MAXIMISING BIODIVERSITY

BPG NOTE 9

Best Practice Guidance for Land Regeneration

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Introduction

Biodiversity refers to the biological diversity of an area and can be defined as 'the variety of plants and animals found on earth, and the place in which they live' (www.sustainable-development.gov.uk). It reflects the variety of species that exist on global, national, regional and local scales.

The significance of biodiversity is widely publicised, but is often thought of in terms of very specific and vulnerable areas at a global level, for example the rain forests of South America, as these affect our food, clothing, medicine, overall environment and moral conscience, while the biodiversity of a reclaimed or urban area is often overlooked as these sites appear to offer little habitat range or significance. However, brownfield sites often offer a vast resource of rare and protected species (Figure 1) and many have been designated as Sites of Special Scientific Interest (SSSIs) for their nature conservation value (DoE, 1996). Species diversity can also be enhanced by careful habitat placement, creation and management.

Overall, recent research has shown that biodiversity is being lost. During the twentieth century the United Kingdom lost over one hundred species of flora and fauna, and many more have been significantly reduced in number or habitat range. The biodiversity of an area is often dependent on the ecosystem diversity that exists there. Reduction in biodiversity is often a result of a decrease in natural habitats, both in the land area they occupy and their variety. Habitat loss impacts on the species diversity in the following ways:

- Populations are moved into smaller and smaller areas which, ultimately, are unable to support them.
- Populations become fragmented so that they become isolated into populations too small to be self-sustaining.
- Areas of habitats are so small that the area to external circumference ratio increases to such an extent that they are heavily influenced by surrounding areas.
- Intensive management and a decline in traditional management methods has led to fewer older trees and less deadwood (www.woodlandtrust.org.uk).

Reclaimed and brownfield land provides a valuable resource for counteracting some of these effects by creating new habitats that are sympathetic to surrounding areas. Woodland establishment is often crucial to the success of any attempt to increase biodiversity as the majority of the United Kingdom's native wildlife live in forests and woodlands. By increasing the biodiversity of a site, the area can become a valued recreational and educational resource, in addition to improving the local environment and providing a more sustainable habitat for the future (www.sustainable-development.gov.uk).

Figure 1 Common spotted orchids are among the plants often found growing on mine waste.

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Quantifying existing biodiversity resources

It should not always be assumed that because a site comprises brownfield or restored land it has no ecological value. Many brownfield sites offer habitats that are suited to species that are unusual in that region; for example, orchids are often found thriving on the acidic soils produced by mine waste (Figure 1). Prior to any decisions being made regarding the ecological enhancement of a site, the existing species and potential for species needs to be assessed. A Phase I Habitat Survey (JNCC, 1990) should be carried out by an experienced ecologist as set out in *Guidelines for baseline ecological assessment* (Institute for Environmental Impact Assessment, 1995). This survey will characterise the site in terms of the habitats and vegetation, including their abundance, age and condition. It will provide an indication of the species that may inhabit or visit the site if no physical evidence is observed (e.g. tracks). If the survey for determining the presence of protected or valuable species is inconclusive it may also be necessary to carry out a Phase II Habitat Survey to give a more detailed description of the ecological resources on the site. If the presence of a particular species is suspected a targeted ecological survey aimed at this specific species should be undertaken.

During the assessment of the ecology present at a site, the following should be considered:

- Are there any protected species present at the site or surrounding it? Statutory legislation exists to safeguard the habitats of such species which needs to be considered in the planning stages of woodland establishment.
- Are there any rare species present at the site or surrounding it? This may include species that are not rare on a national scale, but might be locally.

If the answer to either of these questions is yes:

- What specific characteristics of the site must be retained / enhanced to maintain or encourage migration of populations?
- What habitats and species are or were found in the areas surrounding the site? The proposed woodland establishment should complement the local environment by appropriate landscape design and vegetation species selection.

The current ecological value of the site and its surrounding area will be the primary deciding factor on what actions need to be taken in increasing its biodiversity, in conjunction with the local authority Biodiversity Action Plan (BAP) for that area.

If the Phase I Habitat Survey indicates that any areas currently support or have the potential to support rare or unusual species then the site should be managed to ensure these species are encouraged. The following provide guidance on effective management of such habitats or species:

- Broad Habitat Statements (Jackson, 2000): these provide summary descriptions of all habitats found in the UK, they also give current issues affecting these habitat types and broad policies to counteract them.
- Priority Habitat Action Plans: provide more detailed descriptions for 45 specific habitats; they set out detailed actions that can be taken to enhance these habitats.
- Action Plans for the specified 391 'at risk' species that have been identified within the UK, including any legislation relating to their protection.
- Local BAPs highlight the priorities for specific regions to ensure that the needs of these areas are met and that they contribute to national targets.

