

Bringing the Bogs Back to LIFE



coillte



Restoring Raised Bog in Ireland

LIFE04NAT/IE/000121

Funded by LIFE-Nature and Coillte

October 2004 to September 2008

PROJECT

RESULTS

BOOKLET

Background to the Irish Raised Bog Restoration Project

Raised bogs consist of domed masses of peat, which can be up to 15m deep, formed by the accumulation of dead plant material. They originate in former lake basins or shallow depressions and are mainly concentrated on the Carboniferous Limestone of the central lowlands of Ireland. Raised bogs retain large volumes of water and have a water level generally higher than the local water table. They are very acidic and poor in nutrients due to the fact that once developed, they are sustained by rainwater only, with no groundwater input (ombrotrophic).

Raised bogs are rare in the European Union (EU) and are becoming increasingly scarce and under threat in Ireland. Raised bogs have been developing in Ireland for thousands of years and once covered over 310,000 ha. However due to extensive peat harvesting for fuel and horticulture as well as drainage for agriculture and forestry, much of the original raised bog habitat has been lost. It is estimated that only 18,000 ha of raised bog habitat of conservation value remain. The remaining raised bog habitat now consists of small areas of intact unmodified high bog dome surrounded by extensive modified cutover. High bog represents the remnant of the original raised bog habitat with an intact peat archive. The cutover has been exploited for peat extraction and is affected by drainage.

Irish raised bogs still represent some of the most important examples of this habitat in the world. To protect this habitat, the best examples of raised bog in Ireland have been submitted by the National Parks and Wildlife Service, Department of Environment, Heritage and Local Government to the EU as candidate Special Areas of Conservation (cSACs) under the Habitats Directive.

Coillte Teoranta under this EU LIFE-Nature project have been actively conserving and restoring raised bog habitat on Coillte owned property within cSACs. Over the four year period (2004-2008) Coillte have worked on restoring 571 ha of raised bog habitat. This was the largest afforested raised bog restoration project in Ireland. The raised bog habitat being restored by this

project included both areas of open raised bog and conifer plantations, from which conifers have been felled.

Under this project, the conservation aims were to prevent any further damage to the raised bogs from activities such as drainage, burning, peat-cutting and forestry. These activities had adversely affected the raised bog habitat, by drying out the bog surface, damaging and modifying the raised bog vegetation. Restoration aimed to increase the area of active raised bog and included measures to rewet areas of bog. This involved the removal of conifers and blocking of drains.

By the end of this project, habitat restoration has been completed on over 5% of the raised bog habitat within cSACs. Seventy-five percent of the funding for this project has been provided by the EU LIFE-Nature programme with the remainder provided by Coillte.



The Importance of Irish Raised Bogs

Raised bogs support a diversity of plant and animal species that are otherwise scarce in Ireland. This includes species such as sundews, butterwort, lichens, dragonflies, frogs, otter, hare, merlin, red grouse, snipe and curlew. Apart from species diversity, raised bogs hold a record of past climates and can act as carbon sinks to reduce the impact of climate change.

The Sphagnum mosses that dominate the raised bog vegetation retain water and maintain the acidic conditions on the bog. It is these Sphagnum mosses that form most of the peat, which over time accumulates into the large domes of raised bog that we see today. Due to their water-logged conditions, raised bogs can also hold and preserve archaeological and organic remains.

Raised bogs are characterised by low growing, open vegetation dominated by Sphagnum mosses, sedges and ericaceous shrubs. They are distinguished from blanket bogs by their morphology and the presence of the species such as bog rosemary and cranberry.

Annex 1 of the EU Habitats Directive lists the following raised bog habitats : Active Raised Bog, Depressions on Peat Substrate of the Rhynchosporion, Bog Woodland and Degraded Raised Bog.

Active Raised Bog habitat is characterised by on-going peat formation with high Sphagnum moss cover and usually by the presence of open pools. This habitat occurs in the wetter, quaking areas, mainly in the centre of intact high bog.

The Rhynchosporion habitat occurs on quaking areas in wet depressions, pool edges and erosion channels. The vegetation is dominated by white beak-sedge in association with common cotton-grass, bog bean, sundews and a range of Sphagnum mosses.

