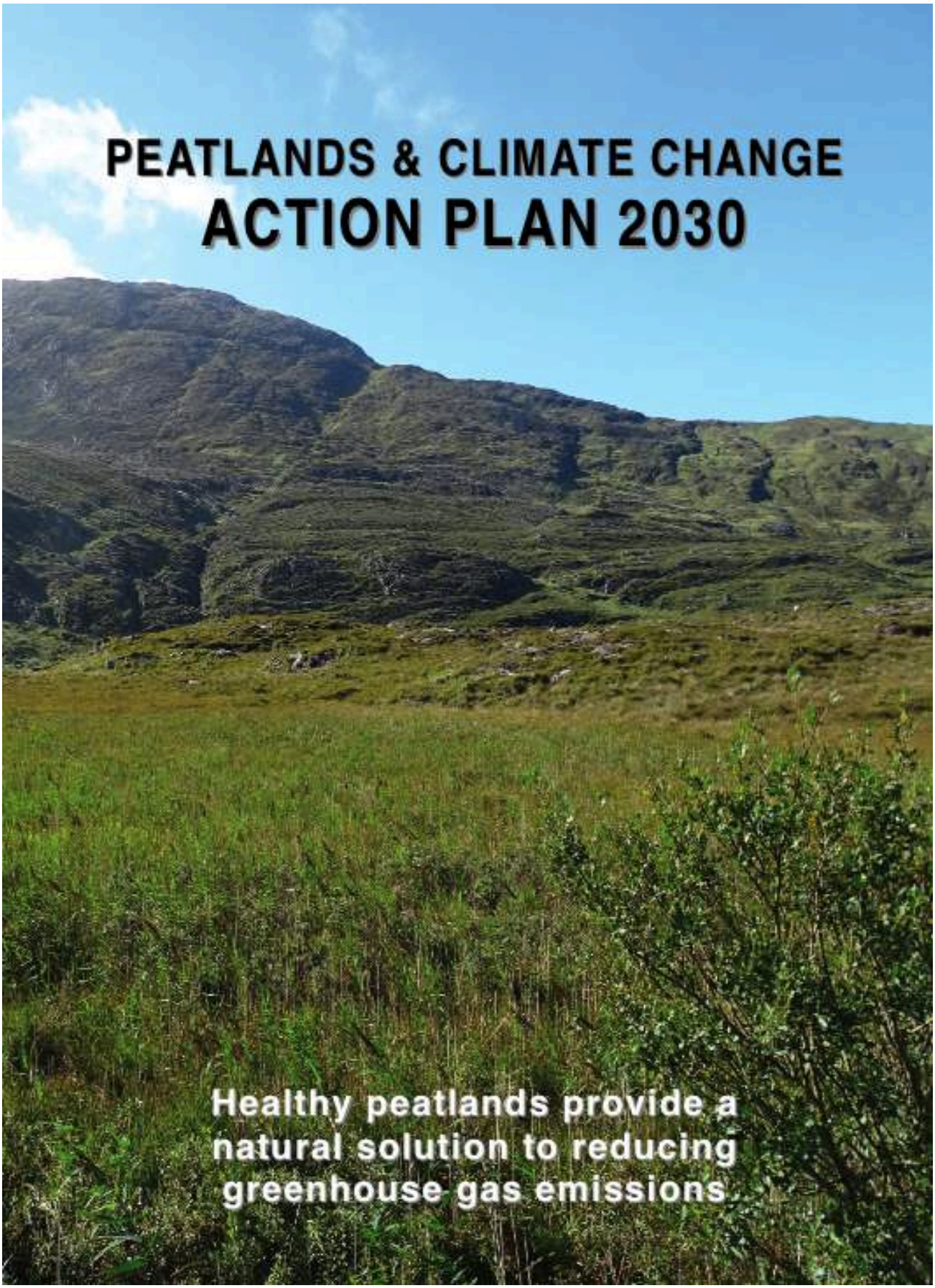
PEATLANDS & CLIMATE CHANGE
ACTION PLAN 2030
Healthy peatlands provide a
natural solution to reducing
greenhouse gas emissions

Peatlands and Climate Change Action Plan 2030

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Cover Image: Blanket bog complex south of Killary Harbour, Co. Galway. Blanket bogs face a number of pressures - overgrazing, drainage for turf cutting and forestry, burning to improve grazing, recreation and windfarm developments. Together these uses can change the natural function of the blanket bog so that it switches from slowing climate change as a carbon sink, to become a carbon source that releases greenhouse gases to the atmosphere. Photo: © C. O'Connell.

The Irish Peatland Conservation Council was founded in 1982. Our mission is to conserve a representative sample of the bogs and fens of Ireland for people to enjoy now and in the future. We run the national Save the Bogs Campaign and our activities include: education and publicity, promoting environmental awareness, providing information and encouraging the protection and conservation of our national heritage for the common good. We own and manage a network of five peatland reserves in Counties Kildare, Waterford, Meath and Kerry. We own and run the Bog of Allen Nature Centre which is open to visitors and school groups. We provide an extensive information service on our web site at www.ipcc.ie. IPCC has four members of staff and are supported by 100 volunteers. 4,000 individuals subscribe to our campaign. The Irish Peatland Conservation Council is a voluntary, non-governmental organisation, a Company Limited by Guarantee (No. 115156) with charitable status (CHY6829, RCN 20013547).

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Contents

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2. Executive Summary

frequently asked questions answered

In 2019 Ireland declared a climate and biodiversity emergency. The government has acknowledged that our country needs to act with urgency on the causes and impacts of climate change. Peatlands are highly significant in the global efforts to combat climate change. The protection and restoration of peatlands is vital in the transition towards a climate resilient and climate neutral economy. To assist in the implementation of climate action plans, the Irish Peatland Conservation Council have developed this plan of action focusing on peatlands. Depending on how we manage our peatland resources they can strongly contribute to the climate crisis or they can support climate mitigation plans and international biodiversity targets.

The overall aims of this action plan are to ensure the protection of peatlands currently in good condition and supporting their range of ecosystem functions and to enhance the resilience to climate change of the entire country's peatlands through management, funding, education and collective effort.

This action plan seeks to address a number of relatively simple questions that people ask in any discussion about peatlands and climate change. It is difficult to give precise answers to questions. Using as much information as possible and from our practical experience in peatland protection the Irish Peatland Conservation Council makes the following answers.

How much carbon is stored?

The total soil carbon stock in raised and blanket bogs was calculated for a continuum of sites from industrial cutaway to intact pristine bog in 2000 by Tomlinson[1]. The mean carbon density expressed as tonnes of carbon per hectare (t C ha^{-1}) in raised bogs was 1,314 t C ha^{-1}, in lowland blanket bogs was 1,022 t C ha^{-1} and in upland blanket bogs was 420 t C ha^{-1}.

It follows that 53% of the total stock of carbon in Irish soils is found in raised and blanket bogs which cover <20% of the total land area of the country[1]. The total carbon stock amounted to 1,188,800 tonnes of carbon (t C).

Lodge Bog in Co. Kildare, an uncut raised bog remnant which had an average peat depth of 3.03m was found to have a carbon soil store of 1,329 t C ha^{-1} (Kerr 2011)[2].

A cutover raised bog where peat depth ranged from 2m to 5.5m was found to have an average carbon soil store of 1,422 t C ha^{-1}. These figures were calculated for Girley Bog cutover, Co. Meath (O'Connell et al 2020[3]). Using the average figure from Girley Bog, there many be 452 million t C (tonnes of carbon) stored in the 317,759ha of cutover bog under turbary in Ireland at this time.

How much CO_2 is sequestered in peatland?

In terms of greenhouse gas sequestration the long-term work led by Kiely et al 2018[4] at Glencar in Co. Kerry found that this pristine blanket bog was a carbon sink, sequestering 30 g C m^{-2} yr^{-1} (grammes of carbon per metre squared per year) or 0.3 t C ha^{1} yr^{-1} (grammes of carbon per hectare per year).

How much greenhouse gases are coming off Irish peatlands?

All anthropogenic or human-modified/drained peatlands are net greenhouse gas sources according to research undertaken across a network of different peatland site conditions and uses (Renou-Wilson et al 2018[5] and Wilson et al 2015[6]). The emissions are between 0.81 and 2.86 t C ha^{-1} yr^{-1} for carbon dioxide (CO_2) and between 0 and 0.015 t C ha^{-1} yr^{-1} for methane (CH_4).