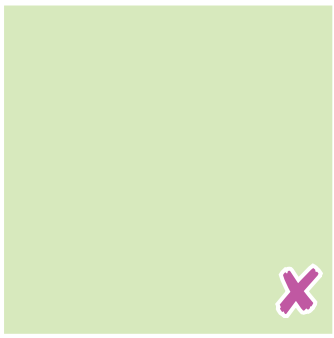
All of these resources can be found on www.ukbap.org.uk.

Planning to maximise biodiversity

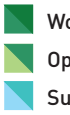
The following general rules, demonstrated in Figure 2, can be applied to increase the overall biodiversity of a site. They may not all be suitable for every site, particularly if the habitat survey has highlighted any protected or unusual species:

- Biodiversity will generally increase as the number of different ecosystems increase. When planning a green space it is better to have several habitats, for example woodland, open grassland and aquatic areas.
- The shape of habitat areas should be designed so that the circumference to area ratio is reduced. The more exposed boundaries that exist increases the influence of surrounding areas; this could include physical damage, air pollution or invasion by other species.
- Habitat areas should be large rather than small. The island biogeographical theories suggest that larger habitat islands can support a larger number of species than smaller ones. The edges of a habitat area may have different species than the centre, so a larger, rounder area will have a larger centre.
- Green corridors should exist between habitat islands; this will allow movement of species between different islands. This is particularly important if the developer wishes to encourage species to move into a new green space from existing woodland or greenspace areas. For example, ancient woodland is often likely to contain a rich variety of species and they often consist of areas left fragmented by past development. A green corridor from surrounding ancient woodland could encourage species to move into a new area and increase the sustainability of the population (Spellerberg, 1995).

Figure 2 Habitat size and shape to promote biodiversity.

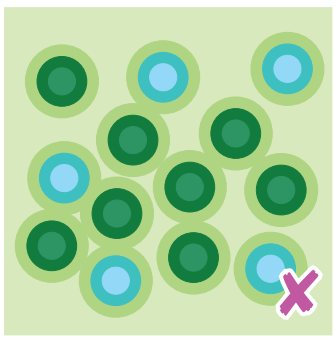


(a) An area consisting of one habitat type



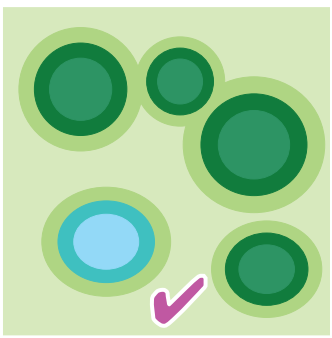
Darker colours denote areas that are influenced by surrounding habitats

(b) An area consisting of three habitat types with high circumference:area ratios



(c) An area consisting of three habitat types with small areas

Areas (b) and (c) indicate that long narrow and small habitats result in smaller areas of the desired habitat type as the proportion of the initial area influenced by surrounding habitats increases



(d) An area consisting of three habitat types with large areas

- Tree species should be varied within an area. Monoculture vegetation provides little biodiversity. The selected species mix can be planted in clumps of single species types, or in mixed clumps, the size of clump and distances between clumps can also be varied (Rodwell and Patterson, 1995). Again, when choosing which species to plant on a site the surrounding ecology should be taken into consideration. Information on species selection for specific site characteristics is available from the ROOTS software package.
- The encouragement of ground vegetation will also provide habitats for a wide range of species. This can be achieved by minimising herbicide applications and, where possible, weeding by hand of undesirable species, and planting a mix of coniferous and broadleaved species as conifers reduce the pH of the soil. Any such encouragement of ground vegetation should be made without compromising tree growth or establishment.
- Species diversity is higher in areas where soils have a low nutrient status, so fertiliser applications should be kept to a minimum. Further information on fertiliser use can be found in BPG Note 7.

In order to monitor the success of any management programme or vegetation establishment on a site a Phase I Habitat Survey should be completed periodically. This will ensure that the site management is having the desired effect on habitat development and species enhancement. It will also highlight any changes that may need to be made to the existing management plan to enhance species response or encompass new priorities.

Most brownfield and contaminated sites used for greenspace establishment will have several end-users. These may include educational, community or local interest groups and individual members of the public in addition to the wildlife inhabitants of the site. With careful consideration of each user's requirements and appropriate planning these sites can offer a multifunctional resource encompassing ecological, social, archaeological and environmental benefits.

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www.roots-software.co.uk

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