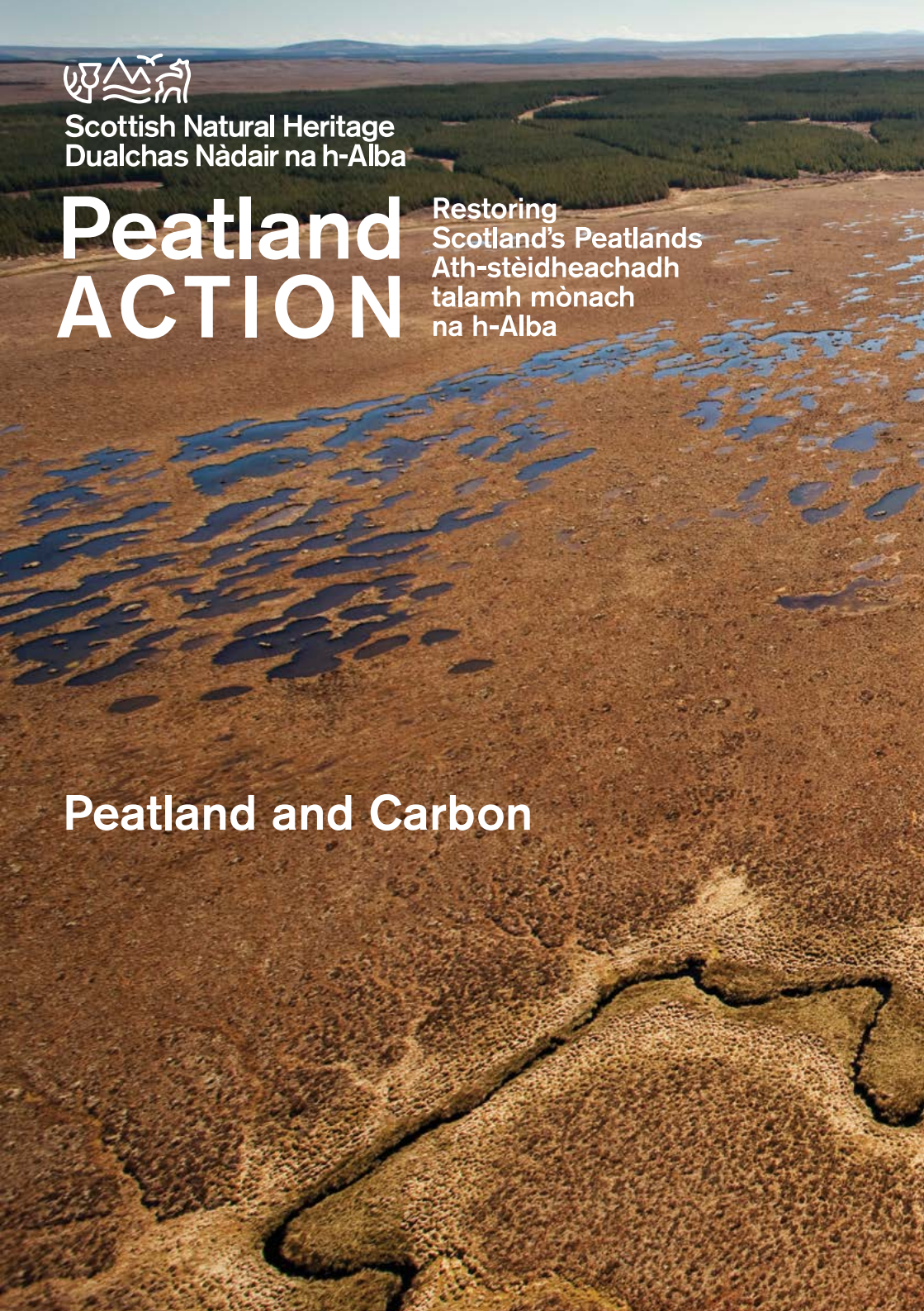


Scottish Natural Heritage
Dualchas Nàdair na h-Alba

Peatland ACTION

Restoring
Scotland's Peatlands
Ath-stèidheachadh
talamh mònach
na h-Alba

Peatland and Carbon

Flanders Moss, an 8,000 year old peat bog and European designated site[1], contains around 3 million tonnes of carbon[2].

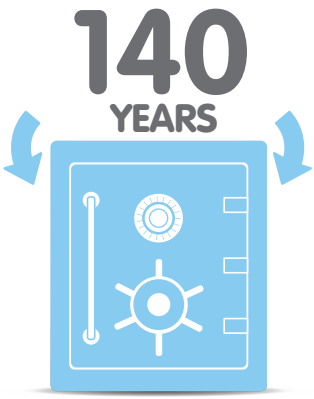
Image courtesy of Iain Jamieson

Carbon storage

Peatlands store significant quantities of carbon. Although they only cover around a fifth of Scotland's total land area, they store 25 times more carbon than all the vegetation of the UK[3].