The volume of greenhouse gases lost in bog water as dissolved organic carbon have not been included in the figures presented.

How much carbon can be saved by restoring peatland?

Following restoration through rewetting land managers can expect CO_2 emissions to reduce. Following rewetting some sites became a CO_2 sink in the order of 0.4 to 1.04 t C ha^{-1} yr^{-1} such as drained only, domestic cutover bogs, nutrient-poor industrial cutaway and peatlands reclaimed to grassland. In terms of CH_4 all rewetted sites examined continued to be a source ranging from 0.020 to 0.197 t C ha^{-1} yr^{-1} (Renou-Wilson et al 2018[5]).

Restoration not only provides

1 Tomlinson, R.W. (2005) Soil Carbon Stocks and changes in the Republic of Ireland. Journal of Environmental Management 76: 77-93

2 Kerr, E. (2011) The Long Term Carbon Storage Capacity of Lodge Bog, Co. Kildare. B.A. (Mod) Thesis, School of Natural Sciences, University of Dublin Trinity College, Dublin.

3 O'Connell, C. A., Madigan, N. & Farrell, P. (2020) Girley Bog Carbon Project. Irish Peatland Conservation Council, Kildare

4 Kiely, G., Leahy, P., McVeigh, P., Lewis, C., Sottocornola, M., Laine, A & Koehler, A-K. (2018) PeatGHG - Survey of GHG Emission and Sink Potential of Blanket Peatlands. Report No. 228, EPA, Wexford.

5 Renou-Wilson, F., Wilson, D., Rigney, C., Byrne, K., Farrell, C. & Müller., C. (2018) Research 236: Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). EPA Wexford.

6 Wilson, D., Dixon, S.D., Artz, R.R.E., Smith, T.E.L., Evans, C.D., Owen, H.J.F., Archer, E. and Renou- Wilson, F., (2015) Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the United Kingdom. Biogeosciences 12(18): 5291–5308.

returns in terms of climate mitigation but it also has valuable benefits in terms of biodiversity, water management and landscape quality.

What's involved in restoration?
Peatland restoration involves making agreements with land owners and providing compensation payments for loss of turf cutting or for permission to carry out works on privately owned land. It also involves land acquisition, research to draw up restoration and drainage management plans and training contractors to carry out drain blocking, cell bunding, *Sphagnum* transfer, conifer removal and other works. A very important part of restoration is monitoring including measuring water tables, biodiversity and greenhouse gas emissions.

What are the restoration costs?
The Irish Peatland Conservation Council has calculated a restoration cost all in of between €180m and €202m for the raised bog network of sites which needs to be undertaken by 2036 in line with the Raised Bog SAC Management Plan and the Raised Bog NHA Review. In terms of climate change only (as peatlands do provide many other benefits) this may provide:

* 3,600ha of active peat forming raised bog habitat
* secure the carbon stock of 40.5 million t C in 30,867ha of supporting habitat and
* create a sink for CO_2 of -0.48 t C ha^{-1} yr^{-1} and a source of CH_4 of +0.197 t C ha^{-1} yr^{-1}. (Note values vary from site to site. Also it would be an overall carbon sink but long-term monitoring of greenhouse gases would be required to quantify actual changes following restoration and to take into account dissolved organic carbon in water dynamics).

The price of restoration for all of the peatlands designated of conservation importance in Ireland including blanket bog and fen has been estimated at €1 billion by the National Parks and Wildlife Service (Regan 2020[1]).

Funding for restoration is available through a variety of European initiatives, from the Carbon Tax fund, Climate Action Fund and government subventions. Funding for restoration on privately owned peatland is available from the Peatlands Community Engagement Scheme and from the heritage and biodiversity funding streams of the Heritage Council, the Community Foundation for Ireland and local authorities.

A long-term revenue stream for peatland restoration needs to be found. The most practical course of action is to develop a system of credits based on the value of the "saved" emissions from peatland restoration. The carbon credits are bought by sponsors to offset their carbon footprint. The Peatlands Code is such a system operated by the International Union for Conservation of Nature (IUCN) in the UK[2].

What state are peatlands in?
The Irish Peatland Conservation Council has reviewed the status of Irish peatlands and we find that 299,192ha remains relatively intact within 895 sites of conservation importance. This however is only 25% of the original peatland area in the Republic of Ireland.

The Irish Peatland Conservation Council has reviewed the designation of Irish peatlands for conservation and we find that 331 sites have been designated as Special Areas of Conservation (SAC) and/or Natural Heritage Areas (NHA) covering an area of 153,078ha[3, 4] (13% of the original peatland area in the Republic of Ireland).

The Irish Peatland Conservation Council has calculated the loss of peatland habitat to different uses and have found that 27% of our peatlands are being used for turbary/private turf cutting, 28% are forested, 6% are being used for peat energy, 2% are being milled for horticultural moss peat, 6% have been reclaimed for agriculture and 5% have been overgrazed. This leaves 25% relatively intact but deteriorating in quality due to on-going threats and the slow pace of restoration[4].

What policies need changing to protect peatlands?
A review of peatland policy shows a need for more climate-friendly action in the areas of controlling turf cutting, positioning wind farms, switching to sustainable home energy, stopping the production of horticultural moss peat, placing a carbon tax on turf cut for domestic use, revising the Peatlands Strategy to include blanket bog and fen habitats, publishing the locations of the Raised Bog sites of conservation importance, streamlining peatland management decisions to avoid conflicting decisions and setting conservation targets for blanket bogs and fens.

What actions are needed?
A road map of 12 actions has been formulated to ensure that Irish peatlands realise their full potential in the country's climate action plan. These actions will guide the save the bogs campaign of the Irish Peatland Conservation Council to 2030. local authorities, government departments, community groups, companies will be targeted to take action sooner rather than later on the issues raised.

1 Regan, S. (2020) An introduction to Irish peatlands: extent, pressures, conservation and value. Presentation to Backing Our Bogs Conference University College Dublin 21.7.20
2 https://www.iucn-uk-peatlandprogramme.org/sites/default/files/2019-07/290918%20Peatland%20Code%20poster.pdf
3 Source www.npws.ie
4 Source Irish Peatland Conservation Council Sites Database

3. Foreword

from Team Irish Peatland Conservation Council

This is the seventh Action Plan on Peatlands in Ireland prepared by the Irish Peatland Conservation Council since our formation in 1982[1-6]. The theme of the Action Plan is climate change, in recognition of the vital role that peatlands play in the carbon cycle and their potential through restoration and rehabilitation to mitigate Ireland's greenhouse gas emissions. The need to protect, sustainably manage and restore peatlands has never been more urgent. Public concern about the climate crisis is strong and through the declaration of a climate emergency by the Irish government, political commitment has been given to act now.

The last action plan devised by Irish Peatland Conservation Council was published in 2009[6]. The campaign developed around this action plan focused on peatland biodiversity and it achieved key milestones such as the development of a National Peatland Strategy, the development of new research and understanding on the ecohydrological functioning of raised bogs and the preparation of site conservation and restoration plans for raised bogs.

This Peatlands and Climate Change Action Plan is a single issue plan that is to be used in conjuction with previous action plans. It covers the decade to 2030 which coincides with the United Nations Decade on Restoration. With this plan the Irish Peatland Conservation Council are bringing together all of the relevant research on peatlands and climate change. This includes measuring the extent to which man-modified and relatively intact peatlands are contributing to climate change, how restoration and rehabilitation can reduce greenhouse gas emissions, analysing changes needed in peatland policy and providing a roadmap of actions to ensure peatlands are managed in a carbon-neutral manner.

Methods

The Irish Peatland Conservation Council conducted an extensive literature review to inform this action plan. Information was extracted from the literature to describe the relationship between peatlands and climate change.

Policy documents published by national and local government from Ireland such as the Climate Action Plan, National Peatland Strategy and Sustainable Development Goals Implementation Plan among others were examined. The literature review was also extended to the UK where much work has been done on peatlands within the same biogeographical zone as those in Ireland and in particular the work of the International Union for Conservation of Nature (IUCN) and the actions arising from the Scottish Peatland Strategy.

Scientific papers, Environmental Protection Agency (EPA) reports, university research projects and Irish Peatland Conservation Council's own research were consulted to extract quantitative data on greenhouse gas emissions from natural and man-modified peatland types in Ireland, the volume of carbon stored in different peatland types and the rate of sequestration of greenhouse gases in peatlands.

