Norwich Western Link

Environmental Statement Chapter 10: Biodiversity Appendix 10.21: Terrestrial Invertebrate Survey Report 2021

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1 Introduction

1.1.1 WSP UK Ltd was commissioned by Norfolk County Council to undertake a terrestrial invertebrate survey, with the following objectives:

- To undertake a desk study to determine the number and type of invertebrate species records within the Study Area (2km radius of the Scheme boundary);
- Identify the key habitats / features within the Survey Area that are likely to be of greatest value to terrestrial invertebrates;
- Sample and identify terrestrial invertebrate species within the Survey Area over spring, summer and early autumn;
- Assess the terrestrial invertebrate assemblage(s) of the Survey Area and evaluate the likely importance of the invertebrate assemblage(s) at a geographical scale; and
- Present the findings in a technical report.

1.1.2 We have included a summary of key information shown in this document in an accessible format. However, some users may not be able to access all technical details. If you require this document in a more accessible format please contact norwichwesternlink@norfolk.gov.uk

Norfolk County Council

Norwich Western Link

Terrestrial Invertebrate Survey Report

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Norwich Western Link

Terrestrial Invertebrate Survey Report

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1 Introduction

1.1 Project background

1.1.1. The Norwich Western Link Road (NWL) is a highway scheme linking the A1270 Broadland Northway from its junction with the A1067 Fakenham Road to the A47 trunk road near Honingham.

1.1.2. The NWL, hereafter referred to as the Scheme, will comprise:

- Dualling the A1067 Fakenham Road westwards from its existing junction with the A1270 to a new roundabout located approximately 400m to the north west.
- Construction of a new roundabout.
- Constructing a dual carriageway link from the new roundabout to a new junction with the A47 near Honingham.

1.1.3. As part of a separate planned scheme, National Highways proposes to realign and dual the A47 from the existing roundabout at Easton to join the existing dual carriageway section at North Tuddenham. If that scheme proceeds, it is expected that National Highways will construct the Honingham junction and the Norwich Western Link will connect to the north-eastern side of that junction.

1.1.4. The Scheme will cross the River Wensum and its flood plain by means of a viaduct. In addition, six other structures are proposed to cross minor roads and to provide habitat connectivity. The Scheme will include ancillary works such as provision for non-motorised users, necessary realignment of the local road network, including the stopping up of some minor roads, and the provision of environmental mitigation measures.

1.2 Ecological background

1.2.1. A Phase 1 Habitat Survey (WSP UK Ltd., 2020) undertaken in 2020 within the Scheme boundary identified the presence of dense patches of flowering plants; roadside verges and hedgerows (including those with mature and veteran trees); floodplain grazing marsh, chalk stream and river corridor (non-aquatic) and established deciduous woodland (including wet woodland) which have the potential to support notable assemblages of terrestrial invertebrates. A targeted terrestrial invertebrate survey was therefore recommended to establish a sufficient baseline to inform impact assessment.

1.3 Brief and objectives

1.3.1. WSP UK Ltd was commissioned by Norfolk County Council to undertake a terrestrial invertebrate survey, with the following objectives:

- To undertake a desk study to determine the number and type of invertebrate species records within the Study Area (2km radius of the Scheme boundary);
- Identify the key habitats / features within the Survey Area that are likely to be of greatest value to terrestrial invertebrates;

- Sample and identify terrestrial invertebrate species within the Survey Area over spring, summer and early autumn;
- Assess the terrestrial invertebrate assemblage(s) of the Survey Area and evaluate the likely importance of the invertebrate assemblage(s) at a geographical scale; and
- Present the findings in a technical report.

1.4 Study and survey areas

Study area

1.4.1. An ecological Desk Study was completed in October 2021 to include recent data relevant to the Scheme. The Study Area for this was defined as a 2km radius of the Scheme boundary, shown in Appendix A (See Separate Document).

Survey area

1.4.2. The Survey Area covered the entire Scheme boundary including proposed access roads and construction compounds which was assessed for its potential to support important terrestrial invertebrate assemblages. Distinct parcels of terrestrial habitat (often geographically separated from each other) identified with potential to support valuable invertebrate assemblages were then subject to targeted survey. The overall Survey Area and targeted survey parcels are shown in Appendix A (See Separate Document).

2 Relevant legislation and policy

2.1.1. The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the Act require the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with Natural England as required by the Act. In accordance with the Act the Secretary of State keeps this list under review and will publish a revised list if necessary, in consultation with Natural England.

2.1.2. The S41 list is used to guide decision-makers such as public bodies, including local authorities and utilities companies, in implementing their duty under Section 40 of the NERC Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions, including development control and planning. This is commonly referred to as the 'Biodiversity Duty.'

2.1.3. Guidance for public authorities on implementing the Biodiversity Duty has been published by Defra. One of the key messages in this document is that 'conserving biodiversity includes restoring and enhancing species populations and habitats, as well as protecting them.' In England the administration of the planning system and licensing schemes are highlighted as having a 'profound influence on biodiversity conservation.' Local authorities are required to take measures to "promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species. The guidance states that 'the duty aims to raise the profile and visibility of biodiversity, clarify existing commitments with regard to biodiversity, and to make it a natural and integral part of policy and decision making.'

2.1.4. In 2007, the UK Biodiversity Action Plan (BAP) Partnership published an updated list of priority UK species and habitats covering terrestrial, freshwater and marine biodiversity to focus conservation action for rarer species and habitats in the UK. The UK Post-2010 Biodiversity Framework, which covers the period from 2011 to 2020, now succeeds the UK BAP. The UK priority list contained 1150 species and 65 habitats requiring special protection and has been used as a reference to draw up the lists of species and habitats of principal importance in England. Of those 1150 species, there are 349 insects, 31 arachnids, 19 molluscs and 14 other inverts (covering worms, crustaceans, and other species) covered under the UK Post-2010 Biodiversity Framework. For the UK Biodiversity Action Plan (BAP) to be implemented successfully it requires some means of ensuring that the national strategy is translated into effective action at the local level, in this case the Norfolk Biodiversity Action Plan (Norfolk BAP).

2.1.5. In England, there are 56 Habitats of Principal Importance and 943 Species of Principal Importance on the S41 list. These are all the habitats and species found in England that were identified as requiring action in the UK BAP and which continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. Of the 943 Species of Principal Importance, 379 of these are terrestrial invertebrates (covering insects, arachnids and molluscs).

3 Methods

3.1 Desk study

3.1.1. A desk-based review of existing biological information was undertaken across the Study Area which utilised the following information sources:

- Multi Agency Geographic Information for the Countryside (MAGIC);
- Ordnance Survey mapping and publicly available aerial photography; and
- A data search report from Norfolk Biodiversity Information Service (NBIS) that included recent and historic invertebrate records within 2km.

3.2 Field survey

Invertebrate habitat potential assessment

3.2.1. The Survey Area (shown in Appendix A, see separate document) was assessed for its potential to support important terrestrial invertebrate assemblages by a suitably experienced entomologist, on 27 April 2021. Survey effort was focussed on habitats that were most likely to be directly impacted by the Scheme (e.g., through habitat loss).

3.2.2. An invertebrate habitat potential assessment survey was undertaken with reference to the (as yet unpublished) Invertebrate Habitat Potential Protocol (Dobson and Fairclough, unpublished). A record was made regarding the habitats present and features considered likely to be of significant value or potentially valuable for notable invertebrate assemblages. Such features can include areas with dense patches of flowering plants (including on roadside verges); south facing banks; patchy mosaic habitat including aggregations of bare ground; margins of scrub/woodland and substrate containing high organic content; mature trees, including standing and fallen dead wood and temporary areas of standing water Permanent aquatic habitats (e.g. rivers, ditches and ponds) were not included in this assessment as these are considered in the aquatic invertebrate report. (e.g. ephemeral pools and seepages) and associated terrestrial habitat (e.g. marshy grassland). To enable a baseline characterisation of the Survey Area for invertebrates, the habitat assessment included observations of features that might limit invertebrate interest, as well as those which might be of value for invertebrates.

3.2.3. The distribution and extent of features of potential value informed the design of targeted terrestrial invertebrate surveys that were subsequently conducted within the Survey Area.

Targeted survey for terrestrial invertebrates

3.2.4. Distinct areas of terrestrial habitat (often geographically separated from each other) identified during the habitat potential assessment with potential to support valuable invertebrate assemblages, were allocated land parcel numbers 1-12 (Appendix A See Separate Document) and subject to targeted survey in spring (April), summer (June) and late summer/early autumn (August/September).

3.2.5. These parcels predominantly comprise woodland (deciduous and mixed), woodland edge (with scrub and grassland), hedgerows (and their margins), marshy grassland and road verges of neutral grassland with dense patches of flowering plants. Therefore, the targeted survey was designed to target data collection of key indicator groups associated with such habitats. This approach relates to the guidance set out in Drake et al. (2007); which lists many of the target taxa of field layer and arboreal assemblages and their value in assessment. Coleoptera (beetles), aculeate Hymenoptera (bees, ants and wasps), Lepidoptera (butterflies and moths), Hemiptera (true bugs) and Orthoptera (grasshoppers and crickets) are four orders that are strongly represented in such assemblages. Certain families (and suborders) of the order Diptera (flies) (e.g., Syrphidae (hoverflies) and other families of the larger Brachycera were also targeted. Observations of other invertebrate taxa including were also recorded.

3.2.6. The following sampling methods were employed: pan traps, pitfall traps, window traps, light trapping, sweep-netting, beating and grubbing. These methods are described below and shown in Appendix B, Figures B1-B5 (See Separate Document).

Pan traps

3.2.7. Clusters of three to five pan (or water) traps were set out in flower-rich areas in April (spring sampling), June (summer sampling) and August / September 2021 (late summer/early autumn sampling). The pan traps comprised a mixture of yellow, blue and white plastic trays into which a small amount of water was poured (along with a few drops of detergent to break the surface tension). Such traps mimic large flowers and attract flying insects of many groups' especially aculeate Hymenoptera and certain Diptera, which become trapped in the fluid and can be collected later. During each visit the traps were set at the start of the survey and collected in at the end of the survey; each trap collected invertebrates for a period of at least 36 hours. Photograph 1 in Appendix C shows a pan trap deployed in situ.

Pitfall traps

3.2.8. Pitfall traps were set out in clusters of three in suitable habitats to target ground dwelling invertebrates e.g. carabid beetles. Pitfall trapping involved the use of circular plant pot trays (24 cm diameter x 5 cm depth) sunk into an excavated circular hole with the tray rims flush with the surrounding ground level. Preserving fluid (and a drop of detergent to break the surface tension) was poured into the trays until they were half full. Lastly, a piece of mesh was secured over the tray to prevent capture of small mammals, amphibians and reptiles. Traps were operational during the periods 28 April to 13 May 2021 (spring sampling) and 23 June to 6 July 2021 (summer sampling). Photograph 2 in Appendix C shows a pitfall trap deployed in situ.

Window flight interception traps

3.2.9. Three window flight interception traps (referred to hereafter as 'window trap') to target the dead wood fauna of veteran and over mature trees in Parcels 1, 3 and 9). Each trap was composed of four 2 litre (L.) plastic drinks bottles, securely locked in place at the base, and so contained within a circular plant pot tray (24 cm diameter x 5 cm depth), which also acted as a roof to shield the trap from excessive rainwater.

3.2.10. Wire fittings were used to bind the four bottles to the circular tray. An outward facing rectangular hole (the 'window') was cut out of each bottle. The constructed trap was inverted and therefore suspended from its base by hanging it from a branch. Approximately 30 millilitres (ml) of preserving fluid, comprising 1-part ethylene glycol (antifreeze) to 2 parts water was poured into each bottle via the 'windows' made on each bottle. Photograph 3 in Appendix C shows a window trap deployed in situ.

3.2.11. One trap was positioned alongside exposed heartwood of a large pedunculate oak in Parcel 1, a second was placed in a cavity of a veteran maple tree within Parcel 3; these remained for the duration of the survey (April to September 2021). A third trap was positioned in the cavity of a storm damaged mature ash tree within Parcel 9, in June and remained here until September.

Light trapping

3.2.12. Nocturnal moth surveying was undertaken on the nights of the 22 and 23 June, 20 and 21 July, 31 August and 1 September (six nights in total) in and around Parcels 1, 2, 3, 6, 10, 11 and 12. A single generator-powered 125W Robinson moth trap was used, fitted with a mercury vapour bulb to attract moths from within the vicinity of the trap. The light was switched on at dusk and was checked throughout the night, into the early hours of the morning in order to record all visiting moths. In addition, two portable 6W actinic heath traps were used in the field at adjacent locations to the Robinson moth trap to supplement the survey effort. Locations of light trapping are shown in Appendix B, Figures B4-B5(See Separate Document).

Sweep netting

3.2.13. Sweep netting involved walking at a steady pace through the vegetation and passing an entomologist's sweep net back and forth through vegetation in a figure of eight motion. Sweep netting was accompanied by 'spot-sweeping' where individual invertebrates (e.g., butterflies and day flying moths) were targeted and collected via a single sweep. Sweep netting was conducted during all three seasonal survey events (April, June and September 2021), within all Parcels.

Beating

3.2.14. Beating is a useful technique for extracting arboreal invertebrates from overhanging branches. This method involves placing a beating tray beneath a branch before delivering several sharp blows to the branch, sending any dislodged invertebrates into the beating tray for inspection. Beating was conducted during all three seasonal survey events (April, June and September 2021), targeting scrub edge habitat and lower reaches of woodland canopies within all Parcels, where appropriate.

Grubbing

3.2.15. Grubbing is the name generally applied to the extraction of invertebrates by hand from a variety of media such as: dead wood or fungi and under bark; from moist cracked ground in seasonally inundated habitats; in dung, or from dense aggregations of leaf matter and detritus (e.g., base of grass tussocks, fern shuttlecocks and leafy / woody deposits). If appropriate, to assist in the detection of small beetles, material was sieved or placed in a bucket of water to capture invertebrates moving to the surface. Grubbing from such media took place during all three seasonal survey events (April, June and September 2021), within all woodland parcels and from Parcel 11 (dung, poached ground, leaf litter and grass tussocks).

Sample sorting and identification

3.2.16. For all surveys, whilst some species could be identified in the field, the majority of specimens were stored in 70% Industrial Methylated Spirit (IMS) for later identification, using a stereoscopic microscope with the aid of identification literature. For all target groups identification was taken down to species level.

3.3 Dates of survey and personnel

3.3.1. The team for this survey and reporting involved the following personnel:

3.3.2. The lead surveyor was a principal consultant entomologist (BSc, PhD, MCIEEM) with extensive experience undertaking invertebrate surveys and assessment at over 100 development sites.

3.3.3. The invertebrate identification specialist (MSc, FRES) is a fellow of the Royal Entomological Society and Curator of Natural Science at Bolton Museum. He specialises in invertebrate identification, particularly Coleoptera, and has carried out work for a wide range of clients across the UK over the last 10 years.

3.3.4. Table 3-1 shows the weather conditions on the days of survey and gives details of the weather in the week preceding surveys.

Table 3-1 - Weather conditions during terrestrial invertebrate surveys

Survey dates and season	Survey type	Survey Effort (Hours)	Weather conditions
27 – 29 April 2021 (Spring)	Habitat potential assessment Targeted survey (sweep, beat, pan trap, pitfall trap setting, window trap setting)	25	Preceding week: Prolonged dry, but cool weather. Dates of Survey: Warm and dry. Gentle breeze. Cloud cover – 1-2 Oktas. Max temp. 15ºC.

Survey dates and season	Survey type	Survey Effort (Hours)	Weather conditions
13 May 2021 (Spring)	Targeted survey (spot sweeping, pitfall trap retrieval)	6	Preceding week: Cool conditions, with some scattered rainfall and sunny spells. Date of Survey: Mild, overcast conditions with sunny spells later in the afternoon. Cloud cover – 5-6 Oktas. Max temp. 18°C
23 – 24 June 2021 (Summer)	Targeted survey (sweep, beat, pan trap, pitfall trap setting, window trap setting / re-setting and moth trapping)	16.5	Preceding week: Frequent rain showers; unseasonably cool. Dates of Survey: Warm and dry. Light breeze. Cloud cover – 6-8 Oktas. Max temp. 17°C. Night temp. 9 °C
6 July 2021 (Summer)	Targeted survey (spot sweeping, pitfall trap retrieval)	6	Preceding week: Warm, sunny and mostly dry conditions. Date of Survey: Overcast, dry conditions. Gentle breeze. Cloud cover 6-8 Oktas. Max temp. 20°C.
20 – 21 July 2021 (Summer)	Targeted survey (Moth trapping)	5	Preceding week: Warm, sunny and mostly dry conditions. Dates of Survey: Warm and dry with some passing clouds. Light breeze. Cloud cover – 2-3 Oktas. Max temp. 25°C. Night temp. 18°C.
31 August – 2 September 2021 (Late summer/early autumn)	Targeted survey (sweep, beat, pan trap, window trap retrieval and moth trapping)	16	Preceding week: Cloudy and settled (dry); unseasonably cool. Dates of Survey: Cool, cloudy and dry. Light breeze. Cloud cover – 2-3 Oktas. Max temp. 20°C. Night temp 16 °C

Data analysis

3.3.5. The results and discussion section places a value on the rare and notable invertebrates found at the Site dependent on their current national status. Further information on status definitions and criteria of invertebrate groups can be found in Appendix D.