Peatlands are wetlands which have accumulated large amounts of carbon-rich peat. Peat, made up of layers of partially decayed plant material, effectively locks up carbon absorbed from the atmosphere by plants.

Peat accumulates very slowly, at a rate of around 1mm per year[4]. This makes some of our deepest bogs[5] around 10,000 years old.



The carbon locked up in Scottish peatland soils is equivalent to 140 years' worth of Scotland's total annual greenhouse gas emissions[6].

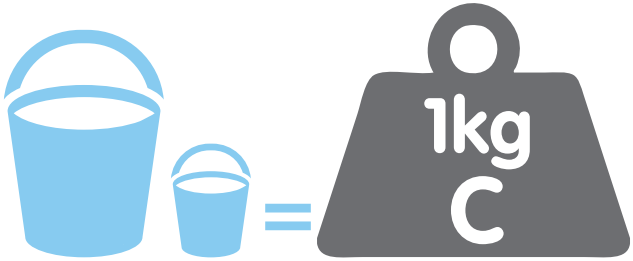
70% of Scotland's blanket bog[7] and 90% of Scotland's raised bog [8] areas are estimated to be damaged to some degree.

Image courtesy of Emily Taylor, Crichton Carbon Centre

Carbon loss

Peatlands in good condition maintain the wet, acidic and low oxygen conditions required to stop dead plant material being fully decomposed and all of their carbon being released back into the atmosphere. Although the greenhouse gases methane (CH_4) and carbon dioxide (CO_2) are released to the atmosphere naturally by peatlands, the rate of release is greatly accelerated when peatlands dry out, contributing to global warming.

A bucket and a half of peat contains around 1 kg of carbon[9].



Peaty water can be a sign of upstream peatland degradation.

Image courtesy of Andrew McBride SNH

Extensive peat erosion revealing the foundations of a trig point.

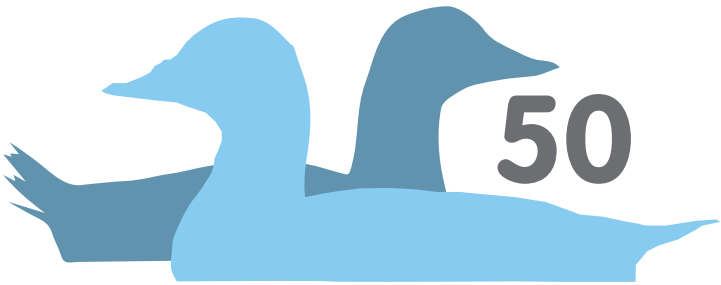
Sphagnum moss, which forms peat and helps keep a peatland wet, can hold 30 times its own weight in water[10].

Common scoter.

Peatlands as habitats

Peatlands are important habitats and support many species under threat.

Only around 50 breeding pairs of common scoter are left in the UK, the core of the population being supported by the blanket bog expanses of Caithness and Sutherland[11].



Large areas of peatland have been drained.

Image courtesy of Emily Taylor

Peatland management

Some peatland management practices, such as drainage, heavy grazing and inappropriate burning, have resulted in changes in vegetation, peat erosion and carbon loss[12,13].

Many peatland areas, however, are now being restored and managed sustainably.

Peatland restoration is not just good for carbon storage, but may also help reduce the risk of wildfire[14], improve water quality[15], stop soil erosion and increase the abundance of insects such as crane flies, which are a vitally important source of food for red grouse and many other upland birds[16].

Greenhouse gases are released to the atmosphere when tree growth is poor and peat soils are heavily drained and disturbed[18].

Image courtesy of Emily Taylor

Peatlands and trees

Trees can absorb carbon quickly but there is a limit to the amount of carbon that a woodland can store[17]. Peatlands form peat much more slowly but they can store carbon for thousands of years.

Eroding bare peat.
Image courtesy of Stephen Corcoran /*CNPA*

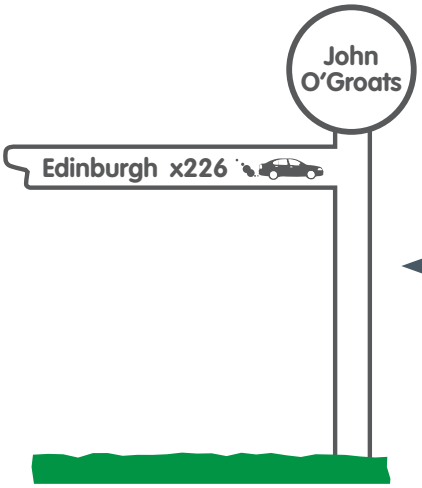
Restoration covers and stabilises eroding peat.
Image courtesy of Stephen Corcoran /*CNPA*

Peatland restoration

With 80% of peatland habitats estimated to be damaged in Scotland, restoration is crucial to "locking-in" carbon, helping to counteract climate change.