Scope

Previous peatland Action Plans produced by the Irish Peatland Conservation Council only considered peatland sites of conservation importance. Over 1,000 sites are monitored by the Irish Peatland Conservation Council and we have a database of information about them. As the majority of peatlands in Ireland are man-modified, they all contribute to greenhouse gas emission. A continuum of site condition exists from those with bare peat through forested and grassed peatlands right through to those that may be drained but with vegetation cover and finally to those that are pristine. How all of these sites are managed has a bearing on the management of greenhouse gas emissions and this is given treatment in this action plan.

1 Irish Peatland Conservation Council (1986) The Irish Peatland Conservation Council Action Plan 1986-1988. Irish Peatland Conservation Council, Dublin.
2 Irish Peatland Conservation Council (1989) The Irish Peatland Conservation Council Action Plan 1989-1992. Irish Peatland Conservation Council, Dublin.
3 Irish Peatland Conservation Council (1992) Irish Peatland Conservation Council Policy Statement and Action Plan 1992-1997. Irish Peatland Conservation Council, Dublin.
4 Foss, P. J. & O'Connell, C. A. (1996) Irish Peatland Conservation Plan 2000. Irish Peatland Conservation Council, Dublin.
5 Foss, P. J., O'Connell, C. A. & Crushell, P. H. (2001) Bogs and Fens of Ireland Conservation Plan 2005. Irish Peatland Conservation Council, Dublin.
6 Malone, S. & O'Connell, C. A. (2009) Irish Peatland Conservation Action Plan 2020 - Halting the Loss of Biodiversity. Irish Peatland Conservation Council, Kildare

4. Natural Climate Regulation

through 10,000 years of peatland formation

Actively growing peatlands (i.e. bogs and fens) accumulate organic mass, and thereby sequester carbon as the excess of vegetation production over decay. Carbon is taken in by peatland plants through the process of photosynthesis from carbon dioxide, largely from the atmosphere. However peatlands also release carbon as a direct result of decay processes. Most of the vegetation decay takes place aerobically in the surface horizons (the acrotelm). However, anaerobic decay also continues, albeit at a much slower rate, at depth in cold, anaerobic horizons (the catotelm), releasing methane.

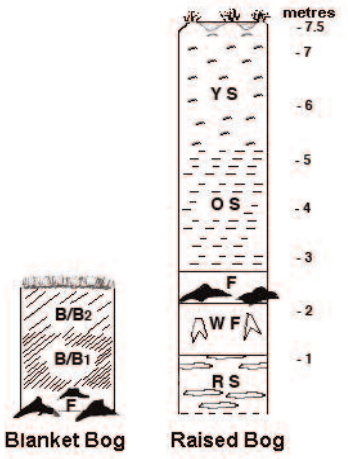

Figure 1: Standardised peat profiles of Blanket and Raised bogs in Ireland (Barry, 1969[1]). Abbreviations used: Blanket Peat: B/B2: Upper stratum of blanket bog peat, moderately or poorly humified.
B/B1: Lower stratum of blanket bog peat, well humified.
F: Forest peat (usually amorphous), with pine stumps common.

Raised Peat: YS: Younger *Sphagnum* peat. OS: Older *Sphagnum* and *Eriophorum* peat. F: Forest peat, with pine remains most common, except over convexities of the floor in the central plain, where oak and yew occur, with or without pine.
WF: Woody-fen peat.
RS: Reedswamp

Peat is brownish-black in colour and in its natural state is composed of 90% water and 10% solid material. It consists of *Sphagnum* moss along with the roots, leaves, flowers and seeds of heathers, grasses and sedges. Occasionally the trunks and roots of trees such as Scots pine, oak, birch and yew are also present in the peat.

Peat Stratigraphy - Fen and Raised Bog

Barry 1969[1] discussed how Ireland's peatlands began to develop in the post glacial environment of 10,000 years ago as the ice melted and retreated (see Figure 1). At first, much of the landscape consisted of pine, oak and yew forests in areas above flood level and reeds (*Phragmites*) began encroaching into lakes scoured out by the retreating ice sheets. Thus fens began to form. Reedswamp peat was the first peat-type to be formed from the remains of aquatic plants and animals. This overlies silt, clay or marl substrate - the watertight bottom of the lake basin. Reedswamp colonised the lake working from the edge to the centre. Pine forests then developed on the margins to form woody fen habitat.

Figure 2: Measuring the extent of the younger and older *Sphagnum* layers visible in a peat bank left behind by turf cutters on a raised bog at Croghan, Co. Roscommon. The peat accumulates at a rate of 1mm per year and may store[2] up to 1314 t C ha^{-1}. Photo: © C. O'Connell

True acid bog peat began to form on the remains of the pine forests that had fallen as a result of climatic changes corresponding with a shift to wetter conditions and the spread of *Sphagnum* moss. This humified peat layer of old *Sphagnum-Eriophorum* was distinguishable from all other peats as it lacked woody remains of trees. A younger relatively unhumified layer of *Sphagnum* peat formed over the older layer (see Figure 2).

Peat Stratigraphy - Blanket Bog

With the climatic shift to wetter conditions and/or the action of man felling forests to create grazing land along the west coast and uplands of Ireland soils became increasingly waterlogged and developed watertight iron pans in their upper horizons. This was the trigger for blanket peat formation to begin. The forests left behind a peat type consisting of the remains of birch and pine wood. True blanket bog peat then began to form consisting of Cyperaceae, Gramineae and Ericaceae which was humified. Above this, the peat is less humified but has the same composition. *Sphagnum* is not as

1 Barry, T. A. (1969) Origins and Distribution of Peat. Types. Irish Forestry, pp. 40-52.
2 Tomlinson, R.W. (2005) Soil Carbon Stocks and changes in the Republic of Ireland. Journal of Environmental Management 76: 77-93

important in the peat stratigraphy of blanket peats (see Figures 1 and 3).

Case Study: Peat Stratigraphy Mongan Bog

A peat core taken from Mongan Bog SAC in Co. Offaly is reported by Tubridy 1984[1]. Data collected included stratigraphy, loss on ignition and pollen analysis. The results are presented in Figure 4. From 8.5m-11m, layers of calcareous marl overlain by a watertight grey clay layer were found. From 8.5 to 6m the sediments were of fen peat. Ferns dominated the vegetation in Mongan Bog along with other fen flora including Willow (*Salix*), Royal fern (*Osmunda regalis*), Meadow Sweet (*Filipendula ulmaria*) and grasses (Gramineae).

At 6m a *Sphagnum* peat layer was recorded with evidence of heather, sedges and *Sphagnum* mosses on the bog surface. The bog was no longer influenced by ground water and the organic content of the peat was at 95%. High concentrations of heather pollen were recorded in the peat sediments between 5 and 4m. However from 4m upwards records show that the water table was at or close to the surface of the bog and the organic content of the peat reached 99%. Remains of *Sphagnum austinii* - a strongly peat-forming *Sphagnum* were recorded in the stratigraphy in this zone and high concentrations of *Sphagnum* spores and sedge pollen were recorded in the core typical of acid, peat-forming raised bog habitat.

Figure 3: Exposed peat profile at the Claggan Mountain Coastal Trail, Co. Mayo. The image to the right shows the watertight iron pan in the soil below the peat and the image to the left shows the presence of a pine stump in the peat stratigraphy. Lowland or Atlantic blanket bog may store[2] 1022 t C ha^{-1}. Photos: © C. O'Connell

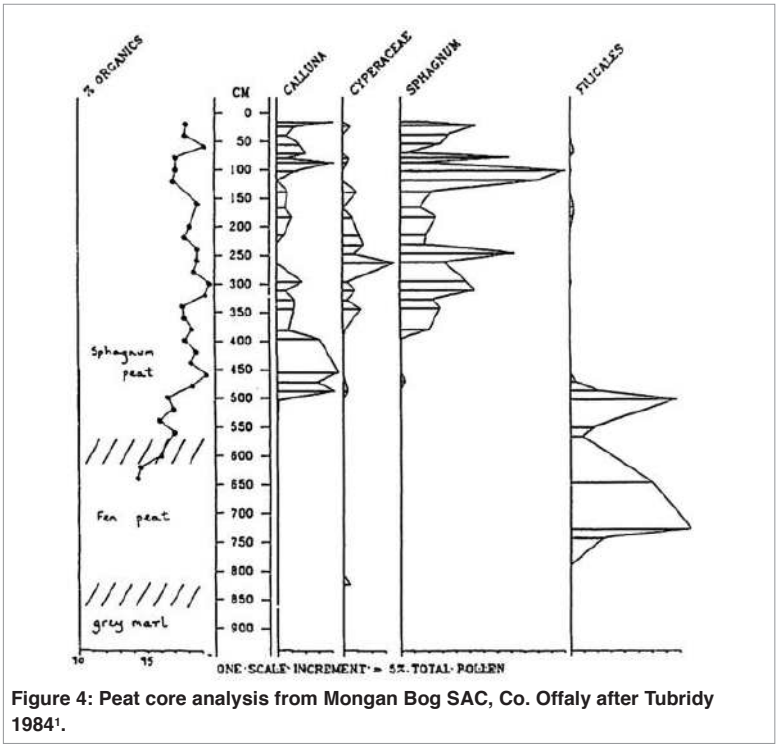

Figure 4: Peat core analysis from Mongan Bog SAC, Co. Offaly after Tubridy 1984[1].