Pantheon assemblage analysis

3.3.6. The list of species derived from the invertebrate surveys was analysed using the "Pantheon" database tool developed by Natural England and the Centre for Ecology and Hydrology (Webb et al., 2018). For each species recognised by Pantheon, various attributes relating to associated habitats and resources, assemblage types and habitat fidelity scores are placed against them. Reports can then be generated including those that provide:

- information on each individual species entered into the database;
- a list of species belonging to different feeding guilds (e.g. xylophagous, saprophagous, nectivorous);
- a list of species with different associations (e.g. to certain groups of plant, fungi or animal);
- a summary of the number of species within the sample that have a particular score or fidelity and, if relevant an overall score that provides insight into the quality of the site that the sample has come from; and
- summary tables that assess where species live and what assemblages they are associated with.

3.3.7. In the context of this assessment, it is the report that Pantheon provides relating to where species live and with which assemblages they are associated, that is considered most useful in evaluating the relative importance of a site for its invertebrates. This considers the habitats and resources used by an invertebrate species at various hierarchical levels, from broad biotopes (e.g. tree associated, wetland, coastal) at the highest level, down to specific habitats (e.g. tall sward and scrub, decaying wood, arboreal, marshland) at a mid-level, and resources (e.g. sapwood & bark decay, heart-rot and fungal fruiting bodies all associated with the decaying wood habitat) at the finest level. The assessment also considers the "ISIS" (Invertebrate Species-habitat Information System) assemblage types that had previously been developed by Natural England (Drake et al., 2007). The original Specific Assemblage Types (SATs) are therefore carried forward in their original form, although 'Habitats' have replaced the ISIS Broad Assemblage Types (BATs).

3.3.8. SATs include only habitat specific species, which are normally faithful to a single habitat or resource, which are often closely associated with sites of higher conservation value. Analysis of SATs is helpful to inform the determination of the nature conservation value of a site for invertebrates; sites with high-scoring SATs are considered to have good quality invertebrate assemblages.

3.3.9. The original role of ISIS was to guide Natural England on assessing the conservation value of Sites of Special Scientific Interest (SSSIs) for their invertebrate assemblages (especially for the purposes of Common Standards Monitoring) (Drake et al., 2007). This was done by identifying whether an assemblage associated with a site was in a "favourable condition" (i.e. where it was considered to be of sufficient condition to meet the threshold criteria for an assemblage of SSSI-level value).

3.3.10. However, whilst the condition assessment function is still retained within Pantheon, it is not the sole use. Accordingly, the analysis may be used in other situations (e.g. by nature reserve managers or those assessing the effects of a development) to help understand which assemblages (SATs) within a site are considered likely to be of value.

3.3.11. A useful measure of the quality of a site for its invertebrate assemblage is to count and assign scores that are more heavily weighted towards the rarer species. The Species Quality Index (SQI) is a numerical scoring system contained within Pantheon that does exactly this. Each species recorded from a sample is given a Species Quality Score (SQS) based on their conservation status. The SQI is the sum of all SQSs divided by the number of species in that sample. This score is multiplied by 100 to give a 3 figure value without decimal places (e.g.100 rather than a 1.00). This SQI score is preferred to the SQS since it eliminates, to a greater extent the effect of recorder effort. Notwithstanding this, sites where little effort has been made to record the common species could result in overly amplified SQI scores. There is presently no published guidance on what SQI score might be classed as ‘good’ or ‘average’ as this might vary between habitats and regions (e.g. northern vs. southern England). However, as a rule of thumb, based on the experience of the author, a habitat with an SQI score exceeding 125 is likely to be of some value and merit further consideration.

3.4 Notes and limitations

3.4.1. Surveys conducted between April and September cover the optimal survey period for invertebrates. However, during the early autumn survey, access to Parcels 6 and 12 was not possible. This represents a minor constraint in interpreting the data for these parcels alone.

3.4.2. Moth surveys undertaken in June were subject to the notably cold spring of 2021. This affected moth activity, although a diversity of moths were trapped during the surveys particular in woodland habitat. Surveys in the more critical mid-summer period for moth diversity were undertaken in optimal conditions. There is therefore considered to have been no constraint to the survey work completed.

3.4.3. The survey approach has been designed with reference to guidance set out in Drake et al. (2007). It should be noted that the confidence in the ISIS / Pantheon analysis of SATs is reduced where survey work does not follow the precise ISIS sampling protocols. The objective of the survey was to identify a broad a range of invertebrates across target groups in predicted key areas of habitat, hence, the methods employed do vary slightly from the ISIS protocol. In such instances Webb *et al*. (2018) advises that caution is applied when using the SAT assessments, and that confidence in a favourable condition should be considered as ‘Medium’ for semi-ISIS compliant samples. In the present context, the analysis is considered to be broadly indicative; and may therefore give further steer to help understand which assemblages within the Survey Area are likely to be of value.

4 Results

4.1 Desk study

4.1.1. NBIS returned multiple records of invertebrate species for groups including Coleoptera (beetles), Diptera (true flies), Hemiptera (true bugs), Hymenoptera (ants, bees, wasps and sawflies), Lepidoptera (butterflies and moths), Odonata (dragonflies and damselflies). Many of these include species protected under the Wildlife and Countryside Act 1981 (as amended) such as Norfolk hawker *Anaciaeschna isosceles* and Desmoulin's whorl snail *Vertigo moulinsiana* (Desmoulin's whorl snail is covered in a separate technical appendix).

4.1.2. A complete list of invertebrate desk study records provided by NBIS is included in Appendix E.

4.2 Field survey

Terrestrial invertebrate habitat potential assessment

4.2.1. Parcels of complementary habitats within the Survey Area were distinguished based on suitability to support terrestrial invertebrates. This informed subsequent targeted surveys as to where valuable invertebrate assemblages were more likely to be encountered.

4.2.2. Appendix A (See Separate Document)shows the location of the Parcels assessed for invertebrates, showing locations of higher suitability (subjected to further targeted survey), and the remainder of the Survey Area with lower suitability (these areas are left blank on the plan). The habitat descriptions (below) are accompanied by photographs of features / habitats of note (Appendix C). For ease of reference, place names derived from the OS Explorer Map (OL10; 1:25,000 scale) have been used to aid the descriptions of the Survey Area; and specific parcels of land where targeted survey for invertebrates has been undertaken have been numbered Parcel 1 to 12.

General habitat description

Woodland and woodland edge habitat (Parcels 1-6)

4.2.3. Blocks and belts of woodland, mostly of planted origin, are located throughout the Survey Area; the most extensive being in the northern half, north west of Ringland village. Woodland was divided into six Parcels based on its geographical location and character. Each parcel is described below.

4.2.4. Parcel 1 relates to the southern and eastern parts of Rose Carr. Large parts of the interior of the woodland in this location are recently planted mainly with sycamore *Acer pseudoplatanus* (see Photograph 4 in Appendix C). The shrub layer is restricted, likely owing to grazing pressure from deer. The ground flora includes frequent dog's mercury *Mercurialis perennis* and ground ivy *Glechoma hederacea*. There are occasional mature trees, and these become frequent with large pedunculate oak *Quercus robur* forming tree-lines on the southern and eastern boundaries of the Parcel (see Photograph 5 in Appendix C).

4.2.5. It is at these boundaries, with the surrounding arable landscape, where the invertebrate interest is highest. The oaks are assessed as being mature to over mature, with considerable quantities of large diameter standing and fallen dead wood evident.

4.2.6. A wide field margin is present at the boundaries on both the southern and eastern sides. Shrubs including hazel *Corylus avellana*, blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and cherry *Prunus sp*. are beneath the canopy. Bramble *Rubus fruticosus* agg., nettle *Urtica dioica*, dead nettle species *Lamium spp*., coarse grasses amongst other ruderal vegetation provides structural diversity and, together with the shrubs, is considered likely to offer good supply of nectar and pollen, including for saproxylic species emerging from dead wood. On the eastern side of the parcel there is a strip of herb-rich grassland that extends out from the woodland, overlying sandy soils. Summer flowering pollen and nectar plants are frequent to abundant, including bird's-foot trefoil *Lotus corniculatus*, ox-eye daisy *Leucanthemum vulgare*, yarrow *Achillea millefolium*, black medick *Medicago lupulina* and common knapweed *Centaurea nigra*. Thermophilic species, particularly aculeate Hymenoptera may also take advantage of the herb-rich margins juxtaposed with sandy soils at the edges of the tilled land, where shelter from prevailing south westerly winds is provided from the surrounding woodland.

4.2.7. Further diversity to the woodland is provided in the north, at the junction to the River Wensum floodplain, where large poplar *Populus sp*. line the banks of a tributary to the Wensum that flows adjacent to the woodland. This area is lower lying, with still humid air and damp underlying substrate that may be of importance for ground beetles, craneflies and hoverflies. Some large poplar have fallen entirely or have lost limbs and these are considered to offer suitable habitat for saproxylic species.

4.2.8. Parcel 2 relates to the Nursery. Trees in this parcel comprise mostly single-aged stands of semi-mature conifers, although there is greater diversity at the field margins, where broadleaved species including pedunculate oak, beech *Fagus sylvatica* and sycamore are present. The ground flora is sparse, and shrubs are infrequent. Overall, this parcel is considered to be of limited value to invertebrates, especially in comparison to neighbouring parcels where trees of considerable antiquity are present together with associated dead wood and developing woodland ground flora and understorey.

4.2.9. Parcel 3 relates to the southern part of Spring Hills. This parcel includes frequent mature beech, pedunculate oak, sweet chestnut *Castanea sativa* and sycamore (see Photograph 6 in Appendix C). Hawthorn, field maple and hazel are frequent in the understorey, particularly to the eastern edges of the woodland, where it meets with a grass dominated field. Bramble, nettle, dog's mercury and ground ivy are frequent to locally abundant in the ground layer, although coverage by ground flora is limited with bare areas maintained likely through grazing / browsing by deer. Both standing and fallen dead wood is frequent, including one mature field maple tree with a hollowed-out trunk that allowed a window trap to be set at its core to capture emerging saproxylic invertebrates (see Photograph 3).

4.2.10. Parcel 4 relates to a central part of Long Plantation. Young (estimated 50 – 70-year-old) Scots pine *Pinus sylvestris* is dominant across most of this parcel (see Photograph 7 in Appendix C), although there are parts which have a broadleaved component that includes dominant sycamore and occasional beech *Fagus sylvatica*, pedunculate oak, cherry and ash *Fraxinus excelsior*. The understorey is dominated by regenerating sycamore and bramble and deer grazing is evident in clearings that are sparsely vegetated. Dog's mercury is infrequent. There is very little dead wood (standing or fallen), that may support saproxylic invertebrates and overall, the habitat quality for invertebrates is considered to be relatively poor owing to the lack of features of antiquity, limited structural and floristic species diversity, and uniform age structure.

4.2.11. Parcel 5 relates to the western part of Gravelpit Plantation. Evidence of planting is present in the form of rows of young sycamore, which is not considered to be of value to invertebrates. However, mature trees are also present, including frequent pedunculate oak, sycamore and hazel. The shrub and ground layer is relatively sparse owing to grazing pressure by deer; although spindle *Euonymus europaeus* and hawthorn are locally frequent in the shrub layer and bramble, ground ivy, nettle, red campion *Silene dioica* and garlic mustard *Alliaria petiolata* are locally frequent in the ground layer. Dead wood is frequent, including large diameter fallen and standing dead wood, an important component for saproxylic invertebrates.

4.2.12. Parcel 6 relates to part of Foxburrow Plantation. Included in this parcel is plantation woodland and associated rides. Semi-mature sycamore are abundant in the canopy and hazel and hawthorn are frequent in the shrub layer. The ground layer includes localised patches of bramble, ground ivy, dog's mercury, although as with other woodland across the Survey Area, grazing and browsing pressure by deer appears to be limiting the establishment of a more diverse and well-structured understorey. Consequently, the opportunities for invertebrates are reduced, with the greater interest considered to be associated with the rides which are more diverse, both structurally and floristically. Included in the rides are a variety of robust herbs offering nectar and pollen for invertebrates as well as foliage for leaf feeding; including: nettle, thistles *Cirsium spp*., docks *Rumex spp*., red campion, cow parsley *Anthriscus sylvestris* and upright hedge parsley *Torilis japonica*. A single stand of tall, mature beech trees is located within this parcel (see Photograph 8 in Appendix C) and constitutes the main area of fallen and standing dead wood.

4.2.13. Except for woodland Parcels 2 and 4, which were considered to be of lower value to terrestrial invertebrates, all other woodland parcels identified above were subject to further targeted survey.

Boundary features

4.2.14. Most of the field boundaries of the Survey Area are considered likely to be of relatively low value to invertebrates, these being uniform and species-poor hedgerows that are likely to permit movement of wildlife (including invertebrates) along these corridors, but not being of sufficient structural complexity and size, or floral species diversity to be of inherent value. These boundary features were therefore discounted in terms of further targeted survey.

4.2.15. Some boundary features are considered to be of higher potential value for invertebrates. Specifically, the road verges and associated habitat that generally run east – west, dissecting the Survey Area and several hedgerows with over mature trees and wide associated field margins. The following boundary features were subject to further targeted survey on account of their likely higher suitability for invertebrates.

Fakenham Road (A1067) (Parcel 7)

4.2.16. The road verges north and south of Fakenham Road (within the Survey Area) are structurally and topographically complex making these of higher potential value to terrestrial invertebrates (see Photographs 9 - 11 in Appendix C). These verges are considered together, in the following account that describes the key features of interest for invertebrates:

- Flat and sheltered areas are located on the southern verge, with a mosaic of sparsely vegetated ephemeral vegetation overlying sandy soils with frequent common stork's-bill *Erodium cicutarium* and ground ivy, alongside more established grassland dominated by coarse grasses, but also with robust herbs such as common knapweed, ox-eye daisy, common ragwort *Jacobaea vulgaris* and patches of dense bracken *Pteridium aquilinum* merging with bramble. This structural complexity is likely to benefit a range of phytophagous species associated with the diversity of plants found in this habitat. The shorter areas appear to be maintained by rabbit grazing, and in proximity to the road, by verge cutting, however, management appears to be restricted towards the margins and this will provide undisturbed areas for overwintering stages of invertebrate.
- There are a number of raised bunds of inert soil formed on the southern verge. This is an area previously taken by the former alignment of Fakenham Road, which was subject to a major road scheme in 2016-2017. The bunds are up to 1.5 m tall and provide localised shelter in their lee and due to variable orientation they offer a range of aspects combining to benefit thermophilous species. The southern sides of the bunds do not appear to be managed by cutting. Bramble scrub and tall robust herbs are abundant, especially on these southern sides, including ox-eye daisy, green alkanet *Pentaglottis sempervirens*, dead nettles *Lamium spp*., nettle, *great* mullein *Verbascum thapsus*, thistles, common poppy *Papaver rhoeas*, common knapweed, scentless mayweed *Tripleurospermum inodorum*, black whorehound *Ballota nigra* and weld *Reseda luteola*. The north facing sides are made of species-rich grassland, including bird's-foot trefoil, ox-eye daisy, cowslip *Primula veris*, yarrow, ribwort plantain *Plantago lanceolata* and red clover *Trifolium repens*.
- The northern verge is less topographically diverse, although it is entirely south facing and this aspect, combined with the underlying sandy soils and high floristic species diversity also make this verge of high suitability to thermophilous species of invertebrate especially aculeate Hymenoptera and ground beetles. Sparsely vegetated areas appear to be maintained short by heavy rabbit grazing, which has created small-scale variation with patches of bare ground. A shallow, (1 m depth) dry ditch is also present, that adds to the topographical diversity of the verge. The grassland of this verge includes many of those species associated with the opposite (north facing banks) of the southern verge.

However, notable additional species of value to invertebrates include frequent to locally abundant viper's bugloss *Echium vulgare*, tansy *Tanacetum vulgare*, musk mallow *Malva moschata* and white campion *Silene latifolia*.

Ringland Lane (Parcel 8)

4.2.17. A 6 m wide band of semi-natural vegetation is formed along the verge either side of Ringland Lane. It is considered to be of potential value to terrestrial invertebrates owing to the heterogeneity of vegetation along the road, the underlying sandy soils, it's sheltered position, surrounded by woodland on elevated ground to the north and south, and it's connectivity to blocks of woodland along its length. Vegetation comprises bramble and mixed scrub (hawthorn, blackthorn, field maple, hazel); tall grassland with bracken, coarse grasses and robust herbs (e.g. nettle, hogweed *Heracleum spondylium*, greater stitchwort *Stellaria holostea* and cow parsley); and shorter grassland and herbs (e.g. dandelion *Taraxacum officinale* agg., ground ivy and lesser celandine *Ficaria verna*). The presence of a number of early flowering species along the verge is of note. This was one of the parcels with an audible buzz of insects during the survey undertaken in April.

