

WASC 1898

Cooker Explainer  
Pamphlet



Mae Ymddiriedolaeth Natur Gogledd Cymru yn elusen leol sydd yn dibynnu ar eu haelodaeth a chyfraniadau gan wirfoddolwyr. Trwy ei gwaith mae'n ymdrechu:

- Hybu gwell dealltwriaeth o fywyd gwyllt, defnydd o gefn gwlad ac eu hamddiffyn.
- Meddiannu a rheoli gwarchodfeydd er mwyn cadwraeth bywyd gwyllt ac i addysgu ac i ymchwilio.
- Cydweithio gyda'r cyhoedd, Cymunedau, Tirfeddianwyr, Awdurdodau Lleol hefyd gyda chyrrff lleol a chenedlaethol sydd â diddordeb mewn etifeddiaeth bywyd gwyllt.

Os hoffech gefnogi cadwraeth yn eich ardal, neu os am fwy o fanylion yng nglyn a gwarchodfeydd natur yn eich ardal cysylltwch â:

Ymddiriedolaeth Natur Gogledd Cymru

Prif Swyddfa ac Aelodaeth 376 Stryd Fawr Bangor Gwynedd LL57 1YE (01248) 351541 e-bost: nwwt@cix.co.uk	Swyddfa Gogledd Ddwyrain Cymru Parc Gwledig Loggerheads Ger Yr Wyddgrug Denbighshire CH7 5LH (01352) 810469 e-bost: nwwte@cix.co.uk
--	---

The North Wales Wildlife Trust is a registered charity dependent on its members and voluntary contributions. Through its work it aims to:

- Promote a better understanding of wildlife, the use of the countryside and its protection.
- Acquire and manage reserves for the conservation of wildlife and for teaching and research.
- Co-operate with the public, communities, landowners, local councils and with other national and local bodies interested in the heritage of wildlife.

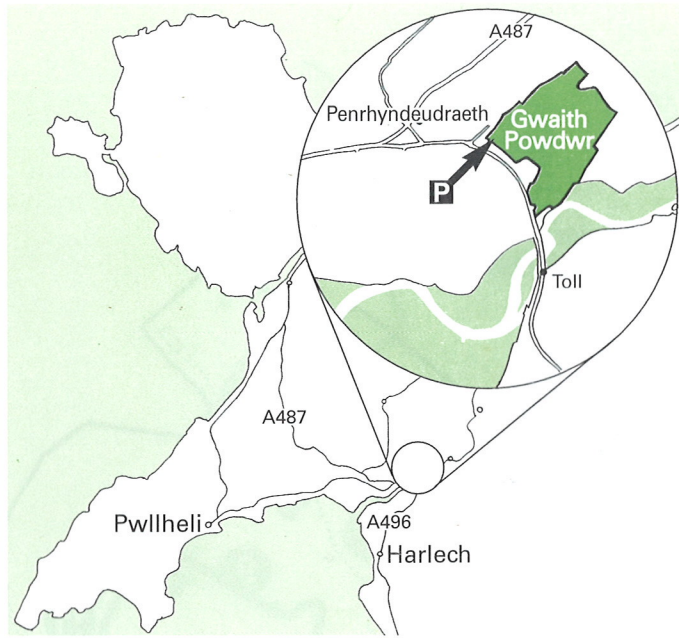
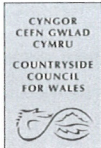
If you would like to help support conservation in your area, or want more information about nature reserves in your area, then please contact;

North Wales Wildlife Trust

HQ & Membership 376 High Street Bangor Gwynedd LL57 1YE (01248) 351541 e-mail: nwwt@cix.co.uk	North East Wales Office Loggerheads Country Park Nr. Mold Denbighshire CH7 5LH (01352) 810469 e-mail: nwwte@cix.co.uk
---	---

[www.wildlifetrust.org.uk/northwales](http://www.wildlifetrust.org.uk/northwales)

Sponsored by • Noddwyd gan



### Lleoliad

Wedi lleoli'n agos at Benrhyndeudraeth, ym mhen dwyreiniol pont Briwet, sef tollbont Harlech. Gall gyrraedd y warchodfa hon drwy y parc busnes.

Bwried y daflen hon yw dangos, drwy daith dywys, y nifer o gynefinoedd ar y safle. Er bod y rhan fwyaf o'r llwybrau drwy'r warchodfa mewn cyflwr da, mae rhai yn rhy serth i bram a chadair olwyn, ond fe nodwyd y rhain ar y map mewnol. Drwy y safle caiff nifer o ffyrdd cul, a gall dalwyr bathodynau oren a glas (drwy drefniant o flaen llaw) yrru o amgylch y warchodfa.

### Location

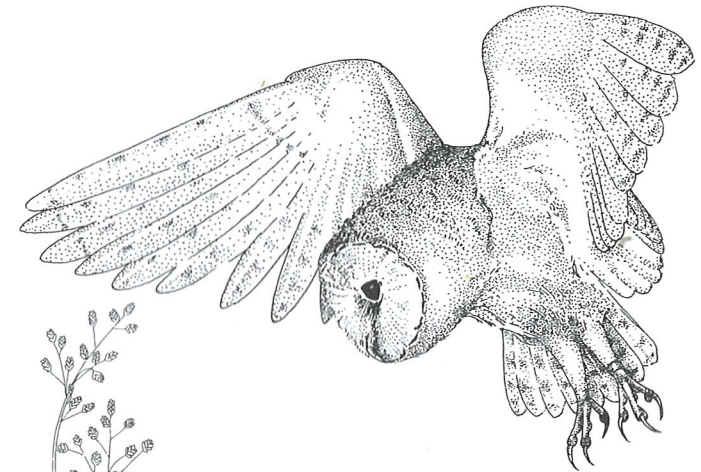
Near Penrhyndeudraeth, at the eastern end of the Harlech toll, this reserve can be reached through the Business Park.

The aim of this leaflet is to show, via a guided walk, the range of habitats on the site. Although most paths through the reserve are in good condition, some are too steep or uneven for prams or wheelchairs, these are marked on the map inside. There are narrow roads throughout the site, so orange badge holders can (by appointment) drive around the nature reserve.

Ymddiriedolaeth Natur  
**Gogledd Cymru**  
North Wales  
Wildlife Trust



# Gwaith Powdwr



*Esiampl dda o sut all bywyd gwyllt ffynnu ar safle diwydiannol ac ôl-ddiwydiant yw'r safle hwn - cyn waith ffrwydron Cooke's.*

*This site, formerly the Cooke's Explosive Works, is a good example of how wildlife can flourish in an industrial and post-industrial setting.*

Gwarchod Bywyd Gwyllt ar gyfer y Dyfodol  
Protecting Wildlife for the future



1

Ffiniwyd y nant, sydd yn llifo drwy'r dyffryn, gan goetir corsog yn cynnwys Helygen a Bedw. Pwysig yw'r awyrgylch llaith o gwmpas y nant, ar ran cynnal rhedyn, mwsogl a chen. Fel rhan o brosiect a ariannwyd gan LIFE, rydym yn ail-adferu cynefinoedd gwlybtr *Erica tetralix* a choedtir helygain.