Bog Woodland: Trees are rarely present on the surface of intact high bog, as it is nutrient poor, but can occur in flushed areas, forming the rare habitat of Bog Woodland, which is dominated by

downy birch and Scot's pine.

Degraded Raised Bog habitat occurs on areas of high bog where active peat formation has ceased, but where with proper management, it could be restored in the foreseeable future. Degraded raised bog habitat can also occur on cutover, where there is re-wetting and regeneration of raised bog species.



The Raised Bog Project Sites

Coillte was established in 1989 to manage publicly owned commercial forests. In 2002 as part of its Nature Conservation Programme, the company embarked on a major blanket bog restoration project with the support of funding from the EU LIFE - Nature Programme.

In 2004, following on from the success of the initial Blanket Bog restoration project, Coillte commenced this raised bog restoration project on Coillte-owned afforested raised bogs, with further funding from the EU LIFE - Nature Programme. The 14 sites selected are located mainly in the midlands and extend as far west as Co. Galway which contains the largest number of sites. There are outlying sites to the north-east, north-west and south-east, which represent the entire distribution of raised bogs in Ireland.

These sites were selected for the project as they are within Raised Bog cSACs, which have been designated for the high quality of raised bog habitat that they support. Most of the sites consist of afforested raised bog habitat, however some sites such as Carn Park and Cloonshanville also contain significant areas of open, largely intact raised bog.

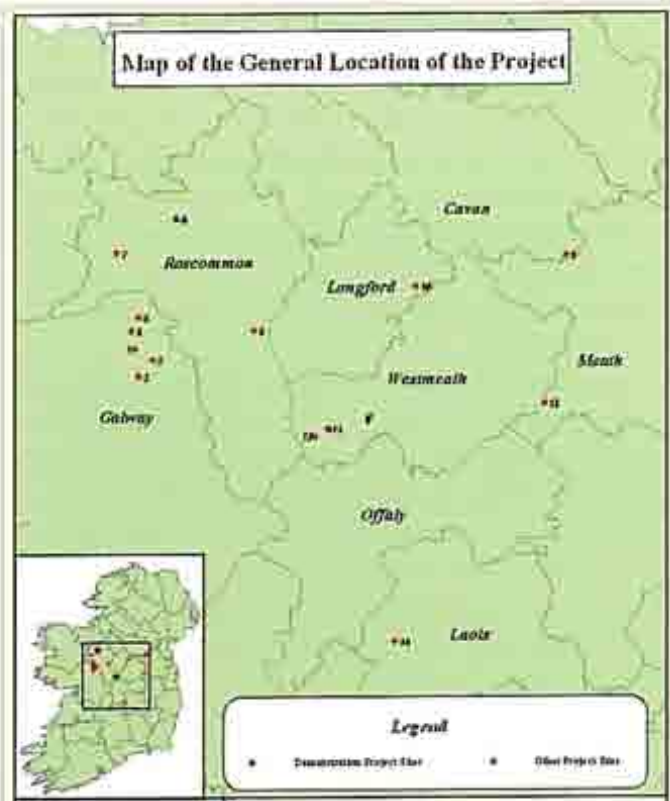


Table 1: List of Project Sites and Area (ha)

Site No.	Site Name	Area (ha)
1	Lough Lurgheen/Glenamaddy	7.3 ha
2	Camderry Bog	13.8 ha
3	Curraglehanagh Bog	40.7 ha
4	Kilsallagh Bog	29.7 ha
5	Lough Ree	49.0 ha
6	Lisnageeragh/Ballinastack	27.1 ha
7	Drumalough Bog	43.2 ha
8	Cloonshanville Bog	34.2 ha
9	Killyconny Bog	11.6 ha
10	Ardgullion Bog	25.0 ha
11	Carn Park Bog	132.2 ha
12	Crosswood Bog	42.7 ha
13	Mount Heavey Bog	58.2 ha
14	Coolrain Bog	56.5 ha
Total		571.2 ha



Aerial Map of Carn Park Bog - Project Site No 11 showing afforested and open raised bog.

Planning for the Project

At the outset of the project a number of visits were made by the project staff to similar raised bog restoration sites in the UK and the Netherlands. Along with visits to the Coillte blanket bog restoration sites, these visits highlighted the advantages and disadvantages of various restoration techniques.