Hedgerows north of Weston Road (Parcel 9)

4.2.18. North of Weston Road (within the Survey Area) is a hedgerow network that includes mostly floristically species-poor hedgerows that are intensively managed and therefore of limited structural diversity. However, there are several over-mature trees in these hedgerows, including for example, a large, mature pedunculate oak in the hedgerow that heads north east from Weston Road, and a damaged mature ash tree (following the loss of a main part of the trunk) in a hedgerow that is at a right angle to this. These trees are considered likely to be of significant intrinsic value to invertebrates, including saproxylic species; a window trap was fitted in the cavity formed by the collapse of the upper trunk of the ash tree. Their location within hedgerows, and also the wide field margins that are 15 - 20 m wide on the south facing sides (see Photographs 12 and 13 in Appendix C) adds to their potential value for invertebrates. These field margins overly sandy soils with exposures present, especially where rabbit grazing and digging is frequent. They contain a variety of summer flowering pollen and nectar plants including wild carrot *Daucus carota*, ground ivy, dandelion, bird's-foot trefoil, ragwort, ox-eye daisy, yarrow, black medick and common knapweed. A combination of pollen and nectar plants, together with underlying sandy soils and sheltered spots created in the lee of hedgerows is considered likely to be beneficial to thermophilic species, particularly aculeate Hymenoptera. Furthermore, the presence of standing dead wood associated with the mature and overmature trees adds further interest, especially for certain solitary bees and wasps that nest in holes in the timber.

The Broadway (Parcel 10)

4.2.19. A narrow wooded belt is formed on either side of a lane named 'The Broadway', with mature pedunculate oak and ash, some with thick ivy *Hedera helix* covering (see Photograph 14 in Appendix C). Shrubs include apple *Malus sp*., field maple and hawthorn. Sycamore and Scot's pine have been planted in the belt south of The Broadway.

4.2.20. Some standing and fallen dead wood is present, including large diameter branches which may benefit saproxylic species. Bramble scrub is dominant in the understorey, with occasional wood sage *Teucrium scorodonia* and bluebell *Hyacinthoides non-scripta*.

River Wensum floodplain (Parcel 11)

4.2.21. Parcel 11 features the cattle-grazed pasture in the low-lying floodplain of the River Wensum. The area of grassland of greatest suitability to terrestrial invertebrates is that which is bounded by a tributary of the River Wensum, flowing parallel to the river, to the south (see Photographs 15 and 16 in Appendix C). Here the grassland has good structural diversity, with short and tall grassland and marshy areas dominated by reeds (e.g. canary reed grass *Phalaris arundinacea* and reed sweet-grass *Glyceria maxima*). Being within the floodplain, there is evidence of leafy debris having accumulated in the grassland, this trash-line may provide additional value for invertebrates and tussocks of tufted hair-grass may offer refuge to invertebrates and hibernating opportunities where these sit proud of the water level during periods of high water (see Photograph 17). Floristic diversity for pollen, nectar and foliage feeding species is enhanced through the presence of water mint *Mentha aquatica*, marsh woundwort *Stachys palustris*, silverweed *Argentina anserina*, thistles *Cirsium spp*. and ragwort, which occupy the marginal zone of the tributary and side ditches. The tributary and ditch sides are locally poached with muddy, damp exposures that may support a specialist invertebrate assemblage (primarily of ground beetles, rove beetles and certain flies such as dance and soldier flies) associated with poached, waterlogged and dung enriched conditions (see Photograph 15 in Appendix C).

Grazed marsh south of The Broadway (Parcel 12)

4.2.22. Parcel 12 is located alongside a stream formed in a shallow valley south of The Broadway and immediately south of Foxburrow Plantation (Parcel 6). It is an area of marshy grassland with similar characteristics and interest to invertebrates as Parcel 11. However, Parcel 12 is more structurally diverse owing to patches of bramble, hawthorn and gorse *Ulex europeaus* scrub in amongst the grassland and along the banks of the stream (see Photograph 18). It is also hemmed in, to the north, by the wooded belt of Foxburrow Plantation which, together with the scrub, provide localised areas of warmth, of benefit to thermophilous invertebrates. Floristic diversity of herbs is relatively high, with frequent dandelion, ground ivy, lesser celandine, creeping buttercup *Ranunculus repens*, lesser spearwort *Ranunculus flammula*, water mint and marsh thistle *Cirsium palustre*. The banks of the stream include abundant fool's watercress *Helosciadium nodiflorum* and brooklime *Veronica beccabunga*; both species also appearing in the adjacent marshy grassland in permanently wet areas.

Agricultural fields

4.2.23. The arable fields and grazed pasture within the Survey Area (excluding the grazed marsh and floodplain described above) are of low suitability to invertebrates owing primarily to their homogenous structure and dominance of relatively few plant species; and also to their exposed nature (many of these fields are comparatively very large and windswept) and intensive / routine management. On these grounds intensive agricultural land uses have been excluded in respect to further invertebrate survey.

Invertebrate species assemblage

4.2.24. The results of the targeted terrestrial invertebrate surveys provide an indication of the relative species diversity within the targeted groups of invertebrates. Over 2,000 specimens were collected or recorded over the course of the surveys, allowing 683 species to be identified from the Survey Area.

4.2.25. Of the target groups, Coleoptera and Lepidoptera were dominant, with 234 species and 228 species respectively. Hemiptera was represented by 54 species; Hymenoptera was represented by 78 species; and Diptera 34 species. Other orders, with fewer than ten species included (but was not limited to) Araneae (spiders), Orthoptera (grasshoppers and crickets), Pulmonata (lunged snails), Julida (millipedes) and Isopoda (woodlice).

4.2.26. Of the species recorded, 510 (c. 75 %) are without any recognised conservation status, being widely distributed and common, and exhibiting little habitat specificity; and 130 species (c. 19 %) are regarded as 'Local'. A total of 43 of the species recorded (c. 6 %) are currently regarded as Nationally Rare, Data Deficient or Section 41 Species of Principal Importance (NERC Act, 2006). Further information on status definitions and criteria of invertebrate groups can be found in Appendix D. The full list of invertebrates recorded within the Survey Area is displayed in tabular format in Appendix F.

4.2.27. Further information relating to species which were recorded with an assessed status, is provided below.

Coleoptera (beetles)

Aderidae (Ant-like Leaf Beetles) Euglenes oculatus - UK Status: Nationally Scarce

This small beetle has wide distribution across southern and central England and is typically found in broad-leaved woodland and pasture-woodland; it has been recorded mainly from stumps and branches of oak, but is also found on lime, hawthorn, beech, birch and chestnut (Hyman and Parsons, 1992). The status of this species has recently been reviewed and changed to Nationally Scarce (Alexander *et al.*, 2014).

Three specimens were taken from a window trap set in Parcel 1, in September 2021.

Carabidae (Ground Beetles) Amara montivaga - UK Status: Nationally Scarce

This species is typically found in litter on dry sandy or calcareous soils with ruderal vegetation (Duff, 2012). It has a local to very local distribution in southern England, central Wales and Scotland. This beetle previously had no status but has recently been reviewed and altered to nationally scarce in Telfer (2016).

Three beetles were identified from a pitfall trap in Parcel 7, retrieved in July 2021.

Carabidae (Ground Beetles) Harpalus attenuatus - UK Status: Nationally Scarce

This ground beetle is found on dry sandy soils in open areas; it has a local distribution in south east England and very local and exclusively coastal distribution in north east and south west England (Duff, 2012).

Two beetles (one of each sex) were identified from a pitfall trap in Parcel 7, retrieved in July 2021.

Cerambycidae (Longhorn Beetles) Phytoecia cylindrica - UK Status: Nationally Scarce

This longhorn beetle is usually found on umbellifers, especially cow parsley *Anthriscus sylvestris*; it is widespread in central and southern England and very local in the north (Duff, 2016). The status of this species has recently been reviewed by Alexander (2019).

One beetle was taken from a pan trap set in Parcel 8, in June 2021.

Cerambycidae (Longhorn Beetles) Prionus coriarius - UK Status: Nationally Scarce

The larvae of this very large beetle feeds in rotten wood, usually of broadleaved trees, for at least three years. It can be found in woods or pasture woodland and is very local in central and south England and Wales. It is thought to be declining (Duff, 2016).

One beetle was recorded at a light trap in July 2021 at Parcel 6.

Chrysomelidae (Leaf Beetles) Cassida prasina - UK Status: Nationally Scarce

This leaf beetle is mainly found on yarrow and sneezewort *Achillea ptarmica*, in most months of the year, hibernating in moss. It is local in central and southern England and coastal Wales, and very local in north-west England (Duff, 2016).

Two beetles were taken from a pitfall trap in Parcel 7 (where yarrow was frequent), retrieved in May 2021.

Chrysomelidae (Leaf Beetles) Chrysolina marginata - UK Status: Nationally Rare

According to Duff (2016), this distinctive beetle can be found on or at the roots of yarrow. It feeds nocturnally on the leaves and hides under stones during the day, so is possibly under-recorded for those reasons. It is very local in England and apparently in decline. Its status was reviewed recently in Hubble (2014) and confirmed as Nationally Rare.

One beetle was recorded form sweeping the field margins at Parcel 9, in September 2021.

Curculionidae (True Weevils) Gymnetron rostellum - UK Status: Nationally Scarce

This small weevil is typically found on field margins and disturbed ground, often on sandy soils (Duff, 2016). It is very local in south east England.

One beetle was identified from a pitfall sample retrieved from Parcel 7 in May 2021. Pitfall traps were set in an artificial bund of loose sandy soil, which matches the habitat requirements of this species.

Curculionidae (True Weevils) Hylesinus wachtli - UK Status: Nationally Scarce

This weevil breeds under the bark and in dead branches of ash and is widely distributed but local in central and southern England and local in northern England (Duff, 2016).

Three specimens were identified from a window trap set in a damaged ash tree in Parcel 9 that was retrieved in September 2021. A further individual was beaten from an ash tree in Parcel 10, also in September 2021.

Curculionidae (True Weevils) Microplontus campestris - UK Status: Nationally Scarce

This weevil is associated with oxeye daisy and is widely distributed but local in central and southern England.

Two beetles were swept from vegetation along the field margins of Parcel 9 in June 2021.

Curculionidae (True Weevils) Otiorhynchus raucus - UK Status: Nationally Scarce

Records for this species are mostly from the eastern side of England. Morris (1997) describes the species as '*ground living in open and sparsely-vegetated, chalky and sandy places*'. Mazur (2003) more specifically suggests that man has shaped its range because it is found in anthropogenic habitats and such as urban parks, gardens, and roadside verges. It is polyphagous, typically found at the base of plants, and the larvae feed on the roots.

One weevil was taken from a pitfall trap set in Parcel 7 (artificial bund associated with a roadside verge) retrieved in both May and July.

Curculionidae (True Weevils) Scolytus mali - UK Status: Nationally Scarce

The larvae of this small weevil develop under the bark or rosaceous trees and shrubs or the living wood of elms *Ulmus* sp. It has a local distribution in England (Duff, 2016).

One beetle was taken from a window trap set in Parcel 1, in September 2021.

Curculionidae (True Weevils) Stenocarus ruficornis - UK Status: Nationally Scarce

The larvae develop in the roots of common poppy and possibly other *Papaver* species, and the beetle can be found in moss. It is local in England and very local in parts of Wales and Scotland (Duff, 2016).

One weevil was taken from a pitfall trap set in Parcel 7 (artificial bund, including common poppy, associated with a roadside verge) retrieved in May.

Elateridae (Click Beetles) Procraerus tibialis - UK Status: Nationally Scarce

This species of click beetle is usually found in the rotten wood of broad-leaved trees or on flowering shrubs in ancient pasture woodland; it is very local in central and southern England (Duff, 2020). It is grade 1 on a list of saproxylic beetles in Alexander (2004) and used in the calculation of Index of Ecological Continuity.

One beetle was identified from grubbing through dead wood in Parcel 5, in June 2021.

Mordellidae (Tumbling Flower Beetles) Mordellistena neuwaldeggiana - UK Status: Nationally Scarce

Mordellidae larvae generally develop in the stems of various grasses, legumes and herbaceous plants and the adult's frequent flowers. This species is found on Apiaceae or on trees and shrubs in woods (Duff, 2020). It is grade 3 on a list of saproxylic beetles in Alexander (2004). The status of this species has recently been reviewed by Alexander *et al*. (2014).

One female was taken from a window trap set in a hollow trunk of a maple tree, in Parcel 3, in September 2021.

Ptinidae (Spider Beetles) Dorcatoma flavicornis - UK Status: Nationally Scarce

This beetle is widespread but very local across southern and central England and parts of Wales, typically in broad-leaved and pasture-woodland. Both larvae and adults inhabit dead wood, especially red-rotten oak. It is grade 3 on a list of saproxylic beetles in Alexander (2004) and used in the calculation of Index of Ecological Continuity. The status of this beetle has been recently reviewed by Alexander (2017).

Three beetles were taken from a window trap set in Parcel 1, in September 2021.

Scraptiidae (False Flower Beetles) Anaspis thoracica - UK Status: Nationally Scarce

This very variable species is widespread in England except for the south-west. The larvae develop in half-dry red-rotten oak wood and the beetle is on a list of saproxylic beetles in Alexander (2004), without grade. The status of this species has recently been reviewed by Alexander *et al*. (2014).

One beetle was swept from vegetation in Parcel 7 in June 2021.

Staphylinidae (Rove Beetles) Ocypus nitens - UK Status: Nationally Scarce

Although fairly widespread, this large staphylinid is recorded mostly from central and south-east England. According to Lott & Anderson (2011) it is found in open and shaded environments on dry or damp soils.

One beetle was taken from a pitfall trap placed in Parcel 3 and retrieved in May 2021.

Tenebrionidae (Darkling Beetles) Pseudocistela ceramboides - UK Status: Nationally Scarce

This species is found in ancient woodland or fens on or near red-rotten old trees, usually oak *Quercus* spp. with the fungus chicken of the woods *Laetiporus sulphureus*. It is locally distributed in central and south east England, and very local in northern England (Duff, 2020). It is grade 2 on a list of saproxylic beetles in Alexander (2004) and used in the calculation of Index of Ecological Continuity.

One beetle was taken from a window trap set in Parcel 1, in September 2021.

Throscidae (Small False Click Beetles) Aulonothroscus brevicollis - UK Status: Nationally Rare

There are relatively few records for this small beetle and its similarity to several similar species and difficulty in identification may hinder recording. Most records come from the Norfolk and Worcestershire area. It is often found in pasture and sometimes broad-leaved woodland and is associated with oak, the adults in the canopy and larvae in dead wood (Hyman & Parsons, 1992). It is grade 1 on a list of saproxylic beetles in Alexander (2004) and used in the calculation of Index of Ecological Continuity.

One beetle was taken from a window trap set in Parcel 1, in September 2021.

Diptera (Flies)

Tipulidae (Craneflies) Ctenophora pectinicornis - UK Status: Nationally Scarce

This distinctive species is the most widespread of the three *Ctenophora* species but is still very local, with few records in most years and there are relatively few records from Norfolk. The larvae require large rotting timbers, preferring heartwood in the shattered ends of broken trunks, often in beech. The species is classed as an ancient woodland indicator (Stubbs, 2021).

One cranefly was extracted from a window trap set in the hollow trunk of a field maple tree, in Parcel 3, in June 2021.

Hemiptera (True Bugs)

Lygaeidae (Ground Bugs) Graptopeltus lynceus - UK Status: Nationally Scarce

This bug feeds mainly on viper's bugloss, although other species in the borage family may be used. It is associated with dry sparsely-vegetated habitats such as dunes, breckland, and old sand or chalk pits (British Bugs website, accessed 25 September 2021). It is a scarce bug which has a scattered distribution across southern England, particularly the south-east.

One specimen was taken from a pitfall trap set in Parcel 7 (roadside verge with frequent viper's bugloss) retrieved in July 2021.

Miridae (Plant Bugs) Lygus pratensis - UK Status: Nationally Rare

The British Bugs website (accessed 25 September 2021) describes the species as '*previously scarce and confined to southern heaths, this bug has recently undergone a dramatic range expansion. It is now widespread throughout much of southern Britain and is much commoner than its RDB3 status suggests*'.

Specimens were swept from vegetation in Parcels 7 and 9 in April and September 2021 respectively.

Rhopalidae (Scentless Plant Bugs) Rhopalus parumpunctatus - UK Status: Nationally Scarce

This is species is '*locally distributed in southern Britain…. found on heathland and dry sandy habitats, including dunes. It is associated with many plants, particularly mouse-ear Cerastium and overwinters as an adult, the new generation appearing in August*' (British Bugs website, accessed 25 September 2021).

One individual (possibly overwintering) was taken from a pitfall trap in May 2021; and another was swept from vegetation in June 2021; both from Parcel 7.

Hymenoptera (Sawflies, Wasps, Bees and Ants)

Andrenidae (Mining Bees) Andrena alfkenella - UK Status: Nationally Rare

This solitary bee is found on dry, well drained soils, particularly chalk grassland, occasionally heaths, dunes, commons and cliffs both coastal and inland. It visits various flowers, particularly Asteraceae. It is very much a southerly insect, with a number of outlying records from Norfolk (BWARS website, accessed 25 September 2021).

One bee was taken from a pan trap set in Parcel 9 in April 2021.

