

Urban Biodiversity: Successes and Challenges: Brownfields: oases of urban biodiversity

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ABSTRACT

Despite their potential to support biodiversity, a strong negative public image has been attached to brownfield sites, with the conservation of these sites therefore lagging behind other habitats. The inclusion of 'Open Mosaic Habitats on Previously Developed Land (OMHPDL)' as a UK Biodiversity Action Plan (UKBAP) priority habitat has however resulted in a renewed focus on brownfields as important wildlife habitats. The experiences of Buglife – The Invertebrate Conservation Trust in both the Thames Gateway and central Scotland have shown that brownfield sites can support many rare, scarce and UKBAP priority species, some of which are becoming increasingly reliant on such sites as their natural habitats come under threat.

INTRODUCTION

The industrial revolution starting in the eighteenth century transformed the scenery of our towns and countryside. Central Scotland was at the heart of this revolution and many heavy engineering works and iron foundries were based there. With the demise of these industries across the country, their former premises have been left derelict. Many of these ex-industrial sites have since been reclaimed by nature through natural succession.

This rich industrial heritage of Scotland has resulted in over 10,000 hectares of land being listed as vacant or derelict. These brownfield sites can be incredibly important for biodiversity, often supporting nationally important populations of rare and endangered invertebrates, alongside other wildlife such as birds, reptiles, plants and lichens. 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 increasingly threatened species in the UK. As a result Open Mosaic Habitat on Previously Developed Land (OMHPDL) was recently included as a UKBAP priority habitat.

Brownfields are any site that have been altered by human activity and are currently not fully in use

(CABE, 2006). They tend to be concentrated in urban and former industrial landscapes but also include quarries, spoil heaps, old railway lines and disused airfields (Allan et al. 1997; Bodsworth et al. 2005; Whitehouse, 2008; Riding et al. 2010). Brownfield sites provide linkages or 'stepping stones' between more natural areas of habitat and facilitate the movement and mixing of individuals in a less favourable urban setting. Lack of management of brownfields often creates an open mosaic of habitats such as species rich grassland, bare ground and early successional habitats (Key, 2000; Bodsworth et al. 2005; Harvey et al. 2008). This, combined with a low nutrient content of the soil which prevents fast growing species becoming dominant, provides a continuity of resources for invertebrates throughout the season (Harvey et al. 2008). In addition, a mosaic of habitats provides a home for a wide range of species and allows many to complete their life cycles within the same site (Bodsworth et al. 2005).

It has long been recognised that brownfields may have as many associated Red Data Book (RDB) and Nationally Scarce invertebrate species as ancient woodlands (Jones, 2003). At least 194 invertebrate species of conservation importance, including 50 red data book and 131 nationally scarce species, have been recorded from brownfield sites in the UK. This includes 50% of rare solitary bees and wasps and 35% of rare ground beetles (Bodsworth et al. 2005). Brownfields also support a suite of UKBAP priority species. For example, the lack of management on brownfield sites often provides a secure area for breeding birds such as skylark (*Alauda arvensis*) and grey partridge (*Perdix perdix*), that are often absent from land under agricultural management. Many features identified at long abandoned industrial sites can no longer be found in the managed and over-farmed wider countryside or even in over-tidied parks (Bodsworth et al. 2005). Loss of natural habitat is causing many species, including bumblebees, beetles, butterflies and reptiles, to become increasingly reliant on brownfield sites.

Despite their potential to support biodiversity a strong negative public image has been attached to brownfields due to lack of management and a perceived untidiness and they are increasingly threatened by development and landscaping (Key, 2000; Riding et al. 2010). Restoration of post-industrial sites into greenspace can destroy much of the existing wildlife interest through the importation of large quantities of topsoil and tree planting. Site restoration can also result in the loss of particular niches at brownfields which will have a knock on effect on the wildlife found at that site (Bodsworth et al. 2005). For example, the loss of bare ground at a site will affect thermophilic (warmth-loving) invertebrate species such as spiders and ground beetles as well as species such as mining bees and solitary wasps that nest in the ground (Key, 2000; English Nature, 2005; Whitehouse, 2008).

In 2007 Open Mosaic Habitat on Previously Developed Land was added to the list of priority habitats in the UK Biodiversity Action Plan (Maddock, 2008). To fit the UKBAP criteria for OMHPDL the site must be over 0.25 hectares in size and have a known history of disturbance (Table 1). In addition, there must also be a mosaic of vegetation on the site comprised of early successional communities and un-vegetated bare areas.

	Criteria
1.	The area of open mosaic habitat is at least 0.25 ha in size.
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.
3.	The site contains some vegetation. This will comprise early successional communities consisting mainly of stress tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of 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.
4.	The site contains un-vegetated, loose bare substrate and pools may be present.
5.	The site shows spatial variation, forming a mosaic of one or more of the early successional communities a) – h) above (criterion 3) plus bare substrate, within 0.25 ha.