Prior to the commencement of restoration activities a series of meetings were held with local Coillte staff and a number of national statutory bodies, including the Forest Service and the National Parks and Wildlife Service. At these meetings the restoration work to be undertaken was outlined and discussed.

The restoration work undertaken in the project was discussed and overseen by the Project Management Group, which included representatives from Coillte, National Parks and Wildlife Service, the Forest Service and the project ecologist. Each year a meeting of the Project Advisory Panel took place where participants from a wide range of interested organizations (including Irish Peatland Conservation Council, Birdwatch Ireland, The Heritage Council, Teagasc), were invited to contribute their views to the Project Management Team.



Discussions in site with Project Advisory Panel members



Site Meeting with NPWS at Killyconny Bog
Project Site No. 9

Restoration Methods

The main restoration work carried out at the project sites was the felling of conifers and the blocking of drains. Where the conifer crop was young/low yielding, it was felled manually by chainsaw and left on site. Where a mature conifer plantation was present, it was clear-felled by machine and the timber removed from the site. The remaining brash was windrowed by machine to partially clear the bog surface of woody material and to allow access for land survey and drain blocking.



Commercial felling at Carrigrohane Bog
Project Site No. 3

Blocking drains on the cutover has two effects slowing further water loss from the raised bog system and re-wetting of the cutover. With water run-off from the high bog and blocking of cutover drains, large areas of cutover can re-wet and it is in such areas that bog regeneration is likely to be most successful in the medium to long term.

In order to prevent the re-growth of tree/shrub species, such as lodgepole pine and downy birch, clearance of natural regeneration was carried out on all sites. New fencing and firebreaks were established where necessary at the boundary of the project sites, to prevent trespass of grazing animals and to prevent fire damage to the project sites.



Peat dam at Carrigrohane Bog & Ballinacree Bog
Project Site No. 6



Commercial felling at Carrigrohane Bog
Project Site No. 11

The main objective of restoration work was to raise and maintain water-levels close to the surface of the raised bog through the blocking of drains. Following advice from Coillte's Blanket Bog Restoration Project, drains were blocked with mechanically installed peat dams where possible, in preference to plastic dams. At sites where high water-levels prevented machinery access, plastic dams were inserted manually.



Peat dam at Carrigrohane Bog



Peat dams at Carrigrohane Bog & Ballinacree Bog
Project Site No. 8

Monitoring of the Project

Monitoring the effects of the various restoration measures was a very important part of the project and this has been done in a number of ways. Throughout the project water-quality in a bog stream at Cloonshanville Bog has been monitored before, during and after restoration activities. This has provided information on any changes in the water chemistry caused by run-off from clear-felling operations.

Hydrological Monitoring

Water-levels within the peat have been monitored using WALRAGs (Water Level Range Gauges) in order to assess the degree of hydrological recovery of the peat soils following restoration. The Walrag measurements were recorded monthly by field staff, which enabled the investigation of water-level fluctuations in the upper levels of the peat throughout the year. It has been noted that the intact areas of high bog have higher water-levels and less fluctuation throughout the year. Drain-blocking has re-wetted the damaged areas and over time water-levels will rise to similar levels as the intact bog. This rise in water-levels can be quite dramatic, as can be seen in the Hydrological Monitoring Graphs for Killyconny Bog.