Apidae (Bees) Nomada fucata - UK Status: Nationally Scarce

According to Falk (2015) this bee occurs wherever its host *Andrena flavipes* is found, especially on soft rock cliffs, chalk downland and brownfield sites. It has expanded in distribution, as its host has, and its status is in need of review.

One bee was taken from a pan trap set in Parcel 7 in April 2021.

Chrysididae (Jewel Wasps) Chrysis illigeri - UK Status: Nationally Scarce

According to the BWARS website (accessed 25 September 2021) this wasp is a southerly insect with many records also from Norfolk.

Three wasps were taken from a pan trap set in Parcel 7 in June 2021. It is a parasitoid of the wasp *Tachysphex pompiliformis*, a species that was also recorded from Parcel 7 in June 2021.

Crabronidae (Digger Wasps) Cerceris quinquefasciata - UK Status: Nationally Rare and SPI

This distinctive wasp preys on weevils, mainly in the Apionidae family and nests in hard sandy soil such as paths. Although widespread in southern England, most records are old and it is scarce, although it can be common where found. It visits creeping thistle and bramble (BWARS website, accessed 25 September 2021).

One male was recorded from a pan trap in Parcel 7, in June 2021.

Crabronidae (Digger Wasps) Nysson dimidiatus - UK Status: Nationally Scarce

This distinctive wasp has been recorded widely across England and Wales as far north as Yorkshire. It is very scarce in most districts and it has never been regarded as common in the past (BWARS website, accessed 25 September 2021). A cleptoparasite of the crabronid wasp *Harpactus tumidus* it is typically found in habitats favoured by its host such as sparsely-vegetated or short-cropped areas on dry sandy or clayey soils fully exposed to the sun on heathland, coastal dunes, coastal land slips, open areas in woodland, sandpits, embankments and occasionally gardens. It feeds on Asteraceae species such as hogweed and wild carrot.

One female was recorded from a pan trap in Parcel 7, in June 2021.

Crabronidae (Digger Wasps) Philanthus triangulum - UK Status: Nationally Rare

The BWARS website (accessed 25 September 2021) states '*less than 20 years ago, this magnificent wasp, commonly known as the 'bee wolf' or 'bee-killer' was considered to be one of the great aculeate rarities in Britain. Records for the last few years indicate that currently the species is locally common to abundant in a steadily increasing number of sites in southern England. In view of the recent expansion of its range, this status should be revised*.' It is usually found in sand dunes and lowland heaths.

One male was recorded from a pan trap in Parcel 7, in September 2021.

Halictidae (Sweat Bees) Lasioglossum quadrinotatum - UK Status: Nationally Scarce

This species is widespread across England, but most records are from the south and south-east, with many records from Norfolk. It can be found in heathland, open woodland and calcareous grassland. It visits various flowers especially Asteraceae (BWARS website, accessed 25 September 2021).

One male was recorded from a pan trap in Parcel 7, in June 2021.

Halictidae (Sweat Bees) Sphecodes crassus - UK Status: Nationally Scarce

This small bee is found in a wide variety of open habitats and visits mayweeds, thistles and umbellifers. It was regarded as scarce but has apparently become more common in recent years and is widespread and locally common across southern England and the midlands (Falk, 2015). This suggests that it will be downgraded in any future review.

One bee was recorded from a pan trap in Parcel 7, in June 2021.

Halictidae (Sweat Bees) Sphecodes longulus - UK Status: Nationally Scarce

One of the smallest members of a genus of bees that are parasitoids of other small bees, this species preys on *Lasioglossum* species such as *L. leucopus* and *L. morio*, which are both recorded from Parcel 7, where this species was found. It is associated with a wide variety of open sandy habitats including heathland, acid grassland, soft rock cliffs and sandpits and is very scarce and local in south-east England and south Wales. It visits flowers of Apiaceae and Asteraceae (Falk, 2015).

One bee was taken from a pan trap set in Parcel 7 in April 2021.

Melitidae (Melittid Bees) Dasypoda hirtipes - UK Status: Nationally Scarce

This rather large, hairy and distinctive species appears to be largely coastal, preferring sandy heaths and dunes. Females dig long burrows in sparsely vegetated level ground between late June and early September and some sites may contain large nest aggregations. It is known to visit various yellow Asteraceae flowers that open in the morning (BWARS website, accessed 25 September 2021).

Six males were taken from a pan trap in Parcel 9, in September 2021.

Lepidoptera (Butterflies and Moths)

Adelidae (Longhorn Moths) Nemophora fasciella - UK Status: SPI

Larvae of this small moth feed on black horehound *Ballota nigra*, firstly on the seeds, then in a case made from foodplant fragments, the adults appearing in July. The species is found mainly in south and south east England and northwards into south Yorkshire and Lancashire (UK Moths website, accessed 25 September 2021).

The moth was recorded in grassland adjacent to woodland at Parcel 1 in July 2021.

Gelechidae (Gelechiid Moths) Monochroa palustrellus - UK Status: Nationally Scarce

The larva of this distinctive moth feeds internally on the roots and stems of dock *Rumex* spp., particularly curled dock *Rumex crispus*. It favours dry sandy areas and is distributed locally in south east England, with most records from Cambridgeshire and Norfolk. It flies between June and August and is attracted to light (UK Moths website, accessed 25 September 2021).

The moth was recorded at light in Parcel 1 in July 2021.

Noctuidae (Owlet Moths) Noctua orbona - UK Status: SPI

The UK Moths website (accessed 25 September 2021) records this as a declining species which has now disappeared from many of its former haunts. Although it still occurs in scattered localities in southern England and East Anglia, it is generally quite rare. There are many records from Norfolk. The larvae feed on various herbaceous plants and grasses, and the adults fly from June to September.

The moth was recorded at light in Parcel 1 in September 2021.

Nymphalidae (Brush-footed Butterflies) Coenonympha pamphilus - UK Status: SPI

According to the UK Butterflies website (accessed 25 September 2021), this small nymphalid '*has shown a severe decline over the long term and is therefore a priority species for conservation efforts*'. It is associated with various grasses including creeping bent *Agrostis stolonifera* and red fescue *Festuca rubra* and known to use ragwort and bramble as nectar sources.

This butterfly was recorded in the grassland adjacent to woodland at Parcel 1 in June 2021.

Pulmonata (Lunged Snails)

Geomitridae - Cernuella virgata - UK Status: Data Deficient

Seddon *et al* (2014) explain that this species is widespread within its known range in Britain; although there is some local and regional decline; hence the UK Status of Data Deficient. The snail is restricted to calcareous sites.

The snail was recorded during sweeping and beating of vegetation in Parcel 12, in June 2021.

Pantheon assemblage analysis

4.2.28. As explained in Section 3, the Pantheon database has been used principally to help understand which assemblages within the site are likely to be important. The species list derived from the targeted surveys across the Survey Area was entered into Pantheon. The data output from the analysis is shown in Table 4-1, Table 4-2 and Table 4-3 below which considers invertebrate assemblages at three different levels.

Broad Biotopes

Table 4-1 - Summary of Pantheon output for broad biotopes

Broad biotope	Number of species	Number of species with conservation status recognised by Pantheon
Open habitats	345	31
Tree-associated	152	10
Wetland	37	0

4.2.29. Table 4-1 shows that there are three broad assemblage habitat types within the Survey Area which are recognised by Pantheon. The best represented is that belonging to open habitats. This is explained by the level of survey effort that targeted open habitats, including linear features (e.g. road verges and hedgerows) and floodplain grassland (Parcels 11 and 12). Species associated with woodland edge (e.g., tall sward and scrub on the boundaries of woodland and along rides) also fit into the Open Habitats biotope and will have therefore made a large contribution to this.

4.2.30. Woodland edge formed a main focus of the survey, as many of the woodland parcels affected by the proposals involve removal of relatively small fragments of the woodland, except for those that are considered to be of lower invertebrate value (e.g. Parcels 2 and 4), and it is along these transitional habitats where a large proportion of survey effort was expended.

4.2.31. A considerable and proportionate targeted survey effort did take place within woodland habitats, which included, grubbing in dead wood, beating of overhanging tree and shrub canopy and use of pitfall traps and window traps in appropriate locations. The setting of window traps in particular, to target saproxylic species would almost exclusively record species from this biotope.

4.2.32. The wetland habitat would have most likely been associated the areas of floodplain grassland and grazed marsh habitat sampled in Parcels 11 and 12 respectively.

Habitats

Table 4-2 - Summary of Pantheon output for habitats

Broad biotope	Habitat	Number of species	SQI	Number of species with conservation status recognised by Pantheon (those underlined do not merit conservation status)
Open habitats	Tall sward & scrub	237	106	9 (*Phytoecia cylindrica, Ocypus nitens, Hylaeus dilatatus, Nemophora fasciella, Tyria jacobaeae, Timandra comae, Hepialus humuli, Hoplodrina blanda, Noctua orbona*)

Broad biotope	Habitat	Number of species	SQI	Number of species with conservation status recognised by Pantheon (those underlined do not merit conservation status)
Open habitats	Short sward & bare ground	111	155	23 (*Amara montivaga, Harpalus attenuatus, Cassida prasina, Chrysolina marginata, Gymnetron rostellum, Microplontus campestris, Otiorhynchus raucus, Stenocarus ruficornis, Graptopeltus lynceus, Rhopalus parumpunctatus, Andrena alfkenella, Nomada fucata, Chrysis illigeri, Hylaeus dilatatus, Cerceris quinquefasciata, Nysson dimidiatus, Philanthus triangulum, Lasioglossum quadrinotatum, Sphecodes crassus, Sphecodes longulus, Dasypoda hirtipes, Coenonympha pamphilus, Cernuella virgata*)
Tree-associated	Arboreal	73	105	0
Tree-associated	Decaying wood	50	180	11 (*Euglenes oculatus, Dorcatoma flavicornis, Prionus coriarius, Hylesinus wachtli, Scolytus mali, Procraerus tibialis, Mordellistena neuwaldeggiana, Anaspis thoracica, Pseudocistela ceramboides, Aulonothroscus brevicollis, Ctenophora pectinicornis*)
Tree-associated	Shaded woodland floor	30	112	0
Wetland	Marshland	16	100	0
Other habitats	Running water, wet woodland, acid & sedge peats, lake	<15	N/A	0

4.2.33. Table 4-2 adds a finer level of detail to Table 4-1, sub-dividing broad biotopes into habitats. The most prominent habitat that features is that of ‘tall sward scrub’ that lies within the broad biotope of open habitats. Whilst belonging to the open habitats biotope, it could be considered as borderline with the tree-associated biotope, since the definition of this habitat in Pantheon, as ‘*Areas of dense herbage or partial shade where a humid microclimate is maintained at ground level. Dominance by woody plants is limited by exposure, grazing or cutting of vegetation, but they often form an important component of the habitat*’ (Webb *et al*., 2018); leans on the importance of woody plants.

4.2.34. The number of species with conservation status associated with this habitat is comparatively low, with four species of the 237 recorded (discounting the more common Tyria jacobaeae, Timandra comae, Hepialus humuli, Hoplodrina blanda and Hylaeus dilatatus), which is reflected by a low SQI score. All four of these species were recorded from woodland or at woodland edge mostly in proximity with Rose Carr and Spring Hills (Parcels 1 and 3), but also including a species associated with umbellifers (*Phytoecia cylindrica*), recorded along a shrub and tall herb lined roadside verge at Parcel 6.

4.2.35. The short sward and bare ground habitats were represented by 111 species, 21 of which have a conservation status. (Discounting the more common Tyria jacobaeae, Timandra comae, Hepialus humuli, Hoplodrina blanda and Hylaeus dilatatus) All of these are from open habitats of which fifteen were taken from a herb-rich roadside verge and vegetated bund at Parcel 7, and four were taken from herb-rich field margins of Parcel 9. Parcel 7 is of particular note, as this had both high species diversity (174 species) and high numbers of rare and scarce species. The corresponding high SQI score for this habitat is reflected by the relatively high number of rare or scarce species, most of which were contributed by Parcel 7.

4.2.36. Ten species with conservation status (discounting the more common Tyria jacobaeae, Timandra comae, Hepialus humuli, Hoplodrina blanda and Hylaeus dilatatus) were recorded from habitats belonging to the 'tree-associated' biotope (decaying wood). The SQI score for this habitat is high, owing to the higher proportions of scarce and rare species taken, many of which were contributed by the three window traps set across the Survey Area. One window trap was highly productive, returning five species with conservation status. This was a trap set within Parcel 1 adjacent to the exposed heartwood of a mature / over mature oak tree at the woodland edge. Seven species with conservation status were recorded from woodland habitat in Parcels 1 and 3 (Rose Carr and Spring Hills), indicating the likely significance of woodland in the northern part of the Survey Area where these Parcels are located.

4.2.37. Although 103 species were assigned to the arboreal and shaded woodland floor habitats, none of these has a conservation status. This accounts for the low SQI scores for these habitats.

4.2.38. It is relevant to note that 'marshland' only featured 16 species, none of which were rarities. Marshland is described by Webb *et al*. (2018) as '*habitat associated with still open water bodies and littoral areas on mineral substrates that may be subject to repeated disturbance, for example by flooding or grazing. Floodplain sites may be inundated for varying periods either by surface run-off or by rising groundwater, but between floods, they can lose surface water to reveal a substrate that is humid rather than saturated*.'

4.2.39. The terrestrial habitat of the River Wensum floodplain within the Survey Area closely matches this description, although on account of the Pantheon analysis not returning a high SQI and any species of conservation status, this habitat is therefore not considered to be of importance for wetland species of invertebrate. A number of other habitats had fewer than 15 species, and therefore were not able to generate a reliable SQI score. Many of these species were associated with wetland habitat and attributed to species taken from Parcels 11 and 12 in marshy, floodplain environments.

Specific Assemblage Types

Table 4-3 - Summary of Pantheon output for specific assemblage types (15 or more species per SAT)

Broad biotope	Habitat	SAT	Number of species	Reported Condition
Open habitats	not applicable	rich flower resource	38	Favourable
Tree-associated	decaying wood	bark & sapwood decay	30	Favourable
Open habitats	short sward & bare ground	bare sand & chalk	22	Favourable
Open habitats	not applicable	scrub edge	15	Favourable
Tree-associated	decaying wood	heartwood decay	11*	(Favourable)

** Favourable condition cannot be inferred as the threshold number of species (considered to be 15 or more) is not met for this SAT.*

4.2.40. Table 4-3 shows that there are four specific assemblage types (SATs) which are recognised by Pantheon with 15 or more species within each SAT. The presence of SATs with high numbers of representative species, especially those in favourable condition provides an insight into the rarest and, often most unique invertebrate assemblages associated with a Survey Area. Such assemblages within the Survey Area are considered likely to be the most valuable. A fifth SAT is described, relating to 'heartwood decay'. This is included on the basis that favourable condition is indicated, although the number of qualifying species (11) is below the threshold level (of 15). Notwithstanding this, it is considered to warrant further mention due to the association of this SAT with other similar SATs, notably 'bark and sapwood decay' that also features within the Survey Area.

4.2.41. The favourable condition returned for 'rich flower resource' suggests that the open habitats within the Survey Area have an important resource of large flower patches capable of supporting a range of associated species (especially aculeate Hymenoptera). The flower patches were evident throughout the surveys, with dandelions providing sources of nectar and pollen early in the season, followed by an array of umbellifers, composites and legumes in mid-summer, a different range of composites in late summer and the promise of flowering ivy in late September / October. Flower-rich resources may also include those associated with woody species (e.g., hawthorn, willow and sycamore) as well as those associated with more typical herbaceous flowering plants.

4.2.42. As explained in Pantheon (Webb *et al*., 2018), the detection of this assemblage is considered to be relevant in that it flags up the importance of the floral resource. The best examples of a flower-rich resource were at Parcel 7 and to a lesser extent, Parcels 8, 9 and 12. At Parcel 7, there was a diverse range of flowering plants on both sides of the road verge, but especially on the southern verge, associated with the bund, and adjacent features (e.g. hedgerow in the south) will have complemented this SAT. The other parcels, whilst have smaller aggregations of flowering plants, were still observed to have sufficient quantity and diversity to be of importance for this invertebrate assemblage.

4.2.43. The 'scrub edge' SAT, which is assessed to be in favourable condition is described in Pantheon (Webb *et al*., 2018) as an '*assemblage type which is found where scrub or woodland grades into or is interspersed with open areas of grassland, heathland or early successional vegetation types*.' Such habitat was widely covered by the targeted surveys of the Survey Area and represented to a certain extent, in all parcels. However, the best examples were along the edges of wooded parcels where sandy underlying soils and tall herbs prevailed, such as Parcels 1, 3, 5 and 6. A wide range of invertebrates can be expected to be recorded from this SAT; aculeate Hymenoptera, weevils, leaf beetles, ground beetles, a variety of true bugs and moths were most frequently recorded from the Survey Area. It is the arrangement of open and woody vegetation and all the variables between this make this SAT important to invertebrates, especially those with complex life cycles that require different microhabitats at different stages of development.

