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TEN YEARS IN REHAB, WHAT HAVE WE LEARNED IN MAYO?

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SUMMARY

Bord na Móna operated the industrial peat production site, at Oweninny (Bellacorick and Bangor bog areas) in County Mayo between 1961 and 2003. Milled peat was harvested from an area of over 6,500ha of former Atlantic blanket bog and supplied as energy peat to a local power station. Peat production ceased in 2003 and a large scale site specific rehabilitation plan was designed and implemented. The main aims of the rehabilitation were to ensure environmental stabilisation of the former industrial peat production area and mitigation of silt run-off.

The rehabilitation work on the cutaway was carried out between 2003 and 2005. A number of changes have occurred since the implementation of the rehabilitation plan. The site was surveyed in 2011 in order to determine the effectiveness of the rehabilitation works. The main changes in vegetation cover and composition between 2001 and 2011 are outlined in this paper.

The vegetation on the former production areas is currently dominated by poor fen and embryonic bog communities (*Sphagnum*-rich habitats) with fragmentary emergence of dry heath, scrub, and areas of open water. Bare peat is still a feature in certain areas within the site, with only sparse emergence of pioneer species. The emergence of *Sphagnum*-rich communities indicates that there is significant potential for a considerable area of the site to revert to a peat-forming system.

KEYWORDS: Rehabilitation; cutaway; Atlantic blanket bog; vegetation.

INTRODUCTION

Blanket Bog in Ireland

Blanket bogs and raised bogs are the two most common type of peatland in Ireland, with blanket bog covering an area of approximately 906,000 hectares (Foss, 1997). Blanket bog forms in areas where summers are cool, humidity is high, and there is more than 1,250mm of rain per annum (Feehan and O'Donovan, 1996). There are two types of blanket bog in Ireland – Atlantic blanket bog and upland blanket bog. Atlantic blanket bog is found extensively on areas of relatively flat ground below 150m. Atlantic blanket bog in Ireland is typically found in western counties such as

Galway, Mayo, Kerry, Cork and Donegal where high rainfall coupled with an acidic geology lead to their formation, (Feehan and O'Donovan, 1996).

Climate is a key factor in the formation of Atlantic blanket bog. Evaporation rates must be low and rainfall must exceed evaporation at a ratio of 2:1 to allow the formation of Atlantic blanket bog to begin (Farrell, 2001).

Bord na Móna in Mayo

In the 1940s Bord na Móna (BnM) acquired approximately 6,500 hectares of Atlantic blanket bog in north west Mayo (Oweninny) in order to develop the site for industrial peat production. Prior to peat production in Bellacorick the average peat depth was four metres (Farrell, 2001; Richard Cosgrave, pers.comm.).

Production involved drainage and removing surface vegetation. Peat production continued until all commercial peat was removed and/or where it was difficult to drain peat or fossil timber was uncovered. This resulted in a mosaic of bare peat fields and re-vegetating cutaway, along with exposed gravel hills and ridges when production ceased at the site.

Rehabilitation at Bellacorick post production

Bord na Móna operates under Integrated Pollution Prevention Control license issued and administered by the Environmental Protection Agency (Ireland) to extract peat from all bog areas. As part of condition of this license, a rehabilitation plan was prepared in 2003 for permanent rehabilitation of the peatlands within the licensed area of the Oweninny works, which comprises both Bellacorick and Bangor. The focus of this paper is the Bellacorick site.

The objectives of the rehabilitation work included the following:

- Stabilisation of the peat production areas (re-vegetation)
- Mitigation of the silt run-off
- Re-establishment of peat-forming communities where possible

Due to site conditions a range of rehabilitation techniques were required across the site. A two pronged approach to site rehabilitation, tailored to suit two specific site conditions was devised (Farrell, 2003):

- **Where peat remains on level surfaces** - re-wetting to encourage the establishment of embryonic peatland communities. This work was carried out by blocking the field drains at regular intervals and/or blocking the main outfalls from production areas to rewet and flood parts of the cutaway.
- **Where peat is on a slope and/or the underlying mineral soil has been exposed** - Slope and hill areas were proven to be slow to re-vegetate. The objective was to encourage establishment of some form of pioneer vegetation that would lead to the stabilisation of peat and gravel in these areas.

The rehabilitation work was carried out between 2003 and 2005.

METHODS AND MATERIALS

A vegetation classification system (BnM classification system) was devised to account for pioneer vegetation on the site. The BnM classification system is based on work already carried out on cutaway peatlands by Farrell (2001) in Bellacorick and Rowlands (2001) in Turraun, Offaly.

The site was walked and using 2008 (1:6000 scale) aerial photos, taken by Ordnance Survey Ireland. Using these aerial photographs as base maps the pioneer vegetation present on the site was accurately mapped. The habitat survey was carried out in accordance with the Heritage Councils “*Best Practice Guidance for Habitat Mapping and Survey*” (Smith *et al.*, 2011). Prior to the survey beginning minimum habitat size to be recorded was set at 0.5ha.