Peat-forming Vegetation

Active refers to a peatland habitat that supports a significant area of peat-forming vegetation and where the right conditions prevail for active peat accumulation to occur. Conditions for active peat formation in raised bogs are well studied in Ireland from many years of Dutch-Irish research. Active peat-forming raised bog typically develops on uncut peatlands with slopes of between 0.2% and 0.6%, depending on effective rainfall which varies between 200 and 900mm per year and which has a range of *Sphagnum* mosses forming a living layer on its surface (Schouten 2002[3], see Table 1). Conditions for the development of active blanket bog are less well researched in Ireland. Active peat

1 Tubridy, M., (1984) 'Creation and management of a Heritage Zone at Clonmacnoise, Co. Offaly. Final Report to E.E.C. project no. 6611/12 by Environmental Sciences Unit, Trinity College Dublin.

2 Tomlinson, R. W. (2005) Soil Carbon Stocks and changes in the Republic of Ireland. Journal of Environmental Management 76: 77-93

3 Schouten, M.G.C. (2002) Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Department of Environment and Local Government, Dublin, Ireland and Staatabosbeheer, The Netherlands.

forming blanket bog is defined as peatland supporting significant areas of vegetation that are normally peat forming (e.g. *Schoenus nigricans, Molinia caerulea, Eriophorum* species and *Sphagnum* species). Plant communities and microtopography of "active" or peat-forming blanket bog can be very variable[1].

Figure 5: *Sphagnum austinii* (left) and *Sphagnum fuscum* (right) two of the strongly peat-forming mosses in peatlands. Photos: © C. O'Connell

Table 1: Ecology and peat forming capacity of the different species of *Sphagnum* mosses occurring on Irish peatlands (P. Crushell pers comm).

Species	Ecology	Peat-forming Capacity
***Sphagnum austinii* (see Figure 5)**	Hummock-forming	High
Sphagnum capillifolium	Hummock- and carpet-forming	Moderate
Sphagnum cuspidatum	Free-floating in pools and lining hollows	Low
Sphagnum denticulatum	Pool and hollow species	Low
Sphagnum fallax	Occurs in lawns and carpets, shade tolerant, indicative of some nutrient enrichment (soaks and active flushes)	Low
***Sphagnum fuscum* (see Figure 5)**	Forms dense low and wide hummocks	High
Sphagnum magellanicum	Lawn species forming carpets and low hummocks	Moderate
Sphagnum palustre	Forms hummocks and dense carpets, often in shaded conditions, indicative of nutrient enrichment (soaks and active flushes)	Low
Sphagnum papillosum	Lawn, hollow and low hummock species	Moderate
Sphagnum pulchrum	Grows in lawns and hollows, more typical of western bogs	Moderate
Sphagnum squarrosum	Forms carpets and small mounds, indicative of nutrient enrichment (soaks and active flushes)	Low
Sphagnum subnitens	Occurs as individual shoots or small cushions and lawns. Tolerant of minerotrophic conditions	Moderate
Sphagnum tenellum	Occurs as single shoots or weak cushions, typically in disturbed areas of the bog surface	Low

Due to centuries of use and the continued degradation of Irish peatlands <6% of raised bogs are regarded as active and approximately 20-30% of blanket bogs are regarded as active (Regan 2020[2]).

How the Carbon Content of a Raised Bog Peatland is Measured

According to Tomlinson 2005[3] there are four essential pieces of data needed to calculate the volume of carbon stored in a peatland.

1. Area of the peatland in which the carbon content is to be estimated in hectares
2. Total depth of peat in the peatland
3. The types of peat present in the peatland e.g. (*Sphagnum* peat, woody fen peat, reed peat) and the thickness of each layer identified
4. The bulk density (the oven dry weight of a known volume of peat) of the different peat layers in the peatland. Bulk density values for different peat types have been quoted in Tomlinson 2005 from the work of Hammond 1989[4] as follows:

Poorly Humified *Sphagnum* peat: 0.062
Humified *Sphagnum* peat: 0.082
Woody Peat: 0.125
Fen/Reed Peat: 0.116

Once these values are known, conversion factors are used to determine organic carbon in a peat sample. These assume that different types of peat contain different portions of organic carbon as follows:

Poorly Humified *Sphagnum* & Humified *Sphagnum* peat are 51% or 1.96 organic carbon
Woody Peat is 49% or 2.04 organic carbon
Fen/Reed Peat is 36% or 2.78 organic carbon

Thus the carbon stock in the peatland measured in tonnes carbon per hectare (t C ha^{-1}) is:
Bulk Density x %C x Thickness of the Peat Layer x Area of the Peatland

To convert carbon to carbon dioxide multiply by 44/12 (the proportion by weight of carbon in a CO_2 molecule) and this gives a figure for the volume of CO_2 in tonnes CO_2 per hectare that could be lost from the peatland if its natural balance was altered through drainage and peat removal.

1 NPWS (2019) The Status of EU Protected Habitats and Species in Ireland, Volumes 1-3. Department of Culture Heritage and the Gaeltacht, Dublin.
2 Regan, S. (2020) An introduction to Irish peatlands: extent, pressures, conservation and value. Presentation to Backing Our Bogs Conference University College Dublin 21.7.20
3 Tomlinson, R.W. (2005) Soil Carbon Stocks and changes in the Republic of Ireland. Journal of Environmental Management 76: 77-93
4 Hammond, R. F. (1989) The characteristics of Irish Midland peatlands which can influence future land use programmes. In: Mollan, C. (Ed.) The Utilisation of Irish Midland Peatlands. Royal Dublin Society, Dublin, pp 49-62.

5. Carbon Storage in Peatlands

the largest natural terrestrial carbon store in Ireland

Peatlands exist because the microbes associated with decay do not decompose the organic matter produced from plant growth. As a result peatland vegetation sequesters carbon each year. A persistently high water table is necessary for this function. As this process has been going on for many thousands of years peatlands are a significant carbon store. Peatlands store more carbon than any other terrestrial ecosystem but once drained, that carbon store is released and that is very damaging to the environment.

Since the beginning of their formation, Irish peatlands have been a persistent net sink of atmospheric carbon dioxide (CO_2), a persistent source of atmospheric methane (CH_4) and a persistent source of carbon (C) in the form of dissolved organic carbon (DOC) in surface/subsurface runoff to rivers. At the same time peatlands have accumulated significant soil carbon stores. This means that the sink of CO_2 has exceeded the sum of the source (emission/loss) of CH_4 and DOC, thereby resulting in the sequestration of carbon in peatlands over the millennia, as pristine peatlands are considered to be a small annual sink for carbon (Kiely et al 2018[1]).

Peatland carbon is increasingly recognised as a persistent and dynamic component of the terrestrial biosphere and the global climate system (Chambers et al 2011[2]). Its importance is due to:

1. the large proportion of global soil carbon that occurs below ground in peatland ecosystems
2. the climate and land-cover sensitivity of emissions of CH_4 and exchange of CO_2 from the global peatlands including those of the northern hemisphere and the tropical peatlands and
3. the link to aquatic systems and the oceans via dissolved carbon.

Carbon Dynamics in Peatlands

In a natural peatland system, the movement of greenhouse gases (e.g. methane and carbon dioxide) between the peatland and air and water is complex. Although peatlands accumulate carbon over the long term, they both fix and emit carbon dioxide and release considerable amounts of methane, a by-product of anaerobic decomposition.