4.2.44. There is some overlap with 'rich flower resource' and 'scrub edge' SATS, and similarly, the 'bare sand and chalk' SAT also crosses over with both, which is explained by the three SATs being nested within the broad biotope of open habitats. Whilst chalk is not understood to be a feature of the Survey Area, the underlying geology means that sand outcrops prevail and these were evident in or adjacent to many Parcels surveyed, especially Parcels 1, 6, 7, 8, 9 and 12. Pantheon (Webb et al., 2018) describe this SAT as containing '*species that are associated with hot, dry soil conditions normally found in bare ground in early successional habitats. It is therefore dependent on natural or anthropogenic disturbance and is likely to be responsive to climate change*.' Aculeate Hymenoptera are strongly represented in this SAT and include species such as *Cerceris quinquefasciata*, a nationally rare species and Section 41 Priority Species that is a specialist of disturbed sandy ground and was recorded at Parcel 7. Certain herbs that flourish in sandy soils were important for certain species of invertebrate in the bare sand SAT, including viper's bugloss, common poppy, yarrow and wild carrot. All of these species were recorded in Parcel 7 which provides the best example of this SAT across the Survey Area.

4.2.45. The favourable condition attributed to the 'bark and sapwood decay' SAT and, to a lesser extent, the 'heartwood decay' SAT, both associated with the decaying wood habitat, signifies the importance of these SATs, and decaying wood habitat in general, within the Survey Area. Decaying wood habitat was frequently targeted during the surveys in many of the wooded parcels and also in Parcel 8, which contained several mature and over mature trees in hedgerows, some with evidence of decaying wood.

4.2.46. Associations with a variety of trees, including, but not restricted to *Quercus*, *Fagus*, *Fraxinus*, *Crataegus* and *Ulmus* species were found for the 41 representative species; although *Quercus* was especially favoured by a large proportion of the species recorded.

4.2.47. The bark and sapwood decay assemblage type is described in Pantheon (Webb *et al*., 2018) as being '*primarily associated with death and decay of the outer woody tissues of the trees or shrubs - the sapwood and bark*'. The heartwood decay assemblage type is described in Pantheon (Webb *et al*., 2018) as being '*found in and around mature and ancient trees and shrubs*'. Open grown trees are especially important as these often develop the full range of heartwood decay conditions and also allow sunlight to reach the trunk and main limbs that can be important for larval development. Pantheon goes on to say that '*the juxtaposition of mature and aging trees with open areas containing flowering shrubs is a key factor since the adult stages of many of the insect species have a requirement for pollen and nectar*'. Overall, these two SATs are considered likely to be well represented within the woodland and mature / over mature tree resource sampled across the Survey Area. Over mature trees, including some with considerable stature owing to open grown conditions that are likely to exhibit heartwood, sapwood and bark decay features, are prevalent on the boundaries of the woodland blocks (e.g., Parcels 1, 3, 5 and 6) and hedgerows and linear woodland strips (e.g. Parcels 9 and 10).

Evaluation of invertebrate assemblages

4.2.48. There is no widely accepted published guidance presently available that provides a clear description of how to evaluate an invertebrate assemblage of a site. Various authors (e.g. Plant, undated) have previously proposed that threshold levels of species with a recognised conservation status could be used to distinguish sites of varying levels of importance across a geographical scale (e.g. a site with more than ten Nationally Scarce species might merit Regional value). However, this relies on relatively comprehensive surveys being undertaken covering a broad range of groups, and the constant state of flux of status applied to species compounds the difficulty in applying such an approach. Former English Nature guidance (English Nature, 2005) advised that an appropriate approach is to compare with other sites of similar nature and habitat. So, for example, a site in the Norfolk is of County importance if it compares well with other similar sites in Norfolk. This however introduces doubt, especially where useful data are unavailable (e.g., poorly recorded areas or where data have not been shared with Local Record Centres).

4.2.49. For the purposes of the present evaluation, it is considered to be more useful to rely on a combination of factors in making a qualitative assessment of the invertebrate value of the Survey Area. This considers the Pantheon output, including the number of species with a recognised conservation status found within the Survey Area during surveys, the SQI scores and number and condition of SATs. It also takes into account desk study information; and professional judgement of the author, based on a knowledge and understanding of the invertebrate importance of sites across the particular geographic region (in this case East Anglia).

4.2.50. Overall, the Survey Area supports a diverse invertebrate fauna, which includes forty-three species currently regarded as Nationally Rare, Scarce, Data Deficient or Section 41 Species of Principal Importance. However, closer examination of this number reveals that certain parcels supported more rarities than others. Parcel 7 supported seventeen such rarities, followed by Parcel 1, with nine rarities, Parcel 9 with five rarities and Parcel 3 with three rarities. All other parcels had one or no rarities. Pantheon analysis reveals that the majority of these species are those associated with woodland and flower-rich grassland and disturbed ground habitats. The best examples of such habitats within the Survey Area included Parcels 1 and 3, and Parcel 7, which were those parcels supporting the greatest diversity of invertebrates and the highest numbers of rarities. Parcel 9 included both over mature trees and herb-rich grassland and included rarities from both habitat types.

4.2.51. Based on the above account, it is appropriate to separate out the Survey Area into those areas of importance for terrestrial invertebrate assemblages and those of lower value. This separation must, however, be mindful to the complex life histories of certain groups, such as saproxylic species, many of which rely on mature and ageing trees with open areas containing flowering shrubs and herbs to provide pollen and nectar for emerging adults. Notwithstanding this, the following terrestrial invertebrate resources are identified as being of particular importance for invertebrates. All other parcels are of Local Importance.

Roadside verge habitat either side of Fakenham Road (A1067) (Parcel 7)

4.2.52. This roadside verge has a diverse invertebrate fauna that includes seventeen species accorded conservation status. Pantheon analysis revealed that the ‘flower-rich resource’ and ‘bare sand and chalk’ Specific Assemblage Types to be in favourable condition. Habitats and environmental conditions associated with both of these SATs are prevalent at Parcel 7, which include sparsely vegetated exposed bare ground and short, herb-rich grassland, maintained by rabbit grazing and burrow creation; bunds of inert soil with associated tall herbs and ruderal vegetation on the southern verge, and a variety of aspects formed by the orientation of the verges and bunds, with south-facing aspects predominating. Parcel 7 is considered to be of at least County Importance to terrestrial invertebrates.

Woodland habitat in the north of the survey area (Parcels 1 and 3)

4.2.53. Parcels 1 and 3 recorded twelve species with conservation status. These mostly include species of decaying wood, a habitat that is prevalent in over mature trees mainly positioned at the boundaries of the woodland parcels. Both Parcels also include scrub edge at the margins, a SAT that was assessed to be in favourable condition. The importance of the scrub edge becomes apparent when considering the life histories of many of the saproxylic invertebrates found in the decaying wood. On emergence, adults need nearby sources of pollen and nectar on which to feed. The two Parcels are considered together on account of them being connected to the same, much larger block of woodland in the north of the Survey Area, and therefore being likely to support a similar range of species. Parcels 1 and 3 are collectively considered to be of County Importance to terrestrial invertebrates.

Hedgerows north of Weston Road (Parcel 9)

4.2.54. Five species of conservation status were recorded from the hedgerow network with mature and over-mature trees and associated wide, herb-rich arable field margins north of Weston Road (Parcel 9). This included a saproxylic species associated principally with an ash tree, two beetles and two bees associated with flowers in the herb-rich field margins, which included sandy exposures at the margins and in areas of rabbit digging. This resource is considered to be of Local to County Importance to terrestrial invertebrates.

5 References

5.1 Project references

WSP. (2020). *Phase 1 Habitat Survey*. Cambridge.

5.2 Technical references

Alexander, K.N.A. (2004). Revision of the Index of Ecological Continuity as used for saproxylic beetles. English Nature Research Report No. 574.

Alexander, K.N.A., Dodd, S. & Denton, J.S. (2014). A review of the scarce and threatened beetles of Great Britain; The darkling beetles and their allies: Aderidae, Anthicidae, Colydiidae, Melandryidae, Meloidae, Mordellidae, Mycetophagidae, Mycteridae, Oedemeridae, Pyrochroidae, Pythidae, Ripiphoridae, Salpingidae, Scraptiidae, Tenebrionidae & Tetratomidae (Tenebrionoidea less Ciidae). Species Status No.18. Natural England Commissioned Report NECR148.

Alexander, K.N.A. (2017). A review of the status of the beetles of Great Britain; The wood-boring beetles, spider beetles, woodworm, false powder-post beetles, hide beetles and their allies – Derodontidoidea (Derodontidae) and Bostrichoidea (Dermestidae, Bostrichidae and Ptinidae). Species Status No.33. Natural England Commissioned Report NECR236.

Alexander, K.N.A. (2019). A review of the status of the beetles of Great Britain; Longhorn Beetles (Cerambycidae). Species Status No.39. Natural England Commissioned Report NECR272.

Dobson and Fairclough (Unpublished) A Methodology for Assessing the Invertebrate Habitat Potential (IHP) of Terrestrial & Aquatic Habitats. Version 3.06 2020.

Drake, C.M., Lott, D.A., Alexander, K.N.A. & Webb J. (2007) Surveying terrestrial and freshwater invertebrates for conservation evaluation. Natural England Research Report NERR005. Natural England

Duff, A.G. (2012). Beetles of Britain & Ireland. Vol 1: Sphaeriusidae to Silphidae. A.G. Duff (Publishing)

Duff, A.G. (2016). Beetles of Britain & Ireland. Vol 4: Cerambycidae to Curculionidae. A.G. Duff (Publishing).

Duff, A.G. (2020). Beetles of Britain & Ireland. Vol 3: Geotrupidae to Scraptiidae. A.G. Duff (Publishing).

English Nature (2005). Organising surveys to determine site quality for invertebrates. A framework guide for ecologists. English Nature.

Falk, S. (2015). Field Guide to the Bees of Great Britain and Ireland. British Wildlife Field Guides. Bloomsbury

Hubble, D. S. (2014). A review of the scarce and threatened beetles of Britain. The leaf beetles and their allies Chrysomelidae, Megalopodidae and Orsodacnidae. Species Status No.19. Natural England Commissioned Reports, Number 161.

16

Hyman, P.S. and Parsons, M.S. (1992). A review of the scarce and threatened Coleoptera of Great Britain. Part 1. UK Nature Conservation: 3. Peterborough: Joint Nature Conservation Committee.

Lott, D.A. & Anderson, R. (2011). The Staphylinidae (rove beetles) of Britain and Ireland. Oxyporinae, Steninae, Euaesthetinae, Pseudopsinae, Paederinae, Staphylininae. Handbooks for the Identification of British Insects: Royal Entomological Society. Vol. 12 Part 7 and 8.

Mazur M. (2003). Description of male of *Otiorhynchus raucus* (Fabricius, 1777) with some remarks on the geographical origin of the species (Coleoptera: Curculionidae). 8 pp. Genus 14(2): 241-248.

Morris, M.G. (1997). Broad-nosed weevils. Coleoptera: Curculionidae (Entiminae). Handbooks for the identification of British insects, vol. 5, part 17a. London: Royal Entomological Society.

Plant, C. (undated) Invertebrates and Ecological Assessment. Colin Plant Associates (UK) Consultant Entomologists.

Seddon, M.B, Killeen, I.J. & Fowles, A.P. {2014). A Review of the Non-Marine Mollusca of Great Britain: Species Status No. 17. NRW Evidence Report No: 14, 84pp, Natural Resources Wales, Bangor.

Stubbs, A.E (2021). British Craneflies. British Entomological and Natural History Society.

Telfer, M.G. (2016). A review of the beetles of Great Britain: Ground Beetles (Carabidae). Species Status No.25. Natural England Commissioned Report NECR189.

Online resources

British Bugs Website (accessed 25 September 2021):
https://www.britishbugs.org.uk/heteroptera/Lygaeidae/graptopeltus_lynceus.html

http://www.britishbugs.org.uk/heteroptera/Miridae/lygus_pratensis.html

http://britishbugs.org.uk/heteroptera/Rhopalidae/rhopalus_parumpunctatus.html

Bees, Wasps & Ants Recording Society (BWARS) Website (accessed 25 September 2021):

https://www.bwars.com/bee/andrenidae/andrena-alfkenella

https://www.bwars.com/wasp/chrysididae/chrysidinae/chrysis-illigeri

https://www.bwars.com/wasp/crabronidae/philanthinae/cerceris-quinquefasciata

https://www.bwars.com/wasp/crabronidae/nyssoninae/nysson-dimidiatus

http://www.bwars.com/wasp/crabronidae/philanthinae/philanthus-triangulum

https://www.bwars.com/bee/halictidae/lasioglossum-quadrinotatum

http://bwars.com/index.php?q=bee/melittidae/dasypoda-hirtipes

UK Moths Website (accessed 25 September 2021):

https://www.ukmoths.org.uk/species/nemophora-fasciella

https://ukmoths.org.uk/species/monochroa-palustrellus

https://www.ukmoths.org.uk/species/noctua-orbona

UK Butterflies Website (accessed 25 September 2021):

https://www.ukbutterflies.co.uk/species.php?species=pamphilus

Webb, J., Heaver, D., Lott, D., Dean, H.J., van Breda, J., Curson, J., Harvey, M., Gurney, M., Roy, D.B., van Breda, A., Drake, M., Alexander, K.N.A. and Foster, G. (2018). Pantheon - database version 3.7.6 [online] Available at: http://www.brc.ac.uk/pantheon/ [Accessed 01 October 2021].

Appendix A – Study and Survey Areas

Key

- Survey Area
- Parcel 9
- Parcel 8
- Parcel 7
- Parcel 6
- Parcel 5
- Parcel 4
- Parcel 3
- Parcel 2
- Parcel 12
- Parcel 11
- Parcel 10
- Parcel 1
- NWL Site
- 2km Study Area