Willow and Birch carr border the stream flowing through this valley. The humid atmosphere around the stream is important for ferns, mosses and lichens. In this area, as part of a LIFE funded project, we are restoring *Erica tetralix* wet heath and willow woodland habitats.

2

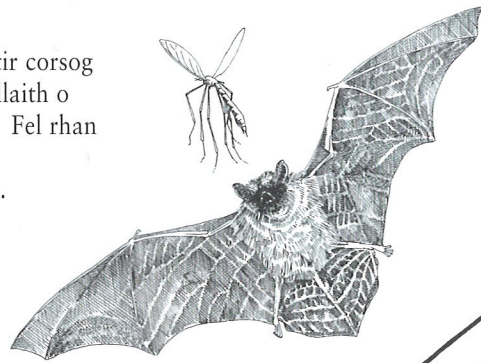
Mae rbwel, a adewir wedi dymchweliad y safle, yn creu is-heuan rhydd dreinio sydd yn dynwared carreg galch. Felly yma fe ddewch hyd i nifer o blanhigion glaswelltir calchaid fel y Cor-rosyn cyffredin a Pys y Ceirw, bwyd cyffredin i'r larfa glöyn byw y Glesyn Cyffredin.

Rubble, left from site demolition, creates a free-draining substrate that mimics limestone. So here you may find typical calcareous grassland plants like Common Rockrose and Bird's-foot Trefoil, the larval foodplant of Common Blue butterflies.

3

Yn y dyffryn hwn gaiff nifer o gynefinoedd, gwelltir, prysg, coedwigoedd derw aeddfed a bedw gwlyb. Rydym yn cynnal y gwelltir er lles y Wiber, y Cyffyllog, Ystlumod ar Tylluanod. Darganfyddir Ystlumod drwy'r warchodfa, felly yma 'rydym yn gosod blychau ystlum ychwanegol.

This valley contains a mix of habitats; grassland, scrub, mature oak and wet birch and willow woodland. We are maintaining the open grassland to benefit Adder, Woodcock, Bats and Owls. Bats are found throughout the reserve, so here we have put up additional bat boxes.



Ystlum lleiaf • Pipistrelle Bat



- ffordd • road
- ffordd serth • steep road
- llwybr • path
- walk route • Llwybr cerdded
- gât • gate

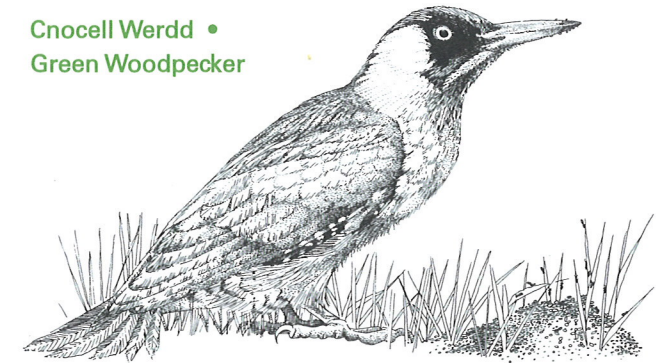
4

Fel cyn man troi a arosfa i lorïau, fe ddatblygodd yr ardal hon rywogaethau sydd yn nodweddiadol o laswelltir naturiol gyda Mefus y Goedwig, Pannog Melyn a Thresgl y Moch. Mae safleoedd, sydd yn gymharol boeth a sych fel hyn yn fannau da i weld y Chwilen Deigr Gwyrdd, heliwr bywiog. Glaswelltir agored wedi amgylchynu gan goedlan aeddfed yw hoff gynefin y Gnocell Werdd. Er eu bod yn swil fe allwch glywed eu cri nodweddiadol, neu os ydych yn ddigon ffodus, eu gweld yn bwydo ar nythod morgrug.

Formerly a turning circle and hard standing area for lorries, this area has developed a community typical of neutral grassland with Wild Strawberry, Great Mullein, and Tormentil. Relatively hot, dry habitats like this are a good place to see the Green Tiger Beetle, an active hunter. Open grassland surrounded by mature woodland is the favoured habitat of Green Woodpecker.

Though shy you may hear their distinctive laughing call or if especially lucky see them feeding at ants' nests.

Gnocell Werdd • Green Woodpecker



5

Heibio'r glaswelltir mae pwll dŵr bach wedi gordyfu gan Helygen Mair. Bwyd pwysig i lawer o lindys gwyfnod yw'r Helygen Mair, sydd yn synnu rhywun yn fawr oherwydd mae'r dail yn llawn o olew aromatig cryf - ymdrechwch rwbio deilen rhwng eich bysedd ond cymerwch ofal, oherwydd mae'r tir yn anesmwyth a gwlyb o dan yr haen prysgwydd.

Beyond the grassland is a small pool, overgrown by Bog Myrtle. Bog Myrtle is an important food for many moth caterpillars, which is surprising as its leaves are packed with strongly aromatic oils - try rubbing a leaf between your fingers, but be careful, as the ground here is uneven and wet beneath the shrub layer.



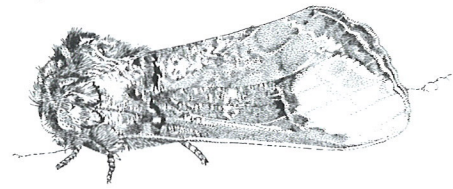
6

Drwy'r warchodfa gwelwch redyn yn llechfeddiannu, symudwyd pob rhywogaeth goresgyn fel rhedyn a rhododendron gan yr Ymddiriedolaeth Natur, i gynnal y cynefin amrywiol.

Throughout the reserve you may notice Bracken encroaching. The Wildlife Trust removes invasive species such as Bracken and Rhododendron to maintain habitat diversity.

7

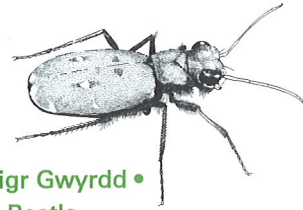
Mae coed derw yn tra-arglwyddiaethu y goedlan hon sy'n llawn bywyd gwyllt - mae coed derw yn cynnal 85% yn fwy o rywogaethau nac unrhyw goed eraill, ac fe ychwanegwn at y defnydd wrth gadw coed marw fel coed sefyll neu goed dymchwel. Mae coed marw yn bwysig am larfa chwilod pren dyllwyr, ar adar hynny fel Delor y Cnau, Cnocell y Coed ar Dringwr Bach sydd yn bwydo arnynt. Daionus iawn yw'r goedlan lydan ddail ar gyfer gwyfynod. Mewn un noson, yn unig, dalwyd mwy na 130 o wahanol rywogaethau yma.



