Good planning practice for invertebrates: mitigation

Thinking about invertebrates early when designing a development means many impacts can be avoided or mitigated. This helps to prevent delays later in the planning process as well as helping to secure genuine benefits for wildlife.

Many invertebrates have complex needs so even small losses of habitat can have a large impact- something often overlooked when assessing impact. Species specific requirements, such as the need for certain food plants, dead or decaying wood or a particular place to lay their eggs, leaves invertebrates vulnerable to changes in their local environment. Consequently the loss of that specific plant or habitat feature can cause the extinction of a species at the site in question. Identify these early in the process

Example of a bee bank © P Kirby

The mitigation hierarchy

Buglife, along with planning policy and good practice advocates that the mitigation hierarchy of '*avoid, mitigate and compensate',* should be the starting point for any mitigation plan:

Avoid high value sites and important features within development sites. Can an alternative location reduce impact?

Mitigate if it is not possible to avoid impact. Look at minimising or preventing an effect.

Compensate as a last resort only. If a development is critical and there is genuinely no other alternative, compensation for habitat loss can be looked at.

Creating new bare ground scrapes on low nutrient substrate © C Dinham

Invertebrate surveys and assessing impact

Assessing a site's value as early in the process as possible will help to avoid delays later on and reduce a development's negative impacts on wildlife. It will help to identify how the mitigation hierarchy should be applied to a development site, provide detail on the important species present, how they are using the site and which features are critical to them. The starting point for this is an invertebrate survey. You can find out more about invertebrate surveys in our survey guidance.

Many invertebrates have specialist habitat requirements, especially the rarer species. Even mobile insects, such as bees which are active over a very large area, will still have precise requirements. An invertebrate may also have different needs depending on the stage of its lifecycle. For example,

bumblebees need spring blossom to be available when setting up a colony, as wells as a variety different plants that will be flowering in the summer to maintain it.

All of this contributes to invertebrates being very sensitive to ecological change. Consequently the removal of one key part of a habitat may on the surface seem trivial, but it could have a disproportionately large impact and lead to the extinction of a population at the development site. E.g. the removal of 50% of habitat on a development site would, in theory, retain half of the site and impact on wildlife could be assessed as being quite low. If on closer inspection it turns out that the area lost contains all of the summer foraging area, or the breeding habitat (this could be as little as one ditch or patch of flowers), the population is unlikely to be able to survive. As a consequence the development impact is high.

Planning a mitigation scheme

Once you have information about the species on site it is possible to start planning the mitigation scheme by pulling out common features needed by species to complete their life cycle. Bear in mind the amount and type of habitat to be lost. It is no good replacing 15 hectares of quality habitat with a few 1 hectare fragments- the mitigation habitat needs to be of comparable size to the area lost.

The end point of any scheme is to guarantee a mosaic of habitats that reflects the spectrum of features required for a full lifecycle. It will be necessary to create new areas of habitat in advance of habitat loss to ensure there is habitat continuity. Large blocks of habitat are more effective than smaller, fragmented areas which are vulnerable to edge effects. There must be good connectivity across the site, allowing species to move throughout the site and the wider landscape.

Case study: Green roofs

These can be a great way of boosting biodiversity and increasing habitat. However, to be of benefit, they must be biodiverse and be part of a wider mitigation scheme, not used in isolation.

© C Dinham

The Victoria & Albert Museum Green Roof (right) was London's first wetland green roof, featuring a wildflower meadow, areas of bare ground, deadwood piles and even a mini wetland habitat. This was designed to provide food and shelter for bees, butterflies and moths.

Typically green roofs are an opportunity to offer drier habitats such as the example below. Here valuable flower-rich habitat has been created on a free draining surface, providing an extra enhancement for pollinators.

Example of a biodiverse green roof © C Dinham

Road side verges can be an opportunity to create areas of flower-rich habitats providing forage for many species © S Falk.

Permeable paving is an innovative way to provide low nutrient surfacing and avoid using topsoil © S Henshall.

Possible features to include -The overall plan will depend on the habitat and features lost. You are aiming to create a mosaic of different habitats to provide as many niches as possible, this should be comparable to what exists prior to development, meet the needs of the species on site and availability must be continuous. This may mean creating them in advance of habitat loss.

Beetle bump mitigation © J Robins

Varied topography such as a variety of slopes, banks, ditches, hummocks and even piles of rubble, helps to create different niches with their own individual climate and aspect. Depending on their individual needs different invertebrates will be able to exploit the sunny south facing slope, wetter areas, over-wintering sites or warm and dry areas created by the changes in topography and aspect.

