buglife Cymru



Coal Spoil Connections





Fostering benefits for communities and nature through a better understanding of the diverse wildlife of coal spoil in South Wales



Project overview
November 2025

Introduction

The thousands of coal spoil sites across South Wales are rarely viewed positively – but many of them are biodiversity hotspots, as well as having cultural significance. In this booklet, we highlight the unique wildlife of coal spoil, and explain how it's possible to manage these sites to benefit people *and* nature.



Small Copper (*Lycaena phlaeas*) © Liam Olds



Gelli Tips © David Barden

About the Coal Spoil Connections project

Coal Spoil Connections is a Buglife partnership project, funded by the Welsh Government's Nature Networks Fund, that aims to:

- Better understand the value of coal spoil sites for biodiversity, through targeted specialist surveys
- Begin shifting public perceptions of coal spoil sites, which are often viewed negatively
- Promote the benefits that sensitively managed coal spoil sites can bring for both wildlife and people.

The project took place in 2024 and 2025, and this report highlights our main conclusions. We hope you enjoy reading it.



Moor Club (*Clavaria argillacea*) © Liam Olds

> "I've been blown away by the sheer diversity of wildlife on our coal spoil sites"
>
> *Iolo Williams, broadcaster and author*

The landscape legacy of coal



Sand Spurrey (*Spergularia rubra*) © Ashleigh Davies

From the 1830s onwards, the South Wales coalfield provided the high-quality coal that helped drive Britain's industrial transformation.

But following the decline of the coal industry in the post-war years, deep coal mining in Wales is now a thing of the past. And it's left not just a cultural and economic legacy, but also a physical one – the vast piles of waste material tipped on the valley sides. There are over 2000 such tips across South Wales, with the majority being from Cwmbran and Pontypool in the east, through the Glamorgan heartlands to Pembrey in the west – an iconic reminder of a bygone age.



Tylorstown tip ('Old Smokey') in 1971
© Mary Gillham Archive Project

From black to green

Following the Aberfan Disaster of 1966, the safety of coal tips became a major concern – and as recent slippages show, continued monitoring and remedial work continues to be needed today.

But as the years have progressed, the other negative aspect of coal tips – their visual appearance – has transformed. Today, rather than being ugly scars on the landscape, coal tips have 'greened-up', with many now having developed some fascinating habitats (pages 4–5). These in turn host a kaleidoscope of colourful plants, fungi, slime moulds and lichens, and a bustling array of insects, birds, and other wildlife (pages 6–17).

For wildlife and people

Spoil tips can also be great places for people too, because many of them are council- or government-owned and so accessible to the public. This provides local residents with open space for recreation and exercise while being surrounded by wildlife. At the same time, mining remains an important part of the identity of the people of the region, and coal spoil sites, enhanced by their archaeological features, are a significant visual reminder of that heritage.

Nevertheless, these benefits are not always widely appreciated, and there are threats to many coal spoil sites (pages 18–19). So the Coal Spoil Connections project aims to show that it's possible to get a 'win–win' for wildlife and people, by fostering greater understanding of these sites (pages 20–23), and encouraging considerate management (see the four purple-highlighted case-studies).



Getting up close to our insect displays © Ashleigh Davies



The ground beetle *Carabus problematicus* © Liam Olds

What makes coal spoil special?

Coal spoil sites are often dismissed as ‘waste land’ and an ‘eyesore’. But the reality is that they contain a remarkable range of habitats and associated wildlife.

In South Wales, extracting the high-grade coal from deep underground involved discarding a vast quantity of low-grade coal and surrounding rock. This tipped material is invariably nutrient-poor, meaning that plant succession takes decades – a pace that encourages a close-knit mix of various habitats to develop. This assemblage is technically termed ‘open mosaic habitat’, and it’s what underpins their astounding range of wildlife.

A diverse mix of habitats



Parc Penallta
© David Barden

Bare spoil – Coal spoil breaks up easily upon frost action to give a fine-grained substrate. Being dark in colour, this warms up quickly in spring sunshine, making it a perfect habitat for invertebrates and reptiles – in a similar way to sand dune habitats.

Lichen heath – Lichens and bryophytes are the first to take advantage of the open conditions on bare coal spoil. Over time, fascinating miniature ‘forests’ of these species can develop, which can be good places for reptiles as well as fungi.



Maerdy Colliery
© Liam Olds



Darren Fawr Tip
© Liam Olds

Grasslands – As the early ‘skeletal soils’ gradually deepen, perennial plants move in, forming patches of grassland containing colourful flowering plants that are ideal for insect pollinators. Such places are also home to mice and voles, which in turn attract birds of prey.

Springs and streams – Rainwater percolating through coal spoil typically emerges in springs on the lower slopes. Such features (enhanced in places by tufa deposits) then join up with existing streams in the valley bottoms – providing a habitat for a range of wildlife.



Maerdy Colliery
© David Barden



Darren Fawr Tip
© Liam Olds

Wetlands – Although coal spoil slopes are often free-draining, drainage is often impeded on flatter ground or where the spoil is compacted. This encourages marshy grassland, pools and reedbeds to develop – home to water birds as well as amphibians and dragonflies.

Heathland – Fresh coal spoil isn’t usually acidic, but over decades, the leaching out of alkaline minerals means that the soil pH can fall, especially in the upper parts. This encourages dominance by pollinator-friendly heathers and bilberry, often with conifers self-seeded from plantations.



Gelli Tips © Liam Olds



Cwm Tips © Liam Olds

Scrub and woodland – Where nutrients accumulate and soils become deeper, scrub and trees will colonise, unless bracken and brambles take over first. Such wooded areas can be good for ferns, fungi, birds and certain insects, but the overall diversity tends to be limited.

Industrial features – Along with trackside cuttings and quarries, collieries usually feature abandoned buildings, retaining walls, and lined drainage channels. These support rock-dwelling species and provide a home for birds and mammals.



Maerdy Colliery
© David Barden

Different sites, different features

All this habitat diversity is enhanced by variety in the type of tipped material (which can be of interest in its own right for its fossils and minerals), plus the complex profiles of many older tips leading to a range of microclimates, from dry and sunny to damp and shady, all within a small area.

Combined with the unique history and location of individual sites, this means that **no two coal spoil sites have exactly the same mix of wildlife** – and that's what makes them such fascinating places to study.



