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# inpractice

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## Rewilding, Habitat Restoration and Species Reintroductions

# Habitat Restoration of Historic Local Authority Landfills in Ynys Môn (Anglesey) and Gwynedd



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Four capped landfill sites in north west Wales, two in Gwynedd and two in Ynys Môn (Anglesey) have been given over to habitat restoration projects. Each site is uniquely different: what they have in common is that they have no subsequent use except as low-quality grazing, providing an opportunity for them to be restored as wildlife habitat. Ecological baseline surveys guide the direction of the restoration as the natural capital of the existing sites is revealed.

## Introduction

Following a successful first for the Wales multi-agency Sustainable Management of Natural Resources (SMNR) demonstration project at Penhesgyn Landfill on the isle of Ynys Môn (the Welsh name for Anglesey),

where Welsh Government grant-in-aid funding was utilised to create a multi-benefit mosaic habitat, a further successful application was made for Challenge funding to expand the project to three other landfills in north west Wales (Figure 1). Uniquely, adopting the template of wildflower meadow creation on the surface of the closed landfills allows maintenance of the landfill gas-extraction infrastructure and maintains the structural integrity of capping works. The project has created 40 ha of donor wildflower meadow above millions of tonnes of capped waste.

Ancillary connected improved low-grade council-owned land surrounding the landfills was included on all four sites and over 45,000 native woodland trees have been planted. Hedgerow expansion and connectivity at scale, multiple wetland and water body creation and improvement to riparian habitat, including a peat-rich fen, have formed ecologically rich connected habitats which are a template for the restoration of contaminated land.

All fencing and barriers to animal movement have been removed and an outreach education project has been established with the aim of reaching all schools in Ynys Môn and



Figure 1. Map of north Wales with locations of the landfill sites.

Gwynedd to increase knowledge and awareness of biodiversity loss and local solutions at scale.

## Restoring nature in the post-industrial landscape

The legacy of industrial activity and waste disposal is one of biodiversity loss and pollution of the natural environment. The activity has degraded land and soils, eliminated habitats and species, permanently polluted large areas of land and reduced the amenity of local places.

Wild Landfill is a Natural Resources Wales (NRW)-led, Welsh Government-funded, multi-agency project aimed at reversal of this trend, utilising degraded, non-contested land to deliver multiple environmental benefits, incorporating



many aspects of the SMNR principle and the ecosystems approach in its brief to deliver multiple biodiversity adaptation and climate benefits. Climate change and the biodiversity crisis are global issues for current and future generations. Wild Landfill aims to provide local solutions to these global issues, empowering the people of Wales to better understand the problems and help to make a tangible difference.

A capped landfill is contaminated and not fit for development purposes. It cannot be planted with trees, or used for anything except low-quality agricultural grazing. What if we could take landfill sites full of rubbish and turn them into oases for wildlife, carbon sinks and wildflower meadows, creating new ponds, wetlands and new forests? Well, that is exactly what the Wild Landfill project is doing. We have taken four landfill sites in Gwynedd and Ynys Môn, each of which contain millions of tonnes of waste, and turned them into ecological hot spots, enhancing biodiversity, creating havens for wildlife and increasing carbon storage in the trees and soils in and around the sites. We have created a connected, fence-free habitat within a lowland, primarily pastoral agricultural landscape.

Wild Landfill aims to reduce the impact of industrial sites on the environment and climate, turning areas of historical environmental degradation into diverse, ecologically rich habitats for wildlife recovery and carbon storage, improving land for pollinators which are vital for food production and creating multiple new water bodies, helping to reverse the decline in freshwater ponds. The UK has lost 90% of its ponds and 97% of its wildflower meadows over the past 100 years. Wild Landfill is helping reverse this trend and has created a series of new wetlands and ponds to create living diverse aquatic habitats to further increase biodiversity.

**“ Wild Landfill aims to provide local solutions to global issues, empowering the people of Wales to better understand the problems and help to make a tangible difference. ”**

The project was initiated by Tony Roberts of NRW through the Welsh Government Challenge Fund and Gwynedd and Ynys Môn County Councils, with collaborations across a spectrum of partnerships and stakeholders.

