



## Rehabilitation of Bord na Móna industrial cutaway peatland at Ballycon, Co Offaly

Ballycon, County Offaly, Ireland  
(UTM 621396, 590545; Lat 53 deg, 17 min, 3.9 sec, Long -7 deg 10 min 44.5 sec)

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Wetland development on a rehabilitated cutaway bog.

### Summary

Bord na Móna (the Irish Peat Company) owns extensive areas of Irish peatlands (around 80 000 ha), primarily in the midlands of Ireland. These lands have been developed at an industrial scale for fuel, energy and horticultural growing media. Rehabilitation is being carried out in areas where peat production has ceased. One such site is Ballycon, Co. Offaly. The main aims of the rehabilitation are to:

- ensure the stabilization of the former peat production areas,
- minimize potential peat runoff and
- encourage the re-establishment of a diversity of semi-natural habitats appropriate to the characteristics of the site.

Natural colonization of vegetation can begin very quickly when peat production ceases. The main strategy of Bord na Móna is to encourage this natural colonization so as to stabilize bare peat and other substrates. Targeted management such as drain-blocking, blocking of outfalls and turning off pumps is also used to enhance natural colonization.

Peat production in Ballycon bog finally ceased in 2001, although some of the site was likely to have been out of production and beginning the process of natural colonisation prior to this date. Part of the site is still used as an industrial railway. Ballycon bog formerly had a pumped drainage system so when pumps were turned off, water levels rose in part of the site to create pioneer wetlands. The natural topography of the site aided wetland creation as it was a basin. The extent of wetlands was enhanced using a berm (constructed 2005–2006) to hold water over previously unflooded sections of the site, along with some drain-blocking and hydrological management at the main outfall. Natural colonisation and habitat development has continued to create a cutaway dominated by a mosaic of wetland habitats. Some additional rehabilitation was carried out in 2013. Rehabilitation at Ballycon has created a site that now provides ecosystem services including habitats that have high biodiversity value with species of conservation interest. Rewetting industrial cutaway may also offset carbon emissions and this is currently being investigated at other sites. Rehabilitation can also be combined with alternative land uses such as renewable energy, industrial development, forestry, agriculture, amenity use and biodiversity. Ballycon has now been designated as a Biodiversity Area by Bord na Móna.

## 1. Practice description

Area of the site	281.5 ha	
Current land cover/use	Re-wetted peatland , forestry, industrial	
Previous land cover/use	Raised bog, then industrial peat production	
Origin of intervention	Bord na Móna (land-owner)	
Types of intervention used in the area	<input checked="" type="checkbox"/> Rewetting <input type="checkbox"/> Drainage <input type="checkbox"/> Cultivation of crops <input type="checkbox"/> Grazing <input checked="" type="checkbox"/> Forestry <input type="checkbox"/> Aquaculture <input type="checkbox"/> Fishery	
Duration of implementation	Rewetting rehabilitation carried out in 2005–2006.	
Main purpose of the practice	The main aim was to increase area of re-wetted cutaway.	
Level of technical knowledge	<input type="checkbox"/> Low <input checked="" type="checkbox"/> Medium <input type="checkbox"/> High	
Water table depth from surface	from -0.5 m to 0.5 m	
Present active drainage system	Width of channels	No channels
	Distance between channels	–

## 2. Implementation of activities, inputs and cost

N	Establishment of activities	Input/materials	Duration	Cost
1	Targeted hydrological management (2005–2006): raising water levels and enhancing wetlands by decommissioning pumps, blocking drains, raising a small embankment across the site and adjusting level of main drainage outfall.	Various heavy machinery including excavators and bulldozers	50 days	63000 USD
2	Targeted once-off fertilizer application (2013) on drier area to enhance natural recolonization and stabilize bare peat of headland	Fertilizer; tractor, fertilizer spreader	1 day	1200 USD

### Remarks

Some conifer forestry (24 ha) was developed on a small section of higher ground in the 1980's while peat production was ongoing over the rest of the site. Natural colonisation began relatively soon after peat production ceased, although peat production ended at Ballycon on a phased basis. Construction of the berm and drain-blocking raised water-levels over previously unflooded sections of the site and this rehabilitation has created a site with predominantly wetland habitats. The general cost of this type of wetland rehabilitation is about 340 USD/ha.