Craig-Evan-Leyshon Common © Liam Olds

Case-study: Meadow management at Mynydd Mawr Woodland Park

This 100-hectare council-owned site at Tumble in Carmarthenshire was a colliery until the 1970s, after which it was levelled, with most of the area either planted with conifers or sown with a standard grass mix.

Forty years on, the grasslands have turned into a mix of marshy grassland and 'open mosaic' habitat, with a diverse range of plants and insects. However, scrub was starting to encroach on the open areas, so since 2021, cut-and-collect mowing (about 20 hectares per year, on a three-year rotation) has been used to reduce the nutrient levels, along with small-scale uprooting of scrub saplings to expose bare spoil and re-start the succession process.

The work has been overseen by the Conservation & Nature Reserves Manager at Carmarthenshire County Council, and is dependent from year to year upon receiving sufficient funding. This has largely come from two sources – the Welsh Government's 'Local Places for Nature' programme, and 'Section 106' mitigation funds from developers.

The result of these efforts has been an increase in the area of open ground suitable for scarce invertebrates such as the Dingy Skipper (*Erynnis tages*) and Common Glow-worm (*Lampyris noctiluca*). Thanks to accompanying improvement to the path network, there has also been an increase in visitor numbers – making this a win–win for wildlife and people.



Dingy Skipper © Liam Olds

Refuges for wildlife



Ant Woodlouse (*Platyarthrus hoffmannseggii*) © Liam Olds

We're in the midst of a nature crisis. But there's some good news, because coal spoil in South Wales is home to an astounding diversity of wildlife – and we're determined to get to know it better.

Due to intensive agriculture, pollution and development, the biodiversity value of our countryside has steadily diminished. But, bucking this trend, post-industrial sites such as coal spoil have emerged as vital refuges for wildlife, thanks to their complex habitat mosaics and ability to link together other nature hotspots.



Suction-sampling at Albion Tips, Cilfynydd © Liam Olds

Improving our understanding

Coal spoil only started to be recognised for its wildlife value from the early 2000s, and since then, surveying has often been sporadic. This is partly because of the sheer number of sites, but also because many of them are located away from cities and main tourist routes, with visiting hampered by poor access information.

But, following the setting up of the Colliery Spoil Biodiversity Initiative by ecologist Liam Olds in 2015, wildlife enthusiasts have begun to take more interest in coal spoil – and their exciting finds have only underscored its biodiversity importance.



Deptford Pink (*Dianthus armeria*) © Liam Olds

Focused wildlife surveys

As part of the Coal Spoil Connections project, we're keen to fill-in our knowledge gaps on coal spoil wildlife. So, to focus our efforts, we picked three invertebrate-rich 'Research sites' that lacked recent systematic data on other species groups. Importantly, these sites have not had significant interventions since the spoil was tipped, allowing us to get a true picture of the diversity that coal spoil can harbour when it's allowed to regenerate naturally.

We then asked experts in various species groups to collate existing records and carry out new surveys on the sites. Some of their findings are in the infographic opposite, and their expert views of what makes coal spoil special for these species groups are on the following pages.

An Iberian connection?

In the last couple of years, it has emerged that eight unusual invertebrate species found on coal spoil in South Wales are identical (or closely related) to ones found in Spain, Portugal and southern France.

All the species are flightless, so how did they get here? One theory is that they came with Spanish iron ore shipments in the late 1800s, with another idea being that human migration about 10,000 years ago is responsible. Either way, it's an example of how human activities have unexpected impacts on our wildlife!



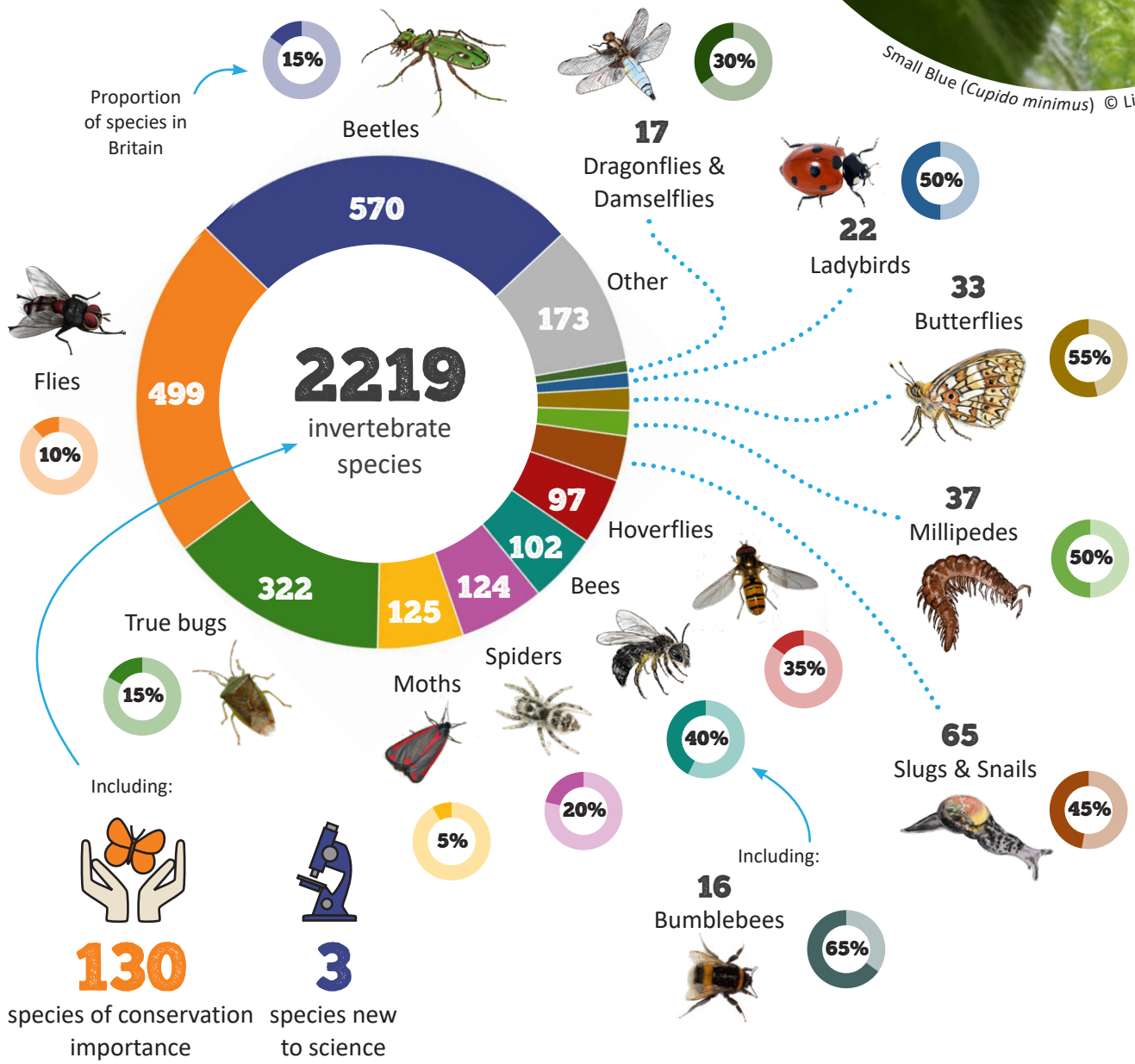
Pyrenean Semi-slug (*Semilimax pyrenaicus*) © Liam Olds

