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Managing brownfields for butterflies

Wildflower-rich brownfields can be refuges for butterflies that have declined across the UK due to agricultural intensification and afforestation. The mosaic of habitats that develop on some brownfields can be the sole resources in the landscape that provide butterflies with all of the appropriate larval foodplants, adult nectar sources, bare ground and shelter required to survive. Around 30 butterfly species can regularly exploit brownfields, including scarce and declining species that rely heavily on a network of brownfields to support populations.

Key species of butterfly on brownfields

This document focuses on five species, the Small blue (*Cupido minimus*), Grayling (*Hipparchia semele*), Dingy skipper (*Erynnis tages*), Grizzled skipper (*Pyrgus malvae*) and Wall (*Lasioommata megera*). Other butterflies which can be strongly reliant on brownfields include Common blue (*Polyommatus icarus*), Brown argus (*Aricia agestis*), Small copper (*Lycaena phlaeas*), Essex skipper (*Thymelicus lineola*), Dark green fritillary (*Argynnis aglaja*), Marbled white (*Melanargia galathea*) and Small heath (*Coenonympha pamphilus*).

Species distributions

All five butterfly species have suffered from significant declines in numbers and range, however, all are still found across large areas of the UK in localised populations where suitable habitat

remains. The Small blue is rare and localised throughout the UK, with populations in England, Scotland Wales and Ireland, but its stronghold is in the south of England. The Grayling is found throughout the UK, but it has a mainly coastal distribution, with inland colonies typically on heathland or brownfield sites. The Dingy skipper is found throughout the UK, but with a stronghold in central and southern England.

Key brownfield habitat features for butterflies

- Warm, sunny microclimate on dry, well-drained soils.
- Bare ground for basking and warm microclimate.
- Specific larval foodplants in abundance.
- Diverse nectar resource for adults during flight period.
- Unmanaged grassland and scrub for shelter.



Small blue (*Cupido minimus*) © Iain H Leach



Grayling feeding (*Hipparchia semele*) © Iain H Leach

The Grizzled skipper occurs in scattered populations across Wales and southern and central England. The Wall butterfly is widely distributed but with strongholds in northern and western England, Wales and southern Scotland, especially coastal areas.

The importance of brownfields for butterflies

Wildlife-rich brownfield sites can provide all of the habitat requirements for many declining butterflies. Thin, low nutrient soils and a history of disturbance prevent rapid succession and can lead to a favourable mosaic of sparsely vegetated habitats. The bare ground and varied topography often associated with brownfields can produce warm microclimates and basking spots that are ideal for these thermophilic species. Brownfields can also support a rich and varied ruderal wildflower resource for adult butterflies during the flight season and crucially, the specific larval foodplants required by many scarce species are often found in abundance. Short, herb-rich turf can be a particularly valuable feature of brownfields, especially where there is rabbit grazing.

Wildflower-rich grasslands have disappeared from much of the countryside, leading to the loss of some important colonies of rare butterflies. The widespread use of fertilisers on grasslands has led to taller, more competitive plants replacing low-growing larval foodplants. Intense cutting or grazing regimes in the heavily managed landscape have also led to a paucity of both larval foodplants and adult nectar sources. Conversely, many previously suitable sites have been lost where an

Larval foodplants for rare butterflies

- Small blue requires Kidney vetch (*Anthyllis vulneraria*) which thrives in open, dry, calcareous conditions.
- Dingy skipper favours Common bird's-foot trefoil (*Lotus corniculatus*) as a foodplant but will utilise Horseshoe vetch (*Hippocrepis comosa*) in calcareous conditions or Greater bird's-foot trefoil (*Lotus pedunculatus*) on damper sites.
- Grizzled skipper larvae predominantly feed on Wild strawberry (*Fragaria vesca*), Creeping cinquefoil (*Potentilla reptans*) and Agrimony (*Agrimonia eupatoria*).
- Grayling requires fine grasses such as fescues (*Festuca* spp.) and Bristle bent (*Agrostis curtisii*), but will also use coarser grasses such as Tufted hair-grass (*Deschampsia cespitosa*).
- Wall butterfly larval foodplants include bents (*Agrostis* spp.), Cock's foot (*Dactylus glomerata*), False brome (*Brachypodium sylvaticum*), Tor-grass (*Brachypodium pinnatum*), Wavy hair grass (*Deschampsia flexuosa*) and Yorkshire fog (*Holcus lanatus*).



