SCOTTISH INVERTEBRATE HABITAT MANAGEMENT

Brownfields

Derelict brick and tile works in Cruden Bay in Aberdeenshire © Craig Macadam

Introduction

Brownfields are any sites that have been altered by human activity and are currently not fully in use. They tend to be concentrated in urban and former industrial landscapes but also include old railway lines and bings. In Scotland, our rich industrial heritage has resulted in over 10,000 hectares (ha) of land being listed as vacant or derelict.

With the loss of natural habitats in the wider countryside through agricultural intensification and development, wild areas within the urban environment have become crucial to the survival of many threatened species in the UK. Between 12-15% of nationally rare and scarce insects have been recorded from Britain's brownfields.

Lack of management and low nutrients in the soil, often creates an open mosaic of habitats such as species rich grassland, bare ground and early successional habitats. This open mosaic of habitat provides a continuity of resources for invertebrates throughout the season. In addition, a mosaic of habitats can provide a home for a wide range of species and allows many to complete their life cycles within the same site.

Brownfield sites provide links or 'stepping stones' between more natural areas of habitat and facilitate the mixing of individuals in a less favourable urban setting. Open Mosaic Habitat on Previously Developed Land (OMHPDL) has recently been included as a UKBAP priority habitat.

Threats

OMHPDL and planning

National Planning Framework 2 (NPF2) aims to bring brownfield sites back into productive use for housing, for economic purposes and to create attractive environments by 2030.

These targets set by the government prioritise new developments on brownfields and give

greenfields much stronger protection.

As much as 50% of brownfields support high levels of biodiversity. Areas with low environmental impact should be prioritised for development regardless of whether they are brownfield or greenfield land.

Negative public image

Many people have a negative opinion towards brownfield sites due to the lack of management and a perceived untidiness. Clearing and tidying up brownfields can have a detrimental impact on biodiversity across the site (see Landscaping below).

Landscaping

Restoration of post industrial sites into greenspace can destroy much of the existing value of the site through the importation of large quantities of topsoil and tree planting. This also results in the loss of particular niches which will have a profound knock on effect on the wildlife found there.

How to recognise OMHPDL

For a site to have OMHPDL there are 5 criteria that must all be met (Table 1). To identify if a site fits these criteria, use the flowchart on page 3 (Figure 1).

A brownfield with 3 or more habitat features such as bare ground, scrub, ruderals, etc. qualifies as having open mosaic habitat and may be an important site for biodiversity.

Important features on brownfields

Bare ground

Areas of bare ground are important to thermophilic (warmth loving) animals such as reptiles and invertebrates. Solitary bees and ground beetles will nest in recently disturbed and loose bare ground as soil under bare ground is significantly warmer than soil under vegetation allowing eggs and larvae to develop faster.

Green tiger beetles (*Cicindela campestris*) can be found on bare ground at brownfields © Greg Hitchcock