wsp

Client

Norfolk County Council

Project

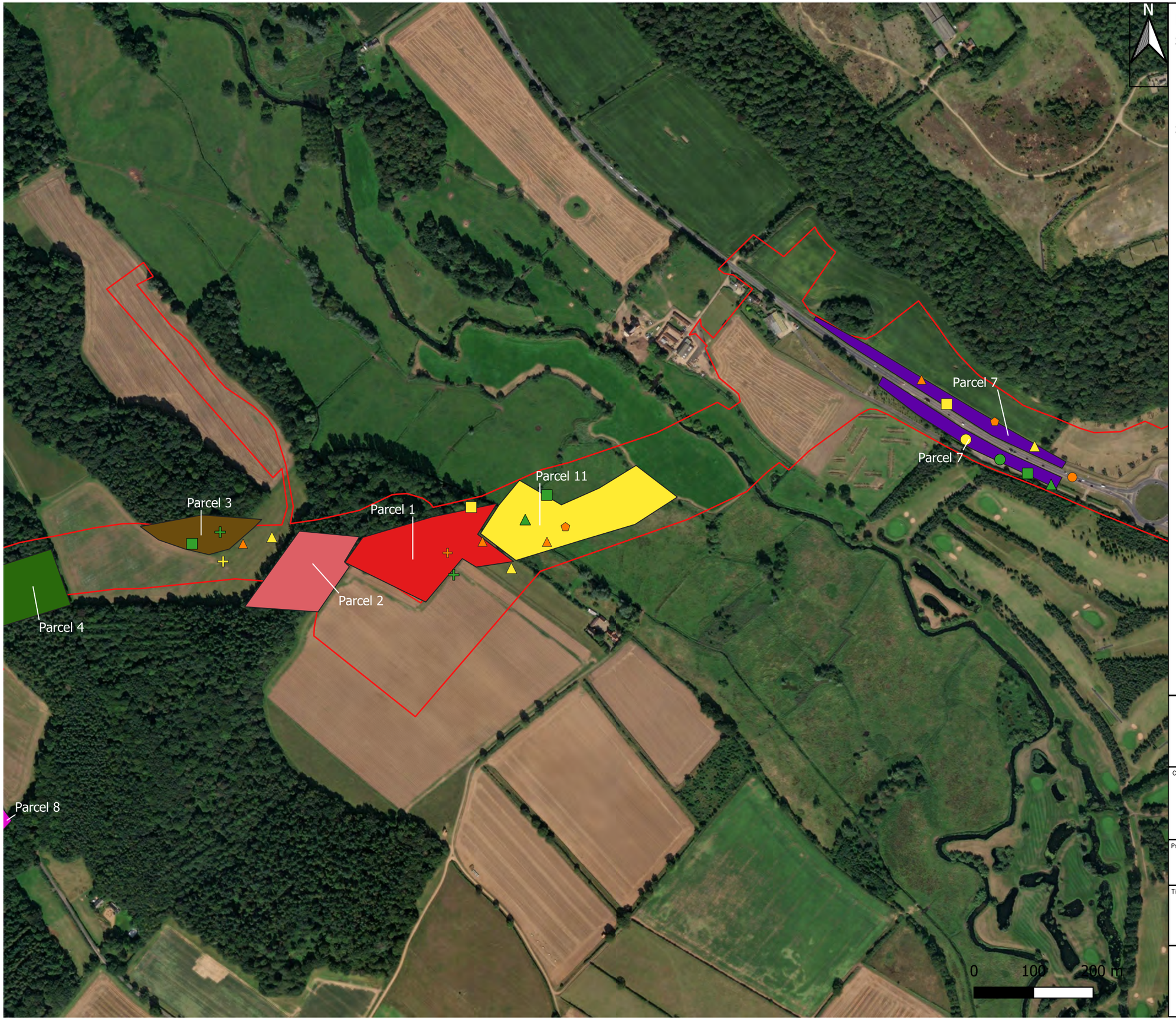
Norwich Western Link

Title

Appendix A
Study and Survey Areas

Drawing No:	Figure 1	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE

Appendix B – Entomological methods used for surveys and light trapping locations



Key

Spring 2021
- Pan traps
- Pitfall traps
- Window trap
- Sweep/beat

Summer 2021
- Pan traps
- Pitfall traps
- Sweep/beat
- Window trap

Late Summer/early Autumn 2021
- Pan traps
- Grubbing
- Sweep/beat
- Window trap

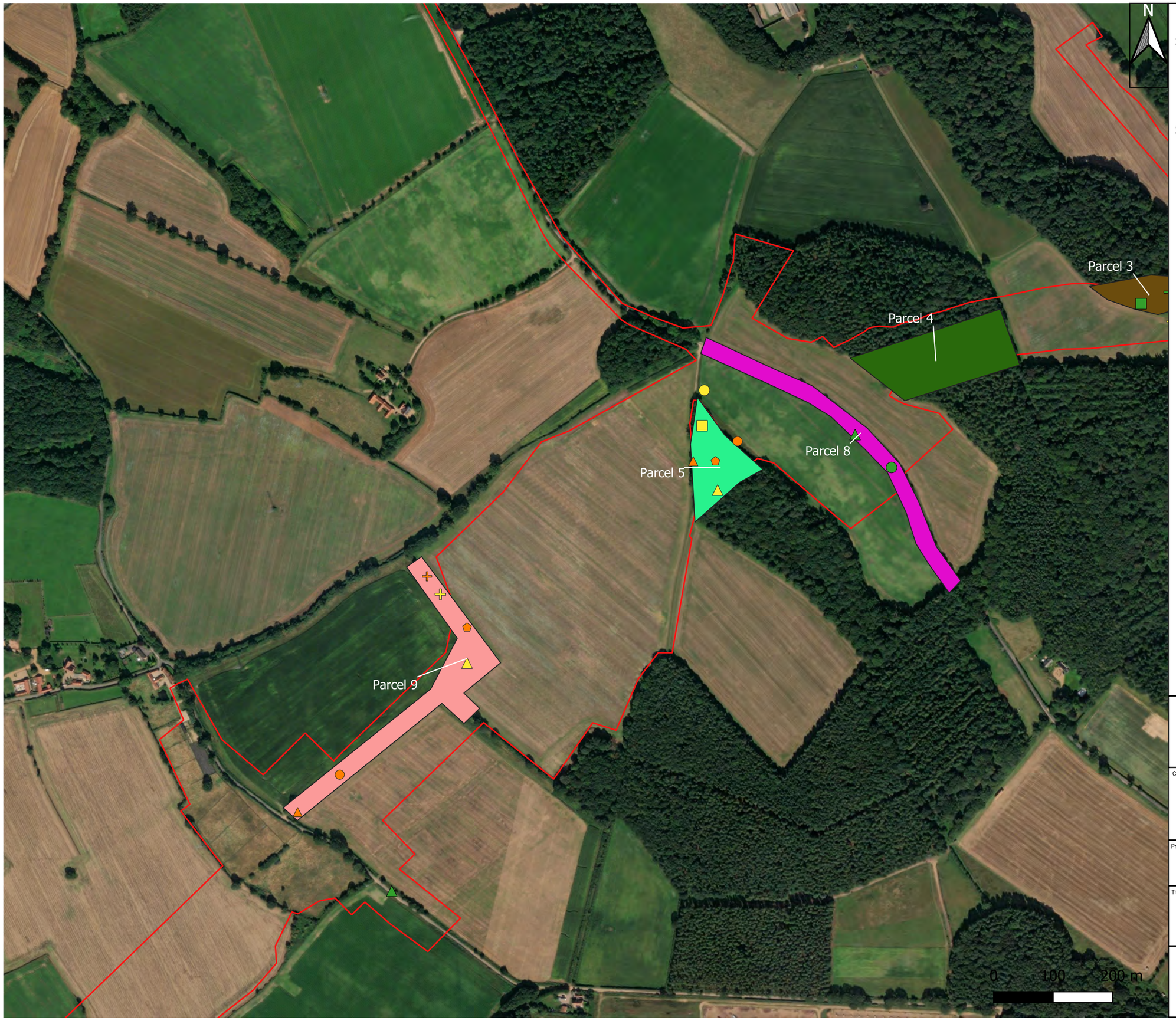
wsp

Client: Norfolk County Council

Project: Norwich Western Link

Title: Appendix B
Entomological Methods used for Surveys

Drawing No:	Figure B1	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE



Key

Spring 2021
- Pan traps
- Pitfall traps
- Window trap
- Sweep/beat

Summer 2021
- Pan traps
- Pitfall traps
- Sweep/beat
- Window trap

Late Summer/early Autumn 2021
- Pan traps
- Grubbing
- Sweep/beat
- Window trap

wsp

Client: Norfolk County Council

Project: Norwich Western Link

Title: Appendix B
Entomological Methods used for Surveys

Drawing No:	Figure B2	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE

Key

Spring 2021
- Pan traps
- Pitfall traps
- Window trap
- Sweep/beat

Summer 2021
- Pan traps
- Pitfall traps
- Sweep/beat
- Window trap

Late Summer/early Autumn 2021
- Pan traps
- Grubbing
- Sweep/beat
- Window trap

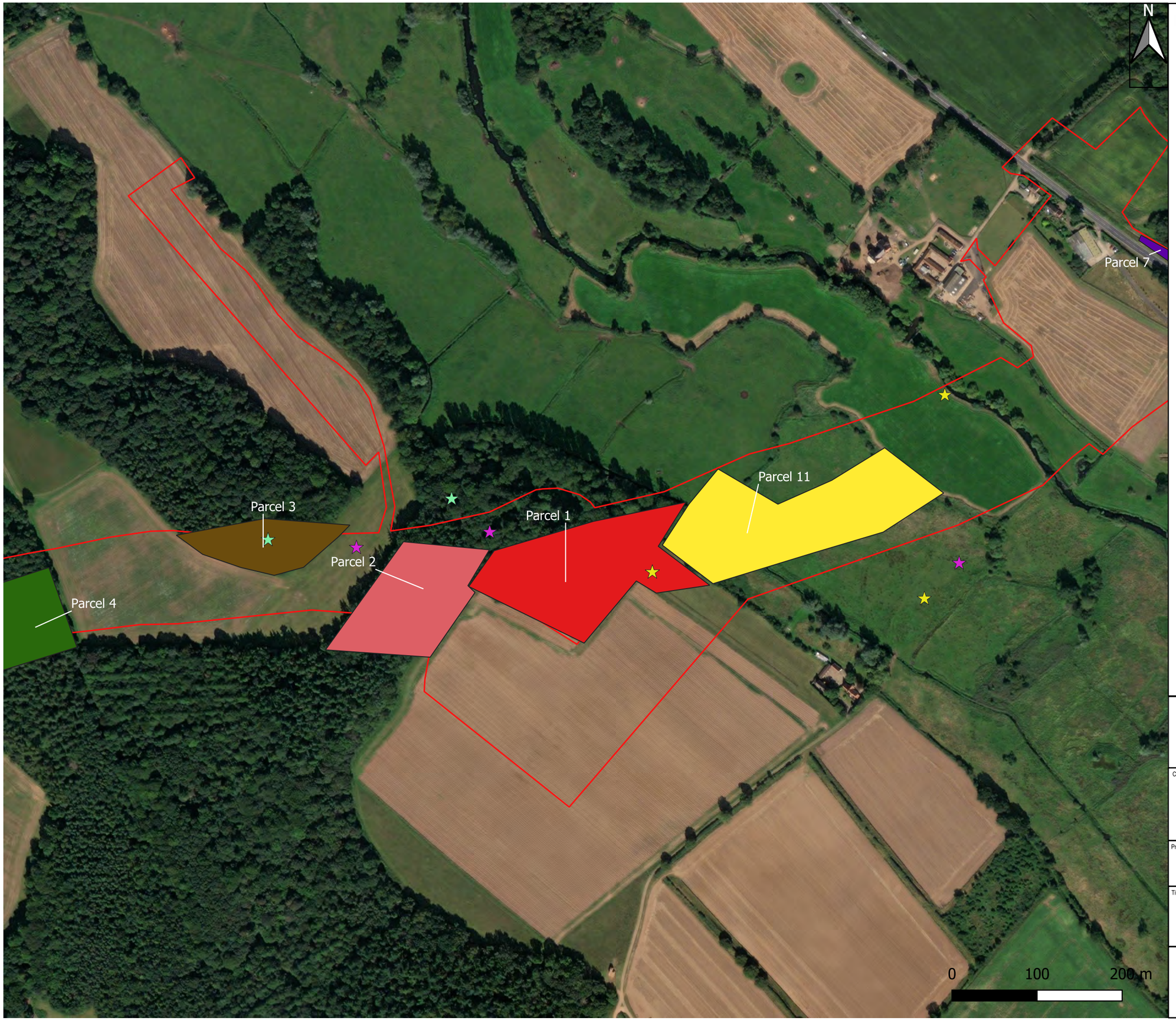
wsp

Client: Norfolk County Council

Project: Norwich Western Link

Title: Appendix B
Entomological Methods used for Surveys

Drawing No:	Figure B3	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE



Key

Light trapping

- June 2021
- August 2021
- July 2021
- September 2021

wsp

Client

Norfolk County Council

Project

Norwich Western Link

Title

Appendix B
Light Trapping Locations

Drawing No:	Figure B4	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE

Key

Light Trapping Locations

- June 2021
- August 2021
- July 2021
- September 2021

wsp

Client

Norfolk County Council

Project

Norwich Western Link

Title

Appendix B
Light Trapping Locations

Drawing No:	Figure B5	Drawn:	CH
Date:	16/02/24	Checked:	SM
Sacale:	1:1	Approved:	IE

Appendix C - Photographs

1. Pan trap in-situ (in Parcel 8)

2. Pitfall Trap in-situ (in Parcel 3)

3. Window trap set in hollow trunk of field maple (in Parcel 3)

4. Parcel 1 - Plantation in interior of woodland

5. Parcel 1 - Woodland edge (eastern side) with frequent mature oak

6. Parcel 3 - Typical woodland habitat with mature oak at centre

	
7. Parcel 4 - Conifer plantation with bramble scrub occupies much of the woodland	8. Parcel 6 - Cluster of tall beech
	
9. Parcel 7 - southern verge and bund in foreground, northern verge to right of picture (April 2021)	10. Parcel 7 - northern verge (June 2021)
	
11. Parcel 7 - southern verge and bund (June 2021)	12. Parcel 9 - Wide field margin and hedgerow with mature trees (April 2021)

13. Parcel 9 - Wide field margin and hedgerow with mature trees (June 2021)

14. Parcel 10 - The Broadway - showing narrow band of woodland either side of the lane

15. Parcel 11 - Floodplain showing tributary of River Wensum and poached margins (April 2021)

16. Parcel 11 - Floodplain showing tributary of River Wensum and tall reed vegetation (June 2021)

17. Parcel 11 - Floodplain, showing variable sward height and grass tussocks (June 2021)

18. Parcel 12 - Marshy grassland south of The Broadway

Appendix D - Status definitions

Much invertebrate conservation evaluation hinges on nationally threatened and scarce species. For many invertebrate groups, species rarity has often been gauged by the number of national 10 km grid squares in which they occur. The fewer “spots on a map”, the rarer it is. This, however, does not exactly equate with how threatened a species is, since some species may be naturally confined to very few localities but are very abundant where they do occur and under no immediate threat of extinction. The matter of how threatened the “rarest” species are has been addressed in a series of Red Data Books (RDB), such as for insects. (Shirt, D. B (ed) (1987) British Red Data Books: Insects. JNCC.) Here, the listing as RDB1 (Endangered), RDB2 (Vulnerable) and RDB3 (Rare) is an assessment of how threatened or endangered the species is in Britain, rather than how scarce it is in terms of map spot counting.

Over the last decade the RDB categories are slowly being replaced by IUCN red-list categories (Critically Endangered, Endangered and Vulnerable), which use different criteria to those developed for the RDBs. The process of replacing RDB categories with IUCN ones is however slow, and IUCN categories are not available for all groups. Accordingly, wherever IUCN categories have been allocated in the report, these are also shown in preference, ahead of RDB categories.

IUCN also recognised the value of a Near Threatened category to identify species that need to be kept under review to ensure that they have not become vulnerable to extinction. This category is used for species which have been evaluated against the criteria but do not qualify for a threatened category, although they may be close to qualifying or likely to qualify in the near future.

At the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own, which essentially sit below RDB / IUCN status (i.e. Near Threatened). Thus, less rare but still significant species can be defined as Nationally Scarce (formerly called Nationally Notable), which is often sub-divided into Na (scarce), Nb (less scarce). These sub-categories were originally devised by (Ball, S.G. (1986) Terrestrial and freshwater invertebrates with Red Data Book, Notable or habitat indicator status. Invertebrate Site Register internal report number 66. NCC) and are based on 10 km square spot counting for the Great Britain grid system.

The Na sub- category represents scarce taxa that are thought to occur in 30 or fewer 10 km squares of the Great Britain grid system. The Nb sub-category represents less scarce taxa that occur in 31 to 100 10 km squares. Taxa in the N- sub-category are those listed as ‘Notable’, but not always distinguished into sub-category Na or Nb. These species are thought to occur in 16 to 100 10 km squares of the National Grid but are too poorly known for their status to be more precisely estimated.

Species that hold ‘Local’ status are those that are not considered ubiquitous, but rather are more infrequently encountered i.e. may be found in relatively few 10 km square records (or well scattered locations), although they may be quite common in the areas, they are present in.

IUCN (pre 1994) categories remain relevant to certain taxa if an update has not been forthcoming. These categories are as follows:

- IUCN (pre 1994) Rare - taxa with small populations that are not at present Endangered or Vulnerable, but are at risk. In the UK, this was interpreted as species which exist in fifteen or fewer 10km squares. Superseded by new IUCN categories in 1994, but still applicable to lists that have not been reviewed since 1994.
- IUCN (pre 1994) Vulnerable - taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. Superseded by new IUCN categories in 1994, but still applicable to lists that have not been reviewed since 1994.

Amber list of ground beetles

During an assessment of the status of British ground beetles, (Telfer, M.G. (2016). A review of the beetles of Great Britain: Ground Beetles (Carabidae). Species Status No.25. Natural England Commissioned Report NECR189) in consultation with others, decided that a group of 33 ground beetles, whilst not fitting into the IUCN Near Threatened category, should be added to an 'Amber List' of declining species. These are ground beetles seen to possibly be at risk due to fragmentation of habitat or a need for early successional habitat, the latter resulting in wide population variability. '*There is considerable uncertainty about what priority conservationists should attach to these species but it is clear that they should all be closely monitored and that the next status review of British carabids will need to consider these species in detail* (ibid.)

Continuity grades as applied to saproxylic beetles

Mention is made in the species accounts of continuity grades (Index of Ecological Continuity), taken from Alexander (2004). This is a ranking of saproxylic beetles which were grouped according to the extent to which they have been consistently recorded from ancient woodlands with continuity of dead-wood habitats, particularly in pasture-woodlands. These grades are identified as follows:

- **Group 1**: Species which are known to have occurred in recent times only in areas believed to be ancient woodland, mainly pasture-woodland.
- **Group 2**: Species which occur mainly in areas believed to be ancient woodland with abundant dead-wood habitats, but which also appear to have been recorded from areas that may not be ancient woodland or for which the locality data are imprecise.
- **Group 3**: Species which occur widely in wooded land, but which are collectively characteristic of ancient woodland with dead-wood habitats.

Note on outdated designations for Hymenoptera, and status errors in Pantheon

The conservation status for many Hymenoptera species is very out of date, and some need re-assessment. A major review was last carried out by Falk (1991) and some information was added more recently on the BWARS site (www.bwars.com/home), but even that needs an update in many cases. Falk (2015) and Else & Edwards (2018) are more current and information from the latter will be used in future conservation reviews.

A particular example of a taxonomic issue that affects a bee record from this site concerns *Hylaeus dilatatus* (Kirby, 1802). Analysis of the species list from NWL using Pantheon flags up this species as RDB3. However, until recently it was incorrectly recorded as *Hylaeus annularis* (Kirby, 1802), which is a much scarcer species that is restricted to the south coast and according to Else & Edwards (2018) name changes for that species '*could potentially cause confusion*'. As *H. dilatatus* is not regarded as rare in that publication it is likely that the Pantheon status is in error, especially as *H. annularis* is shown without status, so probably conflated with that of *H. dilatatus*. A check on the JNCC designations spreadsheet, (JNCC, 2018) lists *H. annularis* as Rare but has no entry for *H. dilatatus*. For these reasons, the Pantheon status has been disregarded and *H. dilatatus* listed as Local as there is nothing to suggest it should be Notable. This and many other issues have been reported back by practitioners to the Pantheon developers.

A further species identified in Pantheon as being of conservation status is the cinnabar moth *Tyria jacobaea*. This species is correctly classed as a priority species, listed on Section 41 of the NERC Act; however, this is not a designation based on rarity or level of threat to the species, but instead is based on scientific and research reasons so is not discussed further in the report.