Coal spoil wildlife in numbers



Small Blue (Cupido minimus) © Liam Olds

Across all coal spoil in South Wales:



And just on our three coal-spoil research sites:

1064	318	125	61	50
Invertebrates	Vascular plants	Bryophytes	Lichens	Birds



All figures are approximate and based on available survey data. Image credits on back cover.

Invertebrates

Coal spoil sites across South Wales have become regionally significant sites of invertebrate diversity, supporting a large proportion of the region's scarce species, with some unusual assemblages, and many species that are rarely seen elsewhere.



Green Tiger Beetle © Liam Olds



Six-belted Clearwing © Liam Olds

This exceptional invertebrate diversity stems from coal spoil's complex habitat mosaics. Bare, nutrient-poor substrates create warm microclimates, favouring heat-loving species, such as the endangered butterfly species Grayling (*Hipparchia semele*) and Wall Brown (*Lasiommata megera*), as well as the very localised Dingy Skipper (*Erynnis tages*). Bare ground also provides nesting sites for burrowing bees and wasps, such as the Red-banded Sand Wasp (*Ammophila sabulosa*), and hunting grounds for predators like the Green Tiger Beetle (*Cicindela campestris*) and the wolf spider *Arctosa perita*.

Grayling © Liam Olds



Habitats from dry to wet

Warm, open grasslands on spoil support thriving ant colonies, which in turn host specialist associates such as the Barred Ant-hill Hoverfly (*Xanthogramma citrofasciatum*). These sunlit slopes also favour distinctive plants: carpets of Mouse-ear Hawkweed attract jewel-like *Cryptocephalus aureolus* beetles and provide forage for bees such as the Cat's-ear Mining Bee (*Andrena humilis*).



Tufa spring at Cwm Tips © Liam Olds

Tufa and its special species

As rainwater percolates through coal spoil, it often picks up calcium minerals, which are then deposited as a whitish spongy rock called tufa where the springs emerge. These rare microhabitats host specialist invertebrate communities, including scarce soldierflies such as the Hill Soldier (*Oxycera pardalina*) and Pygmy Soldier (*O. pygmaea*), whose larvae develop in the mossy spring margins. As a result, the South Wales coalfield may be of national significance for these species.

Abundant legumes, especially Bird's-foot Trefoil, support scarce pollinators including the Red-backed Mining Bee (*Andrena similis*), the Brown-banded Carder Bee (*Bombus humilis*), and a striking day-flying moth, the Six-belted Clearwing (*Bembecia ichneumoniformis*).

Heathland communities are particularly prevalent on older spoil sites, and especially those sited on the valley tops and sides. Bilberry supports the Bilberry Mining Bee (*Andrena lapponica*) and Bilberry Bumblebee (*Bombus monticola*), while Tormentil sustains the scarce Tormentil Mining Bee (*A. tarsata*) and the rare Thick-margined Mini-mining Bee (*A. falsifica*).



Bilberry Bumblebee © Liam Olds



Scarce Blue-tailed Damselfly © Liam Olds

Wetlands add further value, with shallow pools lined with Common Cottongrass and Sphagnum home to the threatened Scarce Blue-tailed Damselfly (*Ischnura pumilio*), the Keeled Skimmer (*Orthetrum coerulescens*), and the scarce snail-killing fly *Dictya umbrarum*. Communities often include species usually restricted to peatlands, such as the shore bug *Chartoscirta cocksii* and the ground bug *Lamproplax picea*.

Marvellous millipedes!

Beddau Beast © Liam Olds



Woodland and shaded spoil support diverse myriapod communities, including nationally rare millipedes such as Telfer's Millipede (*Ceratosphys amoena*) and the Welsh Silk Millipede (*Maurieseuma nontronense*). Most remarkably, coal spoil has yielded entirely new discoveries, perhaps the most celebrated of which are two millipedes found by local entomologist Christian Owen – the Maerdy Monster (*Turdulisoma* cf. *helenreadae*) from Maerdy Colliery, new to science when discovered in 2016, and the Beddau Beast (*Cranogona dalensi*) from Cwm Tips, previously known only from the Pyrenees.

Together, these examples show how coal spoil habitats, once industrial scars, now sustain a wealth of rare and remarkable invertebrates. From butterflies and bees to globally restricted millipedes, spoil sites are not only refuges for threatened species but also cradles of discovery. In South Wales, they represent an irreplaceable and nationally significant resource for invertebrate conservation.

