands also feed into many rivers and streams, which sustain internationally important populations of otter, Atlantic salmon and freshwater pearl mussel. These watercourses also support important fisheries.

### 3.2 The wildlife

Within any given area of the peatlands, the bogs, lochs and dubh lochans, hummocks, hollows and smaller pools provide niches for a wide range of plants, animals and invertebrates.

The lochs and bog pools are home to a range of insects such as dragonflies and pond skaters which are a common site during the warmer months. Frogs, newts and brown trout can also be found in the lochs and lochans, along with the secretive otter. They are also home to less common species such as the nationally rare water beetle *Oreodytes alpinus*. In spring and early summer, the pools are full of flowering bogbean.

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<sup>2</sup> Joosten & Clarke, 2002 'Wise Use of Mires and Peatlands: Background and Principles including a Framework for Decision Making'

<sup>3</sup> As above

Carnivorous plants such as sundew and butterwort are scattered across the peatlands along with a range of other species such as the important peat-forming Sphagnum mosses, cotton grasses, deer grass, heather and bog asphodel. The rare marsh saxifrage and bog orchid can also be found at a few locations. Red deer and mountain hare can be seen throughout the peatlands and the bogs are home to lizards and adders.

On the steeper and higher ground, the bog habitat grades into wet heath and dry heath. Towards the summits of the higher hills, sub-alpine heath becomes visible, with wind clipped heather and an increase in the cover of species such as trailing azalea and the nationally scarce Arctic bearberry.

The rich insect life in turn helps to support a set of special bird species which particularly like breeding in peatland habitats. The bogs are famous for their striking wading birds, like the golden plover with its plaintive whistling call, and the greenshank with its strident alarm and spectacular song flight. The lochs of the peatlands are home to beautiful red- and black-throated divers, large and primitive fish-eating birds with tremendous powers of pursuit, aggressive territorial battles and eerie calls. Here you will also find ducks like common scoters - despite its name, this is a very rare species, with only a few pairs nesting in Britain and about half of these in the Flow Country.

The wide, open landscape of the peatlands is used by quietly quartering birds of prey and holds very important populations of rare species like hen harriers and short-eared owls. Herds of red deer are one of the greatest spectacles of the peatlands, especially in the autumn rut. This landscape of rivers, streams, pools and lochs also provides a perfect home for otters and water voles.

As is the case with bird populations elsewhere, the bird numbers on the peatlands are not static. Unfortunately, dunlin, golden plover, snipe and curlew are declining in number. Marked differences in population change have occurred for these species between the western and the eastern parts of the peatlands, with most species faring better in the west than the east. This may be due to differential changes in land use and/ or climate change.

Whilst some of the peatland birds spend all of the breeding season on the peatlands, others make use of areas either close by or further afield for feeding. Close by, the enclosed pasture or in-bye ground in some parts of the straths provides important feeding for peatland wading birds, particularly the golden plover and dunlin. On the north coast, the calmer sandy bays provide feeding for red throated divers, and greenshank make use of the bays, rivers and areas of saltmarsh. Once the all-important breeding season is over, many of the birds disperse to other parts of Caithness and Sutherland, the UK or beyond.

### 3.3 The landscape

Aside from its nature conservation interest, the landscape value of the area is much appreciated both nationally and in a Highland context. Much of the landscape of the interior of Sutherland and west Caithness is made up of sweeping moorland, slopes and hills, and flatter areas of peatland. The scale of the landscape is vast in UK terms and much of the area is remote. Although the peatlands have a long history of management, this has been mostly low intensity grazing of livestock and deer stalking, neither of which has left much evidence in the way of built development.

Such 'wild land' is a diminishing resource in Scotland but is very much part of the regional character of Caithness and Sutherland and the national identity of Scotland. It provides opportunities for people to experience solitude and closeness to nature and attracts people to the area.

The straths of Kildonan, Halladale and Naver that cut through to the interior of Sutherland and west Caithness are more populated, often supporting forestry, fragments of native woodland, and farming and crofting activity. By contrast the peatlands in the east of Caithness are surrounded by a more intimate landscape of mixed agriculture and forestry.

### 3.4 The historic environment

Across Caithness and Sutherland there is considerable evidence of prehistoric and historic settlement and farming, dating back at least 6,000 years. There is little evidence of hunter-gatherers using the land during the preceding 3–4 millennia but there is no doubt that they did so. Surviving upstanding elements include prehistoric dwellings and associated field systems, burial monuments, brochs, forts and duns, as well as small medieval/post-medieval tower houses, townships, extensive cultivated areas and shieling grounds. Nationally (and internationally) famous sites include the Camster Cairns, Dun Dornaigil and the Rosal pre-clearance township, as well as the archaeological landscape around Loch of Yarrows.

Increasing community interest in local heritage and the application of conditions linked to planning permissions have resulted in new survey work being undertaken across the region in areas where very little has been done in the past. From basic field survey and recording to 3D LiDAR landscape photography, there is an ever-expanding knowledge of details of the historic environment across Caithness and Sutherland.

Prehistoric and historic sites and areas are concentrated around the burns, rivers and lochs of the peatlands, some at considerable distances from the glens that are still populated today. Evidence of pre-peat-growth land uses and habitations will survive in places below and within the apparently ‘wild land’ of the 20th/21st centuries. The peat has developed due to a mix of natural processes, climate change and human interventions that have taken place since the last glacial ice melt, so it should be no surprise that the historic environment has been subsumed by changing natural habitats.

The peat itself can also hold important information on the past activities of humans and about past environments. Whilst most areas of peat are likely to have formed in response to a wet climate and poor drainage, there is evidence that in some places, peat formation has been influenced by tree removal. Research on the peat deposit suggests however that extensive areas of the Caithness and Sutherland landscape have been treeless for at least the last 4,000 years. Further research is needed on the relative significance of the influence of humans and the changing climate on peat formation and retention.

### 3.5 Water supply and flood management

Much of Caithness and Sutherland’s drinking water comes from upland catchments which are generally peat dominated. Healthy peatlands naturally provide high quality water, but where they have been damaged there are greater levels of dissolved organic carbon (DOC). This increases colour levels and is associated with increases in particulate levels. This can lead to increased water treatment costs associated with water quality standards.

The condition of peatlands also has implications for flood control. Undamaged peatlands store water and help to maintain steady flow rates in rivers which they feed. Where peatlands have been damaged by drainage, run off is quicker, which can cause flooding problems downstream. Restoration reduces this downstream flood risk.

### 3.6 Climate change - the carbon store

With growing concerns regarding climate change, the value of peatland as a massive carbon store (also termed a ‘sink’) is now recognised. Peatlands represent the single most important terrestrial carbon store in the UK. As peat is largely made up of the remains of plants, which are themselves made of carbon, it locks up large stores of carbon for thousands of years. This carbon would otherwise be released to the

atmosphere and contribute to global warming. By contrast forests only store carbon for the lifetime of the trees, although the use of timber products can extend this until they are destroyed or decay. The UK's peatlands provide a store of at least 3,000 million tonnes of carbon, which is ten times that stored by the biomass in the UK's forests<sup>4,5</sup>. In its entirety, the peatlands of Caithness and Sutherland stores an estimated 407 million tonnes of carbon, representing 25% of all Scotland's peatland carbon store<sup>6</sup>.

Disturbance of the peat surface, for example through drainage, burning or erosion, allows the peat to break down and carbon dioxide, a driver of climate change, is given off to the atmosphere and to watercourses. Restoration of damaged peatland reduces carbon dioxide emissions and enables peat to begin forming again, so that over time the balance will shift to one where more carbon is being laid down than emitted. The time taken for significant emission reductions will vary depending on the scale of damage and the level of restoration undertaken, and could be between a few years and a number of decades<sup>7</sup>.

### 3.7 Social and economic uses

The peatlands support and are shaped by farming and crofting, sporting management, forestry and conservation. They provide renewable power through many large wind farm developments, contributing towards the Government's 'net-zero' greenhouse gas emission targets. On a small scale they also provide local fuel. These activities provide valuable local employment and income. The peatlands also contribute to the local tourism industry, with many visitors coming to enjoy the wildlife, landscape and archaeology. Use of the area for recreation is at a relatively low intensity but is nevertheless significant. The 'wild land' character of peatlands as a whole also contributes to the international image of Scotland, including as part of the brand image for much of Scotland's food and drink.

### 3.8 Research and education

In recent years the peatlands have become a focus for research by universities and institutions from across the UK, complementing and collaborating with research work led out by members of the Partnership themselves (ERI, RSPB, FLS). This reflects the increasing recognition of the importance of the peatlands not only for their biodiversity, but also as a carbon store, and the need to understand more about their sensitivity to changes in land use and climate. It also reflects how the Flow Country holds a strong concentration of experience in peatland restoration and related monitoring, which is increasingly shared on a national and international basis and used to support decisions on national land use policy.

The recent Flows to the Future Project demonstrated the considerable scope to use the peatlands as an outdoor classroom across the curriculum, exploring its many values. Given its national and international significance, there is also considerable justification for the peatlands to be used remotely as a case study by schools and colleges who may never visit. The new Forsinard Field Centre, delivered by Flows to the Future, with classroom, accommodation and a laboratory, allows us to make a step change in our ability to host visiting students of all stages of education from primary to post-graduate.

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<sup>4</sup> Forest Research (2020) Forestry Statistics: 4: Carbon <https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2020/4-carbon/>

<sup>5</sup> [IUCN UK Peatlands Committee Briefing paper peatlands and climate change](#)

<sup>6</sup> Chapman S 'Flows to the Future Economic Impact Assessment Report', The James Hutton Institute

<sup>7</sup> Arts', R.R.E., Chapman, S.J., Donnelly, D. and Matthews, R.B. (revised in 2013) 'Potential Abatement from Peatland Restoration' Research Summary for Climatexchange, Scotland's centre of expertise connecting climate change research and policy

[https://www.climatexchange.org.uk/media/1616/potential\\_abatement\\_from\\_peatland\\_restoration.pdf](https://www.climatexchange.org.uk/media/1616/potential_abatement_from_peatland_restoration.pdf)

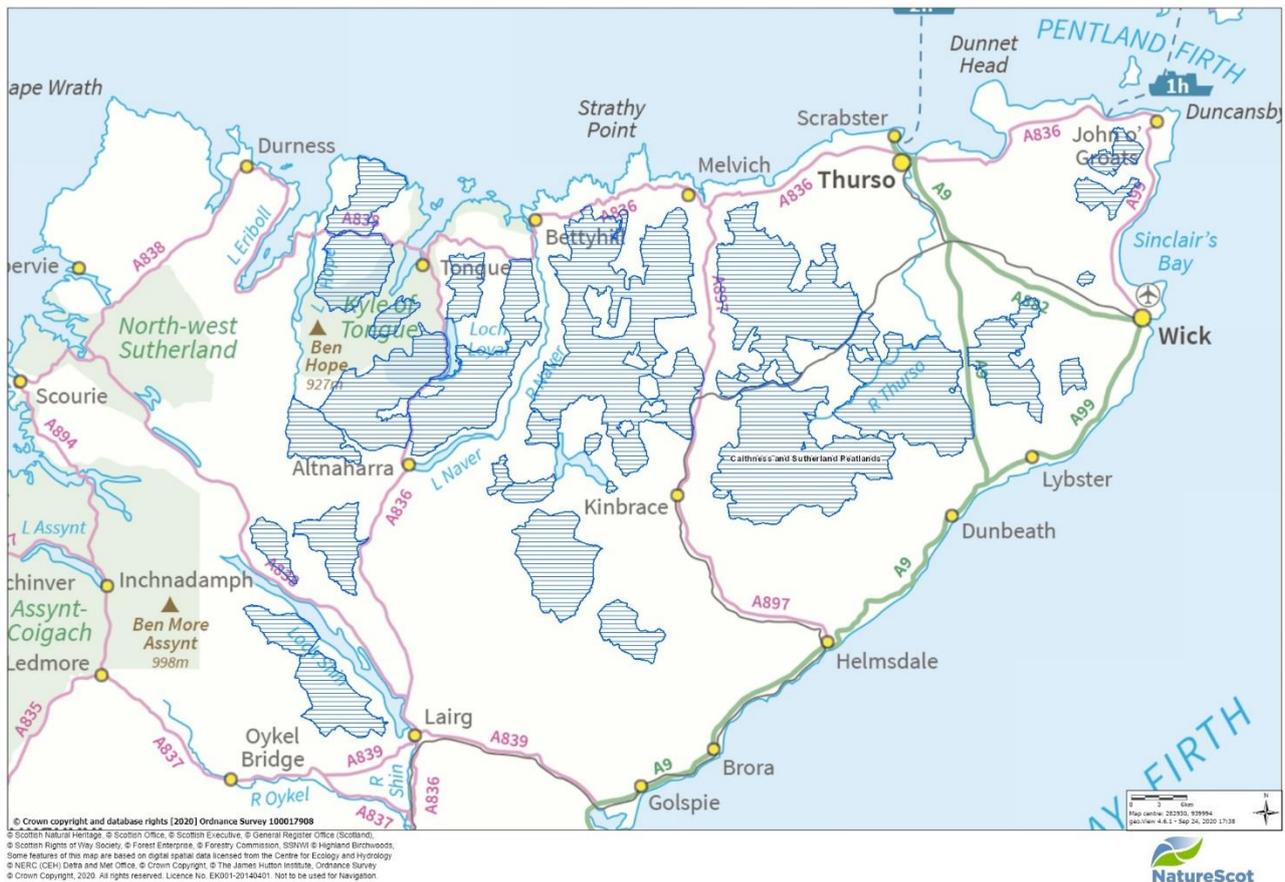
### 3.9 So many titles

In January 1988 the then Secretary of State for Scotland supported the protection of a large area (up to 175,000ha) of the peatlands through a substantial expansion of the SSSI network. During the 1990s, following detailed survey and assessment, almost 150,000 hectares of blanket bog and associated habitats were subsequently designated as Sites of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act (1981).

In 1999 all or part of 39 peatland SSSI (145,370ha), were classified as a Special Protection Area (SPA) under the EU's Birds Directive (79/409/EEC), on account of the populations of breeding waders, wildfowl and raptors (see Annex 1). The same area was also designated in the same year as a Wetland of International Importance, a worldwide accolade under the Ramsar Convention.

Active blanket bog is a priority habitat under the EU's Habitats Directive (92/43/EEC). An area encompassed by, but slightly smaller than the SPA (143,571ha), was designated on 17 March 2005 as a Special Area of Conservation (SAC) under this Directive (see map below). The SAC qualifies for designation on the basis of various habitats including blanket bog, wet heath, and certain types of lochs, as well as its other populations (see Annex 1 for full list). Conservation objectives for the SAC and SPA are given at Annex 2.

Caithness and Sutherland Peatlands SAC



Outside the area covered by the European designations is a considerable area of undesignated blanket bog, much of which is still of high nature conservation interest. These areas make an important contribution to the UK Government's wider responsibilities under the Habitats Directive, Birds Directive, Ramsar Convention and Scottish Biodiversity Programme and should be managed sympathetically.

The UK Biodiversity Action Plan (BAP) identified a series of habitats and species for which priority action was required, as part of the Government's contribution to the International Convention on Biological Diversity. Those present in and around the peatlands included blanket bog, upland heathland, upland birch

woodland, water vole and common scoter. In Scotland, this is being delivered through the Scottish Biodiversity Strategy. Local Biodiversity Action Plans (LBAPs) prepared for both Caithness and Sutherland in 2003 outlined how the Scottish Biodiversity Strategy would be implemented at a local level. They are overseen and promoted by two local Biodiversity Groups under the auspices of the Highland Environment Forum. More recently, the strategic issues from these plans were drawn together in the Highland Biodiversity Action Plan (currently under review). These non-statutory plans are the local manifestation of the Scottish Biodiversity Strategy, (see note below).

Several of the rivers in the peatlands are SACs, namely the Rivers Borgie, Naver and Thurso, on account of the populations of freshwater pearl mussels, Atlantic salmon or otters. Although the main focus of this Strategy is the peatlands, there is an intimate link between the management of the peatlands and the health of the rivers.

The Kyle of Tongue is a National Scenic Area (a national landscape designation). A number of other coastal and upland areas with peatland interest have been identified as Special Landscape Areas by The Highland Council. These are areas of regional importance for their scenic quality. Significant parts of the peatlands are included on the map of 'wild land' published by SNH in 2014<sup>8</sup>. Wild land areas are the most extensive areas of high wildness in Scotland. They are identified as nationally important in Scottish Planning Policy but are not a statutory designation.

Within the area there are numerous Scheduled Monuments and Listed Buildings, which are national historic environment designations.

In 1999 the central area of the Caithness and Sutherland peatlands was placed on the UK Government's 'tentative list' of sites for nomination as World Heritage Sites (see chapter 6 below). In July 2020, the Peatlands Partnership received approval from the UK Government to prepare a nomination bid to UNESCO for the inscription of The Flow Country as a World Heritage Site. If it is inscribed by UNESCO, it would be in recognition of the peatlands outstanding natural importance as one of the largest and most intact areas of blanket bog in the world. There are currently only six sites in Scotland with this prestigious title, and of these only one (St Kilda) holds the title in respect of its natural as well as cultural attributes.

#### Note on Scottish Biodiversity, Climate Change and Peatland ACTION

The first Scottish Biodiversity Strategy focused very much on the biodiversity benefits of peatlands, whereas the 2013 supplement, entitled '2020 Challenge for Scotland's Biodiversity', looks more at the carbon storage benefits of peatland and reflected a shift towards valuing the wider services provided by habitats and species. More recently, 'Scotland's Biodiversity: A Route Map to 2020 – Third Progress Report 2016-2019'<sup>9</sup> recorded peatland restoration progress across Scotland and stated that Flow Country restoration was on track to establish an international benchmark for good practice.

The State of Nature Scotland 2019<sup>10</sup> report draws on the best available data from over 70 wildlife organisations and Government agencies to present the clearest picture to date of the status of species across Scotland. The report states that the abundance and distribution of Scotland's species have on average declined over recent decades and there has been no let-up in the net loss of nature in Scotland. It cites peatland restoration and coastal resilience projects as excellent examples of working to improve nature and stem climate heating, and identifies the Flows of Caithness and Sutherland as an area where

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<sup>8</sup> <https://www.nature.scot/wild-land-2014-maps>

<sup>9</sup> SNH & The Scottish Government (2018) 'Scotland's Biodiversity: A Route Map to 2020 – Third Progress Report 2016-2019' <https://www.nature.scot/biodiversity-route-map-2020-3rd-year-report-2017-2019>

<sup>10</sup> State of Nature Partnership (2019) 'State of Nature Report Scotland 2019' <https://www.nature.scot/state-nature-scotland-report-2019>

major efforts in recent decades have resulted in significant positive progress to reversing historic degradation of peatland habitats.

The Scottish Biodiversity Programme is co-led by Scottish Government and NatureScot. It was created to oversee and coordinate all current and planned activity on biodiversity, to secure a common understanding on priorities and an agreed approach to delivering them. The Programme overview<sup>11</sup> states:

‘The link between biodiversity and climate change is now well established and well understood, both in terms of impact and of joined-up, nature based and nature rich solutions. Scottish Ministers have stated that the challenges facing biodiversity loss are as important as the challenge of combatting climate change. Recent publications such as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) “Global Assessment on Biodiversity and Ecosystems” (2019), the “Net Zero – The UK’s contribution to stopping global warming report” (2019), and the “State of Nature Scotland report” (2019) clearly identify investment in nature and the restoration of natural resources such as peatlands as a significant contributor to climate change and biodiversity improvements, and to people’s wellbeing. These reports underpin new commitments by SG and have highlighted the need to mainstream biodiversity across SG, public bodies, and our wider society. They have also led to increased collaboration with the climate change portfolio, and increased awareness of the impacts of biodiversity loss among stakeholders, business and the general public.’

The Scottish Government’s Biodiversity Statement of Intent<sup>12</sup>, launched on the 14 December 2020, sets the direction for a new biodiversity strategy which will respond to the increased urgency for action to tackle the twin challenges of biodiversity loss and climate change. The statement confirms continuity, and enhancement where possible, of delivery under the existing biodiversity strategy until it is replaced 12 months after the Conference of Parties (CoP) 15 meeting has agreed the Global Biodiversity Framework.

In February 2020, the Scottish Government announced a substantial multi-annual investment in peatland restoration of more than £250 million over the next ten years<sup>13</sup>. This is in recognition of the fact that restoring peatlands is one of the most effective ways of locking in carbon, offering a clear nature-based solution to the climate crisis. This will be delivered through the Peatland ACTION Project, which has supported over 25,000 hectares of restoration since 2012. The Project is led by NatureScot in partnership with Forestry and Land Scotland and the National Parks, and further guidance on peatland restoration and accessing the fund is available on their website<sup>14</sup>.

The Scottish Government’s ‘Update to the Climate Change Plan 2018-2032, Securing a Green Recovery on a Path to Net Zero’ (published in December 2020<sup>15</sup>) strengthened its earlier commitment ‘To deliver on the 2032 emissions reduction envelope annual peatland restoration needs to be far higher than the current 20,000 hectare annual target and we will work closely with delivery partners, land owners, managers, farmers and crofters to continue to encourage more restoration of peatland, both traditional bog but also land that offers the highest emission savings per hectare.’ It continues ‘The prioritisation of these “nature-based solutions” and restoration projects will deliver multiple benefits, not only in terms of carbon sequestration, but also enhanced biodiversity, improved air and water quality, and landscapes and ecosystems that are more resilient to climate change.’