Appendix E – Invertebrate desk study records

Species	Taxon Group	No. Records	Designation
Anaciaeschna isoceles	Insect - dragonfly (Odonata)	1	FEP7/2, RLGB.EN, Sect.41, UKBAP, WCA5/9.1k/l, WCA5/9.1t, WCA5/9.2, WCA5/9.4.a, WCA5/9.4b, WCA5/9.4c, WCA5/9.5a, WCA5/9.5b
Iassus scutellaris	Insect - true bug (Hemiptera)	1	Na
Arenocoris falleni	Insect - true bug (Hemiptera)	1	Breck_Special
Graptopeltus lynceus	Insect - true bug (Hemiptera)	2	Breck_Special, Nb
Oodes helopioides	Insect – beetle (Coleoptera)	3	Nb
Dorytomus salicinus	Insect - beetle (Coleoptera)	1	Nb
Ceutorhynchus constrictus	Insect - beetle (Coleoptera)	1	Nb
Agabus uliginosus	Insect - beetle (Coleoptera)	1	Nb, RLGB.Lr(NT), ScotBL
Agabus striolatus	Insect - beetle (Coleoptera)	21	RDBGB.VU, RLGB.VU
Hydroporus glabriusculus	Insect - beetle (Coleoptera)	7	RLGB.VU, ScotBL
Hydroporus neglectus	Insect - beetle (Coleoptera)	3	NS-excludes
Hygrotus decoratus	Insect - beetle (Coleoptera)	2	Nb, NS-excludes
Laccornis oblongus	Insect - beetle (Coleoptera)	9	RLGB.Lr(NT)
Hydrochus brevis	Insect - beetle (Coleoptera)	12	RLGB.Lr(NT), ScotBL
Hydrochus crenatus	Insect - beetle (Coleoptera)	2	RLGB.Lr(NT)

Species	Taxon Group	No. Records	Designation
Chaetarthria seminulum s. lat.	Insect - beetle (Coleoptera)	2	NS-excludes
Enochrus nigritus	Insect - beetle (Coleoptera)	5	Breck_Special, RLGB.Lr(NT)
Enochrus quadripunctatus	Insect - beetle (Coleoptera)	2	Breck_Special, NS-excludes, ScotBL
Hydraena palustris	Insect - beetle (Coleoptera)	6	Breck_Special, RLGB.Lr(NT)
Agrilus biguttatus	Insect - beetle (Coleoptera)	1	Na
Abdera biflexuosa	Insect - beetle (Coleoptera)	1	Nb
Abdera quadrifasciata	Insect - beetle (Coleoptera)	1	Na
Phloiotrya vaudoueri	Insect - beetle (Coleoptera)	1	Nb
Eledona agricola	Insect - beetle (Coleoptera)	1	Nb
Prionychus ater	insect - beetle (Coleoptera)	1	Nb
Prionus coriarius	insect - beetle (Coleoptera)	4	Na
Stenostola dubia	insect - beetle (Coleoptera)	1	Nb
Phytoecia cylindrica	insect - beetle (Coleoptera)	1	Nb
Longitarsus dorsalis	insect - beetle (Coleoptera)	1	Nb
Hepialus humuli	insect - moth	89	Sect.41, Sect.42, UKBAP
Hepialus humuli subsp. humuli	insect - moth	1	Sect.41, Sect.42, UKBAP
Nemophora fasciella	insect - moth	3	Sect.41, UKBAP
Watsonalla binaria	insect - moth	100	Sect.41, Sect.42, UKBAP
Ethmia dodecea	insect - moth	1	Nb
Stathmopoda pedella	insect - moth	5	Nb
Monochroa palustrellus	insect - moth	2	Nb

Species	Taxon Group	No. Records	Designation
Lycia hirtaria	insect - moth	143	Sect.41, Sect.42, UKBAP
Ennomos quercinaria	insect - moth	66	Sect.41, Sect.42, UKBAP
Ennomos fuscantaria	insect - moth	154	Sect.41, Sect.42, UKBAP
Ennomos erosaria	insect - moth	1	Sect.41, Sect.42, UKBAP
Macaria wauaria	insect - moth	2	Sect.41, Sect.42, UKBAP
Chiasmia clathrata	insect - moth	86	Sect.41, Sect.42, UKBAP
Hemistola chrysoprasaria	insect - moth	45	Sect.41, Sect.42, UKBAP
Chesias legatella	insect - moth	11	Sect.41, Sect.42, UKBAP
Lithostege griseata	insect - moth	1	Breck_Special, RDBGB.R, Sect.41, UKBAP
Eulithis mellinata	insect - moth	31	Sect.41, Sect.42, UKBAP
Ecliptopera silaceata	insect - moth	117	Sect.41, Sect.42, UKBAP
Pelurga comitata	insect - moth	18	Sect.41, Sect.42, UKBAP
Melanthia procellata	insect - moth	7	Sect.41, Sect.42, UKBAP
Orthonama vittata	insect - moth	3	Sect.41, Sect.42, UKBAP
Xanthorhoe ferrugata	insect - moth	122	Sect.41, Sect.42, UKBAP
Scotopteryx chenopodiata	insect - moth	121	Sect.41, Sect.42, UKBAP
Epirrhoe galiata	insect - moth	4	Sect.41, Sect.42, UKBAP
Scopula marginepunctata	insect - moth	3	Sect.41, Sect.42, UKBAP
Timandra comae	insect - moth	210	Sect.41, Sect.42, UKBAP
Malacosoma neustria	insect - moth	1	Sect.41, Sect.42, UKBAP
Trichiura crataegi	insect - moth	9	Sect.41, Sect.42, UKBAP
Acronicta psi	insect - moth	114	Sect.41, Sect.42, UKBAP
Acronicta rumicis	insect - moth	95	Sect.41, Sect.42, UKBAP
Amphipyra tragopoginis	insect - moth	328	Sect.41, Sect.42, UKBAP
Polia bombycina	insect - moth	2	Sect.41, Sect.42, UKBAP
Melanchra persicariae	insect - moth	502	Sect.41, Sect.42, UKBAP
Ceramica pisi	insect - moth	16	Sect.41, Sect.42, UKBAP
Leucania comma	insect - moth	68	Sect.41, Sect.42, UKBAP
Orthosia gracilis	insect - moth	95	Sect.41, Sect.42, UKBAP
Tholera cespitis	insect - moth	2	Sect.41, Sect.42, UKBAP
Tholera decimalis	insect - moth	23	Sect.41, Sect.42, UKBAP

Species	Taxon Group	No. Records	Designation
Heliothis viriplaca	insect - moth	2	Breck_Special, RDBGB.R
Euxoa tritici	insect - moth	98	Sect.41, Sect.42, UKBAP
Euxoa nigricans	insect - moth	18	Sect.41, Sect.42, UKBAP
Noctua orbona	insect - moth	21	Breck_Special, FEP7/2, ScotBL, Sect.41, Sect.42, UKBAP
Graphiphora augur	insect - moth	3	Sect.41, Sect.42, UKBAP
Eugnorisma glareosa	insect - moth	4	Sect.41, Sect.42, UKBAP
Diarsia rubi	insect - moth	235	Sect.41, Sect.42, UKBAP
Xestia agathina	insect - moth	1	Sect.41, Sect.42, UKBAP
Asteroscopus sphinx	insect - moth	49	Sect.41, Sect.42, UKBAP
Allophyes oxyacanthae	insect - moth	190	Sect.41, Sect.42, UKBAP
Litoligia literosa	insect - moth	27	Sect.41, Sect.42, UKBAP
Apamea remissa	insect - moth	48	Sect.41, Sect.42, UKBAP
Apamea anceps	insect - moth	31	Sect.41, Sect.42, UKBAP
Amphipoea oculea	insect - moth	39	Sect.41, Sect.42, UKBAP
Hydraecia micacea	insect - moth	240	Sect.41, Sect.42,
Celaena leucostigma	insect - moth	10	UKBAP
Rhizedra lutosa	insect - moth	102	Sect.41, Sect.42,
Hoplodrina blanda	insect - moth	496	UKBAP
Caradrina Morpheus	insect - moth	586	Sect.41, Sect.42,
Cirrhia icteritia	insect - moth	156	Sect.41, Sect.42, UKBAP
Cirrhia gilvago	insect - moth	4	Sect.41, Sect.42, UKBAP
Brachylomia viminalis	insect - moth	2	Sect.41, Sect.42, UKBAP
Aporophyla lutulenta	insect - moth	2	Sect.41, Sect.42, UKBAP
Mniotype adusta	insect - moth	12	Sect.41, Sect.42, UKBAP
Agrochola lychnidis	insect - moth	226	Sect.41, Sect.42, UKBAP
Agrochola helvola	insect - moth	4	Sect.41, Sect.42, UKBAP
Agrochola litura	insect - moth	136	Sect.41, Sect.42, UKBAP
Atethmia centrago	insect - moth	145	Sect.41, Sect.42, UKBAP
Heliophobus reticulata subsp. marginosa	insect - moth	1	Breck_Special, Sect.41, Sect.42, UKBAP
Arctia caja	insect - moth	8	Sect.41, Sect.42, UKBAP
Spilosoma lubricipeda	insect - moth	282	Sect.41, Sect.42, UKBAP

Species	Taxon Group	No. Records	Designation
Spilosoma lutea	insect - moth	547	Sect.41, Sect.42, UKBAP
Tyria jacobaeae	insect - moth	241	Sect.41, Sect.42, UKBAP
Plebejus argus	insect - butterfly	17	FEP7/2, RLGB.VU, Sect.41, Sect.42, UKBAP, WCA5/9.5a, WCA5/9.5b
Satyrium w-album	insect - butterfly	2	RLGB.EN, Sect.41, Sect.42, UKBAP, WCA5/9.5a, WCA5/9.5b
Limenitis camilla	insect - butterfly	6	RLGB.VU, Sect.41, Sect.42, UKBAP
Coenonympha pamphilus	insect - butterfly	5	RLGB.Lr(NT), Sect.41, Sect.42, UKBAP
Lasiommata megera	insect - butterfly	19	RLGB.Lr(NT), Sect.41, Sect.42, UKBAP
Crombrugghia distans	insect - moth	24	Breck_Special
Calamotropha paludella	insect - moth	9	Nb
Crambus uliginosellus	insect - moth	4	Nb
Crambus hamella	insect - moth	4	Nb
Pediasia contaminella	insect - moth	4	Nb
Platytes cerussella	insect - moth	17	Breck_Special
Evergestis extimalis	insect - moth	1	Breck_Special, Nb
Schoenobius gigantella	insect - moth	7	Nb
Sitochroa palealis	insect - moth	1	N
Nascia cilialis	insect - moth	9	Na
Eudonia delunella	insect - moth	1	Nb
Nephopterix angustella	insect - moth	6	Nb
Homoeosoma nebulella	insect - moth	2	Nb
Agathomyia falleni	insect - true fly (Diptera)	1	NS-excludes
Brachyopa insensilis	insect - true fly (Diptera)	1	N, ScotBL
Criorhina ranunculi	insect - true fly	2	N

Species	Taxon Group	No. Records	Designation
	(Diptera)		
Didea fasciata	insect - true fly (Diptera)	5	N
Epistrophe diaphana	insect - true fly (Diptera)	1	N
Volucella inanis	Insect - Hoverflies	1	N
Volucella inanis	insect - true fly (Diptera)	41	N
Volucella inflata	insect - true fly (Diptera)	2	N
Volucella zonaria	Insect - Hoverflies	3	N
Volucella zonaria	insect - true fly (Diptera)	35	N
Xanthandrus comtus	insect - true fly (Diptera)	1	N
Leopoldius signatus	insect - true fly (Diptera)	3	N
Chrysis illigeri	insect - hymenopteran	1	Nb
Priocnemis (Priocnemis) hyalinata	insect - hymenopteran	1	Nb
Arachnospila (Anoplochares) minutula	insect - hymenopteran	1	Nb
Dolichovespula (Dolichovespula) media	insect - hymenopteran	1	Na
Ectemnius (Clytochrysus) sexcinctus	insect - hymenopteran	1	Nb
Nysson dimidiatus	insect - hymenopteran	1	Nb
Argogorytes fargeii	insect - hymenopteran	1	Na
Cerceris quinquefasciata	insect - hymenopteran	10	Breck_Special, FEP7/2, RDBGB.R, Sect.41, UKBAP
Hylaeus (Prosopis) signatus	insect - hymenopteran	11	Nb
Hylaeus (Abrupta)	insect -	6	Na

Species	Taxon Group	No. Records	Designation
cornutus	hymenopteran		
Andrena (Plastandrena) bimaculata	insect - hymenopteran	5	Nb
Andrena Plastandrena tibialis	insect - hymenopteran	1	Na
Andrena (Poliandrena) tarsata	insect - hymenopteran	1	Sect.41, Sect.42, UKBAP
Andrena (Chlorandrena) humilis	insect - hymenopteran	2	Nb
Lasioglossum (Evylaeus) pauxillum	insect - hymenopteran	5	Na
Osmia (Neosmia) bicolor	insect - hymenopteran	1	Nb
Nomada fucata	insect - hymenopteran	2	Na
Bombus (Psithyrus) rupestris	insect - hymenopteran	2	Nb
Bombus (Thoracobombus) ruderarius	insect - hymenopteran	3	ScotBL, Sect.41, Sect.42, UKBAP
Celaena leucostigma	insect - moth	10	Sect.41, Sect.42, UKBAP
Rhizedra lutosa	insect - moth	102	Sect.41, Sect.42, UKBAP
Hoplodrina blanda	insect - moth	496	Sect.41, Sect.42, UKBAP
Caradrina morpheus	insect - moth	586	Sect.41, Sect.42, UKBAP
Cirrhia icteritia	insect - moth	156	Sect.41, Sect.42, UKBAP
Cirrhia gilvago	insect - moth	4	Sect.41, Sect.42, UKBAP
Brachylomia viminalis	insect - moth	2	Sect.41, Sect.42, UKBAP
Aporophyla lutulenta	insect - moth	2	Sect.41, Sect.42, UKBAP
Mniotype adusta	insect - moth	12	Sect.41, Sect.42, UKBAP
Agrochola lychnidis	insect - moth	226	Sect.41, Sect.42, UKBAP
Agrochola helvola	insect - moth	4	Sect.41, Sect.42, UKBAP
Agrochola litura	insect - moth	136	Sect.41, Sect.42, UKBAP
Atethmia centrago	insect - moth	145	Sect.41, Sect.42, UKBAP
Heliophobus reticulata subsp. marginosa	insect - moth	1	Breck_Special, Sect.41, Sect.42, UKBAP
Arctia caja	insect - moth	8	Sect.41, Sect.42, UKBAP

Species	Taxon Group	No. Records	Designation
Spilosoma lubricipeda	insect - moth	282	Sect.41, Sect.42, UKBAP
Spilosoma lutea	insect - moth	547	Sect.41, Sect.42, UKBAP
Tyria jacobaeae	insect - moth	241	Sect.41, Sect.42, UKBAP
Plebejus argus	insect - butterfly	17	FEP7/2, RLGB.VU, Sect.41, Sect.42, UKBAP, WCA5/9.5a, WCA5/9.5b
Satyrium w-album	insect - butterfly	2	RLGB.EN, Sect.41, Sect.42, UKBAP, WCA5/9.5a, WCA5/9.5b
Limenitis camilla	insect - butterfly	6	RLGB.VU, Sect.41, Sect.42, UKBAP
Coenonympha pamphilus	insect - butterfly	5	RLGB.Lr(NT), Sect.41, Sect.42, UKBAP
Lasiommata megera	insect - butterfly	19	RLGB.Lr(NT), Sect.41, Sect.42, UKBAP
Crombrugghia distans	insect - moth	24	Breck_Special
Calamotropha paludella	insect - moth	9	Nb
Crambus uliginosellus	insect - moth	4	Nb
Crambus hamella	insect - moth	4	Nb
Pediasia ontaminella	insect - moth	4	Nb
Platytes cerussella	insect - moth	17	Breck_Special
Evergestis extimalis	insect - moth	1	Breck_Special, Nb
Schoenobius gigantella	insect - moth	7	Nb
Sitochroa palealis	insect - moth	1	N
Nascia cilialis	insect - moth	9	Na
Eudonia delunella	insect - moth	1	Nb
Nephopterix angustella	insect - moth	6	Nb
Homoeosoma nebulella	insect - moth	2	Nb
Agathomyia falleni	insect - true fly (Diptera)	1	NS-excludes
Brachyopa insensilis	insect - true fly (Diptera)	1	N, ScotBL
Criorhina ranunculi	insect - true fly (Diptera)	2	N

