Common Standards Monitoring Guidance

for

Terrestrial and freshwater invertebrates

Version March 2008

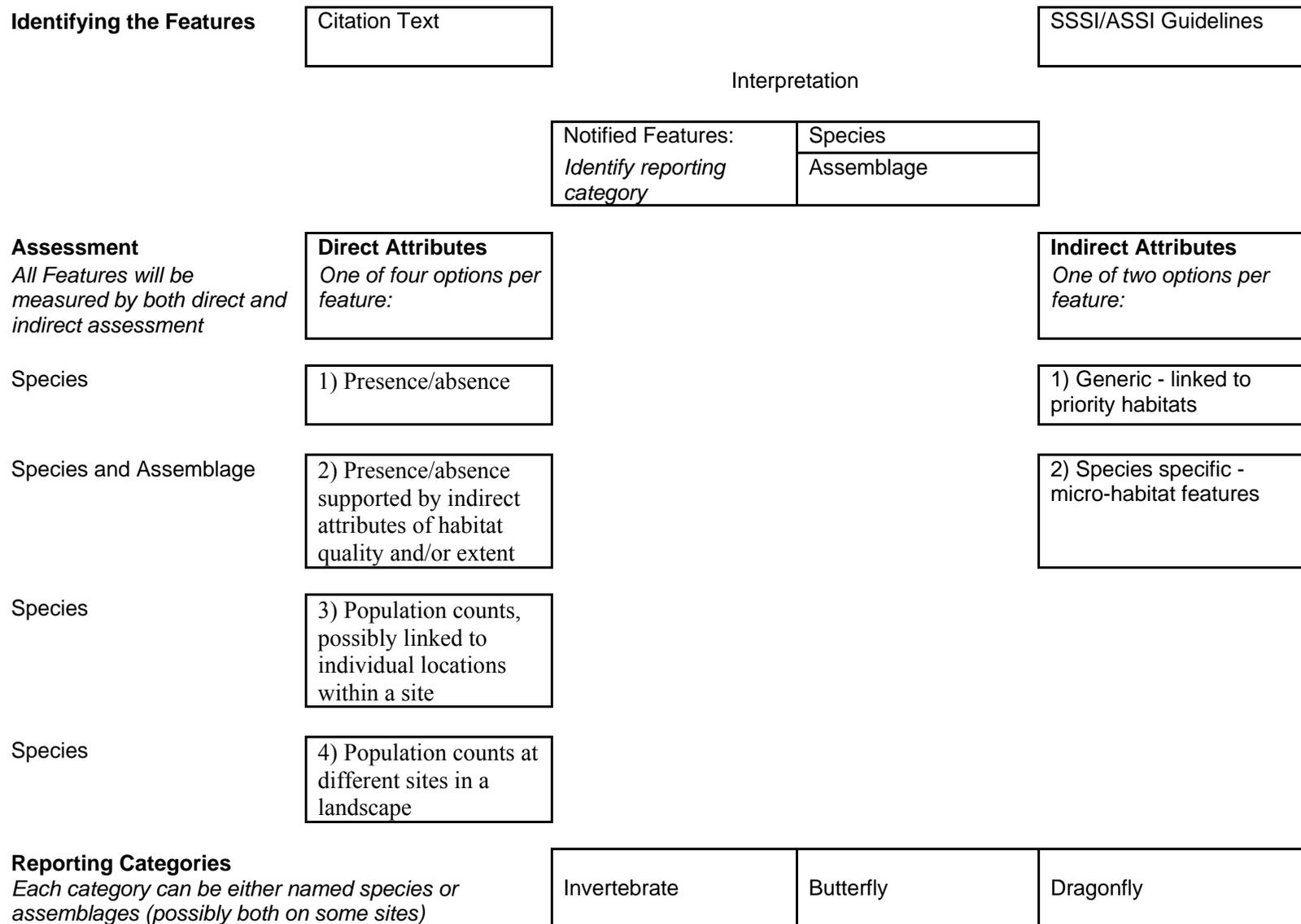# Common Standards Monitoring guidance for terrestrial and freshwater invertebrates

1.   Introduction

1.1.   Many invertebrates have features that make them both excellent indicators of the state of a given environment and challenging to identify and conserve. They often have an annual life cycle with several life stages, each stage reliant on different features of the environment. Hence, they have complex and specialised habitat requirements. Very few invertebrates have a life stage that can live for a long period of time to survive adverse conditions; there is no equivalent to the phenomenon of a seed bank as there is for plants. Many invertebrate species are relatively immobile; they do not travel far so they may be unlikely to re-colonise areas after local extinction events. As a result of these three attributes many species of invertebrate are very sensitive to changes in the condition of their environment and as a consequence many are excellent indicators of habitat quality and historical continuity of their required habitat features.

1.2.   Invertebrates often need different conditions at different stages of their life cycle e.g. a dragonfly will lay its eggs in or very near water, the larvae live as totally aquatic animals, these then emerge as adults. The adult stage needs emergent vegetation to live amongst and may need to forage over a wide area to find food. As a result of their small size invertebrates often have very specific needs at a small scale, a so called micro-habitat feature. This may be a small stretch of sun-drenched sand for a bee to nest in, or a rot hole in a tree for a hoverfly larva to develop in. Following on from the need for different conditions at different life stages, a series of suitable microhabitats near together is often needed, i.e. a habitat mosaic that is diverse often at a range of scales, from juxtapositions of major habitats to small scale variations in the structure and species composition of a vegetation type.

1.3.   Further background information can be found in the *Guidelines for selection of biological SSSIs* (NCC, 1989) and in Kirby (2001) *Habitat Management for Invertebrates: A Practical Handbook*.

1.4.   The guidance given here deals with common standards monitoring (CSM) for those designated sites, including SSSIs and SACs, that specifically identify invertebrates as a site feature. This chapter provides guidance on the identification of interest features, attributes, targets and methods of assessment.

1.5.   The following schema indicates the process needed to assess invertebrate features. Further details are given in the sections that follow.

| **Identifying the Features** | Citation Text | | | SSSI/ASSI Guidelines |

Interpretation

Notified Features:	Species
Identify reporting category	Assemblage

| **Assessment** *All Features will be measured by both direct and indirect assessment* | **Direct Attributes** *One of four options per feature:* | | | **Indirect Attributes** *One of two options per feature:* |

| Species | 1) Presence/absence | | | 1) Generic - linked to priority habitats |

| Species and Assemblage | 2) Presence/absence supported by indirect attributes of habitat quality and/or extent | | | 2) Species specific - micro-habitat features |

| Species | 3) Population counts, possibly linked to individual locations within a site |

| Species | 4) Population counts at different sites in a landscape |

| **Reporting Categories** *Each category can be either named species or assemblages (possibly both on some sites)* | Invertebrate | Butterfly | Dragonfly |

2.   Defining the interest feature

2.1.   The guidance in this chapter deals only with those invertebrate species and assemblages which qualify as notified features according to the *Guidelines for selection of biological SSSIs* (NCC, 1989), or according to similar guidelines that have been used to select ASSIs, or which appear on the Habitats and Species Directive Annex IV.

2.2.   There is much variability in the way that invertebrates have been listed in SSSI/ASSI citations. Some clearly state the invertebrate interest feature of a site although most do not. Some describe the site as "important for its assemblage of beetles" or "has a good assemblage of dry grassland invertebrates" without mentioning any individual species. More recent citations/criteria sheets may list 150+ species, including those in obscure taxonomic groups or that are very difficult to identify. Such species were included on the citation for the purpose of indicating the quality by documenting those species that have been recorded there, rather than as a species list to form a monitoring objective. Common species e.g. the common blue butterfly, are sometimes mentioned as part of a general site description; these are not appropriate for monitoring. Sites that have been designated under the Habitats and Species Directive as Special Areas of Conservation (SAC sites) will have a designation sheet clearly outlining the interest feature. All such features should be monitored.

2.3.   Three chapters in the SSSI/ASSI guidelines deal explicitly with invertebrates: Invertebrates, Butterflies and Dragonflies and these are the reporting categories used within CSM. The guidelines have been interpreted, based on current practice within the agencies, and are set out at Annex 1. In simple terms applying the guidelines results in a site being designated either because it has one or more important invertebrate assemblage or, a strong population of one or more named rare or threatened species.

2.4.   Application of the SSSI guidelines produces three types of invertebrate features: individual species, taxonomic assemblages and habitat assemblages. A considerable amount of work has been done by Country Agency specialists to identify which SSSIs have been notified for invertebrates, interpret the SSSI citation for each site and to derive a workable set of terms to describe the invertebrate assemblages listed. Approximately 900 SSSIs have been designated in the UK, at least in part, on the basis of one or more invertebrate interest features. To ensure consistency, and to make the task simpler, Country Agency specialists have analysed all the SSSIs notified for invertebrates in each country. The resulting lists have been compiled and are presented here for use in CSM.

2.5.   Individual Species considered to be invertebrate interest features are tabulated at Annex 1. The list includes species identified as qualifying features for SAC sites.

2.6.   Taxonomic Assemblages. This refers to dragonfly assemblages identified in chapter 19 of the SSSI guidelines. Some citations will refer to assemblages based on a particular taxon e.g. water beetles or diptera (flies); such terms are, however, not considered to be consistent with the SSSI guidelines and have been replaced by the appropriate habitat term – see next section).

2.7.   Habitat Assemblages. As noted earlier, the terms used in citations to define an invertebrate assemblage can be very broad e.g. 'a good invertebrate fauna' with little or no supporting evidence, or more closely defined e.g. 'a significant water beetle assemblage' backed up by a report of systematic survey. Where a citation refers to an assemblage it must be defined by its ecological character and may be further restricted to a particular taxon. Some citations may also list species names: these are considered to be indicative of the assemblage and are not treated as individually qualifying species (unless the species has been identified as such in the previous section). All SSSI citations that refer to invertebrates, and where the intention is to notify an assemblage, have been assessed. Assemblages have been defined using either commonly recognised habitat terms or simple habitat descriptors and have been organised in to a two level hierarchy. The assemblage descriptors are given at Annex 2. If significant gaps are found in

this hierachy, please bring them to the attention of monitoring staff in the relevant country agency.

3. *Selection of attributes for invertebrate interest features*

3.1. A combination of direct (species observations) and indirect (habitat character) attributes must be monitored to assess all invertebrate features. This combined approach is necessary because neither direct nor indirect attributes alone would allow a sound assessment of feature condition. Failure to meet targets for either set of attributes will lead to the feature being judged unfavourable.

3.2. For most invertebrates the only possible direct measure will be purely qualitative i.e. presence/absence. For some species qualitative measures of a non-adult life stage will be needed to have some assurance that a population is both resident on the site it is being assessed for and is reproductively viable.   Where more quantitative measures are possible they should be used. In most cases these species will be BAP species or have other active programmes of work associated with them, examples of such species include the marsh fritillary butterfly and the ladybird spider. The table at Annex 1 identifies which species may be monitored quantitatively.

3.3. It is not possible to draw up a list of all species that may contribute to a given assemblage, confounding factors such as altitude and latitude prevent the preparation of a universally applicable set of lists. The aim here is to gather sufficient evidence to be confident that a given assemblage still exists on site and is viable. Such an assessment can only be done in close conjunction with the indirect attributes. A decision on which indirect attributes to choose should commence with consideration of the attributes used in the assessment of habitats (see other parts of the CSM guidance). The attributes used for assessing habitats may need to be modified to take account of the scale at which the invertebrates being assessed use the habitat. In case of doubt, please seek advice from country agency invertebrate specialists. Expert help may also be needed to identify whether a sufficient number of species associated with the feature are still present.

3.4. The measurement of direct attributes is likely to be provided by a variety of sources: by agency staff, by specialist contractors, and by co-ordination with voluntary groups or other organisations.

4. *Using the tables to identify attributes and targets*

4.1. The invertebrate interest features identified for a site will consist of one or more named species or one or more assemblages.   The individual species that are currently identified as notified features are given in the table at Annex 1 and assemblages at Annex 2.

4.2. The table of individual species given at Annex 1 identifies which species should be monitored in which country or countries. These tables should be used to identify the appropriate attributes for the species.

4.3. Once the appropriate species has been located in the tables, consideration should be given to identify appropriate indirect attributes to monitor the species.   In some cases these attributes will already be being assessed as part of a notified habitat on the site. Direct attributes will also need to be assessed for these species; these are discussed in section 5 below and tabulated at Annex 1.

4.4. As with individually named species, all invertebrate assemblages will be assessed using a combination of direct and indirect attributes. The only feasible direct attribute for an

assemblage is the presence or absence of a suite of characteristic species. Invertebrate assemblages are usually notified as a collection of species representing a rich diversity of micro-habitats within a biotope. At any particular site this mosaic will vary and, coupled with biogeographically considerations, this means that the identification of species that characterise an assemblage will have to be done on a site by site basis. Expert opinion should be sought to agree on the component species at each site.

5. *Measurement of direct attributes*

5.1 Knowledge of the status of invertebrate populations on sites varies considerably from species to species and the choice of direct attributes must reflect this. Essentially invertebrate species fall into four categories.

- Many species are difficult to find, or their ecology is imperfectly known, and hence they are not reliably sampled during a monitoring programme. For these species presence/absence is the only applicable direct attribute.
- The second category concerns species whose ecology is reasonably well-known and are readily recorded during targeted surveys, but are difficult to sample quantitatively. The direct attribute for this group links presence/absence with occurrence in patches of suitable habitat within a site.
- The next category covers many of the more conspicuous invertebrate groups, such as butterflies and dragonflies, where it is possible to obtain reliable quantitative samples of the population and to identify occupied and potential habitat patches.
- Finally, for a few well-studied species known to exhibit metapopulation dynamics, it may be necessary to assess condition of the feature by considering multiple sites in the landscape, not all of which will have been notified as ASSI/SSSI.

These categories can be presented as follows:
(1)   Presence/absence
(2)   Presence/absence supported by indirect attributes of habitat quality and/or extent.
(3)   Population counts, possibly linked to individual locations within a site
(4)   Population counts at different sites in a landscape.

The table given at Annex 1 indicates the appropriate level of direct assessment for each species and also indicates which life stage or stages should be assessed. Examples of Conservation Objectives for each of these categories are presented here.

CATEGORY 1 SPECIES (example 1):

Conservation objective (for when the feature is in Favourable Condition)	To maintain the ground beetle *Panagaeus crux-major* in Favourable Condition where
Lower limit	The species is recorded at least once during each reporting cycle

Considerable effort has been undertaken on survey for this ground beetle in recent years but most of the few discoveries have been fortuitous, rather than as part of targeted surveys. There is currently no reliable way of finding *Panagaeus crux-major* in the UK, either as a result of genuine rarity at the sites where it occurs or as some aspect of the species' behaviour or micro-habitat. Nor is there any clear idea of the species' macro- or micro-habitat associations, other than an apparent requirement for a fluctuating water level. Attributes cannot, therefore, be set to judge the condition of an area of habitat as to the suitability for this species. The minimum

target for Favourable Condition as presence during the reporting cycle therefore has to be applied until such time as there is better information on the species' ecology and life-cycle.

CATEGORY 1 SPECIES (example 2):

Conservation objective (for when the feature is in Favourable Condition)	To maintain the jumping spider *Heliophanus dampfi* in Favourable Condition on Cors Fochno, where
Lower limit	adult spiders are recorded as present on: 8 of the 15 sections of the monitoring transect.

This spider can be caught with a sweep net from shrubby vegetation on the few lowland raised mires it is known to occur on. Baseline surveys can define its area of occupancy and a transect established which traverses suitable habitat. It is reasonable to expect to find adult specimens in at least 50% of these sections. However, little is known of its ecology at present and hence it is not currently possible to identify indirect attributes.

CATEGORY 2 SPECIES:

Conservation objective (for when the feature is in Favourable Condition)	To maintain the leaf-beetle *Cryptocephalus coryli* in Favourable Condition where
Lower limit	The species is recorded at least once during each reporting cycle in all compartments from which it is known on each site.
	and
Habitat extent Lower limit	Current extent of suitable habitat, as defined during baseline survey
Definition of suitable habitat	Sparse (10-25% cover) young (>5m height), seed-derived birch, in an intimate mosaic with dry *Calluna* heath, lichen heath or *Deschampsia* or *Festuca* grassland, with pockets of birch leaf litter in which larvae develop. Favourable areas have very free drainage and very warm microclimate, protected from cold winds by denser scrub or woodland margins, and core areas on the southern chalk are on south-facing slopes.

Numbers of this brightly-coloured and conspicuous leaf-beetle fluctuate wildly between years. It is unclear whether this represents fluctuations in the strength of the population or the detectability of the species dependent on ambient conditions. Setting a direct attribute for the numbers of individuals of the species would, therefore, appear to be impractical. However, the habitat conditions within which good populations of the species are found are now well known and hence an indirect attribute based on extent of suitable habitat can be utilised.

CATEGORY 3 SPECIES:

Conservation objective (for when the feature is in Favourable Condition)	To maintain the belted beauty *Lycia zonaria* at Morfa Conwy in Favourable Condition where:
Lower limit	In one year in six, the number of adult ♀♀ recorded during a single sampling visit is: 200
Lower limit	and where: 160♀♀ are recorded in the core area and 40♀♀ are recorded in the smaller colony
	and
Habitat extent **Lower limit**	Suitable habitat exists in 10 of the 14 previously occupied sections
Habitat quality **Lower limit**	50% of the habitat is in suitable condition in both Sections A to K and in Sections M to T.
Definition of suitable belted beauty habitat	Mosaic of bare, sandy ground and short, flower-rich turf (a vegetation height of 0-3cm) with *Lotus corniculatus* present within a 25cm radius of any point in April.

The belted beauty population at Morfa Conwy has been under surveillance since 1995. The flightless females are easily counted during daytime surveys and numbers of adults have been recorded for each of seventeen identifiable sections. As they are flightless it is possible to characterise the habitat conditions under which the population thrives. The targets set here are based on the surveillance data and baseline mapping of the habitat.

CATEGORY 4 SPECIES:

Conservation objective (for when the feature is in Favourable Condition)	To maintain the marsh fritillary *Euphydryas aurinia* metapopulation in Favourable Condition where
Lower limit	in one year in 6 the number of larval webs is estimated to be: 200 per hectare of Good Condition habitat
	and
Habitat extent: **Lower limit**	50 hectares of Available marshy grassland, including
Lower limit	10 hectares of Good Condition marsh fritillary habitat
	and

Habitat extent: **Lower limit**	each area of Available marshy grassland vegetation is maintained at baseline extent (i.e. no net loss of habitat capable of supporting this species)
Lower limit	Good Condition marsh fritillary habitat does not fall below 80% of baseline extent
Definition of Good Condition marsh fritillary habitat	Grassland, with *Molinia* abundant where, for at least 80% of sampling points, the vegetation height is within the range of 10 to 20 cm and *Succisa pratensis* is present within a 1 m radius. Scrub (>0.5 metres tall) covers no more than 10% of area.
Definition of Suitable marshy grassland	Stands of grassland where *Succisa pratensis* is present at lower frequencies but still widely distributed (>5% of sampling points) throughout the habitat patch and in which scrub (>0.5 metre tall) covers no more than 25% of area. Alternatively, *Succisa* may be present at high density in close-cropped swards. [note: Available habitat is the total of Good Condition and Suitable habitat]

The marsh fritillary is a well-studied butterfly that occurs in metapopulations. Favourable Condition of the marsh fritillary as a Feature of a site is therefore dependent upon the extent and quality of habitat patches at landscape scale. The attributes and targets selected here reflect current research on the amount of habitat required to support a viable metapopulation, whilst the target for the direct attribute is based on larval web densities recorded at Rhos Llawr-cwrt NNR over the past twenty years.

5.2.   Chapter 19 of the SSSI Guidelines sets out criteria for qualifying dragonfly assemblages in different regions of the GB. A similar approach has been adopted in Northern Ireland. As with individual species features, both direct and indirect attributes will be assessed. Indirect features are dealt with in sections 6 & 7. The threshold set will be above the level at which the Assemblage no longer qualifies under SSSI/ASSI Guidelines, or else must involve additional information on the abundance or distribution of the component species on a particular site.

5.3.   Monitoring of dragonfly assemblages will need to establish whether the requisite number of species are present on the site and that they are breeding there (with the necessary caveat that the baseline data refers to proof of breeding). The BDS proof of breeding criteria (Annex 3) should be used to make the assessment. If the Assemblage is sufficiently large (i.e. above the criteria level for the relevant region) then the direct attribute may refer to fewer species than have previously been recorded as breeding on site, but the threshold must be set above the qualifying figure for the Area of Search (AoS) – see figure 1 at the end of this document. This may be qualified by stipulating that certain less common species must be recorded as present, or it may be enhanced by the additional target that breeding for particular species must be recorded in a certain number of designated areas (this will have to be worked out when the baseline data is assessed). The specific threshold will have to be set on a site-by-site basis, depending upon the composition of the fauna and the range of waterbodies on site, with the aim that Favourable Condition represents the maintenance of a healthy and diverse dragonfly fauna. Assessment should be done at least once within the six year cycle. Ideally all data should be collected in one year, but if necessary this may be stretched to a maximum of three years. The British Dragonfly Society has a very active recording community. It should be possible to collaborate with local recorders to gather proof of breeding data.

5.4.   Direct measurement of invertebrate assemblages relies on finding a characteristic suite of species at the site. The minimum requirement is to directly assess the assemblage(s) on a site at least once within the six year reporting cycle. As yet very few invertebrate assemblages have been identified and assessed qualitatively, the notable exceptions are dead wood (Saproxylic

Quality Index, Fowles *et al.* 1999) and river shingle (ERS index, Fowles 2003) indices. Once the assemblage or assemblages on a site have been identified, a baseline needs to be established against which to monitor the condition of the feature. The baseline will have two sets of species characteristics: 1) the ecological affinities of the species recorded and 2) the conservation status (e.g. RDB, notable, or SAC qualifying species). The minimum requirement for CSM will be to find a similarly representative suite of species. This requirement will be tempered by recording effort: some sites have many species listed, based on several years recording. CSM can only, realistically, find a proportion of these species. As targets will be set on a site by site basis this temporal variation can be taken into account.

Box 2. Case study - Wetland: Acid Mire Assemblage at Wybunbury Moss[1]

1 Background

From Citation:
Wybunbury Moss is a nationally important site as it is one of the finest examples in the country of a 'schwingmoor' and supports an outstanding assemblage of invertebrates including many nationally and locally rare species.
.
.
The range of habitats present at Wybunbury Moss support many invertebrate species including 47 species of spider of which 5 are nationally rare and one, Carorita limnaea *is only known from this site. Three hundred and seven species of moth and butterfly have been recorded of which the Manchester treble bar* Carsia sororiata *ssp.* anglica *and the scallop shell* Rheumoptera undulata *are very rare in Cheshire. Several rare caddis-flies and beetles have also been found as well as the rare white-faced dragonfly* Leucorrhinia dubia*.*

Wybunbury Moss is an acidic mire. Features on such sites that are of importance to invertebrates include *Sphagnum* lawns, grass, rush and sedge tussocks, ericaceous dwarf scrub, stagnant water, bare peat, scattered shrubs and extensive stands of sallow.

Although there are a number of known specialist species from sites such as these, an acidic mire assemblage has yet to be defined in a qualitative fashion. Until such an index has been produced site quality will be somewhat subjective. To make an initial assessment all records from the site should be collated, with as much detail about the location it was recorded from and the time of year the record was made. The surveyor will use this to make an assessment of the likely acid mire invertebrate assemblage to be found on the site. A Review of Acid Mire Assemblages is currently in prep (Boyce) as an English Nature Research Report; which will help to define the assemblage.

For the purposes of CSM the assemblage feature to be monitored is a **Wetland: Acid Mire Invertebrate Assemblage**.

2 Sampling Guidance

For monitoring, the focus will be on ensuring that the acid mire assemblage is of national importance.

Monitoring will be undertaken at least once during a reporting cycle.

Condition Status will be assessed using a combination of direct and indirect attributes. Direct attributes will be surveyed by a suitable skilled contractor/conservation officer with considerable expertise in this field. The surveyor should be familiar with a variety of trapping

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[1] Figures given in this example have not been finalised - they are given here to show the principle i.e. that each site will have a set of targets.

and sampling techniques which are designed to record wetland Diptera, Coleoptera, Arachnida and Lepidoptera.

Techniques would normally include: water netting, pitfall trapping, water trapping, sieving and sweeping. It should be undertaken over a five day period coinciding with the peak activity period for insects (May-September). Such a survey should concentrate on the recording of wetland species but incidental records of further species will also be of interest and importance.

The survey should aim to sample all key habitats on the site There are 10 compartments at Wybunbury Moss, recording should be carried out in each.
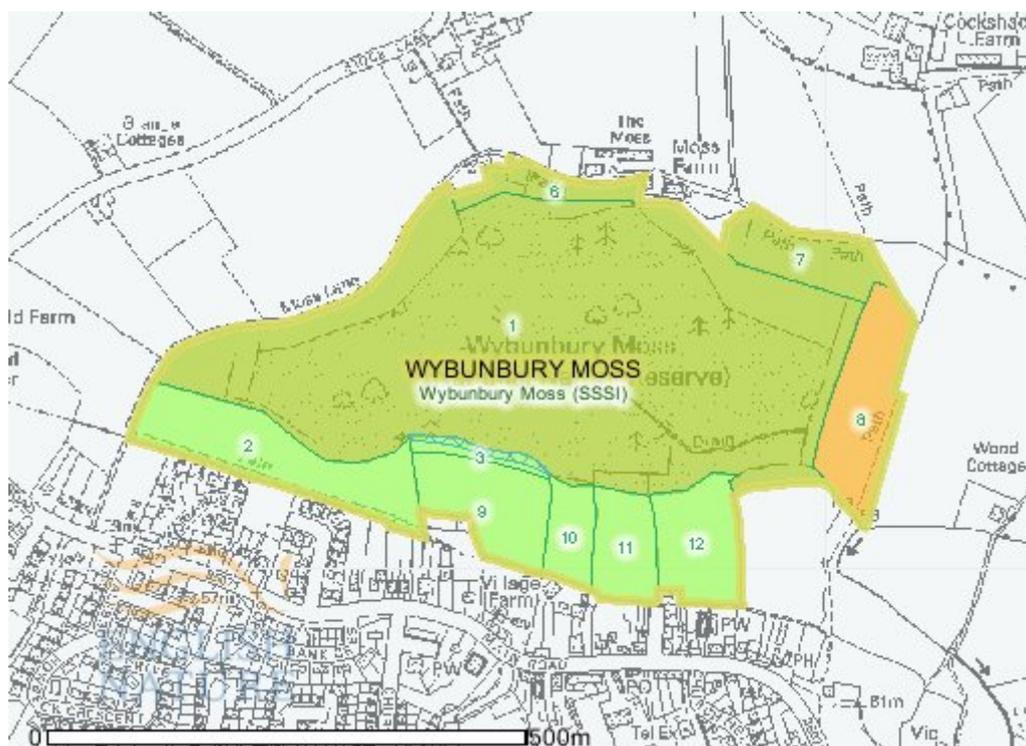
3   Condition Assessment

To assess the direct attributes of the acid mire assemblage at Wybunbury Moss two parameters must be met: the first is a measure of species fidelity and the second a measure of species quality. The species used to assess each parameter may be counted twice i.e. be an acid mire species AND be RDB/notable.

Site Thresholds

   • *A minimum of 10 species with a fidelity to acid mires.*
Information about such species can be gleaned from a number of sources (Boyce in Prep, Lott 2003) but can also include further species where information is available.

   • *Find at least 15 notable and/or RDB aquatic/wetland invertebrates*
The list in the Invertebrate Site Register (ISR) notes that eighteen notable/RDB wetland/aquatic species have been found from the site. These do not necessarily need to be indicative of acid mires.

Remember that indirect attributes will also need to be assessed for the acid mire assemblage at Wybunbury Moss.

5.5. In some cases it may be possible to be more prescriptive in determining the characteristic suite of species at a site by identifying Key Assemblage Species. The constraints to this approach are largely based on lack of detailed autecological knowledge and insufficient resources to carry out the work. The schema given below is included here to illustrate what may be possible with such constraints removed. Individual agencies will decide whether to pursue this route and when.

5.5.1. From the species list for the site, all Red Data Book and Nationally Scarce species should be included initially. Any other species considered to be strongly associated with the habitat to which the qualifying assemblage belongs (e.g. saproxylic, peatland, dune, etc.) should be added. Once this list of species has been compiled, the next step is to collate information on the known ecology of each species, perhaps in the form of a spreadsheet with key habitat elements forming the columns. For some (perhaps many) species, ecological information will be scant or non-existent; these can be ignored as clearly without any baseline information the condition of the feature cannot be assessed.

5.5.2. Once information on the known members of the Assemblage has been complied, there are three stages in defining Key Assemblage Species to use for monitoring Condition:

1. The most significant species (chiefly because of their national or regional status) have to be included in any monitoring initiative if at all possible. Clearly, if all the important species become extinct then the feature cannot be considered to be in Favourable Condition, hence the need to identify these species.
2. Key Assemblage Species must reflect the key habitat element(s) e.g. sand dune, oak woodland, upland flushes or functional guild, e.g. saproxylic species, strandline species, river shingle species. Rare species identified in Step 1 may be sufficient, but if not additional species must be selected from the Assemblage to fill the gaps. Note that there is little point in selecting species that are ubiquitous as they are likely to be able to tolerate a substantial decline in habitat quality before their populations are affected, so Nationally Scarce species are preferred.
3. Ensure that the species selected can, with reasonable expectation, be recorded during the reporting cycle as long as suitable survey techniques are employed. A species that has been recorded once in a hundred years, despite acceptable levels of recording, is not going to help assess the condition of the feature.

The Conservation Objective should then be written to focus on periodic recording (presence/absence) of this suite of species during each reporting cycle. The aim should be to confirm the presence of each Key Species but a Lower Limit for Favourable Condition can be set at 80% of the total number of Key Assemblage Species. However, at least one Key Species per habitat element should be confirmed each reporting cycle.

6. *Measurement of indirect attributes*

6.1. A decision on which indirect attributes to choose should commence with consideration of the attributes used in the assessment of habitats (see other parts of the CSM guidance). The attributes used for assessing habitats may need to be modified to take account of the scale at which the invertebrates being assessed use the habitat. In case of doubt, please seek advice from country agency invertebrate specialists.

6.2. Some species have much more specialised ecological requirements. These have been identified in the table at Annex 1, and an indication of the particular attribute to be assessed given. This attribute (or attributes) must be included in the condition monitoring of the species concerned.

7. *Factors common to both direct and indirect assessment*

7.1. The area or areas of a site that hold the invertebrate feature or features will need to be identified using a combination of knowledge about the feature and knowledge of the site. Survey will be

necessary to map the distribution and extent of the habitat resource. A simple map should be produced that identifies the areas the feature has been found in AND any other areas with suitable habitat. For example, to find dragonfly breeding sites open water in the right condition needs to be identified and recorded. Once the potential search area has been defined a sampling strategy can be developed for each feature. Possible targets would be for a feature to be present in a proportion of all dune slacks or aspen stands.

7.2. Sites vary greatly in size. On smaller sites the entire area likely to be used by the species should be assessed. On large sites and those with multiple interests, however, it may be necessary to sub-sample the site in order to allow for a practical assessment. Where this is done, it is important to select subsamples of the site that are representative of the whole area used by the species, ideally based on prior survey evidence. The target on sites that are subsampled would be to maintain the feature at a proportion of the sample locations. Once the number of sample units have been defined and the threshold determined the attributes become fixed i.e. the targets cannot be changed in subsequent reporting cycles unless there is very clear justification to do so.

7.3. Timing of assessment is dependent on the feature being monitored, guidance about timing will have to be determined on a site by site basis. As a general point, direct assessment of features should be carried out at least once in a reporting cycle i.e. once every 6 years. Indirect assessment may be more frequent in habitats that are significantly affected by catastrophic events or changes in management. Some events, such as fire damage to heathland sites, can have rapid and serious consequences for the condition of invertebrate populations.

8. Assessing the condition of individually notified species and species assemblages

8.1. Individually notified features have been identified as given in preceding sections and are listed in Annex 1 together with the appropriate attributes to be monitored.

8.2. Indirect attributes will be monitored by reference to the habitat guidance provided in other chapters of this manual, modified if necessary by expert input on the micro-habitat requirements of the species under consideration. Assessment will usually be based on the base map of suitable habitat. A number of sample areas will need to be surveyed, how many will depend on the amount of available habitat and the size of the site.

8.3. If all of the indirect attributes meet their targets but the species cannot be found on the site, then the Country Agency specialists must be consulted. The specialists will then make the final decision on the condition of the feature. A number of situations exist, particularly for cryptic, ephemeral or dynamic species, in which specialists may judge it acceptable that a species is not found.

8.4. The final assessment of the species interest feature will be produced by combining the information from the direct and indirect attributes. The conclusion must be one of the following:

8.4.1. **Favourable maintained**. All attributes, both direct and indirect, meet targets in current assessment, and previous assessment favourable.
8.4.2. **Favourable recovered**. All attributes, both direct and indirect, meet targets in current assessment, and previous assessment unfavourable.
8.4.3. **Unfavourable recovering**. At least one attribute does not meet target in current assessment. Either the direct or the indirect attributes or both can be perceived to be recovering as compared to previous assessment. The feature may also be considered to be recovering if positive management is in place, even if no measured attributes are improving, as long as the assessor is confident that the management will eventually produce favourable status.

8.4.4. **Unfavourable no change**. At least one attribute does not meet target in current assessment. No clear evidence of recovery or decline. This conclusion is appropriate if the direct and indirect attributes give differing estimates of recovery and decline.

8.4.5. **Unfavourable declining**. At least one attribute does not meet target in current assessment. Either the direct or the indirect attributes or both can be perceived to be declining as compared to previous assessment.

8.4.6. **Partially destroyed**. This conclusion could be used if some subpopulations of the species had been destroyed along with their habitat, but leaving sufficient on the site to allow for recovery to a viable population level.

8.4.7. **Destroyed**. This conclusion could be used if the species was no longer present on the site and the habitat had been lost. If the habitat is still present and in a good condition then it will be necessary to consider whether there is any possibility of the species returning to the site, including *via* species reintroduction programmes. If the possibility remains, then the feature will be unfavourable and not destroyed.

8.5. Three reporting categories, which relate to chapters of the SSSI/ASSI guidelines have been identified for invertebrate interest features:
   i. Invertebrates
   ii. Butterflies
   iii. Dragonflies
The categories are identified in the tables at Annexes 1 and 2.

9. *How to assess invertebrate interest features at a site*

9.1. The guidance outlined in this chapter refers to four, often interlinked, sets of attributes:

- direct monitoring of species interest features;
- direct monitoring of assemblage interest features (by use of characteristic species);
- indirect monitoring, by reference to the habitat chapters of the CSM guidance;
- indirect monitoring of species specific habitat features (indicated in the table given at Annex 1).

Each feature will have at least one direct and one indirect attribute to assess.

9.2. List the features for the site. These will have been determined by Country Agency specialist staff.

9.3. List the attributes to be assessed for each feature

9.4. Prepare a monitoring schedule for each feature – integrate this as far as possible with monitoring requirements for other features as given in other chapters of this guidance.

9.5. Decide who will monitor which attributes: Country Agency staff? A partner organisation? A contractor? Work can be divided between people with different skills.

10. *Use of Existing Data*

10.1. Where ever possible full use should be made of existing data and of existing monitoring or recording schemes. Where monitoring or recording is ongoing the data gathered may well provide all the necessary data to make an assessment of the condition of a feature on a site.

10.2. Invertebrates may already be being monitored on an SSSI/ASSI under as part of a number of other schemes:

10.3.   There is a legal obligation to monitor Habitats and Species Directive Annex II species and most will already be monitored.

10.4.   Monitoring BAP species is currently the responsibility of the BAP Lead Partner and/or Steering Group where one exists. Monitoring data for these species should be derived, where necessary, by liaison with the relevant Lead Partner. Some of the BAP-listed invertebrates are, however, impractical to monitor at present and monitoring should be started only when the steering group or lead partner considers it practical.

10.5.   Where Butterfly Monitoring Scheme (BMS) transects exist on SSSI/ASSI sites the data gathered should be used. Where a BMS transect does not exist on a site with a significant butterfly fauna, it may be useful to establish one, in collaboration with local naturalists and/or Butterfly Conservation.

10.6.   The Dragonfly Recording Network is run by the British Dragonfly Society and is a source of valuable distribution and proof of breeding data.

10.7.   National Recording Schemes / Biological Recording Centre / National and local societies with an interest in invertebrate species, are all potentially valuable sources of information and expertise. A useful index into information readilly available is available through the National Biodiversity Network www.searchnbn.net.

11.   References

Nature Conservancy Council (1989) *Guidelines for selection of biological SSSIs.* NCC, Peterborough.

Kirby, P. (2001) *Habitat Management for Invertebrates: A Practical Handbook.* RSPB, Sandy.

Fowles, A.P., Alexander, K.N.A. & Key, R.S. 1999. The Saproxylic Quality Index: evaluating wooded habitats for the conservation of dead-wood Coleoptera. *The Coleopterist,* **8**: 121-141)

Fowles, A.P., Alexander, K.N.A. & Key, R.S. 1999. The Saproxylic Quality Index: evaluating wooded habitats for the conservation of dead-wood Coleoptera. *The Coleopterist,* **8**: 121-141)

Annex 1: Individually qualifying species and species that have been identified as part of an assemblage

Monitoring types:

1. detect presence or absence and undertake an assessment of habitat for the beast if possible;
2. detect presence or absence over the site (i.e. check for its localities on site) and map suitable habitat;
3. population count where possible (i.e. making use of butterfly transects etc) and map suitable habitat;
4. population count, habitat mapping on a rigorous scale.

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
		E	NI	S	W				
Abdera affinis				*		Woodland			associated with fungi on birch Betula
Acanthocnema glaucescens				*		Freshwater			
Acleris abietana				*		Woodland			The larva is probably associated with pine and spruce
Acosmetia caliginosa	reddish buff	3							
Acrolepiopsis betulella				*		Woodland	Presence of wild garlic Allium ursinum.		larvae feed in the flower and seed heads of wild garlic Allium ursinum.
Adicella filicornis				*					
Aeshna caerulea	Azure hawker			*			Shallow bog pools	Dense rafts of Sphagnum	
Aeshna isosceles	Norfolk hawker	2					Marsh dykes in East Anglia	Emergent plants used for oviposition, including Stratiotes	
Aethes rutilana				*					
Agabus brunneus	a diving beetle	1/0							
Agonum gracillipes				*					
Agroecadentiger					1				
Ampedus rufipennis	a cardinal click beetle	1							

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Ancylis tineana				*					
Andrena ferox	a mining bee	2							
Andrena gravida	banded mining bee	2							
Andrena hattorfiana	a mining bee	1			2				
Anisus vorticulus	little ramshorn whirlpool snail	2							
Anthophora retusa	potter flower bee	1							
Apatura iris	purple emperor	2/3							
Argynnis adippe	high brown fritillary	2/3			3				
Argyra elongata				*					
Aricia artaxerxes	northern brown argus	2/3		*					
Armadillidium album				*					
Armadillidium pictum					1				
Asilus crabroniformis	hornet robberfly	2			2				
Aspitates gilvaria gilvaria	straw belle	2							
Atheta mortuorum				*					
Austropotamobius pallipes			*		3				
Bagous tubulus					1				
Bembecia chrysidiformis	fiery clearwing				1				
Bembidion humerale	a ground beetle	1							
Bembidion nigropiceum ?	a ground beetle	1/0 ?							

Latin name	English name	Country guidance applies to			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
		Number indicates the type of direct monitoring to be applied						
Bembidion testaceum	a ground beetle	½						
Bembidion virens				*				
Bidessus minutissimus	a diving beetle	2			2			
Bidessus unistriatus	a diving beetle	2						
Bolitophagus reticulatus				*				
Boloria euphrosyne	pearl-bordered fritillary	3			3			
Boloria selene	small pearl-bordered fritillary	3						
Bombus humilis	a carder bumblebee	2						
Bombus monticola ?		2						
Bombus sylvarum	shrill carder bee	2			2			
Bombylius minor	heath bee-fly	1						
Brachytron pratense	hairy dragonfly		*		2	Mesotrophic streams, dykes and canals.	Stands of aquatic plants used for oviposition, including ????	
Brevicornu kingi	A fly				1			
Byctiscus populi	aspen leaf-rolling weevil	2						
Callicera rufa				*				
Callicera spinolae	golden hoverfly	1						
Calliphora uralensis				*				
Callisto coffeella				*				
Callophrys rubi				*				
Carabus intricatus	blue ground beetle	1/2						

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Carterocephalus palaemon				*				
Catinella arenaria	sandbowl snail	2						
Cerastoderma lanacki				*				
Cerceris quadricincta	a solitary wasp	2						
Cerceris quinquefasciata	a solitary wasp	2						
Ceriagrion tenellum	small red damselfly			2		Oligotrophic bog pools.	Dense rafts of Sphagnum	
Cerylon fagi				*				
Ceutorhynchus parvulus				*		Is this Scottish record correct?		
Chamaesyrphus caledonicus				*				
Chirocephalus diaphanus	a freshwater fairy shrimp	2						
Chlaenius tristis				1				
Chorthippus vagans	heath grasshopper	2						
Chrysanthia nigricornis				*				
Chrysis fulgida	a ruby-tailed wasp	1						
Chrysolina cerealis				2				
Cicindela germanica	cliff tiger beetle	2						
Cicindela hybrida	northern dune tiger beetle	2						
Cicindela maritima	dune tiger beetle	2						
Cicindela sylvatica	heath tiger beetle	2						
Clepsis rurinana				*				
Cliorismia rustica	a stiletto-fly	½						

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Clubiona genevensis				1				
Cnemacantha muscaria			*					
Coelambus alineatus			*					
Coenagrion hastulatum	Northern damselfly		*			Oligotrophic bog pools.	Dense rafts of *Sphagnum*	
Coenagrion lunulatum	Irish damselfly	*				Sheltered mesotrophic lakes and large pools on cutover bogs.	Stands of emergents used for oviposition, including *Potamogeton* spp. and *Carex rostrata*	
Coenagrion mercuriale	southern damselfly	4		3		Heathland streams and flushes and chalk streams	Stands of emergents used for oviposition, including *Hypericum elodes*, *Potamogeton* spp., *Apium nodiflorum* and *Menyanthes trifoliatum*	
Coenagrion pulchellum	variable damselfly			2		Well-vegetated lakes, ponds, canals and ditches and cut-over bogs.	Stands of aquatic plants used for oviposition, including *Nymphaea alba*	
Coenonympha tullia	large heath	3		3				
Coleophora tricolor	basil thyme case-bearer	2/3						
Coleophora virgaureae	mining bee		*					
Colletes cunicularis	the vernal colletes	2		2				
Colletes floralis	northern colletes	2	?					
Cordulia aenea	downy emerald			3		Well vegetated pools, often near woodland	Length of water margin with tall emergents, such as *Phragmites*	
Coscinia cribraria bivittata	speckled footman	1						
Cosmia diffinis	white-spotted pinion	½						

Latin name	English name	Country guidance applies to — Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Crossocerus vagabundus	a digger wasp	1							
Cryptocephalus coryli	hazel pot beetle	2							
Cryptocephalus decemmaculatus	ten-spotted pot beetle	2							
Cryptocephalus exiguus	Pashford pot beetle	2							
Cryptocephalus nitidulus	shining pot beetle	2							
Cryptocephalus primarius	a leaf beetle	2							
Cupido minimus	small blue	2/3	*	*	3				
Curimopsis nigrita	mire pill-beetle	1							
Cyclophora pendularia	dingy mocha	½							
Datonychus arquatus					2				
Decticus verrucivorus	wart-biter	3							
Dictyna major				*					
Dicycla oo	heart moth	½							
Dolomedes plantarius	fen raft spider	3			3				
Donacia aquatica	a reed beetle	2	?	*					
Donacia bicolora	a reed beetle	2	?						
Dromius sigma	a ground beetle	1							
Dryocoetinus alni				*					
Dytiscus lapponicus				*					
Eilema sericea					2				
Enicmus rugosus				*					
Epione vespertaria	dark bordered beauty	3							

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Erebia epiphron	mountain ringlet	2/3		*					
Erebria aethiops				*					
Eresus cinnaberinus	ladybird spider	2/3							
Erigone psychrophila				*					
Eristalis cryptarum	bog hoverfly	3							
Eugraphe subrosea					2				
Eumerus sabulonum				*					
Eupithecia egenaria					2				
Eurodryas aurinia	marsh fritillary	¾	*	*	4				
Eurycercus glacialis				*					
Eustroma reticulata	netted carpet	3							
Eutheia linearis				*					
Euxoa cursoria				*					
Evagetes pectinipes	a spider-hunting wasp	1							
Formica aquilonia	Scottish wood ant		?						
Formica candida	black bog ant	3			3				
Formica exsecta	narrow headed ant	3		*					
Formica fusca				*					
Formica lugubris					3				
Formica pratensis	black-backed meadow ant	3							
Formica rufibarbis	red barbed ant	3							
Gabrius scoticus				*					

Latin name	English name	Country guidance applies to — Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Gastrallus immarginatus	maple wood-boring beetle	1							
Glocianus pilosellus					1				
Gnorimus nobilis	noble chafer	½							
Gomphus vulgatissimus	club-tailed dragonfly				2		Sluggish sections of unpolluted rivers	??????	
Graphoderus zonatus	spangled diving beetle	2							
Gryllotalpa gryllotalpa	mole cricket	3							
Gryllus campestris	field cricket	3							
Hadena albimacula	white-spot	½							
Hagenella (Oligotricha) clathrata				*	1				
Hamearis lucina	duke of Burgundy	1							
Helianthemapion aciculare					2				
Heliophanus dampfi				*	2				
Helophorus laticollis	a water beetle	½							
Hemaris tityus	narrow-bordered hawk-moth	3	?	*	3				
Hesperia comma	silver spotted skipper	3							
Hipparchia semele				*	2				
Hirudo medicinalis	medicinal leech	2			2				
Homonotus sanguinolentus	a spider-hunting wasp	1/0							
Hydaticus transversalis					2				

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Hydraecia osseola hucherardi	marsh mallow moth	3						
Hydrelia sylvata	waved carpet	3						
Hydrochara caraboides	lesser silver water beetle	2				exposed, richly vegetated ditches and ponds		
Hydrochus nitidicollis	a water beetle	1/2				exposed riverine sediments, mostly of the shingle type		
Hydrophilus piceus				2				
Hydroporus elongatulus			*					
Hydroporus necopinatus roni	a diving beetle	2						
Hydroporus rufifrons	a diving beetle	2	*					
Hypebaeus flavipes	Moccas beetle	1						
Hypocaccus rugiceps			*					
Idaea dilutaria	silky wave	3		2				
Idaea ochrata cantiata	bright wave	1						
Idiocera sexguttata				1				
Ilyobates nigricollis			*					
Ischnura pumilio	Scarce blue-tailed damselfly		*	2		Shallow, sparsely vegetated, pools and runnels	Stands of emergents used for oviposition, including ???	
Isogenus nubecula				2				
Judolia sexmaculata			*					
Laccophilus poecilus	a diving beetle	2						
Laccornis oblongus				2				
Lampronia fuscatella			*					
Lasioglossum angusticeps	a solitary bee							
Lasiommata megera			*					

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Lasius flavus				*				
Leistus montanus				*				
Lepthyphantes antroniensis				*				
Leptidea sinapis	wood white	½			2			
Lestes dryas	Scarce emerald damselfly						Choked ditches and weedy pools	Stands of emergents used for oviposition, including *Carex* and *Scirpus* spp.	
Leucorrhinia dubia	white-faced dragonfly	2			3		Oligotrophic bog pools.	Dense rafts of *Sphagnum*	
Libellula fulva	scarce chaser						Rivers, dykes and ponds with tall emergent vegetation.	Length of water margin with tall emergents, such as *Phragmites*	
Limnoxenus niger					2				
Limonia (Melanolimonia) stylifera				*					
Limonia goritiensis				*					
Limoniscus violaceus	violet click beetle	1							
Lionychus quadrillum	a ground beetle	1							
Lipsothrix ecucullata				*					
Lophopus crystallinus	a freshwater bryozoan	3							
Luperina nickerlii gueneei					2				
Lycia lapponaria				*					
Lycia zonaria				*					
Lycia zonaria britannica	belted beauty	3			3				
Lygephila craccae	scarce black-neck	1							
Lysandra coridon	chalkhill blue	½							
Maculinea arion	large blue	¾							
Margaritifera margaritifera	freshwater	2	*	*	2				

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
	pearl mussel								
Melanapion minimum	sallow guest weevil	1/0							
Melanargia galathea				*					
Meligethes brevis					2				
Melitaea cinxia	Glanville fritillary	1				Coastal.	eroding coastal cliffs Food plant: ribwort plantain, Plantago lanceolata abundant on south facing slopes. Count colonies		Use data from regular monitoring undertaken by ???
Mellicta athalia	heath fritillary	3				Lowland heathland, Woodland, Lowland grassland			
Metrioptera brachyptera					2				
Microdon devius					2				
Microrhagus pygmaeus				*					
Minoa murinata	drab looper	½							
Moma alpium	scarce merveille du jour	½							
Myolepta potens	a hoverfly	1							
Mythimna turca	double line	½							
Myxas glutinosa	glutinous snail	1			2				
Nebria complanata					2				
Nebria nivalis				*					
Nemapogon picarella				*					
Noctua orbona	lunar yellow underwing	3							
Nomada armata	a cuckoo bee	1							
Nomada errans	a cuckoo bee	1							

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Oberea oculata	eyed longhorn beetle	1							
Ochthebius lenensis				*					
Ocydromia melanopleura				*					
Odontomyia hydroleon	a soldierfly	1			2				
Odontomyia ornata					2				
Odynerus simillimus	a mason wasp	½							
Oreodytes alpinus				*					
Orimarga juvenilis				*					
Orimarga virgo				*					
Orthoperus brunnipes				*					
Osmia parietina	western mason bee	2							
Osmia xanthomelana	a mason bee	2			2				
Otiorhynchus auropunctatus				*					
Oxycera dives				*					
Pachtychius 5-punctatus					2				
Pachynematus torridonensis				*					
Paludinella littorina					2				
Panageus crux-major					1				
Pancalia latreillella				*					
Pancalia schwarzella				*					
Papilio machaon britannicus	swallowtail	2							
Paracolax tristalis	clay fan-foot	1/2							
Paracymus aeneus	Bembridge beetle	2							
Paratachys edmondsi	Edmond's ground	1							

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
	beetle								
Pareulype berberata	barberry carpet	3							
Pechipogo strigilata	common fan-foot	3							
Peltodytes caesus					*				
Phagoteryx brevipennis				*					
Phyllobrotica quadrimaculata				*					
Phyllodecta polaris				*					
Plateumaris braccata					2				
Platycleis albopunctata					2				
Plebejus argus	silver-studded blue	3		*	3				
Podalonia affinis					2				
Polia bombycina	pale shining brown	1?							
Polyommatus bellargus	adonis blue	3							
Porrhomma rosenhaueri					1				
Potamanthus luteus					2				
Pseudanodonta complanata					2				
Pseudepipona herrichii	Purbeck mason wasp	¾							
Pseudomogoplistes vicentae	scaly cricket	½			2				
Psodos coracina				*					
Psylliodes luridipennis	Lundy cabbage flea beetle	2							
Ptinella limbata				*					
Pyrgus malvae					3				
Pyropteron chrysidiformis	fiery clearwing	2							
Quercusia quercus				*					

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied			Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
Rhabdomastix inclinata				*				
Rhabdomastix laeta	a cranefly	1						
Rhaebothorax paetulus				*				
Rhagonycha elongata				*				
Rheumaptera hastata	argent and sable	½						
Rhizophagus nitidulus				*				
Rhynchaenus testaceus	alder flea weevil	2						
Sabra harpagula					2			
Salebriopsis albicilla					2			
Schizotus pectinicornis				*				
Scotopteryx bipunctaria	chalk carpet	2						
Segmentina nitida	shining ramshorn snail	2						
Singa hamata					2			
Siona lineata	black-veined moth	3						
Sitona gemellatus					2			
Sitticus floricola				*				
Somatochlora arctica	Northern emerald					Small shallow bog pools	Dense rafts of *Sphagnum*	
Somatochlora metallica	Brilliant emerald					Wooded lakes and large ponds in England, in Scotland on ancient peaty lochs.	????????	
Spiriverpa lunulata	shingle stiletto-fly	½						
Stenus glacialis				*				
Stethophyma grossum	large marsh grasshopper	2						
Stigmella dryadella				*				
Stratiomys chamaeleon				*	3			

Latin name	English name	Country guidance applies to				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
		Number indicates the type of direct monitoring to be applied							
Strymonidia pruni	black hairstreak	½							
Suillia oxyphora				*					
Sympetrum sanguineum	ruddy darter		*				Margins of ponds and lakes with tall emergent vegetation.	Length of water margin with tall emergents, such as bulrush	
Synanthedon scoliaeformis				*	2				
Tapinotus sellatus					2				
Teodoxus fluviatilis				*					
Tetanocera freyi				*					
Thanasimus rufipes				*					
Thanatophilus dispar				*					
Thecla betulae	brown hairstreak	½			2				
Thereva inornata				*					
Thinobius newberyi					1				
Thymelicus acteon	Lulworth skipper	½							
Thyridanthrax fenestratus	mottled bee-fly	2							
Tipula (Savtshenkia) cheethami				*					
Tipula luridirostris				*					
Trechus rivularis					1				
Trichoniscoides saerocensis				*					
Trichopteryx polycommata	barred toothed stripe	3							
Triops cancriformis	tadpole shrimp	½							
Tyta luctuosa	four-spotted moth	3							
Vertigo alpestris				*					
Vertigo angustior	narrow-	2	*		2				

Latin name	English name	Country guidance applies to Number indicates the type of direct monitoring to be applied				Macrohabitat guidance	Microhabitat attribute	Suggested habitat quality attributes	Comments
	mouthed whorl snail								
Vertigo genesii	round-mouthed whorl snail	2							
Vertigo geyeri	Geyer's whorl snail	2	?		2				
Vertigo lilljeborgi					2				
Vertigo moulinsiana	Desmoulin's whorl snail	2			2				
Xestia rhomboidea	square-spotted clay	½							
Xylena exosoleta				*					
Ylodes (Triaenodes reuteri				*					
Zygaena lonicerae jocelynae				*					
Zygaena loti				*					
Zygaena viciae argyllensis				*					

Annex 2: Invertebrate assemblage descriptors

Assemblage type	Example sub-habitats
Cave	
Saltmarsh	pools
Coastal shingle	
Coastal Cliff	soft/hard
Sand dune	Dune slack
	Strandline
	Fore dune
Aquatic	Coastal lagoon
	Ditch system
	River
	Temporary pond
Exposed riverine sediments	Sand/shingle/silt
Grassland	Calcareous grassland
	Acid grassland
	Wet grassland
Heathland	Wet heath
	Dry heath
Woodland	Glades & rides
	Open canopy
	Closed canopy
	Wet woodland
	Leaf litter
	Fungi
Saproxylic	
Wetland	Blanket bog
	Valley mire
	Fen
	Raised mire
	Reedbed
Scrub	
Upland	Scree
	Montane heath

Annex 3: British Dragonfly Society 'Proof of Breeding' criteria

[Taylor, P. 2003. DCG Special Report - criteria for Proof of Breeding in dragonflies. *Dragonfly News,* **43**: 26-27.]

Breeding is inferred if one of the following states is recorded:

1. **Confirmed breeding**: exuviae or larvae present or teneral (newly emerged) adjacent to suitable water body. (However it should be noted that only the presence of an exuvia constitutes absolute proof that at least one specimen has completed a cycle from egg to adult at the site).

2. **Probable breeding:** pair copulating or female ovipositing or regular presence of both sexes at suitable water body (normally annual presence or a repeated period consistent with the species' life-cycle length).

3. **Possible breeding:** female seen at a water body suitable for the species where at least one male has been observed to be engaged in some form of reproductive behaviour, such as territoriality or pursuing females.

Appendix 1: Interpretation of SSSI/ASSI Guidelines for Invertebrates

Chapter 17 – Invertebrates

Para. 3.1. Under-represented macro- or micro-habitats

A small number of habitat types that are recognised as being particularly important for specialised invertebrates are poorly represented in the SSSI/ASSI series nationally. These are habitats where higher plant interest is minimal, including parklands, river shingle banks, sand quarries and soft rock coastal cliffs. The guidelines recommend that "sites containing the best examples of such features within each Area of Search (AOS) are candidates for selection as SSSI/ASSIs". The problem here lies in determining the 'best examples' as comprehensive surveys have not been carried out.

Para . 3.4.4. Schedule 5 species

All sites containing populations of the listed species qualify for consideration (this excludes butterflies listed as protected from sale only). Additional SSSI/ASSIs should be notified to give adequate protection to the Schedule 5 invertebrates and amendments to the Schedule through Quinquennial Review (or as a result of the implementation of the EC Directive) will also have to be taken into account.

Para. 3.4.5. Red Data Book Species

"Any locality supporting the strongest population in Great Britain.. ..should be regarded as a candidate site, together with localities within each AOS supporting strong populations of RDB species in well-recorded groups". This leads to possible confusion as information on the strength of populations is not available for the majority of RDB species. However, there are some clear examples where the species concerned can be regarded as a qualifying feature. Macro-moths, dragonflies, molluscs, ants and spiders are examples of groups where there is likely to be sufficient information to be able to assess populations in a local and national context. The point to make here is that the presence of an RDB species on an SSSI/ASSI should not be automatically interpreted as a qualifying feature. For most invertebrate groups, short-comings in our knowledge of species' distributions and population abundance means that it would be impossible to give a realistic assessment at present.