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<sup>11</sup> SNH (2020) ‘Scottish Biodiversity Programme - overview’ [https://www.nature.scot/sites/default/files/2020-01/Scottish%20Biodiversity%20Programme%20-%20overview\\_1.pdf](https://www.nature.scot/sites/default/files/2020-01/Scottish%20Biodiversity%20Programme%20-%20overview_1.pdf)

<sup>12</sup> [Scottish biodiversity strategy post-2020: statement of intent - gov.scot \(www.gov.scot\)](https://www.gov.scot/publications/budget-statement-2020-21/)

<sup>13</sup> <https://www.gov.scot/publications/budget-statement-2020-21/>

<sup>14</sup> <https://www.nature.scot/climate-change/nature-based-solutions/peatland-action>

<sup>15</sup> <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/>

## CHAPTER 4: SUSTAINABLE LAND MANAGEMENT IN AND AROUND THE PEATLANDS

This chapter reviews current and historical land management in and around the peatlands, identifies the main impacts on and benefits to the nature conservation interest, and provides an update on progress made since the original Management Strategy was published in 2005.

Key issues and concerns are listed at the start of the chapter, and the priorities for action are suggested at the end. These and other actions are further developed in the Action Plan in Part Two of this document (Table 1.2).

**Objective 1: To promote and carry out sustainable land management that maintains and enhances the nationally and internationally important areas of peatland, the associated habitats and species and the wide range of services they provide.**

### 4.1 Key issues

- The condition of the blanket bog across a small proportion of the SAC remains 'unfavourable' for a number of reasons including forestry edge effects, conifer regeneration, drainage, grazing, trampling and wildfire damage. There is insufficient information on the condition of the peatlands out-with designated sites, but there are localised areas of damage.
- In some areas, forests are having a detrimental impact on underlying and adjacent peatland habitats and species, features associated with the historic environment, and on the carbon stored in the peat.
- In some areas, non-native conifers are regenerating onto adjacent areas of open peatland, and this is exacerbated by climate change.
- Funding is available for tree removal and peatland restoration through the Peatland ACTION Fund, but uptake from private estates has been limited.
- There is a lack of resource and willingness to support ongoing management and maintenance of restoration areas in the longer term, such as regeneration control and drain blocking in areas where trees have been removed.
- Native woodlands are scarce and often heavily grazed, although there is funding and assistance available to promote woodland expansion and creation in the right locations in and around the peatlands.
- Agri-environment schemes have been a positive tool but the options for peatland and associated species are limited and for various reasons including uncertainties of future schemes and difficulties in accessing them, uptake in the peatlands has been low.
- In-bye fields in key areas need to be actively managed to be suitable for peatland waders, however there is insufficient information on both the fields and how birds are using them.
- Where land is under the management of common grazings committees, agreement from multiple crofters is needed to make changes, and this can be difficult and time consuming.
- Our collective understanding of the impact of deer on vegetation, habitats and species is incomplete, but such data is very useful to feed into deer management planning decisions.
- Fencing to exclude deer from new forestry planting or agricultural areas may affect grazing and trampling levels of adjacent areas, as well as having deer welfare implications.
- Many historical drains are still active and eroding peatland areas, funding is available through Peatland ACTION to block them but uptake from private estates has been limited.
- Climatic extremes will influence water levels and temperatures in peatland rivers, burns, pools and lochs, which will impact on invertebrates including freshwater pearl mussels and nesting habitat for waders, divers and ducks.

- Future invasion by invasive non-native species such as Canada geese, American mink, pike and minnows could impact on waders, divers and ducks.
- Wildfires can damage sensitive peatland habitats and destroy paleo-environmental and archaeological data, and are an increasing concern as climate change is leading to increased risk of climatic extremes.
- All-terrain vehicles and quad bikes can cause damage to sensitive peatland habitats.
- The restoration of redundant tracks could have habitat benefits, but there is insufficient knowledge on the technical and legal aspects.

## 4.2 The condition of the open peatlands

The condition of the 39 component SSSIs that comprise the Special Protection Area and Special Area of Conservation (the Natura site) is regularly monitored by NatureScot. The most recent collation of site condition monitoring results (2017) assessed the blanket bog feature of the Natura site as ‘unfavourable – no change’. NatureScot estimates that the majority of the designated areas are in ‘favourable condition’, with the ‘unfavourable’ areas being confined to some 20% of the area of 20% of the component SSSIs. Forest edge effects and the spread of conifer regeneration continue to affect some of these areas, and active hill drains remain widespread. Concentrations of red deer have damaged the vegetation by trampling in some areas, whilst other places have been damaged by large, uncontrolled fires<sup>16</sup>.

All work to improve the condition and functioning of blanket bog habitats will also improve their resilience to climate change and reduce the impacts of extreme events such as flooding and wildfires using nature-based solutions.

Following the designation of the Caithness & Sutherland Peatlands SPA in 1999, monitoring work showed that the populations of a number of the bird species had declined within some of the component SSSIs, and golden plover and black-throated diver had declined across the entire SPA site so that they fell below what is deemed to be ‘favourable’ condition. The 2015 site condition monitoring of dunlin, golden plover and greenshank showed that there were increases in mean density for all three species since 2009, but a decline for golden plover since the mid-1990s. All three species of wader and black-throated divers were considered to have returned to favourable condition in 2015, but forestry plantations are still identified as a negative pressure on golden plover and dunlin (see below).

Research has provided evidence that dunlin and golden plover are likely to have been adversely affected by afforestation, as they avoid breeding in proximity to mature forest edges<sup>17</sup>; furthermore, dunlin declines are more pronounced near forestry<sup>18</sup>. A plausible mechanism for this pattern is the greater activity-abundance of predatory mammals in and around forestry plantations compared to intact bog, which can be reversed in the long term by forest-to-bog restoration<sup>19</sup>.

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<sup>16</sup> Source: SNH Site Condition Monitoring

<sup>17</sup> Wilson et al (2014) ‘Modelling edge effects of mature forest plantations on peatland waders informs landscape-scale conservation’, *Journal of Applied Ecology* 2014, 51, 204–213, <https://besjournals.onlinelibrary.wiley.com/doi/pdf/10.1111/1365-2664.12173>

<sup>18</sup> Hancock et al (2009) ‘Associations between distance to forest and spatial and temporal variation in abundance of key peatland breeding bird species’, *Bird Study*, 56:1, 53-64, <https://www.tandfonline.com/doi/full/10.1080/00063650802648176>

<sup>19</sup> Hancock et al (2020) ‘Guild-level responses by mammalian predators to afforestation and subsequent restoration in a formerly treeless peatland landscape’, *Restoration Ecology*, <https://onlinelibrary.wiley.com/doi/abs/10.1111/rec.13167>

## 4.3 Forests and woodlands in and around the peatlands

Objective 1 cannot be delivered effectively without consideration of the management of forests and woodlands in and around the peatlands. This is in part because this Strategy is seeking to promote management on a landscape scale, and peatlands and woodlands share this same landscape. It is also in part because there is a legacy of large areas of non-native conifers which are having a detrimental impact on underlying peatland and in some cases on adjacent peatland habitats and species. Scottish Government has policies which seek both to restore peatland and to maintain and extend forest and woodland cover across Scotland as a whole. These policies are being applied within the context of this peatland being of national importance.

Many of the conifer forests are now coming to maturity and owners are reviewing management options and beginning felling operations. Some 2 million tonnes of timber are forecast to be produced from the Flow Country over the next 10-15 years. This provides a significant opportunity to increase the local economic and community benefits from forestry and contribute to the green recovery. The public road network is fragile and so haulage is limited to certain agreed routes and tonnage limits. The Highland Timber Transport Group has been working over a number of years to explore options and attract investment in infrastructure to enable these large volumes to reach the market and to minimise impacts on the public road network. Rail haulage has been trialled and is now being looked at again. Felling operations need to be considered and approved by Scottish Forestry. This is usually done through a forest plan which sets out the forest management for the next 20 years. These plans are subject to scoping and consultation, which provide the mechanism to discuss and agree the approach to felling, replanting and peatland restoration.

The location, type and extent of forestry within Caithness and Sutherland is changing to enable restoration of sensitive peatlands. Since 2014, 3,965ha of forest have been removed on public and private land to restore peatlands and address edge effects, with a further 2,300ha approved for clearance over the next ten years. Another significant driver that is reducing forest cover in parts of Caithness and Sutherland is the development of wind farms, which can provide support for woodland removal, peatland restoration and ongoing management over longer timeframes (25-30 years). As per the Scottish Government's woodland removal policy, clearance of forestry will now usually result in a requirement for compensatory planting elsewhere in Highland. Care is needed to ensure that compensatory planting proposals do not threaten existing wildlife and peatland habitats.

The remaining native woodlands in and around the peatlands are scarce and often heavily grazed. Local and national policies seek to expand and improve the condition of native woodlands. Much has been done across Caithness and Sutherland but there is considerable scope to do more along the Straths and around the peatlands.

### The impacts of forests on the peatlands

In the 1970s and 1980s some plantations were established on peatland of similar quality to that subsequently designated as SSSI, leading to a direct loss of blanket bog and associated habitats. Therefore, in some areas, forests are having a detrimental impact on underlying and adjacent peatland habitats and species, and on the carbon stored in the peat. In some places non-native trees are also regenerating from these forests onto adjacent areas of open peatland, which will cause damage. Regeneration occurs across land ownerships and co-ordination is needed to ensure the resulting trees are removed as soon as possible, so that both damage and costs can be minimised.

The effect of forests on neighbouring peatlands has been assessed and the edge effect in the Flow Country set out in a paper in 2014<sup>20</sup>. This showed that some forests were having negative effects on golden plover and dunlin breeding densities, and also on the hydrology of adjacent open blanket bog. When conifer forests are established on peatland, the water level in the peat is lowered through drainage works, water extraction by tree roots and through the interception of rain and snow by growing trees. This causes the peat under and adjacent to the trees to dry out and subside. Research showed a drying effect of first rotation forestry on adjacent blanket bog at a distance of up to 40m, extending up to 100m in subsequent rotations. The effects on golden plover and dunlin are strongest within 800m of the forest edge, with the most sensitive areas being where the habitat is flat and with pool systems. The factors which are causing the avoidance of forest edges by some species are likely to include increased predation (by for example hooded crows and foxes living in the forest), avoidance by birds of tall structures (to allow views of predators), and changes to habitat management (e.g. reduced burning adjacent to forests or increased trampling by deer by forest edges).

Research is also ongoing looking at the balance of losses and gains of stored carbon and the movement (flux) of gases that are significant in climate change (greenhouse gases) both from growing trees on peatland and from restoring previously afforested peatland. Data from a site at Cross Lochs was published in 2015<sup>21</sup>, providing the first peer-reviewed evidence that the unmanaged Forsinard blanket bog is still actively sequestering carbon. Drainage and cultivation of peatland for afforestation result in the loss of soil organic carbon. In drawing up a 'scorecard' of losses and gains, account also has to be taken of the accumulation of carbon in the growing trees, harvesting and the end use of timber.

### Future management of forests in Caithness and Sutherland

In light of the understanding we now have of the significance of the peatlands of Caithness and Sutherland both for biodiversity and as a carbon store, there has been a shift away from forestry in the core peatland area. In accordance with the Highland Forest and Woodland Strategy<sup>22</sup>, the focus for productive woodlands in Caithness and Sutherland is now away from the peatlands. There is a presumption against new planting on many peatland soils, particularly where peat depth is greater than 50cm, where there may be net negative environmental impacts of planting in terms of greenhouse gas emissions. Planting design should also ensure long-term protection of deep peat areas. The Forests and Peatland Habitats Guidance Note<sup>23</sup> sets out forestry policy and practice in relation to peatland habitats and indicates how Scottish Forestry will evaluate proposals for replanting or expanding woodland or for restoration of peatland habitats from woodland.

Restocking is not appropriate where the forestry is identified as having a significant impact on the Natura site, as described in Scottish Forestry's guidance to forest managers<sup>24</sup>. Restocking is also not required where a site is a priority for peatland restoration or where the future growth is likely to be insufficient to cover greenhouse gas losses from the soil. This is based on research on the balance between carbon emissions and the laying down of carbon by growing trees or by active peat. There may also be cases where the areas identified as suitable for restocking are too small to be viable as a forest and where a return to a more open peatland landscape would be more appropriate.

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<sup>20</sup> Wilson, JD et al (2014) 'Modelling edge effects of mature forest plantations on peatland waders informs landscape-scale conservation' <https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.12173>

<sup>21</sup> Levy, PE & Graty, A (2015) 'Greenhouse gas balance of a semi-natural peatbog in northern Scotland'. Environmental Research Letters, 10(9), 094019 <http://nora.nerc.ac.uk/id/eprint/511853/1/N511853JA.pdf>

<sup>22</sup> The Highland Council (2018) 'Highland Forest and Woodland Strategy' <https://www.highland.gov.uk/downloads/file/891/highland-forest-and-woodland-strategy>

<sup>23</sup> Forestry Commission (2000) 'Forests and Peatland Habitats; Guideline Note' <https://www.forestresearch.gov.uk/research/forests-and-peatland-habitats/>

<sup>24</sup> Forestry Commission Scotland (2015) 'Guidance to Forest Managers preparing Forest Plans within the Caithness & Sutherland Peatlands SAC/SPA' <https://forestry.gov.scot/publications/3-guidance-to-forest-managers-preparing-forest-plans-within-the-caithness-and-sutherland-peatlands-sac-spa>

There may be areas of mineral ground or shallow peat where it is appropriate to plant new areas of woodland, particularly where these bring multiple benefits. For example, increasing the amount of riparian woodland in the peatlands would not only achieve biodiversity benefits but also support fisheries interests by reducing water temperatures which would otherwise rise with climate change and reduce suitability of spawning areas.

### Restoration of afforested areas to blanket bog and wet heath habitats

The first phase of restoration work was in the 1990s. Since then, techniques have been refined and developed, and it is now recognised that removing felled trees and leaving as little tree material as possible on site will lead to a speedier recovery. In wetter areas where growth has been poorer and tree size and density is much lower, trees are mulched (shredded) on site. Once trees have been removed or mulched, the main drains need to be blocked to enable the water table to rise again. The time taken for deforested sites to recover to blanket bog or wet heath vegetation will vary greatly depending on site history, conditions and techniques used.

The restoration works carried out under the Flows to the Future Project (2014-2019) removed 837.4ha of non-native trees from deep peat areas and cleared a further 564ha of regenerating non-native conifers. Forestry furrows and drains were blocked in over 1,747ha. In total, the Project carried out surveys, prepared management guidance and submitted funding applications for land managers across almost 75,000ha (19%) of the Flow Country. This work will continue with Scottish Government funding through the Peatland ACTION scheme, which is managed by NatureScot and Forestry & Land Scotland.

SSE Renewables are committed to addressing the issue of inappropriately planted conifers on their sites. To date, 520ha has been felled at their Strathy North wind farm, with a further 141ha to be felled by 2026. Their consent at Strathy South includes a commitment to restore and manage more than 2,500ha of peatland on and off site. The removal of the entire conifer plantation (1,133ha) within the site boundary, will remove indirect impacts of the forestry on the Caithness and Sutherland Peatland SPA/SAC, and allow the restoration of peatland on site.

There is a shortage of contractors with experience of peatland restoration work nationally, but in Caithness & Sutherland the Peatland ACTION Project has been working to bring on board and upskill new contractors with several training events undertaken in recent years, with good uptake. The Project has also been working with Scottish Government to amend the funding model to allow for greater flexibility in terms of the timing of works, which will reduce bottlenecks in contractor capacity and maximise restoration completed on the ground.

Restoration secures the underlying peat and carbon deposit and reduces ongoing losses associated with disturbances. The re-initiation of carbon storage and peat formation are much longer-term processes which rely on the successful re-establishment of peat forming conditions and suitable climate. The reduction in carbon emissions compared with a damaged peatland is a 'gain' (termed 'avoided loss' by the IUCN). The net reduction in carbon emissions varies according to site characteristics and methods used. However, there is now published evidence that forest to bog restoration brings back net carbon sequestration within 16 years when older techniques (felling to waste) are assessed. Novel techniques that involve whole tree harvest and furrow blocking may lead to faster recovery. There are still uncertainties in the actual emissions, and the most up to date inventory is the one provided by Evans et al (2017) 'Implementation of

an emission inventory for UK peatlands<sup>25</sup>. ClimateXChange<sup>26</sup> has issued a policy briefing explaining the climate benefits of forest to bog restoration and the current knowledge gaps<sup>27</sup>, and further research is available, e.g. Hambley et al (2019) 'Net ecosystem exchange from two formerly afforested peatlands undergoing restoration in The Flow Country of northern Scotland'<sup>28</sup>. Recent research from satellite data suggests that in some forest to bog areas, plant productivity returns to near natural levels within five years<sup>29</sup>.

There are some concerns that when peatlands are in the early stages of restoration, they emit more methane, a highly potent greenhouse gas. There is evidence however that these emissions are outweighed by the reductions in carbon dioxide emissions following restoration. No evidence has been found of methane spikes in forest to bog restoration in the Flow Country so far, but further research will continue to develop our understanding of whether any features in near-natural sites (e.g. pools) or whether specific intervention (e.g. drain-blocking) might be associated with methane 'hot spots'. Similarly, given the significance of emissions associated with wildfires, further research should aim to improve our understanding of the conditions under which fire resilience is increased and carbon emissions minimised.

It is recognised that afforestation during the later 20th century caused damage or destruction of archaeological sites and palaeo-environmental data, by the physical processes of building access routes, insertion of drainage and ploughing. It is assumed that in many instances the re-establishment of the peatlands will prove beneficial to any surviving sub-surface deposits within areas affected by land use changes. However, where historic environment features have survived, peatland restoration and management need to be undertaken in an appropriate, integrated way.

Monitoring and evaluation work is being undertaken on all the restoration techniques being used on the RSPB Forsinard Flows Reserve, as well as on Forestry & Land Scotland holdings and wind farm sites.

## 4.4 Agriculture

Away from the more fertile land in the east of Caithness, the majority of the agricultural land in the peatlands is given over to rough grazing, with improved in-bye ground restricted to parts of the coast and the straths. Very little land is now under crops, with sheep dominating and only limited cattle numbers. Crofting tenure predominates in the north and west, coexisting with large sporting estates. Recent years have seen a reduction in the number of active crofters, with a few crofters running a large number of holdings in some areas.

The EU's Common Agricultural Policy (CAP) underwent a series of reforms and a new CAP was introduced in 2014. The 'Basic Payments' part of this (Pillar 1) was paid on an area basis, with much of the peatlands

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<sup>25</sup> Evans et al (2017) 'Implementation of an emission inventory for UK peatlands'. Report to the Department for Business, Energy and Industrial Strategy, Centre for Ecology and Hydrology. [https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1904111135\\_UK\\_peatland\\_GHG\\_emissions.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1904111135_UK_peatland_GHG_emissions.pdf)

<sup>26</sup> ClimateXChange is Scotland's Centre of Expertise on Climate Change, providing independent advice, research and analysis to support the Scottish Government as it develops and implements policies on adapting to the changing climate and the transition to a low carbon society

<sup>27</sup> Hermans et al (2017) 'Climate benefits of forest-to-bog restoration on deep peat – policy briefing' <https://www.climateexchange.org.uk/media/3654/climate-benefits-of-forest-to-bog-restoration-on-deep-peat.pdf>

<sup>28</sup> Hambley et al (2019) 'Net ecosystem exchange from two formerly afforested peatlands undergoing restoration in The Flow Country of northern Scotland' [in special issue: The Flow Country peatlands of Scotland] *Mires and Peat*, 23, 05. 14, pp <http://nora.nerc.ac.uk/id/eprint/522756/>

<sup>29</sup> Lees et al (2019) 'A model of gross primary productivity based on satellite data suggests formerly afforested peatlands undergoing restoration regain full photosynthesis capacity after five to ten years'. [https://www.sciencedirect.com/science/article/pii/S0301479719303421?casa\\_token=j\\_pw8SUjiv8AAAAA:7ENXOpCw\\_uXN9ZhrbysAtwR\\_BQbxVxfvhCsCE1tiautflA7dbC\\_kxGN\\_Px8nXiTkn3xAddG7Eak](https://www.sciencedirect.com/science/article/pii/S0301479719303421?casa_token=j_pw8SUjiv8AAAAA:7ENXOpCw_uXN9ZhrbysAtwR_BQbxVxfvhCsCE1tiautflA7dbC_kxGN_Px8nXiTkn3xAddG7Eak)

within Caithness and Sutherland falling within 'Payment Region 3' which tended to be the poorest land with the lowest stocking densities. For farm businesses dependent on this type of land, the new CAP introduced a voluntary sheep support scheme which aimed to stop the decline in sheep numbers in these areas. There were concerns that the new support scheme would encourage an increase in sheep numbers, which had been declining across the area since the shift from a headage to an area-based payment in 2005. This has not happened, but things may change now that we left the European Union.

Rural development (Pillar 2 of the CAP) was delivered through the Scottish Rural Development Programme (SRDP). The main priorities were enhancing the rural economy, supporting agricultural and forestry businesses, protecting and improving the natural environment, addressing the impact of climate change and supporting rural communities. Within SRDP, funding is available through the Agri-Environment Climate Scheme (AECS) for land management practices which protect and enhance natural heritage, improve water quality, manage flood risk and mitigate and adapt to climate change. This includes options for the peatlands and uplands, and is delivered jointly by the Rural Payments & Inspections Division (RPID) of Scottish Government and NatureScot.