Gwyfyn Blaen Llwyd-Felen • Buff Tip  
Bach Adain Rheuan • Pebble Hook-tip



The woodland here is dominated by Oak and is rich in wildlife - Oak supports 85% more species than any other tree and we add to its usefulness by retaining dead trees as standing or fallen timber. Dead wood is important for wood-boring beetle larvae and those birds, such as Nuthatch, Woodpecker and Treecreeper, which feed on them. The broad-leaved woodland is especially good for moths. In just one night more than 130 different species were caught here.



Chwilen Deigr Gwyrdd •  
Green Tiger Beetle



8

O'r man gwylio, gwelwch aber yr afon Dwryrd, Ynys Giffan a chastell Harlech yn y pellter.

From the viewpoint, you can see the Dwryrd estuary, Ynys Giffan and Harlech Castle beyond.

9

Diddorol yw'r llethr gan ei fod yn adlewyrchu y newidiad mewn cynefin gyda uchelder - o'r goedlan Derw ac Onnen ar y tir isel, drwy goed Bedw a phrysg Draenen wen i rostir sych gyda eithin a grug.

This steep slope is interesting as it reflects the change in habitat with altitude - from the lowland Oak and Ash woodland, through Birch and Hawthorn scrub to dry heathland with Gorse and Heather.

10

Efallai eich bod wedi gweld gweision y nadroedd a mursennod oddi amgylch y warchodfa, ond yn enwedig ger pyllau bach fel hyn. Rydym yn cynnal dŵr agored er lles infertebratau dyfrol wrth gribino'r chwyn trwchus.

You may see damselflies and dragonflies throughout the reserve, but especially near small pools like this. We maintain some open water for aquatic invertebrates by raking out dense weeds.

11

Prif safle nythu'r Troellwr, aderyn prin a amddiffynnwyd gan ddeddf, yw'r rhostir, felly yn yr haf rydym yn cau y llwybr hwn. Fe all glywed y Troellwr yn galw oddi yma neu o'r rhostir yr ochr arall i'r aber.

This heath is the main nesting site for Nightjar, a scarce and protected bird, so in summer we close this path. You will need to retrace your steps and follow the alternative route. You may hear Nightjar 'churring' from here or from the heath on the other side of the estuary.



12

Cymerwch seibiant wrth y llyn a gwylwch y dwr. Fe welwch nifer fwy o anifeiliaid dyfrol na welsoch ar yr edrychiad cyntaf. A allwch weld madfallod, larfa gwas y neidr a chwilod dŵr? Gall ddarganfod fwy o fanylion ar y bwrdd gwybodaeth gyfagos.

At the pool, stand still and take a while to observe the water. You will see many more aquatic animals than at first glance. Can you see newts, dragonfly larvae and water beetles? More information can be found on the nearby information panel.



Medfyll Llyfn • Smooth Newts

13

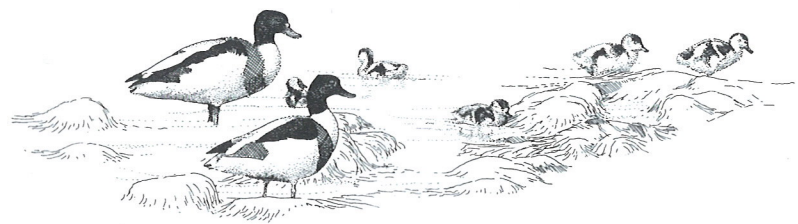
Lleoliad da yw'r fainc i edrych dros yr Afon Dwryrd. Gyda ysbïenddrych (a lwc) gallwch weld Dyfrgi, Sewin a Hwyaaden yr Eithin.

The bench is a good place to look out over the Afon Dwryrd. With a pair of binoculars (and if you are lucky) you can see Otters, Sea Trout and Shelduck.

14

Yma, fel rhan o'r arbrawf ariannwyd gan LIFE, rydym yn ymdrechu ehangu cynefin y rhostir o'r grib hyd at yr is-haen rwbel. Os weithith yr arbrawf, fe fydd cynefinoedd cyn-ddiwydiannol eraill drwy Ewrop yn cael ei ail adferu yn yr un modd. Gall ddarganfod fanylion pellach ar y bwrdd gwybodaeth LIFE gerllaw.

Here, as part of a LIFE funded experiment, we are trying to expand the heath habitat from the ridge onto the rubble substrate. If the experiment works, the same method will be used to regenerate other post-industrial sites throughout Europe. More information can be found on the LIFE information panel nearby.



Hwyaaden yr Eithin • Shelduck



15

Serth iawn yw'r llwybr at y guddfan, ond lleoliad nythu saff yw'r eithin ar y llethrau serth yma i adar fel y Llinos a Chlochdar y Cerrig.

The path down to the bird hide is very steep, but the gorse on these steep slopes is a safe place for nesting birds such as Linnet and Stonechat.

16

Lleoliad da i weld gloynnod byw fel Iâr Fach y Graig yn torheulo yw ardaloedd fel hyn, lle mae'r tir yn llwm. Ond gallant fod yn anodd yw gweld gan ei bod wedi cuddwedu'n dda ac maent yn ongli eu cyrff tuag at yr haul, a bach iawn yw'r cysgod a daflant.

Areas like this, where the ground is bare, are a good place to see Grayling butterflies basking. They can be hard to see though as they are well camouflaged and they angle their bodies towards the sun so they cast the least shadow.

Iâr Fach y Graig • Grayling



Parhewch ar hyd y llwybr yn ôl at ddechrau'r daith (gweler y map). Os am fwy o wybodaeth yng nglyn ar rywogaethau ar y warchodfa hon, neu os hoffech ddweud wrthym am y rhywogaethau 'rydych wedi eu darganfod ar y safle, yna cysylltwch â Ymddiriedolaeth Natur Gogledd Cymru.

Continue along the path back to the start of the walk (see map). If you want more information about the species found on this nature reserve or wish to tell us about species you have found on the site, please contact the North Wales Wildlife Trust.



