ENGLISH NATURE

Organising surveys to determine site quality for invertebrates

A framework guide for ecologists

working towards *Natural England*
for people, places and nature

This leaflet is a guide for ecologists and other professionals who aim to use the services of a specialist to determine the invertebrate interest of a site. It should be particularly useful for Local Government Ecologists, Agency Staff and conservation bodies. Although surveys are often required by the planning regulations, you may wish to consider commissioning a survey for other reasons, for example as part of biodiversity enhancement work.

A wet flush – an example of good invertebrates habitat.
S J Falk

The planning system: when should you ask for an invertebrate survey?

The Government's objective to conserve biodiversity as an integral part of sustainable development forms a key strand of draft Planning Policy Statement 9.

Biodiversity is a material planning consideration, and planning decisions must take account of nature conservation interests, including invertebrates.

Where a proposed development is likely to impact upon biodiversity, the planning system will often require the developer to carry out a survey of the biodiversity interest of a site. Planning decisions must take account of the results of such surveys and seek to avoid significant harm to biodiversity. Where some impact on biodiversity is inevitable it should be mitigated, or compensated, by modifying the design of a development, by attaching appropriate conditions, or by means of an S106 planning obligation.

Shrill carder bee. Michael Hammett/English Nature

The degree of protection that can be given to a site's biodiversity interest through the planning system will depend on its status: legal protection under the Habitats Directive, notification as an SSSI, or a local protected designation. If the wildlife of the site forms part of a national or local Biodiversity Action Plan, or if there are other legally protected species (under the Habitats Directive or the Wildlife and Countryside Act), this will also be taken into account in the determination of planning applications.

Some developments may require an Environmental Impact Assessment (EIA) under the Town and Country Planning Regulations 1999, England and Wales. Where the requirement for an EIA is discretionary under the Regulations, the environmental sensitivity of a proposal is often a deciding factor. An assessment of the impacts on biodiversity should form part of an EIA and the process should identify opportunities to enhance biodiversity and minimise harm.

Where a formal EIA is not justified, developers should be encouraged to carry out an ecological appraisal to understand the impacts of the development on biodiversity.

A survey of a site's invertebrate interest should form part of any wider ecological assessment. There are no hard and fast rules about when an invertebrate survey should be requested from a developer, but any site that may have 'good' invertebrate interest should be examined in some way.

Sussex emerald moth – a protected species. Roger Key/English Nature

Entomologists and invertebrate specialists

The term entomologist specifically applies to someone who studies insects. Invertebrate specialists can refer to any person who studies insects, spiders, crustaceans (crabs etc), myriapods (centipedes and millipedes), leeches, molluscs (slugs and snails) and any other groups of animals without backbones, including microscopic ones.

Titles such as 'Entomologist' can imply a specialist knowledge that covers a wide spectrum of different taxonomic groups. This is usually not the case. There are over 30,000 British invertebrates and to master the identification of them all is near impossible. Although there are a few invertebrate specialists who have a very wide breadth of knowledge, most tend to specialise in one or two taxonomic groups. With invertebrate

diversity being so huge, it is only by focusing on particular groups that any expertise can be fostered. Therefore, it is far more likely to encounter a 'Lepidopterist', 'Dipterist', 'Coleopterist' or an 'Arachnologist' who study moths and butterflies, true flies, beetles or spiders respectively.

Opilo mollis – a scarce saproxylic beetle.
Roger Key/English Nature

Expertise can also be based on community types. For example, some invertebrate specialists focus on wetlands, or just those aquatic species within wetlands; others may have expertise solely in herb-dominated systems, such as grasslands, heathlands and dunes. In the examples above, the taxonomic groups covered will vary considerably between surveyors.

Where a wide number of taxonomic groups is to be covered under one project, it is not uncommon for more than one invertebrate specialist to be involved.

Swallowtail butterfly – a protected species. Roger Key/English Nature

Scoping the site

The best way to gauge likely invertebrate interest is for an invertebrate specialist to carry out a scoping visit. Experienced invertebrate specialists can have a good eye for a site's quality without necessarily undertaking a detailed survey. Such a visit focuses on habitat features, using them to estimate the site's potential for further survey. Sites with a varied habitat structure usually contain a greater invertebrate interest.

Examples include:

- Areas of **flower-rich grassland** that are NOT regularly mown, cut or grazed and are allowed to flower without interruption. These sites do not have to contain rare plants to be of interest. Composites, umbellifers, bird's-foot-trefoil and vetches in adequate numbers can be of great value as nectar and pollen sources, and many scarce plant-eating (phytophagous) insects use surprisingly common foodplants (but sometimes under very specific circumstances).