A future round of AECS is anticipated in 2021 covering the period 2021-2024, although this will be similar to the last scheme and there will be no new options. There may be scope to introduce new options to benefit peatland species in any new scheme post 2024<sup>30</sup>.

### Management of neighbouring farm and croft land

In-bye ground (defined as part of the farm or croft bounded by a fence, dyke or hedge which is used for arable or grassland production and not hill or rough grazings<sup>31</sup>) can play an important role in supporting many of the birds that live on the peatlands. Species making use of farmland close to the peatlands include dunlin, golden plover, snipe, curlew, hen harrier, short-eared owl, merlin, greylag goose and lapwing. Active management is needed to ensure the conditions are right to provide plenty of food and, for some species, nesting sites. Some fields are known to be particularly important for golden plover and dunlin, with birds travelling considerable distances over seemingly similar fields to reach favoured fields to feed, although knowledge of the reasons for this is incomplete.

No formal assessment has been made of the extent or condition of in-bye grassland, but much is known not to be grazed or actively managed in recent years. Current stocking levels, policies, support schemes and management have led to a situation where in-bye is often in poor condition for biodiversity in general, and for peatland birds in particular. In-bye needs to be actively managed to maximise the biodiversity benefits, with for example control of rushes, soil aeration and suitable grazing densities. Although there are no specific prescriptions under AECS for golden plover and dunlin, there are management options for other waders and support for rush control, creating wet areas and small arable areas, and for cattle grazing.

The 'wader grazed grassland' option has been popular, but this is targeted at the grasslands most suitable for breeding farmland waders, so some areas of peatland in-bye were excluded, and it didn't really benefit golden plover or dunlin. 'Small scale rush management' and 'creation of wader scrapes' have also had reasonable uptake. Rush control will have improved some fields for golden plover and dunlin, but again this is aimed at breeding waders. As mentioned above, any new AECS scheme which is in place from 2021 to 2024 will not have new options, however there may be scope to introduce new options for golden plover and dunlin into a future scheme post 2024, and the Flow Country Partnership could make a case for this.

Plantlife Scotland have a new AECS agreement for their reserve at Munsary in Caithness, and are continuing to graze the in-bye fields with cattle to improve the habitat for golden plover and dunlin as well as farmland

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<sup>30</sup> James Plowman, NatureScot, pers. comm.

<sup>31</sup> Scottish Government (2011) 'Definitions of Land Types' in Scottish Rural Development Programme 2014-2020 <https://www.gov.scot/policies/agriculture-payments/scottish-rural-development-programme-srdp/>

waders and to improve species diversity. RSPB are currently undertaking further work to improve the in-bye fields at Forsinain Farm for waders. The Caithness Wetland and Wildlife Initiative<sup>32</sup>, a partnership between RSPB, Scotland's Rural College and the Bumblebee Conservation Trust, and supported by the National Farmers Union Scotland, was launched in 2013 to promote positive management for waders across the County. The Working For Waders<sup>33</sup> Project started in 2017 to tackle the decline of wading birds across Scotland, and is supported by a wide range of charities, organisations and individuals, from farmers and conservationists to gamekeepers and birdwatchers.

Discussions are ongoing as to the best areas to plant trees on farm and croft land, to create much needed native woodland without damaging important wader sites.

Much of the hill or rough grazings croft land on the margins of the peatlands is managed by common grazings committees. Agreement from multiple crofters is needed to make changes; this can be difficult and time-consuming.

## 4.5 Deer and game management

Much of the open ground in the peatlands is managed for sport, with a significant proportion being in the ownership of a small number of large estates. Deer management is undertaken by individual landowners, coordinated by the Deer Management Groups (DMGs). There was a rise in deer numbers from the 1960s to the 1980s. Then, the traditional deer range was reduced with the widespread afforestation of the 1970s and 1980s, which affected deer densities and movements. Some estates have made significant efforts to reduce deer numbers, but densities remain high over much of the area.

Over the last ten years there has been much closer working between land managers, public bodies and conservation organisations at a national level to promote and deliver sustainable deer management for a range of benefits including healthy ecosystems. This was expressed as a vision, with priorities for future work, in the 2014 policy document 'Scotland's Wild Deer, a National Approach including 2015-2020 priorities'<sup>34</sup>. There have also been changes to deer legislation giving stronger regulatory powers to NatureScot, a new code of practice and a new series of best practice guidance notes.

The Code of Practice on Deer Management<sup>35</sup> came into effect in 2012 as a result of changes in deer legislation included within the Wildlife and Natural Environment (Scotland) Act 2011<sup>36</sup>. This puts responsibilities on all land managers to manage deer responsibly and to produce Deer Management Plans.

The Northern Deer Management Group (NDMG) contains the largest part of the Flow Country, covering some 150,000 hectares in five sub-groups which reflect the main deer movements. There are also DMGs in North West and East Sutherland, and all three groups manage their deer in accordance with agreed Deer Management Plans. Concerns include changing numbers and distributions of deer within the area as a whole, in particular falling numbers of stags coupled with increasing numbers of hinds, and the associated habitat impacts and potential conflict with other land uses (e.g. conservation, grouse) that this may bring. Changes in forest management including felling for commercial or peatland restoration reasons have

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<sup>32</sup> <https://www.rspb.org.uk/our-work/conservation/projects/caithness-wetlands-and-waders-initiative/#:~:text=and%20waders%20initiative-,Caithness%20wetlands%20and%20waders%20initiative,and%20the%20great%20yellow%20bumblebee.>

<sup>33</sup> <https://www.workingforwaders.com/>

<sup>34</sup> Scottish Government (2014) 'Scotland's Wild Deer: a national approach including 2015-2020 priorities' <https://www.nature.scot/scotlands-wild-deer-national-approach-2015-2020-priorities>

<sup>35</sup> Scottish Natural Heritage (2011) 'Code of Practice on Deer Management' <https://www.nature.scot/code-practice-deer-management>

<sup>36</sup> <https://www.legislation.gov.uk/asp/2011/6/contents>

impacted on the resources available to deer, as have the development of a number of extensive windfarms within the NDMG area.

The Deer Management Group is a forum for Government agencies, conservation organisations and land managers to discuss and address issues such as overgrazing and trampling, supported by habitat condition monitoring and information on deer numbers collected by NatureScot and individual estates at a sub-group level. It is also a means of members collectively addressing concerns such as a shortage of mature stags across the area. In addition, there is now a recognition that DMGs need to engage wider community interests in their work<sup>37</sup> and deliver public benefits such as contributing to non-protected countryside being in good condition. This wider engagement is particularly important here in the peatlands, due not only to their national and international importance, but also to the ongoing efforts to promote wider awareness and understanding of the land and its management, and to encourage more visitors. Closer links between land managers and the surrounding communities would deliver benefits for the area.

Erection of fences without reference to deer movements is a cumulative issue in the area in relation to smaller scale woodland planting. Such planting also tends to be on better ground, which is therefore removing good feeding areas (see also deer issues under forestry section above).

Parts of the drier moorland in the east of the peatlands are managed for grouse, although this is restricted in extent and in recent years, hampered by reductions in grouse numbers. This may be due to a range of factors including changes in land use, burning practice and gamekeeper activity, poor weather in some years, heather beetle attacks, and the presence of a significant tick problem in some areas.

There is no evidence from the limited study to date that ticks have a significant effect on other moorland birds, although they frequently carry obvious tick loadings. There have been various studies on ticks and peatland restoration in recent years. Felling conifer forest to restore peatlands could produce a dramatic decline in tick abundance, with implications for disease risk<sup>38</sup>.

Many land managers are concerned about loss of heather cover across the area, as heather provides feeding for both deer and grouse. The causes of this are not known but contributory factors can be high grazing and trampling levels by deer and sheep, and poor burning practice. Attacks of heather beetle are also a significant factor. Management guidance to reduce the risk of heather beetle attack is to carry out muirburn in accordance with the Muirburn Code. Well-managed heather is not as badly affected by heather beetle and young heather is likely to recover more rapidly from an attack. However, studies undertaken by The Heather Trust found no evidence that either burning or cutting of the heather is necessary to re-establish heather after a beetle attack, and that care should be taken to avoid further damage by trampling or overgrazing as the heather plants are often weakened<sup>39</sup>.

## 4.6 Management issues

### Grazing and trampling

Due to slow vegetation growth and poor nutritional quality, blanket bogs can only support low densities of grazing animals. Sheep and/or red deer graze most of the designated peatlands, with the impacts of the two being difficult to distinguish. Sheep numbers have reduced over the past 15 years due to economics, an

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<sup>37</sup> [http://www.scottish.parliament.uk/S4\\_RuralAffairsClimateChangeandEnvironmentCommittee/GeneralDocuments/2014.03.05\\_-\\_Ministers\\_response\\_on\\_Deer\\_Management.pdf](http://www.scottish.parliament.uk/S4_RuralAffairsClimateChangeandEnvironmentCommittee/GeneralDocuments/2014.03.05_-_Ministers_response_on_Deer_Management.pdf)

<sup>38</sup> Gilbert, Lucy (2013) 'Can restoration of afforested peatland regulate pests and disease?' *Journal of Applied Ecology*, <https://besjournals.onlinelibrary.wiley.com/doi/abs/10.1111/1365-2664.12141>

<sup>39</sup> The Heather Trust (2019) 'Heather Beetle' guidance note, [https://01a393a3-c4d4-4ca5-885d-c2330c108548.filesusr.com/ugd/fdc287\\_a3a63069ec3546c89c964cb431459413.pdf](https://01a393a3-c4d4-4ca5-885d-c2330c108548.filesusr.com/ugd/fdc287_a3a63069ec3546c89c964cb431459413.pdf)

ageing population and the switch from headage to area agricultural support payments following reforms of the Common Agricultural Policy that came into force in 2005. Stocking levels are now lower on open ground and active shepherding much reduced, with stock tending to be kept on better in-bye ground.

Cattle grazing takes place on a few areas at the peatland margins. Limited summer cattle grazing can be beneficial on certain areas as they graze less selectively than sheep, creating a more diverse vegetation structure which in turn can benefit moorland birds and other wildlife. However, cattle grazing has to be carefully managed as it can lead to excess trampling and the erosion of the fragile peat soils.

Deer have moved into the vacuum left by sheep on open ground and the increased availability of feeding has led to higher deer productivity. In places deer grazing and trampling is now damaging the biodiversity of the peatlands and deer numbers need to be controlled. Damage can be a particular issue where forest fences restrict and channel deer movements, causing localised tracking and erosion along fence lines. Less frequently, there are places with undergrazing. It is not known whether deer grazing levels on the peatlands are being affected by the rise in both red and roe deer populations in forests where fences have not been maintained or where sport is the main management objective.

Trampling can have a more significant impact than grazing, particularly in the wetter 'flows', as grazing is only attractive in these areas for a short period during the early winter and spring. Trampling can kill off bog mosses and other plants leaving bare peat, and can be exacerbated by fencing, which can channel deer through narrow areas. Where pools and wetter areas lie adjacent to fences, trampling damage can be more extensive. Overgrazing and excessive trampling can both lead to erosion, with the slow growth of vegetation and cool wet climate slowing or preventing vegetation recovery.

Deer numbers are counted regularly across the peatlands. There is however a recognition that there are challenges with obtaining accurate count data. There is now more emphasis on looking at trends rather than absolute numbers and monitoring the impacts of deer and other grazing animals on habitats. Best practice guidance has been developed by NatureScot to enable deer managers to carry out Habitat Impact Assessments using a standardised monitoring methodology<sup>40</sup>.

Over the last few years, NatureScot, Deer Management Groups and the Flows to the Future Project have carried out joint working and training to support more use of Habitat Impact Assessments, but further work is needed to encourage greater uptake both on designated and non-designated peatlands. Training helps to develop a common understanding of the impacts of management on vegetation, what constitutes good vegetation condition, and how this can be achieved to support all interests. The results of monitoring then need to be translated where appropriate into changes in management, and this is starting to be implemented on some peatland sites e.g. Ben Griams<sup>41</sup>.

## Drains

Through the 1950s and 1960s, financial incentives were provided for the draining of agricultural land, as part of a post-war policy to promote food production. In reality these drains did little to improve agricultural output in most areas of the peatlands, and they are now often detrimental to the nature conservation interest and to water quality and quantity. Drains affect over half of the SAC, with 22% of the area seriously affected.

Typically, the water table is lowered for a distance of up to four metres either side of a drain, with other less obvious effects potentially extending further. Gradual slumping of the peat occurs towards the drain and in older drains deep lateral cracking and collapse are observable. The drier conditions allow better

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<sup>40</sup> <https://www.bestpracticeguides.org.uk/impacts/principles/>

<sup>41</sup> Claire Foot-Turner, RSPB, pers com

heather growth and halt peat formation. This drying out may also reduce the number of invertebrates, which will have a knock-on effect on birds.

Where drains have been dug on the most gentle of gradients and where maintenance has not taken place, infilling is gradually taking place. By contrast, on steeper slopes, the impact of the drains has increased over time as scouring by rock and debris from further up the hill has increased the size and erosive power of the drains. The silt carried into streams and rivers by these drains may have negative effects on game fisheries and on drinking water supplies. Periods of high rainfall exaggerate the problems of erosion and lead to high flows in adjacent watercourses. In recent years there has been an increasing tendency towards flash floods in rivers locally.

Drain blocking is beneficial to fisheries interests, as it helps to moderate river flows and reduce silt inputs. It also leads to improvements in water quality that will help the drinking water treatment process, if the activities are within a drinking water catchment. This brings the benefits of compliance with Drinking Water Standards, customer satisfaction, reduced energy and chemical use, deferred capital expenditure, increased life of water treatment works and reduced costs to customers.

The first phase of restoration work was in the 1990s with funding from the EU Life Programme. This early work focused on the RSPB Reserve at Forsinard and the Plantlife Reserve at Munsary. Over the last 25 years, RSPB has blocked drains across 4,800ha of their Reserve, which totals 21,000ha in size. There is a further 2,800ha of damaged land left to restore across the Reserve.

In 2012 the Scottish Government established the Peatland ACTION Project, which supports practical peatland restoration works such as blocking drains to increase water levels and revegetating peat hags to stabilise bare eroding peat. The Fund is managed by NatureScot and Forestry & Land Scotland (FLS). Since 2014 FLS has restored 3,052ha of open habitat in Caithness & Sutherland. In addition to the work carried out on RSPB and FLS land, the Peatland ACTION Project has supported 2,714ha of restoration work on private land, with a further 420ha project currently underway in the Flow Country. In addition, the Scottish Government Agri-Environment Climate Scheme committed £501,000 towards drain blocking in the peatlands of Caithness & Sutherland between 2017 and 2020.

In recent years there has been a growing awareness of the implications of drains on peatland for climate change. As noted above the lowered water levels can mean that peat ceases to form, so that carbon is no longer locked up. At the same time, the erosion of the peat following drainage can lead to the release of carbon, either in the form of Dissolved Organic Carbon (DOC) within water leaving the peat or through oxidation into the atmosphere as carbon dioxide. Drain blocking can reverse this, eventually leading to carbon storage once successfully revegetated.

In recognition of this, in February 2020 the Scottish Government announced a further investment of more than £250 million towards peatland restoration across Scotland over the next ten years. This will be delivered through the Peatland ACTION Project.

## Muirburn

Muirburn is a traditional land management practice, carried out to promote new vegetation growth and so increase the amount of feeding available for stock, deer or grouse. It is regulated by legislation and guided by a code of practice known as 'The Muirburn Code'<sup>42</sup> (amended by the Moorland Forum in 2017 and supported by supplementary information<sup>43</sup>). It aims to ensure that when muirburn<sup>43</sup> is carried out, it is in the right place, avoids damage to sensitive habitats and ecosystem services, and doesn't lead to wildfire.

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<sup>42</sup> Scottish Natural Heritage (2017) 'The Muirburn Code: Management of Moorland by Burning and Cutting' <https://www.nature.scot/sites/default/files/2017-11/Guidance%20-%20Management%20of%20Moorland%20-%20Muirburn%20Code.pdf>

<sup>43</sup> <http://muirburncode.org.uk/supplementary-information/>

Muirburn on most areas of blanket bog is contrary to The Muirburn Code, and the focus of activity should be on the drier heather areas. Extensive less well controlled burns sometimes encroach on areas of blanket bog, particularly when fires are set in drier or windier conditions using limited manpower. Such damage has occurred in recent years within the Natura site and the Muirburn Code needs to be followed to ensure that no further damage occurs. On SSSIs muirburn practice is subject to consultation. Muirburn can also impact on water quality in some circumstances.

In many areas muirburn is carried out more sporadically than in the past, as numbers of people with available time and knowledge have fallen. This can mean that when burning does take place, there is a higher chance of fires spreading quickly over large areas that have accumulated tall leggy heather and purple moor grass litter. The presence of dry dead heather damaged by heather beetle can also add to the risk of fire spreading.

Some habitats are extremely sensitive to burning, and many of the rare and sensitive plants and animals found in peatlands cannot survive fires. Although the vegetation of an area burnt in the past may superficially appear unchanged, regular or severe burning reduces plant and animal diversity, damaging soils and removing some sensitive peat forming species. Erosion can also result from severe burns, and once established on these sensitive peat soils it can be very difficult or impossible to reverse.

## Wildfires

Wildfires have become an increasing concern across rural Scotland in recent years. The months between June and August in 2018 saw four times the number of wildfires recorded in the same period in 2017, and that was an increase on the year before<sup>44</sup>. Wildfires can be caused deliberately by wilful fire raising or through carelessness via sparks from unmanaged garden fires, residual heat from unextinguished bonfires, casually discarded litter including glass bottles and cigarette butts, or by inappropriate or badly managed muirburning. They are particularly concerning on peatland because the fires can exist in the peat long after they are thought to have been extinguished.

Wildfires can cause significant damage to biodiversity and agricultural, forestry, recreational and sporting interests; and can threaten infrastructure, property, and life. They release carbon dioxide, damage the capacity of peatlands to sequester carbon, and smoke affects human health. Wildfires place significant operational burdens and costs on the Scottish Fire and Rescue Service (SFRS) and other public services, and under expected climate change scenarios wildfire incidence and severity are predicted to increase.

Earth Observation techniques are now being applied by the Environmental Research Institute (ERI), NatureScot and others to assess the fires that have taken place. In 2019, a case study was undertaken on West Halladale in the Flow Country, which had experienced a large wildfire earlier that year (5,614ha)<sup>45</sup>. It affected bog and heath habitats, including bog that was undergoing peatland restoration. The study found that wetter, intact bogs were less affected and should recover sooner than drained or otherwise damaged bog, and concluded that not only will peatland restoration efforts lock up more carbon, they will also help limit the amount of carbon released during wildfire events. ERI is currently leading a further research project on this theme to inform policy and management practices, entitled 'How does land management influence Fire REsilience and carbon fate in BLANKET bogs? (Fire Blanket)'<sup>46</sup>.

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<sup>44</sup> BBC News (2019) 'Wildfire numbers in Scotland quadruple in a year' <https://www.bbc.co.uk/news/uk-scotland-48798789>

<sup>45</sup> <https://www.arcgis.com/apps/Cascade/index.html?appid=91001a1e278d4c41a7b28886e8530f25>

<sup>46</sup> <https://gtr.ukri.org/projects?ref=NE%2FT006528%2F1#/tabOverview>

The Scottish Wildfire Forum<sup>47</sup> aims to raise awareness of the work being undertaken across Scotland in relation to minimising the impact of wildfire and is working with SFRS to develop training for land managers in wildfire response. The SFRS has a Community Asset Register on its website<sup>48</sup>, where people can register equipment and skilled practitioners who could help with a wildfire. The creation of local fire partnerships and plans could also help SFRS and individual estates access additional equipment and personnel to jointly tackle wildfires on the peatlands.

## Vehicle use

All-terrain vehicles (ATVs) and quad bikes are now seen as essential tools for both sporting and agricultural work, and their use is continuing to increase. The cumulative effects of the last fifty years of use are however now evident in some places. When used in softer and wetter areas of peatland they can cause significant damage to the fragile plant communities, with recovery either being very slow or erosion taking place.

It is possible that more constructed tracks will be proposed to upgrade informal ATV routes and fishing access tracks in future. Whilst constructed tracks can limit the incremental spread of damage, they have their own effects on the vegetation and on water movement. In terms of vehicle technology, ATVs with front wheel steering are likely to cause less damage than those that rely on skid steering.

## Peat cutting

No commercial peat cutting takes place within the Natura site, and elsewhere in the peatlands there is just one site where there is limited ongoing extraction. Domestic peat cutting still takes place but is much less widespread than it used to be. Where it still occurs, it has become increasingly mechanised. On designated peatland it is subject to discussion under SSSI procedures.

## 4.7 Management for nature conservation

Until the 1980s the national and international importance of the peatlands was not widely recognised. Since then there has been a growth in the management of land specifically for nature conservation.

Between 1992 and 2007, SNH ran the Peatland Management Scheme (PMS), which had a dedicated advisory officer and offered management agreements to land managers taking on appropriate peatland management prescriptions. The advisory post and PMS ceased in 2007 with the advent of the Scotland Rural Development Scheme (SRDP), which also enabled payments for peatland management (and other agri-environment measures) within SSSI. Around 65% of the SAC was covered by PMS agreements, but not all of these transferred to an agreement under the SRDP. This may have been due to the complexity and cost of the SRDP application process compared with the PMS.

The RSPB has become very active in the area since the mid-1990s and is now a major landowner/manager (21,027ha, including all or part of 11 peatland SSSIs). It is also a significant employer, with six full-time staff equivalents (FTE) involved directly in the peatlands.