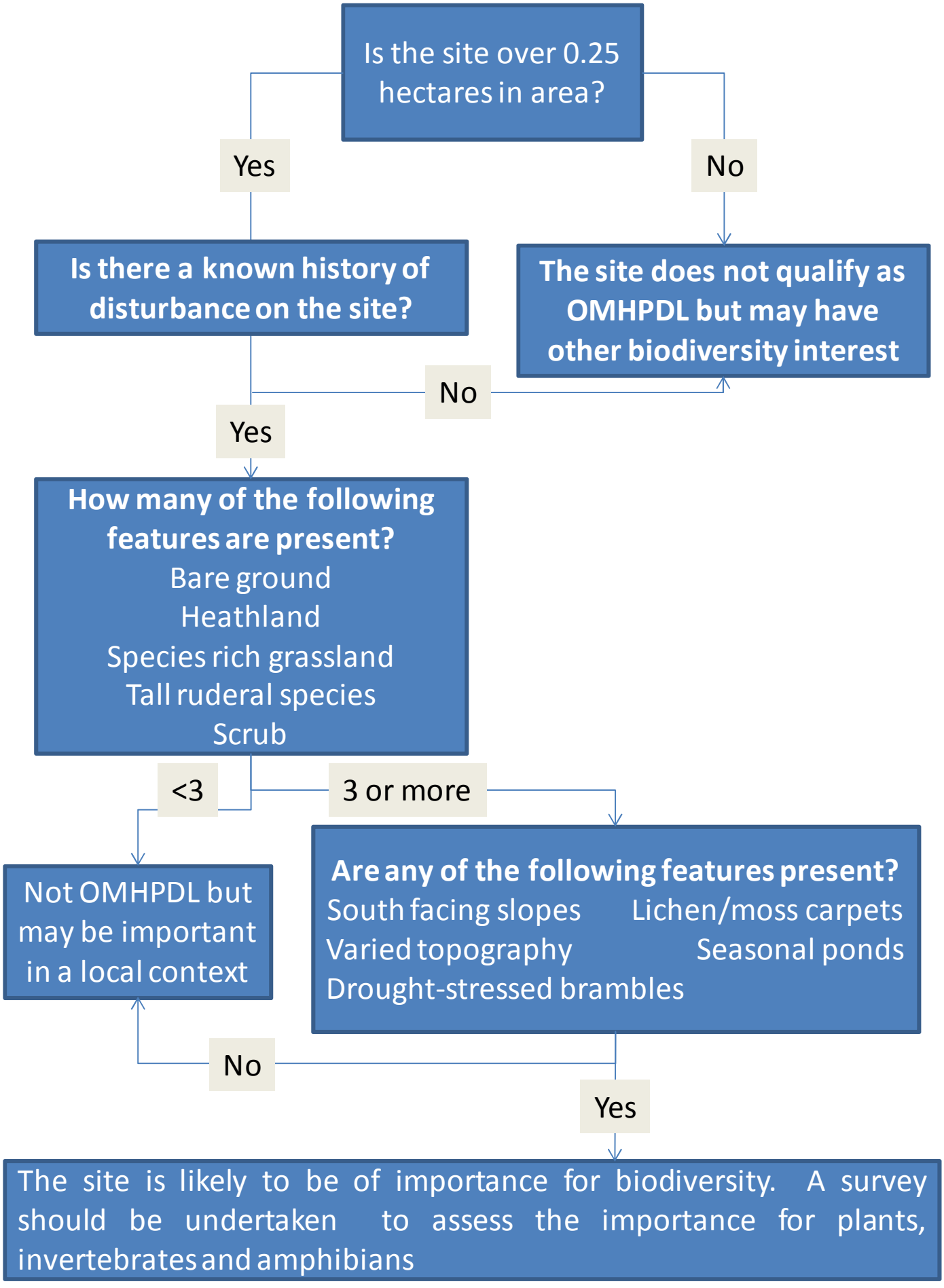
Species rich grassland

Meadows with a diverse range of wildflower and grass species provide a valuable foraging habitat for a number of pollinator species including bees, wasps, hoverflies, butterflies and beetles (Case study: box 2, page 6).

Table 1. All of the following criteria must be met for a site to be designated with OMH (Riding *et al*. 2010).

Criterion 1	Site is at least 0.25 ha in size
Criterion 2	Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use (s) of the site. Extraneous materials / substrates such as industrial spoil may have been added.
Criterion 3	Site contains some vegetation. This will comprise of early successional communities consisting mainly of stress tolerant species (e.g. indicative of low nutrient status or drought), such as a) annuals, or b) mosses/liverworts, or c) lichens, or d) ruderals, or e) inundation species, or f) open grassland, or g) flower-rich grassland, or h) heathland.
Criterion 4	Site contains un-vegetated, loose bare substrate and pools may be present.
Criterion 5	Site shows spatial variation, forming a mosaic of one or more of the early successional communities plus bare substrate, within 0.25 ha.