The more damaged a peatland site is, the more it will cost to put right. Drain blocking with peat dams is quick and low cost compared to tackling large areas of bare and eroding peat.

Taking action now can save restoration costs in the future.



Restoring an area of bare peat the size of Glasgow's George Square would save 19 tonnes of carbon dioxide every year, which is the same as the emissions produced by 226 car journeys between Edinburgh and John O'Groats[20].

Restoring all of the currently known area of bare peat in Scotland would save the same emissions as produced by 755,000 flights between Edinburgh and London every year[21].

Peatland and Carbon footnotes

[1] Flanders Moss Management, Scottish Natural Heritage. Available at: http://www.nnr-scotland.org.uk/flanders-moss/management/

[2] Scottish Peat Committee and Macaulay Institute. Peat Surveys: Peat Deposits from 1984. James Hutton Institute. Available at: http://www.hutton.ac.uk/learning/natural-resource-datasets/peat-surveys/peat-deposits*,**

*Assumes 50kg of carbon per m^3 (Lindsay, R. (2010) Peatbogs and carbon: a critical synthesis to inform policy development in oceanic peat bog conservation and restoration in the context of climate change. Technical Report. University of East London, Environmental Research Group).

** Flanders Moss East plus Flanders Moss West

[3] Peatland and Climate Change: what do we really know? Joint Nature Conservation Committee: http://jncc.defra.gov.uk/page-5547.

[4] Lindsay, R., Birnie, R. & Clough, J. (2014) IUCN UK Committee Peatland Programme Briefing Note: Peat Bog Ecosystems: Key Definitions. IUCN UK Committee Peatland Programme Available at: http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/1-10%20Peatland%20Briefings%20-%205th%20November%202014.pdf.

[5] Scottish Peat Committee and Macaulay Institute. Peat Surveys: Peat Deposits from 1984. James Hutton Institute. Available at: http://www.hutton.ac.uk/learning/natural-resource-datasets/peat-surveys/peat-deposits

[6] Total peatland carbon (1778 Mt C*) = 6,525.26 CO_2 eq**. Annual emissions of Scotland in 2014 is 46.70 Mt CO2 eq***.

* Smith,P., Smith,J., Flynn,H., Killham,K., Rangel-Castro,I., Foereid,B., Aitkenhead,M., Chapman,S., Towers,W., Bell,J., Lumsdon,D., Milne,R., Thomson,A., Simmons,I., Skiba,U., Reynolds,B., Evans,C., Frogbrook,Z., Bradley,I., Whitmore,A., Falloon,P. ECOSSE - Estimating carbon in organic soils sequestration and emissions. (2007). Edinburgh, Scottish Executive Environment and Rural Affairs Department.

** Conversion factor of 3.67

*** Scottish Government (2016). Scotland's Greenhouse Gas Inventory, 1990-2014. Edinburgh: Scottish Government.

[7] Artz, R.R.E., Donnelly, D., Andersen, R., Mitchell, R., Chapman, S.J., Smith, J., Smith, P., Cummins, R., Balana, B. and Cuthbert, A. (2014). *Managing and restoring blanket bog to benefit biodiversity and carbon balance – a scoping study*. Scottish Natural Heritage Commissioned Report No. 562.

[8] Lindsay, R.A. & Immirzi, C.P. 1996. An inventory of lowland raised bogs in Great Britain. Scottish Natural Heritage Research. Survey and Monitoring Report No 78.

[9] Taking approximate carbon content of 50kg per m^3 (Lindsay, R. (2010) Peatbogs and carbon: a critical synthesis to inform policy development in oceanic peat bog conservation and restoration in the context of climate change. Technical Report. University of East London, Environmental Research Group) and an average bucket being 14 litres (0.014m3).

[10] Yoshikawa, K., Overduin, P.P. and Harden, J.W. 2004. Moisture content measurements of moss (Sphagnum spp.) using commercial sensors. Permafrost and Periglacial Processes.15. 309-318.

[11] Robinson, R.A. (2017) BirdFacts: profiles of birds occurring in Britain & Ireland (BTO Research Report 407). Available at: http://blx1.bto.org/birdfacts/results/bob2130.htm#trends

[12] Grant, M., Mallord, J., Stephen, L., and Thompson, S. (2012). 'The costs and benefits of grouse moor management to biodiversity and aspects of the wider environment: a review'. RSPB Research Report No. 43. Sandy, Bedfordshire: RSPB. Available at: https://www.rspb.org.uk/Images/grant_mallord_stephen_thompson_2012_tcm9-318973.pdf.