Table 1. Open mosaic habitat on previously developed land definition and criteria (Riding *et al.* 2010).

The conservation of brownfield sites has lagged behind other important habitats for plants and wildlife. The term brownfield was first used by the government in 1998 when they set a national target of 60 % of all new housing developments to be located on brownfield land (Bodsworth *et al.* 2005; Riding *et al.* 2010). In Scotland, the National Planning Framework aims to bring ‘vacant and derelict land’ back into productive use for housing, for economic purposes and to create attractive environments however there is potential for this vision to conflict with the conservation of Open Mosaic Habitats on Previously Developed Land OMHPDL and urban biodiversity.

BROWNFIELDS AND BUGLIFE

Buglife was one of the first conservation organisations to highlight the ongoing loss of brownfield habitats – and the serious consequences of this for biodiversity – and has been working to conserve brownfield wildlife since 2004. Buglife’s flagship ‘All of a Buzz in the Thames Gateway’ project in southern England has mapped and assessed the biodiversity of over 1,000 brownfield sites. This study has identified that although

as many as a third of all brownfield sites support high levels of biodiversity – in many cases significantly higher than surrounding ‘greenfield’ agricultural land – many of these sites are being lost to development as a result of government targets for new housing.

Brownfield sites in the Thames Gateway are very important for the brown-banded carder bee (*Bombus humilis*) and the shrill carder bee (*Bombus sylvarum*). The East Thames corridor with its large areas of open flower rich brownfield grasslands is home to the most important remaining metapopulations of these bumblebees.

The streaked bombardier beetle (*Brachinus sclopeta*) was thought to be extinct in Britain but was rediscovered in 2005 on a brownfield site in London (Jones, 2006). The site is currently being developed for housing and as mitigation around 65 beetles have been translocated to a nearby site. Invertebrate translocations typically have a low success rate, particularly with species with complex life histories as is the case with the streaked bombardier. It is therefore highly unlikely that this mitigation will save this species at this site and it may well become permanently extinct in Britain].

The distinguished jumping spider (*Sitticus distinguendus*) was discovered during surveys in 2005 at West Thurrock Marshes (Harvey, *et al.*, 2005). This species is only known from one other site – Swanscombe Marshes where it is threatened by re-development proposals. The site at West Thurrock currently has planning permission for warehousing and car parking which, if developed, would destroy the habitat of this species.

THE SCOTTISH EXPERIENCE

Evidence suggests that this issue is as pressing in Scotland as elsewhere. In September 2010 Buglife launched a new project ‘All of a Buzz Scotland’ as a response to this challenge. This project follows in the successful footsteps of work completed in the Thames Gateway. The first phase of this project assessed 1,522 sites listed as ‘derelict’ on the Scottish Vacant and Derelict Land Register and identified 393 sites that had the potential to satisfy the UKBAP criteria for OMHPDL. The assessment of these sites followed a remote assessment methodology using aerial photography to identify features typical of OMHPDL (Macadam, 2011).

It was noted during this initial assessment that some of the aerial photography was up to 12 years old and the sites identified as potentially fitting the criteria for OMHPDL may no longer qualify as a priority site due to re-development or succession during the intervening period. The next phase of this project is therefore to ground-truth the results from the initial assessment to ensure that we can have confidence in the findings. Advice and information on how to assess a site for the

presence of OMHPDL to ensure that Local/Planning Authorities and Government Agencies can identify areas of OMHPDL on 'new' sites in the future will also be prepared. Future phases of the project will promote the management of brownfield sites for biodiversity and provide guidance on tools for mitigation in developments such as green and living roofs, and off-site habitat creation.

The 'All of a Buzz in Scotland' project will produce much-needed evidence and support for planners and developers, enabling them to plan and implement developments in an environmentally sustainable way. It will also promote more natural habitats, native plant species, and a 'less tidy' approach to land management both within developments and in the wider urban landscape.

FALKIRK'S BROWNFIELDS

Buglife has recently undertaken a more detailed investigation of the invertebrate diversity of brownfield sites in the Falkirk area (Bairner and Macadam, 2011). An assessment of the habitat on each of the 76 sites in the Scottish Vacant and Derelict Land Register for Falkirk was undertaken during May 2010. Details of each site were recorded using Buglife's brownfield habitat assessment form and included current activity, the vegetation type, plant species diversity and abundance. Photographs were taken on each site for future reference. Potential invertebrate species diversity was estimated as low, medium or high for each site based on plant abundance and plant species diversity on the site as well as the presence of a mosaic of habitats, including bare ground, scrub and mixed grassland and herbs.

From the sites on the register, 19 were chosen as being important for invertebrates.