The sites will be an educational resource for the public, educators, environmentalists, politicians, policy-makers and all other interested parties. They will act as a template for the development of a network of thriving, biodiverse sites across Wales that are rich in wildlife and create a multitude of nature-based solutions in response to the climate and nature emergencies. Through a dedicated online resource and a schools outreach programme that incorporates a website, animated and documentary-style films, and useful simple environmental information, Wild Landfill is engaging, educating and invoking action across multiple stakeholder groups in Wales.

### Establishing a baseline

To draft a management plan for the future, it is necessary to establish an inventory of what is already present: an ecological baseline. This was a substantial operation across four sites, because as much of the flora and fauna as possible needed to be sampled. There was a limited budget for this work, and as the sites are situated in different counties the funding was drawn from different financial sources, requiring considerable input from multiple partners. Private sector contractors who were appointed actively participated in the design and delivered additional work *pro bono* to ensure maximum environmental benefit was achieved within budget and on time.

Funds enabled extended Phase 1 and breeding bird surveys across all the sites, and some limited invertebrate surveys on Ynys Môn, including moth trapping by volunteers. Volunteer days also enabled additional botanical surveys of sites on Ynys Môn by the local Flora Group, affiliated to the Botanical Society of Britain and Ireland (BSBI). Without the input of volunteers, the data collected would have fallen short of the requirements of a good baseline survey. However, too much reliance on volunteers can undermine the value placed on the work.

Professional consultants are guaranteed to do the work, governed by a code of conduct and underwritten by liability insurance. Consultants are also proficient at managing technical requirements such as licences and permits. Personal communication with Natural England while managing the Fenns and Whixall Moss NNR LIFE project suggests that around 15% volunteer input is a good balance.

### Sites in Gwynedd 1: Ffridd Rasmus

The baseline site surveys highlighted how different the sites were from one another. This site, near Harlech, would have been maritime acid grassland, grey dune and heath before the establishment of the landfill and surrounding commercial forestry. Imported soil and compaction has created large stands of willow (*Salix cinerea*) and buddleia (*Buddleia davidii*) scrub, and, peculiarly, dry reedbed on the high point of the landfill where imported clay topsoil from ditch clearance has been spread. It has breeding whitethroat (*Curruca communis*) and sedge warbler (*Acrocephalus schoenobaenus*) in the drainage ditches, and a remarkable display of viper's bugloss (*Echium vulgare*) in late summer, indicative of what it might become.

Among the project constraints there is a requirement for tree planting on all sites to meet the Welsh Senedd targets (Mosalski 2021), amounting to 42% of the 32 ha of landfill. Consultation with all stakeholders (including NRW, Snowdonia National Park, the local authority and the RSPB) concluded that encouraging development to Atlantic dune woodland (Tryfon 2016) would be desirable, and a tree mix appropriate to the habitat target was duly proposed, including native conifers (Sassoon *et al.* 2021) (Figure 2).

### Sites in Gwynedd 2: Llwyn Isaf

The second Gwynedd site was 24 ha located next to a Site of Special Scientific Interest (SSSI), part of the Ynys Môn and Llŷn Fens Special Area of Conservation (SAC). This helpfully provided information on what to