Pygmy Soldier © Liam Olds



Mottled Grasshopper (*Myrmeleotettix maculatus*) © Liam Olds

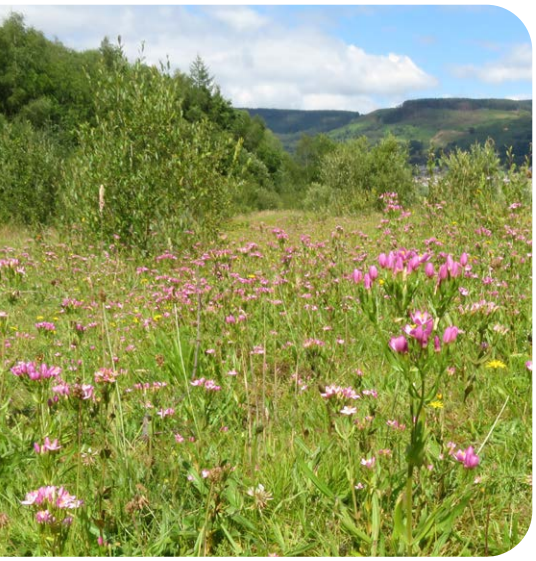


Vascular plants



Pearly Everlasting © David Barden

By providing a varied source of food, vascular plants – which include all flowering plants and ferns – form the foundation of much of the biodiversity on coal spoil sites.



Common Centaury © David Barden

The low nutrient levels of coal spoil make it perfect for a wide range of vascular plants. In South Wales, some species are very characteristic of coal spoil, with the classic one being the non-native Pearly Everlasting (*Anaphalis margaritacea*), rarely found elsewhere. Other typical species are often annuals or biennials of loose substrates, and include Small Cudweed (*Logfia minima*), Blue Fleabane (*Erigeron acris*) and Carline Thistle (*Carlina vulgaris*).

Some widespread plants are often plentiful on coal spoil, especially Wild Strawberry (*Fragaria vesca*), Tormentil (*Potentilla erecta*) and Bird's-foot Trefoil (*Lotus corniculatus*), as well as Common Centaury (*Centaurium erythraea*), eyebrights (*Euphrasia*) and Fairy Flax (*Linum catharticum*) on many sites. Members of the Composite family, such as Common Cat's-ear (*Hypochaeris radicata*), hawkbits (*Leontodon*) and hawkweeds (*Hieracium* and *Pilosella*), can also give fine displays.

Plentiful nectar sources... and regional rarities

As coal spoil sites age, soluble alkaline minerals tend to leach out, turning the soil more acidic. In such places, nectar-rich Heather (*Calluna vulgaris*) can be abundant, often with areas of Common Gorse (*Ulex europaeus*), Broom (*Cytisus scoparius*) and Bilberry or Whimberry (*Vaccinium myrtillus*).

In damper places, the soil chemistry can be complex, leading to close associations of acid-loving and lime-loving species. Here, a range of sedges (*Carex*) can be found, along with other typical marsh species that add to the overall diversity. These sometimes include Southern Marsh Orchid (*Dactylorhiza praetermissa*), Common Cottongrass (*Eriophorum angustifolium*), and – in pools – macroalgae such as Common Stonewort (*Chara vulgaris*).

Carline Thistle © David Barden



Upright Chickweed © David Barden



On our three research sites, several rarities have been found since 2010, with highlights being the regionally scarce Lanceolate Willowherb (*Epilobium lanceolatum*) at all of them, as well as Common Wintergreen (*Pyrola minor*), Tall Mouse-ear Hawkweed (*Pilosella praealta*), Blue-eyed Grass (*Sisyrinchium bermudiana*), and Sand Spurrey (*Spergularia rubra*). Other exciting finds on South Wales coal spoil sites in recent years include Upright Chickweed (*Moenchia erecta*), Deptford Pink (*Dianthus armeria*), and even Green-flowered Helleborine (*Epipactis phyllanthes*)!

Bryophytes


Irish Daltonia © Mark Evans

Coal spoil supports a high diversity of bryophytes (mosses, liverworts and hornworts), with sites in the South Wales coalfield being regionally important.

The high bryophyte diversity of coal spoil is a result of its low nutrient levels and lack of competition from more robust flowering plants, as well as variation in the coal spoil substrate itself, which ranges from dry to wet, and from acidic to rather alkaline. Coal spoil sites also happen to be located in wetter districts, which also favours a diverse bryophyte community. Additional niches are provided by trees, with willows (often plentiful in damper spots) being especially good for bryophytes.


Ciliated Fringewort © Barry Stewart

Approximately 290 bryophyte species – about one-third of the total for the region – have been recorded on coal spoil sites in South Wales, including those that grow on open spoil, rock exposures, by streams and ponds, on the ground in woodland and directly on trees. However, most sites have not been well-recorded, so the true species total is likely to be much higher, especially given the ease with which wind-borne bryophyte spores can colonise new sites. By way of example, 97 species have been found at Maerdy Colliery, even though this is only the outcome of a single day's recording!

Characteristic species of coal spoil


Lindberg's Plaitmoss © Charles Hipkin

Having said all that, coal spoil sites in South Wales lack genuine rarities, with the nationally rare Irish Daltonia (*Daltonia splachnoides*), recorded on Willow at a tip near Cwmaman, being the exception to this rule. However, some species are more common on coal spoil than elsewhere, with notable examples being Dense Fringemoss (*Racomitrium ericoides*), Clay Earthmoss (*Archidium alternifolium*), Lindberg's Plaitmoss (*Calliergonella lindbergii*) and Ciliated Fringewort (*Ptilidium ciliare*), a liverwort with a characteristically hairy appearance.


Whorled Tufa-moss © Barry Stewart

Where alkaline groundwater emerges at the surface, Maidenhair Pocketmoss (*Fissidens adianthoides*) often forms large patches, with Whorled Tufa-moss (*Eucladium verticillatum*) associated with tufa deposits at Cwm Tips.

Fungi



Salmon Salad © Liam Olds

The complex habitat networks found on coal spoil provide many niches for fungi, with numerous sites in the area holding over 300 species – some of which attract attention by their colourful spore-bearing structures.



Waxcap (*Hygrocybe* sp.)
© Steve Murray

Birch-covered slopes hold the unmistakeable Fly Agaric (*Amanita muscaria*), with vibrant colour in tree-covered areas also provided by Salmon Salad (*Guepinia helvelloides*) and Cobalt Crust (*Terana caerulea*), as well as agarics, boletes, fibrecaps (*Inocybe*), brittlegills (*Russula*), milkcaps (*Lactarius*) and earthballs (*Scleroderma*).

Grasslands on coal spoil hold many of the 'CHEGD' group of fungi used to signify good habitat quality, with waxcaps, clubs and pinkgills (*Entoloma*) often seen. Lichen heath is also notable for Moor Club (*Clavaria argillacea*) and for lichen-specific fungi (see below).