A map that showed the extent of vegetation cover in Bellacorick in 2001 was produced using a 2001 aerial photograph (1:6000 scale) taken by Ordnance Survey Ireland, along with site information gathered from Farrell (2001). Once the field work was completed, work began on digitising habitat maps using Arc Map 10.

Two habitat maps were produced;

- A habitat map based on the extent of the vegetation that was present on the site in 2001.
- A habitat map based on the extent of vegetation on the site in 2011.

RESULTS

Once habitat maps for Bellacorick in both 2001 and 2011 were produced, it was then possible to

- 1) Compare the spread of vegetation across the site over a ten year period.
- 2) Establish what the main vegetation types on the Bellacorick cutaway are.
- 3) Evaluate the success of the rehabilitation measures.

Figure 1 illustrates the extent to which pioneer vegetation developed across Bellacorick in the ten years between 2001 and 2011. There has been a rapid increase in vegetation across much of the site. In areas where re-wetting occurred, vegetation was quick to establish, particularly species such as *Juncus effusus*, *J. bulbosus* and *Eriophorum angustifolium* along with bryophyte species including *Polytrichum commune* and *Campylopus introflexus* were also quick to establish. Wet moss hummocks in the inter tussock areas and where an area is shallow flooded favours the spread of *Sphagnum* species including *S. subnitens*, *S. cuspidatum*, *S. fallax*, *S. auriculatum* and *S. squarrosum*.

In areas of the site where slopes and hills occur, the rehabilitation measures focused on contouring sloping ground in order to halt peat erosion from these areas to lower lying areas. The rehabilitation in these areas had varying degrees of success. In many areas *Calluna vulgaris* has slowly begun to become established in drier areas with *Eriophorum angustifolium*, *Juncus effusus* and even *Sphagnum* sp. establishment where water has been held back by the creation of berms and contours.