Since 1994 two tranches of funding from the EU LIFE Programme, and then funding from other sources, have enabled firstly experimentation and then larger scale peatland management and restoration work. This was largely on RSPB and Forestry and Land Scotland ground, but also to a more limited extent on the Munsary Plantlife Reserve and on private estates in more recent years with support from the Flows to the Future Project and Peatland ACTION Fund. Work includes large scale drain blocking within the European

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<sup>47</sup> <https://www.scottishwildfireforum.co.uk/>

<sup>48</sup> <https://firescotland.gov.uk/your-safety/community-asset-register.aspx>

designated peatland and targeted tree removal and peatland restoration on adjacent areas, with a view to protecting the Natura site features. Further information on peatland restoration is given in Chapter 4.2 Restoration of afforested areas to blanket bog and wet heath habitats.

The 2014 to 2019 Flows to the Future Project drew down £11.3 million of funding for peatland restoration and awareness raising. Between 2014 and 2019, RSPB employed a further 4.7 FTE posts in the peatlands as part of the project. Over £4.2 million was spent using local contractors and the permanent legacy of the project currently supports spend to the equivalent of 4.2 FTEs in Caithness and Sutherland.

## 4.8 Water catchment and fisheries management

One of the main drivers for sustainable water management in the UK is the EU Water Framework Directive<sup>49</sup> (implemented in Scotland by the Water Environment and Water Services (Scotland) Act 2003<sup>50</sup>). This sought to ensure that the quality of water bodies does not deteriorate and that all water bodies achieve at least 'good' ecological status by 2015. In order to do this, new regulatory and monitoring systems were brought in.

The peatlands cover a major land area, and their management influences the water quality in burns, rivers and lochs both within the peatlands and over much larger areas. Consideration therefore needs to be given to drinking water catchments in assessing any potential land use change. In the peatlands, there are very limited areas with water quality issues at present.

There is also an intimate link between management of the peatlands and fisheries. Fish spawning areas and juvenile habitats are often found in the peatlands, miles from any main river or burn, and care needs to be taken to ensure their protection.

Atlantic salmon, sea trout and brown trout fisheries make an important contribution to the economy of the area. Atlantic salmon and sea trout populations have declined markedly through most of their ranges over recent decades, due to a combination of factors including higher mortality at sea and changes in land and river management. Populations have however remained healthy over much of north and east Caithness and Sutherland. This is perhaps in part due to the naturally high productivity of the rivers, resulting from the underlying geology. In contrast, populations have declined on the west coast where natural productivity levels of the shorter river systems are lower and marine mortality higher.

The Rivers Borgie, Naver and Thurso have their origins in the peatlands and are all SACs for nature conservation interests that include Atlantic salmon. The Borgie and the Naver also have freshwater pearl mussel populations and were part of the LIFE + project Pearls in Peril (2012-2017), which aimed to save and restore populations at 21 key Natura 2000 sites in Scotland, England and Wales.

Brown trout are found in lochs and rivers across the area and include the unique Ice Age relict Crocach trout in lochs above Loch Hope. Brown trout populations are generally good and reflect the productivity of the waters - high in those areas with limestone featuring in the geology, and low where peat predominates in dubh lochans. Angling pressure remains light to moderate for the most part. RSPB have amended their fishery management at Forsinard to benefit common scoter.

## 4.9 Implications of climate change

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<sup>49</sup> [https://ec.europa.eu/environment/water/water-framework/index\\_en.html](https://ec.europa.eu/environment/water/water-framework/index_en.html)

<sup>50</sup> <https://www.legislation.gov.uk/asp/2003/3/contents>

Climate change may result in less suitable climatic conditions for bog growth. Both increased rainfall and increased temperature are predicted for Scotland, with most of the additional rainfall anticipated as coming over the winter. These changes are likely to result in bogs drying out over the summer months as a result of the higher temperatures and resultant higher evapo-transpiration rates.

If conditions do become sub-optimal for bog growth (in particular *Sphagnum* mosses) then increasing levels of erosion through oxidation, physical removal of particulate peat and increased release of heavy metals, organic compounds and nutrients into watercourses can be expected. The release of huge quantities of carbon stored in the peat along with other greenhouse gas emissions would further accelerate climatic warming. 20% of Scotland's carbon emissions currently come from peatlands, predominantly damaged ones<sup>51, 52</sup>.

Ensuring peatland is in good condition reduces the dangers of erosion and carbon loss from the system. A particular priority is to reduce any artificial drainage to help mitigate the predicted increase in summer drying and to reduce winter run-off. It will also be important to reduce areas of bare peat so as to reduce the likelihood of erosion.

Climate change is also likely to affect plants and animals living in the peatlands. Most of the characteristic bird species for example are normally northerly breeders near or at the southern edge of their range. They would therefore be expected to be particularly vulnerable to any changes in the climate. Changes to marine and coastal habitats as a result of climate change may also affect peatland species that use these areas for feeding.

## 4.10 Next steps

Part Two of this draft Management Strategy contains an update on progress made since 2015 and an Action Plan for the ten-year period to 2030. Potential projects and actions have been suggested and for each, a lead partner and timescale are identified in addition to potential outputs and targets.

The table of actions in Part Two are not ranked and follow the same structure used in the preceding chapter, however six priority issues and suggested actions to deliver Objective 1 are listed below. These proposals reflect recent and ongoing shifts in policies and support mechanisms for peatland restoration and land management. Please refer to Table 1.2 in Part Two for further details on these priorities in addition to the full table of proposed actions.

- **Blanket bog condition:**  
**Issue:** The condition of the blanket bog across a small proportion of the SAC remains 'unfavourable' for a number of reasons including forestry edge effects, conifer regeneration, drainage, trampling and wildfire damage. There is insufficient information on the condition of the peatlands out-with designated sites, but there are localised areas of damage.  
**Suggested action:** Promote and provide mechanisms and incentives that support sustainable grazing and peatland restoration, and address forest edge effects. Work with forest owners to support removal of the edges of conifer forests which are having the highest impacts on peatland biodiversity.

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<sup>51</sup> Evans et al (2017) 'Implementation of an emission inventory for UK peatlands'. Report to the Department for Business, Energy and Industrial Strategy, Centre for Ecology and Hydrology. [https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1904111135\\_UK\\_peatland\\_GHG\\_emissions.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1904111135_UK_peatland_GHG_emissions.pdf)

<sup>52</sup> Salisbury et al (2015) 'Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2013' [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/455529/DA\\_GH\\_GI\\_1990-2013\\_Report\\_v1.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/455529/DA_GH_GI_1990-2013_Report_v1.pdf)

- Peatland restoration:**  
**Issue:** Funding is available for tree removal and peatland restoration through the Peatland ACTION Fund, but uptake from private estates has been limited.  
**Suggested actions:** Employ dedicated Peatland Advisory Staff to provide advice and training on the sustainable management of peatland habitats, restoration of damaged bog, removal of non-native tree regeneration, monitoring, funding etc. Provide training to land managers and agents to promote uptake of the Peatland ACTION Fund and other opportunities for enhanced peatland management through e.g. the Agri-Environment Climate Scheme (AECS).
- Conifer regeneration:**  
**Issue:** In some areas, non-native conifers are regenerating onto adjacent areas of open peatland, and this is exacerbated by climate change.  
**Suggested action:** Conduct a review of conifer regeneration on peatland to identify priorities and potential solutions, develop a costed action plan to secure agreement on the scale of the issue, and engage with owners to implement a programme for removal of non-native regeneration from priority areas.
- Woodland expansion:**  
**Issues:** Native woodlands are scarce and often heavily grazed, although there is funding and assistance available to promote woodland expansion and creation in the right locations in and around the peatlands.  
**Suggested action:** Secure additional funding and employ a Flow Country Woodland Adviser to provide advice on the sustainable management and regeneration of existing native woodlands, and the planting of new native and non-native woodlands on appropriate non-peatland habitats (such as croft and farm woodlands) in and around the peatlands of Caithness and Sutherland.
- In-bye management:**  
**Issue:** In-bye fields in key areas need to be actively managed to be suitable for peatland waders, however there is insufficient information on both the fields and how birds are using them.  
**Suggested action:** Collate habitat and species information on in-bye grassland, identify and ground-truth priority areas, and advise land managers on appropriate management for peatland waders. Employ a Flow Country Grassland Officer to provide advice on the sustainable management of existing grasslands utilised by wading birds in and around the Flow Country, identify and help restore 'abandoned' or rank grasslands of wildlife importance, and assist land managers to apply for funding through schemes like AECS.
- Wildfire mitigation:**  
**Issue:** Wildfires can damage sensitive peatland habitats and destroy paleo-environmental and archaeological data, and are an increasing concern as climate change is leading to increased risk of climatic extremes.  
**Suggested action:** Establish a Flow Country Wildfire Group to minimise the risk and impact of fires, ensure fire plans are in place, share experience of best practice of wildfire prevention and management, and facilitate joint responses to incidents including the provision of personnel and equipment.

## CHAPTER 5: COMMUNITY AND ECONOMIC DEVELOPMENT

The future long-term health of the peatlands depends very much on decisions that are made regarding community and economic development in the area. Some aspects of development are dealt with in other parts of the Strategy, particularly woodlands (chapter 4), and tourism and interpretation (chapter 6).

The following chapter looks at development issues that already impact on the peatlands or that may do so in the future. It identifies key issues that need to be addressed to deliver Objective 2 and suggests some priority actions. These and other actions are further developed in the Action Plan in Part Two of this document (Table 2.2).

**Objective 2: To encourage sustainable community and economic investment that is compatible with safeguarding those features that make the peatlands important.**

### 5.1 Key issues

- There is a lack of direct community and business involvement in the management of the peatlands.
- There are opportunities to create skilled and long-term local employment through peatland-based development and the upscaling of habitat restoration activities.
- The strong policy drive towards development of further renewable energy sites to help meet CO<sub>2</sub> emission targets will increase development pressures, despite concerns on the scale and cumulative impacts of wind farms across the area.
- There are further long-term restoration opportunities that could be delivered through habitat management plans associated with peatland developments.
- There is insufficient information on the community and economic benefits of the peatlands, including future opportunities that may arise from the potential World Heritage Site inscription.
- Peatland communities and business sectors experience difficulties in accessing markets for various reasons including remoteness and scale of operations.
- The North Coast 500 driving route brings both opportunities and challenges for local communities and the peatland environment.

### 5.2 Community management and engagement

Over recent years there has been an increasing interest in community involvement in land management and ownership, spurred on by the provisions of the Land Reform (Scotland) Act 2003<sup>53</sup> and Community Empowerment (Scotland) Act 2015<sup>54</sup>. This legislation aims to empower community bodies through the ownership or control of land and buildings, and by strengthening their voices in decisions about public services.

The only peatland within the Natura site in community ownership at present is on the Melness Crofters Estate, although the Assynt Crofters Trust, Assynt Foundation, Kylesku Crofters Trust and Culag Community Woodland Trust also own areas of peatland. In addition, the North Sutherland Community Forest Trust (NSCFT) owns several large sheds at Forsinain which are used for wood processing, with some of the wood coming from peatland restoration areas.

The various crofting grazing committees are a mechanism for local collective management of peatland, although the number of active committees is in decline. A number of grazing committees have taken advantage of changes in legislation and have carried out woodland regeneration or planting schemes.

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<sup>53</sup> <https://www.legislation.gov.uk/asp/2003/2/contents>

<sup>54</sup> <https://www.legislation.gov.uk/asp/2015/6/contents/enacted>

Whilst local employment in forestry will not return to the heights of 1980s, other sectors are coming in to play creating skilled and long-term local employment. Examples include renewable energy and the likely significant upscaling of habitat restoration for carbon and wildlife. There is also increased recognition of the important role the peatland landscape has played in the recent increase in tourism related employment.

Community engagement in the peatlands has the potential to ensure that local priorities are addressed, that more economic benefits are retained locally, and that a sense of ownership is maintained or developed. Forestry & Land Scotland and RSPB Scotland both seek community involvement in the management planning for their holdings in the area, and there is also wide consultation on both public and private forestry proposals.

The Peatlands Partnership was formed in 2006 and changed its name to the Flow Country Partnership in 2021. It comprises a range of bodies and groups involved in the management of the peatlands who wanted to work together to implement the first edition of this Strategy, some of whom represent community-based interests. There is scope to broaden the membership of the Partnership and involve more communities and key individuals in the management of the area.

### 5.3 Local Planning and Community Planning

The Government is currently preparing its fourth National Planning Framework (NPF4) which will guide spatial development, set out national policies, designate national developments and reflect regional spatial priorities. The recently published NPF4 Position Statement<sup>55</sup> sets out current thinking on the issues that will need to be addressed and opportunities taken to help stimulate the green economy and combat climate change. When it is adopted by Scottish Ministers, the new Framework will incorporate Scottish Planning Policy (SPP) and take on an enhanced status as part of the statutory Development Plan.

In 2020, The Highland Council approved an Indicative Regional Spatial Strategy for Highland<sup>56</sup> as part of its submission to the Scottish Government's engagement on the emerging National Planning Framework 4. Renewable energy and action on carbon emissions is central to the long-term vision, which states: 'by 2050, Highland will be an exemplar carbon action region by optimising its unique, rich and diverse assets to lead national emissions reduction targets', and 'This will maintain and enhance Highland's role as a global centre of excellence for renewable energy innovation and generation'.

The Highland-wide Local Development Plan (2012)<sup>57</sup> (HwLDP) is the land use plan which the Council uses to guide development and investment across The Highland Council area. Together with supplementary guidance covering specific issues and more detailed Area Local Development Plans, it aims to create sustainable communities and balance population growth, economic development and the safeguarding of the environment. The planned review of the HwLDP started in 2016 but was postponed until the implications of the Planning (Scotland) Act 2019<sup>58</sup> and NPF4 are more clearly understood.

The Caithness and the Sutherland Community Partnerships<sup>59</sup> are the organisations responsible for promoting and leading community planning activity in their respective counties. They bring together representation from business interests, communities, local government and other government bodies to improve the way public services are delivered by involving the communities who use the services in the decision-making processes.

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<sup>55</sup> <https://www.gov.scot/publications/scotlands-fourth-national-planning-framework-position-statement/>

<sup>56</sup> [https://www.highland.gov.uk/meetings/meeting/4304/economy\\_and\\_infrastructure\\_committee](https://www.highland.gov.uk/meetings/meeting/4304/economy_and_infrastructure_committee)

<sup>57</sup> [https://www.highland.gov.uk/info/178/local\\_and\\_statutory\\_development\\_plans/199/highland-wide\\_local\\_development\\_plan](https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan)

<sup>58</sup> <https://www.legislation.gov.uk/asp/2019/13/contents/enacted>

<sup>59</sup> <https://www.highlandcpp.org.uk/>

## 5.4 Renewable energy developments

A major economic shift affecting the peatlands in recent years has been the growth in renewable energy developments, with most interest to date being in relation to wind farms. The wind regimes of Caithness and Sutherland combined with low population densities, proximity to electricity grid and availability of grid capacity make the area particularly attractive to developers, and a significant number of wind farms have been developed or consented within and adjacent to the peatlands.

The recently published update to the 2018-2032 Climate Change Plan (CCP) entitled 'Securing a green recovery on a path to net zero' (Dec 2020)<sup>60</sup> sets out the Government's pathway to its new and ambitious targets set by the Climate Change (Emissions Reduction Targets) (Scotland) Act (2019)<sup>61</sup>. The Government has committed to reduce emissions by 75% by 2030 (compared with 1990) and to net zero by 2045. The Government's Energy Strategy Update, to be published in 2021, will set out the role that onshore wind will have in the wider energy system, but the Onshore Wind Policy Statement (2017)<sup>62</sup> stated that 'Scotland will continue to need more onshore wind development and capacity, in locations across our landscapes where it can be accommodated.' In terms of this Management Strategy, these documents reflect the strong national policy drive towards further development of renewable energy, including onshore wind farms, as well as the restoration of degraded peatland areas.

In 2019, The Highland Council declared a climate and ecological emergency, and agreed to meet net zero emissions by 2025. The Council's Climate Change Panel aspires to reposition Highland as a low CO<sub>2</sub> region, and is developing a framework around this vision.

Caithness and Sutherland are already contributing towards these targets. In terms of onshore wind energy, as of January 2020 the two counties together host around 380 turbines constructed over about 100 sites varying from single small/micro turbines to windfarms comprising numerous large turbines and having a combined installed capacity of around 620 megawatts (MW). In addition, 16 turbines were under construction across 2 sites, with an installed capacity of around 34 MW. About a further 165 turbines were approved (but not yet under construction) across approximately 35 sites, with an installed capacity of around 440 MW<sup>63</sup>. The Highland Council has produced interactive maps of wind turbines and hydro schemes across Highland, which are available on its website<sup>64</sup>.

There are environmental concerns about renewable developments in or close to the peatlands, particularly those situated on deep peat. Scottish Planning Policy recognises the importance of peatland and deep peat as a nationally important habitat and its role in carbon storage. Policy 55 of the Highland Wide Local Development Plan gives a presumption against unacceptable peat disturbance and states that development proposals should demonstrate how they have avoided unnecessary disturbance, degradation or erosion of peat and soils. However, it is acknowledged that impacts can be avoided or reduced through siting and design being informed by relevant surveys, and in some areas, development could result in peatland restoration as a component of a wind energy scheme.

### Key natural heritage considerations

The following list identifies a number of potential impacts of renewable energy developments in the peatlands from a natural heritage perspective:

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<sup>60</sup> <https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/>

<sup>61</sup> <https://www.legislation.gov.uk/asp/2019/15/enacted>

<sup>62</sup> <https://www.gov.scot/publications/onshore-wind-policy-statement-9781788515283/>

<sup>63</sup> David Cowie, Highland Council, pers comm

<sup>64</sup> <https://www.highland.gov.uk/info/198/planning-long-term-and-area-policies/152/renewable-energy>

- Habitat loss, damage or fragmentation and impacts on species either through land take (e.g. for turbines, tracks, grid connections and other infrastructure), hydrological disruption, during construction or decommissioning, through peat slides (triggered by the construction and/or operation of a wind farm), or when infrastructure is renewed in the future.
- CO<sub>2</sub> emissions from peat disturbance both during and after construction.
- Displacement of birds if they avoid wind farms due to turbine operation / visitor disturbance or are deterred from using their normal routes to feeding and roosting grounds, which can have implications for their energy consumption.
- Collision risk with turbines for some species of birds.
- Impacts on deer welfare, habitats (including potential for grazing and trampling damage elsewhere if deer are displaced), and other interests (e.g. impact of displaced deer on any nearby access and recreation areas).
- Risk of concentrations of suspended solids or contaminants entering watercourses during construction, during operation or as a result of a peat slide.
- Risk of monitoring and management not being maintained on restored peatland areas agreed as mitigation for development impacts.
- Potential impacts on landscape, archaeological and historic sites and areas, and on access and recreation.

The level of impact depends on the location, design and management of the wind farm. However, the cumulative impact of wind farms on landscapes, habitats and species is now a significant consideration in Caithness and Sutherland. Research is ongoing concerning potential impacts and is more advanced for some issues than others. NatureScot and others have also developed a range of guidance for onshore wind energy developments<sup>65</sup> including spatial guidance, research, and guidance on assessing the potential impacts on the natural heritage, good practice during construction, restoration and decommissioning.

The siting and design of wind farms has to be cognisant of peatland resources, which vary in quality. However, successful co-existence can bring about not only renewable energy generation benefits, but also specific peatland restoration opportunities, which taken together are aimed at combating the global Climate Emergency. Appropriately sited wind farm development provides an opportunity to implement habitat management and peatland restoration, and wind farms can provide a source of finance to support the restoration of degraded habitats. Environmental Impact Assessment, Habitat Management Plans and Construction Environmental Management Plans are all tools that can substantially reduce impacts.

Scottish Renewables (2020) 'Wind Power and Peatland: Enhancing Unique Habitats'<sup>66</sup> sets out a number of case studies, providing examples of positive management and sensitive approaches to developing peatland sites. These include RWE's Habitat Management Plan at Bad a Cheo near Mybster in Caithness which is seeking to restore areas of peat bog, modified and degraded by years of peat cutting and commercial forestry, to a more functional blanket bog state over the life of the wind farm. Almost 10 miles of drains were blocked across 39 hectares of peatland, at a cost of around £30,000. The publication also highlights SSE Renewables' plans for extensive peatland restoration and management associated with their Strathy South wind farm, should a variation to its planning permission be consented. On site, SSE Renewables would remove 1,133ha of commercial forest to allow the restoration of peatland habitats. Further peatland restoration and management across 1,535ha of the adjacent Caithness and Sutherland Peatland Special Areas of Conservation is also proposed. Similar peat restoration programmes are being undertaken elsewhere in Caithness & Sutherland by these and other wind farm companies, with advice from SEPA and NatureScot.

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<sup>65</sup> <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/onshore-wind-energy/advice-wind-farm-development>

<sup>66</sup> [Wind Power and Peatland: Enhancing Unique Habitats \(scottishrenewables.com\)](https://www.scottishrenewables.com/wind-power-and-peatland-enhancing-unique-habitats)

There is also a growing interest in hydro-electric power schemes on rivers, with several schemes having consent in the west of Sutherland<sup>67</sup>. As well as potential water quality issues, there may be impacts from access tracks and from pipe installation. With small schemes this impact can be disproportionate to the renewable energy generation benefit. NatureScot, SEPA and others have produced guidance on the potential impacts of hydro schemes on the natural heritage<sup>68</sup>.