Drainage of a peatland upsets the accumulation process and leads to a vast increase in the amount of CO_2 released to the atmosphere from the peatland, a by-product of aerobic decomposition. While water loaded with dissolved organic carbon (DOC) naturally leaves

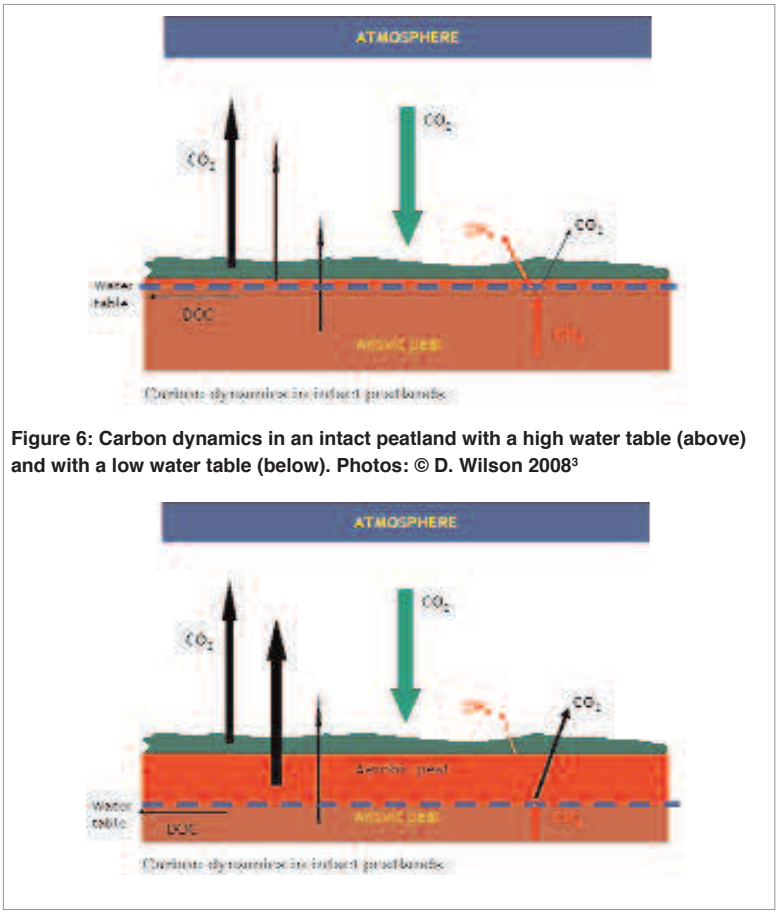

Figure 6: Carbon dynamics in an intact peatland with a high water table (above) and with a low water table (below). Photos: © D. Wilson 2008[3]

1 Kiely, G., Leahy, P., McVeigh, P., Lewis, C., Sottocornola, M., Laine, A. & Koehler, A-K. (2018) PeatGHG – Survey of GHG Emission and Sink Potential of Blanket Peatlands. EPA Research Report No. 228, Environmental Protection Agency, Dublin.

2 Chambers, F. M., Beilman, D. W. & Yu, Z. (2011) Methods for determining peat humification and for quantifying peat bulk density, organic matter and carbon content for palaeostudies of climate and peatland carbon dynamics. Mires and Peat 7: 1-10.

3 Wilson, D. (2008) Death by a thousand cuts: small-scale peat extraction and the Irish peatland carbon store: In: Farrell, C. & Feehan, J. (eds.), Proceedings of the 13th International Peat Congress, After Wise Use - The Future of Peatlands, Tullamore, Ireland.

pristine peatlands, drainage increases the amount of DOC losses. The diagrams prepared by Wilson (2008[1]) illustrate these concepts (see Figure 6).

Carbon Storage

There are many figures quoted across the scientific literature concerning the volume of carbon stored in Irish peatlands. The figure is a dynamic one as peatlands continue to be exploited and removed from the landscape. The loss of soil carbon stock in our peatlands is driven by their exploitation for fuel for private use, for electricity generation (until December 2020 for Shannonbridge and Lanesboro Power Stations and 2023 for Clonbollogue/Edenderry Power as planning permission is in place until then and the station burns both peat and biomass to produce electricity) and for horticultural peat. Further losses are continuing due to the impact of drainage on sites designated for conservation that have not yet been restored.

In 2000 the Republic of Ireland peatlands were estimated to store 1065 million tonnes of carbon (Mt C) in just 17% of the land area of the country (Tomlinson 2005[1]). This corresponds to 53% of all soil carbon stored in the island of Ireland. Note this figure does not include fen peats (see Table 2). However Tomlinson (2005[1]) also found that between 1990 and 2000 the soil carbon stock in raised and blanket bogs decreased by 24 million tonnes of carbon (M t C) due to industrial peat extraction.

The National Peatlands Strategy of 2015[3], states that peatlands store 1,566 M t C, corresponding to 64% of the total soil organic carbon stock in Ireland. No breakdown of this figure across the different peatland types is presented in the strategy.

Kiely et al 2009[4] provide comparative figures for soil

Table 2: Carbon Stocks in Irish Peatlands

Tomlinson 2005[2] estimated the carbon stocks in Irish peatlands including raised bogs, lowland blanket bogs and mountain blanket bogs but not for fens. This includes the full continuum of peatland condition within the three peatland types in the Republic of Ireland (ROI). He found the following for data collected from 2000:

Peatland Type	Mean C density (t ha^{-1})	Area ha ROI	Carbon Stock (t C)	% Total Carbon Stock in ROI
Raised Bog (Basin Peat)	1,313.51	375,600	493,354,368	24.41
Atlantic/Lowland Blanket Bog	1,022.10	382,000	390,441,184	19.32
Mountain Blanket Bog	420.20	431,200	181,190,948	8.96
Total		**1,188,800**		**52.69**

Table 3: Carbon levels in Irish mineral-rich and peat-rich soils and catchment stream waters from Kiely et al 2009[4].

Parameter	Mineral Soil		Peat Soil
Soil Organic Carbon	<5%		>45%
Bulk Density	0.8-1.3 g cm^{-3}		0.17-0.25 g cm^{-3}
	Arable Catchment		**Peat Catchment**
Streamwater Dissolved Organic Carbon (DOC) Range	1,121 kg m^2 yr^{-1}	to	15,622 kg m^2 yr^{-1}

Bog Water and Carbon

The yellowish-brown colour of bog water is a familiar sight in the bogs. Water discharged from bogs contains Dissolved Organic Matter (DOM) leached from the peat soil. DOM is composed of natural acids and proteins produced by the specialist peat forming plants unique to bog ecosystems. It is the organic forms of carbon, nitrogen and phosphates contained in DOM that are responsible for the colour of bog water. Drainage transforms a bog from a carbon sink to a carbon source.

Carbon is lost from the peat by two pathways: - as direct atmospheric exchange through soil respiration and as DOM in water discharged from the drainage ditches cut into the bog. Once discharged into receiving water the organic compounds making up DOM are broken down by decomposers and carbon dioxide is one of the compounds released from the decomposition process. The carbon dioxide released in this way is considered a fugitive emission in relation to climate change (Cody 2020[5]). Particulate organic carbon is also present suspended in the water discharged from bog drains and can settle in stream beds and estuaries. Again this material is decomposed releasing carbon but it is a process that may take up to 30 years (Goulsbra et al 2014[6]). Further work on bog water is being carried out by a number of research projects. The Living Bog Raised Bog Restoration Project is examining water discharge and water quality from 12 raised bogs in the Irish midlands before and after drain blocking to help quantify carbon dioxide release and the potential savings from restoration. The UCD SWAMP project aims to investigate the pressures on Irish waters from drained peatlands and develop mitigation measures.

1 Wilson, D. (2008) Death by a thousand cuts: small-scale peat extraction and the Irish peatland carbon store: In: Farrell, C. & Feehan, J. (eds.), Proceedings of the 13th International Peat Congress, After Wise Use - The Future of Peatlands, Tullamore, Ireland.

2 Tomlinson, R.W. (2005) Soil Carbon Stocks and changes in the Republic of Ireland. Journal of Environmental Management 76: 77-93

3 National Parks and Wildlife Service (2015) National Peatlands Strategy, Department of Arts, Heritage and the Gaeltacht, Dublin.

4 Kiely, G., McGoff, N. M., Eaton, J. M., Yu, X., Leahy, P & Carton, O. (2009) SoilC - Measuring and Modelling of Soil Carbon Stocks and Stock Changes in Irish Soils. EPA Report No. 35, EPA, Wexford.

5 Cody, J. (2020) What is in the Bog Water? Catchments Newsletter 13: 31-33.

6 Goulsbra, C., Evans, M., Allott, T., Rowson, J. & Evans, C. (2014) The effect of particulate organic carbon deposition (POC) on the gaseous carbon budget of a floodplain in an actively eroding peatland. EGU General Assembly Conference Abstracts.