Mae Ymddiriedolaeth Natur Gogledd Cymru yn elusen leol sydd yn dibynnu ar eu haelodaeth a chyfraniadau gan wirfoddolwyr. Trwy ei gwaith mae'n ymdrechu: • Hybu gwell dealltwriaeth o fywyd gwyllt, defnydd o gefn gwlad ac eu hamddiffyn. • Meddiannu a rheoli gwarchodfeydd er mwyn cadwraeth bywyd gwyllt ac i addysgu ac i ymchwilio. • Cydweithio gyda'r cyhoedd, Cymunedau, Tirfeddianwyr, Awdurdodau Lleol hefyd gyda chyrrff lleol a chenedlaethol sydd â diddordeb mewn etifeddiaeth bywyd gwyllt.

Os hoffech gefnogi cadwraeth yn eich ardal, neu os am fwy o fanylion yng nglyn a gwarchodfeydd natur yn eich ardal cysylltwch â:

Ymddiriedolaeth Natur Gogledd Cymru

Prif Swyddfa ac Aelodaeth 376 Stryd Fawr Bangor Gwynedd LL57 1YE (01248) 351541 e-bost: nwwt@cix.co.uk	Swyddfa Gogledd Ddwyrain Cymru Parc Gwledig Loggerheads Ger Yr Wyddgrug Denbighshire CH7 5LH (01352) 810469 e-bost: nwwte@cix.co.uk
--	---

The North Wales Wildlife Trust is a registered charity dependent on its members and voluntary contributions. Through its work it aims to: • Promote a better understanding of wildlife, the use of the countryside and its protection. • Acquire and manage reserves for the conservation of wildlife and for teaching and research. • Co-operate with the public, communities, landowners, local councils and with other national and local bodies interested in the heritage of wildlife.

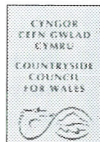
If you would like to help support conservation in your area, or want more information about nature reserves in your area, then please contact;

North Wales Wildlife Trust

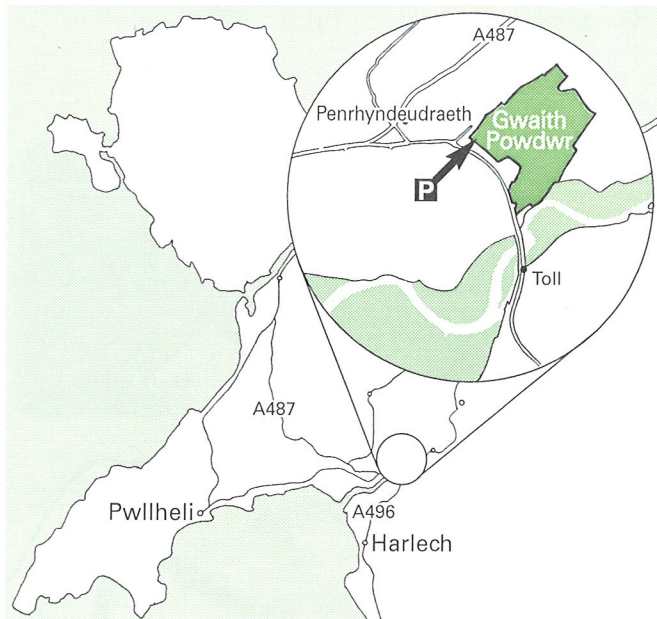
HQ & Membership 376 High Street Bangor Gwynedd LL57 1YE (01248) 351541 e-mail: nwwt@cix.co.uk	North East Wales Office Loggerheads Country Park Nr. Mold Denbighshire CH7 5LH (01352) 810469 e-mail: nwwte@cix.co.uk
---	---

[www.wildlifetrust.org.uk/northwales](http://www.wildlifetrust.org.uk/northwales)

Sponsored by • Noddwyd gan



Alan Wagstaff • Natural DTP (01248) 354739 • naturandtp@nwl.org



Lleoliad

Wedi lleoli'n agos at Benrhyndeudraeth, ym mhen dwyreiniol pont Briwet, sef tollbont Harlech. Gall gyrraedd y warchodfa hon drwy y parc busnes.

Pwrpas y daflen hon yw goleuo, drwy daith dywys, ychydig o hanes y safle. Fe gewch ddarganfod fanylion pellach ar y paneli ar hyd y daith. Er bod y rhan fwyaf o'r llwybrau drwy'r warchodfa mewn cyflwr da, mae rhai yn rhy serth i bram a chadair olwyn, ond fe nodwyd y rhain ar y map mewnol. Drwy y safle caiff nifer o ffyrdd cul, a gall dalwyr bathodynau oren a glas (drwy drefniant o flaen llaw) yrru o amgylch y warchodfa.

Location

Near Penrhyndeudraeth, at the eastern end of the Harlech toll, this reserve can be reached through the Business Park.

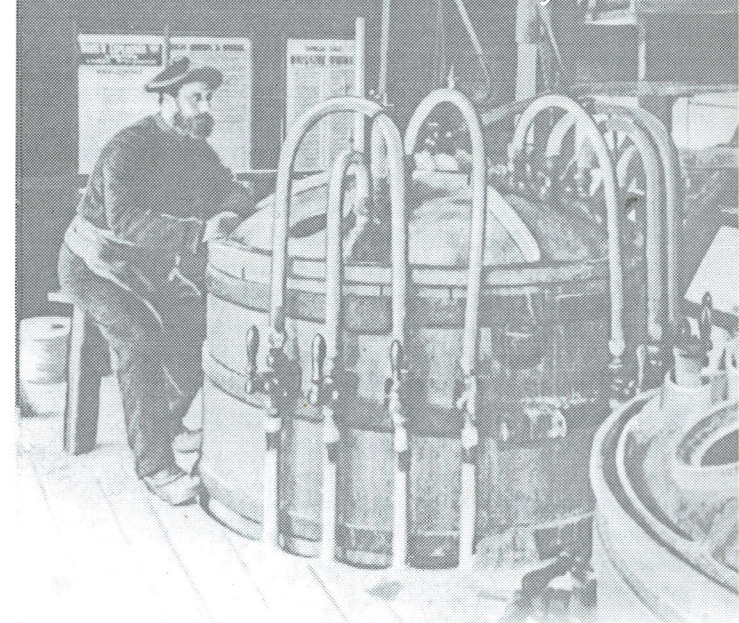
The aim of this leaflet is to inform you, via a guided walk, of something of the site's history. You will be able to find more information on the panels along the walk. Although most paths through the reserve are in good condition, some are too steep or uneven for prams or wheelchairs, these are marked on the map inside. There are narrow roads throughout the site, so orange badge holders can (by appointment) drive around the nature reserve.