Grizzled skipper (*Pyrgus malvae*) © Iain H Leach

absence of management has led to open habitats reverting to scrub and woodland.

Brownfields can mimic many of the traditional habitats used by rare butterflies which have declined in the countryside. For example chalk or limestone quarries, as well as industrial spoil such as blast furnace slag, develop habitat that strongly mimics the traditional chalk and limestone grasslands associated with Small blue and Dingy skipper. Whereas larval foodplants may be sparse in poorly managed chalk grasslands, many brownfields such as quarries can support plentiful amounts. The creation of new calcareous habitats from industrial activity, such as spoil heaps, provide new opportunities for these species, allowing them to colonise new areas. Some species are becoming increasingly reliant on brownfield sites to provide appropriate habitat at the landscape-scale, alongside natural and semi-natural habitats. The degree of reliance can vary geographically, for example Small blue and Dingy skipper are now almost entirely confined to brownfields in the Midlands part of their range.

The diverse nature of brownfield sites in terms of topography, hydrology, aspect and soil chemistry, encourages a range of vegetation communities to develop, providing diverse forage for adults throughout their flight period. In addition, patches of longer, unmanaged grassland and scrub pockets create sheltering opportunities for adults during unfavourable weather conditions.

Butterfly metapopulations

Butterflies exist in metapopulations, which are groups of small but linked populations using patches of suitable habitat

scattered across the landscape. Natural cycles of local extinction are balanced by re-colonisation from nearby sites, allowing their survival across the landscape. Where there is progressive loss of suitable habitat, remnant sites become fragmented and their populations isolated. As sites become more isolated, it is more difficult for suitable habitat to be colonised, with progressive local extinctions leading to their declines across the landscape and the potential loss of entire metapopulations.

Brownfield sites have the potential to act as habitat stepping stones within the wider landscape, providing both breeding sites and aiding movement across the landscape.

Threats to butterflies on brownfields

Brownfield sites are frequently favoured for development by local authorities. The loss of clusters of brownfield land is likely to have negative impacts on butterfly metapopulations as key sites are lost.

Inappropriate management of brownfields for public access can lead to sites being tidied up, resulting in the loss of early successional habitat features. Conversely, an absence of management on long abandoned brownfields can lead to scrub encroachment and the eventual loss of open habitats. It is important that the right balance of management is found to keep a site in good condition, as some poor dispersers do not easily colonise new habitat when a site become unfavourable.

Creating & managing habitat for butterflies

Although an absence of management is often a key factor in the high biodiversity of brownfields, management will eventually be necessary to maintain the early successional habitats required by rare butterflies. Habitat creation and management for rare butterflies should aim to produce open, sheltered and sunny areas, with a mosaic of herb-rich

Nectar sources for rare butterflies

- Grayling- Common bird's-foot trefoil (*Lotus corniculatus*), Bramble (*Rubus fruticosus* agg.), thistles (*Cirsium* and *Carduus* spp.), heathers (*Calluna vulgaris* and *Erica* spp.), Marjoram (*Origanum vulgare*), Teasel (*Dipsacus fullonum*), Red clover (*Trifolium pratense*).
- Dingy skipper- Common bird's-foot trefoil, Bugle (*Ajuga reptans*), vetches (*Vicia* spp.), buttercups (*Ranunculus* spp.), Ragged robin (*Lychnis flos-cuculi*), hawkweeds (*Hieracium* and *Hypochoeris* spp.).
- Grizzled skipper- Ragged robin, buttercups, Bugle Common bird's-foot trefoil.
- Small blue- Common bird's-foot trefoil, Kidney vetch (*Anthyllis vulneraria*), vetches.
- Wall- hawkweeds, knapweeds (*Centaurea* spp.), Marjoram, Ragged robin, Common ragwort (*Senecio jacobaea*), thistles, Daisy (*Bellis perennis*), Water mint (*Mentha aquatica*), Common fleabane (*Pulicaria dysenterica*) and Yarrow (*Achillea millefolium*).

early successional habitat and bare ground. It is best to target low nutrient areas away from scrub or treelines to prevent the rapid succession of open habitats. Methods to enhance brownfield habitats for butterflies include:

- Rotationally creating new scrapes every few years to produce a mosaic of early successional stages. Scrapes are an effective method of creating disturbed, low nutrient habitats with a mosaic of early successional herbs and bare ground. Scrapes can be created at a small scale using hand tools or with machinery, by removing topsoil to a depth of around 20cm. The edges should be left as gentle rounded angles to diversify aspect and microclimate. They are ideally created on flat ground, or by cutting out wedges on south-facing slopes to create a bare wall fronted by a plateau, with



Early successional mosaic on chalk butterfly scrape © J. Davis



Newly created Small blue scrape © Scott Shanks

the angle of the back wall dependent on the requirements of the target species. Any arisings can be piled into a bund at the front of the scrape to add further habitat variation. Scrapes should be larger than 2m by 2m to reduce the impact of encroaching vegetation. It is preferable to create a number of smaller scrapes across a site rather than a single larger one, ideally staggered over a number of years to encourage a site-wide mosaic of successional stages. To add further interest to scrapes, leave small ruts, mounds and hollows on the floor of scrapes rather than leaving it level, which will diversify the range of microclimates. It is important that once scrapes are created, the seed of larval foodplants are sown by dropping a pinch of seed onto bare areas, as there is no guarantee that they will colonise naturally.

- Combining sunny, south-facing butterfly banks with adjacent scrapes can create an ideal habitat mosaic with sheltered, sunny microclimates alongside forage and food plants. Butterfly banks are best when running east-west so that south-facing slopes dominate the longest edge. Small banks can be created using hand tools, but ideally larger banks can be created using machinery such as an excavator. To start a butterfly bank, the topsoil in the area surrounding the planned bank should be scraped off and stored to one side. A trench in the shape of the planned bank should then be dug with the low-nutrient sub-soil then put aside. The trench should then be filled with the topsoil from the whole area and a mound created. The topsoil mound should then be capped with the low nutrient sub-soil, effectively creating a raised, inverted soil profile. To complete the butterfly bank, cap the mound with 5-10cm of aggregate or rubble, choosing a material appropriate to the needs of the target butterfly's foodplant. Consider spreading the same aggregate over some areas of the new scrape, providing a mosaic of bare underlying substrate and areas of aggregate. Seeding with larval foodplants is again important, by dropping pinches of seed onto bare areas. It can be helpful to introduce

seeds on the top of banks, so that seeds are dropped downslope, facilitating their spread over time.

- Management of butterfly banks and scrapes should aim to maintain a mosaic of 50% bare ground and 50% early successional vegetation throughout a feature. This can be easily achieved by scraping off vegetation or turning over soils using either machinery or hand tools. Where vigorous species are invading new open areas, weeding should be done by hand where possible, however, spot treatment with Glyphosate can be used if necessary.
- Some butterflies will actively seek out warmer microclimates for egg laying, with both Grizzled and Dingy skipper favouring foodplants around highly localised features such as bare rock and warm hollows (Slater 2007, 2008). Creating butterfly walls of closely spaced brick and rubble pieces or laying them in floors can encourage egg laying in foodplant-rich areas. Plants will then grow around the rubble with shoots close to the low lying rubble preferred by laying adults due to the warmer microclimate.
- Increasing the quantity of larval foodplants across a site can be extremely beneficial. Seeding by hand can be very effective, scattering small pinches of seed over newly created or existing bare ground. Scattering seed at the top of slopes can be useful as developing plants will drop their seed downslope, facilitating their spread. Seeds can also successfully be sown in short sward areas, so long as there is localised disturbance to provide germination sites.
- Creating wildflower-rich areas can improve the nectar resource for foraging adults, particularly where there are only limited nectar sources of a target species. Wildflower enhancement should target low nutrient areas which are less likely to be dominated by coarse grasses. Creating suitable ground for sowing seed may require initial cutting, followed by herbicide spraying and a two week waiting period. Harrowing or other methods of disturbance can then remove overlying



Dingy skipper (*Erynnis tages*) © Greg Hitchcock



Basking Wall (*Lasiommata megera*) © Iain H Leach

vegetation and create disturbed ground for seeds. Sowing seed can be done simply by broadcasting or using machinery for larger areas. Seed sowing times will vary by species, with some requiring an autumn sowing to overwinter in the soil.