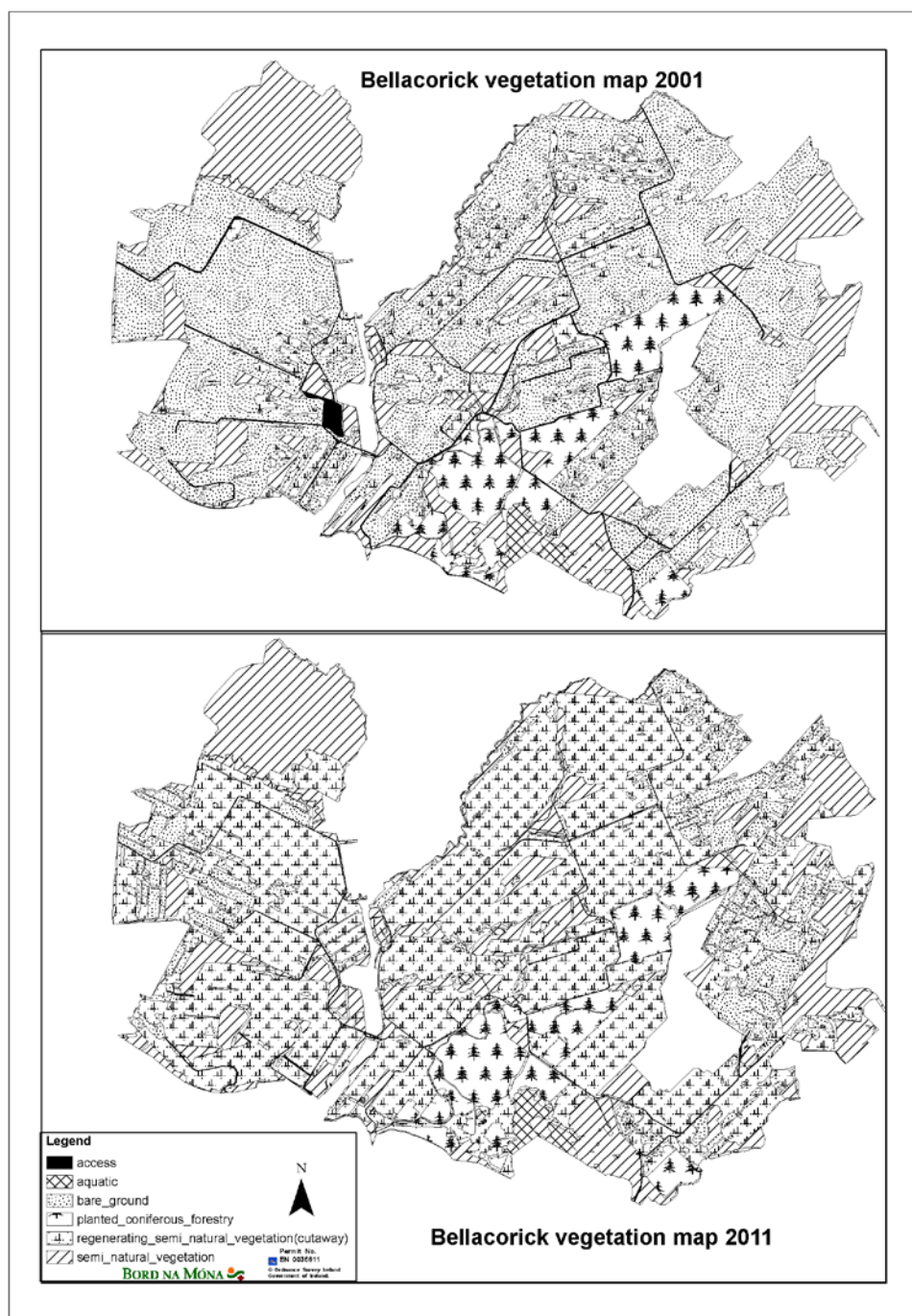


Figure 1 Cutaway habitat maps for Bellacorick in 2001 and 2011.

In the ten year period from 2001 to 2011 there has been a significant change in the area of bare peat, which in 2001 comprised over 50% of the site, while in 2011 it accounted for just over 10% of the site. *Juncus effusus*-dominated pioneer poor fen has increased from 6% in 2001 to 26% in 2011. Some areas of bare peat remain in Bellacorick, these areas are mostly concentrated in an area where rehabilitation was limited by a planned wind farm development.

Areas of poor fen that are rich in *Sphagnum* (>50% cover) account for 1.3% of the site (*Sphagnum*-rich poor fen and *Sphagnum*-rich poor fen with pine scrub) in 2011

compared with 2001, when this habitat type was only found in small pockets in Bellacorick. *Sphagnum* species are emerging across the site and are establishing in areas of newly developed poor fen. Pioneer poor fen habitats have increased by 20% within the same period.

Lodgepole Pine (*Pinus contorta*) has also been spreading across the site. This tree species has been naturally regenerating from nearby conifer plantations. In 2011 *P. contorta* occupied 7% of Bellacorick compared with 2001 when little spread of was recorded.

DISCUSSION

The re-vegetation of the site has been enhanced by the rehabilitation work that occurred on the site between 2003 and 2005. The rehabilitation work on the site encouraged vegetation growth by holding water on the site. Over time vegetation becomes established and moves from species poor pioneer stands to more diverse vegetation. This has stabilised the peat and also intercepted silt run off from Bellacorick. In contrast, part of the site that did not receive any targeted work, due to exclusion for a proposed wind farm development, contained the largest areas of bare peat in 2011.

Pioneer *Juncus effusus* rapidly establishes on peat where the water table is held close to the surface. This species creates a suitable micro climate for other species by providing shelter from high winds and exposure, which prevails at Bellacorick. In this way pioneer habitats that are dominated by one species gradually become more diverse as other species become established over time. This is evident where *J. effusus* dominated poor fen begins to develop a moss layer (*Polytrichum commune* and *Campylopus introflexus*), and then develops a *Sphagnum* rich (>50% cover) flora in the inter-tussock spaces. Rochefort *et al.* (2003) suggested that populations of *Polytrichum alpestre* and *Eriophorum vaginatum* created microclimatic conditions that favoured *Sphagnum* development in North American cutaway bog sites. A similar situation appears to be the case in Bellacorick where *J. effusus* and associated moss layer favour *Sphagnum* establishment.

Lodgepole Pine (*Pinus contorta*) has rapidly colonised across much of the site from neighbouring conifer plantations. The effects of *Pinus contorta* on the pioneer habitats within Bellacorick will need to be monitored in the future. Work carried out on Boreal bogs suggests that pine growth impacted on *Sphagnum* development (Ohlson *et al.*, 2001).

Work carried out on cutaway sites in Belarus show that carbon dioxide (CO₂) uptake has been reported from rewetted sites (Tanneberger and Wichtmann, 2011). Ongoing work at the Bellacorick site detailed by Wilson *et al.* (in press) shows how sections of the site where *Sphagnum* growth is extensive, are changing from being a CO₂ source to habitats where CO₂ is actively being sequestered. These changes in carbon fluxes have occurred alongside changes in the vegetation of the site. The emergence of *Sphagnum*-rich plant communities in Bellacorick suggests that there is potential for sections of the site to revert to peat forming communities. Given that *Sphagnum* is

spreading across the site, it is likely that it will become much more widespread and extensive in the future.

Large areas of bare peat that exist in the eastern section of the site have not been subjected to rehabilitation measures in the past; a programme of rehabilitation is planned for this area in 2012. Ongoing monitoring of Bellacorick will continue in the future in order to track development of the site and vegetation changes.

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