Ymddiriedolaeth Natur  
Gogledd Cymru  
North Wales  
Wildlife Trust



## Gwaith Powdwr

Hanes • History



*Ar un adeg Gwaith Powdwr oedd y ffatri cynhyrchu ffrwydron mwyaf technegol yn Ewrop, a daethpwyd yn ddiweddarach i arbenigo mewn ffrwydron i ddiwylliant mwyngloddiaeth. Gan nad oedd galwad am y ffrwydron, caewyd y gwaith yn 1995.*

*Gwaith Powdwr was once the most high tech explosives factory in Europe. Most recently specialising in safety explosives used in mining. As the need for these explosives diminished, the works closed in 1995.*

Gwarchod Bywyd Gwyllt ar gyfer y Dyfodol  
Protecting Wildlife for the future



Cynhyrchwyd y ffrwydron cyntaf ar y safle yn 1865. Yn y dechrau, cynhyrchu "Guncotton" defnydd wedi mwydo mewn nitro-glycerine ac asid sylffwric ac wedi ei adael i sychu - ac yna, bellach ymlaen TNT. Yn ystod y Rhyfeloedd Byd roedd y safle yn cynhyrchu ffrwydron milwrol ac arfogaeth - yn 1915 cymerwyd y cyfrifoldeb dros y safle o ddwylo Ergite Ltd. gan yr Adran Arfau Milwrol (Ministry of Munitions) yn dilyn ffrwydriad anferth pan chwalwyd y safle. Yn dilyn hyn fe dynhawyd y rheolau diogelwch drwy y D.U. Wedi cau y safle, dros dro, rhwng 1918 a 1922, fe werthwyd y safle i Cooke's Explosives Ltd. Drwy gydol yr ail ryfel byd cynhyrchwyd 5000 tonn o ffrwydron milwrol, llenwyd 17 miliwn o granades a chynhyrchwyd 31 miliwn o ddetonators yn o gystal â 24000 tonn o ffrwydron masnachol (i'r diwylliant mwyngloddiaeth). Yn y 50au ar ymdeoliad Mr Cooke, fe brynwyd y cwmni gan ICI.

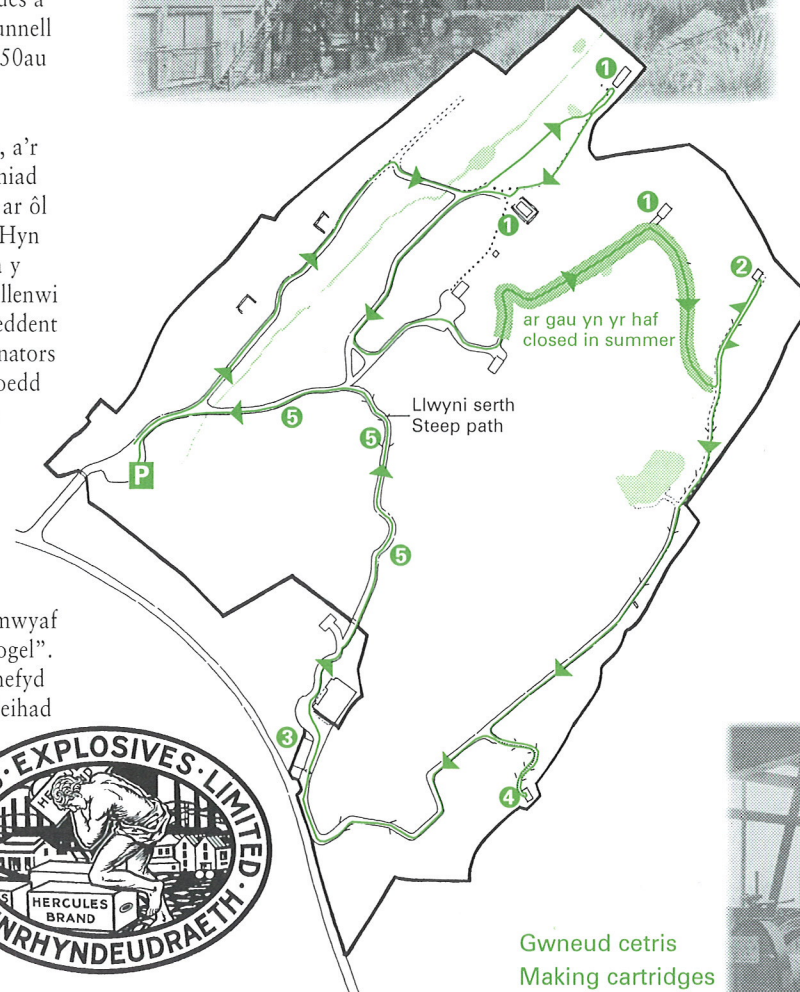
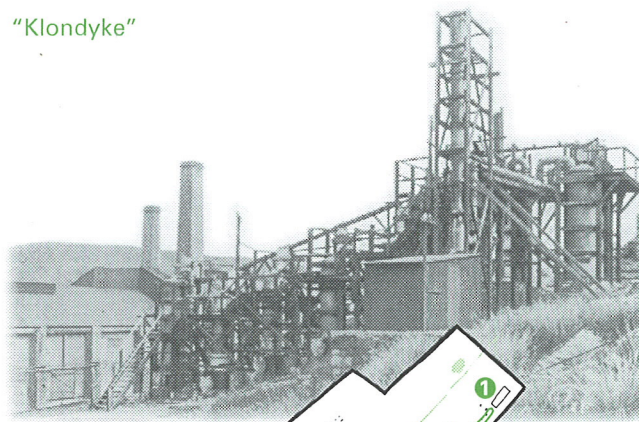
Penderfynwyd ar y safle am dri rheswm; 1. y pellter o bob man, a'r ffaith ei fod wedi rhannu yn dri dyffryn, hyn yn rhoi amddiffyniad naturiol os digwydd ffrwydriad. Dyffryn Klondyke, wedi enwi ar ôl yr amrywiaeth o beipiau â oedd angen ar y broses gynhyrchu. Hyn yn rhoi arolwg tref o gyfnod y "gold-rush" yn yr Amerig. Yma yn cynhyrchwyd y nitro-glycerine. Yn Nyffryn Cooke roeddent yn llenwi y cetris gyda ffrwydrydd ac yn Nyffryn Diogel y Mwynwyr roeddent yn gwneud llawer o weithrediadau yn cynnwys cynhyrchu'r detonators a'i harbrofi. 2. Gan fod y safle mewn rhai llefydd yn serth fe roedd hyn yn gwneud hi'n haws symud y nitro-glycerine dan bwysau disgyrchiant o'r tanciau sefydlogi hyd at y golchfeydd - y ffordd saffaf o bell ffordd. 3. Y ffaith y bod hi'n bosibl cludo'r defnydd crai ac allforio'r ffrwydron gorffenedig ar y môr o Porthmadog, i gwsmeriaid ar hyd a lled y byd.