Bare ground is often overlooked as a feature but used by a range of insects for nesting, hunting and basking. This can be maintained by periodically disturbing the surface or placing low nutrient surface materials on south facing slopes and banks.

The type of soil or surface material is important, look for **low nutrient surface materials and avoid top soil**! Aim for dry, low nutrient substrate such as pulverised fuel ash, chalk or sand. This will warm up more quickly and be easy to burrow into. An innovative surfacing material is permeable pavement. Also look at re-using materials already on site such as sub soil, broken bricks, blast furnace slag, pulverised fuel ash or crushed concrete, as this will keep costs down.

Log piles of dead and decaying wood provide a variety of habitat pockets and refuges for bugs.

Wet areas such as pools, marshy areas, ditches etc. are places for wildlife to live and are a source of food for species like dragonflies. The exact structure and management will depend on the needs of invertebrates on site but you should aim for permanently and seasonally wet areas with variation in depth and profile.

Scrubby areas and hedgerows are important for linking different areas of habitat and providing shelter, resting places or locations for over wintering depending on the species. Hedgerows and trees also provide spring blossom for food.

Example of habitat creation © S Falk

Low growing wildflowers provide food without reducing bare ground. © S Falk.

Low growing wild flowers on disturbed ground are vital pollen and nectar sources for adult insects. The sparse vegetation will also not overshadow the ground, allowing it to warm up in the sun and be used by invertebrates for basking.

Grassy areas should include long grass, grassy tussocks and short grassy areas so there is vegetation of differing heights. This will provide food plants for caterpillars of moths and butterflies and places for some species to overwinter or nest.

Flower-rich areas can include flowering shrubs, wild flowers, grasses etc. and should create a source of food throughout the year for adults and larvae. Try to ensure that any specific food plant requirements for rare species are met. Ideally allow space for parts of the site to always have dead seed heads and stems for species to overwinter, along with areas of flowering plants for food or places to lay eggs. Small patches of ruderal species such as hogweed, thistles and ragwort are an easy win and are great food sources.

Sites with a full range of habitats at different age stages (known as successional stages) will support the largest number of invertebrate species, so it is important to maintain this diversity. By ensuring the needs of the rare species are met (they tend to have specialist requirements) you will usually cater for the more common species as a by-product.

You can also use the principles of invertebrate mitigation to help increase the potential wildlife value of a new development. This could include creating flower-rich areas, patches of sunny bare ground or a biodiverse green roof. Analyse what features and resources are provided by the surrounding habitat and use the development to plug any gaps and complement what already exists.

Translocation

Translocating a species or habitat is a compensatory measure of last resort only. There is no evidence, particularly for invertebrates that translocation schemes are successful. There is every risk that a translocation scheme will be extremely expensive and have a high risk of failure.

Often the requirements of a particular species are poorly understood so it is impossible to translocate them with any certainty of success. For example the Four banded weevil wasp (*Cerceris quadricincta*) and Five banded weevil wasp (*Cerceris quinquefasciata*) are often absent from places where areas of suitable habitat exist, for unknown reasons.

Long term management and monitoring

Mitigation and compensation plans should have a long term management plan secured by planning conditions or ideally, a legal agreement. Adequate funds must be put aside for this and if a site is to be passed over to a nature conservation organisation for future management, an endowment will usually be required.

Monitoring must be built into the mitigation plan with detail on how often and for how long the mitigation will be monitored. It must also include prescriptions for review of monitoring data and a mechanism by which the mitigation can be altered if found to be ineffective in any way.

Case study: Brown-banded carder bee (*Bombus humilis*)

© S Falk

This species needs large areas of fairly tall, open flower-rich grasslands with a variety of plant species, particularly long-tubed flowers from the Pea (Fabaceae), Figwort (Scrophulariaceae), Broomrape (Orobanchaceae) and Mint (Lamiaceae) plant families.

These need to be distributed over a large area. They like to nest on the surface or just below ground, either at the base of long vegetation or under accumulated plant litter, most commonly in mature undisturbed grassland that has a sunny exposure and a slope.

To effectively mitigate impacts for this species it is necessary to ensure that all of the features above are available on site in sufficient quantities to support the population.

For more information please visit our Brownfield Hub and Planning Toolkit

www.buglife.org.uk/brownfield-hub

www.buglife.org.uk/planning

References

Gedge D, Grant G, Kadas G and Dinham C (2010) Creating green roofs for invertebrates. Buglife publication.

Buglife (2009) Planning for Brownfield Biodiversity: A best practice guide. Buglife - The Invertebrate Conservation Trust, Peterborough

Whitehouse, A. T. (2008) Managing aggregate sites for invertebrates: a best practice guide. Buglife - The Invertebrate Conservation Trust, Peterborough