## Planning and policy requirements

Scottish Planning Policy (2014)<sup>69</sup> (SPP) gives guidance on considerations for all types of renewable energy and other development and a specific framework for identifying where wind farm developments are likely to be appropriate. In relation to the peatlands, it identifies the following areas of significant protection where 'further consideration will be required to demonstrate that any significant effects on the qualities of these areas can be substantially overcome by siting, design or other mitigation':

- World Heritage Sites;
- Natura 2000 and Ramsar sites;
- Sites of Special Scientific Interest;
- National Nature Reserves;
- National Scenic Areas;
- areas of wild land as shown on the 2014 SNH map of wild land areas;
- carbon rich soils, deep peat and priority peatland habitat; and
- an area not exceeding 2km around cities, towns and villages.

SPP also states in relation to all types of development that 'Where peat and other carbon rich soils are present, applicants should assess the likely effects of development on carbon dioxide (CO<sub>2</sub>) emissions. Where peatland is drained or otherwise disturbed, there is liable to be a release of CO<sub>2</sub> to the atmosphere. Developments should aim to minimise this release.'

There are extensive areas within the peatlands of Caithness and Sutherland which have a number of the attributes highlighted within the SPP guidance. The outstanding intrinsic value of the peatlands is not just in the value of the individual areas, but in the collective value of such an extent of deep peat and such an extensive landscape dominated by peatland. This is reflected in its inclusion on the list for nomination as a World Heritage Site. It is also reflected in the vision of this Strategy to not only maintain the peatlands but also to restore those areas of peatland which are not currently being managed to promote biodiversity and the wide range of services provided by the peatlands.

The SPP Spatial Framework applies to developments above the thresholds defined by the Council (single turbines 50m or more to blade tip, or more than one turbine 30m or more to blade tip). All onshore wind energy developments, irrespective of their size, are assessed against the other parts of the Onshore Wind Energy Supplementary Guidance and the HwLDP policies.

The Highland Council has robust planning policies set out in the Highland-wide Local Development Plan (2012) and further elaborated in the Onshore Wind Energy Supplementary Guidance (2016 and 2017)<sup>70</sup>. There is a presumption against the disturbance, degradation or erosion of peat, and construction environmental management and other natural environment factors are addressed. The Council's development management process plays a vital role in balancing the achievement of renewable energy targets with environmental, economic and other objectives.

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<sup>67</sup> [https://www.highland.gov.uk/info/198/planning\\_-\\_long\\_term\\_and\\_area\\_policies/152/renewable\\_energy/5](https://www.highland.gov.uk/info/198/planning_-_long_term_and_area_policies/152/renewable_energy/5)

<sup>68</sup> <https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/hydroelectric-power>

<sup>69</sup> <https://www.gov.scot/publications/scottish-planning-policy/>

<sup>70</sup> [https://www.highland.gov.uk/directory\\_record/712079/onshore\\_wind\\_energy](https://www.highland.gov.uk/directory_record/712079/onshore_wind_energy)

It is increasingly recognised that while wind farms may be successfully accommodated within some peatland areas where they avoid deep peat and sensitive habitats and maximise restoration opportunities, damage to peatland as a result of wind farm development can significantly undermine the climate benefits of renewable energy.

Applicants of wind energy developments are strongly encouraged to calculate carbon impacts using the Scottish Government's carbon calculator<sup>71</sup>. This is a tool developed for use in the consideration of wind farm developments over 50 MW on peatlands which require consent under Section 36 of The Electricity (Scotland) Act 1989<sup>72</sup>. It is also beneficial for assessing smaller developments likely to affect the peatlands. In the case of the peatlands of Caithness and Sutherland there are wider considerations beyond these site-by-site calculations, reflecting the impact of any individual development on the area as a whole. These should include potential impacts on future restoration opportunities.

### Marine renewable energy schemes

There has been an increased interest in marine renewables in recent years, with two large offshore wind farms under construction in the Moray Firth. These may affect breeding and overwintering divers and scoters from the peatlands that use this area for feeding. Tidal energy proposals are also being considered between Orkney and the mainland. Marine proposals and any land based associated infrastructure may have implications for those peatland birds that breed on the peatlands but also feed in marine and coastal areas such as divers, greenshank and common scoter. Potential issues include disturbance during construction, collision and avoidance issues.

## 5.5 Other developments

Any peatland development has the potential to cause damage through habitat loss or fragmentation, CO<sub>2</sub> emissions through peat disturbance, suspended solids or contaminants entering watercourses, wildlife disturbance and displacement, or impacts on landscape and other peatland attributes. As above, the level of impact depends on the location, scale, design and management of the development. Again, large developments will be subject to Environmental Impact Assessment, and Habitat Management Plans and Construction Environmental Management Plans are tools that can substantially reduce impacts and identify opportunities for improvements including peatland restoration.

### Space Hub Sutherland

There is a proposal to erect a satellite launch station on the Melness Crofters Estate at A'Mhoine, North Sutherland<sup>73</sup>. Launch related infrastructure will include a control centre, 2.5 km of road and a launch pad, occupying a total of just over 4 hectares of a 300ha peatland site. This project is being led by Highlands & Islands Enterprise and Orbex and has received planning approval from The Highland Council. The proposal is supported by local people and the Environmental Impact Assessment includes a restoration plan that will see all of the peat that is dug out during construction retained on site and used to repair areas that were degraded by past digging.

The impacts on the surrounding habitats and wildlife are as yet unknown, and there may be opportunities to offset the operation of the site by identifying additional restoration proposals nearby.

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<sup>71</sup> <https://www.gov.scot/publications/carbon-calculator-for-wind-farms-on-scottish-peatlands-factsheet/>

<sup>72</sup> <https://www.legislation.gov.uk/ukpga/1989/29/contents>

<sup>73</sup> <https://www.hie.co.uk/our-region/regional-projects/space-hub-sutherland/>

The proposal will progress towards assessment of impacts at operation licence regulation stage under the UK Space Industry Act (2018)<sup>74</sup>.

### Infrastructure developments

Other developments which may occur in the area include road and track repair or creation, water supply provision and house building. New planning controls were introduced in 2014 by the Scottish Government so that prior notification and approval is needed for hill tracks being constructed for agricultural or forestry purposes<sup>75</sup>. Community and economic benefits of any new developments will need to be assessed against potential environmental impacts. NatureScot has also produced guidance on hill track construction and management which may be relevant.<sup>76</sup>

### Marketing and branding

There may be scope in the future to develop the economic benefits arising from the peatlands through additional marketing or branding of products from the area, particularly if it is designated as a World Heritage Site. This could have the dual benefits of bringing additional income and raising the profile of the area. It will be important to identify and promote these economic and social benefits to local people, to help engender a sense of pride in the Flows.

### Tourism

The influx of visitors to the North Highlands through very successful marketing campaigns such as the North Coast 500 and following the 2020 COVID-19 travel restrictions has brought income to the area; but is not without its challenges to local services and fragile ecosystems such as the peatlands. It is important to encourage the right visitor who appreciates and looks after our countryside. Teaching establishments and accommodation providers need to promote the Flows and nurture a pride in the area, continuing the good work already started by the Peatlands Partnership in the Flows to the Future Project.

## 5.6 Next steps

Part Two of this Management Strategy contains an update on progress made since 2015 and an Action Plan for the ten-year period to 2030. Potential projects and actions have been suggested and for each, a lead partner and timescale are identified in addition to prospective outputs and targets.

The table of actions in Part Two are not ranked and follow the same structure used in the preceding chapter, however three priority issues and suggested actions to deliver Objective 2 are summarised below. These proposals reflect recent and ongoing shifts in policies and support mechanisms for biodiversity and climate change. Please refer to Table 2.2 in Part Two for further details on these priorities in addition to the full table of proposed actions.

- **Community engagement:**

**Issue:** There is a lack of direct community and business involvement in the management of the peatlands.

**Suggested actions:**

- Broaden the membership of the Flow Country Partnership to include further community and land management interests.

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<sup>74</sup> <https://www.legislation.gov.uk/ukpga/2018/5/contents/enacted>

<sup>75</sup> [https://www.legislation.gov.uk/ssi/2014/300/pdfs/ssipn\\_20140300\\_en.pdf](https://www.legislation.gov.uk/ssi/2014/300/pdfs/ssipn_20140300_en.pdf)

<sup>76</sup> <https://www.nature.scot/constructed-tracks-scottish-uplands>

- Investigate community benefit funding from e.g. renewable developments or carbon credit finance as a possible source of longer-term support to develop a stronger sense of ownership and community engagement in the peatlands, promoting sustainable communities including outreach work and economic investment linked to the area's international importance and potential WHS inscription.
- **Renewable energy developments:**

*Issue:* The strong policy drive towards development of further renewable energy sites to help meet CO<sub>2</sub> emission targets will increase development pressures, despite concerns on the scale and cumulative impacts of wind farms across the area.

*Suggested actions:*

  - Undertake landscape and ecological sensitivity appraisals and spatial planning to identify strategic capacity for future onshore wind energy developments, with particular focus on cumulative impacts.
  - Work with developers of wind farms and other peatland projects to prevent or minimise negative impacts and contribute to biodiversity gain across the peatlands of Caithness and Sutherland.

## CHAPTER 6: SPREADING THE MESSAGE ABOUT THE PEATLANDS

Six years ago, despite the acknowledged importance of the peatlands, opportunities to find out about them were limited, as were places where you could access and enjoy them. The Flows to the Future Project (2014-2017) went some way to addressing these issues and has left a great legacy in terms of interpretation, visitor facilities and online resources. However, in view of the international importance of the peatlands, there is still work to do to capitalise on the outcomes of this Project and embed a greater sense of local pride and ownership amongst the communities of Caithness and Sutherland.

This chapter looks at issues surrounding the promotion of better engagement and enjoyment of the peatlands as well as the nomination of the area as a World Heritage Site. It identifies key issues that need to be addressed to deliver Objective 3 and suggests some priority actions. These and other actions are further developed in the Action Plan in Part Two of this document (Table 3.2).

**Objective 3: To promote greater awareness, understanding and enjoyment of the special wildlife, carbon store, landscape, water environment, historical and cultural values of the peatlands.**

### 6.1 Key issues

- The Flows to the Future Project resulted in significant awareness raising and community engagement outputs, however there is a lack of longer-term funding for community outreach work, visitor facilities and infrastructure to enhance local pride and sense of ownership in the peatlands.
- The Flow Country Partnership has received approval from the UK Government to prepare a World Heritage Site nomination bid to UNESCO. The boundary and management plan are yet to be agreed, and there is work to do to engage local support and secure local benefits that may arise from the inscription.
- The increase in visitors in recent years has benefited the local economy but has also resulted in a rise in antisocial behaviour, littering and damage to the environment.

### 6.2 Awareness raising

#### Tourism, recreation, awareness and interpretation

Levels of awareness of the value of the peatlands amongst local people have grown considerably in local years, but still remain variable. Local support for and pride in the peatlands is key to ensuring the objectives of this Strategy are met. This is likely to come not only from increased awareness, but also from demonstrable economic benefit. Tourism is the most likely source for this, but in itself is more likely to be successful where there is a pride in the local area.

There are quite a few community heritage groups working in the peatlands including Discover Assynt's Historic Assynt Projects in Sutherland, the Castletown Heritage Society (which is very active across North Caithness), and the Caithness Archaeological Trust. These groups are led by local people and undertaking work that involves other residents, visitors and tourists coming to the area or extending their stays to participate in heritage projects.

Six years ago, the infrastructure of interpretation facilities for locals and visitors was limited, with the notable exception of facilities on the RSPB Forsinard Flows Reserve. A review of possible interpretation activities was undertaken as part of the development of the Flows to the Future Project, and a number of these have been implemented, listed below.

A key priority for the Project was to increase the number of places where people can easily access and learn about the peatlands, whilst recognising the fragile nature of the habitat and landscape sensitivities:

- Improved parking, interpretation and seating was installed at four roadside sites: Cnoc Craggie, Moine House (which also has an all-abilities walk), Crask and Loch Rangag.
- A review of the existing peatland paths was undertaken, and the Project has way-marked and promoted five walking routes.
- A viewing tower with all-abilities boardwalk was constructed on the existing Dubh Lochan Trail at Forsinard Flows RSPB Reserve. This enables people to walk through and have an elevated view of a bog pool system. The tower also acts to encourage more people to visit Forsinard and the peatlands as a whole.
- An information point was installed at Forsinain.
- Three new museum and visitor centre displays were created at Caithness Horizons, Strathnaver Museum and the RSPB Forsinard Flows Visitor Centre. An information booklet was produced and is available at hotels, tourist attractions and elsewhere across the area.

The peatlands are a long way from where most people live. They are however a resource of national and international importance, and greater understanding and support from this wider audience is needed if they are to be protected. This was also addressed through Flows to the Future:

- A touring exhibition travelled to 13 UK venues and was seen by 150,000 people.
- 27 events were held out with the peatlands including in London, Edinburgh and Orkney.
- A website [www.theflowcountry.org.uk](http://www.theflowcountry.org.uk) was produced and contains resources that were designed specifically for the Project including a carbon capture game, digital model and peatland film.
- The Project worked with a number of visiting art students and two artists residencies, and an interactive installation with arthouse Cryptic: Below the Blanket was established in the Royal Botanic Garden in Edinburgh.
- The Project stimulated a lot of press coverage in local and national newspapers, radio and TV.

### Learning and volunteering opportunities

Successive peatland projects have delivered programmes of school and community activities over the past 25 years, supported by staff and volunteers from RSPB Scotland and the Highland Council Rangers (now employed by High Life Highland). The RSPB also offers volunteering opportunities on its reserve at Forsinard Flows, where people can be directly involved in practical management activities.

The Flows to the Future Project worked with schools and communities throughout Caithness and Sutherland to deliver a wide range of community engagement activities and volunteering opportunities:

- 151 events were held locally including walks, talks and workshops, with over 4,000 attendees.
- Forsinard Flows RSPB Reserve welcomed 61 school visits, and a further 151 outreach visits were undertaken with 35 schools. In all, 4,246 interactions with school children took place across Caithness and Sutherland, learning about 'The wonders of the Flow Country' covering different topics linked to many parts of the curriculum.
- 270 volunteers were trained and carried out conservation, engagement and office work, contributing over 5,500 days.

The Flows to the Future Project worked with a range of partners including archaeology, astronomy and the North Rail Line. It will be important for any future peatland projects to continue this wider engagement.

Clearly, a lot has been achieved by the Flows to the Future Project in its five years duration. However, like preceding projects, the activities are time limited. A longer-term commitment to raising awareness and securing engagement from local people would help foster a better sense of ownership and more enduring

local pride in the peatlands, which will be a key part of the World Heritage Site application. It would be sensible to deliver this important ongoing work through existing networks such as the High Life Highland Ranger Service and RSPB's volunteering programme, if sufficient longer-term funding can be secured from external sources. Community benefit funding from renewables developments is one possible source of longer-term funding for community outreach work such as this.

### 6.3 World Heritage Site nomination

In 1999 The Flow Country was added to the 'Tentative List' held by the UK government of sites that might be put forward for nomination as World Heritage Sites (WHS). Its position on the list was reassessed and confirmed in 2011. UNESCO bestows this international accolade on either natural or cultural properties of outstanding universal value. The Flow Country will be submitted in the natural heritage category. Nominations are made through the Scottish Government and then through the UK government.

The first stage of the process is to undertake a Technical Evaluation to determine whether a site has a strong case for claiming Outstanding Universal Value and whether it would have adequate protection, management and resourcing. An initial Technical Evaluation was submitted to the UK government in 2013. The Assessment Panel recommended further work be undertaken including a comparative study of peatlands across the world, to support the premise that the area is of outstanding universal value. A second Technical Evaluation was submitted in 2015 which required some further enhancements. In December 2019, the Partnership's World Heritage Site Working Group submitted a third Technical Evaluation of The Flow Country proposed WHS to the UK Government's Department of Digital, Culture, Media and Sport and in July 2020, the Government invited the Peatlands Partnership to make a full Nomination to UNESCO<sup>77</sup>.

The partners aim to submit the Nomination documentation in early 2023, and the submission will need to be accompanied by a draft management plan for the area. The proposed boundary for The Flow Country World Heritage Site has still to be determined but the core area of the Site is likely to comprise all or most of the Caithness and Sutherland peatlands Natura site. It is likely that some of the surrounding area would be included either within the core site, or in places as a buffer zone. As an accolade this international designation would make a significant contribution to raising the profile of the peatlands and the area more generally, both nationally and internationally.

### 6.4 Next steps

Part Two of this Management Strategy contains an update on progress made since 2015 and an Action Plan for the ten-year period to 2030. Potential projects and actions have been suggested and for each, a lead partner and timescale are identified in addition to prospective outputs and targets.

The table of actions in Part Two are not ranked and follow the same structure used in the preceding chapter, however two priority issues and suggested actions to deliver Objective 3 are summarised below. These proposals reflect lessons learned from previous projects and opportunities which may be provided in recognition of the importance of the peatlands. Please refer to Table 3.2 in Part Two for further details on these priorities in addition to the full table of proposed actions.

- **Long-term funding:**

Issue: There is a lack of longer-term funding for community outreach work, visitor facilities and infrastructure to enhance local pride and sense of ownership in the peatlands.

Suggested action:

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<sup>77</sup> <https://www.nature.scot/green-light-peatlands-partnership-apply-unesco-world-heritage-site-status>

- Facilitate learning and engagement to enhance local pride and sense of ownership in the peatlands through inspiring and enthusing all generations about the globally important nature and landscapes in the Flow Country and its fundamental role in climate change mitigation.
- Help communities and businesses to access additional resources to support community outreach work, visitor facilities and infrastructure to help manage increased visitor activity.

- **WHS benefits:**

**Issue:** The Flow Country Partnership has received approval from the UK Government to prepare a World Heritage Site bid to UNESCO. The boundary and management plan are yet to be agreed, and there is work to do to engage local support and secure local benefits that may arise from the inscription.

**Suggested action:** Prepare a World Heritage Site submission to UNESCO including nomination documentation, management plan (including visitor and tourism management planning, restoration opportunities, climate change implications & opportunities, opportunities to be gained from WHS status e.g. socio-economic, environmental educational) and agreed boundary.

## CHAPTER 7: UNDERSTANDING THE PEATLANDS

Our understanding of the peatlands has grown tremendously over the 16 years since this Strategy was first published with improved funding, networking and co-ordinated research and monitoring on subjects such as climate change, carbon dynamics, biodiversity, water regulation, peatland restoration and land management. However, our collective knowledge is still far from complete.

This chapter focuses on research and monitoring of the peatlands. It identifies key issues that need to be addressed to deliver Objective 4 and suggests some priority actions. These and other actions are further developed in the Action Plan in Part Two of this document (Table 4.2).

**Objective 4: To support and promote the value of the area for best practice management and research and as an exemplar and inspiration for others working on peatland management and restoration, to the benefit of peatlands here and elsewhere.**

### 7.1 Key issues

- There is scope to develop the links between land managers and the research community through joint research and monitoring projects and workshops, as well as further engaging with communities of interest through 'citizen science' type projects.
- Peatland restoration practitioners, researchers and policy makers need to align their strategies and work together to ensure that restoration and monitoring is evidence-based and underpinned by science.
- Around the UK, the metrics required to adequately monitor peatland restoration are still largely under development with no standardised approach, spatial scale or timescale to assess the cost-effectiveness of the wide range of methods deployed over large areas.
- Further work is needed to quantify the social and economic benefits of peatland restoration in cost-benefit terms.
- Understanding the past development of the peat is crucial if we are really to understand what will happen during and after peatland restoration work. Better integration of the findings from palaeoecological and archaeological studies with studies into contemporary responses of peatlands to similar changes will help improve forecasting models.
- Our collective understanding on the impact of deer on vegetation, habitats and species is incomplete, but such data is very useful to feed into deer management planning decisions.
- There is insufficient information on the importance of in-bye fields to peatland waders.
- Our understanding of the erosion of upland peat areas is incomplete.
- Common scoter ecology, including how they move in and out of the Flows during migration & commuting during breeding season and links to loch & peatland management, is not well understood. Further research using innovative technologies would help us improve management for this important species.
- There has been insufficient independent assessment on the cumulative impacts of wind farms on peatland landscapes and ecosystems, and on knowledge gaps such as the impacts on birds flying at night.

### 7.2 Research and monitoring

RSPB, Plantlife and Forest Research (Forestry Commission) have been engaged in research and monitoring linked to their own landholdings for many years. However, despite the international importance of the peatlands, research efforts by universities, colleges and research institutions were initially sporadic, hampered by a lack of funding and the remoteness of the area. This has changed dramatically in recent years.

It is now recognised that the Flow Country is a vital area in developing our understanding of a wide range of peatland issues, from the ecology of individual species and changes in their populations over time to greenhouse gas fluxes and the role of peatland habitats in climate change mitigation and adaptation. This is because the peatlands of Caithness and Sutherland encompass a range of states from near-pristine to highly degraded, include several large-scale restoration sites, and span a climatic gradient with rainfall as high as 4,400mm per year to the west and as low as 500mm per year to the east. They profile an ideal setting to understand the influences of land use and climate change on carbon dynamics, biodiversity, water regulation both in peatlands and connected landscapes, but also to improve our capacity to predict the consequences of a changing climate upon those ecological functions.