Y cyflogwr mwyaf ym Mhenrhyndeudraeth ers y 50au, gyda 500 yn gweithio yno yn y 60au. Yn y 70au, yma oedd y safle mwyaf blaenllaw o'i bath yn Ewrop, yn arbenigo mewn "ffrwydron diogel". Erbyn diwedd y 70au roedd y dirywiad yn y diwydiant glo, a hefyd gwelliannau mewn ffrwydron yn argoeli yn ddrwg gan olygu lleihad yn y gofyn am ffrwydron wedi ei sylfaenu ar nitro-glycerine a gynhyrchwyd yma. Daeth cynhyrchu i ben yn 1995.

Cafwyd y safle ei ddad-gomisiynu, ar gost o 6 miliwn a dihantiwyd yr adeiladau gan dân, er mwyn ffrwydro unrhyw nitro-glycerine roedd ar ôl. Golchwyd y lloria plwm gyda chemegau niwtraleiddio ffrwydron a'i codi. Yn o gystal fe ddimchwelwyd rhai o'r adeiladau, yr olion rwbel nawr yn prysur cael ei gartrefu gan fywyd gwyllt.

Fe adawyd yr adeiladau diddorol yn sefyll, mae'r map yn dangos taith i chwi archwilio'r safle. Yma ac acw o gwmpas y safle mae byrddau dehongli. Byrddau yng nglyn a'r bywyd gwyllt a hanesion yr adeiladau unigol.

## "Klondyke"

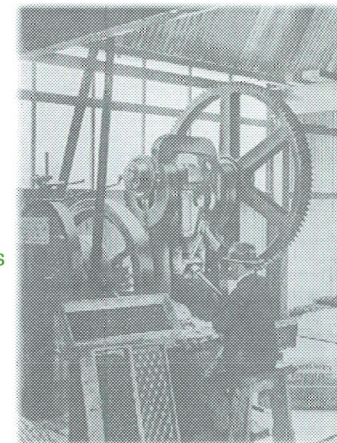


- |                   |   |                   |
|-------------------|---|-------------------|
| Cwt y Ffrwydron   | 1 | Explosives Shed   |
| Cwt y Pendil Mawr | 2 | Pendulum Shed     |
| Storfa Belfast    | 3 | Belfast Store     |
| Y Sied Setlo      | 4 | The Settling Shed |
| Cysgod Argyfwng   | 5 | Emergency Shelter |

This site started producing explosives in 1865. Initially it made Guncotton, and then later TNT. During the World Wars the site produced munitions - in 1915 responsibility for the site was taken away from Ergite Ltd. by the Ministry of Munitions, following a massive explosion that destroyed the site. After this explosion the Health & Safety regulations were tightened throughout the U.K. After temporary closure of the site, between 1918 and 1922, it was sold to Cooke's Explosives Ltd. During the Second World War, 5000 tons per year of munitions were produced, 17 million grenades were filled and 31 million detonators were produced as well as 24000 tons of commercial explosives (mostly for the mining industry). In the 50's, upon Mr Cooke's retirement, the company was purchased by I.C.I.

There were three reasons for choosing the site; 1. the remoteness and the fact that the site was divided into three valleys, gave a natural defence against blast. Klondyke Valley (named because the piping required for production resembled a gold-rush town), produced nitro-glycerine. In Cooke's Valley they filled the cartridges with the explosives and in the Miner's Safety Valley several processes were undertaken which included detonator testing and manufacture. 2. The steepness of the site made it easier to move the nitro-glycerine by gravity from the settlement tanks to the washing tanks - by far the safest method. 3. The raw materials required for manufacture and the finished explosives could be transported by sea. Explosives were exported from Porthmadog, to customers all over the world.

In the 1950's the company was the largest employer in the area and in the 1960's had a work force of 500. In the 70's, this site was the most advanced in Europe, specialising in the manufacture of "Safety Explosives". By the end of the 70's the decline in the coal industry, as well as new developments in explosives meant that there was a falling demand for the nitro-glycerine based explosives produced here. Production ceased in 1995.



The site was decommissioned, at a cost of £6 million. Buildings were decontaminated by fire, to explode any residual nitro-glycerine. The lead floors were washed with neutralising chemicals and removed. In addition some of the buildings were demolished, leaving areas of rubble, which are now being colonised by wildlife.

Some especially interesting buildings were left. The map shows a walk that you may like to take to explore the site. Around the site you will see interpretation boards about individual buildings and wildlife.

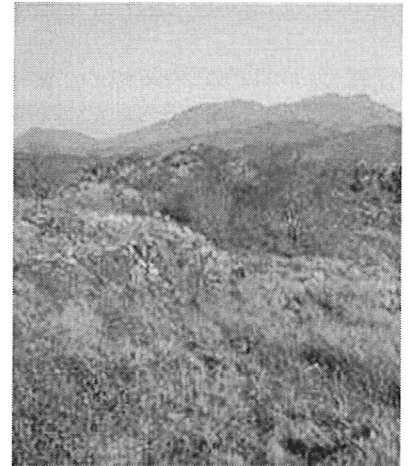


## Gwaith Powdwr

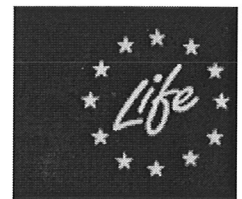
Gwaith Powdwr was an explosive works from 1865 to 1995. It was donated to the North Wales Wildlife Trust by ICI in 1998 and is now managed as a nature reserve. This 28 hectare site exhibits a range of habitats including woodland, scrub, heathland, bare rock and open water and supports a wide range of species including Nightjar, Barn Owl, Pied flycatcher, Polecat, seven species of bat, and the impressive Emperor Dragonfly. The reserve offers fabulous views over the Mawddach Estuary from the bird hide and the many paths throughout the site will offer excellent access.

For information on how to get to the reserve, please [contact](#) our Bangor office.

Important work funded by LIFE is currently being undertaken on this reserve. For more details click on the LIFE logo opposite.