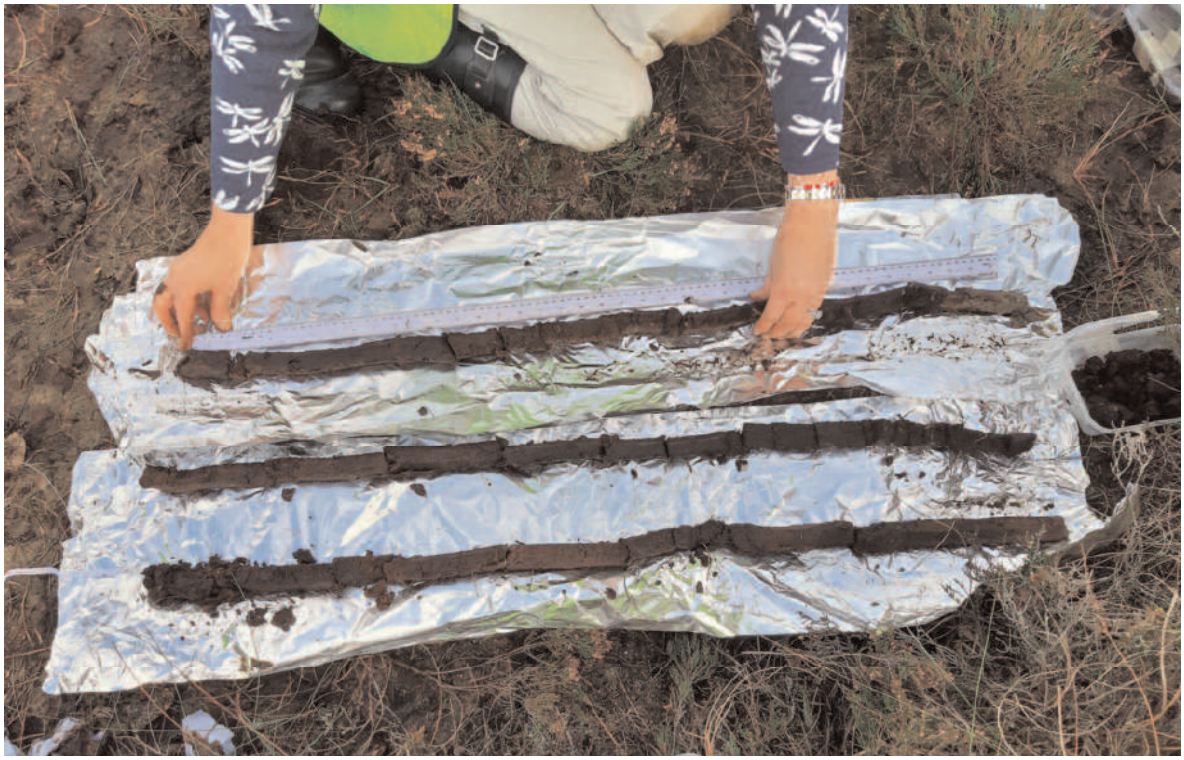

Figure 7: Peat core measuring 3m removed from Girley Bog, Co. Meath for stratigraphy and bulk density determination in 2020. The changing colours and textures of the peat within the core represent different types of peat laid down in the history of the development of this site. Photo: © N. Madigan

organic carbon, bulk density and streamwater dissolved organic carbon (DOC) for mineral soils and peat (see Table 3) in river catchments. These figures inform our understanding of soil organic carbon in Ireland.

The Irish Peatland Conservation Council have been directly involved in two studies on our reserves at Girley Bog and Lodge Bog that sought to quantify the carbon stored in the peat deposits of these sites. Lodge Bog in Co. Kildare, an uncut raised bog remnant which had an average peat depth of 3.03m was found to have a carbon soil store of 1,329 t C ha^{-1}. This figure was calculated using site-specific bulk density figures analysed for a 6m peat core taken from the site by Kerr (2011)[1]. As Lodge Bog covers an area of 35ha, the carbon store for the entire bog may be calculated as 46,515 t C.

At Girley Bog in Meath (see Figure 7), the cutover bog was found to have a carbon store ranging from 910-2,084 t C ha^{-1} based on peat depths ranging from 2.06-5.55m recorded in the area (O'Connell et al 2020[2]). The mean carbon soil store for the Girley Bog cutover was 1,422 t C ha^{-1}. As the cutover bog area in this 100ha site is 27.5ha this implies that the mean carbon soil store for the entire cutover bog is 39,105 t C.

1 Kerr, E. (2011) The Long Term Carbon Storage Capacity of Lodge Bog, Co. Kildare. B.A. (Mod) Thesis, School of Natural Sciences, University of Dublin Trinity College, Dublin.
2 O'Connell, C. A., Madigan, N. & Farrell, P. (2020) Girley Bog Carbon Project. Irish Peatland Conservation Council, Kildare

6. Carbon Sequestration in Peatlands

a fragile and dynamic function at risk from climate change

Research on the greenhouse gas dynamics of peatlands to determine carbon balance has been undertaken by a number of workers on both pristine and man-modified sites.

Pristine Sites

In the Glencar SAC blanket bog habitat in Kerry, the Hydromet Research Group in University College Cork set up the an eddy covariance flux tower for the purpose of measuring the fluxes of CO_2, CH_4 and DOC in this pristine peatland (see Figure 8). While they monitored the site from 2002-2011 only for six years in that period did they have quantitative data on the three elements of the carbon balance budget in this site (see Table 4). Although they found that for two of the six years measured the site overall was a source of carbon due to the response of the components to weather conditions, for the other four years the site was a sink. The overall balance showed that the site was a sink with a total carbon sink balance of the order of –30 g C m^{-2} yr^{-1} or 0.3 t C ha^{-1} yr^{-1} (Kiely et al 2018[1]) when the data collected for the six years was analysed.

Table 4: Glencar, Co. Kerry Carbon Budget (data recorded from 2003-2008). Source: Kiely et al 2018[1]

The Glencar pristine blanket peatland:
is a sink for CO_2 of the order of –50 g C-CO_2 m^{-2} yr^{-1};
is a source of DOC of the order of +14 g C-DOC m^{-2} yr^{-1};
is a source of CH_4 of the order of +4 g C-CH4 m^{-2} yr^{-1};
has a total carbon sink balance of the order of –30 g C m^{-2} yr^{-1}.

Note that a negative flux means uptake or sequestration.

Understanding Carbon Sequestration in Bogs

Kiely et al 2018[1] found that during the growing season from May to September the bog was a carbon sink, while from October to April it was a carbon source. There was one exception, during a very dry period in May 2010 the bog was a source of CO_2. This particular year of monitoring confirmed that ground surface wetness i.e. the water table level has a significant influence on the behaviour of CO_2.

Drained "Intact" Sites

This category of peatlands includes all sites that may have marginal and/or internal drains but which have never had their entire peat-forming vegetation removed. The majority of Irish peatlands fall into this category as a result of over 400 years of

Figure 8: Greenhouse gas monitoring equipment on Glencar Bog SAC, Co. Kerry. This site was found to be sequestering carbon and had a total carbon sink balance of the order of –30 g C m^{-2} yr^{-1}. Photo: © C. O'Connell

1 Kiely, G., Leahy, P., McVeigh, P., Lewis, C., Sottocornola, M., Laine, A & Koehler, A-K. (2018) PeatGHG - Survey of GHG Emission and Sink Potential of Blanket Peatlands. Report No. 228, EPA, Wexford.

Figure 9: Bog cotton (*Eriophorum angustifolium*) is a member of the sedge family of plants. This species has air channels within its stem and root structure, an adaptation to living in waterlogged conditions. Usually these channel oxygen from the aerial parts of the plant to its roots in the waterlogged peat. But these air channels also facilitate the movement of methane gas from the anaerobic peat zone to the atmosphere. The diagram inset shows a cross section through the stem of bog cotton and the presence of aerenchyma tissue. Photo: © C. O'Connell

exploitation for turf fuel and other activities involving drainage.

Renou-Wilson et al 2018[1] measured greenhouse gas emissions from a network of different drained "intact" sites (the NEROS network) which included four raised bog sites and 1 blanket bog site. They found that these sites were a source of CO_2 at +1.35 t C ha^{-1} yr^{-1} and a source of CH_4 in the range of +0 to +0.015 t C ha^{-1} yr^{-1}.