This rehabilitation has been very successful and the site has now predominantly re-vegetated or has surface water. There is a mosaic of wetland vegetation types along with Birch and Willow scrub, although much of the site is still relatively young and in the pioneer stages of habitat development. Red List bird species recorded breeding at the site include Redshank (*Tringa totanus*) and Lapwing (*Vanellus vanellus*), which are wetland wader species, and Meadow Pipit (*Anthus pratensis*) and Skylark (*Alauda arvensis*), which are ground-nesting songbirds. There is potential to raise water-levels to a higher level at the site when an industrial railway has ceased use in the future.

A small drier area (30 ha) around the margin of the site was treated with a once-off fertiliser application to help natural colonisation as this bare peat area had been slow to recolonise. This has already begun to help recolonisation (May 2014).

### 3. Environmental characteristics

Climate	<input type="checkbox"/> Tropical <input checked="" type="checkbox"/> Temperate <input type="checkbox"/> Boreal	
Average annual rainfall	800–1000 mm	
Altitude	70 m a.s.l.	
Slope	0–5 % (generally flat)	
Peat depth (cm)	<input type="checkbox"/> ≤ 30 <input type="checkbox"/> 30–50 <input checked="" type="checkbox"/> 50–100 <input type="checkbox"/> 100–300 <input type="checkbox"/> >300	
Peatland type based on the water source	<input checked="" type="checkbox"/> Fen <input type="checkbox"/> Bog <input type="checkbox"/> Undefined	
Hydrologic network	–	
Main vegetation species	Before practice	<i>Calluna vulgaris</i> , <i>Eriophorum vagination</i> , <i>Sphagnum</i> spp.
	During practice	<i>Betula pubesens</i> , <i>Juncus effusus</i> , <i>Eriophorum angustifolium</i> , <i>Carex</i> spp. <i>Phragmites australis</i> .
Water quality	Water pH	7.1
	Water turbidity	–
	Dissolved organic carbon content	–

### 4. Socio-economic dimension

Local stakeholders	Local communities, local authorities.
Land tenure	Owned by Bord na Móna. Bord na Móna is a semi-state organisation.
Land, water, and other natural resource access and use rights	No general public access or use rights as site still being used by industrial railway
Conflicts	No conflicts
Conflict resolution mechanism	–
Legal framework	EPA Act 1992 (IPPC licensing for BnM peat production activities requires development and implantation of a rehabilitation plan).
Products derived from the peatland	Energy peat pre-rehabilitation; post rehabilitation no products derived.
Market orientation	Current objectives are to allow site to continue to develop semi-natural habitats and develop its biodiversity value. There may be opportunities in the future to develop amenity pathways at this site.

## 5. Assessment of impacts on ecosystem services

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Provisioning services	Agricultural production	4
	Food security and nutrition	4
	Employment	4
	Income	4
	Non-timber forest products yield	4
	Livelihoods opportunities	5
	Resilience and capacity to adapt to climate change	5
Socio-cultural services	Level of conflicts	4
	Gender equality	4
	Learning and innovation	6
Regulating services	Waterborne carbon (DOC) loss	1
	Fire frequency	3
	Biodiversity	7
	Subsidence rate	4
Off-site benefits	Water quality	6
	Frequency of flooding	4

## 6. Climate change mitigation potential

1 highly decreasing/ 2 moderately decreasing/ 3 slightly decreasing/ 4 neutral/ 5 slightly increasing/ 6 moderately increasing/ 7 highly increasing