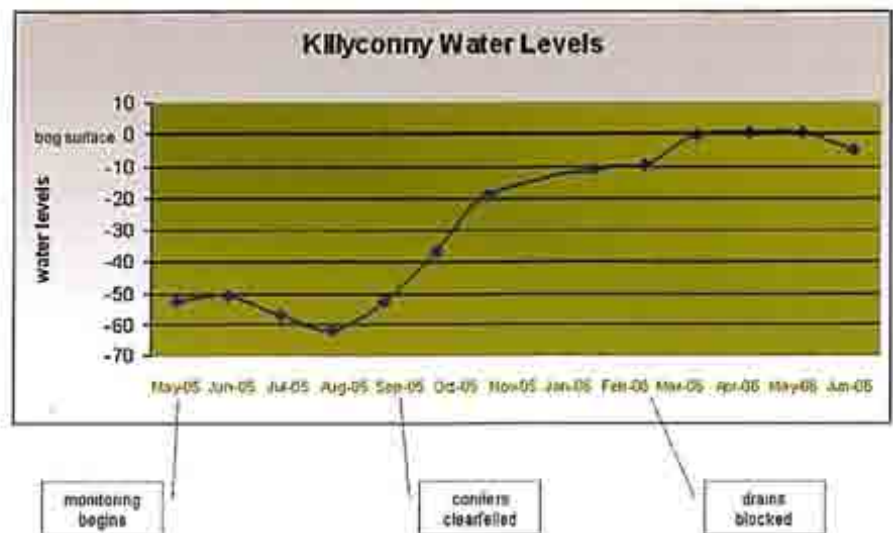


Vegetation monitoring

The recovery of raised bog vegetation has also been monitored throughout the lifetime of the project. The main purpose of this survey work was to document the changes that have taken place following the felling of conifers, and blocking of drains at the various project sites. This has been achieved by documenting the changes in plant species composition and cover in permanent quadrats over time. A photographic record of these quadrats has been kept.

Hydrological Monitoring Graph Killyconny Bog - Project Site No. 9 May 2005-June 2006

The following graph shows the monthly water-level range on Killyconny Bog. A reading of 0 represents surface level and the aim of restoration is to maintain water-levels within 10cm of the surface. The Walrag was installed in May 2005. It can be clearly seen that water-levels have increased dramatically over the course of a year. Clear-felling of conifers occurred in Autumn 2005 with drain-blocking in Spring 2006. This has resulted in an increase in water-levels by over 50cm, to within 10cm of the bog surface as required for active raised bog regeneration.



Additional Monitoring

Through communication with third-level institutions, additional monitoring has been facilitated by the raised bog restoration project. The National University of Ireland Galway provided a MSc. student to examine changes in the invertebrate population following restoration work. The National University of Ireland Dublin carried out a survey into the testate amoeba populations on project sites.

Invertebrate Survey

MSc. Thesis: The effects of forestry and restoration practices on the invertebrate fauna of a raised bog with particular reference to Coleoptera (type of beetle).



The aim of this study was to determine what effects forestry has on the species composition of a raised bog. The study site was located at Carn Park Bog. It was found that forestry did have an effect on species composition. It was concluded that Coleoptera may be useful bio-indicators for habitat change but at this early stage in the rehabilitation of the clearfell sites, vegetation may be a more useful indicator. There is potential for further study in this area.

Testate Amoeba Survey

Testate amoebae (Protozoa, Rhizopoda - single celled organism with a shell) are a group of shell-forming protozoa common to moist environments world-wide. As a result of their rapid colonisation abilities, protozoa are capable of responding almost immediately to changes in their habitat. As such, they offer a potential 'early warning system



for environmental change.

Researchers in the early 20th Century recognised that testate amoebae comprised a vital part of the protozoan community in Sphagnum-dominated raised mires. The principal factor responsible for the composition of a mire rhizopod assemblage at a given point in time is the hydrological status of the site. A functional raised mire has a 'fingerprint' testate amoeba assemblage, as does a drained or cut-over mire.

It therefore follows that the process of restoring a damaged mire is intrinsically linked to the restoration of a particular testate amoeba assemblage and can be tracked by monitoring such changes.

A number of short cores have been taken from several sites in the process of restoration at points of apparently differing hydrological conditions (e.g. hummock, pool). Initial results demonstrate that these sites are in moderately good condition; while traditional indicators of 'healthy' Sphagnum-dominated peatlands are not as abundant as might be hoped, taxa indicative of severely degraded mires are scarce. This suggests that ongoing restoration efforts are at least maintaining the sites in their current state and may be going some way towards actual improvement of site 'health'.



Main Results

All of the 450ha of conifer plantations within the project sites have been felled and drains have been blocked over approximately 427ha. There was a marked difference in surviving bog vegetation cover between open canopy and closed canopy conifer plantations. On sites where the conifer crop was relatively young and the trees had not formed a closed canopy, bog vegetation still remained in the understory and recovery of bog vegetation has been good.