Figure 1. Use the following flow chart to identify an open mosaic of habitats at a brownfield site.



Ruderals

High levels of nutrients created by nitrogen fixing legumes such as clovers (*Trifolium* spp.) and vetches (*Vicia* spp.) allow fast growing ruderal plants such as Common nettle (*Urtica dioica*), Thistle (*Cirsium* spp.) and Rosebay willowherb (*Chamerion angustifolium*) to become dominant.

Ruderals can change soil composition on a site as when these early pioneering species die they create plant litter that over time breaks down to form soil. Over several years this creates enough soil for scrub to develop hence furthering the succession process.

Scrub

Birch (*Betula* spp.) and Willow (*Salix* spp.) are pioneering tree species that are commonly found at brownfields. A proportion of scrub and young trees is beneficial as they provide shelter and homes for a number of species. Scrub and trees should however be maintained at less than 15% cover overall as they can shade areas of bare ground and other important habitats; thus affecting biodiversity of a site and reducing the mosaic of habitats.

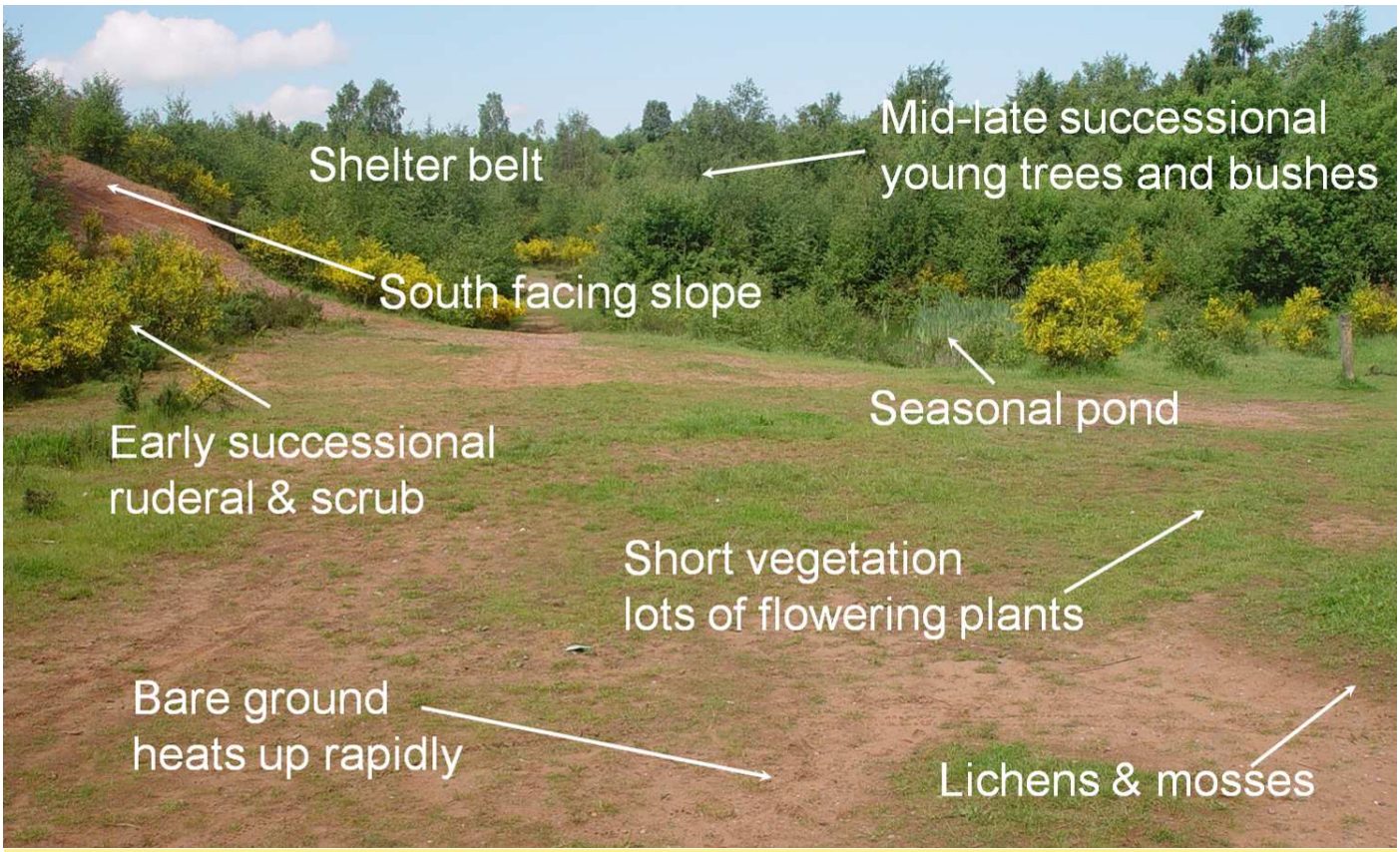
Solitary bee (*Andrena barbilabris*) © Suzanne Bairner