Effects of Climate Change

The dynamics and the interannual variation in the three components of the carbon balance (budget) of pristine peatlands is considered to be fragile and potentially at risk from a changing climate. The carbon balance of man-modified peatlands is already disrupted and this increases the risk to such sites from climate change and enhances their role in accelerating climate change.

A wetter climate is likely to release greater amounts of both CH_4 and DOC than are emitted currently. A wetter climate, by raising the water table level, is likely to reduce the CO_2 exchange between the atmosphere and the peat surface. The exploitation of peatlands for agriculture, peat extraction and afforestation, all involve drainage which in turn lowers the level of the water table significantly. A lower water table not only alters the pattern of CO_2 and CH_4 exchange between the atmosphere and the peatland surface but also the hydrology and the magnitude of the DOC flux component of the carbon budget.

CH_4 fluxes are also strongly influenced by the vegetation composition of the peatland, in particular aerenchymatic plant species, such as sedges including bog cotton (see Figure 9). These plants have air channels within their structure to allow for the exchange of gases between the parts of the plant growing above the bog surface and the roots which can penetrate up to 60cm deep into the peat. With this unique cellular structure, these plant species facilitate the movement of CH_4 from the anoxic peat directly to the atmosphere, by-passing the oxic peat zone where CH_4 is oxidised to CO_2.

Climate Changes Predicted for Ireland by the End of the 21st Century

Ireland has seen an increase in the mean annual air temperature of 0.4°C during the period 1980-2008, a shortening of the frost season and increases in the length of the growing season and the spread of species suited to warmer temperatures. The most recent climate change projections for Ireland indicate that by 2050, average annual temperatures will rise by between 1°C and 1.6°C, with the greatest change in daily minimum temperatures projected for future winters: the number of frost days will be reduced by 50%, and the length of the growing season will increase by over 35 days per year. There are also projected to be significant decreases in precipitation in spring and summer (with an increase in the number of extended dry periods, defined as at least five consecutive days with daily precipitation <1mm) but more frequent heavy precipitation events in winter and autumn (Nolan 2015[2]).

1 Renou-Wilson, F., Wilson, D., Rigney, C., Byrne, K., Farrell, C. & Müller., C. (2018) Research 236: Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). EPA Wexford.

2 Nolan, P. (2015) Ensemble of Regional Climate Model Projections for Ireland. Environmental Protection Agency, Wexford.

7. Peatland-rich Nation

protects its carbon store to help combat global warming

Peatlands originally covered 1.17 million hectares of the Republic of Ireland according to Hammond 1979[1] (see Tables 5 and 11 and Figure 12). In the global league table of peatland cover the Republic of Ireland is in position 3 with 17.2% of our land area covered in peat[2]. A lack of awareness of the benefits of peatlands means that they have been severely overexploited and damaged as a result of actions including drainage, agricultural conversion, forestry, burning and mining for fuel and horticultural peat, among others. Figure 10 shows the current status of our peatland resources based on their uses to date while Figure 11 gives a breakdown of the ownership of Irish peatlands.

Bord na Móna Bogs

Bord na Móna was formerly the largest industrial semi-state peat company operating in Ireland. Their land holding of peatland is significant at 88,000ha. This divides into 8,000ha in Mayo and 80,000ha in the Midlands of Ireland. The Bord na Móna Biodiversity Plan 2016 to 2021[3] reported on the results of an assessment of the status of the land bank of the company undertaken from 2012 to 2015. The use of the Bord na Móna land bank at this time is described in Table 6 as published in 2016[3]. In 2018, the company began to move away from peat production as part of a "brown to green" strategy. In 2020, they secured funding from government to carry out rehabilitation of 33,000ha of peatland formerly in active production (see Table 6).

Table 6: Land Use of Bord na Móna owned peatlands. The total area is 88,000ha. Source: IPCC Sites Database and Bord na Móna Biodiversity Plan 2016-2021[3].

Land Status	Cover	Area (ha)	Description
Active Production	55%	48,400	Milled Peat, sod peat, sod moss, horticultural peat production bogs
Cutaway Bog	30%	26,400	Naturally regenerating lands out of production and lands in afteruses such as plantations, sand & aggregates, landfill & composting facilities
Bog Remnants and Marginal	12%	10,560	Degraded raised bog with supporting habitats as well as some active raised bog, birch woodland and cutover bog
Drained Raised Bogs	3%	2,640	Sites never fully developed for peat production and which have a high conservation value nationally. These sites are part of the Bord na Móna Raised Bog Restoration programme and are expected to be designated as SAC or NHA
Total		**88,000**	

Table 5: Peatland Resources in the Republic of Ireland 1979[1] and the intact area in 2020 of conservation value (from the IPCC database)

Peatland Type	Area (ha) 1979[1]	Area (ha) 2020
Total	**1,175,617**	**299,192**
Fen	92,508	23,049
Raised Bog	308,742	46,196
Blanket Bog	774,367	233,403

Coillte Peatland Resources

Coillte is the largest single owner of peatland in the Republic of Ireland as shown in Table 7 (NPWS[4]). 20% of the resource is under its management which involves an area of 232,509ha. Information on the Irish Peatland Conservation Council sites database indicates that Coillte fully or partially own 97 sites of conservation importance in Ireland. The company is committed to managing 20% of its estate for biodiversity although to date they have only restored 1.38% of peatland habitat[5].

National Parks and Wildlife Service (NPWS)

The NPWS own a selection of peatlands which they manage for nature conservation. According to the Peatlands Strategy 2015[4] they own 41,339ha of peatland. Information on the Irish Peatland Conservation Council sites database indicates that NPWS fully or partially own 77 sites of conservation importance in Ireland.

Table 7: Peatland Resources in the ownership of Coillte. Source: IPCC Sites Database and the National Peatlands Strategy 2015[4].

Peatland Type	Area (ha)
Total	**232,509**
Raised Bog	31,725
Blanket Bog	188,334
Industrial Cutaway Bog	12,450

Private Ownership

The remaining area is in private ownership by individuals, non governmental organisations and other commercial interests. This includes areas being cut for domestic turf, industrial horticultural peat production sites by companies other than Bord na Móna, farmed peatland and relatively intact sites under conservation designation.

Near Natural Peatlands

The designation of peatlands under Irish and/or European legislation is a crucial step in their

1 Hammond, R. F. (1979) The Peatlands of Ireland. Soil Survey Bulletin No. 35, Teagasc, Dublin.

2 Taylor, J. A. (1983) The peatlands of Great Britain and Ireland. In Gore, A. J. P. Ed. Ecosystems of the World Volume 4B, Mires: Swamp, Bog, Fen & Moor. Elsevier Scientific Publishing Company, Oxford.

3 Bord na Móna Biodiversity Action Plan 2016-2021, Bord na Móna, Newbridge, Co. Kildare

4 National Parks and Wildlife Service (2015) National Peatlands Strategy, Department of Arts, Heritage and the Gaeltacht, Dublin.

5 www.coillte.ie/our-forests/public-goods/biodiversity

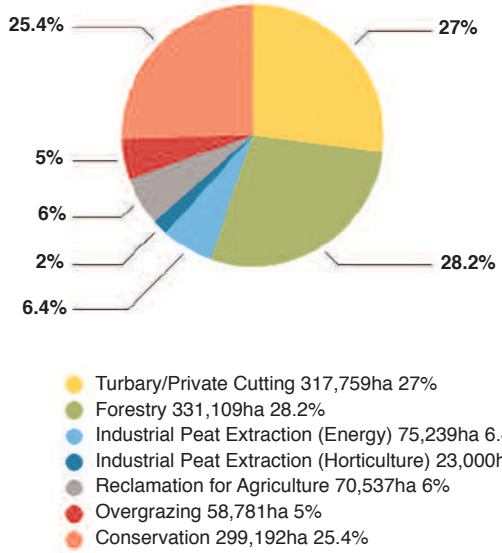

Figure 10: Peatland Utilisation in the Republic of Ireland 2020[3, 4, 5, 6, 7]. The total peatland area is 1,175,617ha.

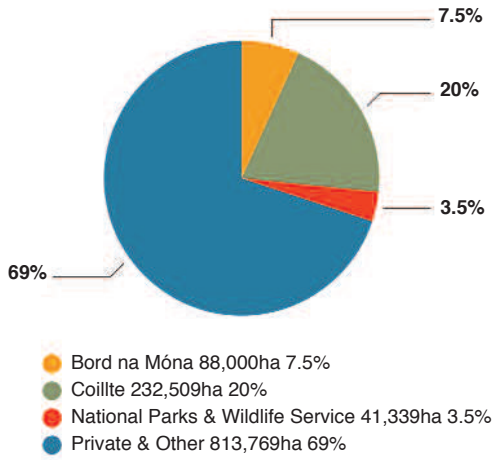

Figure 11: Ownership of peatlands in the Republic of Ireland[2]. The total peatland area is 1,175,617ha.