Impact	Rate	Estimate (t ha <sup>-1</sup> year <sup>-1</sup> , CO <sub>2</sub> -eq)	Remarks
Net GHG emission	2	–	
CH <sub>4</sub> emission	6	–	Rewetting and creating new wetlands increases CH <sub>4</sub> emissions for a time, but these may decline over time.
CO <sub>2</sub> emission	2	–	Rewetting helps to reduce CO <sub>2</sub> emissions from the remaining peat and, in some instances, sites may also become carbon sinks once again.
N <sub>2</sub> O emission	1	–	Rewetting of drained organic soils reduces N <sub>2</sub> O emissions.
Carbon sequestration/ storage abovegrounds	5	–	Creating pioneer wetlands can initially lead to increased CH <sub>4</sub> emissions. Pioneer wetlands may in future develop into fen habitats with increased –rates of carbon sequestration

## 7. Additional information

Ballycon is just one of 130 individual bog units owned by Bord na Móna and rehabilitation plans have now been prepared for each of these bog units. The Bord na Móna baseline ecology survey showed that the emerging cutaway was a diverse mosaic of different vegetation types and habitats developing in diverse environments as a result of a variety of factors, such as hydrology, local topography and remaining peat depths (Bord na Móna 2010). By slowing surface water drainage through these sites, wetland development within the cutaway can also be very beneficial in mitigating silt runoff. However, the entire cutaway cannot be rewetted or managed in such a way. It will not be possible to apply any one particular rehabilitation tool to an entire site, as there is such a broad range of environmental conditions within sites (e.g. peat depth, drainage). Flat areas that are wet revegetate with relative ease. However, sloping, higher areas that tend to dry out in summer months must also be taken into consideration. Each bog unit is likely to have site-specific issues.

Other ecosystem services provided by rehabilitated cutaway include providing refuge areas for more common species under increasing pressure by various land uses in the wider landscape, the creation of wildlife corridors, and water filtration and the regulation of water flow.

Estimating GHG fluxes in cutaway peatlands is quite difficult due to the wide variety of different environmental factors including, hydrology, topography, the remaining peat depths and pioneer vegetation types and habitats. A significant amount of work has been carried out to determine GHG fluxes from the different cutaway vegetation types and habitats at other sites to determine emission factors (Wilson et al. 2013a). However, there are still significant gaps in research and estimated emission factors have large uncertainties. For example, Wilson et al. (2013a) estimated that rewetted nutrient-poor industrial cutaways in the Republic of Ireland are a carbon sink of 4 120 tonnes per year with an uncertainty range of 6 125 (source) to 14 365 (sink) tonnes per year. Rewetted nutrient-rich industrial cutaways are a source of 17 544 tonnes of carbon per year with a range of 1 754 (source) to 33 334 (source) tonnes. Much of the variation within these two land-use categories can be attributed to differences in microsite composition following rewetting (e.g. bare peat, vegetation communities), hydrological conditions and time since rewetting.

Work remains to develop accurate emission factors for the variety of cutaway habitats that are developing and to accurately map these habitats in order to estimate overall carbon emissions from Bord na Móna cutaways. Research has shown that rewetting cutaways does lower carbon emissions (Wilson et al. 2013b), although not all the cutaway has the potential to be rewetted. Rewetting cutaways may also develop habitats that will provide suitable conditions for carbon sequestration in the future. Ultimately, rehabilitation of the Bord na Móna cutaways will have to balance issues of carbon emissions and local hydrology with sustainable management and the natural development of emerging habitats. Their compatibility with the development of other land uses such as renewable energy and the needs of local communities will also need to be taken into consideration. The developing cutaway landscape will develop significant natural capital into the future.

Bord na Móna (2010). Bord na Móna Biodiversity Action Plan 2010–2015.  
[www.bordnamona.ie](http://www.bordnamona.ie)  
[www.loughbooraparklands.com](http://www.loughbooraparklands.com)

**Wilson, D., Müller, C., & Renou-Wilson, F.** (2013a): Carbon emissions and removals from Irish peatlands: present trends and future mitigation measures. *Irish Geography*, <http://dx.doi.org/10.1080/00750778.2013.848542>

**Wilson, D., Farrell, C., Mueller, C., Hepp S. and Renou-Wilson F.** (2013b). Rewetted industrial cutaway peatlands in Western Ireland: Prime location for climate change mitigation? *Mires and Peat*, 11, 1–22. <http://www.mires-and-peat.net/>.

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