A host of new records

Our sites are also constantly turning up new records, with the most remarkable being the truffle-like North American species *Rhizopogon pseudoroseolus* found new to Britain from Bedwellty Tip. There are also several sightings that are new for Wales, amongst which Coedely Colliery leads the way with six species, including the nationally rare *Gloeotinia* cf. *granigena* and an insect pathogen, *Erynia neophidis*. At other sites, Scaly Webcap (*Cortinarius pholideus*) has been seen at Tower Colliery, and Sooty Cup (*Helvella leucomelaena*) at Maerdy Colliery.



Green Elf Cup (*Chlorociboria aeruginascens*)
© Steve Murray

Finally, we shouldn't overlook the vital ecological role that fungi play, which isn't limited to just decomposing dead material in the soil. By channelling nutrients to the roots of plants through their microrrhizal networks, fungi help vegetation (and some trees in particular) to gain a foothold on the poor soils.

Fungi as parasites of lichens!

Many fungi only grow on certain substrates, and there's one group – the lichenicolous fungi – that are parasites of lichens. Identifying these fungi usually requires determining the lichen species first, making them doubly challenging, especially as they usually take the form of inconspicuous discs (with the species shown being a rare exception).

It's therefore exciting that during the lichen survey of Gelli Tips (page 14), eight species in this group were seen. All were parasitic on land-dwelling lichens in the genera *Cladonia* and *Peltigera*, with five being new to Glamorgan!



Arthrenia peltigerina parasitising *Peltigera didactyla* © Nicola Bacciu

Slime moulds

Slime moulds (also known as myxomycetes) are neither animal, plant or fungus, but a member of a more ancient group known as protists – and thanks to their habitat diversity, coal spoil sites are a good place to look for them.



Stemonitis axifera © Steve Murray



Metatrichia floriformis © Steve Murray

Slime moulds spend a good proportion of their existence as a single huge, sheet-like cell called a plasmodium, which digests algae, bacteria and fungi as it 'crawls' over damp surfaces, most often wood, vegetation and soil. Once this stage is over, the slime mould pushes up 'fruits' from which spores are released, and it's at this stage that they're easiest to spot and identify.

Regular finds on coal spoil are widespread species including Flowers of Tan (*Fuligio septica*) and the descriptively-named Dog's Vomit (*Didymium spongiosum*), as well as the False Puffball (*Enteridium lycoperdon*) and the pale-grey *Physarum leucophaeum*.

Strange structures and striking colours



Strawberry Slime © Steve Murray

More notably, well-rotted wood supports the initially bright orange Wolf's Milk (*Lycogala epidendrum*), the aptly-named Strawberry Slime (*Tubifera ferruginosa*), and the striking ginger-and-black *Metatrichia floriformis*. On twigs, bark and more intact wood, *Stemonitis axifera*, *S. fusca* and *S. lignicola* have been seen. These bear close-packed cylinders on thin stalks, and are associated with specialist beetles that feed on the spores and possibly help transport them.



Cribraria aurantiaca © Steve Murray

Members of the genus *Cribraria*, featuring cage-like balls on stalks, have also been found on our sites – *C. cancellata* and the bright-yellow *C. aurantiaca* are often seen, and the less often reported *C. mirabilis* has been spotted at Lady Windsor Colliery. The diverse genus *Trichia* is also well-represented, with *T. botrytis*, *T. decipiens*, *T. favoginea*, *T. persimilis* and *T. varia* all reported. And last but not least, a common find in areas with fallen conifers is Coral Slime (*Ceratomyxa fruiticulosa*), with its branching networks of white, worm-like tubes.

Lichens



Cladonia diversa © Barry Stewart

Lichens can be tricky to identify and are under-recorded, but it's clear from our work that coal spoil sites can be hotspots for species of unvegetated, low-fertility ground.

Lichens are not single organisms, but close associations between a fungus and a 'photobiont', which can be an alga or a cyanobacterium, or sometimes both. They're often the first organisms to colonise bare surfaces, helping other species to get a foothold, and providing shelter, food, and moisture for small invertebrates.



Hypogymnia tubulosa © Nicola Bacciu

There are very few studies of lichens on coal spoil in South Wales, so to gain an idea of the diversity that these sites can harbour, one of our research sites, Gelli Tips, was investigated in autumn 2024, with a remarkable total of 63 species of lichen being found.

Trees are one habitat for lichens at Gelli, with the larch, gorse and willow at the site hosting an 'acidic' lichen community, thanks to the relatively unpolluted air at the site. A small number of rock-dwelling lichens were seen, although because they often take many decades to establish, this is not a habitat where we were expecting to find high diversity.



Cladonia portentosa © Charles Hipkin

Remarkable finds on lichen heath

But by far the most interesting habitat for lichens at Gelli was the 'lichen heath' that had developed on virtually bare coal spoil on the top of the tips. Overall, 15 species from the genus *Cladonia* were identified here, making it a site of regional significance for heathland lichens – which are typically restricted to bare, nutrient-poor ground because they're such poor competitors.



Lichen-rich habitat at Gelli Tips © Nicola Bacciu

So, although this is a single 'snapshot', given the presence of such early-successional habitats on other coal spoil sites in South Wales, there's clearly potential for other interesting records of heathland lichens to be made!

Cladonia floerkeana © Charles Hipkin



Birds



Goldfinch © Paul Denning

The more well-vegetated habitats on coal spoil sites are of greatest value to birds – and because they're relatively undisturbed, they can be 'refuges' for those that have been displaced from the surrounding area by human activity.



Chiffchaff © Paul Denning

Birds are a well-studied group, and one of our research sites, Cwm Tips, has received particular attention, and is likely to be typical of many tips in the area. Over the course of an average year, about 50 bird species would normally be seen at Cwm (excluding those flying over or 'passing through') , of which about 35 are resident through the year, and with the remainder about evenly split between summer or winter visitors. Of the total, about 40 species would normally breed on the site.