Table 8: Peatland habitats designated in the Republic of Ireland 2020. Source: IPCC Sites Database and www.npws.ie 27.7.20. Please note that some sites are a complex of one or more habitats or one or more designations and there is overlap between categories and designations as a result.

Habitat Code	Habitat/Peatland Type	# SAC	# NHA	# Sites	Area (ha)
Total		**192**	**148**	**331**	**153,078**
7230	Alkaline Fen	38			
7210*	Calcareous Fen	17			
7220*	Petryfying Springs with Tufa	20			
7140	Transition Mire	20			
7120	Degraded Raised Bog	62			
7110*	Active Raised Bog	54			
7150	Rhynchosporion	63			
91D0*	Bog Woodland	13			
7130(*)	Active Blanket Bog	50			
4010	Wet Heath	45			
4060	Alpine Heath	35			
Total Number	Fen Complex SAC	87			
Total Number	Raised Bog SAC	63			
Total Number	Blanket Bog SAC	64			
Total Number	Fen Complex NHA		16		
Total Number	Raised Bog NHA		75		
Total Number	Blanket Bog NHA		73		
Total Number	Fen Complex NHA & SAC			99	8,200
Total Number	Raised Bog NHA & SAC			129	30,867
Total Number	Blanket Bog NHA & SAC			137	200,574

Table 9: Peatland SPAs for threatened birds in the Republic of Ireland 2020 . Source: IPCC Sites Database and www.npws.ie 30.9.20

Bird Species	# SPA
Total # SPAs Designated	**41**
Bewick Swan	1
Chough	13
Curlew	1
Golden Plover	10
Greenland White-fronted Goose	16
Hen Harrier	2
Lapwing	7
Merlin	5
Peregrine Falcon	11
Whooper Swan	13
Wetland & Waterbirds	15
Fen Habitat SPA	*23*
Raised Bog Habitat SPA	*11*
Blanket Bog Habitat SPA	*18*
# of peatland habitats with SPA designation	***52***

protection. At present we have 192 SACs and 148 NHAs (Table 8) are designated. The designation of peatlands is incomplete and this is creating difficulties among the authorities charged with protecting sites from unwanted developments. The Irish Peatland Conservation Council maintain a database of peatlands of conservation importance in Ireland which contains over 1,000 sites (see. Figure 13).

Habitat Condition

The principal milestone in monitoring peatland habitat condition is the mandatory six year cyclical reporting carried out by NPWS under Article 17 of the Habitats Directive. In 2019 NPWS[1] described the Conservation Status of our peatland habitats as largely “Bad and Deteriorating”. In terms of climate change the bad status of our peatlands is of serious

1 NPWS (2019) The Status of EU Protected Habitats and Species in Ireland, Volumes 1-3. Department of Culture Heritage and the Gaeltacht, Dublin.
2 National Parks and Wildlife Service (2015) National Peatlands Strategy, Department of Arts, Heritage and the Gaeltacht, Dublin.
3 Malone, S. & O’Connell, C. A. (2009) Irish Peatland Conservation Action Plan 2020. Irish Peatland Conservation Council, Kildare.
4 Forest Statistics Ireland 2019. Department of Agriculture, Food and the Marine, Wexford.
5 McNally, G., Keane, M. & Renou-Wilson, F. (2008) Forestry on Peatlands. In: International Peat Congress 2008 After Wise Use Mid-Congress Tours. Ed. C. A. Farrell. Bord na Móna, Newbridge.
6 Reilly, J. & Riordan, P. (2008) Peat in Energy. In: International Peat Congress 2008 After Wise Use Mid-Congress Tours. Ed. C. A. Farrell. Bord na Móna, Newbridge.
7 A Review of the Use of Peat in the Horticultural Industry: Key Issues Consultation Paper January 2020

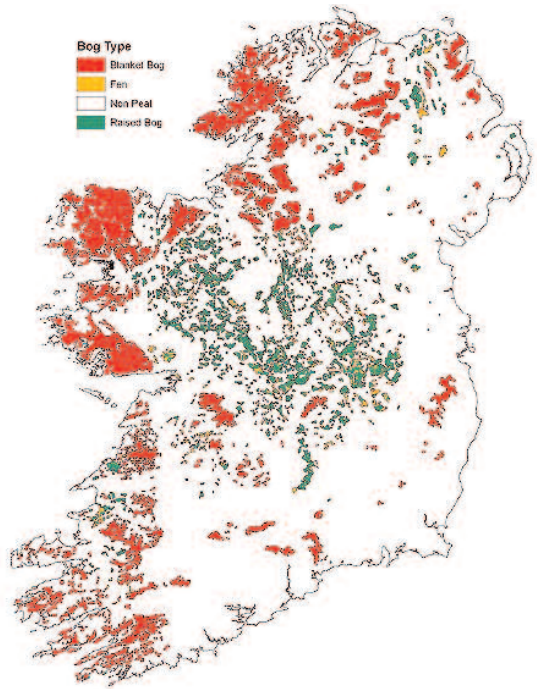

Figure 12: The peatlands of Ireland from Hammond 1981[3]

Figure 13: Peatlands of conservation importance in Ireland held within the Irish Peatland Conservation Council database 2020. Photo: © T. Whyte.

concern as the sites may be lacking the resilience needed to adjust to climatic events and predicted changes in temperature and rainfall. As a result sites urgently require management and restoration to repair their hydrology which benefits both biodiversity and mitigates climate change.

Bird Species Status

The status of Irish birds is assessed using the Birds of Conservation Concern guidelines (Colhoun & Cummins 2013[1]). The assessment from 2014-2019 found that many peatland birds are on the amber or red lists as a result of habitat loss. These include Merlin, Meadow Pipit, Red Grouse, Curlew, Snipe, Golden Plover, Skylark, Kestrel, Hen Harrier, Marsh Harrier, Peregrine and Lapwing. Reporting to the European Union on the status of birds protected within Special Protection Areas (SPAs) is undertaken every six years according to Article 12 of the Birds Directive. Table 9 shows the number of SPAs designated for each threatened peatland bird.

Raised Bog Natural Heritage Areas Habitat Review

In 2014 a review of the Natural Heritage Area (NHA) raised bogs network in Ireland was carried out by the National Parks and Wildlife Service[2]. Over 270 raised bog sites were examined including 53 SAC raised bogs, the existing 75 NHA raised bogs, and over 100 other non-designated sites. As a result of the review a reconfigured NHA network of 61 sites is proposed but has yet to be formally recognised in Irish law (see Table 10). Advantages of this change include: the areas of both Active Raised Bog and Degraded Raised Bog Still Capable of Natural Regeneration will be greater in the new network than in the current network. The figures are presented in . Management complexity in the new network will be much lower due the lower number of sites and the number of active turf cutters. Despite the acknowledgement of the role of bogs in climate regulation, the analysis gave no weight to the carbon stores present within the sites reviewed. Up to 100 good peatland sites (including 25 NHAs that are to be de-designated) are consigned to drainage, turf cutting and greenhouse gas release. Furthermore in the six years since the reconfiguration, landowners and managers have not been informed making the protection and restoration of the sites impossible.

Table 10: Proposed reconfiguration of the Natural Heritage Area Network of raised bogs (NPWS 2014[2])

	Current	New
Number of Sites	75	61
Active Raised Bog Area (ha)	284	290
Degraded Raised Bog Area (capable of Restoration) (ha)	410	475
Total Active and Degraded Bog Area (ha)	694	765
Estimated Number of Active Turf Cutters	3,091	518
Number of Sites (part of 7 sites removed/retained)	75	61
Turf Cutting Cease Date	Continues	2017
Number of Sites to be Designated		25
Number of sites to be de-designated (7 partial)	46	

1 Colhoun, K. & Cummins, S. (2013) Birds of Conservation Concern in Ireland 2014 - 2019. Irish Birds 9: 523-544

1 Review of Raised Bog Natural Heritage Area Network, 2014, National Parks and Wildlife Service, Dublin

3 Hammond, R. F., (1981) The Peatlands of Ireland 60. An Foras Talúntais, Dublin