On sites with closed canopy conifer plantations, there was very little bog vegetation remaining in the understory, and recovery will be slower. At these sites, the peat soil had dried out more and there was a greater presence of undesirable plant species such as soft rush and downy birch. Vegetation control has been carried out on these sites, but in the driest areas birch woodland maybe the eventual outcome. At a number of the sites the natural regeneration of pine was also a significant problem which was removed and this will need to be monitored into the future.

The blocking of drains has resulted in a marked increase in water-levels on most project sites and it is expected that bog vegetation will recover most successfully in the wetter areas. The main species to re-colonise following conifer clearance are ling heather, willow-herb and bramble. As the peat gets progressively more waterlogged, it is anticipated that plant species indicative of wetter bog conditions such as Sphagnum mosses, white-beaked sedge, and sundews will gradually re-colonise. Over time, Sphagnum mosses will begin to dominate these wet areas and active peat formation will be restored.



Project Communication

One of the most important aspects of this project has been its communication to a wider audience. This has been achieved by a variety of means including the production and circulation of project information leaflets, the publishing of newspaper and magazine articles, the staging of information days for various interested parties and the creation of a project website www.raisedbogrestoration.ie. The project also had information stands at a range of popular outdoor events, such as the National Ploughing Championships.



Shooting the DVD at Clonsilla Bog
Project site No. 5

Along with the communication of the project through the media, two of the project sites were selected as demonstration sites where car parks, boardwalks and information boards have been provided. These demonstration sites have frequently been used to host field visits from a variety of groups and organisations from Ireland and many European countries including – Finland, Latvia, and Denmark.



Local community as part of a Bog Walk on Carr
Park Bog – demonstration site



Launch of the DVD at ENFO (L to R, David)

David Gunning CEO Coillte, Mary Wallace TD, Minister of State at the Dept of Agriculture, Fisheries and Food and Elaine Scully RTÉ TV Presenter

In addition a DVD promoting Coillte's Blanket Bog and Raised Bog Projects was produced and this was launched by Mary Wallace, TD., Minister of State at the Department of Agriculture, Fisheries and Food, with special responsibility for Forestry at the ENFO offices in Dublin in January 2008.



Interpretative signage
at Carr Park Bog demonstration site



Guided field project visit Carr Park Bog

Wider Benefits of the Project

In addition to improving both the quality and quantity of raised bog habitat within a number of important Irish Natura 2000 sites, this project has also provided important insights into raised bog restoration. Prior to this project, there was very little information regarding the large-scale restoration of afforested raised bog habitat in Ireland. This project has demonstrated that with adequate funding, large areas of raised bog habitat can be restored.



Keep going with learning in a bog with a Cornish Bog - All St. 14

Through the distribution of the DVD and other promotional material, this project has highlighted the importance of protecting the remaining raised bog habitat in Ireland. Hopefully this will encourage a greater understanding and appreciation of this important wildlife habitat by the general public.

Community Involvement

Local community involvement has been an important and rewarding part of the restoring raised bog in Ireland project. Project staff have engaged with several local communities during the lifetime of the project – they include Baylin Community Development, Lawrencetown Community Group and Frenchpark Tidy Towns Committee. We also organised a poetry competition at the local school closest to the demonstration site at Carn Park Bog (Site No. 11) to encourage children in the area to take an interest in the raised bog restoration project, this proved to be very successful.



Baylin School Co. Wickliffe - Poetry competition winner - Lillian McAnnamack pictured with her teachers and the Project PR Manager



Baylin village monument of long oak sculpture Plaque - refers to Carn Park Bog - Natura 2000 site



Site Manager John Farrows meets with Frenchpark Tidy Towns Committee Co. Roscommon



Children exploring on Cornish Bog Project site No. 14

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Coillte is pleased to acknowledge the generous funding received from the EU LIFE Programme towards the implementation of this project. We also wish to thank the Forest Service, the National Parks and Wildlife Service and the Irish Peatland Conservation Council, as well as all the other organisations and individuals who have participated in the project and contributed to its success.

Aerial photographs supplied by NPWS -
Lough Ree Bog - Project site No. 5.

Text and photographs supplied by the Project Team



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