A malaise trap. Roger Key/English Nature

- Areas of **early successional habitat**, particularly on free-draining substrata such as chalk, sand, gravel and rock. These areas, when adjacent to other habitat types (such as wasteland, scrub and wetlands), can be especially good. They are often used for nesting and sunning spots, and are the focal point for many active, heat-loving (thermophilic) species. (Note that former industrial or derelict 'brownfield' sites may display many such features).

- **Wetland**, such as damp flushes, seepage lines, pools, streams, rivers, wet woodland and coastal habitats. Many rare species prefer seasonally-flooded areas as opposed to permanent water bodies and the value of such habitats should not be underestimated.

- **Scrubland** and scrubby grassland, particularly where this forms a mosaic with another habitat (such as flower-rich grassland, woodland or wetland) rather than occurring as one distinct block. Scrub provides nesting areas, perches and shelter, as well as providing food for many species.

Early successional habitat in a sand quarry. Roger Key/English Nature

- **Mature and veteran trees** can also be of high value for invertebrates, especially where these from part of a network of trees within the wider countryside. Specimens that are in middle to later stages of decay (a natural process), with hollowed trunk, are the most valuable to invertebrates. Such trees can occur along hedgerows, within parklands, orchards, wood-pasture, woodlands and in commercial plantations. Open-grown trees and those in partial shade are of higher value for invertebrates because they are often better developed and of a larger size than those within a deep canopy.

If a scoping visit has determined that a site has potential interest then it might be appropriate to follow up with a full survey. The following sections deal with the various issues of setting up and running such a survey.

Survey methodology

A competent, experienced invertebrate specialist can be left to define their own methodologies and the choice of target taxa that will prove most useful in determining a site's quality. There may be instances where a survey requires a specific technique (such as repeating a trapping method as part of long-standing monitoring of the site to make comparisons with other sites or historical records) but, in the main, an experienced invertebrate specialist will be best placed to decide what needs to be done.

Collecting aquatic samples. N Mott

A solitary bee, Megachile sp. Roger Key/English Nature

On the other hand, there is a risk that an inexperienced invertebrate specialist might use the wrong methodology for a site, only collect the groups with which they are most familiar, fail to ask the right questions, or misinterpret their results. Therefore, before choosing a surveyor, seek the advice of local ecological experience in organisations, such as the local wildlife trust, or local records centre.

Certain taxonomic groups can only be surveyed within very specific timescales. Most species become more active throughout the spring and summer months, this activity tailing off through the autumn and winter. Many species (bees, for example) have very specific flight periods, only being 'on the wing' when certain plants are in flower. It is beyond the scope of this document to go into further detail, but any survey work should be carried out at appropriate times.

Authoritative identifications and the retention of voucher specimens are also critical. Even highly-experienced invertebrate specialists will send specimens to other experts for verification.

Assessing site quality

The most critical aspect of any survey report is to define clearly the quality of the site – this should be stressed as one of the outcomes. In simple terms: how good is it for invertebrates? Any report that doesn't highlight this has failed in its remit.

Other questions worth asking are: is the site improving or deteriorating? Is it in a state of constant flux? How resilient is the site in relation to disturbance, site management and natural succession?

Exposed riverine sediment. N Mott

A survey should classify a site as one of the following:

1 Little / no importance.

2 Local / county importance: would/should qualify under County Wildlife Site Guidelines. Such sites have merit at the county level and are recognised in the planning process.

3 Regional importance: a site clearly of high interest at the regional level although not necessarily outstanding nationally. This category includes examples of species groupings and assemblages that may be poorly represented in that region but are perhaps common in other areas.

4 National importance: a site that, when compared with others, is of outstanding interest at a national level.

5 European importance: one that has features/assemblages of international significance.

The surveyor should come to these conclusions by comparing and contrasting with other sites of similar nature and habitat. For example, a site is of regional importance if it compares well with other sites within that region; a site is of county importance if it compares well with other sites within that county. Where useful data is unavailable, expert opinion must be relied upon instead.

Direct searching on exposed riverine shingle. N Mott

Where a county does not have invertebrate data for a wide range of comparable sites, it may be feasible to compare results with other datasets from outside the county. This is particularly useful when comparing your site with a site that has already been assigned a level of importance (see table opposite) and a reason for this - for example, “this site has a nationally important dead wood fauna”. Where there is little or no comparable data, every effort should be made to undertake further survey work on four or five comparable sites in the same region. Extra survey and data comparison work should be considered at the planning stage of any proposed survey or, if not carried out, highlighted as an omission.

Where information is inadequate, it is prudent to assume that the site is of high value until proven otherwise.

Site quality indicators include:

Rarity. Possibly the most commonly-used indicator of quality. Sites that support numbers of rare species can be considered as being of high nature conservation importance.