South facing slopes and banks

Varied topography, with hollows, mounds and south-facing banks provide different substrate depths, physical diversity and hydrology. This can lead to the development of vegetation with a varied species composition and structure, with a resultant associated diverse invertebrate fauna (Case study: box 1, page 6).

Seasonal ponds

Hollows and mounds, in combination with free draining, compacted and impermeable



Examples of microhabitats that can be found at a brownfield site that create an open mosaic of habitats © Buglife

substrates provide various degrees of permanent or seasonal wetness and drought conditions. These ponds subsequently develop characteristic plant and invertebrate communities. Ponds can vary in size between years and are dependent on local weather and habitat conditions.

OMHPDL in Scotland

Buglife have assessed 80% of vacant and derelict land in Scotland from the 2009 register to see if it supports OMHPDL. Remote assessments identified 5,207 ha of potential OMHPDL which amounted to 27% of derelict land and 18% of vacant land.

Birch scrub across a brownfield site in Banknock in Falkirk © Suzanne Bairner

The Scotland vacant and derelict land register from 2011 shows that 41 sites previously identified by Buglife as supporting OMHPDL have been delisted, amounting to 201 ha, however 2,433 sites have been added with a total of 2,976 ha.

Capitalising on OMHPDL

It is important to ensure that there is a network of interconnected OMHPDL 'stepping stones' at varying stages of succession within an area.

Brownfields are transitory and if left un-managed have a typical lifespan of between 15 and 20 years, as through natural succession bare ground will eventually vegetate, open grassland will close up and coarse grasses and scrub will dominate.

Therefore, these sites should be used for short to medium term gain.

When redeveloping sites which support OMHPDL, consideration should be given to the retention of features within the grounds of the new development. Examples of mitigation include biodiverse roofs, flower rich meadows and bee banks (see Case study: page 6 and 7).

The development of green roofs and bee banks on a site should be used to form part of a wider mitigation scheme which incorporates the retention of existing habitats or the restoration of ground level habitats.

Typical features of OMHPDL

Bare ground

Includes soil, sand, gravel and concrete that may have been recently disturbed and may be fully or partially compacted.

Species rich grassland

A lack of soil nutrients prevents fast growing plant species becoming dominant and creates species rich grassland.

Native ruderals

Patches of ruderals can be found alongside areas of species rich grassland at sites with varying nutrient levels in the soil.

Scrub

Woody plants and shrubs between 5 and 8 m tall including alder (*Alnus glutinosa*), and gorse (*Ulex europaeus*).

Banks

South facing slopes and banks warm up quickly and are important to a number of wildlife species.

Seasonal Ponds

A pond is any body of water that varies in size from 1 m^2 to 2 ha and which holds water for four months of the year or more.