### 7.3 Flow Country Research Hub

In 2012, a network of researchers and stakeholders involved or interested in the scientific research taking place in the peatlands of the Flow Country was launched, known as the ‘Flow Country Research Hub’<sup>78</sup>. The Hub seeks to establish the Flow Country as a UK and, increasingly, international focal point of peatland science addressing contemporary environmental and societal issues such as climate change, biodiversity, resource management and sustainability. The Hub is coordinated by the Environmental Research Institute<sup>79</sup> in Thurso. Communication between the different groups involved in Flow Country research is promoted via twitter, a quarterly newsletter circulated to over 100 people, and a regular (every 18 months) Flow Country conference where researchers, students and practitioners gather to share the latest findings and visit field restoration sites.

There are a wide range of peatland research projects taking place in the Flow Country, most of which are collaborative in nature. This is in line with the long-term aspirations of the network, which are to:

- Provide and maintain infrastructures which promote international collaborations, student placements and visiting researchers, and which enable sustainable, world-class research to take place in the Flow Country.
- Improve the integration between scientists, landowners, practitioners, governance bodies and policy makers to help deliver restoration objectives in Scotland.
- Develop a better platform for the provision of outreach and knowledge exchange activities making research accessible.

In 2019, a special issue of the scientific journal ‘Mires and Peat’ was dedicated to recent advances in research in the Flow Country and featured 9 research articles with authorships from 25 different institutions, all of which are open access<sup>80</sup>. The Flow Country Research Hub was also shortlisted for a ‘Nature of Scotland’ Award in 2019 in the category ‘Conservation Science’, demonstrating that the coordinated approach is starting to bear fruits.

### 7.4 Peatland restoration research and monitoring

Restoration of peatlands is one of the most significant landscape-scale changes currently taking place in the UK and aims to deliver multiple benefits in terms of enhanced biodiversity, water supply and flood management, and natural carbon capture/long-term storage. Understanding how peatland degradation and restoration impact the delivery of all these ecosystem services is essential to improve management strategies. The long-term decadal and multi-decadal monitoring and research programmes that are needed

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<sup>78</sup> <https://www.theflowcountry.org.uk/learning-and-teaching/research/research-hub/>

<sup>79</sup> For more information see <https://eri.ac.uk/>

<sup>80</sup> <http://mires-and-peat.net/pages/volumes/map23/map2303.php>

to address these objectives have underpinned some key research outputs (e.g. on long-term restoration outcomes) from the Flow Country research community, although they do not fit with traditional research funding that typically support projects for 2 or 3 years.

However, this funding landscape may be changing; long-term commitments from Scottish Government towards peatland restoration, including monitoring, have been welcome by the research community. A new, large research programme based in the Flow Country funded by the Leverhulme Trust (£1M, ERI-UHI led, 2020-2025) will bring new opportunities to develop the research strands that tie in with this Strategy<sup>81</sup>. Other large initiatives under development also include the Flow Country as a key site and with the development of the National Peatland Research and Monitoring Group, which underpins the delivery of the National Peatland Plan<sup>82</sup>, there is now a much more direct link between research and policy.

The renewables energy sector is providing long-term funding to support peatland restoration and associated monitoring programmes, and there is scope for further collaborative working both in terms of research programmes and in the sharing of lessons learned across all sectors. The support and co-operation of landowners in the Flow Country, including non-governmental organisations, governmental and private landowners, is key to the continuity of long-term studies of peatland restoration.

### Monitoring blanket bog restoration: need for reference systems, proxies and metrics

In order to assess the success of blanket bog restoration, adequate monitoring needs to be undertaken to compare the pre- and post-restoration status and set them in context using a reference system. This means understanding the current status of both degraded (e.g. drained, afforested) and less impacted blanket bogs in Caithness and Sutherland in terms of greenhouse gas emissions, carbon storage, biodiversity, water quality etc. We also need to gain a better understanding of how those functions vary with time and location, both in disturbed and more natural systems, in order to be able to attribute changes in a restored site to restoration rather than to e.g. inter-annual variability.

Evaluating peatland restoration is challenging due to the large areas and timescales involved. This can be addressed by well-designed ground-based monitoring, particularly replicated trials with controls and both before and after data. These schemes can then be used to ground-truth newer remote sensing techniques, which - if they can be validated properly against ground data - might then allow a degree of inference for broad outcomes over much larger areas and time periods.

In the last five years, the application of remote sensing technology to monitor vegetation changes and eco-hydrological behaviours in peatland has been developed in the Flow Country<sup>83, 84</sup> and current projects are looking at developing tools for the monitoring of peatland restoration based on these novel approaches. A key challenge going forward is to relate meaningfully some of these proxies to greenhouse gas emissions using a combination of measures like vegetation type, ground surface motion, temperature, moisture and light. In order to do this, researchers will need to combine remote sensing with quality ground measurements - something which they already have a good track record of doing in various Flow Country studies. This can be built on to further develop remote sensing tools.

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<sup>81</sup> <https://eri.ac.uk/research/major-projects/developing-a-new-understanding-of-blanket-bog-resilience-from-molecules-to-landscapes/>

<sup>82</sup> <https://www.nature.scot/scotlands-national-peatland-plan-working-our-future>

<sup>83</sup> Alshammari, L., Boyd, D.S., Sowter, A., Marshall, C., Andersen, R., Gilbert, P., Marsh, S. and Large, D.J., 2020. Use of Surface Motion Characteristics Determined by InSAR to Assess Peatland Condition. *Journal of Geophysical Research: Biogeosciences*, 125(1), p.e2018JG004953.

<https://pure.uhi.ac.uk/en/publications/use-of-surface-motion-characteristics-determined-by-insar-to-asse>

<sup>84</sup> Lees, K.J., Artz, R.R., Khomik, M., Clark, J.M., Ritson, J., Hancock, M.H., Cowie, N.R. and Quaife, T., 2020. Using Spectral Indices to Estimate Water Content and GPP in Sphagnum Moss and Other Peatland Vegetation. *IEEE Transactions on Geoscience and Remote Sensing*.

<https://ieeexplore.ieee.org/document/8970455>

## Developing restoration techniques in response to different disturbances and objectives

Different restoration approaches will be required for drained, drained and afforested, and eroded peatlands, and for each approach, different levels of intervention (e.g. number of dams, material used to construct the dam, tree harvest or mulching etc.) are available. Understanding which peatland management and restoration methods are optimal for biodiversity conservation, for carbon storage or for other ecosystem functions is necessary for decision making, especially where trade-offs may be required. Determining priority areas for restoration and optimal and cost-effective restoration approaches is essential both for the ongoing management of afforested peatland areas, and to inform government support schemes which may finance bog restoration. To achieve this, the practitioners, researchers and policy makers need to align their strategies and work together to ensure that restoration and monitoring on the ground is underpinned by science and is evidence-based.

Illustrating the strong practitioner-researcher partnerships in the area, the Flow Country includes a number of long-running monitoring schemes with data on hydrology, vegetation, birds, and carbon dynamics. The area also hosts a number of major designed & replicated management trials of different restoration approaches. These elements provide excellent opportunities to build on, in order to understand how restoration should best be carried out and where the highest priority areas are for restoration management.

## Cost-benefit of restoration in economic terms

Restoration of peatlands often requires a large up-front capital investment that is expected to translate into wider benefits (e.g. reduction in carbon emissions). Quantifying these benefits in economic terms has the potential to influence future policies and also investment in peatland restoration. There is an increasing recognition of the need to take integrated landscape approaches and in the Flow Country. This means including riparian (native) woodland planting alongside peatland restoration schemes. It also means starting to document the potential impact of peatland restoration and management on the surrounding rivers and lochs. There is likely to be a significant positive response in terms of water quality, flood control and the overall health of the aquatic ecosystem. Given that many peatland rivers and streams are prime salmon habitat, understanding the downstream impacts of restoration has a particularly high socio-economic relevance in Caithness and Sutherland. As well as these aspects, values that are less easily expressed in monetary terms, such as cultural or biodiversity values, need to also remain central to our management of the Flow Country.

## Future forecasting: linking past-present-future condition

Understanding the past development of the peat is crucial if we are really to understand what will happen during and after peat restoration work. Features associated with the historic environment should be taken into account as we develop restoration techniques. With changes in management regimes and climate, it is difficult to predict how peatland systems, degraded or not, will respond in the future. Given that restoration aims to recover peatlands in a climate now that is different than when they started to form in the early-mid Holocene, what outcome is it reasonable to expect? Using palaeoecological techniques (for example plant macrofossil analysis, carbon dating, pollen analysis) we can understand how peatland plant species and carbon accumulation have changed in the past in relation to climatic shifts, or changes in land use. Better integration of knowledge and techniques from such studies with studies looking at the contemporary responses of peatlands to similar changes will help us to improve our forecasting models.

In the past few years, the UK has experienced a range of extreme weather events, and these are predicted to become more frequent with climate change in the future. In the Flow Country, these included cold snap and heavy precipitation in winter (the 2017 'beast from the east', and in February 2020), a prolonged summer drought (2018) and the largest wildfire in the UK (2019, 5,600ha). Understanding how

peatlands in different condition respond to these events is essential to improve the reliability of land surface models, and will be a key component of the ERI-UHI's and the Flow Country Research Hub's strategic priorities in the next 5 years. Ultimately this knowledge will help us identify management practices, for example, around deer management, that can help keep the peatlands in good condition so that it is resilient in the face of future climate change and extreme events.

### Linking research and the community

It is proving hugely beneficial for land managers to work directly with the research community and there is scope for this to develop further in the future, for example through further joint research and monitoring projects and workshops. There is also a great opportunity to use the research and monitoring as a way of engaging with the local community, for example thorough 'citizen science' and other community activities, apprenticeships and summer schools. The Flow Country is already an exemplar of joint working between land managers and researchers, and we can further build on this foundation, to strengthen both the evidence base for land management and policy choices, and deep scientific understanding of how peatlands respond to differing interventions, which in turn helps to reveal key mechanisms and pathways.

## 7.5 Potential research areas to develop further

In addition to core areas around peatland restoration, biodiversity and climate, it is important to continue research and monitoring in other areas such as land management and renewable energy developments, see list below. New windfarm developments are subject to robust Environmental Impact Assessment which includes assessment of cumulative impacts in relation to the proposed development, and NatureScot provides information on the siting of new onshore windfarm developments. However, there are concerns surrounding the cumulative impacts of wind farms on peatland landscapes and ecosystems, and further independent studies would be welcome.

## 7.6 Next steps

Part Two of this draft Management Strategy contains an update on progress made since 2015 and an Action Plan for the ten-year period to 2030. Potential projects and actions have been suggested and for each, a lead partner and timescale are identified in addition to potential outputs and targets.

The table of actions in Part Two are not ranked and follow the same structure used in the preceding chapter, however the priority issues and suggested actions to deliver Objective 4 are summarised below. These proposals were chosen to address the key issues identified above and reflect the importance of basing good environmental management on sound scientific knowledge. Please refer to Table 4.2 in Part Two for further details on these priorities in addition to the full table of proposed actions.

- **Joint working:**

Issues:

- There is scope to further develop the links between land managers and the research community through joint research and monitoring projects and workshops, as well as further engaging with communities of interest through 'citizen science' type projects.
- Peatland restoration practitioners, researchers and policy makers need to align their strategies and work together to ensure that restoration and monitoring is evidence-based and underpinned by science.

Suggested actions:

- Continue to support the extensive research collaboration working through the Flow Country Research Hub to understand climate and biodiversity effects of management decisions in the Flow Country, and the implications of upland land use policy more widely.

- Develop science with research collaborators to better understand areas such as i) spontaneous recovery of high-altitude eroded areas, ii) deer impacts on condition and climate resilience, iii) management routes to supporting resilience to drought and wildfire.
- **Peatland restoration:**  
*Issue:* Around the UK, the metrics required to adequately monitor peatland restoration are still largely under development with no standardised approach, spatial scale or timescale to assess the cost-effectiveness of the wide range of methods deployed over large areas.  
*Suggested action:* Combine long-term monitoring data and novel remote-sensing approaches to improve understanding of the effectiveness of different restoration techniques.
- **Potential research areas to develop further:**  
In addition to core areas around peatland restoration, biodiversity and climate, the Action Plan identifies a number of topics as potential research areas to develop further.

# PART TWO: ACTION PLAN

## Introduction

The most significant development since the first edition of this Strategy has been the recognition not only of the imperative to act to slow climate change, but also that the peatlands have a significant part to play in that. There therefore needs to be a step change in the speed of delivering the actions within this Strategy. The Flow Country Partnership has a key role to play here, but it also needs engagement from land managers, other organisations and communities. Reviewing this Strategy has demonstrated just how quickly policy changes. Peatlands are currently high on the agenda at a UK and Scotland level, and advantage should be taken of this window of opportunity.

Part Two of this Management Strategy focuses on action and is divided into four chapters, each reflecting one of the Strategy's four objectives. The chapters begin by restating the objectives and issues. An update on the actions identified in the 2015 Strategy is given, and the second table contains an Action Plan proposing priority actions, projects and work streams for the ten-year period to 2030. The proposed actions reflect recent and ongoing shifts in policies and support mechanisms for agriculture, forestry, sporting management, the natural heritage, carbon capture and rural development which seek a greater synergy between the environment and our activities. Although they are listed in four separate tables relating to the Strategy's objectives, the actions are grouped under common headings labelled A-N for ease of reference.

Chapter 1: Sustainable land management	A: The condition of open peatlands B: Forests and woodlands C: Agriculture D: Grazing management E: Wildfire F: Nature conservation
Chapter 2: Community & economic development	G: Community engagement & representation H: Sustainable community facilitation I: Renewable energy developments
Chapter 3: Spreading the message	J: Awareness raising & engagement K: World Heritage Site nomination
Chapter 4: Understanding the peatlands	L: Joint working M: Restoration research & monitoring N: Potential research areas to develop further

Several of these actions are dependent on securing additional funding to support the employment of a number of new staff to promote peatland restoration and management, appropriate rural development and community engagement. The five-year Flows to the Future Project was a tremendous success and demonstrated the benefits of working together to achieve a common goal. A major challenge for the Flow Country Partnership will be to put together a strong case for a future project or projects which build on the achievements made to date and enables local communities and land managers across the peatlands of Caithness and Sutherland to make the most of the opportunities that are currently available through the World Heritage Site application and the Peatland ACTION programme.

Securing external funding from grant applications and developer contributions is one way of financing joint projects such as this. The Flow Country Partnership is also looking at novel approaches such as connecting with green financiers and identifying pathways for increasing investment in sustainable nature-based solutions to achieve the vision.

**The vision:** Our vision for the peatlands is one of a revitalised, sustainably managed landscape, with extensive sweeps of hill and bog intersected by fertile straths and forests. These straths and coastal strips support a mosaic of productive crofts and farms, rivers, forestry and native woodland. Above and between the straths lies the open landscape of the world-renowned peatlands of Caithness and Sutherland, which, together with their lochs and lochans, support a spectacular assemblage of birds, plants and other wildlife, including internationally important numbers of raptors, waders and waterfowl. The straths, bogs, hills, lochs, rivers, woodlands and forestry are managed together for the wide range of services they provide and interests they support. Different land management objectives and uses are integrated and support each other, with everything underpinned by a healthy environment, at the centre of which is the great peatland of the north. Everyone who lives, works in or visits the area values the peatlands, which are an exemplar of good management and an inspiration to all.

## CHAPTER 1: SUSTAINABLE LAND MANAGEMENT IN AND AROUND THE PEATLANDS

**Objective 1: To promote and carry out sustainable land management that maintains and enhances the nationally and internationally important areas of peatland, the associated habitats and species and the wide range of services they provide.**

### Key Issues

- The condition of the blanket bog across a small proportion of the SAC remains 'unfavourable' for a number of reasons including forestry edge effects, conifer regeneration, drainage, grazing, trampling and wildfire damage. There is insufficient information on the condition of the peatlands out-with designated sites, but there are localised areas of damage.
- In some areas, forests are having a detrimental impact on underlying and adjacent peatland habitats and species, features associated with the historic environment, and on the carbon stored in the peat.
- In some areas, non-native conifers are regenerating onto adjacent areas of open peatland, and this is exacerbated by climate change.
- Funding is available for tree removal and peatland restoration through the Peatland ACTION Fund, but uptake from private estates has been limited.
- There is a lack of resource and willingness to support ongoing management and maintenance of restoration areas in the longer term, such as regeneration control and drain blocking in areas where trees have been removed.
- Native woodlands are scarce and often heavily grazed, although there is funding and assistance available to promote woodland expansion and creation in the right locations in and around the peatlands.
- Agri-environment schemes have been a positive tool but the options for peatland and associated species are limited and for various reasons including uncertainties of future schemes and difficulties in accessing them, uptake in the peatlands has been low.
- In-bye fields in key areas need to be actively managed to be suitable for peatland waders, however there is insufficient information on both the fields and how birds are using them.
- Where land is under the management of common grazings committees, agreement from multiple crofters is needed to make changes, and this can be difficult and time consuming.
- Our collective understanding of the impact of deer on vegetation, habitats and species is incomplete, but such data is very useful to feed into deer management planning decisions.
- Fencing to exclude deer from new forestry planting or agricultural areas may affect grazing and trampling levels of adjacent areas, as well as having deer welfare implications.
- Many historical drains are still active and eroding peatland areas, funding is available through Peatland ACTION to block them but uptake from private estates has been limited.
- Climatic extremes will influence water levels and temperatures in peatland rivers, burns, pools and lochs, which will impact on invertebrates including freshwater pearl mussels and nesting habitat for waders, divers and ducks.
- Future invasion by invasive non-native species such as Canada geese, American mink, pike and minnows could impact on waders, divers and ducks.
- Wildfires can damage sensitive peatland habitats and destroy paleo-environmental and archaeological data and are an increasing concern as climate change is leading to increased risk of climatic extremes.
- All-terrain vehicles and quad bikes can cause damage to sensitive peatland habitats.
- The restoration of redundant tracks could have habitat benefits, but there is insufficient knowledge on the technical and legal aspects.

## 1.1 Progress update

The numbered actions in the following table were taken from the 2015 revised Management Strategy. The table summarises progress that has been made and where appropriate, suggests future works which have been incorporated into the Action Plan for 2021-2030 (Table 1.2).

**Table 1.1 Progress update on the actions identified in 2015 to deliver Objective 1**

<b>Action 1.1</b>	Ensure land management support schemes include options that maximise the opportunities for the sustainable management of the peatlands & associated habitats.
Progress Update	AECS has peatland options. Scottish Government has allocated £250M to peatland restoration over next 10 years.
Future Action	Identify restoration priorities, help land managers access Peatland ACTION fund and ensure C&S peatlands benefit from this funding. (Actions A1 & A2 below)
<b>Action 1.2</b>	Promote uptake of SRDP options (or other funding schemes) which support appropriate management and restoration of open peatland and associated habitats including in-bye, through promotion, demonstration sites and training.
Progress Update	Work undertaken by NatureScot, Peatland ACTION, RSPB & Caithness Wetlands and Waders Initiative
Future Action	Employ dedicated C&S Peatland Advisory Staff to promote existing initiatives and help target funding to priority areas. (Action A2 below)
<b>Action 1.3</b>	Raise awareness of the EIA (Agriculture) (Scotland) Regulations to ensure proposals for improvement of rough grazings are appropriately assessed and that inappropriate improvements do not take place.
Progress Update	Limited progress, greater land manager awareness of EIA regulations.
Future Action	Identify & protect important in-bye grasslands (Actions C2 & C3 below)
<b>Action 1.4</b>	Assess the extent of in-bye ground, its significance for peatland waders and any trends in management.
Progress Update	No progress
Future Action	Collate habitat & species information, identify/ground-truth areas. (Action C2 below)
<b>Action 1.5</b>	Identify ways of monitoring the overall condition of the peatlands across their range.
Progress Update	Satellite work undertaken
Future Action	Ongoing, habitat impact assessment work (Action D1 below)
<b>Action 1.6</b>	Seek to reduce and reverse trends of loss of heather from areas of heath and bog.
Progress Update	Studies into heather beetle by The Heather Trust
Future Action	Forms part of sustainable management promoted by Actions A1 & D1 below
<b>Action 1.7</b>	Manage deer and stock numbers at levels that sustain the natural heritage interest of the peatlands, and are compatible with other land uses.
Progress Update	NatureScot promoting use of Habitat Impact Assessment and the development of DMG Management Plans.
Future Action	Promote use of habitat impact assessment & use findings to influence land management. (Action D1 below). Promote the continued development and implementation of effective management plans.
<b>Action 1.8</b>	Promote and support regular assessment of deer and sheep numbers and habitat impact assessments.
Progress Update	Promoted through DMG work and through AECS contracts. Sheep stock numbers submitted to SGRPID annually.
Future Action	Promote use of habitat impact assessment & use findings to influence land management. (Action D1 below)
<b>Action 1.9</b>	Support initiatives that increase the value of venison
Progress Update	No progress