Gwaith Powdwr and its spec



Click [here](#) to cl



## INTRODUCTION.

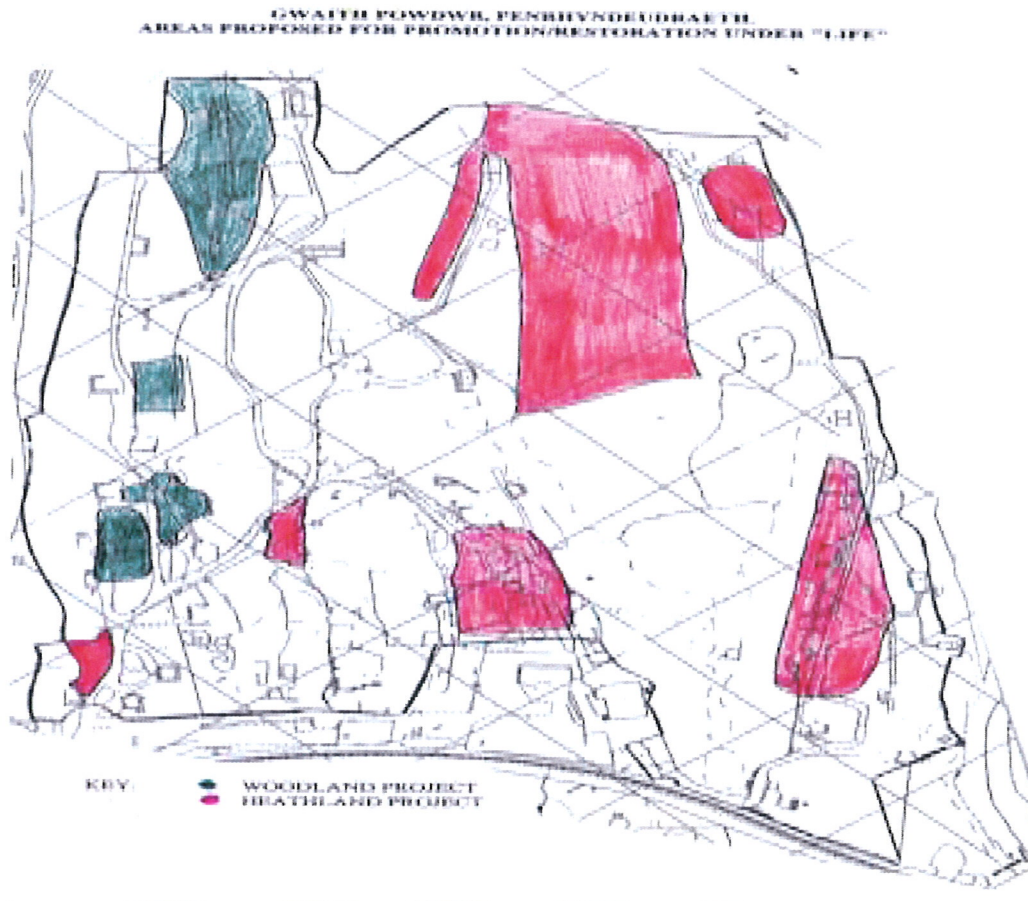
Nobels explosives works at Penrhyndeudraeth, Gwynedd, North Wales, started production in 1865. At its peak in the 1970's the plant employed 500 staff and produced 9000 tonnes of explosives annually. The factory closed in 1995, and decommissioning was completed in 1997.

The decommissioning process involved razing all but 7 buildings on site and grading the resultant rubble into the general landscape. Part of the original site is being re-developed for new light industrial use, but the majority has been taken out of economic use, and is being managed as a nature reserve by the North Wales Wildlife Trust.

Therefore, there were areas on the nature reserve that could be described as postindustrial wasteland - a rubble strewn, vegetation free zone with pH and soil anomalies due to brick mortar mainly.

The main aspect of the LIFE project was to attempt to restore heathland on these waste areas, using a variety of methods for propagation of seeds, and planting mediums.

A further aspect was to promote semi-natural habitat recovery on selected areas through out the site.



Gwaith Powdwr is also targeted to be the NWWT's flagship nature reserve because it already has infrastructure in place; it is close to rail and bus routes, and it has a wider interest due to its history. Thus, the Trust was seeking funding for interpretation, building modification, publicity and visitor access.

The whole site required a considerable input of resources, and a partnership of organisations was involved: -

- **European Commission, LIFE** - Major Funding partner
- **Heritage Lottery Fund** - Major Funding Partner
- **Countryside Council for Wales** - Funding Partner



- The University of Wales (Bangor) - Technical advisor
- The Welsh Development Agency - Technical advisor.

## PRINCIPAL OBJECTIVE OF THE LIFE RESTORATION PROJECT.

---

To create vegetation that will have a higher biodiversity and conservation value than would have developed if the site had been left to re-vegetate of its own accord.

---

The delivery of this objective requires **Management, Monitoring and Recording**. All funding partners require clear **Dissemination** to a wide audience. For the results to be meaningful, any methods/systems used must be **Transferable** to similar situations in the UK and Europe.

## METHODOLOGY

Heather plants were raised from seed collected on site, by gathering litter from under existing heather cover on site. This was sieved through two different sized meshes to see if propagation would be affected. The results were minimal; the smaller sieve size reduced the amount of birch seedlings in the resulting plug, otherwise no difference.

The seeds were then grown into plugs (for ease of planting) at the University of Wales (Bangor). Thus, when a plug grew, it was a mini heath-land mix, not just heather, but gorse, birch etc.

The planting method was straight forward - a large crow bar was used to make a hole in the rocky substrate, put in peat free compost, plus any treatments, put plug in, push down and water.

### 1. MAIN EXPERIMENT AREA

In each experimental block, four transect lines were established at right angles to the road. Heather transplants were set out either side of the line, in groups of between twenty and thirty plants.

(Experiment block 1, quadrats A-D, Experiment block 2, quadrats E-H and Experiment block 3, quadrats I-L). The quadrats measured approximately 1m<sup>2</sup> and were 1 metre apart.

Heather plugs were raised from seed with or without Swelgel (a moisture-retaining compound) in the pots.

At the time of planting, different combinations of fertiliser and Swelgel were added to the ericaceous compost. These combinations provided eight different treatments, plus a control zone: -

Control no treatment (C).

presence (W) or absence of Swelgel in the growing pots

presence (S) or absence of Swelgel in the planting soil

presence (F) or absence of fertiliser in the planting soil

presence (FS) or absence of fertiliser & Swelgel

The eight treatments were carried out in duplicate. A sample of heather plants was measured from each of the quadrats within the three experimental areas.

It was expected that the use of Swelgel and fertiliser would enhance the growth and survival of the heather plants in what were sub-optimal growing conditions.

At first, only survival percentage counts were used to compare treatments, but as little variance was observed, an attempt to compare vigour of the plants under different treatments was undertaken in the final year, by recording the species of heather found (*calluna vulgaris*, *Erica cinerea*, or *E. tetralix*) and height of the individual plant.

During the course of the 3yr LIFE program, management of pioneer plant species became necessary as they colonized the bare ground and made monitoring difficult. So this growth, mostly bramble, was cut back annually.

The demonstration areas had to be fenced off after access was allowed again after foot and mouth disease outbreak in UK, as trespassing sheep had gained access to the site, and were eating or pulling plugs out. This led to a successful application for a 12-month extension as monitoring windows had been missed, and the plants had to recover from trespass grazing.