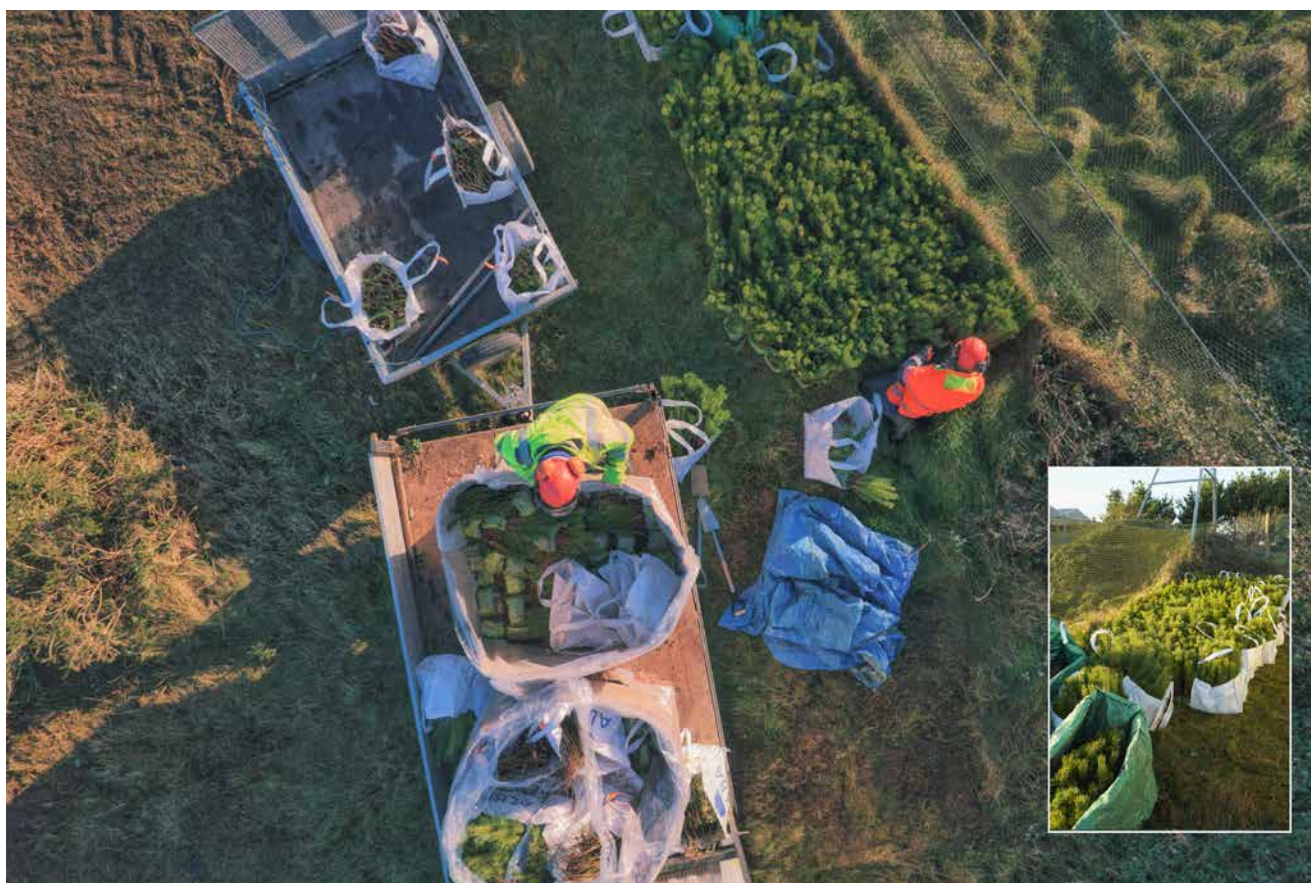


Figure 2. Scot's pine (*Pinus sylvestris*) loaded onto a flatbed, ready for planting. Photo credit: Jonas Stuart, Rocketland.

**“ Part of the Llwyn Isaf grassland has been managed successfully for butterflies, with populations of small heath and dingy skipper as well as the more typical grassland butterflies. ”**

expect, both from the SAC and supporting SSSI designations. In addition, because protected sites are generally better recorded, good data was received from the Biodiversity Records Centre for North Wales (Cofnod). Part of the grassland has been managed for butterflies, and with some success, for it has populations of small heath (*Coenonympha pamphilus*) and dingy skipper (*Erynnis tages*; Figure 3) as well as the more typical grassland butterflies.

Tree planting will occupy 2.5 ha of the Llwyn Isaf site not occupied by capped landfill. The covered landfill will be allowed to develop as species-rich grassland, subject to the same management regime that has



Figure 3. Dingy skipper (*Erynnis tages*) is already present at two of the sites in Gwynedd and Ynys Môn. Photo credit: Richard Birch.





Figure 4. Ponds at Llwyn Isaf. Photo credit: Jonas Stuart, Rocketland.

encouraged the butterflies that are already there. Several new water bodies have also been established by enhancing the site watershed soakaways (Figure 4), which will provide further permanent climate-resilient aquatic habitat at the site.

### Sites in Ynys Môn 1: Clegir Mawr

In addition to the Welsh Senedd's commitment to tree planting, restoring and preserving fen is a recognised strategy for sequestering carbon. Both the Ynys Môn sites are former fens. The 12.5 ha site at Clegir Mawr, closed in the 1960s, is now so well recorded botanically that it is the subject of an experimental reintroduction project with the involvement of BSc Honours students from the University of Wales in Bangor, in conjunction with the university's Botanic Garden at Treborth. Using the botanical species list as a guide, and a wider knowledge of plants typical of the Ynys Môn fens, it is possible to imagine what species might have been present had they not been lost or failed to colonise. These include species proposed as key performance indicators (KPIs) to facilitate a quantitative experimental increase in biodiversity.

The initial project involved a widespread Ynys Môn species absent from the site, even though the habitat appears suitable. Forty plants of marsh helleborine (*Epipactis palustris*), grown from locally sourced stock at Treborth Botanic Garden, from original material collected from a sand dune restoration project 16 km away, were planted in two plots in September 2022 (Figure 5)

and their establishment will be measured by students in future years. The existing grassland at Clegir Mawr is already sufficiently diverse that seed mixes – proposed for the capped landfill at some of the sites – are unnecessary and management is confined to grazing and scrub clearance. However, piecemeal additions planted as part of student projects fulfil another aim of the scheme, that of community involvement and education. Good colonies of marsh helleborine and, in future, vervain (*Verbena officinalis*) and yellow bartsia (*Parentucellia viscosa*) will be considered as part of larger projects, and will add to the species diversity,

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which already includes great crested newt (*Triturus cristatus*), common lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*).

Purists might consider this proactive approach as 'gardening', but it is no more so than sowing wildflower seed or planting trees. Corridors through which species can reach the site naturally are rare. Natural colonisation may take years, and one thing we can do to counter the dearth of biodiversity is to provide experimental re-introduction where it is appropriate.

### Sites in Ynys Môn 2: Penhesgyn

The second Ynys Môn site was capped only recently and highlights how plants get moved from place to place by



Figure 5. (a) Flowering-sized plants of marsh helleborine (*Epipactis palustris*). (b) Marking out and preparing 1 m x 1 m plot for 20 plants. (c) Arranging the plants in the plot. (d) After planting. Photo credit: Richard Birch.



Figure 6. Capped landfill meets lowland fen. Inset: golden-ringed dragonfly (*Cordulegaster boltonii*). Photo credits: Richard Birch.

accident, so why not by informed design? Botanical survey produced two plants new to Ynys Môn: field pepperwort (*Lepidium campestre*) and marsh yellow-cress (*Rorippa palustris*). Their origin is unknown, but both are behaving as adventives and it is likely they were introduced with soil used to cap the landfill from further afield.

This second locality contains a large expanse of poor-quality derelict fen (Figure 6). A preliminary survey with canes revealed that in places it is made up of peat to a depth of nearly 2 m, which is four times the depth that qualifies as deep peat (Natural Resources Wales 2022) and deeper than some of the fens included in the Ynys Môn and Llŷn Fens SAC designation.

Following consultation with RSPB and NRW's peatland team, a strategy for re-wetting the fen is being initiated. This is potentially complex, requiring lengthy discussions with adjacent landowners and fen recovery experts. Applications for funding will take up a great deal of unfunded time but must be prioritised if the desired outcomes are to be achieved in a timely fashion. However, the prospects for success look promising, given the Senedd's commitment to restoring peatlands (Welsh Government 2020), and the scheme has fully engaged waste managers, local councillors and heads of service. Once contributing partners are on board, the collaborative effort and time spent reaps rich rewards.

There are precedents for restoring peat in uplands and lowland bogs, but fewer for fens, where the main peat-forming plant is common reed (*Phragmites australis*). The Penhesgyn fen is so degraded by drainage dykes and channels cutting across it that there is no reed remaining; instead, it has been replaced by reed canary-grass (*Phalaris arundinacea*), with patches of great pond sedge (*Carex riparia*), indicating that there was once sufficient water to support a fen community. After establishing where and how much peat there is across the site, the restoration exercise will involve blocking drains and creating a saturated environment suitable for peat formation. The funding emphasis is on peat restoration, but in this case it must incidentally provide habitat for other species, particularly those attracted by open water.

Restorers of moss peatlands would rather not have open water in the ecosystem in case it should attract too many wildfowl and cause eutrophication, but the corollary is that this would be a notable biodiversity gain on the Ynys Môn fens. In 2016, bittern nested on Ynys Môn for the first time in 20 years, just 3.5 km away from Penhesgyn, at the RSPB reserve of Gors Ddyga. A notable success would be the colonisation of the Penhesgyn fen by birds like bittern and marsh harrier. To paraphrase Kevin Costner's character in the 1989 film *Field of Dreams*, "Build it, and they will come." Now, wouldn't that be something?

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