Future Action	Support local community branding initiatives. (Included in Action H2 below)
<b>Action 1.10</b>	Encourage co-operation between deer and forestry managers to address forest deer issues that affect peatlands.
Progress Update	DMGs and Deer Management Plans address this issue.
Future Action	Ongoing – driven by national legislation and policy
<b>Action 1.11</b>	Ensure forest and woodland planning and design take account of deer management and where appropriate, include compensatory culls.
Progress Update	Scottish Forestry addresses this through Forest Plans.
Future Action	Ongoing – again driven by national strategy.
<b>Action 1.12</b>	Take opportunities to create links between land managers and local communities e.g. through wider engagement in Deer Management Groups, as a means of increasing wider awareness and understanding.
Progress Update	Flows to the Future engaged a significant number of local community members.
Future Action	Continue the engagement work started in the FttF Project by supporting existing services (e.g. HLH Rangers) and relevant community initiatives. (Actions J1 & J2 below)
<b>Action 1.13</b>	Facilitate implementation of Local Biodiversity Action Plans for Caithness and Sutherland and the Scottish Biodiversity Strategy.
Progress Update	Many projects undertaken by both Caithness and Sutherland LBAP groups.
Future Action	LBAP funding no longer available, support relevant biodiversity projects undertaken by local voluntary groups. (Actions J1 & J2 below)
<b>Action 2.1</b>	Promote and provide mechanisms and incentives that support peatland restoration and address forest edge effects on peatlands.
Progress Update	FttF and Peatland ACTION funding have facilitated restoration.
Future Action	Continue to identify priorities for restoration and help land managers access funding. (Actions A1 & A2 below)
<b>Action 2.2</b>	Provide clear guidance on the location and type of woodland that might be appropriate in and around the peatlands.
Progress Update	THC Forest & Woodland Strategy updated in 2018, FCS/UHI PhD undertaken (2016-2020), BTO wader hotspot mapping project.
Future Action	Continue to promote relevant guidance on appropriate woodland location and type e.g. Scottish Forestry Edge Effect guidance and other SF guidance, THC Forest & Woodland Strategy & BTO wader hotspot mapping with early consultation with RSPB/NatureScot and survey work on prospective sites. (Action B1 below)
<b>Action 2.3</b>	Provide criteria and guidance on where restoration is a priority for peatlands.
Progress Update	Scottish Forestry uses edge effect sensitivity maps & provides guidance to managers when forest plan or felling permission applications are submitted.
Future Action	Continue to identify priorities for restoration and help land managers access funding. (Action A1 below)
<b>Action 2.4</b>	Monitor the impact of removing forests on peatland habitats and species, and if required adjust guidance.
Progress Update	Baseline implemented by Forest Research & NatureScot
Future Action	Continue to research edge effects and forest to bog restoration, ensure results are written up & used to guide future work. (Actions L1 & M1 below)
<b>Action 2.5</b>	Put in place a programme to tackle regeneration on open peatlands.
Progress Update	Some surveys undertaken & regeneration controlled through FttF & Peatland ACTION
Future Action	Conduct a review of regeneration of conifers on peatland and develop an action plan to tackle this issue. (Actions B2 below)
<b>Action 2.6</b>	Maximise the local economic and community benefits from any forest restructuring or clearing work.
Progress Update	CONFOR study, 3 priorities identified, NSCFT are clearing part of Dyke forest for use in local community sawmill
Future Action	Make projections of future work more available and maximise the local economic and community benefits from any forest restructuring or clearance work. (Action B5 below)

<b>Action 2.7</b>	Support the development and delivery of a timber transport strategy by the Highland Timber Transport Group.
<b>Progress Update</b>	Work recently reinvigorated, rail extraction trials restarted in 2020
<b>Future Action</b>	Secure additional funding for solutions including enhanced rail infrastructure and a cross flows haul route. (Action B6 below)

## 1.2 Action plan

The table below is a list of priority actions for the 2021 Strategy. It is based on discussions with key partners, feedback on the delivery on actions from the 2015 Strategy, and responses from the consultation on the draft Strategy (Nov-Dec 2020). The actions are not listed in order of priority, rather the table is structured to reflect the layout of the Management Strategy above (Part One). Several of the actions are dependent on securing additional funding to support the employment of new posts to promote peatland restoration and improve habitat management.

**Table 1.2 Proposed actions to deliver Objective 1 (2021-2030)**

Proposed Action	Output, Timescale & Lead Partners	Outcome & Target
<b>A. The condition of open peatlands</b>		
A1. Promote and provide mechanisms and incentives that support sustainable grazing and peatland restoration, and address forest edge effects. Work with forest owners to support removal of the edges of conifer forests which are having the biggest impacts on peatland biodiversity.	Staff time 2021-2030 NatureScot, Scottish Forestry, Forestry & Land Scotland & RSPB	Outcome: Improved management of blanket bog & associated habitats, increased resilience against climate change, reduced carbon emissions. Targets: Contact owners of forests without approved plans which address impacts on peatlands by 2021, ensure SRDP and Peatland ACTION funding is available, and owners are supported in accessing it.
A2. Provide advice and training on the sustainable management of peatland habitats, restoration of damaged bog, removal of non-native tree regeneration, monitoring, funding etc. Provide training to land managers and agents to promote uptake of the IUCN Peatland Code, the Peatland ACTION Fund and other incentives & opportunities for enhanced peatland management through e.g. AECS.	Dedicated Peatland Advisory Staff (1-2 FTE posts) 2023-2028 led by NatureScot & RSPB	Outcome: As above Targets: Agreement on post remits, employment route, funding sources & area/engagement targets by 2021, Advisory Staff appointed by 2023.
A3. Promote Forsinard Flows, Forestry & Land Scotland sites and relevant sites on SSE and private land as innovation hubs and demonstration sites in relation to peatland restoration.	Staff time 2021-2030 led by RSPB, Forestry & Land Scotland, SSE Renewables & NatureScot, supported by ERI through Flow Country Research Hub	Outcome: Enhanced knowledge and awareness of best practice peatland restoration, funding opportunities and sources of assistance. Target: 20 land managers & policy makers influenced p/a by discussing restoration on sites.
<b>B. Forests &amp; woodlands</b>		

B1. Develop a strategic plan for forestry associated with the peatlands of Caithness & Sutherland. Engage forest owners, communities and stakeholders in developing this plan which will provide a strategic framework for the future of productive woodlands whilst addressing timber transport, peatland restoration and edge effects.	Adviser & staff time 2021-2030 led by The Highland Council & Scottish Forestry	Outcome: Strategic plan to provide greater detail to The Highland Council Forest & Woodland Strategy and help provide direction for the long-term woodland cover in and around the peatlands. Target: Strategic plan for forestry associated with the C&S peatlands led by the Woodland Adviser (Action B3 below), 2023 start, plan to be agreed by stakeholders by 2025.
B2. a) Conduct a review of conifer regeneration on peatland to identify priorities and potential solutions, develop an action plan to secure agreement on the scale of the issue and how to tackle it. b) Engage with owners to implement a programme for removal of non-native regeneration from priority areas.	a) Review & action plan: £20,000 contract 2021-2022 b) Removal programme: Peatland Advisory Staff time 2023-2030 led by NatureScot, Scottish Forestry & RSPB	Outcome: Improved management of blanket bog habitat adjacent to conifer plantations and reduced forest edge effects. Targets: a) Review & costed action plan identifying the scale of the issue and how to address it by 2022. b) Removal programme to start in 2023, area targets to come from a).
B3. Provide advice on the sustainable management and regeneration of existing native woodlands, and the planting of new native and non-native woodlands on appropriate non-peatland habitats (such as croft and farm woodlands) in and around the peatlands of C&S.	Flow Country Woodland Adviser (1 FTE post) 2023-2028 led by NatureScot & Scottish Forestry (with external funding)	Outcome: Enhanced knowledge of best practice in relation to native woodland in a peatland environment, native and non-native woodland established in appropriate locations in & adjacent to the peatlands. Targets: Agreement on post remit, employment route, funding sources & area/engagement targets by 2021, Adviser appointed by 2023.
B4. Conduct a review of appropriate ground for native woodland establishment on Forsinard Reserve, and plant / regenerate new native woodland in appropriate locations.	Staff time 2022-2030 RSPB	Outcome: Areas of new native woodland of biodiversity value e.g. on steeper ground or riverine corridors. Target: Area target to be agreed following completion of review.
B5. Contribute to the green recovery by maximising the local economic and community benefits from any forest restructuring, management or clearing work.	Staff time 2021-2030 led by CONFOR, NatureScot	Outcome: Improved community income & benefits from forest restructuring, management & clearing work, training & employment opportunities for local peatland restoration contractors.
B6. Develop sustainable timber transport solutions to maximise local economic benefits and ensure environmental considerations are taken into account. Secure additional funding for solutions including enhanced rail infrastructure and a cross flows haul route.	Staff time 2020-2030 led by CONFOR, Highland Timber Transport Group & Scottish Forestry (additional funding requirements)	Outcome: Improved infrastructure to aid timber extraction from the peatlands.
<b>C. Agriculture</b>		

C1. Advocate to Scottish Government for improvements to agri-environment funding, e.g. additional AECS option to improve habitat for peatland waders.	Staff time 2020-2030 led by NatureScot & RSPB with input from Scottish Land & Estates, crofting & farming interests	Outcome: Funding available for land management projects which meet the needs of the peatlands of C&S. Target: Submission to the 2024 SRDP revision.
C2. a) Collate habitat & species information on in-bye grassland, and b) identify & ground-truth priority areas.	a) one-year Project Officer, 2023, and b) one-year Scientist contract to analyse, ground truth and prioritise areas, 2024 led by RSPB	Outcome: Improved understanding of the location & importance of grasslands for peatland waders. Targets: a) Information collated by 2023, b) surveys undertaken & areas prioritised by 2024. Results to feed into Action C3.
C3. Provide advice on the sustainable management of existing grasslands utilised by wading birds in & around the Flow Country, identify & help restore 'abandoned' or rank grasslands of wildlife importance, and assist land managers to apply for funding through schemes like AECS.	Flow Country Grassland Officer 0.5 FTE post 2025-2030 led by NatureScot & RSPB	Outcome: Improved management of in-bye grasslands for wading birds, secured funding for improved management in & adjacent to the Flow Country. Targets to be agreed once areas prioritised (see C2).
<b>D. Grazing management</b>		
D1. Undertake training in habitat impact assessment, analyse patterns in deer/sheep and vegetation to better understand how they affect vegetation and numbers of key species such as waders, use findings to influence management via e.g. deer management plans, common grazings.	Staff time 2021-2025 NatureScot, RSPB, Deer Management Groups, Environmental Research Institute	Outcome: Improved understanding of the impact of large herbivores on biodiversity, management decisions informed, resulting in improved grazing management benefiting habitats and key species. Follow-up research on habitat responses. Targets: 20 land managers trained, input to 5 management plans/groups, Publication or report on impacts and recommendations.
<b>E. Wildfire</b>		
E1. Establish a Flow Country Wildfire Group to minimise the risk & impact of fires, ensure fire plans are in place, share experience of best practice of wildfire prevention and management and facilitate joint responses to incidents including provision of personnel & equipment.	Staff time 2021-2030 led by Scottish Land & Estates with support from the Scottish Fire & Rescue Service	Outcome: Incidents of wildfire are dealt with collectively and damage is minimised. Targets: 1 meeting p/a, list of contacts, personnel & equipment (held by area, updated annually), joint responses to incidents.
E2. Disseminate results of the FireBlanket Project & make policy and management recommendations to support improved practices such as rewetting and brash management over drained areas and areas undergoing forestry removal.	Research Project 2019-2021 Led by ERI (NERC funded project)	Outcome: Improved peatland management practices that reduce fire risk and maximise soil C resilience to future climate extremes, contribution to emissions and climate mitigation target. Targets: 1 workshop report on "Building fire resilience in the Flow Country Peatland", input to Peatland ACTION and the UK Peatland Code.

<b>F Nature conservation</b>		
F1. Develop partnership working to support & implement a work plan for common scoters including survey & monitoring, research, conservation actions and stakeholder engagement.	Staff time 2021-2030 RSPB	Outcome: Increased understanding of scoter numbers & ecology, management undertaken, increased awareness & support from stakeholders. Targets: Scoter targets set & met/surpassed.

## CHAPTER 2: COMMUNITY AND ECONOMIC DEVELOPMENT

**Objective 2: To encourage sustainable community and economic investment that is compatible with safeguarding those features that make the peatlands important.**

### Key Issues

- There is a lack of direct community and business involvement in the management of the peatlands.
- There are opportunities to create skilled and long-term local employment through new peatland-based developments and the upscaling of habitat restoration activities.
- The strong policy drive towards development of further renewable energy sites to help meet CO<sub>2</sub> emission targets will increase development pressures, despite concerns on the scale and cumulative impacts of onshore wind farms across the area.
- There are further long-term restoration opportunities that could be delivered through habitat management plans associated with peatland developments.
- There is insufficient information on the community and economic benefits of the peatlands, including future opportunities that may arise from the potential World Heritage Site inscription.
- Peatland communities and business sectors experience difficulties in accessing markets for various reasons including remoteness and scale of operations.
- The North Coast 500 driving route brings both opportunities and challenges for local communities and the peatland environment.

### 2.1 Progress update

The numbered actions in the following table were taken from the 2015 revised Management Strategy. The table summarises progress that has been made and where appropriate, suggests future works which have been incorporated into the Action Plan for 2021-2030 (Table 2.2).

**Table 2.1 Progress update on the actions identified in 2015 to deliver Objective 2**

<b>Action 3.1</b>	Support community engagement in planning and management of the peatlands area.
Progress Update	Several voluntary trusts in many of the areas funded by the Climate Challenge Fund are working to maximise sustainable development opportunities.
Future Action	Broaden the membership of the FCP to include community and land management interests, work up proposals to facilitate community engagement. (Actions G1 and H1-2 below)
<b>Action 3.2</b>	Engage individuals and communities in the work of the Peatlands Partnership.
Progress Update	Flows to the Future Project held 151 local events with over 4,000 attendees.
Future Action	As above
<b>Action 3.3</b>	Undertake spatial planning to identify capacity for future renewable energy developments.
Progress Update	THC has mapped existing sites, NatureScot & others have developed spatial guidance
Future Action	Identify strategic capacity for future onshore wind energy developments. (Actions I1 & I2 below)
<b>Action 3.4</b>	Support habitat and species research and monitoring work that may inform future development planning.
Progress Update	SSE funded research, undertaken by RSPB into the effects of windfarms on golden plover, published in 2016 <sup>85</sup>
Future Action	Work with developers of wind farms and other peatland projects. (Action I2 below)

<sup>85</sup> <https://onlinelibrary.wiley.com/doi/abs/10.1111/ibi.12364>

<b>Action 3.5</b>	Support renewable energy developments where these are compatible with the natural heritage.
Progress Update	Numerous examples of positive management and sensitive approaches to onshore wind developments on peatland sites (see Scottish Renewables (2020) ‘Wind Power and Peatland: Enhancing Unique Habitats’).
Future Action	Identify strategic capacity for future onshore wind energy developments & work collaboratively to minimise negative impacts and contribute to biodiversity gain. (Actions I1-2 below)
<b>Action 3.6</b>	Promote branding of products related to the natural heritage of the peatlands.
Progress Update	No progress
Future Action	There are branding opportunities through e.g. the WHS inscription bid and the circular economy work undertaken by the Flow Country Partnership (included in Action H2 below).
<b>Action 3.7</b>	Identify and monitor the community and economic benefits arising from the peatlands.
Progress Update	Voluntary groups and the NHS promote health and wellbeing through nature.
Future Action	Develop a plan and help communities and businesses to maximise the local benefits from the Flow Country. (Action H2 below)

## 2.2 Action plan

The table below is a list of priority actions for the 2021 Strategy. It is based on discussions with key partners, feedback on the delivery on actions from the 2015 Strategy, and responses from the consultation on the draft Strategy (Nov-Dec 2020). The actions are not listed in order of priority, rather the table is structured to reflect the layout of the Management Strategy above (Part One). Several of the actions are dependent on securing additional funding to support the employment of new posts to facilitate sustainable communities and green finance investment into the peatlands, linked to the area’s international importance and potential World Heritage Site inscription.

**Table 2.2 Proposed actions to deliver Objective 2 (2021-2030)**

Action	Output, Timescale & Partners	Outcome & Target
<b>G. Community engagement &amp; representation</b>		
G1. Broaden the membership of the Flow Country Partnership to include further community and land management interests.	Staff time 2021-2030 led by NatureScot & Environmental Research Institute	Outcome: Broader Partnership with representation from community and land management interests. Target: Membership to be expanded & first full meeting held by end 2021.
<b>H. Sustainable communities</b>		
H1. a) Investigate community benefit funding from e.g. renewable developments or carbon credit finance as a possible source of longer-term support to develop a stronger sense of ownership and community engagement in the peatlands. b) Use longer term funding to promote sustainable communities, including outreach work and economic investment linked to the area’s international importance and potential WHS inscription.	a) Staff time Long-term funding secured by 2024 b) Officer time 2024 onwards led by The Highland Council & Highlands & Islands Enterprise	Outcome: Longer-term funding available to promote sustainable communities. Target: Funding secured by 2024, Sustainable Communities project to start with appointment of officer in 2024 (see H2b below).

(actions H2, H3, H4, J1, J2 below).		
<p>H2. a) Develop a plan and process to assist businesses, communities and individuals to think creatively about new sustainable development opportunities, encourage the development of innovative and novel products, and facilitate joint initiatives such as branding (e.g. Flow Country venison), to help build an economic case and infrastructure for a World Heritage Site.</p> <p>b) Manage and oversee development projects on behalf of communities and third sector groups to help businesses, communities and individuals to maximise the local benefits from the increasingly known global status of the Flow Country.</p>	<p>a) Staff time/contract Plan completed by 2022-2023 Led by Highlands &amp; Islands Enterprise</p> <p>b) Flow Country Sustainable Communities Officer 1 FTE post 2024-2030 led by HIE (with external funding)</p>	<p>Outcome: Businesses and communities are better able to realise economic and social benefits associated with the Flow Country and its designations, attract inward investment and increase employment opportunities, skills and wellbeing.</p> <p>Targets: a) Plan completed by 2023 (part of WHS preparatory works) b) Project specification to be worked up, targets agreed &amp; funding secured by 2023, with Officer appointed in 2024.</p>
<p>H3. Provide advice to businesses, communities and individuals within the Flow Country area to help them transition to a net-zero economic model. Consider including carbon trading and other natural capital financing opportunities, building on the outcomes of the Highland Adapt Project.</p>	<p>Flow Country Climate Adaption Officer 0.5 FTE post 2025-2030 led by The Highland Council (with external funding)</p>	<p>Outcome: Home and SME energy advice provided to improve efficiency, reduce carbon emissions and help tackle climate change and fuel poverty.</p> <p>Targets: Project specification to be worked up, targets agreed &amp; funding secured by 2024, with Officer appointed in 2025.</p>
<p>H4. Raise awareness of health &amp; wellbeing issues and how nature and the environment can help to address them, deliver outdoor activities in and around the Flow Country, co-ordinate delivery of social prescribing services and advocate the vital ecosystem services provided by the Flow Country.</p>	<p>Flow Country Health and Wellbeing Officer 0.5 FTE post 2025-2030 led by High Life Highland (with external funding)</p>	<p>Outcome: Health and wellbeing through nature best practice disseminated across relevant networks.</p> <p>Targets: Project specification to be worked up, targets agreed &amp; funding secured by 2024, with Officer appointed in 2025.</p>
<b>I. Renewable energy developments</b>		
<p>I1. Undertake landscape and ecological sensitivity appraisals and spatial planning to identify strategic capacity for future onshore wind energy developments, with particular focus on cumulative impacts.</p>	<p>Staff time 2021-2030 led by The Highland Council &amp; NatureScot with independent ecological advice</p>	<p>Outcome: Improved guidance to developers and planners.</p> <p>Target: guidance agreed and disseminated by 2023.</p>
<p>I2. Work with developers of wind farms and other peatland projects to prevent or minimise negative impacts and contribute to biodiversity gain across the peatlands of Caithness and Sutherland.</p>	<p>Staff time 2021-2030 led by The Highland Council &amp; NatureScot with independent ecological advice</p>	<p>Outcome: Peatland habitats and species protected and enhanced.</p> <p>Target: Independent ecological input to all new Peatland Habitat Management Plans by 2025.</p>

## CHAPTER 3: SPREADING THE MESSAGE ABOUT THE PEATLANDS

**Objective 3: To promote greater awareness, understanding and enjoyment of the special wildlife, carbon store, landscape, water environment, historical and cultural values of the peatlands.**

### Key Issues

- The Flows to the Future Project resulted in significant awareness raising and community engagement outputs, however there is a lack of longer-term funding for community outreach work, visitor facilities and infrastructure to enhance local pride and sense of ownership in the peatlands.
- The Flow Country Partnership has received approval from the UK Government to prepare a World Heritage Site bid to UNESCO. The boundary and management plan are yet to be agreed, and there is work to do to engage local support and secure local benefits that may arise from the designation.
- The increase in visitors in recent years has benefited the local economy but has also resulted in a rise in anti-social behaviour, littering and damage to the environment.

### 3.1 Progress update

The numbered actions in the following table were taken from the 2015 revised Management Strategy. The table summarises progress that has been made and where appropriate, suggests future works which have been incorporated into the Action Plan for 2021-2030 (Table 3.2).

**Table 3.1 Progress update on the actions identified in 2015 to deliver Objective 3**

<b>Action 4.1</b>	Continue to support the Peatlands Partnership to co-ordinate the implementation and monitoring of this Strategy.
Progress Update	The PP continued throughout this period and sub-groups took forward the Flows to the Future Project and World Heritage Site nomination bid.
Future Action	FttF Project now closed, WHS Group to prepare application to UNESCO (Action K1 below).
<b>Action 4.2</b>	Support individual and community engagement in the work of the Peatlands Partnership.
Progress Update	Flows to the Future Project held 151 local events with over 4,000 attendees.
Future Action	Broaden the FCP membership (Action G1 above) and support community engagement and outreach work (Actions J1-2 below).
<b>Action 4.3</b>	Facilitate and undertake activities to increase awareness, understanding and engagement with the peatlands, both locally and remotely.
Progress Update	As above, FttF also delivered 27 events further afield, 3 displays in museums etc & a new website with film, digital model & carbon capture game.
Future Action	Continue to maintain the website & displays, employ further longer-term posts to facilitate learning, engagement and community outreach work (Actions J1-2 below).
<b>Action 4.4</b>	Undertake and support projects that encourage community engagement in the peatlands and that bring community benefit.
Progress Update	As above, £4.3 million was spent with local businesses following FttF.
Future Action	Undertake further community engagement and outreach work (Actions J1-2 below)
<b>Action 4.5</b>	Provide training to increase the understanding and awareness of the peatlands for those who work with visitors and interest groups.
Progress Update	270 volunteers were trained and contributed over 5,550 days via the FttF project.
Future Action	Employ a Learning & Engagement Officer (Action J1 below).
<b>Action 4.6</b>	Facilitate and provide appropriate recreation and access facilities.
Progress Update	FttF installed 1 lookout tower & all-abilities boardwalk, 4 viewpoints, 1 info point & 5 signposted walking routes.