[13] Littlewood, N., Anderson, P., Artz, R., Brass, O., Lunt, P. and Marrs, R. (2010) 'Peatland Biodiversity'. Technical review. Edinburgh: IUCN UK Peatland Program. Available at: http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/Review%203%20Peatland%20Biodiversity%20-%20Summary.pdf.

[14] Anderson, A. (2016). 'Briefing Note: Grouse Moors and Flooding'. Lancaster: Moorland Association. Available at: http://www.moorlandassociation.org/wp-content/uploads/2016/01/Briefing-Note-Grouse-Moors-and-Flooding1.pdf.

[15] Anderson, A. (2016). 'Briefing Note: Grouse Moors and Flooding'. Lancaster: Moorland Association. Available at: http://www.moorlandassociation.org/wp-content/uploads/2016/01/Briefing-Note-Grouse-Moors-and-Flooding1.pdf

[16] Carroll, M. J., Dennis, P., Pearce-Higgins, J. W. and Thomas, C. D. (2011). 'Maintaining northern peatland ecosystems in a changing climate: effects of soil

moisture, drainage and drain blocking on craneflies', *Global Change Biology*, 17: 2991–3001. doi:10.1111/j.1365-2486.2011.02416.x

[17] Broadmeadow, M and Matthews, R. (2003). Forests, Carbon and Climate Change; the UK Contribution Information Note. Forestry Commission. Available at: http://www.forestry.gov.uk/pdf/fcin048.pdf/$FILE/fcin048.pdf.

[18] Forestry Commission Scotland (2015). 'Deciding future management options for afforested deep peatland'. Practice Guide. Edinburgh: Forestry Commission Scotland. Available at: http://scotland.forestry.gov.uk/news-releases/1199-deep-peat-practice-guide.

[19] Scotland's National Peatland Plan: Working for our future (2015). https://www.nature.scot/climate-change/taking-action/carbon-management/restoring-scotlands-peatlands/scotlands-national-peatland-plan

[20] Restoring 1 ha of eroding peat saves 19 t CO_2 eq year*. Average petrol car emits 0.30875 kgCO2e per mile**. 272 mile between Edinburgh and John O'Groats. George Square is 1.1ha

* Smyth,M.-A., Taylor,E., Artz,R., Birnie,R., Evans,C., Gray,A., Moxey,A., Prior,S., Dickie,I., Bonaventura,M. Developing Peatland Carbon Metrics and Financial Modelling to Inform the Pilot Phase UK Peatland Code. Project NR0165, 1-23. 2014. Dumfries: Crichton Carbon Centre.

** Department for Business, Energy & Industrial Strategy (2016). UK Government GHG Conversion Factors for Company Reporting. UK Government.

[21] Total area of bare peat is 3567ha*. Save 19t CO2 eq per ha per year by restoring bare peat**. 1 km of average short haul flight emits 0.16844 kg CO2 eq***, flight from Edinburgh to London is 533 km.

* Chapman S, Artz R, Donnelly D (2012). Carbon savings from peat restoration. ClimateXChange report to Scottish Government, James Hutton Institute, Aberdeen.

** Smyth,M.-A., Taylor,E., Artz,R., Birnie,R., Evans,C., Gray,A., Moxey,A., Prior,S., Dickie,I., Bonaventura,M. Developing Peatland Carbon Metrics and Financial Modelling to Inform the Pilot Phase UK Peatland Code. Project NR0165, 1-23. 2014. Dumfries: Crichton Carbon Centre.

*** Department for Business, Energy & Industrial Strategy (2016). UK Government GHG Conversion Factors for Company Reporting. UK Government.

Find out more

If you have a potential project that you would like to discuss, or you have a request for information or data gathered from the project, please get in touch by emailing **peatlandaction@nature.scot**

Scotland National Peatland Plan
www.nature.scot/climate-change/taking-action/carbon-management/restoring-scotlands-peatlands/scotlands-national-peatland-plan

Towards an assessment of the state of UK Peatlands, JNCC report No. 445
www.jncc.defra.gov.uk/pdf/jncc445_web.pdf

Peatbogs and carbon: a critical synthesis
www.rspb.org.uk/Images/Peatbogs_and_carbon_tcm9-255200.pdf

Peatland Action videos and guidance on peatland restoration:
www.nature.scot/peatlandactionvideos

Further information on peatland management and restoration:
www.iucn-uk-peatlandprogramme.org/resources/iucn-briefing-notes-peatlands

www.nature.scot/peatlandaction

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot