



Ashfield Land Management and Gazeley GLP Northampton s.à.r.l

Annex K: Invertebrate Survey Report

Rail Central

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RSK

Commissioned by
RSK Environment Ltd
Abbey Park
Humber Road
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RAIL CENTRAL SITE, NORTHAMPTON INVERTEBRATE SURVEY REPORT

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1 INTRODUCTION

1.1 Introductory comments

- 1.1.1 **Colin Plant Associates (UK)** were commissioned on 12th July 2016 by **RSK Ltd** to undertake an assessment of terrestrial invertebrate ecology at the Rail Central Site in Northamptonshire (“the site”).
- 1.1.2 Three sampling sessions were undertaken. An initial walkover survey of the whole site was performed on 21st July 2016; on this date, all areas of the site were seen and most were visited, with the aim of defining the areas likely to be most representative of the whole site.
- 1.1.3 Invertebrate species sampling was then undertaken on the next day, 22nd July, on 7th August and finally on 18th September 2016. This spread of dates recognises the seasonal appearance of most invertebrate species and was aimed at maximising the number of taxa available for listing and analysis. Sampling affected the whole area of the sit. However, for practical reasons it was concentrated in a number of areas that were judged likely to generate samples that were representative of the whole area. These representative areas were the hedges numbered 21, 22, 48, 49, 52, 53 and 64 in Maps 2 - 4 and all are illustrated in the site photographs in this report.
- 1.1.4 In all, three different surveyors, each with a different area of taxonomic expertise, undertook the site visits together, so that taxonomic coverage was comprehensive.
- 1.1.5 Daytime visits lasted a minimum of 7 hours, in order to ensure that all areas of the site could be visited for a period of time that was sufficient for effective sampling. Care was taken to undertake all visits on dates that supported weather conditions appropriate to invertebrate recording.

1.2 Invertebrate sampling methodology

- 1.2.1 Terrestrial invertebrate sampling involved both direct observation and active sampling using various methods, as follows:
- **Sweep-netting.** A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species.
 - **Beating trees and bushes.** A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. Black or white trays are used depending upon which group of invertebrates has been targetted for search. Insects are collected from the tray using a pooter – a mouth-operated suction device.
 - **Suction Sampling** consists of using a converted leaf-blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species, which do not fly readily or which live in deep vegetation.
- 1.2.2 Various factors contra-indicated the use of passive methodologies such as pitfall trapping and flight interception trapping.

1.3 Target species

1.3.1 A third party list of invertebrate species that had allegedly been recorded in the survey area in recent years was provided to us by you. This list is presented in Table 1, together with our initial comments.

Table 1. Third party list of recorded invertebrates, with our own comments

Species	English name	Our comments made in advance of survey
<i>Coenonympha pamphilus</i>	Small Heath butterfly	S.41 species*. Probably present.
<i>Lasiommata megera</i>	Wall butterfly	S.41 species*. Has contracted northwards and to the coastal area. Likely to be an old record. Not likely to be present in 2016.
<i>Leptidea sinapis</i>	Wood White butterfly	S.41 species*. Habitat suggests [presence on site is unlikely].
<i>Abraxas sylvata</i>	Clouded Magpie moth	Local species, associated with Elm trees. Potentially present, but not likely to be detected by the present survey as regular overnight moth recording was not commissioned.
<i>Acronicta rumicis</i>	Knot Grass moth	S.41 Research Only species**. Widespread and common and likely to be present.
<i>Adscita statures</i>	Forester moth	S.41 species*. Probably absent.
<i>Atolmis rubricollis</i>	Red-necked Footman moth	Past records most likely refers to immigrant examples, which are thus not site-related and therefore of no consequence in an ecological assessment.
<i>Entephria caesiata</i>	Grey Mountain Carpet moth	Unlikely to reflect a correct identification.
<i>Eupithecia valerianata</i>	Valerian Pug moth	Prefers damp woodland with Common Valerian plants. Unlikely to affect the surveyed area in 2016. In any event, potentially an incorrect identification.
<i>Synanthedon myopaeformis</i>	Red-belted Clearwing moth	Recently realised to be far more widespread and numerous than thought. Potentially present if there are elderly and sickly apple trees in the hedges.
<i>Xanthia gilvago</i>	Dusky-lemon Sallow moth	S.41 Research Only species**. Associated with elm and possibly present, but not likely to be detected by the present survey as regular overnight moth recording was not commissioned.

* refer to Section 2.2.2 below.

** refer to Section 2.2.4 below.

2 RESULTS OF INVERTEBRATE SAMPLING

2.1 Overview

- 2.1.1 A full list of all recorded invertebrate species is presented as Appendix 1. A total of 289 invertebrate species is listed.
- 2.1.2 The list is annotated with formal National Status codes where these are better than “nationally common”; these status codes are explained in Appendix 2.
- 2.1.3 The list is also annotated with the primary ecological associations of each species, where known. Although this is only a summary of some important features, it nevertheless allows species with differing primary habitat affinities to be immediately discerned.

2.2 Species of conservation interest

- 2.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species found during the survey are now examined.

UK Biodiversity Action Plan (UK BAP) Priority Species/Section 41 Species

- 2.2.2 The UK list of Biodiversity Action Plan Priority Species remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England and Wales these statutory lists are currently presented in *The Natural Environment & Rural Communities Act, 2006*: Section 41. *List of Species of Principal Importance for Conservation of Biological Diversity in England* and Section 42: *List of Species of Principal Importance for Conservation of Biological Diversity in Wales*.
- 2.2.3 No such Species of Principal Importance for Conservation of Biological Diversity in England were recorded at the site during the present survey.

UK Biodiversity Action Plan (UK BAP) “Research only” moth species

- 2.2.4 The original list of UK Biodiversity Action Plan Priority Species *of moths* was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present. The second section is a list of 69 species that have declined in population strength by a significant amount in the past 25 years. These were defined as “not yet rare” and were flagged as UK BAP species “**for research only**”.
- 2.2.5 It is unfortunate that this “Research Only” list has been incorporated into the current priority listing process and that these species are now, therefore, of statutory interest. Many conservation bodies now specifically recommend that these species are excluded from an appraisal of Section 41 and Section 42 species (see, for example, Gwent Wildlife Trust, 2009).

- 2.2.6 Unfortunately, the species are not listed separately so that non-specialists are unable to discern them. At the Northamptonshire Rail Site, we have recorded one such “Research Only” moth species during the 2016 survey process. .

Species	English name	Caterpillar foodplant	Actual status in England
<i>Tyria jacobaeae</i>	Cinnabar moth	Ragworts	widespread and common, though perhaps declining numerically

Red Data Book Species

- 2.2.7 One of the species recorded is listed, formally, in the British Red Data Book (Shirt, 1987). It is included in the “indeterminate” category of species for which there are inadequate data.

The leaf beetle *Psylliodes luteola* is an enigmatic species with a distribution that is centred upon the Oxford area, from where it was first reported in Britain during the year 1912. For reasons that are not fully understood, there is a second population locus south of here in the general area of Dorset and Hampshire, though the beetle is numerically less well-represented here. The early stages are known to feed on various grasses, although most reports relate to adults, which tend to be most easily found by beating the foliage of trees over a collecting tray.

Nationally Scarce Species

- 2.2.8 A total of two species recorded during the survey are designated as “Nationally Scarce”. Both are included in the former Nationally Notable Na category (see Appendix 2):

The yellow-faced bee *Hylaeus cornutus* is largely confined to the south-central and south-eastern counties of England. Alongside the River Thames it is found in post-industrial habitats and disused mineral extraction sites where Wild Carrot *Daucus carota* or other white umbellifers grow in quantity. There is a close association with these flowers, especially Wild Carrot, from which the bee collects pollen to provision its cells. Nest chambers are constructed in hollow plant stems, especially those of bramble, but these may be some distance away from feeding areas so that in most cases a mosaic of grassland and scrub habitat is essential to support this bee.

The leaf hopper *Iassus scutellaris* was discovered for the first time in Britain in Surrey in 1978, and is now found widely across southern and central England despite its classification as Nationally Scarce (category Notable A). Associated with English Elm *Ulmus procera* and able to persist on low re-growth following die-back due to Dutch Elm Disease, it is similar in appearance to the common oak-feeding *I. lanio* but the colour of the forewings is generally a much brighter lime-green.

Nationally Local Species

- 2.2.9 Thirteen of the recorded species are listed formally as Nationally Local (see Appendix 2). These are listed, together with their primary associations, in Table 2, below.

Table 2. List of Nationally Local invertebrates recorded at the site during the present survey

Species	English name	Main ecological associations
<i>Amara convexior</i>	a ground beetle	open gravelly ground
<i>Anomoia purmunda</i>	a picture-winged fly	Larva feeds in the flesh of hawthorn berries
<i>Apolygus lucorum</i>	a plant bug	low plants
<i>Ceutorhynchus alliariae</i>	a weevil	ecology unclear
<i>Chrysotoxum verralli</i>	a hoverfly	grassland with associated scrub
<i>Coremacera marginata</i>	a snail-killing fly	dry habitats, especially grasslands
<i>Cryptocephalus pusillus</i>	a leaf beetle	trees, especially birch, often sallow
<i>Eupteryx florida</i>	a froghopper	various labiates
<i>Oedemera lurida</i>	a beetle	a common grassland species
<i>Orchestes alni</i>	a weevil	larva mines in leaves of elms
<i>Psylliodes chrysocephala</i>	a leaf beetle	various Cruciferae
<i>Rhamphus oxyacanthae</i>	a weevil	larva mines in leaves of hawthorn
<i>Sphecodes monilicornis</i>	a solitary bee	Cleptoparasite of halictid mining bees.

Previously reported species of interest

2.2.10 Of the list of species that are allegedly recorded from the area, and which are summarised above in Table 1, six are considered unlikely to be present here during 2016. These are:

- *Lasiommata megera* Wall butterfly
- *Adscita statices* Forester moth
- *Entephria caesiata* Grey Mountain Carpet moth
- *Eupithecia valerianata* Valerian Pug
- *Atolmis rubricollis* Red-necked Footman moth
- *Leptidea sinapis* Wood White butterfly

2.2.11 The remaining five comprise one butterfly and four moth species. The butterfly might have been overlooked; although that would be surprising, its presence would not be outstanding. The moths, on the other hand, would require specific searching for (including overnight moth recording at different dates); they could easily have been overlooked in the present survey.

- *Coenonympha pamphilus* Small Heath butterfly Grassland species
- *Abraxas sylvata* Clouded Magpie Elm, particularly in hedges
- *Acrionicta rumicis* Knot Grass Hedgerow species
- *Synanthedon myopaeformis* Red-belted Clearwing Diseased apple trees
- *Xanthia gilvago* Dusky-lemon Sallow Elm, particularly in hedges

3 ANALYSIS OF RESULTS

3.1 General comments

- 3.1.1 It is clear that the site supports a significant level of invertebrate biodiversity. This includes a significant proportion of the species that are already known by recent survey of adjoining land to the north and east.
- 3.1.2 These data can be analysed in a number of ways that allow the results to be considered in the wider context of overall significance.

3.2 Species Quality Index

- 3.2.1 In order to provide a “rough and ready” indication of site quality, an Invertebrate Index can be calculated. Using this method, invertebrates recorded are scored according to their national status as follows:

Table 3. Scores allocated to each status category

S.41 species	100 points
RDB species	100 points
Notable - Na species	50 points
Notable - Nb species	40 points
Notable - N species	40 points
Local species	20 points
Common species	no score

- 3.2.2 These scores are derived from Ball (1986) – see references in Section 5, below. Adding together the scores in each category provides the overall **Invertebrate Index**.
- 3.2.3 It has been necessary to modify the scores because Biodiversity Action Plan species (now Section 41 species) were designated after the inception of this scoring system in 1986. Here, these are treated as Red Data Book species and allocated 100 points each, except that the BAP(R) moths are afforded only 20 points as if they were “Local” species.

Table 4: Allocation of invertebrate scores and calculation of Species Quality Index

Category	Score per unit	Units	Total score
S.41 species	100	0	0
BAP(R) moths	20	1	20
RDB species	100	1	100
Notable - Na species	50	2	100
Notable - Nb species	40	0	0
Notable - N species	40	0	0
Local species	20	13	260
Common species	0	277	0
All species	-	289	480

- 3.2.4 Inevitably, raised recording effort at a site will increase the number of species recorded and in time the Invertebrate Index will also increase, rendering use of the Invertebrate Index alone of limited value unless all the sites in a comparison are thoroughly and equally recorded. In order to take account of the overall number of species recorded (as a measure of recording effort) in assessing the rarity value of a species assemblages, a **Species Quality Index (SQI)** may be calculated through simple division of the Invertebrate Index gained from a site by the number of species recorded at that site. In this way, SQI is effectively the average number of points which each recorded species is worth.
- 3.2.5 The invertebrate Index value is 480 and this is derived from a total of 289 species. Thus, the SQI value of the site is 1.66. This is a very low value; good invertebrate sites are likely to support a minimum score of around 4 or higher.

3.3 Invertebrate Species-habitats Information System

- 3.3.1 Assessment of the rarity component of the assemblage is important, but is not the only tool available. Some sites may have immensely diverse invertebrate assemblages but few rare species within these; they are of equal, if different, ecological value. It is therefore important to undertake a further assessment that also includes all of the common species. We have undertaken this using the Invertebrate Species-habitats Information System (ISIS).
- 3.3.2 ISIS is a tool introduced by Natural England to undertake common standards monitoring. It monitors the condition of sites based on the invertebrate assemblages present and evaluates their conservation value.
- 3.3.3 The ISIS assemblage types are defined by lists of characteristic species that are generally found together in nature. Broad assemblage types (BATs) are a comprehensive series of assemblage types that are characterised by more widespread species. Specific assemblage types (SATs) are characterised by stenotopic (ecologically restricted) species of intrinsic nature conservation value.
- 3.3.4 In plain English this means that instead of approaching site assessment from a “questioning” viewpoint (e.g., a client asking us “How important is habitat x at this site?”), the software instead looks at *all* of the recorded species, including even the most common, then looks up their various habitat requirements (which may be multiple for some species) and finally concludes that “for this group of species to be here then the following habitat type *must* be present”. In this way, some habitats that may otherwise have been overlooked by a surveyor might be identified so that they can be searched for and mapped.
- 3.3.5 It then continues by grading that habitat, with the highest category being determined on the basis of “if all of these species are actually here then this particular habitat *must* actually be in an ideal (favourable) condition”.
- 3.3.6 Using all of the 289 recorded invertebrate species in the analysis, ISIS has determined that the top terrestrial *Broad* Assemblage Types present at the site are as indicated in Table 5, below.

Table 5: Recorded *Broad* Assemblage Types present at the site

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness
F2	grassland & scrub matrix	10	114		90
A1	arboreal canopy	4	126		38
F1	unshaded early successional mosaic	2	110		20
A2	wood decay	2	114		14
W3	permanent wet mire	1	100		5
W2	mineral marsh & open water	0	100		2
F3	shaded field & ground layer	0	100		1
W1	flowing water	0	200		1

3.3.7 Where the invertebrate assemblage recorded indicates that the associated habitat type is in ideal condition this is flagged as “Favourable”; no such assemblages are identified at the Northampton Rail Site.

3.3.8 At a more habitat specific level, the dominant *Specific* Assemblage Types identified as present within the species inventory are identified in Table 6, below.

Table 6: Recorded *Specific* Assemblage Types present at the site

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	1		5	114
F002	rich flower resource	11		5	
F001	scrub edge	8		4	
A212	bark & sapwood decay	10		2	114
F006	dung	1		1	
A211	heartwood decay	1		1	114
F112	open short sward	1		0	110
F003	scrub-heath & moorland	1		0	

3.3.9 Again, none of the invertebrate assemblages recorded is in Favourable condition.

3.4 Overall ranking of site value

3.4.1 Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006), note that “In some EIAs (or other integrated assessments), the ecologist may be required to use other approaches to assigning levels of value (in order to be consistent across different technical subjects). In such cases, it is often helpful for the prescribed terms to be translated into the geographical scale that is set out above, so that the legal and policy consequences of any significant impact can be clearly understood by all ecologists”.

3.4.2 Invertebrates qualify for such separate treatment.

3.4.3 *Colin Plant Associates* put forward provisional invertebrate assessment criteria to CIEEM several years ago; these can be found on the CIEEM website. They have been used by invertebrate specialists and at present form the only finite guidelines available. They are presented in Table 7, below, which has been modified to accommodate the provisions of the NERC Act of 2006 – in particular the creation of “Species of Principal Importance for Conservation of Biological Diversity in England” (SPICs).

3.4.4 Within each of the geographical categorisations, the significance may be Moderate, High or Very High (there is no “Low Significance” category - such sites are already defined by the Evaluation Table). The application of Moderate, High or Very High significance at each geographical level is based on a wide number of factors and does not sit well with a table of pre-defined rules. Additionally, within a site of particular geographical significance, different component parts may have differing levels of actual significance. The allocation of the level of significance should always be performed by, or subsequently approved by, a qualified entomologist.