Fidelity. Fidelity measures a species selectivity to certain habitats. Some species have a very high fidelity to specific habitats and are not found elsewhere. Sites that support a number of species with a high habitat fidelity should be considered of high importance.

Species richness within any given community/assemblage. Species richness of a **specific community**, even of common species, can infer site quality. Species richness of a particular taxonomic group, especially in comparison with similar sites, can also infer quality. However, it should be noted that quality based on the **overall species richness** of a site is not necessarily indicative of quality and is often a result of the survey methods employed – it is not difficult to generate large lists of common and ubiquitous species! It must also be noted that some invertebrate communities, those in acid mires for example, have inherently low species-richness.

Seven-spot ladybird.
Roger Key/English Nature

An example of assessing site quality:

A chalk quarry contains an early successional/herb rich assemblage mainly of bees, wasps and beetles. This assemblage includes 102 species of which 33 are local, 15 are notable and three are Red Data Book (RDB) species.

This information was compared with similar sites within the county and the quarry was found to contain a greater species richness, a higher number of rare and scarce species and the largest concentration of calcicolous species. It is at least of regional importance. Further analysis would be required to determine whether it was of national importance.

Frequently-used statuses for invertebrates in descending order of rarity (based on post-1970 records):

Unknown: species for which distribution has not been fully determined. These species are often from poorly-studied groups that are difficult to identify.

Common: species readily recorded at a number of different localities throughout the UK and seemingly well distributed. Can include ubiquitous species found in a variety of situations, for example, the seven-spot ladybird *Coccinella septempunctata*, as well as common species requiring a more specific niche, for example, the common cardinal beetle *Pyrochroa serraticornis*, that lives under bark.

Local: this is a less formal category used to cover species which are not common. They may be widespread but restricted to vulnerable habitats. Many are useful indicators of a particular habitat.

Nationally scarce: species estimated to be recorded in 16-100 hectads of the National Grid.

Nationally scarce, Category B: recorded in 31-100 hectads of the National Grid, or, for less well-represented groups, between eight and 20 vice-counties.

Nationally scarce, Category A: recorded in 16-30 hectads of the national grid, or, for less well-represented groups, within seven or fewer vice-counties.

Red Data Book RDB3: rare. Estimated to exist in only 15 or fewer hectads.

Red Data Book RDB2: vulnerable. Taxa believed likely to become endangered in the near future.

Red Data Book RDB1: endangered. Species which are known or believed to occur as only a single population within one hectad of the National Grid.

Red Data Book RDBI: indeterminate. Taxa considered to be endangered, vulnerable or rare, but where there is not enough information to say which of the three categories (RDB1-3) is appropriate.

Red Data Book RDBK: insufficiently known. Taxa that are suspected, but not definitely known, to belong to one of the above categories.

IUCN categories in descending order of risk	
Critically Endangered (CR)	Extremely high risk of extinction
Endangered (EN)	Very high risk of extinction in the near future
Vulnerable (VU)	Very high risk of extinction in medium term
Lower Risk (LR). Split into:	Conservation Dependant (LRcd)
	Near Threatened (LRnt)
	Nationally Scarce (LRns)
	Least Concern (LRlc)

What communities are present?

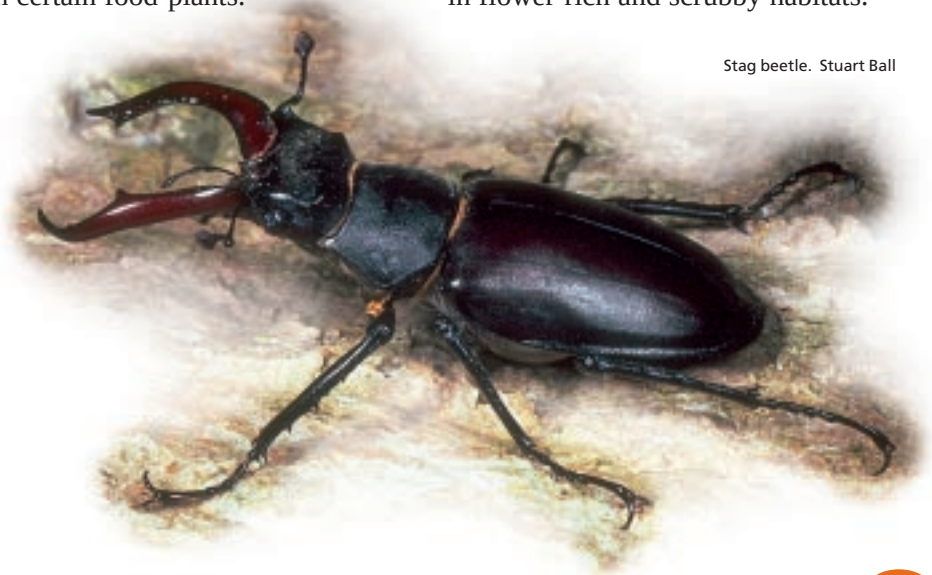
It is important to list the more valuable communities present on a site. Lists of species have their merit but when they have not been split into ecological assemblages, it is often difficult to assess which aspects of a site are of greatest significance. Therefore, any report should state the communities present, give some indication of their location on-site and their interest level.

Examples of ecological communities/ assemblages for invertebrates:

- dead wood (saproxylic)
- early successional
- aquatic
- brackish
- suites of species associated with certain food-plants.

If a survey is based on the sampling of one (or a few) taxonomic groups then it should be noted that, depending on habitat, some groups are better indicators of quality than others.

For example: bees and wasps (aculeate Hymenoptera in part) are excellent indicators of flower-rich habitats, early successional habitats and ericaceous heathland, but are generally poorly represented in wetland habitat and are thus poor indicators of its quality. Beetles are good indicators for a variety of habitats but the families represented in different habitat types vary greatly, for example, rove beetles (Staphylinidae) and ground beetles (Carabidae) are good indicators of wetlands, while weevils (Curculionidae) and leaf beetles (Chrysomelidae) are well represented in flower-rich and scrubby habitats.



Stag beetle. Stuart Ball

Species of special interest

As well as describing the communities present, there might also be instances where a particular species is of high enough interest to merit mention in its own right. These should include:

- UK BAP listed species.
- Schedule 5 species cited in the Wildlife & Countryside Act.
- Threatened species. In most instances limited to RDB1 (endangered) and RDB2 (vulnerable) species and the CR, EN and VU categories in the IUCN categories.

Where these species do occur on-site, their locations and the locations of habitats suitable for them should be noted.

How long should the survey and report take?

The time that needs to be allotted to a survey and subsequent report writing will depend on a number of factors: the number and type of taxonomic groups covered, the skill of the surveyor, the intensity of the survey and the size of the site. Unforeseen factors, such as extreme weather, might also play a part.

As a guideline, for an 'average' site (between 10 ha and 50 ha) where a

High brown fritillary butterfly.
Michael Hammett/English Nature

number of groups is being covered, then at least eight days, but preferably more, should be allotted. This would be broken down as:

- Three to seven days of field work (five to seven hours per day in summer, with less time usually needed in spring and autumn.)
- Three to seven days of identification, possibly more for difficult groups.
- Two to five days of report-writing, usually carried out in winter once the field season is finished.

If a surveyor is looking at a number of different taxonomic groups, then a number of visits over a long period (for example, between March and October) may be required. Where surveys are more specific (for

example, an aquatic survey only or where the area of land is small) then the survey time can be reduced. Conversely, larger sites will merit more work. If traps are to be set then the time taken to set and empty them, and to sort any catches must also be taken into account.

Certain habitats are more productive at certain times of the year, for example, ericaceous heathland when the heather blooms in late summer, and grasslands in June and July when most plants are in flower.

Finance

Where resources are limited, the survey should focus on areas and species that would yield the most interest (do you want a large species list from the whole site, or do you just want to know how important an area of relict fen is?). Also, given that the start of the optimum survey season coincides with the start of the financial year, it is important to sort out contracts as soon as possible, preferably a few months before the start of spring.

Soft rock cliffs – an example of good habitat for invertebrates. A Jukes

What should be included in a report?

- A description of methodologies and name of the surveyor and identifiers.
- List everything, not just the rare species. Denote which taxonomic groups have been targeted.
- List the species in more than one order; alphabetically for non-invertebrate specialists and taxonomically for invertebrate specialists.
- Provide all data – full scientific name, recorder, location, date and grid reference.
- Ensure that the site's quality – including comparisons with other sites – has been properly defined.

- Ensure boundaries demarking areas of interest have been accurately mapped.
- List factors that may affect site quality.

What the surveyor will need from you:

- Clear instructions on what the survey is intending to achieve.
- Maps for use in surveying and subsequent reporting.
- Any previous records from the site and other relevant sites.
- The contact details of useful individuals and organisations.
- The relevant access permissions and landowner contacts.

You should also:

- Ensure that the surveyor has made an assessment of any health and safety issues on site and completed the relevant Fieldwork Risk Assessment Sheets (though in some cases this might be the responsibility of the Contractor).
- Ensure that the surveyor has been given a reasonable deadline. Most invertebrate specialists will undertake report writing in the winter, so a mid-winter deadline would be reasonable for many.

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Netted carpet moth. Michael Hammett/English Nature 24,717

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Top left: Old oak in field margin, Devon. Roger Key/English Nature
Bottom left: Chrysis ignita. Roger Key/English Nature
Main: Water beetle survey. M Nott

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