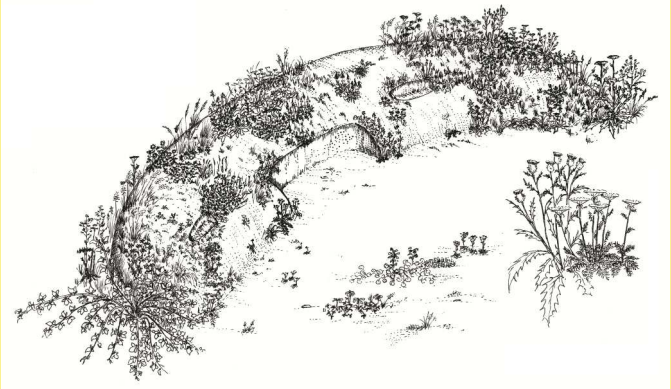
Case Studies: Examples of mitigation

Box 1: Bee banks

The construction of bee banks can create new bare ground habitat and add topographic interest within a site. Bee banks can provide useful habitat for many thermophilic ground nesting invertebrate species including solitary bees, solitary wasps, beetles and spiders.

Material (such as aggregate and sand) is shaped into a mound with various slopes, hollows and angles that may be utilised and favoured by different species. Vertical banks created on bee banks take much longer to vegetate and this makes them attractive to many species. Over time a bee bank will be vegetated over through succession.

Planting vegetation in an open structure in front of a bee bank will provide extra habitat for invertebrates that are attracted to the bee bank. Flower rich areas nearby will provide important foraging areas for pollinators.



Bee bank design with vegetation © Buglife Peter Kirby

Bee bank at West Thurrock © Greg Hitchcock

Box 2: Species rich grassland

Common carder bee (*Bombus pascuorum*) © Stuart Rook

A diverse wildflower meadow © Suzanne Bairner

It is estimated that 97% of wildflower meadows in Britain have been lost since the 1930s. When creating a wildflower meadow it is important to plant a diversity of species that are native to the area and are of local provenance. Including annuals and perennials in a species mix provides a burst of colour during the first year from annual species and colour from perennial species during subsequent years.

Including Yellow rattle (*Rhinanthus minor*) seeds within a wildflower mix can help to improve species diversity within a meadow as it affects the growth of grasses.

It is also important to get the cutting regime of a meadow correct as this will help to improve species diversity by reducing competition for space between wildflowers and grasses.

Box 3: Biodiverse green roofs

A green roof is a roof or deck onto which vegetation is intentionally grown. Standard *Sedum* based green roofs can provide some benefits for invertebrates when compared to a traditional bare roof. However, the varied design features of a **biodiverse green roof** can have considerably greater benefits both for wildlife (invertebrates and some birds) and communities in an urban area.

Biodiverse roof design considerations:

Substrate type - low nutrient, porous and light weight.

Substrate depth - varied and undulating (typically between 80 mm and 150 mm) to encourage the development of structurally diverse flora.

Provision of some bare ground - areas for invertebrates to burrow and bask.

Flora - seed and/or plug plants with locally sourced native seeds appropriate to the area (*Sedums* should normally comprise no more than 30% of the total species composition).

Biodiverse roofs can be designed to replicate brownfield sites with an open mosaic of habitats. Additional features such as bug hotels, habitat piles, bee banks and wet areas can greatly increase a roofs potential to support invertebrates.

As well as being good for wildlife, a green roof also provides other benefits:

- Retention of water in substrate reduces and slows water runoff
- Increase in roof lifespan
- Reduction in energy consumption by reducing heating and cooling costs
- Aesthetically pleasing and can be used for recreation and relaxing
- Green roofs also absorb air pollutants, dust and noise

Appropriately designed biodiverse roofs can support Local, Regional and National Biodiversity Action Plan targets. Key research in Britain and Switzerland has shown that biodiverse roofs designed for rare species can increase the overall biodiversity benefit of an area.

The biodiverse green roof at Abbey Hive mimicking a brownfield site in Camden, London © Claire Dinham

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An abandoned distillery at Banknock in Falkirk © Suzanne Bairner

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