Para. 3.4.6. Nationally scarce and regionally scarce species

"Where possible, all nationally scarce species should be represented in the SSSI/ASSI series within each AOS where they occur". Several thousand invertebrate species are given nationally and regionally scarce status by JNCC and for most groups it would be an administrative nightmare to comply with these guidelines. In practice it is much more realistic to evaluate sites that contain a 'rich invertebrate faunal assemblage' and this is certainly one of the uses that the ISR database can be put to. There will be cases where information on the status of a particular nationally scarce species in an AOS is comprehensive enough to identify qualifying sites. However, such instances will be rare.

Chapter 18 – Butterflies

Para. 2.1 Butterflies: nationally rare species

The following species specific criteria have been used to select butterfly sites.
- Large blue and large copper may qualify a site for SSSI/ASSI designation at re-introduction sites.
- Large tortoiseshell sites qualify only if there is long-term residence (i.e. continuous occupation for at least 5 years); sites with only sporadic or transient breeding do not qualify.
- Heath fritillary: all sites with remaining natural colonies are eligible unless these are very small; large sites with dispersed colonies count as one site; introduced colonies do not normally qualify for SSSI/ASSI selection, unless they have survived for at least 10 years.
- High brown fritillary: up to three sites per AOS are eligible, or all strong colonies if there are more than three sites; large sites with dispersed colonies count as one site.
- Swallowtail: all semi-natural sites with regular breeding are eligible.

- Glanville fritillary: all coastline sites with regular occurrence qualify; inland sites qualify if breeding is regular; introduced colonies do not normally qualify for SSSI/ASSI selection.
- Silver-spotted skipper: up to five sites per AOS qualify, or all strong colonies if there are more than 5 sites.

Para. 2.2. Butterflies: endemic races

All sites for the endemic (Great Orme) races of the grayling and silver-studded blue qualify.

Para. 2.3. Nationally scarce butterfly species

The strongest three (or five) colonies in each AOS qualify, depending on the proportion of GB colonies contained within the AOS. The species covered are: black hairstreak, chequered skipper, adonis blue, brown hairstreak, duke of Burgundy, Lulworth skipper, marsh fritillary, mountain ringlet, northern brown argus, pearl-bordered fritillary, purple emperor, silver-studded blue, white-letter hairstreak, and wood white

Para. 2.4. Butterflies which have experienced substantial local declines:

Qualifying species are: brown argus, chalkhill blue, dark green fritillary, dingy skipper, grayling, green hairstreak, grizzled skipper, large heath, marbled white, purple hairstreak, scotch argus, silver-washed fritillary, small blue and small pearl-bordered fritillary. The two strongest colonies in each AOS should be considered for selection but, "wherever possible, the site selected should support colonies of some nationally rare and scarce species in addition to those identified here". In practice this implies that sites should be assessed on the basis of 'rich faunal assemblages' and the presence of these butterfly species alone should not be taken as implying that the site qualifies for selection. The white admiral is possibly expanding its range at present and hence this species should not be regarded as a qualifying feature on its own.

Chapter 19 – Dragonflies

Para 19, 2.1. Nationally rare and scarce dragonflies:

Any site that is found to have *Oxygastra curtisii, Coenagrion armantum, Coenagrion scitulum* or *Aeshna isosceles* will qualify for selection. The following species are were classified as nationally rare or scarce at the time the guidance was written: *Coenagrion haustulatum, Lestes dryas, Somatochlora arctica, Libellula fulva, Coenagrion mercuriale, Aeshna caerulea, Brachytron pratenense, Coenagrion pulchellum, Cordulia aena, Ischnura pumilio, Leuccorrhina dubia, Somatochlora metallica, Ceriagrion tenellum* or *Gomphus vulgatissimus*. The guidelines allow a site to qualify as a candidate for selection if it contains a strong population of one or more of these species in an AOS, or if all populations are weak then the largest population in an AOS qualifies. Only resident breeding populations should be considered This is of particular relevance to the scarce blue-tailed damselfly as it is a temporary colonist of newly-created water bodies and is permanently established on far fewer sites, chiefly in shallow, slow-flowing seepages. In addition records should be within 3 years of selection date.

Para. 3.1. Outstanding dragonfly assemblages

The total number of all species of dragonfly considered to constitute an outstanding assemblage has been quantified according to the area of the country being considered. This is shown on a map (figure 1). If this number is reached or exceeded then a site may be considered for selection. The chief problem here lies in the definition of a site, as these totals are easily reached in some places if a number of different water bodies are included in a site boundary. Assemblages consisting entirely of relatively widespread species (i.e. species not mentioned under Para 19, 2.1. above) are unlikely to be regarded as 'special features'.

Figure 1: map of dragonfly numbers from SSSI/ASSI guidelines
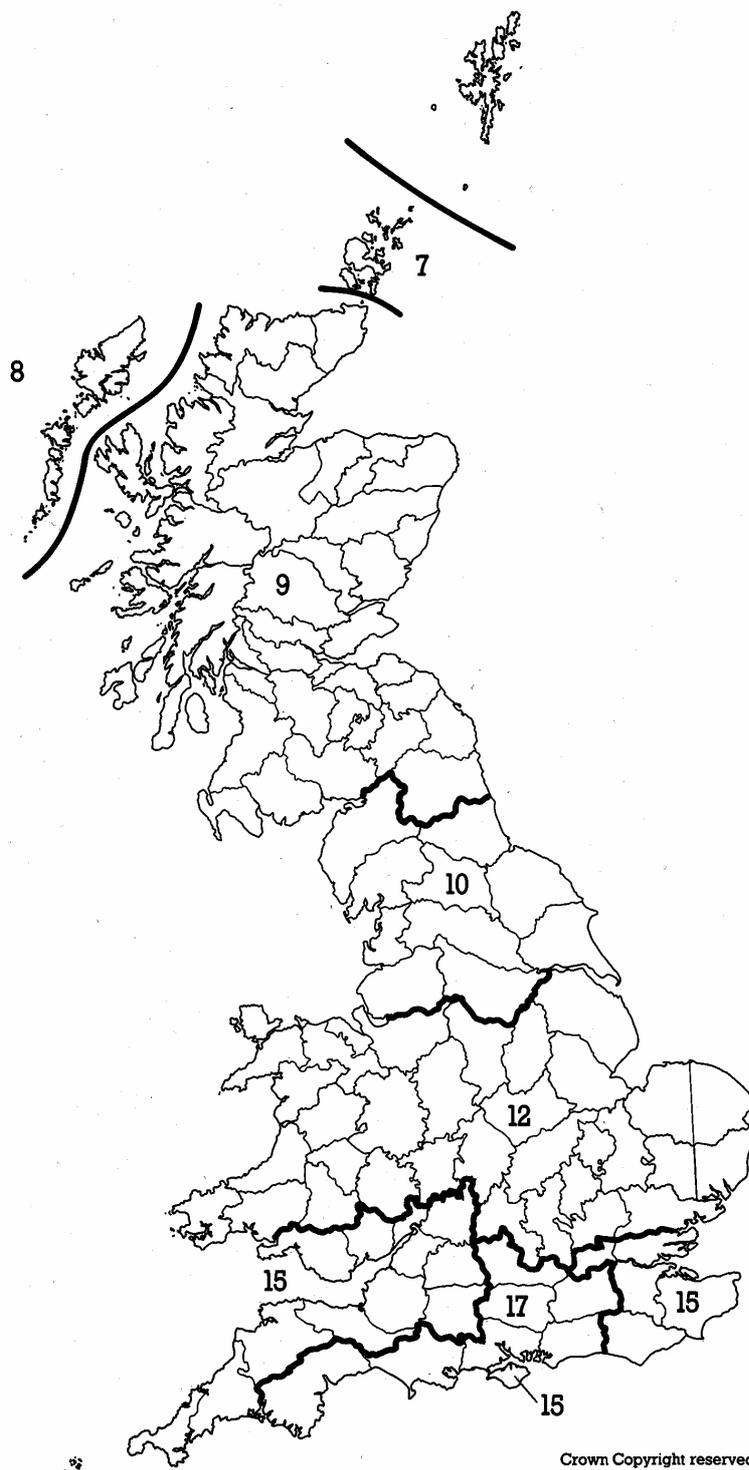

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Figure 8 Total numbers of dragonfly species regarded as outstanding assemblages in different parts of Britain

(Note that the total number of species in Shetland is too small for this concept to be valid.)