Table 7. Provisional criteria for site assessment based on the invertebrate fauna

Significance	Description	Minimum qualifying criteria
International	European important site	Internationally important invertebrate populations present or containing any species protected under European legislation or containing habitats that are threatened or rare at the European level (including, but not exclusively so, habitats listed on the EU <i>Habitats & Species Directive</i>)
National	UK important site	Achieving SSSI invertebrate criteria (NCC, 1989) or supporting sustainable populations of species that are listed as Critically Endangered or supporting sustainable populations of species listed in the <i>European Union Habitats and Species Directive</i> or supporting sustainable populations of species listed in and generally held to fairly belong within Red Data Book category 1 (Endangered) or supporting sustainable populations of any species protected under the UK Wildlife and Countryside Act, as amended or containing important invertebrate habitats that are actively threatened nationally (Great Britain)
Regional (for border sites, both regions must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce, rare or threatened in the region	Habitat that is scarce or threatened in the region, or which is well-represented in the region but is are or absent outside the region, and which has, or is reasonably expected to have, an assemblage of invertebrates that includes a combination of Nationally Rare Red Data book category 3) and Nationally Scarce (former Nationally Notable categories) species amounting to at Least ten such species in total or supporting sustainable populations of at least six “SPICs” (excluding “research only” moths)
County (for border sites, both counties must be taken into account)	Site with populations of invertebrates or with invertebrate habitats considered scarce, rare or threatened in the county in question	Habitat that is scarce or threatened in the county and either contains or is reasonably expected to contain an assemblage of invertebrates including a combination of Nationally Rare Red Data book category 3) and Nationally Scarce (former Nationally Notable categories) species amounting to at least five such species in total provided that these species warrant now that status which was allocated

Significance	Description	Minimum qualifying criteria
		several years earlier. or which has viable populations of at least five species regarded as Regionally Scarce by the county records centres and/or field club or which has viable populations of at least five “SPICs” .
District (e.g., Unitary Authority, City, or Borough)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the administrative District	A rather vague definition of habitats falling below county significance level, but which may be of greater significance than merely Local. They include sites for which Nationally Scarce species in the range from 1 to 4 examples are reasonably expected, but not yet necessarily recorded, sites that have 1 to 4 “SPICs” and sites that have an outstanding assemblage of “Research Only” Section 41 moths.
Local	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the affected and neighbouring Parishes (except Scotland, where the local area may best be defined as being within a radius of 5 kilometres	Habitats or species unique or of some other significance within the local area
Low significance	—	Although almost no area is completely without significance these are the areas with nothing more than expected “background” populations of common species and the occasional Nationally Scarce.

3.4.5 On the basis of these assessment criteria the site is of fairly low value as an invertebrate habitat and may support an interest that is of Local level only.

4 DISCUSSION

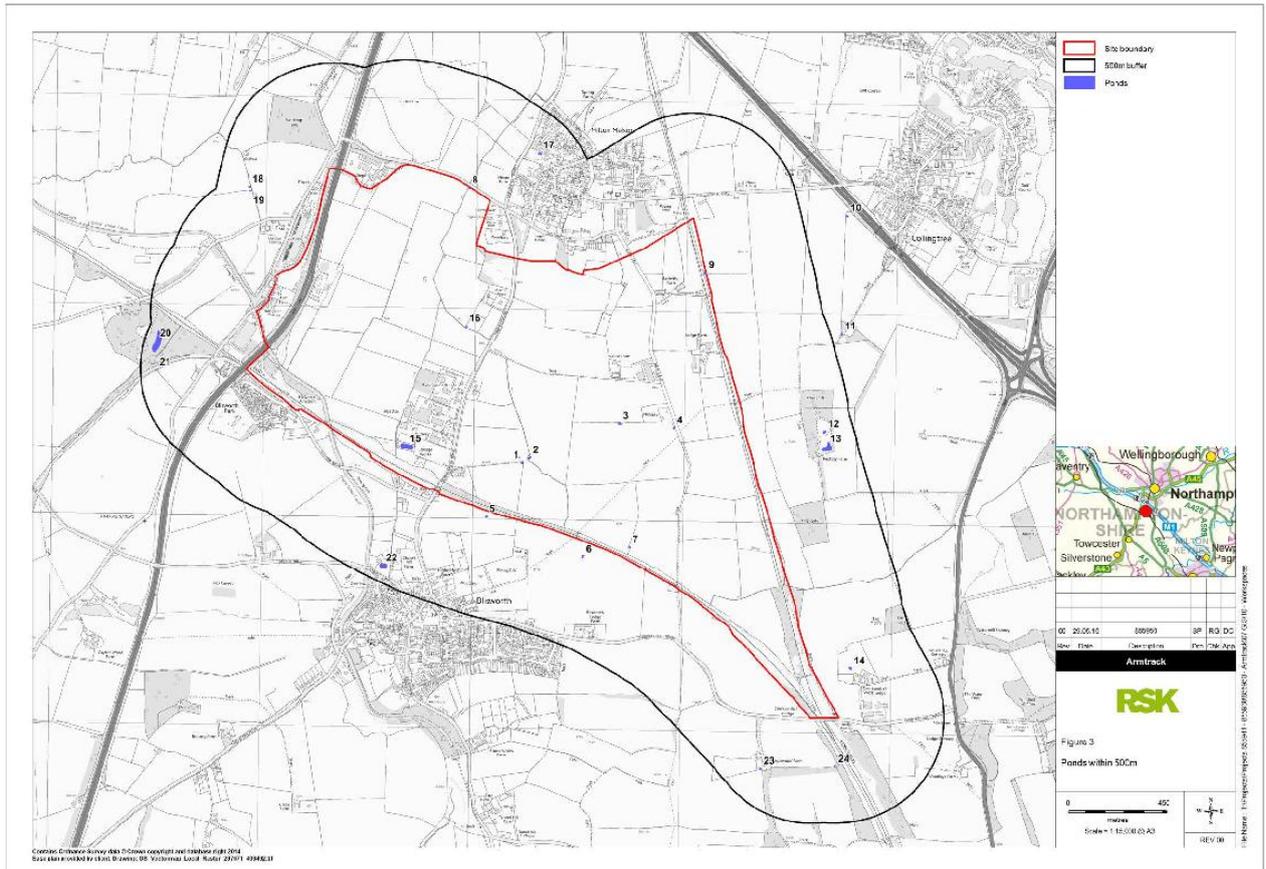
- 4.1 Passive trapping, in which traps continue to operate in the absence of the surveyor's presence, would doubtless have boosted the total of 289 invertebrate species recorded and in particular, malaise trapping might have been especially productive. However, for a number of practical reasons this was not done. Nevertheless, the inventory that has been obtained is, in our opinion, adequately representative of the terrestrial invertebrate species that affect the site and the absence of passive trapping does not adversely affect the process of site assessment.
- 4.2 It appears that the general insect biodiversity across the site is fairly low. This is because the invertebrate assemblages that affect this extensive site are limited those which can be linked to the hedgerow plants themselves; this is the "*intrinsic*" invertebrate interest.
- 4.3 The grassland and scrub matrix is also identified as a Broad Assemblage Type of invertebrates present. This relates directly to the interface zone between the fields and hedges (edge habitats or ecotones), but examination of the ISIS analysis table shows that only 10% of the invertebrate fauna is involved in this assemblage type, indicating that it is not of the highest quality whilst the open, field areas appear to support only the lowest of interests.
- 4.4 The data gathered during the 2016 survey are, undeniably, merely representative of the wider area and it is possible that intensive sampling at a large number of stations across the site over a full calendar year might allow for the detection of one or more invertebrate "hot spots". However, on the basis of the first hand knowledge gained by examining the site and in combination with significant experience at similar sites in this general geographical region of England, we consider this to be not especially likely and that the results from the various stations sampled across the site reflect the situation over the wider area.
- 4.5 Our overall conclusion is that the intrinsic invertebrate interest of the hedges and field margins across the site is, at 2016, of a fairly low level.
- 4.6 Hedgerows and associated field margins also perform a secondary function, in addition to supporting an intrinsic invertebrate interest since, by virtue of their physical structure, they act as corridors for the migration of invertebrates about the landscape. This fact is reflected in the lower-scoring or less well-represented assemblage types identified at both levels by ISIS (those that represent habitats that are self-evidently absent).
- 4.7 It is evident from the data obtained that this aspect of invertebrate ecology is also poorly represented at the site, although the restricted calendar-related limitations of the 2016 survey might mask a slightly higher value.
- 4.8 The losses to invertebrate ecology as a consequence of site development might, therefore, be relatively minor. On this basis, loss mitigation is potentially a relatively simple matter; it should strive to maintain and enhance the physical network of hedges across the landscape into the long term future.
- lost hedges should be replaced;
 - breaches in the network should be countered by establishing new and better physical links elsewhere;
 - All new plantings should involve species that are native to this general area of Britain, so that they might service residual populations of insects;
 - The physical structure of hedges should be enhanced in the long term to produce gradual rather than abrupt interface zones between hedges and fields;
 - A hedgerow management regime should be established that allows for some sections of hedge to develop without regular cutting (this is particularly important to the survival of some moths whose eggs are laid on the tips of twigs and may rest in this position for several months before hatching).

5 REFERENCES USED IN THE CREATION OF THIS REPORT AND ITS APPENDICES

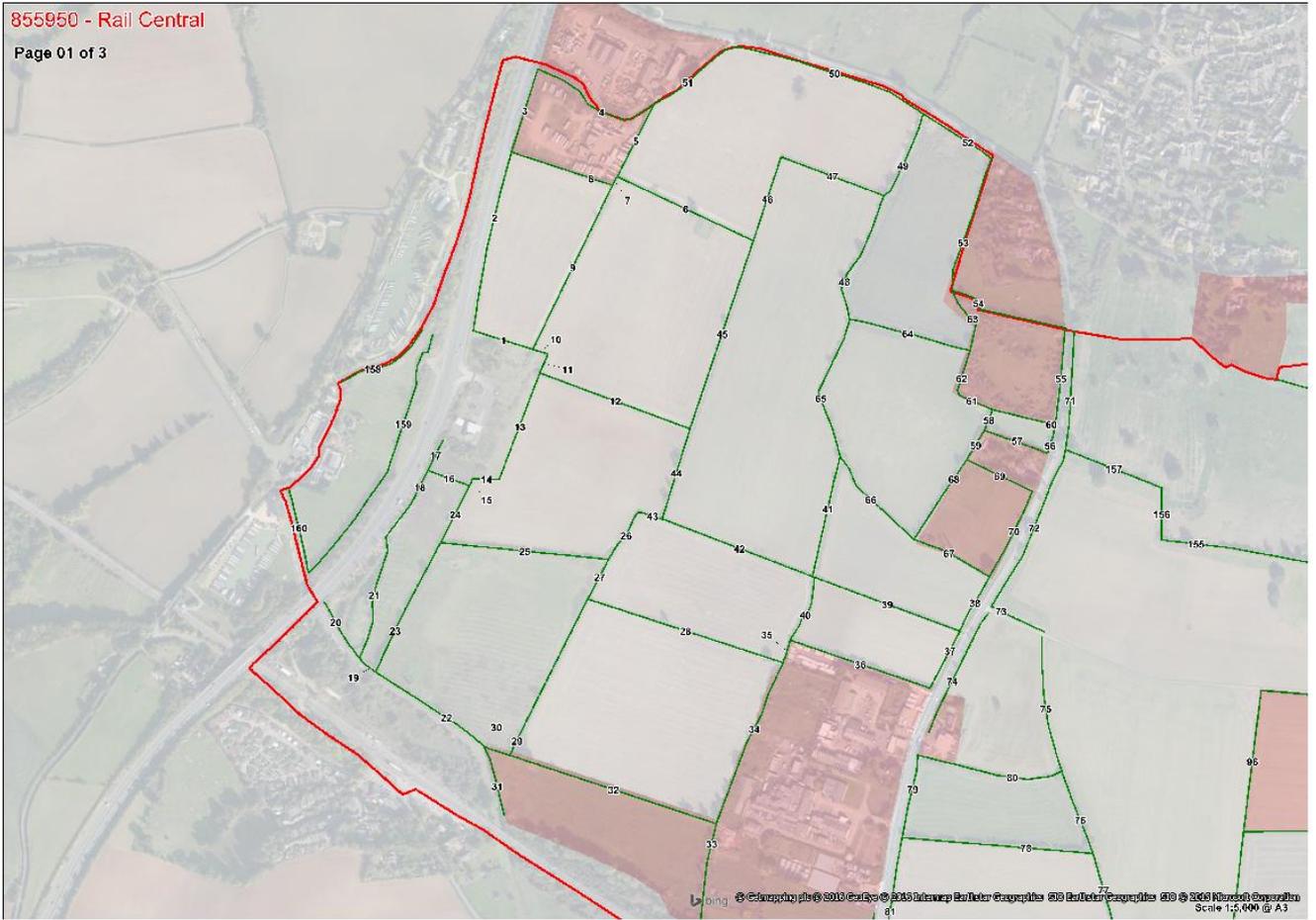
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UK Biodiversity Group	1999	<i>Tranche 2 action plans. Volume iv - invertebrates.</i> English Nature.

APPENDICES



Map 1. The overall survey area is defined by the red line



Map 2: North section of survey area, showing hedge numbers



Map 4: South section of survey area, showing hedge numbers

SITE IMAGES





HEDGES 48 & 64



HEDGE 53



APPENDIX 1: TERRESTRIAL INVERTEBRATE SPECIES RECORDED

National status codes are explained in Appendix 2.

Group / species	English name if available	National status	Main ecological associations
ARACHNIDA: ARANEAE	SPIDERS		
Linyphiidae			
<i>Lepthyphantes tenuis</i>			ubiquitous - often in grassland, but also a pioneer species
ARACHNIDA: ACARI	GALL MITES		
Eriophyidae			
<i>Aceria crataegi</i>			causes galls on leaves of hawthorn
<i>Aculus fraxini</i>			causes galls on Ash leaves
<i>Phyllocoptes goniothorax</i>			causes galls on leaves of hawthorn
COLEOPTERA	BETTERLES		
Anobiidae			
<i>Anobium punctatum</i>	woodworm beetle		larvae feed in dead timber
Apionidae	seed weevils		
<i>Aspidapion radiolus</i>			various species of Malvaceae
<i>Malvapion malvae</i>			Malvaceae - especially <i>Malva sylvestris</i>
<i>Perapion hydrolapathi</i>			dock plants - in the stems
<i>Protapion fulvipes</i>			various clovers
<i>Protapion trifolii</i>			various clovers; widespread and common
Byturidae			
<i>Byturus tomentosus</i>	the raspberry beetle		Brambles and raspberries
Cantharidae	soldier beetles		
<i>Cantharis cryptica</i>			tall vegetation, especially at the woodland/grassland interface
<i>Cantharis lateralis</i>			damp grasslands and wetlands
<i>Rhagonycha fulva</i>			tall, rank vegetation in lowland areas
<i>Rhagonycha limbata</i>			dry grasslands
Carabidae	ground beetles		
<i>Amara aenea</i>			Phytophagous species of gardens and other open, dry and sunny habitats
<i>Amara communis</i>			phytophagous species of open sites, hiding under leaf rosettes, stones, etc
<i>Amara convexior</i>		Local	open gravelly ground
<i>Amara familiaris</i>			Phytophagous species of gardens and other open, dry and sunny habitats
<i>Carabus violaceus</i>			fairly widespread in most habitats
<i>Dromius quadrimaculatus</i>			arboreal species of deciduous trees and occasionally on conifers, especially under bark
<i>Harpalus affinis</i>			a species typically of dry grasslands
<i>Harpalus rufipes</i>			ubiquitous
<i>Nebria brevicollis</i>			ubiquitous late summer and autumn species
<i>Notiophilus biguttatus</i>			most open ground habitats
<i>Pterostichus madidus</i>			ubiquitous
<i>Pterostichus melanarius</i>			ubiquitous
Chrysomelidae	leaf beetles		
<i>Altica lythri</i>			Associated with various willowherbs (Onagraceae)
<i>Cryptocephalus pusillus</i>		Local	trees, especially birch, often sallow
<i>Lochmaea crataegi</i>			Hawthorn - larvae mine the berries. Occasionally on Blackthorn or Rowan

Group / species	English name if available	National status	Main ecological associations
<i>Phyllotreta atra</i>			various Brassicaceae
<i>Phyllotreta nigripes</i>			various Brassicaceae
<i>Psylliodes chrysocephala</i>		Local	various Cruciferae
<i>Psylliodes dulcamarae</i>			Woody nightshade (<i>Solanum dulcamara</i>)
<i>Psylliodes luteola</i>		RDBK	Larvae on the seeds of grasses; adults from foliage of trees. Distribution centred on Oxford
Coccinellidae	ladybirds		
<i>Adalia bipunctata</i>	2-spot ladybird		predatory on other insects
<i>Adalia decempunctata</i>	10-spot ladybird		predatory on other insects
<i>Coccinella septempunctata</i>	7-spot ladybird		predatory on other insects
<i>Halyzia sedecimguttata</i>	Orange ladybird		predatory on other insects
<i>Harmonia axyridis</i>	Harlequin ladybird		a recent colonist in Britain
<i>Propylea quattuordecimpunctata</i>	14-spot ladybird		predatory on other insects
<i>Psyllobora vigintiduopunctata</i>	22-spot ladybird		feeds on mildews
<i>Rhyzobius litura</i>			predatory on other insects
<i>Subcoccinella vigintiquatuorpunctata</i>	24-spot ladybird		predatory on other insects
Curculionidae	weevils		
<i>Anthonomus pedicularis</i>			larvae develop in hawthorn berries
<i>Anthonomus rubi</i>			flowers of brambles and raspberries
<i>Ceutorhynchus alliariae</i>		Local	ecology unclear
<i>Ceutorhynchus pallidactylus</i>			ecology unclear
<i>Cionus scrophulariae</i>			Figworts (<i>Scrophularia</i> species)
<i>Cionus tuberosus</i>			Figworts (<i>Scrophularia</i> species) and Verbascum
<i>Magdalis armigera</i>			a weevil found on elm and other trees
<i>Nedus quadrimaculatus</i>			nettles - feeding on the flowers
<i>Orchestes alni</i>		Local	larva mines in leaves of elms
<i>Orchestes quercus</i>			larvae mine the leaves of oak trees
<i>Polydrusus pterygomalus</i>			polyphagous on broad-leaved trees, especially oak and hazel
<i>Rhamphus oxyacanthae</i>		Local	larva mines in leaves of hawthorn
<i>Sitona hispidulus</i>			larvae feed in the root nodules of clover and other legumes
<i>Sitona lepidus</i>			larvae feed in root nodules of legumes, especially clovers
<i>Sitona lineatus</i>			various legumes
Elateridae	click beetles		
<i>Hemicrepidus hirtus</i>			grassland, woodland rides, etc. The larvae feed in decaying wood and in soil
<i>Kibunea minuta</i>			a species of dry grasslands
Hydrophilidae			
<i>Cercyon lateralis</i>			in animal dung
<i>Cryptopleurum minutum</i>			found in vegetable litter, moss and dung
Kateretidae			
<i>Brachypterus glaber</i>			Nettles
<i>Brachypterus urticae</i>			Nettles
Latridiidae			
<i>Cartodere bifasciatus</i>			litter, compost, tussocks etc - more or less ubiquitous
<i>Enicmus transversus</i>			associated with fungi under bark and in other places
Malachiidae			
<i>Malachius bipustulatus</i>	a malachite beetle		grasslands

Group / species	English name if available	National status	Main ecological associations
Nitidulidae			
<i>Meligethes aeneus</i>			various flowers
<i>Pria dulcamarae</i>			various flowers - especially of woody nightshade
Oedemeridae			
<i>Oedemera lurida</i>		Local	a common grassland species
<i>Oedemera nobilis</i>			a common grassland species
Scolytidae			
<i>Scolytus scolytus</i>	elm bark beetle		under elm bark
Scraptiidae			
<i>Anaspis frontalis</i>			larvae in twigs of oak and other trees; adults at hawthorn blossom
<i>Anaspis maculata</i>			larvae in dead branches and twigs
Staphylinidae	rove beetles		
<i>Aleochara intricata</i>			ecology unclear, probably saprophagous
<i>Tachinus rufipes</i> (= <i>signatus</i>)			amongst grass litter, in tussocks, etc
CRUSTACEA	WOODLICE		
Oniscidae			
<i>Oniscus asellus</i>			damp, but not wet, habitats everywhere
Philosciidae			
<i>Philoscia muscorum</i>			under stones etc
Porcellionidae			
<i>Porcellio scaber</i>			under stones etc
DERMAPTERA	EARWIGS		
Forficulidae			
<i>Forficula auricularia</i>	common earwig		generalist species
DIPTERA	TRUE FLIES		
Agromyzidae			
<i>Agromyza anthracina</i>			larva makes mines in nettle leaves
<i>Agromyza pseudoreptans</i>			larvae mine the leaves of stinging nettle
<i>Aulagromyza heringii</i>			larva mines the leaves of Ash trees
<i>Calycomyza artemisiae</i>			larva mines leaves of Mugwort
<i>Chromatomyia syngenesiae</i>			larva mines leaves of various plant species
<i>Phytomyza lappae</i>			mines leaves of Burdock (<i>Arctium</i> species)
Anthomyiidae			
<i>Pegomya bicolor</i>			larva mines the leaves of docks and sorrels
Asilidae			
<i>Dioctria baumhaueri</i>			predatory - mainly in edge habitats
<i>Dioctria rufipes</i>			predatory - mainly in edge habitats
<i>Leptogaster cylindrica</i>			grassland predator
Bibionidae			
<i>Dilophus febrilis</i>			feeds in the roots of various plants
Cecidomyiidae			
<i>Dasineura crataegi</i>			forms galls on hawthorn
<i>Dasineura urticae</i>			forms stem galls on nettles
Dolichopodidae			
<i>Chrysotus gramineus</i>			very common predatory grassland species
Empididae			
<i>Empis (Kritepiss) livida</i>			predatory on other flies
<i>Empis (Pachymeria) femorata</i>			predatory on other flies
<i>Empis (Pachymeria) tessellata</i>			predatory on other flies
Rhagionidae			
<i>Chrysopilus asiliformis</i>			damp habitats
<i>Rhagio lineola</i>			woodland and scrub - especially at the edges

Group / species	English name if available	National status	Main ecological associations
Scathophagidae			
<i>Scathophaga stercoraria</i>			animal dung
Sciomyzidae			
<i>Coremacera marginata</i>		Local	dry habitats, especially grasslands
Stratiomyidae			
<i>Beris vallata</i>			saprophagous larvae
<i>Chloromyia formosa</i>			ubiquitous
<i>Chorisops tibialis</i>			saprophagous larvae
<i>Microchrysa flavicornis</i>			larvae feed in decaying vegetable matter
<i>Pachygaster atra</i>			woodland edge & scrubland species - larvae under dead bark of trees
<i>Pachygaster leachii</i>			woodland edge & scrubland species - larvae under dead bark of trees
<i>Sargus bipunctatus</i>			associated with the scrub/grassland interface
Syrphidae			
<i>Cheilosia bergenstammi</i>			larvae feed in the stems and roots of ragwort on dry chalky or sandy sites or in ruderal areas
<i>Cheilosia pagana</i>			larvae are thought to feed in the roots of <i>Anthriscus sylvestris</i>
<i>Cheilosia proxima</i>			larvae feed in the roots of <i>Cirsium</i> species of thistle, especially <i>Cirsium palustre</i>
<i>Chrysotoxum bicinctum</i>			grassland species - associated with ants' nests
<i>Chrysotoxum verralli</i>		Local	grassland with associated scrub
<i>Dasyrphus albostriatus</i>			aphid predator at woodland edge habitats
<i>Episyrphus balteatus</i>			ubiquitous species, partly immigrant, and a predator of aphids
<i>Eristalis arbustorum</i>			Larvae require damp habitats but adults are more or less ubiquitous
<i>Eristalis intricarius</i>			larvae feed in wet organic matter, especially in margins of water bodies
<i>Eristalis pertinax</i>			Larvae require damp habitats but adults are more or less ubiquitous
<i>Eupeodes corollae</i>			Grassland
<i>Eupeodes luniger</i>			Grassland
<i>Melanostoma mellinum</i>			Grassland
<i>Melanostoma scalare</i>			Grassland
<i>Myathropa florea</i>			larvae are semi-aquatic
<i>Neoascia podagrica</i>			edge-habitat species
<i>Platycheirus albimanus</i>			ubiquitous - larvae prey on aphids
<i>Platycheirus scutatus</i>			an edge-habitat species
<i>Sphaerophoria scripta</i>			Grassland - larvae prey on aphids
<i>Syritta pipiens</i>			larvae in decaying vegetation; adults at flowers
<i>Syrphus ribesii</i>			larvae are aphid predators on trees and bushes
<i>Syrphus vitripennis</i>			larvae are aphid predators on trees and bushes
<i>Volucella pellucens</i>			inquiline in nests of social wasps/hornet
<i>Xylota segnis</i>			Damp, dead wood
Tabanidae			
<i>Haematopota pluvialis</i>			damp habitats - adult females are blood sucking horseflies
Tachinidae			
<i>Eriothrix rufomaculata</i>			larva parasitises moth larvae

Group / species	English name if available	National status	Main ecological associations
<i>Panzeria rudis</i>			internal parasite of noctuid moths
Tephritidae			
<i>Anomoia purmunda</i>		Local	Larva feeds in the flesh of hawthorn berries
<i>Urophora cardui</i>			larvae gall the flowers of thistles
<i>Xyphosia miliaria</i>			larvae gall the flowers of thistles - ubiquitous
Tipulidae			
<i>Nephrotoma appendiculata</i>			open grassland
<i>Nephrotoma flavescens</i>			grassland and other usually open habitats
<i>Tipula oleracea</i>			ubiquitous, larvae feeding on roots of grasses
<i>Tipula paludosa</i>			ubiquitous, larvae feeding on roots of grasses
HETEROPTERA	TRUE BUGS		
Acanthosomatidae			
<i>Acanthosoma haemorrhoidale</i>	hawthorn shield bug		hawthorn
<i>Elasmucha grisea</i>			birch, occasionally alder
Anthocoridae			
<i>Anthocoris confusus</i>			trees and shrubs
<i>Anthocoris nemoralis</i>			trees and shrubs
<i>Anthocoris nemorum</i>			low vegetation
<i>Temnostethus pusillus</i>			Resides on the vertical surfaces of trees, usually in woodland
Coreidae			
<i>Coreus marginatus</i>			Develops on a variety of Polygonaceae in open habitats
Lygaeidae			
<i>Heterogaster urticae</i>			Nettles
Miridae			
<i>Apolygus lucorum</i>		Local	low plants
<i>Atractotomus mali</i>			hawthorn, apple and other trees
<i>Campyloneura virgula</i>			broad-leaved trees and shrubs
<i>Closterostomus norvegicus</i>			polyphagous
<i>Deraeocoris flavilinea</i>			predatory amongst trees and bushes
<i>Deraeocoris lutescens</i>			predatory amongst trees and bushes
<i>Deraeocoris ruber</i>			nettles, brambles and similar rough vegetation
<i>Dicyphus epilobii</i>			Epilobium hirsutum
<i>Dicyphus errans</i>			predatory amongst low plants
<i>Harporcera thoracica</i>			Oaks -solitary and in woods
<i>Heterotoma planicornis</i>			edge habitats - especially in association with nettles
<i>Leptoterna dolabrata</i>			found in a wide range of grassland habitats
<i>Liocoris tripustulatus</i>			stinging nettle
<i>Lygocoris pabulinus</i>			Polyphagous amongst low vegetation
<i>Macrotylus solitarius</i>			On Hedge Woundwort, so usually in edge habitats
<i>Megaloceraea relicticornis</i>			grass feeding plant bug of a wide range of habitats
<i>Miris striatus</i>			associated with oak
<i>Neolygus viridis</i>			primarily associated with lime trees
<i>Notostira elongata</i>			grasslands
<i>Orthotylus marginalis</i>			willow trees, occasionally alder and apple trees
<i>Orthotylus ochrotrichus</i>			polyphagous amongst tall herbage with

Group / species	English name if available	National status	Main ecological associations
			scrub
<i>Orthotylus prasinus</i>			on deciduous trees in the south - possibly prefers elm
<i>Pinalitus cervinus</i>			associated with trees - especially lime but also hazel, ash and ivy
<i>Plagiognathus arbustorum</i>			polyphagous, but usually associated with stinging nettles
<i>Plagiognathus chrysanthemi</i>			polyphagous
<i>Psallus lepidus</i>			
<i>Stenotus binotatus</i>			grasslands
Nabidae			
<i>Himacerus apterus</i>			a tree-dwelling species
<i>Himacerus mirmicoides</i>			ground dwelling predator of dry, open areas
Pentatomidae			
<i>Eysarcoris venutissimus</i>			probably polyphagous
Tingidae			
<i>Physatocheila dumetorum</i>	a lacebug		hawthorn
HOMOPTERA: APHIDOIDEA	APHIDS		
Pemphigidae			
<i>Tetraneura ulmi</i>			causes galls on elm leaves
HOMOPTERA: AUCHENORHYNCHA	PLANT HGOPPERS		
Aphrophoridae			
<i>Aphrophora alni</i>			larvae feed under froth on a wide range of trees and shrubs
<i>Philaenus spumarius</i>	spittle-bug		larvae feed under froth on a wide range of herbaceous plants
Cicadellidae			
<i>Alebra albostriella</i>			associated with oak trees
<i>Alebra wahlbergi</i>			a variety of broad-leaved trees
<i>Alnetoidea alneti</i>			found on a range of deciduous trees
<i>Aphrodes makarovi</i>			on nettles, thistles and other plants in grasslands
<i>Edwardsiana crataegi</i>			associated with hawthorns
<i>Eupteryx aurata</i>			low growing plants
<i>Eupteryx florida</i>		Local	various labiates
<i>Eupteryx urticae</i>			Usually on nettles
<i>Eurhadina concinna</i>			oaks and sometimes other trees
<i>Eurhadina pulchella</i>			oaks and sometimes other trees
<i>Iassus scutellaris</i>		NS(Na)	associated with Elm
<i>Ribautiana ulmi</i>			elm
<i>Typhlocyba quercus</i>			associated with oak trees
Delphacidae			
<i>Javesella pellucida</i>			grasses in a range of habitats
HOMOPTERA: PSYLLOIDEA	PLANT LICE		
Psyllidae			
<i>Cacopsylla peregrina</i>			associated with hawthorns
<i>Psylla crataegi</i>			hawthorns
<i>Psyllopsis fraxini</i>			galls the leaves of Ash trees
Triozidae			
<i>Triozia urticae</i>			stinging nettle
HYMENOPTERA: ACULEATA	BEEES, WASPS AND ANTS		

Group / species	English name if available	National status	Main ecological associations
Apidae			
<i>Apis mellifera</i>	honey bee		flowers in general
<i>Bombus campestris</i>			a cuckoo bee parasite of <i>Bombus pascuorum</i> and <i>Bombus humilis</i>
<i>Bombus lapidarius</i>	red-tailed bumble bee		ubiquitous
<i>Bombus lucorum</i>	white-tailed bumble bee		ubiquitous
<i>Bombus pascuorum</i>	common carder bee		ubiquitous
<i>Bombus terrestris</i>	buff-tailed bumble bee		ubiquitous
<i>Hylaeus cornutus</i>		NS(Na)	nests in stems of herbaceous plants
<i>Lasioglossum calceatum</i>			nests in burrows on steep sandy banks
<i>Lasioglossum morio</i>			excavates nest burrows in level ground
<i>Nomada fabriciana</i>	a nomad bee		nest parasite of <i>Andrena</i> bees - especially <i>Andrena bicolor</i>
<i>Nomada flava</i>	a nomad bee		nest parasite of <i>Andrena scotica</i>
<i>Sphecodes monilicornis</i>		Local	Cleptoparasite of halictid mining bees.
Chrysididae			
<i>Trichrysis cyanea</i>			parasite of sphecid wasps, especially <i>Trypoxylon</i> species
Eumenidae			
<i>Symmorphus bifasciatus</i>			nests in hollow plant stems and preys on the larvae of chrysomelid beetles
Formicidae			
<i>Lasius flavus</i>	yellow ant		grassland. A high nest density indicates long term grassland continuity
<i>Lasius niger</i>	common black ant.		generalist species
<i>Myrmica rubra</i>	a red ant		ubiquitous
Sphecidae			
<i>Ectemnius cavifrons</i>			nests in decaying wood and preys on hoverflies
<i>Trypoxylon attenuatum</i>			preys on spiders. Nests in plant stems, beetle tunnel or other cavities
Vespidae			
<i>Vespula germanica</i>	a common social wasp		ubiquitous
<i>Vespula vulgaris</i>	a common social wasp		ubiquitous
HYMENOPTERA: PARASITICA	GALL WASPS		
Cynipidae			
<i>Andricus lignicola</i>			forms a gall on oak
<i>Andricus quercuscalicis</i>			forms galls in acorns on oaks
<i>Biorhiza pallida</i>			forms the oak apple gall
<i>Neuroterus quercusbaccarum</i>			forms the hairy spangle gall on oak leaves
<i>Neuroterus tricolor</i>			causes galls on oak leaves
HYMENOPTERA: SYMPHYTA	SAWFLIES		
Tenthredinidae			
<i>Athalia bicolor</i>			ubiquitous sawfly species
<i>Athalia liberta</i>			ubiquitous sawfly species
<i>Athalia rosae</i>			phytophagous species
<i>Fenusia pumila</i>			Larvae mine the leaves of Elm
<i>Profenusia pygmaea</i>			larva mines the leaves of oak trees
<i>Rhogogaster scalaris</i> (= <i>chlorosoma</i>)			predatory species
LEPIDOPTERA 1:	BUTTERFLIES		
Hesperiidae			
<i>Thymelicus sylvestris</i>	Small skipper		grassland
Nymphalidae			

Group / species	English name if available	National status	Main ecological associations
<i>Aglais urticae</i>	Small tortoiseshell		larvae feed on Stinging Nettle
<i>Aphantopus hyperantus</i>	Ringlet		woodland edge and clearings, hedges and other edge habitats
<i>Maniola jurtina</i>	Meadow brown		grassland species
<i>Polygonia c-album</i>	Comma		nettles
<i>Vanessa atalanta</i>	Red admiral		most often recorded as an immigrant from overseas
Pieridae			
<i>Pieris brassicae</i>	Large white		various Cruciferae
<i>Pieris napi</i>	Green-veined white		ubiquitous
LEPIDOPTERA 2:	MOTHS		
Arctiidae			
<i>Tyria jacobaeae</i>	Cinnabar	BAP(R)	Ragworts
Bucculatricidae			
<i>Bucculatrix ulmella</i>			oak
Choreutidae			
<i>Anthophila fabriciana</i>	Nettle-tap		nettles
Coleophoridae			
<i>Coleophora alcyonipennella</i>			clovers
Gelechiidae			
<i>Scrobipalpa costella</i>			woody nightshade (<i>Solanum dulcamara</i>) - mining the leaves
Gracillariidae			
<i>Caloptilia semifascia</i>			Field Maple
<i>Cameraria ohridella</i>			larva mines the leaves of Horse Chestnut - a recent colonist in Britain, from Europe
<i>Phyllonorycter corylifoliella</i>			mines leaves of hawthorn and other rosaceous shrubs, rarely on birch
<i>Phyllonorycter harrisella</i>			mines leaves of oak
<i>Phyllonorycter oxyacanthae</i>			mines leaves of hawthorn and other rosaceous shrubs
<i>Phyllonorycter quercifoliella</i>			mines leaves of oak
Nepticulidae			
<i>Ectoedemia atricollis</i>			rosaceous trees, especially hawthorn, mining the leaves
<i>Stigmella aurella</i>			mines leaves of bramble
<i>Stigmella lemniscella</i>			mines leaves of elm
<i>Stigmella perpygmaeella</i>			mines leaves of hawthorn
<i>Stigmella ruficapitella</i>			mines leaves of oak and perhaps Sweet Chestnut
Noctuidae			
<i>Autographa gamma</i>	Silver Y		nettles and other herbaceous plants - rarely surviving winter. Immigrants from Europe are regular
Oecophoridae			
<i>Batia unitella</i>			under loose dead bark, feeding on fungi
<i>Esperia sulphurella</i>			under loose dead bark, feeding on fungi
Pyralidae			
<i>Trachycera advenella</i>			hawthorn, occasionally rowan
Tischeriidae			
<i>Emmetia marginata</i>			mines leaves of bramble
<i>Tischeria ekebladella</i>			mines leaves of oak
Tortricidae			
<i>Ditula angustiorana</i>			deciduous trees and shrubs
<i>Endothenia gentianaeana</i>			teasels - in the seed heads
<i>Grapholita compositella</i>			Trifolium and Lotus

Group / species	English name if available	National status	Main ecological associations
Yponomeutidae			
<i>Acrolepia autumnitella</i>			woody nightshade (bittersweet) and deadly nightshade
<i>Argyresthia goedartella</i>			birch and alder
<i>Plutella xylostella</i>			primary immigrant from overseas; temporary resident on Cruciferae
<i>Prays fraxinella</i>			feeds in buds, shoots and leaves of ash trees
MECOPTERA			
Panorpidae			
<i>Panorpa germanica</i>			edge habitats
MYRIAPODA: CHILOPODA	CENTIPEDES		
Lithobiidae			
<i>Lithobius forficatus</i>			many habitats
MYRIAPODA: DIPLOPODA	MILLIPEDES		
Julidae			
<i>Tachypodoiulus niger</i>			many habitats and often found climbing trees
NEUROPTERA	LACEWINGS		
Chrysopidae			
<i>Chrysopa perla</i>			aphid predator amongst herbage
<i>Chrysoperla carnea</i>			aphid predator of trees and bushes
<i>Nineta flava</i>			thought to be associated with oak, feeding on aphids on the leaves
Hemerobiidae			
<i>Micromus paganus</i>			ubiquitous, but usually in association with wood or scrub
<i>Micromus variegatus</i>			probably a predator of root aphids
ODONATA	DRAGONFLIES AND DAMSELFLIES		
Aeshnidae			
<i>Aeshna grandis</i>	Brown Hawker dragonfly		static water bodies, adults flying from July to October
Calopterygidae			
<i>Calopteryx splendens</i>	Banded Demoiselle		slow rivers with muddy bottoms, the adults flying from May to August
Coenagriidae			
<i>Ischnura elegans</i>	Blue-tailed damselfly		found in most permanent water bodies, the adults flying from May to August
ORTHOPTERA	GRASSHOPPERS AND CRICKETS		
Acrididae			
<i>Chorthippus brunneus</i>	Field grasshopper		grassland
<i>Chorthippus parallelus</i>	Meadow grasshopper		grassland
Tettigoniidae			
<i>Leptophyes punctatissima</i>	Speckled Bush-cricket		rough herbage and scrub
<i>Meconema thalassinum</i>	Oak Bush-cricket		oak trees, especially when at the woodland edge
PSOCOPTERA	BARK LICE		
Ectopsocidae			
<i>Ectopsocus petersi</i>			associated with trees and bushes
Stenopsocidae			
<i>Graphopsocus cruciatus</i>			associated with broad-leaved trees

APPENDIX 2: INVERTEBRATE STATUS CODES

Earlier published reviews of scarce and threatened invertebrates employed the Red Data Book criteria used in the British Insect Red Data Book (Shirt 1987) with the addition of the category RDBK (Insufficiently Known) after in 1983. In addition, the status category Nationally Notable (now termed Nationally Scarce) was used from 1991. The original criteria of the International Union for the Conservation of Nature (IUCN – now called the World Conservation Union) for assigning threat status used in these publications had the categories *Endangered*, *Vulnerable*, and *Rare*, which were defined rather loosely and without quantitative parameters. The application of these categories was largely a matter of subjective judgment, and it was not easy to apply them consistently within a taxonomic group or to make comparisons between groups of different organisms. The deficiencies of the old system were recognised internationally, and in the mid-1980s proposals were made to replace it with a new approach which could be more objectively and consistently applied. In 1989, the IUCN's Species Survival Commission Steering Committee requested that a new set of criteria be developed to provide an objective framework for the classification of species according to their extinction risk. The first, provisional, outline of the new system was published in 1991. This was followed by a series of revisions, and the final version adopted as the global standard by the IUCN Council in December 1994. The guidelines were recommended for use also at the national level. In 1995, the Joint Nature Conservation Committee (JNCC) endorsed their use as the new national standard for Great Britain, and subsequent British Red Data Books have used these revised IUCN criteria. These criteria are used in this present report and are as follows:

EXTINCT (EX) A species is *Extinct* when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD A species is *Extinct* in the wild when it is known to survive only in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.

CRITICALLY ENDANGERED

A species is *Critically Endangered* when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 80%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based on any of these parameters.

B. Extent of occurrence estimated to be less than 100 Km² or areas of occupancy estimated to be less than 10 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at only a single location.
2. Continuing decline, observed, inferred or projected, in any of the following: a. extent of occurrence b. area of occupancy c. area, extent and/or quality of habitat d. number of locations or sub-populations e. number of mature individuals
3. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 50 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 50% within 10 years or 3 generations, whichever is the longer.

ENDANGERED (Formerly RDB category 1)

A species is Endangered when it is not *Critically Endangered* but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 50%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 5,000 Km² or areas of occupancy estimated to be less than 10 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.

C. Population estimated to number less than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 250 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 20% within 20 years or 5 generations, whichever is the longer..

VULNERABLE (Formerly RDB category 2)

A species is *Vulnerable* when it is not *Critically Endangered* or *Endangered* but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 20%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 20,000 Km² or areas of occupancy estimated to be less than 20,000 Km² and estimates indicating any two of the following:

1. Severely fragmented or known to exist at no more than ten locations. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.
2. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented (*i.e.* no sub-population estimated to contain more than 1000 mature individuals) or all individuals are in a single sub-population

D. Population very small or restricted in the form of either of the following:

1. Population estimated to number less than 1,000 mature individuals.
2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km) or in the number of locations (typically less than 5). Such a species would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming *Critically Endangered* or even *Extinct* in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild of at least 10% within 100 years.

LOWER RISK (Formerly RDB category 3)

A species is Lower Risk when it has been evaluated but does not satisfy the criteria for any of the categories *Critically Endangered*, *Endangered* or *Vulnerable*. Species included in the Lower Risk category can be separated into three sub-categories:

- **Conservation Dependent** species which are the focus of a continuing species -specific or habitat-specific conservation program targeted towards the species in question, the cessation of which would result in the species qualifying for one of the threatened categories above within a period of five years.
- **Near Threatened** Species which do not qualify for *Lower Risk (Conservation Dependent)*, but which are close to qualifying for *Vulnerable*.
- **Least Concern**
Species which do not qualify for *Lower Risk (Conservation Dependent)* or *Lower Risk (Near Threatened)*.

DATA DEFICIENT A species is *Data Deficient* when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. A species in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. *Data Deficient* is therefore not a category of threat or Lower Risk.

LOWER RISK (NATIONALLY SCARCE – FORMERLY NATIONALLY NOTABLE)

Species which are not included within the IUCN threat categories and are estimated to occur less than 100 hectads of the Ordnance Survey national grid in Great Britain. It should be noted that Lower Risk (Nationally Scarce) is not a threat category, but rather an estimate of the extent of distribution of these species. Lower Risk species are subdivided as follows:

- Na** species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System.
- Nb** species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System.
- N** Diptera (flies) not separated, falling into either category Na or Nb.

NATIONALLY LOCAL (L)

Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid.

ASSOCIATED DEFINITIONS

Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a species, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of species (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a species, excluding cases of vagrancy. The measure reflects the fact that a species will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a species (e.g. colonial nesting sites, feeding sites for migratory species). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the species. The criteria include values in km², and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small.

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June 23rd 2017

Our Reference: CPA-17029

Land south of the M1 J15a (approx. SP725569): Appraisal of invertebrate habitats

Dear Roberta,

Further to your instruction of 19th June 2017, we have now visited the above site; the surveyors on this occasion were Marcel Ashby and Tristan Bantock. This letter is our formal report of that visit.

Statement of impartiality

Please note that this report presents our surveyors' impartial and unbiased opinion on the existing invertebrate ecology of the site at the date of examination. Unless otherwise stated, our findings and any conclusions drawn or recommendations made are independent of the detail of any proposed development to the site and are wholly independent of any third party opinions where these may exist.

If this report contains suggestions or recommendations relating to mitigating losses, these have been made without specific consideration of the details of the proposed development works and are offered on the assumption that the entire area inside the red line would be lost.

Introduction

The site visit was undertaken on 23rd June 2017 in warm conditions conducive to high invertebrate activity. All areas of the site were accessible and were examined.

Purpose of visit

The purpose of the visit was to appraise the invertebrate habitats present on site and to advise whether or not it is likely that a proposed development would have an impact on invertebrate ecology. Of particular concern was the potential for the site to support Species of Principal Importance in England, as defined within Section 41 of the *Natural Environment and Rural Communities (NERC) Act 2006*, although species included in other conservation categories were also considered.

You also asked us to determine the scope of any additional invertebrate survey work required to make a comprehensive site assessment.

Invertebrate habitats present in June 2017

The site (3 ha) is bordered by the M1 junction 15a to the north, the Grand Union Canal to the east and by arable fields to the south and west. The dominant habitat is wet grassland that occupies the majority of the site, with a transition to deciduous woodland at the edges, where mature willows and oaks are present. Scattered willow scrub is also present throughout the central area. The infield vegetation is species-rich, with numerous elements of tall-herb fen, including abundant meadowsweet, marsh thistle, horsetail, willowherb, figwort, dock, as well as rushes, tall sedges and stands of reed canary-grass. Meadow vetchling was abundant throughout and several orchids (*Dactylorhiza* species) were also noted.

Lush marshes, fens and wet meadows are generally very important for invertebrates and several groups likely to be well-represented in such habitats, particularly species of flies with aquatic larvae, such as many soldierflies, hoverflies and craneflies. Various other groups, including plant-feeding beetles and true bugs may also have rich faunas, since the raised botanical interest predicts that numerous invertebrate host plants are likely to be represented. In a wider context, the site may also be of indirect importance as a foraging area for solitary bees and wasps, given its open nature and abundance of meadow vetchling, which can be a key pollen resource for various species, some of which are of high conservation value.

Conclusions and recommendations

The site under discussion presents many features of potential value to invertebrates and in our opinion, has a current invertebrate interest that is likely to be raised above the expected regional background level.

Formal guidelines generated by Natural England for invertebrate surveys call for a full cross-seasonal sampling effort from April/May to September/October, with the precise effort likely to vary between sites of different character. However, the guidelines allow a degree of leeway on the part of the specialist entomologist and in this instance we believe a full five-day survey is not necessary given the relatively small size of the site and nature of the habitats present. We suggest that three visits, one each in July, August and September, would be sufficient to detect any Species of Principal Importance, provide a robust invertebrate species inventory and broadly inform appropriate mitigation strategies. This level of survey effort would also be consistent with that afforded to the main Northampton Rail Central Site in 2016.

** * end of formal report * * **

I hope that you will find this brief report adequate for your client's current needs.

With all best wishes,



Tristan Bantock
Partner

Commissioned by

RSK

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RAIL CENTRAL, NORTHAMPTON LAND SOUTH OF THE M1 J15a

INVERTEBRATE SURVEY REPORT

Report number: CPA-17032

October 2017

Prepared by

Colin Plant Associates (UK)

Consultant Entomologists

30a Alexandra Rd

London

N8 0PP

1 INTRODUCTION AND METHODOLOGY

1.1 Introduction

- 1.1.1 **Colin Plant Associates (UK)** were commissioned by **RSK Ltd.** on 28th June 2017 to undertake an invertebrate survey of a parcel of land south of the M1 Junction 15a at approximately SP725570.
- 1.1.2 The site covers approximately three hectares and consists of marshland, with a transition to deciduous woodland at the edges, where mature willows and oaks are present. Scattered willow scrub is present throughout. The infield vegetation is species-rich and contains numerous elements of swamp and tall-herb fen communities.
- 1.1.3 A preliminary assessment made by Colin Plant Associates (UK) on 23rd June 2017 concluded that the habitats present were likely to be of raised value to invertebrates and warranted further survey. Various families within the Diptera (flies), Hemiptera (true bugs) and Coleoptera (beetles) were considered particularly likely to be well represented.
- 1.1.4 The preliminary assessment recommended three days of survey effort between July and September to determine the broad nature of the invertebrate assemblages present and to inform appropriate mitigation in the eventuality of habitat loss due to development.
- 1.1.5 This seasonal coverage is commensurate with previous invertebrate survey work carried out by Colin Plant Associates (UK) on the main Rail Central site during 2017. The level of survey is also in accordance with the minimum specified by Natural England guidelines.

1.2 Survey Constraints

- 1.2.1 None to report.

1.3 Methodology

- 1.3.1 Invertebrate sampling visits were made on 5th July, 16th August and 18th September 2017. We regard this as adequate coverage for the site in question.
- 1.3.2 The sampling was undertaken by two surveyors, each with a different specialist area of invertebrate knowledge/experience.
- 1.3.3 Terrestrial invertebrate sampling was undertaken by direct observation/capture and by the following active sampling methods:

Sweep-netting. A stout hand-held net is moved vigorously through herbaceous vegetation or scrub to dislodge resting insects. This technique is effective for many invertebrates, including bees and wasps, flies, many groups of beetles and true bugs and large number of other insects that live in vegetation of this type.

Beating. A cloth tray, held on a folding frame, is positioned below branches of trees or bushes that are sharply tapped with a stick to dislodge insects. This technique is effective in obtaining arboreal species, including many beetle groups, true bugs, caterpillars of Lepidoptera, spiders and others.

Suction Sampling. A garden vacuum with a mesh bag fitted inside the inlet pipe is used to collect samples from low vegetation and the ground surface by suction. The sample is then everted into a large net bag or white trays for examination. The advantage of suction sampling is that it quickly collects strongly ground dwelling species which do not fly or ascend the vegetation readily, as well as species which live in deep, structurally complex habitats such as dense grass tussocks and reed beds, which are difficult to sample by other methods. It is particularly productive for certain groups of beetles, true bugs and spiders.

Grubbing/hand searching. Important host plants may be searched by hand. This is particularly useful for species which live on or even below the ground surface and can be found by grubbing around and underneath basal leaf rosettes. Other invertebrate microhabitats such as loose bark, litter, fungi and various decay features associated with dead wood can also be productive when searched by hand. Turning large stones, pieces of wood and other refuse often reveals species which are nocturnally active, in particular spiders, ground beetles and rove beetles.

2 INVERTEBRATE SPECIES

2.1 Summary

- 2.1.1 Appendix 1 details the complete list of terrestrial insect taxa encountered during the survey; a total of 365 species was recorded. The list is annotated with formal conservation status codes that are further explained in Appendix 2.
- 2.1.2 The Appendix 1 list is also annotated with the primary ecological associations of each species, where known. This allows species with differing habitat affinities to be immediately discerned.

2.2 Species of conservation interest

- 2.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species found during the survey are now examined.

UK Biodiversity Action Plan (UK BAP) Priority Species/Section 41 Species

- 2.2.2 UK BAP priority species were those identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). The original UK BAP list was created between 1995 and 1999 and stood at 577 species. Following a two-year review, a revised list was produced in 2007 which increased the number of BAP priority species to 1149. A total of 123 species no longer met the criteria for selection and were removed.
- 2.2.3 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focussed at a country level rather than a UK level, and the UK BAP has recently (July 2012) been succeeded by the *UK Post-2010 Biodiversity Framework*. The full list of priority invertebrate species can be viewed at: <http://jncc.defra.gov.uk/page-5169>.
- 2.2.4 The UK BAP list remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England and Wales these statutory lists are currently presented in *The Natural Environment & Rural Communities Act, 2006: Section 41. List of Species of Principal Importance for Conservation of Biological Diversity in England* and *Section 42: List of Species of Principal Importance for Conservation of Biological Diversity in Wales*.
- 2.2.5 No such Species of Principal Importance for Conservation of Biological Diversity in England were recorded during the present survey:

Former UK Biodiversity Action Plan (UK BAP) "Research only" moth species

- 2.2.6 The original list of UK Biodiversity Action Plan Priority Species of butterflies and moths was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these are recorded in the surveyed area and none are likely to be present. The second section is a list of 69 species that have declined in population strength by a significant amount in the past 25 years. These were defined as "not yet rare" and were flagged as UK BAP

species “**for research only**”.

2.2.7 It is unfortunate that this “Research Only” list has been incorporated into the current priority listing process and that these species are now, therefore, of statutory interest. Some bodies now specifically recommend that these species are excluded from an appraisal of Section 41 and Section 42 species and this is a view with which we fully agree. Unfortunately, the species are not listed separately so that non-specialists are unable to discern them.

2.2.8 At the site under discussion here we have recorded one such “Research Only” moth species:

Blood-vein *Timandra comae* S41 is a moth found in various habitats, particularly damp places with rank, herb-rich vegetation including woodland edges and wet meadows. The larvae feed on docks *Rumex* species, Common Orache *Atriplex patula*, Knotgrass *Polygonum aviculare* and other related species. It is widespread throughout England and Wales as far north as southern Scotland, where it is much more local.

Nationally Rare / Red Data Book species

2.2.9 The following species listed in the British Red Data Books (Shirt, 1987; Bratton, 1991) or which have been elevated to the status of Nationally Rare by subsequent formal reviews were recorded by the present survey (see Appendix 2):

***Lathrobium pallidum* RDBK** is a rove beetle usually found in riparian habitats in riversides and marshes, although it has been recorded in a variety of other situations, including cliffs and upland grassland. Its ecology is poorly understood. It is widespread but very local in southern England as far north as Yorkshire. As far as we are aware, this appears to be the first Northamptonshire record for this species.

Nationally Scarce Species

2.2.10 The following Nationally Scarce species were recorded by the present survey (see Appendix 2):

***Elodes minuta* NS** is a semi-aquatic beetle, the larvae developing in fresh water, particularly base-poor streams. Adults are terrestrial and usually found away from water on foliage and flowers. This species is widespread but local throughout much of Britain. *E. minuta* may be synonymous with the extremely similar *E. pseudominuta* and is regarded as such by European authorities. The combined distribution of these two taxa suggests a species that should probably not be considered nationally scarce. A single adult was recorded by sweeping tall wetland vegetation.

***Acalyptus carpini* NS (Nb)** is a small weevil found in fens, mires and carr woodland, feeding on various species of *Salix*. Eggs are laid in the female catkins, on which the larvae feed before pupating in the soil. A very local species confined to southern England, with most records from the fen district of East Anglia. Several adults were swept from low willow scrub near the northern boundary. There are very few records from Northamptonshire.

***Drymus pumilio* NS (Nb)** is a true bug that is strongly ground dwelling and occurs in various habitats. Old records are mainly from chalk grassland, where it has been found in moss, but many recent records are from wetlands, in particular fens. Its ecology is poorly known and it is rarely found in numbers; there do not appear to be obvious host plant associations but like related species it presumably feeds on unripe seeds. *D. pumilio* is a local species in southern England and

South Wales and is also considered rare and range-restricted in continental Europe. It is however easily overlooked and is probably significantly under-recorded. This species was found in numbers in the course of suction sampling, indicating that the site supports a substantial population. This record represents the first for the county of Northamptonshire.

***Nemotelus pantherinus* NS** is a soldier fly found locally in fens, marshes, damp meadows and seepages, mostly in southern Britain. It can also occur in coastal grazing marsh and dune slacks but evidently does not tolerate saline conditions. The larvae have been found in wet mosses of seepages and shallow standing water. An adult was swept from wetland vegetation.

Median Wasp *Dolichovespula media* NS (Na) is a social wasp found in various habitats including urban situations. It is a tree-nesting species and nests are built in aerial sites, in nearly all cases suspended from the branches of trees and shrubs, from ground level to a height of several metres. This species arrived in Britain in 1980 and has since spread throughout much of England, recently reaching as far north as southern Scotland. It no longer warrants a conservation status. This species was associated with oaks at the eastern margin of the site.

***Lasius brunneus* NS (Na)** is an ant that nests in mature trees, in particular oaks, although nests have also been found in stumps, hedgerows and timber framed buildings. The species is much more widespread than it was historically and is found throughout central and southern England. It probably no longer warrants a conservation status. This species was associated with oaks at the eastern margin of the site.

2.3 The overall invertebrate community

- 2.3.1 Rarity is only one factor to be taken into account in the assessment of the ecological value of a site. Some sites may have immensely diverse invertebrate assemblages but few rare species within these; they are of equal, if different, ecological value. It is therefore important to carry out a further assessment that also includes all the remaining species.
- 2.3.2 We have undertaken this using Osiris, a habitat and resource association utility found within Pantheon, a database tool developed by Natural England and the Centre for Ecology and Hydrology and freely accessible online at www.brc.ac.uk/pantheon. This system has updated and replaced the Invertebrate Species-habitats Information System (ISIS) as of 2017. A major improvement achieved by Pantheon has been the incorporation of current species conservation status designations, as many have changed since the original release of ISIS.
- 2.3.3 Pantheon interprets species lists by recognising assemblage types and scoring each type according to its conservation value. This information is used to assess the overall quality of the site, reveal its key ecological resources and ultimately inform decisions regarding habitat management and mitigation. In some cases, habitats that may have been overlooked or not considered important during the survey might be identified as significant.
- 2.3.4 To date around 12,000 species are included in the Pantheon database, around a quarter of the total macro-invertebrate fauna. It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, true bugs, moths, bees and many others.
- 2.3.5 Invertebrate species are linked to habitats and resources in a large hierarchical database. The hierarchy is arranged with 'Broad biotopes' as the highest level.

- 2.3.6 Each Broad biotope can be further divided into more detailed ‘Habitats’ (previously known as ‘Broad Assemblage Types’ (BATs) in ISIS).
- 2.3.7 Each Habitat contains a set of ‘Resources’, defined by typing species to other environmental factors or microhabitats. Only those resources that are considered important to the completion of the life cycle of a species are included. Typing was not attempted for species that are either very catholic or where their ecology was not well defined in the literature.
- 2.3.8 Specific assemblage types’ (SATs) are characterised by stenotopic (ecologically restricted) species that are of intrinsic nature conservation value. SATs are more narrowly defined than Habitats and each SAT is nested within a parent Habitat. *Note that the use of SATs is restricted to Natural England Common Standards Monitoring on SSSIs.*
- 2.3.9 Pantheon provides the following scoring systems for Broad biotopes, Habitats, Resources and SATs:
- A total count of species in each category.
 - The number of species represented in each category that have a conservation status.
 - The number of species belonging to each category as a percentage of the total number of species belonging to each category.
 - A Species Quality Index (SQI) score for each category where more than 15 species are represented. Each species recorded from the sample is given a Species Quality Score (SQS) based on their conservation status. The SQI score is equal to the sum of all SQS scores divided by the number of species and then multiplied by 100 to give a 3-figure score that does not contain decimal places (e.g. 100 rather than a 1.00).

2.4 Pantheon output

Table 1. Pantheon sample scores by Broad biotope.

Broad biotope	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	168	4	102	2	1Na, 1Nb
tree-associated	78	2	107	3	2Na, 1Nb
wetland	72	3	117	3	1RDBK, 2NS

- 2.4.1 Pantheon sample scores by Broad biotope are shown in Table 1. Of the 365 species recorded by the survey, 331 are represented in the Pantheon database.
- 2.4.2 Just over half of these were associated with open habitats. The remainder were split almost equally between tree-associated and wetland species.
- 2.4.3 However, the rarity component of the wetland fauna was the highest of the three broad biotopes (SQI = 117) and included three species with a conservation status: the rove beetle *Lathrobium pallidum*, the soldier fly *Nemotelus pantherinus* and the marsh beetle *Elodes minutula*.
- 2.4.4 In our opinion, the weevil *Acalyptus carpini* and the ground bug *Drymus pumilio* should also be

considered as species characteristic of wetlands, at least to some extent. Although directly dependent on willows, *A. carpini* is found almost exclusively in fens and marshes and most recent records of *D. pumilio* are from wetland situations. Pantheon currently groups these two species under 'tree-associated' and 'open habitats' respectively.

Table 2. Pantheon sample scores by Habitat.

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	155	6	102	1	1Nb
tree-associated	arboreal	43	3	108	2	1Na, 1Nb
wetland	marshland	32	4	119	2	2NS
wetland	peatland	28	3	111		
tree-associated	shaded woodland floor	22	2	100		
open habitats	short sward & bare ground	14	1	N/A		
tree-associated	decaying wood	13	1	N/A	1	1Na
wetland	running water	7	<1	N/A		
tree-associated	wet woodland	7	3	N/A		
wetland	wet woodland	7	3	N/A		

- 2.4.5 Pantheon sample scores by Habitat are shown in Table 2. Species associated with marshland and peatland make up the vast majority of the wetland species, as expected for a site that maintains saturated soil conditions for part of the year. The rove beetle *Lathrobium pallidum* is not assigned at the Habitat level since its precise ecology is imperfectly known.
- 2.4.6 The highest SQI score corresponds to those species associated with marshland (SQI = 119). These include species more characteristic of periodically inundated soils, rather than those that remain permanently wet with little fluctuation.
- 2.4.7 This value is some way below the SQI score of 150 which Natural England suggests as the approximate threshold score that corresponds to a 'good' site supporting a regionally important invertebrate fauna.

3.0 DISCUSSION AND RECOMMENDATIONS

3.1 Overview

- 3.1.1 The most valuable invertebrate habitats present at the site in question are those associated with wetland, in particular marshland and peatland. In combination the species dependent on these two habitats are broadly representative of a fen assemblage.
- 3.1.2 Although the wetland invertebrate assemblage present does not meet the criteria for national or regional significance, the site supports some species which are rare and important in a local context, such as the ground bug *Drymus pumilio*, the weevil *Acalyptus carpini* and the rove beetle *Lathrobium pallidum*. In particular, *D. pumilio* and *L. pallidum* are not previously known from Northamptonshire.
- 3.1.3 Lowland fen is an uncommon habitat type throughout much of Britain and many sites, such as this one, are small and set within a wider landscape of drained farmland. The isolated nature of the site means that invertebrate species losses are unlikely to be replaced via dispersal from populations present in the surrounding area.
- 3.1.4 In our opinion it would be impossible to adequately mitigate for impacts on the invertebrate fauna resulting from the construction of a link road across the site. Although direct habitat loss may not affect the entire area of habitat, the remainder would deteriorate significantly due to drainage and associated changes in hydrology. Crossing the site via an elevated road could reduce these impacts significantly, but given the small size of the site it is likely that the integrity and character of the habitats present would still be severely compromised. The area of the site directly beneath the road would also suffer from the effects of shading.
- 3.1.5 Nor do we believe that it would be possible to adequately compensate for losses incurred by the creation or improvement of adjacent habitats. The invertebrate assemblage present suggests that the site has a long history as a wetland and any newly created wetland habitat would have a much lower value to invertebrates. The wider landscape is predominantly intensively arable and any potential enhancement of these habitats would not offset overall losses to invertebrate biodiversity.

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APPENDIX 1: TERRESTRIAL INVERTEBRATE SPECIES RECORDED

National status codes are explained in Appendix 2.

Group / Species	English name	IUCN Status	GB rarity Status	Associations / Ecology
ARANEAE	SPIDERS			
Araneidae	Orb-web spinners			
<i>Araneus diadematus</i>	Garden Spider	LC		bushes, trees and man-made structures in gardens, also woodland edges. Widespread throughout Britain
<i>Araneus quadratus</i>		LC		tall grassland and low scrub. Widespread and common.
<i>Larinioides cornutus</i>		LC		watersides, on tall vegetation. Widespread throughout Britain
Clubionidae				
<i>Clubiona phragmitis</i>		LC		in low vegetation in wet places, especially amongst common reed Phragmites. Widespread in southern Britain
Dictynidae				
<i>Dictyna arundinacea</i>		LC		common and widespread on low vegetation, especially that which is dry or dead.
Linyphiidae	Money spiders			
<i>Walckenaeria acuminata</i>		LC		in the litter layer of woods and other sheltered places. Widespread but seldom abundant.
Lycosidae	Wolf spiders			
<i>Pardosa pullata</i>		LC		A wolf spider found in wetlands, wasteland and gardens. Widespread and common.
Philodromidae				
<i>Philodromus aureolus</i>		LC		on trees and bushes. Common and widespread throughout much of Britain
<i>Philodromus cespitum</i>		LC		A common crab spider found in bushes and trees in spring and early summer.
<i>Tibellus oblongus</i>		LC		grasses in damp places. Common throughout Britain
Pisauridae				
<i>Pisaura mirabilis</i>	Nursery Web Spider	LC		various open habitats. Very common and widespread.
Tetragnathidae				
<i>Metellina segmentata</i>		LC		grassland and low vegetation. Widespread throughout Britain
Theridiidae				
<i>Enoplognatha ovata</i>		LC		grassland and low vegetation. Widespread throughout Britain
<i>Phylloneta impressa</i>		LC		A small spider making tangled web among bushes and low vegetation. Local throughout much of Britain.
<i>Theridion pictum</i>		LC		among bushes and low vegetation, usually in damp places. Local, mainly southern species.
Thomisidae	Crab spiders			
<i>Ozyptila brevipes</i>		LC		Small crab spider with no apparent habitat specificity. Usually damp places. Predominantly southern species, nowhere common.
<i>Xysticus cristatus</i>		LC		on the ground or in low vegetation. Common and widespread throughout much of Britain
OPILIONES	HARVESTMEN			
Nemastomatidae				

<i>Nemastoma bimaculatum</i>		NE		in leaf and grass litter in many habitats. Very common.
Leiobunidae				
<i>Leiobunum rotundum</i>		NE		various habitats. Common and widespread throughout Britain.
<i>Dicranopalpus ramosus</i>		NE		A harvestman, frequenting gardens where it can be found on walls and bushes. Rare, Cornwall, Hampshire, Sussex and Essex.
Phalangidae				
<i>Lacinius ephippiatus</i>		NE		in the ground layer in various habitats. Widely distributed.
<i>Mitopus morio</i>		NE		A harvestman, usually found amongst low vegetation, but also in bushes and trees. Widespread and common.
COLEOPTERA	BEETLES			
Apionidae	Weevils (part)			
<i>Eutrichapion ervi</i>		NE		On vetches throughout Britain, the larvae developing in flower buds
<i>Perapion hydrolapathi</i>		NE		larvae mine the stems of the larger species of Rumex. Very common.
<i>Protapion trifolii</i>		NE		in flowerheads of Trifolium spp., especially T. pratense. Widespread in England and Wales
Cantharidae	Soldier beetles			
<i>Cantharis nigra</i>		LC		lowland marshes and damp grassland. Predatory. Widespread in England and Wales
<i>Cantharis thoracica</i>		LC		fen and reed bed vegetation, and watersides. Predatory. Widespread in England and Wales
<i>Malthodes minimus</i>		LC		woodlands; particularly abundant in woods on base-rich soils. Widespread throughout southern Britain
<i>Rhagonycha fulva</i>		LC		ubiquitous in habitat. Predatory. Widespread throughout Britain
<i>Rhagonycha testacea</i>		LC		Wet woodlands and scrubby marshes. Predatory. Widespread throughout England and Wales
Carabidae	Ground beetles			
<i>Acupalpus parvulus</i>		LC		in damp habitats near vegetation
<i>Agonum fuliginosum</i>		LC		in marshes, damp grasslands and moorland
<i>Agonum thoreyi</i>		LC		in marshes, fens and reed beds
<i>Bembidion biguttatum</i>		LC		on open mud and silty ground near standing fresh water
<i>Bembidion guttula</i>		LC		ubiquitous in almost all habitats, especially near water
<i>Bembidion lunulatum</i>		LC		on damp bare ground near water
<i>Demetrias atricapillus</i>		LC		on dunes, in tussocky grasslands and agricultural fields
<i>Oxypselaphus obscurus</i>		LC		in marshes and damp shaded habitats including woodland
<i>Paradromius linearis</i>		LC		in dry grasslands, arable fields and dunes
<i>Pterostichus diligens</i>		LC		in marshes, shaded or damp grassland and upland moors
<i>Pterostichus madidus</i>		LC		in woodlands, gardens and dry grasslands
<i>Pterostichus strenuus</i>		LC		in almost all habitats except at high altitudes, especially grasslands
<i>Pterostichus vernalis</i>		LC		in most damp or shaded lowland habitats, especially grasslands
<i>Trichocellus placidus</i>		LC		in well vegetated lowland marshes, damp grassland and woodland litter
Cerambycidae	Longhorn beetles			
<i>Grammoptera ruficornis</i>		NE		larvae in fungus-infected twigs and small branches of deciduous trees; adults at flowers
Chrysomelidae	Leaf beetles			
<i>Altica lythri</i>		LC		Wide range of mainly damp habitats; adults feed on various willowherbs. Widespread
<i>Altica palustris</i>		LC		Various habitats; adults and larvae feed on leaves of various

				willowherbs. Widespread
<i>Aphthona euphorbiae</i>		LC		Wide range of habitats; adults feed on leaves of many herbaceous plants.
<i>Bruchidius varius</i>		NA		Various habitats; adults feed mainly on pollen of clovers, larvae probably within clover seeds
<i>Bruchus rufimanus</i>	broad-bean weevil	LC		Various habitats; adults feed on pollen of various plants, larvae develop within seeds of bean plants
<i>Chaetocnema hortensis</i>		LC		Various habitats; adults feed on leaves of wild and cultivated Poaceae, larvae mine the stems
<i>Crepidodera aurata</i>		LC		Wide range of habitats; adults feed on leaves of Salix, larvae feed on the roots
<i>Crepidodera fulvicornis</i>		LC		Wide range of habitats; adults feed on leaves of willows Salix (and possibly pollen and other trees), larvae feed on the roots
<i>Cryptocephalus pusillus</i>		LC		Various habitats; adults and larvae feed on leaves of birches and sallows
<i>Galerucella lineola</i>		LC		Wide range of habitats; adults and larvae feed on leaves of alder <i>Alnus glutinosa</i> , hazel <i>Corylus avellana</i> and willows <i>Salix</i>
<i>Lema cyanella</i>		LC		Thistles, especially creeping thistle <i>Cirsium arvense</i> in various habitats; adults and larvae feed on leaves
<i>Longitarsus flavicornis</i>		LC		Various habitats; adults feed on the leaves of ragworts <i>Senecio</i> , larvae develop at the roots
<i>Longitarsus luridus</i>		LC		Wide range of habitats; adults feed on numerous plants, larvae develop at roots
<i>Longitarsus parvulus</i>		LC		Wide range of habitats; adults feed on flax <i>Linum</i> and then move on to a variety of other plants (herbaceous and woody), larvae feed on roots
<i>Longitarsus rubiginosus</i>		LC		Various habitats; adults feed on the leaves of Convolvulaceae bindweeds, larvae feed at the roots
<i>Neocrepidodera transversa</i>		LC		Wide range of habitats; adults feed on various plants, especially thistles <i>Cirsium</i>
<i>Oulema rufocyanea</i>		LC		Farmland, gardens and many other habitats; adults and larvae feed on leaves of cereals and wild grasses
<i>Phaedon tumidulus</i>		LC		Wide range of habitats; adults and larvae feed on leaves of leaves of various Apiaceae
<i>Phyllotreta tetrastigma</i>		LC		Various wet habitats, adults feed on leaves of water-cresses <i>Rorippa</i> , bitter-cresses <i>Cardamine</i> , garden radish <i>Raphanus sativus</i> ; larvae are leaf-miners
<i>Psylliodes chrysocephala</i>		LC		Wide range of habitats; adults feed on Brassicaceae, and sometimes plants in other families, larvae mine the stems
<i>Psylliodes picina</i>		LC		Various habitats; adults feed on leaves of cereals, larvae develop at the roots of grasses
Coccinellidae	Ladybirds			
<i>Chilocorus renipustulatus</i>	Kidney-spot ladybird	NE		commonly found in deciduous woodland but also from mixed woodland, grassland and scrub
<i>Coccidula rufa</i>		NE		a wetland species found on reeds, rushes and wetland grasses
<i>Coccinella septempunctata</i>	7-spot ladybird	NE		a ubiquitous species
<i>Harmonia axyridis</i>	Harlequin ladybird	NE		a recent arrival (2003) that has rapidly spread - a ubiquitous generalist species
<i>Propylea 14-punctata</i>	14-spot ladybird	NE		a ubiquitous species
<i>Psyllobora 22-punctata</i>	22-spot ladybird	NE		on low vegetation in grassland habitats - feeds on mildews on leaves
<i>Scymnus haemorrhoidalis</i>		NE		in damp habitats such as bogs, water margins and undisturbed grassland
<i>Halyzia sedecimguttata</i>	Orange ladybird	NE		woodlands and on trees in other habitats. Feeds on mildew. Widespread throughout much of Britain
Curculionidae	Weevils (part)			
<i>Acalyptus carpini</i>		NE	NS(Nb)	on willows in wetlands, particularly fens. Very local in

				southern England
<i>Cionus scrophulariae</i>		NE		on figworts and sometimes Buddleia. Widespread in southern Britain
<i>Cionus tuberculatus</i>		NE		on figworts and sometimes Buddleia. Widespread in southern Britain
<i>Hylesinus toranio</i>		NE		under the bark of ash branches. Widespread in southern Britain
<i>Nedyus quadrimaculatus</i>		NE		on nettle <i>Urtica dioica</i> . Very common wherever nettles grow.
<i>Rhamphus pulicarius</i>		NE		mines the leaves of willow, birch and sweet gale. Widespread and common throughout Britain
<i>Rhinoncus perpendicularis</i>		NE		on amphibious bistort <i>Persicaria amphibia</i> . Widespread throughout much of Britain
<i>Sitona lineatus</i>		NE		on most species of leguminosae mainly in grassland. Very common and widespread
<i>Sitona suturalis</i>		NE		on various Leguminosae, especially meadow vetchling <i>Lathyrus pratensis</i> . Widespread in England and Wales, local further north
Helophoridae				
<i>Helophorus obscurus</i>		LC		a beetle of muddy bottomed water bodies, both neutral and alkaline
Hydrophilidae				
<i>Anacaena globulus</i>		LC		in mud and decaying vegetation at water's edge - ubiquitous in almost all non-saline habitats
<i>Anacaena limbata</i>		LC		in mud and decaying vegetation at the edge of well-vegetated, eutrophic, still waters
Kateretidae				
<i>Kateretes pusillus</i>		NE		2mm long dark brown beetle with 2 reddish spots. Lives in wet places where there is <i>Juncus</i> . Local, but very numerous where found.
Latridiidae				
<i>Cartodere bifasciata</i>		NE		in leaf litter, compost, grass tussocks etc. Introduced and now very common.
<i>Corticara gibbosa</i>		NE		Leaf and grass litter, moss etc. Very common in most habitats.
Malachiidae	Malachite beetles			
<i>Axinotarsus marginalis</i>		NA		deciduous woodland, larvae in dead wood. Adults feed on pollen. Southern and central England
<i>Malachius bipustulatus</i>		LC		Adults feed on pollen and nectar; larvae are active predators on tree trunks. Widespread in England and Wales
Nitidulidae				
<i>Meligethes aeneus</i>		NE		A small pollen beetle. Very common species, feeding in a very wide variety of Brassicaceae
<i>Meligethes nigrescens</i>		NE		A pollen beetle associated with <i>Trifolium repens</i>
Oedemeridae				
<i>Oedemera lurida</i>		LC		The larvae develop in the old stems of various plants. Widespread and common throughout England and Wales
<i>Oedemera nobilis</i>		LC		The larvae develop in the old stems of various plants. Widespread and common throughout England and Wales
Phalacridae				
<i>Stilbus oblongus</i>		NE		Small beetle associated with <i>Typha latifolia</i> . S England, S Wales and E Anglia. Rare elsewhere.
Scirtidae				
<i>Cyphon coarctatus</i>		LC		usually amongst vegetation near water
<i>Elodes minuta</i>		LC	NS	larvae aquatic in fresh water, adults on foliage. Local throughout much of Britain
Scraptiidae				

<i>Anaspis fasciata</i>		LC		larvae in dead wood, adults frequently on hawthorn blossom. Widespread in England and Wales
<i>Anaspis frontalis</i>		LC		Has been reared from decaying wood of oak and maple in Sweden; frequently found at hawthorn blossom.
Silvanidae				
<i>Psammoecus bipunctatus</i>		NE		in reed litter in fens and marshes. Widespread in southern Britain
Staphylinidae	Rove beetles			
<i>Anotylus rugosus</i>		NE		Damp vegetable litter; marshes
<i>Carpelimus rivularis</i>		NE		various wetland and riparian habitats with silty substrates
<i>Lathrobium pallidum</i>		NE	RDBK	Riparian habitat. Very local in southern England.
<i>Lesteva sicula</i>		NE		in moss, especially beside streams and waterfalls. Generally common species.
<i>Metopsia clypeata</i>		NE		in moss, grass tussocks and decaying vegetation. Widespread but local.
<i>Mocyta fungi</i>		NE		
<i>Philhygra elongatula</i>		NE		
<i>Quedius fuliginosus</i>		NE		a variety of habitats including wetlands, grassland and woodland
<i>Quedius fumatus</i>		NE		6-8mm long brownish black rove beetle. Leaf litter, moss and under stones. Generally common species.
<i>Quedius maurorufus</i>		NE		on wet soils, fens and pond margins. Widespread and fairly common.
<i>Quedius nigriceps</i>		NE		on damp soils usually in woodland
<i>Reichenbachia juncorum</i>		NE		in moss and grass tussocks in damp habitats. Locally common throughout southern Britain, becoming more local northwards.
<i>Rugilus rufipes</i>		NE		
<i>Stenus bimaculatus</i>		NE		Margins of mesotrophic and eutrophic wetlands, often in partly shaded sites including carr areas
<i>Stenus brunripes</i>		NE		Generalist; various grassland habitats
<i>Stenus flavipes</i>		NE		In litter in wet woodland and carr
<i>Stenus fulvicornis</i>		NE		moss and litter in wet pastures and marshy areas, including pools in woodlands
<i>Stenus nitidiusculus</i>		NE		wetlands, mires, bogs, fens, rush pasture, moorland, rich pond margins
<i>Stenus ossium</i>		NE		damp habitats in, grassland, dunes, and marshy but rarely in very wet areas
<i>Stenus providus</i>		NE		grasslands, grazing marsh, richer mires, lakeshores and riparian habitats
<i>Stenus pusillus</i>		NE		wetland margins and in grasslands
<i>Tachyporus chrysomelinus</i>		NE		Moss, leaf litter, grass tussocks on heavier or less well drained soils.
<i>Tachyporus dispar</i>		NE		Moss, leaf litter, grass tussocks
<i>Tachyporus hypnorum</i>		NE		In moss, leaf litter, grass tussocks etc. Very common in most habitats.
<i>Tachyporus nitidulus</i>		NE		Moss, leaf litter and grass tussocks etc. Very common in most habitats.
<i>Tachyporus obtusus</i>		NE		Moss, leaf litter, grass tussocks etc. Very common in most habitats.
Tenebrionidae	Darkling beetles			
<i>Lagria hirta</i>		LC		larvae in soil. Widespread and common
DERMAPTERA	EARWIGS			
Forficulidae				
<i>Forficula auricularia</i>	Common Earwig	LC		Ubiquitous
POLYDESMIDA	MILLIPEDES			

Polydesmidae			
<i>Brachydesmus superus</i>		LC	various habitats; common and widespread
DIPTERA	FLIES		
Agromyzidae			
<i>Cerodontha iraeos</i>		NE	
Asilidae			
<i>Leptogaster cylindrica</i>		LC	predatory; dry grassland, larvae in sandy soil. Widespread in southern Britain
Cecidomyiidae			
<i>Dasineura ulmaria</i>		NE	forms a gall on the leaves of meadowsweet
Chloropidae			
<i>Chlorops pumilionis</i>		NE	
Conopidae			
<i>Conops quadrifasciatus</i>		NE	various habitats, larvae parasitic on <i>Bombus</i> species. Widespread but usually uncommon.
<i>Phyocephala rufipes</i>		NE	meadows, heaths and open-structured woodland, usually feeding on umbels and composites. The larvae are parasitoids of adult bees.
Empididae			
<i>Empis livida</i>		NE	Large, predatory fly typically seen visiting flowers in mid-summer. Common and widespread.
Lauxaniidae			
<i>Peplomyza litura</i>		NE	in damp, grassy places amongst scrub or near woodland edge; larvae in decaying organic matter. Widespread in southern Britain
<i>Trigonometopus frontalis</i>		NE	in marshy places, often amongst sedges or reeds. It is widely distributed in the south, but rather local.
Opomyzidae			
<i>Opomyza florum</i>		NE	larvae are stem borers in grasses. Widespread in Britain and sometimes common in lowland areas, but scarce in the west.
Pallopteridae			
<i>Paloptera quinquemaculata</i>		NE	open areas and woodland clearings. The larvae feed inside the basal part of the stems of false oat-grass. Widespread.
<i>Paloptera saltuum</i>		NE	has been bred from the stems of Umbelliferae including <i>Heracleum</i> . Widespread
Psilidae			
<i>Chyliza leptogaster</i>		NE	larvae are probably root and stem dwellers. Widespread but local.
Ptychopteridae			
<i>Ptychoptera albimana</i>		NE	A cranefly of pond margins, streams with muddy margins, seepages in meadows and woods, carr, woodland puddles. Larvae aquatic in mud.
Rhagionidae	Snipe flies		
<i>Chrysopilus asiliformis</i>		LC	lush damp vegetation, often near streams or ponds. Local abundant in the south, scarce in the north.
<i>Chrysopilus cristatus</i>		LC	lush vegetation in damp places, larvae in extremely rotten wood and other rotting vegetable matter. Common and widespread.
Scathophagidae			
<i>Cordilura ciliata</i>		NE	in marshland, larvae in the leaf sheathes of sedges and rushes. Mostly recorded from southern Britain where it is locally abundant.
<i>Scathophaga stercoraria</i>		NE	abundant predatory fly which breeds in dung. Widespread throughout Britain
Sciaridae			

<i>Sciara hemerobioides</i>		NE		larvae in damp soil and leaf litter, widespread in western Britain
Sciomyzidae	Snail-killing flies			
<i>Coremacera marginata</i>		NE		various dry habitats, especially on calcareous soils. Larvae are parasitoids of various snails, especially <i>Cochlicopa</i> and <i>Discus</i> spp. Widespread
<i>Euthycera fumigata</i>		NE		Snail-killing fly found in damp places near permanent water. Biology unknown.
<i>Limnia paludicola</i>		NE		in a wide range of mesotrophic wetland habitats. The larval biology is unknown.
<i>Limnia unguicornis</i>		NE		various open habitats, larvae feed on aquatic snails. Widely distributed and generally common on Britain.
<i>Pherbellia schoenherri</i>		NE		in the marginal vegetation of ponds and ditches, especially in fens and levels marshes. Widely distributed and not uncommon, but never numerous.
<i>Pherbina coryleti</i>		NE		A common snail-killing fly of wet places.
<i>Tetanocera elata</i>		NE		various habitats, particularly on vegetation bordering ponds or streams and in marshes, larvae are predators of slugs. Widespread
Sepsidae				
<i>Sepsis fulgens</i>		NE		larvae in all types of dung. Widespread and common.
<i>Sepsis punctum</i>		NE		various habitats, larvae dung. Common throughout Britain.
Stratiomyidae	Soldier flies			
<i>Beris vallata</i>		LC		grassy places, larvae in rotting litter at the soil surface. Widespread and common.
<i>Nemotelus pantherinus</i>		LC	NS	fens and calcareous flushes, larvae are aquatic. Widespread but very local in southern Britain
<i>Oxycera nigricornis</i>		LC		fens and marshes or sedge margins of old silted up pools, larvae are aquatic.
<i>Pachygaster atra</i>		LC		hedgerows and woodland margins, larvae in rotting organic matter. Widely distributed and common.
<i>Pachygaster leachii</i>		LC		hedgerows and woodland margins, larvae in rotting organic matter. Widely distributed and common.
Syrphidae	Hoverflies			
<i>Baccha elongata</i>		LC		Frequent in shady situations. The larvae are predatory on aphids. Widespread throughout Britain
<i>Cheilosia impressa</i>		LC		Damp wooded situations, larval ecology unclear. Widespread in England and Wales.
<i>Cheilosia pagana</i>		LC		various habitats, larvae develop in the root bases of <i>Anthriscus sylvestris</i> . Widespread throughout Britain
<i>Cheilosia proxima</i>		LC		various habitats, larvae feed on the roots of <i>Cirsium palustre</i> . Widespread throughout Britain
<i>Chrysogaster solstitialis</i>		LC		various habitats. Adults often on umbels; larvae aquatic. Widespread and abundant.
<i>Chrysotoxum bicinctum</i>		LC		warm, open habitats; larvae feed on aphids in ants nests. Widespread throughout Britain.
<i>Chrysotoxum cautum</i>		LC		warm, open habitats; larvae feed on aphids in ants nests. Southern England and south Wales
<i>Chrysotoxum festivum</i>		LC		warm, open habitats; larvae feed on aphids in ants nests. Southern Britain.
<i>Episyrphus balteatus</i>		LC		various habitats, larvae predatory on aphids. Very common and widespread
<i>Eristalis arbustorum</i>		LC		various habitats, larvae aquatic. Widespread throughout Britain
<i>Eristalis intricaria</i>		LC		woodland margins especially near marshy areas, larvae aquatic. Widespread throughout Britain
<i>Eristalis pertinax</i>		LC		various habitats, larvae aquatic. Widespread throughout Britain
<i>Helophilus pendulus</i>		LC		various habitats, larvae aquatic in wet decaying vegetation. Widespread throughout Britain

<i>Melanostoma scalare</i>		LC		grassy places throughout Britain but scarce in the uplands. The larvae feed on aphids.
<i>Myathropa florea</i>		LC		gardens, hedgerows and woodland edges. larvae aquatic in wet hollows. Widespread throughout Britain
<i>Neoascia podagrica</i>		LC		various habitats with lush vegetation, larvae in wet decaying vegetation. Widespread throughout Britain
<i>Platycheirus albimanus</i>		LC		various habitats including gardens. The larvae are predatory on aphids. Widespread and common throughout Britain
<i>Platycheirus rosarum</i>		LC		wetlands including ditches and marshes, the larvae are predatory on aphids. Widespread, but local throughout Britain
<i>Riponnensia splendens</i>		LC		wet meadows, marshes and fens, larvae in wet rotting vegetation. Widespread in southern Britain
<i>Sphaerophoria interrupta</i>		LC		various grassland habitats, the larvae are predatory on aphids. Widespread throughout Britain
<i>Sphaerophoria scripta</i>		LC		various grasslands, larvae feeding on aphids on herbaceous plants. Widespread in southern Britain
<i>Syritta pipiens</i>		LC		various habitats including urban areas, larvae develop in rotting organic matter. Widespread throughout Britain
<i>Syrphus ribesii</i>		LC		various habitats, larvae are aphidophagous on herbaceous plants. Widespread throughout Britain
<i>Volucella inanis</i>		LC		various habitats, larvae in the nests of social wasps. Widespread in southern and central England
<i>Volucella pellucens</i>		LC		woodland rides and margins, larvae scavenge in the nests of social wasps. Widespread throughout Britain
<i>Xanthogramma pedissequum</i>		LC		grassland and woodland rides, larvae in nests of <i>Lasius flavus</i> and <i>L. niger</i> , feeding on aphids. Widespread in southern Britain
Tachinidae				
<i>Exorista larvarum</i>		NE		larvae are gregarious parasites of Lymantriidae and Lasiocampidae caterpillars which overwinter in the host and pupate in the host cocoon or in the soil. Widely distributed.
<i>Pseudoperichaeta nigrolineata</i>		NE		
<i>Eriothrix rufomaculata</i>		NE		various grassland habitats, parasitic on the crambid moth <i>Cryoteuchia culmella</i> . Generally distributed and very common.
<i>Tachina fera</i>		NE		various habitats, larvae are parastoids of various larger moths. Southern Britain
Tephritidae	Picture-winged flies			
<i>Anomoia purmunda</i>		NE		various open habitats, larvae develop in the fruits of <i>Crataegus</i> Widespread in southern Britain
<i>Tephritis conura</i>		NE		upland grasslands, larvae form a gall in the flower head of <i>Cirsium helenoides</i> and <i>C. palustre</i> . Northern Britain, Wales
<i>Tephritis hyoscyami</i>		NE		open habitats, larvae form a small, hard gall in the flower heads of <i>Carduus nutans</i> or <i>C. crispus</i> . Southern Britain
<i>Terellia ruficauda</i>		NE		grasslands, larvae in the flower heads of thistles. Widespread and common in southern Britain, north to Yorkshire.
<i>Terellia tussilaginis</i>		NE		larvae in the flowerheads of burdocks, <i>Arctium</i> species, in a variety of habitats. Throughout England and Wales.
<i>Urophora stylata</i>		NE		various grasslands, larvae in a gall formed in the flower head of thistles. Widespread in southern Britain
<i>Xyphosia miliaria</i>		NE		grasslands, larvae in flower heads of various thistles. Throughout Britain
Tipulidae	Crane flies			

<i>Nephrotoma cornicina</i>		NE		various habitats. Primarily southern in distribution, though occurs in Scottish localities to the Outer Hebrides.
<i>Tipula fascipennis</i>		NE		open habitats on dry sandy soils, larvae in soil. Widespread in much of Britain
HEMIPTERA	TRUE BUGS			
Aphrophoridae	Froghoppers			
<i>Aphrophora alni</i>		NE		adults are found on a wide range of trees and shrubs and low vegetation; nymphs feed in froth-lumps on a wide range of plants.
<i>Neophilaenus lineatus</i>		NE		on grasses in a wide range of habitats.
<i>Philaenus spumarius</i>	Common Froghopper	NE		Ubiquitous on a very wide range of herbaceous plants
Cicadellidae	Leafhoppers			
<i>Agallia consobrina</i>		NE		on <i>Urtica dioica</i> , particularly in shaded situations.
<i>Alebra albostriella</i>		NE		on oak
<i>Allygus modestus</i>		NE		on various deciduous trees; nymphs on grasses
<i>Alnetoidea alneti</i>		NE		on various deciduous trees
<i>Aphrodes makarovi</i>		NE		on herbs in moist eutrophic habitats, particularly <i>Urtica dioica</i>
<i>Cicadella viridis</i>		NE		on <i>Juncus</i> in damp grasslands and marshes
<i>Cicadula frontalis</i>		NE		on <i>Carex</i> or <i>Scirpus</i> in marshy places
<i>Cicadula quadrinotata</i>		NE		On <i>Carex</i> , usually in marshy places
<i>Conosanus obsoletus</i>		NE		on grasses in damp places, including both freshwater and saltmarshes. Widely distributed and generally common throughout Britain.
<i>Elymana sulphurella</i>		NE		in dry grassland
<i>Erzaleus metrius</i>		NE		in marshes and watersides on <i>Phalaris arundinacea</i>
<i>Eupteryx aurata</i>		NE		on a wide range of low-growing plants, including <i>Urtica dioica</i>
<i>Eupteryx signatipennis</i>		NE		on <i>Filipendula ulmaria</i> in wet grasslands and marshes
<i>Eupteryx thoulessi</i>		NE		principally on <i>Mentha aquatica</i> and <i>Lycopus</i> in marshes wet grasslands
<i>Eupteryx urticae</i>		NE		on <i>Urtica dioica</i>
<i>Eupteryx vittata</i>		NE		on a wide range of low-growing plants, including <i>Glechoma hederacea</i> , mints and buttercups
<i>Idiocerus lituratus</i>		NE		on various <i>Salix</i> species
<i>Lindbergina aurovittata</i>		NE		on oaks
<i>Macropsis cerea</i>		NE		on various <i>Salix</i> species
<i>Macropsis prasina</i>		NE		on various <i>Salix</i> species
<i>Macropsis scotti</i>		NE		on <i>Rubus fruticosus</i>
<i>Macrosteles septemnotatus</i>		NE		on <i>Filipendula ulmaria</i> in wet grasslands and marshes
<i>Populicerus confusus</i>		NE		on various <i>Salix</i> species
<i>Ribautiana ulmi</i>		NE		on elms
Cixiidae	Planthoppers (part)			
<i>Cixius nervosus</i>		NE		in a wide range of habitat types, but most frequent in woods
<i>Tachycixius pilosus</i>		NE		nymphs develop at the base of grasses in dry places, adults on low vegetation, bushes and trees
Delphacidae	Planthoppers (part)			
<i>Anakelisia fasciata</i>		NE		on tall sedges in fens and marshes
<i>Conomelus anceps</i>		NE		on <i>Juncus</i> species
<i>Delphacodes venosus</i>		NE		in marshes and fens, often at the base of rushes and other vegetation
<i>Javesella pellucida</i>		NE		on grasses in a wide range of situations

<i>Megamelodes quadrimaculatus</i>		NE		amongst vegetation in marshes
<i>Stenocranus major</i>		NE		on <i>Phalaris arundinacea</i> in marshes
<i>Struebingianella lugubrina</i>		NE		marshes and watersides on <i>Glyceria</i>
Acanthosomatidae	Shieldbugs (part)			
<i>Acanthosoma haemorrhoidale</i>	Hawthorn Shieldbug	LC		Deciduous woodland and scrub, feeding on rosaceous berry-bearing shrubs, in particular <i>Crataegus</i>
Anthocoridae				
<i>Anthocoris nemorum</i>		NE		Predatory species, on a range of deciduous tree and herbs, particularly <i>Urtica dioica</i>
<i>Buchananiella continua</i>		NE		Predatory species, associated with dead or dying vegetation and litter piles
<i>Orius laevigatus</i>		NE		Predatory species, on various trees and herbaceous species
<i>Orius niger</i>		NE		Predatory species, on various trees and herbaceous species
<i>Orius vicinus</i>		NE		Predatory species, on various trees and herbaceous species
<i>Temnostethus gracilis</i>		NE		Predatory species, usually on lichen-encrusted trees
Coreidae				
<i>Coreus marginatus</i>	Dock Bug	LC		Grasslands and ruderal habitats, feeding principally on <i>Rumex</i> , but other species of <i>Polygonaceae</i> are also used
Lygaeidae	Ground bugs			
<i>Chilacis typhae</i>	Bulrush Bug	NE		On <i>Typha latifolia</i> in wetlands, feeding on the seeds
<i>Cymus glandicolor</i>		NE		On various <i>Carex</i> species
<i>Cymus melanocephalus</i>		NE		On various <i>Juncus</i> species
<i>Drymus pumilio</i>		NE	NS(Nb)	Strongly ground-dwelling. A variety of habitats, particularly chalk grassland and calcareous fen, but also sandy sites. No specific host plant associations have been identified.
<i>Drymus sylvaticus</i>		NE		Strongly ground-dwelling. Dry grassland, probably feeding on moss, fungi and a range of herbaceous plants
<i>Ischnodemus sabuleti</i>		NE		Polyphagous on a range of grasses
<i>Scolopostethus puberulus</i>		NE		Strongly ground-dwelling. Dry and moist grasslands, particularly on calcareous soils.
<i>Scolopostethus thomsoni</i>		NE		A variety of habitats, frequently associated with <i>Urtica dioica</i>
<i>Stygnocoris sabulosus</i>		NE		Strongly ground-dwelling. Dry grasslands, probably polyphagous.
Miridae	Plant bugs			
<i>Amblytylus nasutus</i>		NE		Dry grasslands; polyphagous on a range of grasses.
<i>Apolygus lucorum</i>		NE		Primarily on <i>Artemisia vulgaris</i>
<i>Atractotomus mali</i>		NE		On <i>Malus</i> and <i>Crataegus</i>
<i>Campyloneura virgula</i>		NE		On various deciduous trees.
<i>Deraeocoris lutescens</i>		NE		Predatory species. On various deciduous trees
<i>Dicyphus epilobii</i>		NE		On <i>Epilobium</i> species
<i>Grypocoris stysi</i>		NE		On <i>Urtica dioica</i>
<i>Heterotoma planicornis</i>		NE		Ubiquitous on <i>Urtica dioica</i>
<i>Leptopterna dolabrata</i>		NE		Ubiquitous in various grassland habitats and polyphagous on a range of grass species
<i>Liocoris tripustulatus</i>		NE		Ubiquitous on <i>Urtica dioica</i>
<i>Lygocoris pabulinus</i>		NE		On various herbaceous plants, particularly <i>Urtica dioica</i>
<i>Lygus rugulipennis</i>		NE		In dry open habitats on a range of <i>Asteraceae</i>
<i>Macrotylus solitarius</i>		NE		On <i>Stachys sylvatica</i> in woods and woodland margins
<i>Megacoelum infusum</i>		NE		Predatory species. On <i>Quercus</i> species

<i>Orthops campestris</i>		NE		On various species of Apiaceae
<i>Orthops kalmii</i>		NE		On various species of Apiaceae
<i>Orthotylus marginalis</i>		NE		On Salix species
<i>Phytocoris varipes</i>		NE		Dry grasslands, polyphagous on a range of grasses and herbaceous plants
<i>Plagiognathus arbustorum</i>		NE		Ubiquitous on <i>Urtica dioica</i>
<i>Plagiognathus chrysanthemi</i>		NE		Polyphagous on a range of herbaceous plants
<i>Polymerus nigrita</i>		NE		Dry grasslands, on <i>Galium</i> species
<i>Psallus haematodes</i>		NE		On Salix species
<i>Stenodema laevigata</i>		NE		Polyphagous on various grasses
<i>Stenotus binotatus</i>		NE		Polyphagous on various grasses
<i>Tytthus pygmaeus</i>		NE		In various wet and dry habitats, associated with <i>Juncus</i> and a range of grasses. Predatory on the eggs of leafhoppers.
Nabidae	Damsel bugs			
<i>Himacerus apterus</i>		NE		Predatory species, on a variety of deciduous trees and occasionally conifers
<i>Himacerus mirmicoides</i>		NE		Strongly ground-dwelling. Predatory species in a range of dry, open habitats, often with sparse vegetation
<i>Nabis ferus</i>		NE		Strongly ground-dwelling. Predatory species in dry grasslands
<i>Nabis limbatus</i>		NE		Predatory species, particularly associated with damp grasslands
<i>Nabis lineatus</i>		NE		Predatory species associated with wetlands, including saltmarshes
Pentatomidae	Shieldbugs (part)			
<i>Eysarcoris venustissimus</i>	Woundwort Shieldbug	LC		Grasslands and ruderal habitats on Lamiaceae and Urticaceae, particularly <i>Stachys sylvatica</i> , <i>Ballota nigra</i> and <i>Urtica dioica</i>
<i>Palomena prasina</i>	Common Green Shieldbug	LC		Grasslands and scrub, polyphagous on a very wide range of plants
<i>Pentatoma rufipes</i>	Red-Legged Shieldbug	LC		Deciduous woodland and scrub; polyphagous but particularly associated with <i>Quercus</i>
<i>Picromerus bidens</i>	Spiked Shieldbug	LC		A predator of Lepidopteran and Hymenopteran larvae (moths, butterflies and sawflies). Widespread in a variety of open habitats
Rhopalidae				
<i>Corizus hyoscyami</i>		LC		Ruderal habitats, polyphagous on a range of composites
Psyllidae	Psyllids (part)			
<i>Cacopsylla peregrina</i>		NE		A green or brown jumping plant louse which feeds on hawthorn <i>Crataegus</i> . It is common throughout Britain.
Triozidae	Psyllids (part)			
<i>Trioza urticae</i>		NE		feeds on nettle. It is widespread and very common throughout Britain.
HYMENOPTERA				
Apidae	Bees (part)			
<i>Apis mellifera</i>		NE		a domesticated species, although colonies may persist in the wild for a few years in hollow trees and other structures.
<i>Bombus hortorum</i>		NE		abundant in most parts of Britain and commonly found in gardens. Usually nests on or just under the ground.
<i>Bombus pascuorum</i>		NE		Various habitats, nesting under dense vegetation. Very common and widespread throughout Britain.
<i>Bombus terrestris</i>		NE		Various habitats, nesting underground. Very widespread and common in lowland Britain.
Colletidae	Bees (part)			

<i>Hylaeus communis</i>		NE		a wide range of lowland habitats, nesting in holes and dead stems. Widespread in southern Britain
Halictidae	Bees (part)			
<i>Lasioglossum morio</i>		NE		various open habitats, nesting in south-facing slopes and visiting a range of flowers. Widespread in southern Britain.
Crabronidae	Digger Wasps			
<i>Crossocerus capitosus</i>		NE		nests in twigs and stems, stocks nest with small Diptera and psyllids. Widespread and uncommon
<i>Crossocerus elongatulus</i>		NE		nests in the soil and in dead wood, burrows stocked with small Diptera. Common in England and Wales.
<i>Crossocerus podagricus</i>		NE		various open habitats, nests in holes in dead wood and stocks burrow with small Diptera. Widespread in England and Wales
<i>Pemphredon lethifer</i>		NE		various habitats, nest in dead wood and stems. Prey aphids. Widespread but local in Britain
<i>Rhopalum coarctatum</i>		NE		various open habitats, nests in stems. Prey chiefly small flies. Local throughout England and Wales
<i>Trypoxylon attenuatum</i>		NE		various habitats, nests in dead wood and stems. Prey small spiders. Widespread in much of Britain
Eumenidae				
<i>Symmorphus gracilis</i>		NE		various habitats, nesting in holes in wood and preying on larvae of the beetles <i>Chrysomela populi</i> and <i>Cionus hortulanus</i> . Widespread in England north to Yorkshire.
Vespididae	Social wasps			
<i>Dolichovespula media</i>	Median Wasp	NE	NS(Na)	various habitats including urban situations. Widespread in England and Wales
<i>Vespula vulgaris</i>	Common Wasp	NE		a social wasp found in various habitats, widespread throughout Britain
Pompilidae	Spider-hunting wasps			
<i>Anoplius nigerrimus</i>		NE		various habitats, nesting in numerous situations. Widespread and fairly common.
Formicidae	Ants			
<i>Lasius brunneus</i>		NE	NS(Na)	nests in mature trees, in particular oaks. Mainly central and southern England.
<i>Lasius niger</i>		NE		numerous habitats including gardens. Widely distributed, but absent from some parts of Scotland.
<i>Myrmica ruginodis</i>		NE		various habitats including shaded sites. Widespread in Britain
Cynipidae	Gall wasps			
<i>Andricus quercuscalicis</i>	Knopper Gall	NE		forms a gall on the acorns of various oaks. Common and widespread
<i>Neuroterus numismalis</i>	Silk Button Gall Wasp	NE		forms a gall on the leaves of oaks. Common and widespread
Argidae	Sawflies (part)			
<i>Arge pagana</i>		NE		larvae on <i>Rosa</i> . Widespread in southern England north to Durham.
Tenthredinidae	Sawflies (part)			
<i>Allantus calceatus</i>		NE		Larvae on <i>Alchemilla vulgaris</i> , <i>Sanguisorba officinalis</i> and also <i>Filipendula</i> and <i>Fragaria</i> , <i>Rosa</i> and <i>Rubus</i> . Common throughout Britain and Ireland.
<i>Athalia cordata</i>		NE		Larvae on <i>Ajuga reptans</i> , <i>Antirrhinum</i> and <i>Plantago</i> sp. One of the commonest sawflies throughout Britain.
<i>Athalia rosae</i>		NE		Larvae periodically a pest of turnips, radish and other Cruciferae. Population fluctuates but commonest in southern Britain.
<i>Claremontia tenuicornis</i>		NE		
<i>Empria pallimaculata</i>		NE		Larvae on <i>Filipendula ulmaria</i> . Common throughout Britain.
<i>Nematus ribesii</i>		NE		Larvae a well-known pest on <i>Ribes uva-crispa</i> , <i>R. rubrum</i> and <i>R. alpinum</i> . Common throughout Britain. In the subgenus

				Kontuneimiana
<i>Pontania proxima</i>		NE		Larvae causes galls on the leaves of willows. Common and widespread in Britain.
LEPIDOPTERA	Butterflies & Moths			
Yponomeutidae				
<i>Argyresthia bonnetella</i>		NE		scrub and hedgerows, larvae feed on Hatwthorn. Widespread throughout Britain
Choreutidae				
<i>Anthophila fabriciana</i>	Nettle-tap	NE		various habitats, larvae feed on <i>Urtica dioica</i> . Common and widespread throughout Britain
Crambidae				
<i>Udea lutealis</i>		NE		various open habitats, larvae feed on a wide range of herbs. Widespread throughout Britain
Erebidae				
<i>Orgyia antiqua</i>	Vapourer	NE		The larva feeds on most deciduous trees. Distributed throughout the British Isles, often common in suburban areas.
Geometridae				
<i>Camptogramma bilineata</i>	Yellow Shell	NE		Very common species of various habitats, the larvae developing on docks, chickweeds and various other low herbage species.
<i>Epirrhoe alternata</i>	Common Carpet	NE		larvae on bedstraws, including cleavers <i>Galium aparine</i> . Generally distributed and common.
<i>Lomaspilis marginata</i>	Clouded Border	NE		various habitats, larvae on willows and poplars. Widespread.
<i>Timandra comae</i>	Blood-vein	NE	S41	larvae on docks and related plants. Widespread and common as far north as Scotland
Gracillariidae				
<i>Caloptilia semifascia</i>		NE		
<i>Phyllonorycter viminiella</i>		NE		Fens, marshes and other wet areas, the larva feeding on <i>Salix viminalis</i> , <i>S.fragilis</i> and more rarely other species of <i>Salix</i> . England, Wales with isolated records from Scotland.
Hesperiidae				
<i>Thymelicus sylvestris</i>	Small Skipper	LC		various open habitats, larvae feed on grasses. Widespread in England and Wales
Lasiocampidae				
<i>Euthrix potatoria</i>	Drinker	NE		A large brown moth common and widespread in Great Britain. The large hairy caterpillar feeds on grass and can be found in the spring.
Lycaenidae				
<i>Celastrina argiolus</i>	Holly Blue	LC		sunny rides and clearings of woodlands, gardens and hedgerows, larvae feed on <i>Ilex aquifolium</i> and <i>Hedera helix</i> . Widespread in England and Wales
Noctuidae				
<i>Autographa gamma</i>	Silver Y	NE		Mainly a migrant moth, most abundant in southern and eastern England but reaching all the British Isles
Nymphalidae				
<i>Aglais urticae</i>	Small Tortoiseshell	LC		various habitats, larvae feed on <i>Urtica dioica</i> . Widespread throughout Britain
<i>Aphantopus hyperantus</i>	Ringlet	LC		damp woodland rides and scrub on heavy soils, larvae feed on various grasses. Widespread throughout England, Wales and parts of Scotland
<i>Pararge aegeria</i>	Speckled Wood	LC		various open habitats, larvae feed on grasses in shade. Widespread in southern Britain and parts of Scotland
<i>Polygonia c-album</i>	Comma	LC		various habitats, larvae feed on <i>Urtica dioica</i> and <i>Humulus lupulus</i> . Widespread throughout England and Wales
Oecophoridae				

<i>Crassa unitella</i>		NE		various open habitats, larvae feed in fungi and under dead tree bark. Widespread in southern Britain
Phyllocnistidae				
<i>Phyllocnistis saligna</i>		NE		larvae mine the leaves of willow. Mainly southern England.
Pieridae				
<i>Gonepteryx rhamni</i>	Brimstone	LC		various habitats, larvae feed on Frangula and Rhamnus. Widespread in England and Wales
<i>Pieris brassicae</i>	Large White	LC		various habitats, larvae feed on Brassicaceae. Widespread throughout Britain
Plutellidae				
<i>Prays fraxinella</i>	Ash Bud Moth	NE		woodland and scrub, larvae feed on ash. Widespread throughout Britain
Peleopodidae				
<i>Carcina quercana</i>		NE		woodlands, larvae feeding on the leaves of various trees, particularly oaks. Widespread throughout Britain
Tortricidae				
<i>Celypha lacunana</i>		NE		various open habitats, larvae polyphagous on herbs and shrubs. Widespread throughout Britain
<i>Endothenia gentianaeana</i>		NE		various open habitats, larvae in teasel flowerheads. Widespread in southern Britain
<i>Eucosma cana</i>		NE		various open habitats, larvae feed in the flowerheads of thistles and knapweed. Widespread throughout Britain
<i>Lathronympha strigana</i>		NE		various open habitats, larvae feed on Hypericum perforatum. Widespread throughout much of Britain
<i>Pseudargyrotoza conwagana</i>		NE		Woodland and scrub, larvae feed on ash and privet. Widespread throughout Britain
<i>Spilonota ocellana</i>		NE		on various deciduous trees. Widespread throughout Britain
Zygaenidae				
<i>Zygaena lonicerae</i>		NE		various open habitats; larvae on a variety of vetches and trefoils. Widespread and common in England, in Wales restricted to the south-east.
MECOPTERA				
Panorpidae				
<i>Panorpa communis</i>		NE		various habitats, adults predatory, larvae soil-dwelling, Widespread throughout Britain.
<i>Panorpa germanica</i>		NE		various habitats, adults predatory, larvae soil-dwelling, Widespread throughout Britain.
NEUROPTERA	LACEWINGS			
Chrysopidae				
<i>Chrysopa perla</i>		NE		in the undergrowth of deciduous woods, feeding on aphids. Widespread throughout Britain
<i>Chrysoperla carnea</i>		NE		various habitats including gardens. Larvae are active predators on the foliage of shrubs and trees. Widespread throughout Britain
Hemerobiidae				
<i>Hemerobius humulinus</i>		NE		on broadleaved trees and shrubs, particularly in woodland. The larvae are active predators. Widespread throughout Britain.
ODONATA	DRAGONFLIES & DAMSELFLIES			
Aeshnidae				
<i>Aeshna grandis</i>	Brown Hawker	LC		lakes, ponds, canals and slow moving rivers including urban areas. Widespread throughout England but absent from the south west and much of Wales
<i>Aeshna juncea</i>	Common Hawker	LC		acidic, oligotrophic bog pools, lakes and ponds. Widespread in upland and heathland areas of Britain.

<i>Anax imperator</i>	Emperor Dragonfly	LC		in larger ponds, lakes, flooded sand and gravel pits, dykes, canals and slow flowing rivers. Widespread in southern England and south Wales.
Agriidae				
<i>Calopteryx virgo</i>	Beautiful Demoiselle	LC		clear, fast-flowing streams with stony bottoms with overhanging trees and shrubs. Local throughout southern Britain
Coenagriidae				
<i>Ischnura elegans</i>	Blue-tailed Damselfly	LC		generalist; all types of still and slow moving water. Widespread and very common in England and Wales, rather more restricted in Scotland
ORTHOPTERA	GRASSHOPPERS & BUSHCRICKETS			
Conocephalidae				
<i>Conocephalus discolor</i>	Long-winged Conehead	LC		usually found in long grassland. Historically scarce but now widespread in southern and central England.
Meconematidae				
<i>Meconema thalassinum</i>	Oak Bush Cricket	LC		deciduous woodland, in the north mainly on limestone. Widespread and common in southern Britain.
Tettigoniidae				
<i>Metrioptera roeselii</i>	Roesel's Bush Cricket	LC		usually found in long grassland. Historically scarce but now widespread in southern and central England.

APPENDIX 2: INVERTEBRATE STATUS CODES

The new IUCN status codes

Many British invertebrate species have been assigned a formal status code. These codes are paramount in the definition of noteworthy species and accordingly, it is necessary to explain them here.

Natural England has recently instigated a new programme of invertebrate status reviews, in which species are assessed according to universally accepted criteria set by the International Union for the Conservation of Nature (IUCN) (IUCN 2012a, 2012b, 2014). In contrast to previous status assessments, which focussed largely on absolute rarity, the IUCN approach places each species into a threat category that also takes historic population trends into account. Species qualifying for a threat status (Critically Endangered, Endangered or Vulnerable) are those that are not only rare, but also have a history of decline or extreme population fluctuations. Species not assigned to a threat category are categorised as Near Threatened, Least Concern, Data Deficient or Not Applicable.

As of 2016, a total of almost 4000 species have been reviewed in accordance with IUCN guidelines. All of these belong to groups that have readily available identification keys, active recorders and a history of recording. Progress with the IUCN invertebrate status review programme has recently been afforded a very useful summary (Webb & Brown, 2016).

A key to the IUCN status codes is given below and summarised in Fig. 1.

REGIONALLY EXTINCT (RE)

A taxon is Extinct when there is no reasonable doubt that the last individual has died.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Table 1). Critically Endangered species that are likely to be Extinct, but for which confirmation is still required are reported as Critically Endangered (Possibly Extinct), abbreviated as CR(PE).

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Table 1).

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Table 1).

NEAR THREATENED (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

NOT EVALUATED (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

NOT APPLICABLE (NA)

This category is typically used for introduced non-native species whether this results from accidental or deliberate importation. It may also be used for recent colonists (or attempted colonists) responding to the changing conditions available in Britain as a result of human activity and/or climate change. The IUCN regard 1500 as the cut-off date after which a species is classed as 'non-native'.

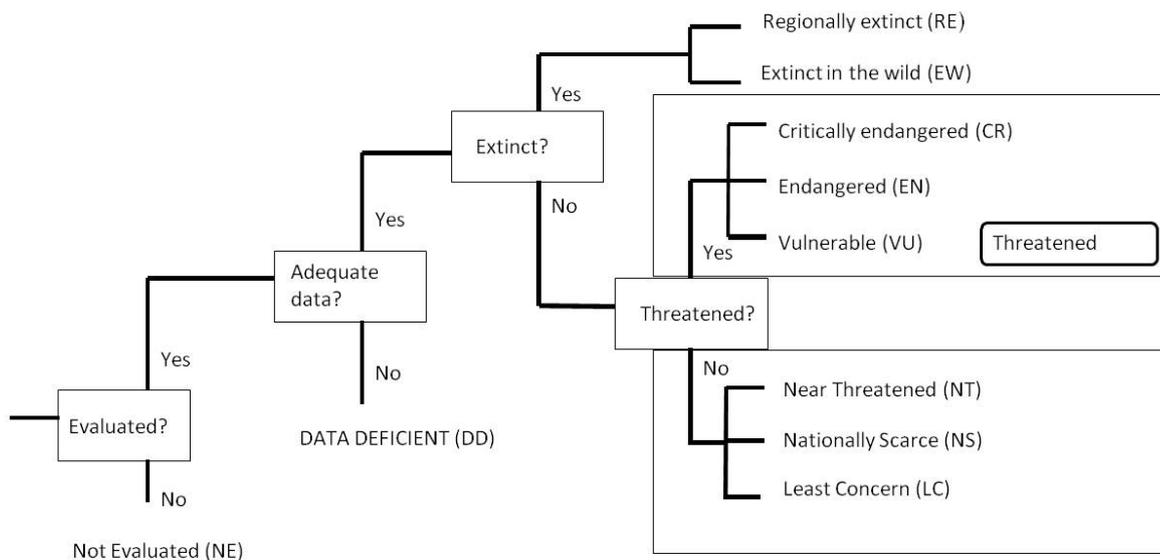


Fig. 1. Hierarchical relationships of the categories

Taxa listed as Critically Endangered, Endangered or Vulnerable are defined as Threatened (Red List) species. For each of these threat categories there is a set of five main criteria A-E, with a number of sub-criteria within A, B and C (and an additional sub-criterion in D for the Vulnerable category), and one of which qualifies a taxon for listing at that level of threat. The qualifying thresholds within the criteria A-E differ between threat categories and are summarised in Table 1.

Table 1. Summary of the thresholds for the IUCN Criteria

Criterion	Main thresholds		
	<i>Critically Endangered</i>	<i>Endangered</i>	<i>Vulnerable</i>
A. Rapid decline	>80% over 10 years or 3 generations in past or future	>50% over 10 years or 3 generations in past or future	>30% over 10 years or 3 generations in past or future
B. Small range + fragmented, declining or fluctuating	Extent of occurrence <100 km ² or area of occupancy <10 km ² + two of the following: - severely fragmented or only a single location - continuing decline - extreme fluctuations	Extent of occurrence <5,000 km ² or area of occupancy <500 km ² + two of the following: - severely fragmented or no more than 5 locations - continuing decline - extreme fluctuations	Extent of occurrence 20,000 km ² or area of occupancy <2,000 km ² + two of the following: - severely fragmented or no more than 10 locations - continuing decline - extreme fluctuations
C. Small population and declining	<250 mature individuals, population declining	<2,500 mature individuals, population declining	<10,000 mature individuals, population declining
D. Very small population	<50 mature individuals	<250 mature individuals	D1. <1,000 mature individuals
D2. Very small area of occupancy			D2. <20 km ² or 5 or fewer locations
E. Quantifiable probability of extinction	>50% within 10 years or three generations	>20% within 20 years or five generations	>10% within 100 years

Curent GB rarity codes (IUCN assessed species)

The IUCN reviews also provide an assessment of rarity, based purely on the number of hectads (10km x 10km squares) in which any given species occurs. Two categories are defined:

Nationally Rare (NR)

Species recorded from between 1 and 15 hectads within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.

Nationally Scarce (NS)

Species recorded from between 16 and 100 hectads within a given date class when there is reasonable confidence that exhaustive recording would not find them in more hectads.

Broadly speaking, the Nationally Rare category is equivalent to the Red Data Book categories used by Shirt (1987) and Bratton (1991), namely: Endangered (RDB1), Vulnerable (RDB2), Rare (RDB3) and Insufficiently Known (RDBK). The Nationally Scarce category is directly equivalent to the combined Nationally Notable A (Na) and Nationally Notable B (Nb) categories introduced by the Nature Conservancy Council (Ball, 1986).

Curent GB rarity codes (Non-IUCN assessed species)

For species not yet evaluated against the IUCN criteria, the most recent conservation status assessment is given, as specified by the Red Data Book categories (Shirt, 1987; Bratton, 1991) and Nationally Notable categories (Ball, 1986):

RDB1 (Endangered)

Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. These include:

- Species known from only a single locality since 1970.
- Species restricted to habitats that are especially vulnerable.
- Species which have shown a rapid and continuous decline in the last 20 years and are now estimated to exist in 5 or fewer localities.
- Species believed extinct but which would need protection if re-discovered.

RDB2 (Vulnerable)

Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. These include:

- Species declining throughout their range.
- Species in vulnerable habitats.
- Species whose populations are low.

RDB3 (Rare)

Taxa with small populations that are not at present endangered or vulnerable but which are at risk. These include:

- Species that are estimated to occur in 15 or fewer localities.

RDBK (Insufficiently known)

Taxa suspected to fall within the RDB categories but which are insufficiently known to enable placement.

RDBi (Indeterminate)

Taxa believed to qualify as either RDB1, RDB2 or RDB3 but which cannot be reliably placed into any category.

pRDB (Provisional)

The prefix 'p' before any Red Data Book category implies that the grading is provisional., pending the publication of a future edition of the Red Data Book.

Nationally Scarce species are those falling within the Nationally Notable categories introduced by Ball (1986). They are species that are estimated to occur within the range of 16 to 100 ten-kilometre squares of the British National Grid system since 1970. Notable species are subdivided as follows:

NS (Na)

Species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System, or for less well-recorded groups, within seven or fewer vice counties.

NS (Nb)

Species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System, or for less well-recorded groups, between eight and 20 vice counties.

NS (N)

Species estimated to occur in 16 to 100 10 km squares in Great Britain. The subdividing of this category into Nationally Scarce A and Nationally Scarce B has not been attempted for some species because of either the degree of recording that has been carried out in the group to which the species belongs, or because there is some other reason why it is not possible to be so exact.

Recent provisional status assessments

Certain poorly-recorded Dipteran groups have been subject to recent status assessment which is not based on comparisons of hectad data over two time periods (Falk et. al, 2016). This review uses IUCN status terminology with the added prefix 'p' (e.g. pVulnerable and pNationally Scarce) to indicate that these are provisional assessments based on data which would be insufficient for a formal IUCN status review. The category 'Data Deficient' (DD) is included.