- The addition of substrates such as industrial spoil, sand or calcareous aggregates will enhance the floral resource by creating different soil conditions and bare substrates for characteristic plant communities to develop. Aggregate types can be targeted for the requirements of specific foodplants, such as by introducing chalk or calcareous aggregates to encourage Kidney vetch. Introducing substrates may be particularly useful where fertility is raised, with a layer of materials such as stony chippings suppressing vigorous vegetation and creating a good starting point for some foodplants to germinate and establish.
- Rotational disturbance in scattered areas around a site to help encourage a successional mosaic with a diverse flora. Creating newly disturbed areas every few years will ensure a continuity of colonisation opportunities for both adult and larval foodplants as well as a dynamic bare ground resource. Disturbance can be small scale and undertaken manually with hand tools or with machinery such as an excavator to scrape off larger areas of material and vegetation, overturn soil or simply be driven around and churn up soils.
- Rotational scrub and bramble clearance can help restore open habitats on sites where an absence of management has led to scrubbing over. Some areas of scrub and bramble should always be retained as they are valuable habitats in their own right, as well as providing and adult



Butterfly bank and adjacent scrape © Keith Warmington

nectar source and pockets of shelter. Stumps should be treated after cutting and any humic layer or leaf litter scraped off to provide bare conditions for ruderal plants to colonise. Previously cleared areas are best managed by regularly pulling young saplings to slow succession.

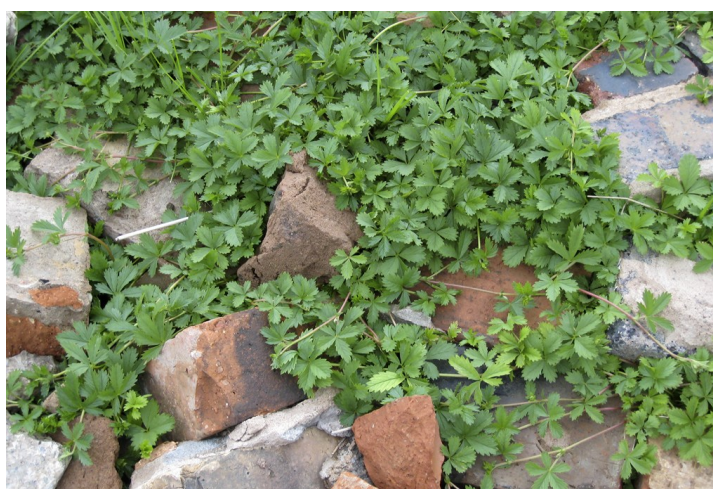
- Some sites may feature grazing or cutting within their site management plans. A long rotation should be implemented, only cutting small patches of grassland in any one year. Cuttings should be either piled in an assigned part of the site or removed from the site to actively reduce the nutrient status of soils. Grazing is rarely possible or appropriate on brownfield sites. However, winter cattle grazing can open up swards to provide structural variation while creating localised poached areas that make suitable germination sites for foodplants.
- Cutting and grazing by livestock are best avoided on brownfields. However, if used it must be carefully considered so as not to interfere with flower availability during adult flight periods. Management should be restricted to a proportion of a site to retain a site mosaic, with longer grassland areas retained to provide shelter.

Links

- <http://www.warwickshire-butterflies.org.uk/downloads/Factsheets/Butterfly%20Bank%20Factsheet.pdf>
- <http://www.warwickshire-butterflies.org.uk/downloads/Factsheets/Butterfly%20Scrape%20Factsheet.pdf>
- <http://www.warwickshire-butterflies.org.uk/downloads/Factsheets/Seeding%20and%20Plug%20Planting%20Factsheet%20.pdf>
- <http://butterfly-conservation.org/files/habitat-brownfield-leaflet.pdf>

References

- Slater, M., 2007 Creation of a drystone wall to create egg laying habitat for Grizzled Skipper *Pyrgus malvae* at Ryton Wood Meadows Butterfly Conservation Reserve, Warwickshire, England. *Conservation Evidence* 4, 35-40.
- Slater, M., 2008. Dingy Skipper *Erynnis tages*: Investigation to ascertain the preferred sites for ova deposition on its larval foodplant *Lotus* sp. in Warwickshire on a range of colony sites.



Foodplants growing around rubble create egg laying habitat © Keith Warmington

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