Future Action	Ongoing maintenance associated with FttF facilities, viewpoints & routes. Investigate scope for further facilities. (Action J2 below)
<b>Action 4.7</b>	Develop and market the peatlands as a green tourism destination and support appropriate ventures that bring local benefit.
Progress Update	FttF produced a new information booklet for tourist outlets across the area.
Future Action	Undertake a Sustainable Communities Project to provide advice on branding and sustainable development opportunities. (Action H2 above)
<b>Action 4.8</b>	Support the nomination of an area of the peatlands as a World Heritage Site.
Progress Update	In 2020 the UK Government invited the PP to make a full submission to UNESCO.
Future Action	Prepare WHS submission. (Action K1 below)

### 3.2 Action plan

The table below is a list of priority actions for the 2021 Strategy. It is based on discussions with key partners, feedback on delivery of the 2015 Strategy, and responses from the consultation on the draft Strategy (Nov-Dec 2020). The actions are not listed in order of priority, rather the table is structured to reflect the layout of the Management Strategy above (Part One). Several of the actions are dependent on securing additional funding to support the employment of new posts to facilitate learning and engagement associated with the important role the peatlands play in biodiversity and climate change mitigation, as well as helping communities to benefit from the increasing recognition of the importance of the Flow Country and the World Heritage Site submission.

**Table 3.2 Proposed actions to deliver Objective 3 (2021-2030)**

Action	Output, Timescale & Partners	Outcome & Target
<b>J. Awareness raising &amp; engagement</b>		
J1. Facilitate learning and engagement to enhance local pride and sense of ownership in the peatlands through inspiring and enthusing all generations about the globally important nature and landscapes in the Flow Country and its fundamental role in climate change mitigation.	a) Representation of the Flow Country at COP26, 2021 Environmental Research Institute b) Flow Country Learning & Engagement Officer (1 FTE post) 2023-2028 led by High Life Highland (with external funding)	Outcome: Environmental education and awareness raising activities will be delivered to all ages and abilities in and around the Flow Country. Targets: a) Representation of the Flow Country at COP26 (2021). b) Learning & Engagement Project specification to be worked up, targets agreed & funding secured by 2022, with Officer appointed in 2023.
J2. Help communities and businesses to access additional resources to support community outreach work, visitor facilities and infrastructure to help manage increased visitor activity. Promote responsible access, educate visitors so that they understand and respect the Outdoor Access Code and ensure irresponsible activity is curtailed.	Flow Country Outreach Officer (1 FTE post) 2023-2028 led by High Life Highland (with external funding)	Outcome: Communities will be more resilient and better able to manage challenges and benefits presented by increased numbers of visitors. Target: Project specification to be worked up, targets agreed & funding secured by 2022, with Officer appointed in 2023.
J3. Maintain and promote the Flows Field Centre as a hub for both local and residential volunteering, including new opportunities	Staff time 2021-2030	Outcome: Increased understanding of the importance of peatlands.

such as social prescribing and for visiting researchers, students and artists.	RSPB, Environmental Research Institute through the Flow Country Research Hub	Targets: 15% increase in volunteer numbers and use of facilities by 2025.
<b>K. World Heritage Site nomination</b>		
K1. Prepare a World Heritage Site submission to UNESCO including nomination documentation, management plan (including visitor and tourism management planning, restoration opportunities, climate change implications & opportunities, opportunities to be gained from WHS status e.g. socio-economic, environmental, educational) and agreed boundary.	Staff time 2021-2023 led by NatureScot, The Highland Council & Environmental Research Institute	Outcome: Peatlands profile raised nationally and internationally. Target: Submission of nomination bid in 2023

## CHAPTER 4: UNDERSTANDING THE PEATLANDS

**Objective 4: To support and promote the value of the area for best practice management and research and as an exemplar and inspiration for others working on peatland management and restoration, to the benefit of peatlands here and elsewhere.**

### Key Issues

- There is scope to develop the links between land managers and the research community through joint research and monitoring projects and workshops, as well as further engaging with communities of interest through 'citizen science' type projects.
- Peatland restoration practitioners, researchers and policy makers need to align their strategies and work together to ensure that restoration and monitoring is evidence-based and underpinned by science.
- Around the UK, the metrics required to adequately monitor peatland restoration are still largely under development with no standardised approach, spatial scale or timescale to assess the cost-effectiveness of the wide range of methods deployed over large areas.
- Further work is needed to quantify the social and economic benefits of peatland restoration in cost-benefit terms.
- Understanding the past development of the peat is crucial if we are really to understand what will happen during and after peatland restoration work. Better integration of the findings from palaeoecological and archaeological studies with studies into contemporary responses of peatlands to similar changes will help improve forecasting models.
- Our collective understanding on the impact of deer on vegetation, habitats and species is incomplete, but such data is very useful to feed into deer management planning decisions.
- There is insufficient information on the importance of in-bye fields to peatland waders.
- Our understanding of the erosion of upland peat areas is incomplete.
- Common scoter ecology, including how they move in and out of the Flows during migration & commuting during breeding season and links to loch & peatland management, is not well understood. Further research using innovative technologies would help us improve management for this important species.
- There has been insufficient independent assessment on the cumulative impacts of wind farms on peatland landscapes and ecosystems, and on knowledge gaps such as the impacts on birds flying at night.

### 4.1 Progress update

The numbered actions in the following table were taken from the 2015 revised Management Strategy. The table summarises progress that has been made and where appropriate, suggests future works which have been incorporated into the Action Plan for 2021-2030 (Table 4.2).

**Table 4.1 Progress update on the actions identified in 2015 to deliver Objective 4**

<b>Action 4.9</b>	Support and undertake research and monitoring that enhances understanding of, and supports the maintenance and enhancement of, the condition of the peatlands.
<b>Progress Update</b>	Several large collaborative projects recently started funded by NERC & the Leverhulme Trust, several large proposals under development with all the partners.
<b>Future Action</b>	Continue to support the delivery of research and monitoring that enhances understanding of and supports the maintenance and improvement of the condition of the peatlands (Actions below).

<b>Action 4.10</b>	Establish long term monitoring of peatland restoration on areas cleared of forest including those to reduce edge effects.
Progress Update	Ongoing long-term monitoring programme (RSPB, FLS) and collaborative funded project (ERI-NatureScot-RSPB).
Future Action	Combine monitoring data and novel remote-sensing approaches to improve understanding of effectiveness of restoration techniques (Action M1 below).
<b>Action 4.11</b>	Support and promote activities that encourage community engagement in research and monitoring.
Progress Update	Several activities through the Flows to the Future Project, dedicated research conferences in 2016 and 2018.
Future Action	Continue to support and promote activities that encourage community engagement in research and monitoring (Action L3 below).

## 4.2 Action plan

The table below is a list of priority actions for the 2021 Strategy. It is based on discussions with key partners, feedback on delivery of the 2015 Strategy, and responses from the consultation on the draft Strategy (Nov-Dec 2020). The actions are not listed in order of priority, rather the table is structured to reflect the layout of the Management Strategy above (Part One).

**Table 4.2 Proposed actions to deliver Objective 4 (2021-2030)**

Action	Output, Timescale & Partners	Outcome & Target
<b>L. Joint working</b>		
L1. Continue to support the extensive research collaboration working through the Flow Country Research Hub to understand the climate and biodiversity effects of management decisions in the Flow Country, and the implications of upland land use policy more widely. Encourage practitioners, researchers and policy makers to align their strategies and work together to ensure that restoration and other peatland management is evidence based.	Staff time 2021-2030 Flow Country Partnership members led by the Environmental Research Institute (Flow Country Research Hub host)	Outcome: Land management decisions and advocacy work are based on strong science.
L2. Develop science with research collaborators to better understand areas such as: i) spontaneous recovery of high-altitude eroded areas, ii) deer impacts on condition and climate resilience, iii) management routes to supporting resilience to drought and wildfire.	Staff time 2021-2030 Led by ERI, with collaboration from RSPB, NatureScot & others in developing funding bids	Outcome: Priority areas are identified and progressed e.g. through PhD projects linked to part of wider work on peatland resilience. Targets: Projects worked up and underway to address each of the three areas by 2023.
L3. Support and promote activities that encourage community engagement in research and monitoring.	Staff time 2021-2030 led by ERI & NatureScot	Outcome: Local community awareness and engagement is raised, sense of ownership & pride in the peatlands is strengthened, and research

		projects benefit from local knowledge and assistance. Targets: WHS monitoring plan includes citizen science, projects to start in 2024.
<b>M. Restoration research and monitoring</b>		
M1. Combine long-term monitoring data and novel remote-sensing approaches to improve understanding of the effectiveness of different restoration techniques.	Ongoing long-term monitoring programme (RSPB, FLS) and collaborative funded project (NERC & Leverhulme grants to ERI-UHI, NatureScot, FLS, RSPB, RESAS programme from the James Hutton Institute)	Outcome: Results and recommendations to be fed back to partners to guide future restoration works. Targets: By 2022, InSAR-based methods are developed and validated for the Flow Country condition assessment and restoration monitoring. By 2025, a 'tool-kit' of remote sensing technologies is available for practitioners.
M2. Repeat the FttF economic study to quantify the social and economic benefits of peatland management and restoration in cost-benefit terms taking into account the outcomes of upcoming green finance solutions.	Independent contract 2024 Led by HIE with input from Peatland Partnership partners	Outcome: Results are disseminated and widely understood by local communities and businesses. Target: secure funding and repeat study in 2024 (FttF study undertaken in 2019).
M3. Integrate the findings from palaeoecological and archaeological studies with studies into contemporary responses of peatlands to similar changes to help improve forecasting models.	Led by ERI (Flow Country Research Hub host) with input from RSPB and NatureScot	Outcome: Research findings on past development of peat are widely shared and used to inform management decisions. Targets: PhD projects on long-term development of Flow Country landscape underway by 2021; publications of recent work on native woodland, peatland development and long-term effects of forestry by 2023.
M4. Carry out second phase of edge effect research work, to understand responses of waders to forestry removal to date. (A repeat of the 2003-2005 wader edge effects study to measure rate and scale of any wader response to forest to bog restoration in the intervening period).	Staff time 2022-2024 led by NatureScot, findings disseminated via the Flow Country Partnership	Updated understanding and evidence around waders' responses to forestry removal. Target: Study to be repeated in 2022-2024
M5. Complete first phase of research on forest to bog restoration methods by writing up early trials and completing the setting up of later phases, ensure relevant research findings are used to inform future restoration projects.	Staff time, 2020-2025, RSPB supported by ERI, findings disseminated via the Flow Country Partnership and Flow Country Research Hub	Collective understanding on land-use change & management is evidence-based. Target: Research completed; findings disseminated & incorporated into future management.
M6. Review experience of forest track removal elsewhere as precursor to trials of track removal and restoration.	Staff time start by 2022	Outcome: Proposals prepared include review of experience

	led by RSPB with input from ERI, results disseminated via the Flow Country Partnership	from elsewhere, trials undertaken at Forsinard. Targets: Completed evidence review, feasibility study and trial restoration of a short spur track end section.
<b>N. Potential research areas to develop further</b>		
N1. Investigate the role of non-carbon elements of climate interactions (e.g. albedo, volatile organics, cloud formation) in understanding full climate implications of management and policy decisions (e.g. around forestry) in the peatlands.	Research project 2030 Lead partner: Flow Country Research Hub	Outcome: Results to inform policy decisions and peatland management. Targets: Research project worked up & underway by 2030.
N2. Develop research to understand the composition of mammalian predator community of forest plantations, and their use of linear features.	Staff time 2022-2024 led by RSPB, results disseminated via the Flow Country Partnership & Flow Country Research Hub	Outcome: Improved understanding of forestry effects on predators & the role of linear features. Target: Camera trapping study of linear feature use by mammals in forestry, restoration and open peatland habitats in Forsinard Reserve area.
N3. Analyse patterns in duck productivity over time (scoters, wigeon, other ducks) and in relation to forest proximity, using long-running Forsinard scoter survey dataset.	Staff time 2020-2023 led by RSPB, results disseminated via the Flow Country Partnership & Flow Country Research Hub	Outcome: Updated understanding & evidence around wildfowl responses to forestry removal. Target: Temporal patterns in duck productivity, informing forestry policy and management decisions.
N4. Study the origins and connectivity of brown trout populations in the Flow Country to distinguish native populations from those influenced or established by past stocking from outside the area.	Staff time 2024-2025 led by RSPB, results disseminated via the Flow Country Partnership & Flow Country Research Hub	Outcome: Increased understanding of brown trout populations, improved habitat management for common scoters & other peatland species. Target: research undertaken, and management recommendations developed by 2025.

## List of Acronyms used in the Action Plan

AECS	Agri-Environment Climate Scheme
BTO	British Trust for Ornithology
C&S	Caithness & Sutherland
CONFOR	Confederation of Forest Industries
COP26	Conference of Parties – UN Climate Change Conference, Glasgow 2021
DMG	Deer Management Group
EIA	Environmental Impact Assessment
ERI	Environmental Research Institute
FCP	Flow Country Partnership
FCS	Forestry Commission Scotland
FLS	Forestry & Land Scotland (formerly Forest Enterprise / Forestry Commission)
FTE	Full-time equivalent
FttF	Flows to the Future
HIE	Highlands & Islands Enterprise
HLH	High Life Highland
HTTG	Highland Timber Transport Group
IUCN	International Union for the Conservation of Nature
JHI	James Hutton Institute
LBAP	Local Biodiversity Action Plan
NERC	Natural Environment Research Council
NHS	National Health Service
NS	NatureScot (formerly Scottish Natural Heritage)
NSCFT	North Sutherland Community Forest Trust
PP	Peatlands Partnership
RESAS	Scottish Government Rural & Environment Science & Analytical Services
RSPB	Royal Society for the Protection of Birds
SEPA	Scottish Environment Protection Agency
SF	Scottish Forestry (formerly Forestry Commission Scotland)
SFRS	Scottish Fire & Rescue Service
SGRPID	Scottish Government Rural Payments & Inspections Directorate
SME	Small and Medium Enterprise
SRDP	Scottish Rural Development Programme
SSE	Scottish & Southern Energy
THC	The Highland Council
UHI	University of the Highlands & Islands
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WHS	World Heritage Site

## Annex 1: SAC & SPA qualifying habitats & species

Annex 2: SAC & SPA conservation objectives

## Annex 3: Glossary

Agri-Environment Climate Scheme (AECS)	Promotes land management practices which protect and enhance Scotland's natural heritage, improve water quality, manage flood risk and mitigate and adapt to climate change.
Biodiversity	Term used to describe the enormous variety of life on Earth, it can be used more specifically to refer to all of the species in one region or ecosystem.
Biodiversity Crisis	Refers to the rapid loss of species and the rapid degradation of ecosystems - 1 million animal and plant species are now threatened with extinction, the current global response is insufficient, and transformative changes are needed to restore and protect nature (IPBES, 2019).
blanket bog	A type of peatland where the vegetation is only supplied with water and nutrients from the atmosphere.
carbon sequestration	The process of capturing and storing atmospheric carbon dioxide.
carbon store / sink	A reservoir that retains carbon and keeps it from entering Earth's atmosphere, e.g. forests, peatlands.
citizen science	The collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists.
Climate Change Plan	Scotland's 2018-2032 Climate Change Plan, updated in 2020, sets out the Scottish Government's pathway to its ambitious targets set by the Climate Change Act 2019.
Climate Emergency	A situation in which urgent action is required to reduce or halt climate change and avoid potentially irreversible environmental damage resulting from it. Many governments and organisations have declared a Climate Emergency.
Construction Environmental Management Plan (CEMP)	Deals with environmental impacts during construction, sets out how developers will mitigate or compensate for the impacts, complimentary to Habitat Management Plans.
emission targets	Greenhouse gas emissions reduction targets set by governments to tackle climate change, measured against 1990 levels.
Environmental Impact Assessment (EIA)	A means of drawing together, in a systematic way, an assessment of the likely significant environmental effects arising from a proposed development.
Flow Country	Area of deep peat, dotted with bog pools, that forms the heart of the Caithness and Sutherland peatlands.
Flow Country Partnership	Expanded group of organisations & representatives renamed from the Peatlands Partnership in 2021 to deliver this Peatland Management Strategy.
Flow Country Research Hub	A network of researchers and stakeholders involved or interested in the scientific research taking place in the peatlands of the Flow Country, established in 2012.
Flows to the Future	Peatland project which ran from 2014-2019 delivering local and remote engagement activities, improving interpretation & engagement facilities and enabling peatland restoration over a large area.
green recovery	Widely adopted name for a proposed package of environmental, regulatory and fiscal reforms to recover prosperity after the COVID-19

	pandemic; term also used in relation to climate change and reducing carbon emissions.
greenhouse gas	Any gas that has the property of absorbing infrared radiation (net heat energy) emitted from Earth's surface and reradiating it back to Earth's surface, thus contributing to the greenhouse effect. Carbon dioxide, methane, and water vapour are the most important greenhouse gases.
Habitat Management Plan (HMP)	Sets out how developers will mitigate or compensate for the impacts caused by the development, or enhance the natural heritage interest of the area. Where a HMP proposes land management within or potentially affecting a Natura site, consideration of the requirements of the Habitats Regulations will also be required.
Highland-wide Local Development Plan (HwLDP)	Highland Council's vision for the area, sets out how land can be used by developers over 20 years, to be read alongside Area Local Development Plans & reviewed following publication of NPF4.
Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)	An independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development.
International Union for Conservation of Nature (IUCN)	The global authority on the status of the natural world and the measures needed to safeguard it.
National Planning Framework (NPF)	Long-term plan for Scotland that sets out where development and infrastructure is needed to support sustainable and inclusive growth. The current framework (NPF3) was published in 2014 and the Scottish Government has now begun a process of review and preparation of a new framework, NPF4.
Natura site	Caithness & Sutherland Peatlands SPA/SAC: part of a network of sites selected to ensure the long-term survival of Europe's most valuable and threatened species and habitats.
nature based solutions	Refers to the use of nature and natural environments to help tackle socio-environmental challenges, providing benefits to people and nature. In particular, these solutions can help us mitigate and adapt to climate change.
net zero	Refers to achieving a balance between the amount of greenhouse gas emissions produced and the amount removed from the atmosphere. The net-zero target recognises that emissions need to be fully offset, predominantly through natural carbon sinks such as oceans, forests and peatlands.
North Coast 500 (NC500)	Coastal touring route of just over 500 miles around the northern Highlands.
paleoecology	The study of interactions between organisms and/or interactions between organisms and their environments across geologic timescales.
peat slide	Naturally occurring landslides which occur on the blanket bogs, large amounts of peat soil move downslope and into water courses. Some peat slides are associated with human use of peatlands, where drainage or construction has modified the hydrology or loaded the slopes, leading to failure.
peatland	A general term for any area with a naturally accumulated peat layer at the surface, regardless of the vegetation or land use.

Peatland ACTION	Scotland-wide peatland restoration project set up in 2012, led by NatureScot in partnership with Forestry and Land Scotland and the National Parks.
peatland restoration	Term used to describe management measures that aim to restore the original form and function of peatland habitats to favourable conservation status.
Peatlands Partnership	Group of organisations & representatives formed in 2006 to oversee delivery of the Peatlands of Caithness & Sutherland Management Strategy, now called the Flow Country Partnership.
Ramsar site	Wetland of International Importance designated under the Ramsar Convention, an intergovernmental environmental treaty established by UNESCO which came into force in 1975.
Scottish Rural Development Programme (SRDP)	Part of the Common Agricultural Policy, funds economic, environmental and social measures for the benefit of rural Scotland.
Special Area of Conservation (SAC)	Protects one or more special habitats and/or species – terrestrial or marine, listed in the EU Habitats Directive.
Special Protection Area (SPA)	Selected to protect one or more rare, threatened or vulnerable bird species listed in Annex I of the EU Birds Directive, or certain regularly occurring migratory species.
United Nations Educational, Scientific and Cultural Organisation (UNESCO)	Specialised agency of the United Nations aimed at promoting world peace and security through international cooperation in education, the sciences, and culture.
Water Framework Directive	European environmental legislation which aims to improve and protect the water environment on a catchment scale.
WHS Tentative list	Inventory of properties which a State party considers to be cultural and/or natural heritage of outstanding universal value, and therefore suitable for inscription on the World Heritage List.
wild land	Term used to describe areas of Scotland, chiefly in the north and west, with largely semi-natural landscapes that show minimal signs of human influence - these may be mountains and moorland, undeveloped coastline or peat bog.
World Heritage Site (WHS)	Cultural and/or natural site of outstanding universal value which is important across countries and generations, nominated by individual governments & inscribed by UNESCO.