The value of trees... and buildings



Woodcock © Paul Denning

Many of the birds seen at Cwm are familiar species of gardens and the wider countryside. In the grassland areas, seed-bearing flowering plants provide food for species such as Goldfinch (*Carduelis carduelis*), Linnet (*Linaria cannabina*), and some migratory birds, but generally speaking, scrub and secondary woodland are the main source of food and nesting sites for most species. The woodland species Blackcap (*Sylvia atricapilla*), Chiffchaff (*Phylloscopus collybita*) and Willow Warbler (*P. trochilus*) are regularly seen at Cwm in the summer, and small berry-bearing trees are a source of food for members of the thrush family, including Song Thrush (*Turdus philomelos*) and winter visitors such as Redwing (*T. iliacus*).

There are a few rarities too. The secretive and scarce Woodcock (*Scolopax rusticola*) has been seen amongst leaf litter in the winter, and at the same time of year, Water Rail (*Rallus aquaticus*) has been heard in the reedbeds that adjoin the tip. The same habitat also hosts a few pairs of Reed Warblers (*Acrocephalus scirpaceus*) in the summer.

Finally, coal spoil sites can be useful for some birds of prey, with Buzzard (*Buteo buteo*) commonly seen gliding on thermals rising from the warm tip slopes, and Red Kite (*Milvus milvus*) also now seen more frequently. Cwm is also home to Peregrine (*Falco peregrinus*) and Raven (*Corvus corax*), which have nested on the old industrial buildings!



Peregrine © Paul Denning



Raven nest © Paul Denning

Mammals



Wood Mouse © Ben Williams

As well as their abundant plant and insect life as a food source, the fact that many coal spoil sites are undisturbed is part of their appeal to mammals.

Mammals tend to be relatively late arrivals to coal spoil sites, because of their need for substantial vegetation cover. On sites in South Wales, Field Vole (*Microtus agrestis*), Bank Vole (*Clethrionomys glareolus*), Rabbit (*Oryctolagus cuniculus*) and Brown Hare (*Lepus europaeus*) are the first to appear, feeding on grasses and other flowering plants before the larger shrubs and trees take over.



Polecat © Ben Williams

As insects become more abundant, the Common Shrew (*Sorex araneus*) and Pygmy Shrew (*S. minutus*) move in, along with mice. Of these, the Wood Mouse (*Apodemus sylvaticus*) is the most common, with reports of its close relative, the Yellow-necked Mouse (*A. flavicollis*), yet to be confirmed. The Harvest Mouse (*Micromys minutus*) is found on sites with scrub present amongst open grassland, while on sites near human habitation, the Brown Rat (*Rattus norvegicus*) has been seen. The presence of all these species attracts predators, such as Polecat (*Mustela putorius*), Stoat (*M. erminae*), Weasel (*M. nivalis*) and American Mink (*M. vison*).



Badger © Ben Williams

All these smaller mammals have been surveyed on several sites using catch-and-release traps, as well as by looking at tracks in snow cover. In contrast, Badgers (*Meles meles*) and Foxes (*Vulpes vulpes*) are easily observed, and are present on more compacted, older tips. Hedgehogs (*Erinaceus europaeus*) have also been noted, especially on landscaped sites, while the native Roe Deer (*Capreolus capreolus*) has begun to colonise the region, and might be expected on the more remote coal spoil sites in the future.



Grazing at Bryn Tip © Rose Revera

Case-study: Conservation grazing at Bryn Tip

Bryn Tip in Neath Port Talbot is a typical example of 1980s tip restoration, with a uniform domed profile originally sown with a grass and legume mix. However, over the decades species-rich grassland has developed, enhanced by sedge-rich flushes and patches of gorse. It's been managed as a Local Nature Reserve by NPT Council since 2012, and is now home to uncommon species >>

Reptiles & Amphibians

Because reptiles and amphibians are cold-blooded, they need exposed, sunny areas to warm up – and the bare ground and short grassland of coal spoil sites is ideal for them.



Common Frog © Danny White

In addition, pockets of scrub and heather give them cover from patrolling birds of prey, as well as providing sheltered, humid spots to cool down in our increasingly hot summers. Another factor is the abundance of invertebrates on coal spoil, providing food for reptiles and amphibians.

Of all the members of the group seen on coal spoil, Common Lizard (*Zootoca vivipara*) is the most common; they can often be seen basking amongst heather, with the dark-coloured young being well-camouflaged on coal spoil. In such places, the normally elusive Slow-worm (*Anguis fragilis*) can occasionally be spotted, with its ability to burrow to safety hampered by the often stony ground.



Adder © Danny White

In early spring, wet flushes and hollows on our coal spoil sites are often swarming with tadpoles of the Common Frog (*Rana temporaria*), with the Common Toad (*Bufo bufo*) sometimes heard calling from any deeper pools present. These places can also host Palmate Newt (*Lissotriton helveticus*), and even the protected Great Crested Newt (*Triturus cristatus*), both taking advantage of warm shallow waters and abundant aquatic larval prey. Finally, Grass Snake (*Natrix helvetica*) and Adder (*Vipera berus*) are present on some sites, and feed on all of the above species!

such as Dingy Skipper, Linnet, Dark Green Fritillary, Bee Orchid and Barn Owl.

As on other coal spoil sites, the growth of coarse vegetation was threatening the open mosaic habitats, so since 2023, conservation grazing by cattle has been put in place from October to May. 'NoFence' collars are used to confine them to certain areas of the site, with a QR code at the entrance linking to a website showing real-time cattle movements, to reduce conflict with dog-walkers.

Funding from the Heritage Lottery Fund and Welsh Government's 'Local Places for Nature' fund has facilitated the cattle grazing and habitat restoration works including scrub control, with the cost of day-to-day maintenance funded on an ad-hoc basis from several council departments. Other grants have enabled, for example, building of a wildlife tower and clearance of invasive cotoneasters – with local residents and others volunteering their time for path maintenance, habitat management, litter-picking and stock-checking. It's therefore a nice example of how to involve the community in looking after a coal spoil site!

Coal spoil at risk

Coal spoil only started to be recognised for its wildlife value from the 2000s, and accordingly very few sites in South Wales have any statutory protection. Preserving their biodiversity therefore means being aware of the potential threats… but also opportunities.



Conifer succession at Gelli Tips © David Barden

Succession to woodland: As coal spoil sites age, trees eventually colonise, most often fast-growing birches, willows and conifers, with a related risk being woodland creation to meet tree-planting targets. At first, trees enhance overall biodiversity by providing a different habitat, but in the long-term, they cause a decline due to shading and the loss of open ground. This can be resolved by periodic management, including scrub clearance, grassland mowing, livestock grazing, and occasional soil disturbance.