Monitoring was undertaken in May and September every year bar 2001 (foot and mouth).



Aftercare: Frequent watering was required for the first two weeks after planting due to dry weather conditions.

## **2. OTHER AREAS**

The aim in these areas is the same principle as the experiment area i.e. To create vegetation that will have a higher biodiversity and conservation value than would have developed if the site had been left to re-vegetate of its own accord. The methods used in these "other areas" would be simple and chemical free. Most prior work has focused on the use of commercial plant material and high levels of fertilisers, which often result in low biodiversity habitats.

In the heath-land areas (see map above), the same plugs were used, and planted in the same way, using just peat free compost. In one area (6A) as this was designated as a wet heath area, an attempt was made to choose Cross leaved heather (*Erica tetralix*) for this area, as the heather most tolerant to wet conditions.

For the woodland areas, the primary habitat type was Willow Carr expansion. Willow whips were obtained by taking cutting from existing trees on site and planting them in a simple V notch slit made with a spade. Survival rate was measured. Cuttings were selected with many buds on.

In addition, management work was undertaken to remove non-native or invasive species - *Rhododendron ponticum*; Bracken (*Pteridium aquilinum*); Scrub (mainly silver birch - *Betula Pendula*).

## **RESULTS**

Altogether, about 8000 heather plugs and 300 willow whips were planted across the site. This includes some planting around the demonstration plots to link them with the existing heath-land.

### **1. Main experiment area (1).**

As the additional height measuring work was started in the final year, and is on going, not all the field data has been analysed at February 2003. The tables consist of rows of numbers, and have not been tabulated yet, therefore what follow is a summary of the results to date, taken from the Draft report of results, Dr T. Child and K. Gibbs, Jan 2003.

The following text refers to measurements from *Calluna vulgaris* and *Erica cinerea*. Little *E. tetralix* in these areas as too dry.

- The results show a very varied response to treatment. The most consistent finding for both species is the highly significant negative effect on growth in those quadrats where the heathers planted had Swelgel in the propagation plug.

*The reason for this is not clear, but from observation made, as the swel gel took up water, in some cases it could push the newly planted plug up and out of the hole, leaving the plug's roots exposed.*

- The results show there is a clear difference between the growth of heather in the three blocks, under the same treatment. This is shown by both species. This suggests strongly that any variation in height of the heather plants could be due to different physical conditions in the quadrat areas. This appears to override the contribution made by fertiliser and Swelgel since there is no consistent combination of treatments giving better growth. Both species noticeably showed similarities in median height in those quadrats where growth was better than average.
- The control quadrats had significantly different growth over the experimental blocks for *C. vulgaris* but not for *E. cinerea*. These results further supports the view that environment may have made a greater contribution to variation in growth.
- The "patchiness" of the height records observed shows a mosaic of good and bad growing conditions, which probably overrides the effects of treatment.
- Not surprisingly, fertiliser more often than not helped with growth, and on occasions Swelgel may also have contributed.



- It appeared to be consistently clear that the use of Swelgel at propagation was not to be recommended although the reason is not proven.
- Investigation of areas, which were planted as “landscaping” with no treatments, may confirm the theory that soil condition was more important than treatment. Certainly, one area very close to the experiment area, but with a different aspect, has the best survival rate and growth rate for heathers anywhere on the reserve, and this was achieved without any nutrient or swelgel additions.

### **SUMMARY OF RESULTS TO DATE.**

There has been a significant survival of heather plugs beyond the initial planting. Although comparison was made difficult, and progress set back, when sheep grazed or uprooted some plugs, there is an indication of movement towards a dry heath NVC H8 community in some of the demonstration areas. **The treatments do not appear to have a significant effect. By far the most crucial factor for survival of the plugs seems to be frequent watering for c.10 days after planting.**

Comparison with control plot data (plots within blocks 1, 2 and 3 where no planting was done, to allow natural re-colonisation) to measure success of stated objective: **To create vegetation that will have a higher biodiversity and conservation value than would have developed if the site had been left to re-vegetate of its own accord.**

The control plot data has been recorded in the vegetation reports compiled on the site annually since 1999. (See Jo Clark's reports and Sandra Peters reports 1999 - 2001 areas 1a, b and c in particular as these are alongside the experiment blocks).  
An acidic grassland habitat is slowly establishing, similar to NVC community U4b (CORINE habitat No.....). "This is the most extensive kind of pasture on better-drained, base-poor mineral soils of North-west Britain. It is a grassland of agricultural importance, making up the bulk of the better quality rough grazing over steeper unenclosed slopes,... as well as some improved grazings". - From **Rodwell, J.S.**

Thus, U4 grassland is far less rare than the H8 (CORINE Habitat 31.2) - dry heath - which is the habitat becoming established within the experiment area.  
The H8 community therefore has a higher conservation value, and biodiversity carrying capacity, and the delivery of this objective is within reach.

### **1> Other areas.**

As the treatments seem to have had no effect, the heather plugs planted in these areas have not been at a disadvantage, and have survived well. On all heath areas where planting was done, heather has flowered, and continues to grow well.

The Willow survival rate is on average c.50%, a good success for a cost-effective method of planting. Observation has shown that if there is a deep litter layer in the soil, whips survive better if this litter is removed first, as the whip is closer to the water table, and more likely to take root. Interestingly, only one of the failed whips produced roots, the rest simply did not take at all, or put another way, of the whips which managed to start growing roots, 99% survived.

### **CONCLUSIONS.**

As there is still some field data to analyse, it would be premature to draw too many conclusions. However, from the results to date, some observations can be made: -

- The method of gathering seed of local provenance via litter, cultivating it in green-houses, and planting back out in the form of a self contained heath-land plug, is an effective method for re-establishing a heath-land community to an area within three years, BUT the site must be kept grazing free, and the newly planted plugs require daily attention for the first few weeks.
- Providing additional help to the plugs via nutrients and swelgels has no measurable effect, and is not required.
- To re-establish/promote Willow Carr, the simple notch and plant method works very well. Expect to lose about half the initial number planted.



- Management of more vigorous vegetation growth e.g. Bramble, Buddleia; etc is not necessary for the establishment of the plugs (although it does make monitoring them easier!). Although obviously they require managing before to long, as they directly compete for resources, and grow quicker and more rampant than the heather.

#### **BIBLIOGRAPHY.**

**Child T & Gibbs K (2003) Draft report of results**

**Clarke, J. (1999) Gwaith Powdwr surveillance and monitoring report**

**Peters, S (2001) Gwaith Powdwr surveillance and monitoring report**

**Rodwell, J.S (1992) British plant communities, Vol 3 - grasslands and montane communities.**