Invertebrate survey work was undertaken on 14 of these sites. The remaining sites from the register fitting the OMHPDL criteria were visited for assessment purposes but no invertebrate survey work was possible due to access restrictions. In addition invertebrate surveys were also undertaken at two other sites which are not on the vacant and derelict land register, but have been previously recognised as fitting the criteria for OMHPDL.

Surveys of brownfield sites in Falkirk commenced in May 2010, with the majority of field work carried out between June to October 2010 and March to June 2011. Samples of terrestrial invertebrates were collected using pitfall traps, sweep nets and/or pan traps. When collected each sample was labelled with site name, collection method and date and stored in 70% alcohol. Samples were first sorted into different invertebrate orders and then identified to family, genus or species by close examination under a high power microscope with reference to taxonomic books and keys. Most groups were identified to species, however in the Diptera, Myriapoda, Acari, Collembola and

Mollusca a lower taxonomic precision was used in some cases.

Of the invertebrate species collected during survey work 75 have not been recorded from the Falkirk area before. A number of these species are common and widespread in Britain including the green tiger beetle (*Cicindela campestris*) and violet ground beetle (*Carabus violaceus*), the field digger wasp (*Mellinus arvensis*) and marram spider (*Tibellus maritimus*). Results show that 44 of the 72 species of beetle recorded during survey work have not been recorded in Falkirk before. The reason why there are no records for many species, particularly beetles, may be due to the lack of a local biological records centre for the area, although there are relatively few active entomologists in the area.

The diversity of invertebrate species collected clearly shows the importance of brownfields in Falkirk. As an example, the brownfield at Carron Works (Forge Dam) is particularly important due to the high diversity of plants and wildlife, especially the invertebrates that were recorded. Four invertebrate species collected at this site are considered rare or scarce in Scotland:

- The comb-footed spider *Anelosimus vittatus* (Theridiidae) is widespread and common in England and Wales although there are only a few records in Scotland.
- The hobo spider *Tegenaria agrestis* (Agelenidae) is a brownfield specialist and was previously only known from five locations in Scotland (Bo'ness, Grangemouth, two locations in Edinburgh and near Dingwall in the Highlands).
- The Nationally Scarce (Notable B) ground beetle *Amara praetermissa* (Carabidae) was recorded in Bo'ness in the 1980s and during field work three individuals were collected from Carron Works. This represents only the second record of this species in Scotland.
- The rare (RDB3) solitary bee *Andrena ruficrus* (Andreninae) has previously not been recorded from Falkirk.

CONCLUSIONS

Open mosaic habitats with varying stages of natural succession are scarce in the over-managed and farmed countryside. In an urban setting brownfields can be used as 'stepping stones' to allow movement and mixing of animals and plants across an area (Macadam, 2011). Due to natural succession at these sites, brownfields are transitory habitats and if left unmanaged they have a typical lifespan of between 15 and 20 years (Key, 2000; Bodsworth et al. 2005). This is not necessarily a problem as new 'brownfield' sites are always being created. The transitory nature of these sites means that the extent of this habitat will fluctuate as a result of succession, redevelopment and dereliction. The species that inhabit these sites will colonise and retreat in response to the availability of

the habitat in each local authority area however it is important that a series of 'stepping stones' are provided as refugia for these species. These 'stepping stone' sites should be managed to retain an open mosaic of habitats for the species that depend upon them.

If properly managed, brownfield sites with high value for biodiversity can not only deliver suitable habitat for many species, but can also transform themselves into wild city spaces full of wildflowers that will attract pollinators and other animals. Such sites are an important part of the habitat network, providing corridors for species to disperse around and through urban areas. Brownfield sites can also provide valuable open spaces for local people and are often seen as being the only truly 'wild' city spaces remaining for the public to enjoy – the 'unofficial countryside'. There is great potential to make many of these sites more accessible, safe and enjoyable through imaginative planning and positive management. In many built-up areas, brownfield sites may be the sole natural greenspace available. If properly managed, they could help significantly to reduce the number of areas deficient in accessible open space, and contribute to the delivery of urban green networks. Improving access to green spaces will bring attendant quality of life and health benefits to residents, as well as economic benefits.

Recommendations made by Bodsworth et al. (2005) for the management of brownfield sites to maximise their value for invertebrate conservation include surveying sites to identify their wildlife interest and the protection of sites from development. Researchers also recommend the management of bare ground, vegetation structure, floristic diversity and shelter to maintain biodiversity at a site once its value has been identified.

The importance of brownfield wildlife in urban areas must be recognised and valued if it is to be protected and managed as a vital component of the townscape. Its long-term survival will depend on the support of the local people who use and value their local environment. Developing opportunities for people to see, enjoy and learn about brownfield invertebrates will help increase awareness and understanding of the value of biodiversity in urban areas.

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