Invasive species: Certain rapidly-growing plant species can come to dominate large areas of coal spoil, and so reduce overall biodiversity. The most problematic native species are bramble, bracken and gorse, which are widespread, while of the non-native species, cotoneasters are perhaps the most concerning due to the ease with which they colonise lightly-vegetated ground. In each case, management needs to be tailored to the species and site in question.



A cotoneaster at Bedwellty Tip © David Barden



Coal spoil development at Coedely Colliery © Liam Olds

Development: Like other brownfield sites, coal spoil has often been a high priority list for development, especially for industrial estates and solar farms, but also (occasionally) for extraction of aggregate and coal. However, work by Buglife and other organisations has helped to shift the perspective of coal spoil amongst local authorities in South Wales, with the work done at RCT council to embed an ecological perspective worth special mention.

Remediation: Recent cases of coal spoil slippage have increased the need to stabilise some of the most high-risk tips in South Wales. In the past, landscaping often involved creating large, uniform areas of fertilised, mown grassland of less value for wildlife. However, where remediation work is needed today, we're recommending modest changes to groundwork plans that avoid needlessly destroying the ecological interest (see case-study opposite).

Anti-social behaviour: Coal spoil sites have a history of being used for off-road motorcycling and 4×4 driving, which is usually accompanied by other activities that can harm wildlife, such as fire-lighting, littering and fly-tipping. All these activities also discourage the public from visiting these sites, and cements their reputation as low-value 'wasteland'. In addition, off-roading can damage the vegetation layer, making erosion worse and risking spoil slippage on steep sites. But raising local awareness of these risks and restricting access can work.



Motorbike damage at Maerdy Colliery © David Barden

Lack of knowledge: Many of the coal spoil sites in South Wales have never been thoroughly surveyed for their wildlife. This increases the risk that planning decisions are based on old or unreliable data, and that any remediation work is poorly targeted. As part of the Coal Spoil Connections project, we've been engaging with ecologists and volunteers across South Wales to overcome this knowledge deficit.



Cryptocephalus aureolus © Liam Olds

Case-study: Remediation at Tylorstown

In February 2020, rainfall from Storm Dennis caused about 60,000 tonnes of material in the Llanwonno Upper Tip at Tylorstown to slip into the Afon Rhondda Fach. The tip was a Site of Importance for Nature Conservation (SINC), with a mosaic of acid grassland, bracken, flush, heathland and scrub, partly on coal spoil and partly on natural ground.



Mound of relocated coal spoil above Tylorstown © RCTCBC

Much of that habitat value was lost in the slip, and the site needed a major tip restoration and safety program. Following the early work to restore the river course and make the site safe, the main remodelling work began in 2023. This involved using some of the remaining tip material to smooth out the hillside profile, and relocating the rest of it to a 500 m long, 8 m high mound close to the hill summit.

Importantly, RCT council recognised the previous and remnant ecological value of the site, and ensured that wildlife-friendly practices were designed into the project. These included:

- Carefully **storing the nutrient-poor topsoils** on the tip site and the relocation site, and then using those to re-cover the surface following drainage works, and so give a head-start to the buried seed of specialist coal spoil plants.
- Creating small **hummocks and hollows** in the relocated material to help form a habitat mosaic.
- Where possible, using wildlife-friendly **biodegradable hessian matting** and **turf-lined swales** for stabilisation and drainage.
- Where needed, using hydroseeding of a **simple grass mix** to avoid introducing wildflower species not typical of the location.
- **Burying topsoil** contaminated with seeds of the invasive Himalayan Balsam underneath the new mound.
- Designating the new site as a '**Living Landscape' biodiversity site**, with an interpretation board, and plans for continued ecological monitoring and **nature conservation management** (which might include grazing).

The result of this work is not only a site that is now safe, but one that is ready-made for coal spoil wildlife to move in. Mosses and lichens are already colonising, Common Lizards are basking on nearby fence-posts, and the iconic Grayling butterfly has even been seen flitting across the newly profiled tip!



Common Lizard © Danny White

Connecting people to coal spoil



Investigating invertebrates at Dare Valley Country Park © Carys Romney

As part of the Coal Spoil Connections project, we've been busy helping people of all ages and backgrounds to engage with coal spoil sites.

From talks to walks, and from site management training to 'bug safaris', our three-strong Coal Spoil Connections team has been working hard across South Wales to raise awareness of the importance of coal spoil. Here are some of the activities we've done since the project started in mid-2024:



Giving a talk at Parc Penallta
© Carys Romney

Discussing site management

- We've held **two workshops on conservation management** with groups involved in coal spoil sites, focusing on best-practice for how to clear scrub and maintain areas of open mosaic habitat.
- We've given a **talk on the wildlife value of brownfield sites** at the Wales conference of the Chartered Institute of Ecology and Environmental Management, continuing our existing collaboration on how to achieve good planning outcomes for invertebrates.
- We've held a one-day **workshop on integrated tip management**, aiming to build understanding and strengthen collaborations between everyone working on tip safety, ecology, planning and heritage.



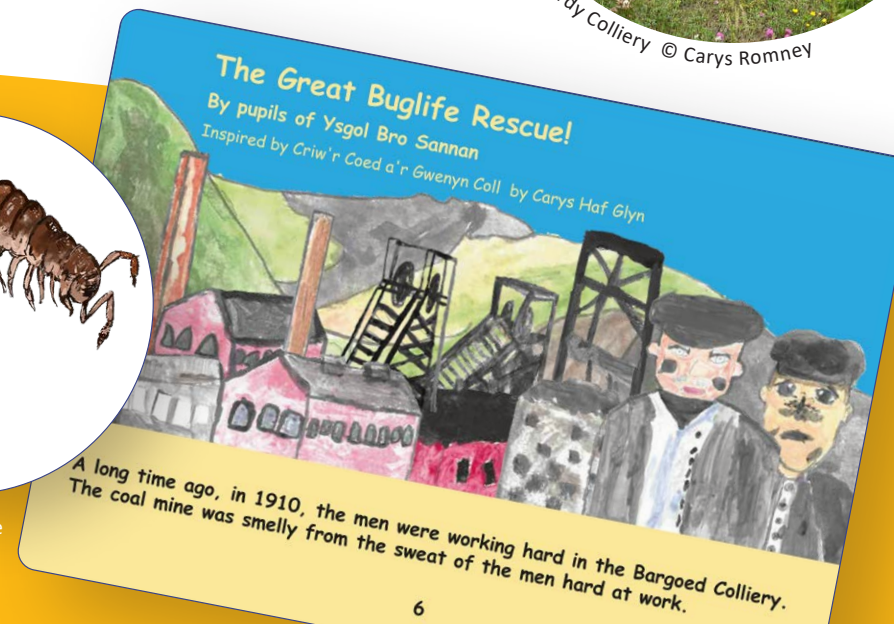
Sweep-netting at Maerdy Colliery © Carys Romney

Getting kids involved

- Working with artist Tom Maloney and local schools, we've produced **posters** and a **book**, 'The Great Buglife Rescue', which tells stories from the coal-tips and features fantastic student artwork!







© Buglife & Tom Maloney

- We've run **activity days** for four schools – Maerdy Community Primary School, Ysgol Bro Sannan in Aberbargoed, St Joseph's Primary School in Tredegar, and the River Centre 3–16 Learning Community in Blaenau Gwent – which have included 'bug hunts', getting up close to insects and other coal-spoil wildlife, art-based activities, and litter-picking.
- We've run **activity days** for Duke of Edinburgh students from Coleg Y Cymoedd, with a focus on conservation work and wildlife surveying.
- We've provided **course training** for students at Pencoed College to help them achieve HND qualifications in Environmental Conservation Management.

In 21 months, we've interacted with 845 people at 41 Buglife-led events, and carried out 8 site surveys... all supported by over 370 volunteer hours!



Buglife stall at Cambrian Colliery, Clydach Vale
© Katie Barret

Engaging with the public

- We've given **14 talks** to organisations as diverse as the SEWBReC Recorders' Forum and an over-60s social group.
- We've been involved with **17 walks** and **two bioblitz events** on coal spoil sites, focusing on wildlife and its links to South Wales' industrial heritage.
- We've partnered with Nature on your Doorstep to provide **six wellbeing sessions**, including wildlife recording and 'bioluminescence walks' for children.

- We've worked with the Innovate Trust, Wales REACH, the Duke of Edinburgh scheme, and Coleg Y Cymoedd to give **four sessions** on coal spoil for adults and children with special needs.
- We've created a **short video** covering the interesting plants found on Cwm Tips.
- We've run over eight **drop-in sessions** and **kids' summer clubs** at local venues across the region.
- We've set up **collaborations** with other environment-focused organisations, including the Initiative for Nature Conservation Cymru, A River for All, the Lost Peatlands Project, and environment officers at local councils.
- And of course we've been sharing all our activities on **social media** to reach as wide an audience as possible!

Enjoying a day out on Cwm Tips © Carys Romney





Silent Valley, Ebbw Vale © Carys Romney

The future of our coal spoil sites

We hope that this phase of the Coal Spoil Connections project is just the start, and that we can attract funding to continue our work in the coming years.

As we've shown in this booklet, we've achieved a lot so far! But there's so much more we need to do, to ensure that coal spoil sites in South Wales become fully recognised both for their valuable wildlife, and significance for communities and regional culture. Here are some of our ideas for the future.

Expand the topics covered in our educational activities to include more of the context around coal spoil sites – such as the history of coal mining, the industrial processes used, geology and fossils!

Run more wildlife surveys to better understand the range and distribution of wildlife on our sites, especially species groups that are less well-studied, such as fungi and lichens. This biodiversity data can then feed into the planning process, to ensure that development proposals are founded on the latest knowledge.



Bee Orchid (*Ophrys apifera*) at Bryn Tip © Rose Revera



Small Pearl-bordered Fritillary (*Boloria selene*) © Liam Olds

Increase the number of groups that we work with. In this project, it's become clear that many groups and organisations are really keen to engage with coal spoil sites – and we'd love to work with more of them. The work done at Sirhowy Hill Woodlands, involving the setting up of a 'community interest company' and regular outreach activities, is a fantastic example of what is possible.



Five-spot Ladybird (*Coccinella quinquepunctata*) © Liam Olds

> "Linking people to their local heritage and nature is so important – and this project has done both! I hope it can be extended across the South Wales coalfield in the future"
>
> *Cllr Julie Barton, RCT County Borough Council*

Expand the geographical coverage of the project. So far, most of our activities have been in the county boroughs of RCT, Caerphilly and Blaenau Gwent, but we'd like to achieve more complete coverage of the whole South Wales coalfield.

Run more advice sessions and hands-on management workshops with those in the environmental sector, and including training collaborations with schools, colleges and youth schemes.

Case-study: RCT Living Landscapes

In an excellent example of biodiversity-led thinking, RCT council has so far designated 59 sites in its ownership as 'Living Landscapes' – places that are not only great for wildlife, but are valuable for public engagement and promotion of wildlife-friendly management.

Over one-quarter of these sites feature areas of coal spoil, showing the potential there is for councils to take a lead in championing the wildlife value of publicly-owned coal spoil sites in South Wales.



Western Bee-fly (*Bombylius canescens*)
© Liam Olds

Promote wildlife-friendly tip remediation, using experiences such as the Tylorstown project (see page 19).

Facilitate visiting of publicly-owned coal spoil sites by raising awareness of their existence and the best access routes. This could be extended further to support regional tourism through Welsh-focused heritage and wildlife events.

Want to get involved?

If you're interested to get involved with protecting coal spoil wildlife, then we'd love to hear from you!

Visit the Buglife website:

Visit the Coal Spoil Connections page:



Invertebrate discovery at Dare Valley Country Park © Robert Williams

The Coal Spoil Connections Project is funded by the Welsh Government's Nature Networks Fund, and is administered by the National Lottery Heritage Fund. We have also received support from The D'Oyly Carte Charitable Trust.



Rhondda Heritage Park © Liam Olds



'Iconic Spoil Species' workshop © Carys Romney

This booklet was written, edited and designed by Dr David Barden (Clearly Scientific) with assistance from Liam Olds and Carys Romney (Buglife).

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Bee Beetle (*Trichius fasciatus*) © Liam Olds

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