Species	Taxon Group	No. Records	Designation
Didea fasciata	insect - true fly (Diptera)	5	N
Epistrophe diaphana	insect - true fly (Diptera)	1	N
Volucella inanis	Insect - Hoverflies	1	N
Volucella inanis	insect - true fly (Diptera)	41	N
Volucella inflata	insect - true fly (Diptera)	2	N
Volucella zonaria	Insect - Hoverflies	3	N
Volucella zonaria	insect - true fly (Diptera)	35	N
Xanthandrus comtus	insect - true fly (Diptera)	1	N
Leopoldius signatus	insect - true fly (Diptera)	3	N
Chrysis illigeri	insect - hymenopteran	1	Nb
Priocnemis (Priocnemis) hyalinata	insect - hymenopteran	1	Nb
Arachnospila (Anoplochares) minutula	insect - hymenopteran	1	Nb
Dolichovespula (Dolichovespula) media	insect - hymenopteran	1	Na
Ectemnius (Clytochrysus) sexcinctus	insect - hymenopteran	1	Nb
Nysson dimidiatus	insect - hymenopteran	1	Nb
Argogorytes fargeii	insect - hymenopteran	1	Na
Cerceris quinquefasciata	insect - hymenopteran	10	Breck_Special, FEP7/2, RDBGB.R, Sect.41, UKBAP
Hylaeus (Prosopis) signatus	insect - hymenopteran	11	Nb
Hylaeus (Abrupta) cornutus	insect - hymenopteran	6	Na

Species	Taxon Group	No. Records	Designation
Andrena (Plastandrena) bimaculata	insect - hymenopteran	5	Nb
Andrena (Plastandrena) tibialis	insect - hymenopteran	1	Na
Andrena (Poliandrena) tarsata	insect - hymenopteran	1	Sect.41, Sect.42, UKBAP
Andrena (Chlorandrena) humilis	insect - hymenopteran	2	Nb
Lasioglossum (Evylaeus) pauxillum	insect - hymenopteran	5	Na
Osmia (Neosmia) bicolor	insect - hymenopteran	1	Nb
Nomada fucata	insect - hymenopteran	2	Na
Bombus (Psithyrus) rupestris	insect - hymenopteran	2	Nb
Bombus (Thoracobombus) ruderarius	insect - hymenopteran	3	ScotBL, Sect.41, Sect.42, UKBAP
Platytes cerussella	insect - moth	17	Breck_Special
Evergestis extimalis	insect - moth	1	Breck_Special, Nb
Schoenobius gigantella	insect - moth	7	Nb
Sitochroa palealis	insect - moth	1	N
Nascia cilialis	insect - moth	9	Na
Eudonia delunella	insect - moth	1	Nb
Nephopterix angustella	insect - moth	6	Nb
Homoeosoma nebulella	insect - moth	2	Nb
Agathomyia falleni	insect - true fly (Diptera)	1	NS-excludes
Brachyopa insensilis	insect - true fly (Diptera)	1	N, ScotBL
Criorhina ranunculi	insect - true fly (Diptera)	2	N
Didea fasciata	insect - true fly (Diptera)	5	N
Epistrophe diaphana	insect - true fly (Diptera)	1	N

Species	Taxon Group	No. Records	Designation
Volucella inanis	Insect - Hoverflies	1	N
Volucella inanis	insect - true fly (Diptera)	41	N
Volucella inflata	insect - true fly (Diptera)	2	N
Volucella zonaria	Insect - Hoverflies	3	N
Volucella zonaria	insect - true fly (Diptera)	35	N
Xanthandrus comtus	insect - true fly (Diptera)	1	N
Leopoldius signatus	insect - true fly (Diptera)	3	N
Chrysis illigeri	insect - hymenopteran	1	Nb
Priocnemis (Priocnemis) hyalinata	insect - hymenopteran	1	Nb
Arachnospila (Anoplochares) minutula	insect - hymenopteran	1	Nb
Dolichovespula (Dolichovespula) media	insect - hymenopteran	1	Na
Ectemnius (Clytochrysus) sexcinctus	insect - hymenopteran	1	Nb
Nysson dimidiatus	insect - hymenopteran	1	Nb
Argogorytes fargeii	insect - hymenopteran	1	Na
Cerceris quinquefasciata	insect - hymenopteran	10	Breck_Special, FEP7/2, RDBGB.R, Sect.41, UKBAP
Hylaeus (Prosopis) signatus	insect - hymenopteran	11	Nb
Hylaeus (Abrupta) cornutus	insect - hymenopteran	6	Na
Andrena (Plastandrena) bimaculata	insect - hymenopteran	5	Nb
Andrena (Plastandrena) tibialis	insect - hymenopteran	1	Na

Species	Taxon Group	No. Records	Designation
Andrena (Poliandrena) tarsata	insect - hymenopteran	1	Sect.41, Sect.42, UKBAP
Andrena (Chlorandrena) humilis	insect - hymenopteran	2	Nb
Lasioglossum (Evylaeus) pauxillum	insect - hymenopteran	5	Na
Osmia (Neosmia) bicolor	insect - hymenopteran	1	Nb
Nomada fucata	insect - hymenopteran	2	Na
Bombus (Psithyrus) rupestris	insect - hymenopteran	2	Nb
Bombus (Thoracobombus) ruderarius	insect - hymenopteran	3	ScotBL, Sect.41, Sect.42, UKBAP
Platytes cerussella	insect - moth	17	Breck_Special
Evergestis extimalis	insect - moth	1	Breck_Special, Nb
Schoenobius gigantella	insect - moth	7	Nb
Sitochroa palealis	insect - moth	1	N
Nascia cilialis	insect - moth	9	Na
Eudonia delunella	insect - moth	1	Nb
Nephopterix angustella	insect - moth	6	Nb
Homoeosoma nebulella	insect - moth	2	Nb
Agathomyia falleni	insect - true fly (Diptera)	1	NS-excludes
Brachyopa insensilis	insect - true fly (Diptera)	1	N, ScotBL
Criorhina ranunculi	insect - true fly (Diptera)	2	N
Didea fasciata	insect - true fly (Diptera)	5	N
Epistrophe diaphana	insect - true fly (Diptera)	1	N
Volucella inanis	Insect - Hoverflies	1	N
Volucella inanis	insect - true fly (Diptera)	41	N

Species	Taxon Group	No. Records	Designation
Volucella inflata	insect - true fly (Diptera)	2	N
Volucella zonaria	Insect - Hoverflies	3	N
Volucella zonaria	insect - true fly (Diptera)	35	N
Xanthandrus comtus	insect - true fly (Diptera)	1	N
Leopoldius signatus	insect - true fly (Diptera)	3	N
Chrysis illigeri	insect - hymenopteran	1	Nb
Priocnemis (Priocnemis) hyalinata	insect - hymenopteran	1	Nb
Arachnospila (Anoplochares) minutula	insect - hymenopteran	1	Nb
Dolichovespula (Dolichovespula) media	insect - hymenopteran	1	Na
Ectemnius (Clytochrysus) sexcinctus	insect - hymenopteran	1	Nb
Nysson dimidiatus	insect - hymenopteran	1	Nb
Argogorytes fargeii	insect - hymenopteran	1	Na
Cerceris quinquefasciata	insect - hymenopteran	10	Breck_Special, FEP7/2, RDBGB.R, Sect.41, UKBAP
Hylaeus (Prosopis) signatus	insect - hymenopteran	11	Nb
Hylaeus (Abrupta) cornutus	insect - hymenopteran	6	Na
Andrena (Plastandrena) bimaculata	insect - hymenopteran	5	Nb
Andrena (Plastandrena) tibialis	insect - hymenopteran	1	Na
Andrena (Poliandrena) tarsata	insect - hymenopteran	1	Sect.41, Sect.42, UKBAP
Andrena (Chlorandrena) humilis	insect - hymenopteran	2	Nb

Species	Taxon Group	No. Records	Designation
Lasioglossum (Evylaeus) pauxillum	insect - hymenopteran	5	Na
Osmia (Neosmia) bicolor	insect - hymenopteran	1	Nb
Nomada fucata	insect - hymenopteran	2	Na
Bombus (Psithyrus) rupestris	insect - hymenopteran	2	Nb
Bombus (Thoracobombus) ruderarius	insect - hymenopteran	3	ScotBL, Sect.41, Sect.42, UKBAP

Appendix F – Species List from Surveys in 2021

DD = Data Deficient, NS = Nationally Scarce, SPI = Species of Principal Importance, Unk = Unknown

Order	Family	Taxon	Status
Araneae	Araneidae	*Araneus diadematus*	None
Araneae	Araneidae	*Drassodes lapidosus*	None
Araneae	Araneidae	*Larinioides cornutus*	None
Araneae	Araneidae	*Nuctenea umbratica*	None
Araneae	Pisauridae	*Pisaura mirabilis*	None
Araneae	Thomisidae	*Diaea dorsata*	Local
Araneae	Thomisidae	*Xysticus cristatus*	None
Clitellata	Arhynchobdellida	*Haemopis sanguisuga*	Local
Clitellata	Erpobdellidae	*Erpobdella octoculata*	None
Coleoptera	Aderidae	*Euglenes oculatus*	NS
Coleoptera	Anthicidae	*Anthicus floralis*	None
Coleoptera	Anthicidae	*Notoxus monoceros*	Local
Coleoptera	Apionidae	*Exapion ulicis*	None
Coleoptera	Apionidae	*Perapion violaceum*	None
Coleoptera	Apionidae	*Taeniapion urticarium*	Local
Coleoptera	Attelabidae	*Attelabus nitens*	Local
Coleoptera	Byrrhidae	*Byrrhus pilula*	None
Coleoptera	Byturidae	*Byturus ochraceus*	Local
Coleoptera	Cantharidae	*Cantharis cryptica*	None
Coleoptera	Cantharidae	*Cantharis lateralis*	Local
Coleoptera	Cantharidae	*Cantharis nigricans*	None
Coleoptera	Cantharidae	*Cantharis rustica*	None
Coleoptera	Cantharidae	*Rhagonycha nigriventris*	None
Coleoptera	Carabidae	*Acupalpus dubius*	None
Coleoptera	Carabidae	*Agonum thoreyi*	None
Coleoptera	Carabidae	*Amara aenea*	None
Coleoptera	Carabidae	*Amara communis*	Local
Coleoptera	Carabidae	*Amara convexior*	Local
Coleoptera	Carabidae	*Amara montivaga*	NS
Coleoptera	Carabidae	*Amara ovata*	None

Order	Family	Taxon	Status
Coleoptera	Carabidae	*Amara tibialis*	Local
Coleoptera	Carabidae	*Bembidion guttula*	None
Coleoptera	Carabidae	*Bembidion lampros*	None
Coleoptera	Carabidae	*Calathus fuscipes*	None
Coleoptera	Carabidae	*Calathus melanocephalus*	None
Coleoptera	Carabidae	*Calathus rotundicollis*	None
Coleoptera	Carabidae	*Calodromus spilotus*	None
Coleoptera	Carabidae	*Carabus granulatus*	Local
Coleoptera	Carabidae	*Carabus problematicus*	None
Coleoptera	Carabidae	*Carabus violaceus*	None
Coleoptera	Carabidae	*Clivina fossor*	None
Coleoptera	Carabidae	*Curtonotus aulicus*	None
Coleoptera	Carabidae	*Cychrus caraboides*	Local
Coleoptera	Carabidae	*Demetrias atricapillus*	None
Coleoptera	Carabidae	*Harpalus affinis*	None
Coleoptera	Carabidae	*Harpalus attenuatus*	NS
Coleoptera	Carabidae	*Harpalus rubripes*	Local
Coleoptera	Carabidae	*Harpalus rufipes*	None
Coleoptera	Carabidae	*Harpalus tardus*	Local
Coleoptera	Carabidae	*Laemostenus terricola*	Local
Coleoptera	Carabidae	*Leistus ferrugineus*	None
Coleoptera	Carabidae	*Loricera pilicornis*	None
Coleoptera	Carabidae	*Nebria brevicollis*	None
Coleoptera	Carabidae	*Nebria salina*	None
Coleoptera	Carabidae	*Paradromius linearis*	None
Coleoptera	Carabidae	*Poecilus versicolor*	Local
Coleoptera	Carabidae	*Pterostichus madidus*	None
Coleoptera	Carabidae	*Pterostichus melanarius*	None
Coleoptera	Carabidae	*Pterostichus niger*	None
Coleoptera	Carabidae	*Pterostichus nigrita*	None
Coleoptera	Carabidae	*Pterostichus rhaeticus*	None
Coleoptera	Carabidae	*Pterostichus strenuus*	None
Coleoptera	Carabidae	*Pterostichus vernalis*	Local

Order	Family	Taxon	Status
Coleoptera	Carabidae	*Syntomus foveatus*	None
Coleoptera	Carabidae	*Trechus obtusus*	None
Coleoptera	Cerambycidae	*Arhopalus rusticus*	Local
Coleoptera	Cerambycidae	*Clytus arietis*	None
Coleoptera	Cerambycidae	*Grammoptera ruficornis*	None
Coleoptera	Cerambycidae	*Leiopus nebulosus s.str*	Local
Coleoptera	Cerambycidae	*Phymatodes testaceus*	Local
Coleoptera	Cerambycidae	*Phytoecia cylindrica*	NS
Coleoptera	Cerambycidae	*Pogonocherus hispidus*	Local
Coleoptera	Cerambycidae	*Prionus coriarius*	NS
Coleoptera	Cerambycidae	*Pseudovadonia livida*	Local
Coleoptera	Cerambycidae	*Rutpela maculata*	None
Coleoptera	Chrysomelidae	*Cassida prasina*	NS
Coleoptera	Chrysomelidae	*Cassida rubiginosa*	None
Coleoptera	Chrysomelidae	*Chaetocnema hortensis*	None
Coleoptera	Chrysomelidae	*Chrysolina marginata*	Rare
Coleoptera	Chrysomelidae	*Crepidodera plutus*	Local
Coleoptera	Chrysomelidae	*Cryptocephalus fulvus*	Local
Coleoptera	Chrysomelidae	*Galerucella sagittariae*	Local
Coleoptera	Chrysomelidae	*Lochmaea crataegi*	None
Coleoptera	Chrysomelidae	*Longitarsus atricillus*	None
Coleoptera	Chrysomelidae	*Longitarsus dorsalis*	Local
Coleoptera	Chrysomelidae	*Longitarsus flavicornis*	None
Coleoptera	Chrysomelidae	*Neocrepidodera transversa*	None
Coleoptera	Chrysomelidae	*Oomorphus concolor*	Local
Coleoptera	Chrysomelidae	*Oulema melanopus*	None
Coleoptera	Chrysomelidae	*Phaedon tumidulus*	None
Coleoptera	Chrysomelidae	*Phyllotreta nemorum*	None
Coleoptera	Chrysomelidae	*Phyllotreta nigripes*	None
Coleoptera	Chrysomelidae	*Phyllotreta undulata*	None
Coleoptera	Chrysomelidae	*Phyllotreta vittula*	Local
Coleoptera	Chrysomelidae	*Plateumaris sericea*	Local
Coleoptera	Chrysomelidae	*Psylliodes chrysocephala*	Local

Order	Family	Taxon	Status
Coleoptera	Chrysomelidae	*Psylliodes napi*	None
Coleoptera	Chrysomelidae	*Sphaeroderma rubidum*	None
Coleoptera	Chrysomelidae	*Sphaeroderma testaceum*	None
Coleoptera	Ciidae	*Cis castaneus*	Local
Coleoptera	Cleridae	*Thanasimus formicarius*	Local
Coleoptera	Coccinellidae	*Adalia decempunctata*	None
Coleoptera	Coccinellidae	*Coccidula rufa*	None
Coleoptera	Coccinellidae	*Coccinella septempunctata*	None
Coleoptera	Coccinellidae	*Exochomus quadripustulatus*	None
Coleoptera	Coccinellidae	*Halyzia sedecimguttata*	Local
Coleoptera	Coccinellidae	*Harmonia axyridis*	None
Coleoptera	Coccinellidae	*Propylea quattuordecimpunctata*	None
Coleoptera	Coccinellidae	*Psyllobora vigintiduopunctata*	None
Coleoptera	Coccinellidae	*Rhyzobius litura*	None
Coleoptera	Coccinellidae	*Subcoccinella vigintiquattuorpunctata*	None
Coleoptera	Coccinellidae	*Tytthaspis sedecimpunctata*	Local
Coleoptera	Curculionidae	*Acalles misellus*	Local
Coleoptera	Curculionidae	*Ceutorhynchus obstrictus*	None
Coleoptera	Curculionidae	*Ceutorhynchus pallidactylus*	None
Coleoptera	Curculionidae	*Curculio glandium*	Local
Coleoptera	Curculionidae	*Euophryum confine*	None
Coleoptera	Curculionidae	*Graptus triguttatus*	Local
Coleoptera	Curculionidae	*Gymnetron rostellum*	NS
Coleoptera	Curculionidae	*Hylesinus toranio*	Local
Coleoptera	Curculionidae	*Hylesinus wachtli*	NS
Coleoptera	Curculionidae	*Hypera arator*	None
Coleoptera	Curculionidae	*Hypera venusta*	None
Coleoptera	Curculionidae	*Mecinus pascuorum*	None
Coleoptera	Curculionidae	*Mecinus pyraster*	None
Coleoptera	Curculionidae	*Microplontus campestris*	NS
Coleoptera	Curculionidae	*Microplontus melanostigma*	Local
Coleoptera	Curculionidae	*Nedyus quadrimaculatus*	None
Coleoptera	Curculionidae	*Otiorhynchus ovatus*	Local

Order	Family	Taxon	Status
Coleoptera	Curculionidae	*Otiorhynchus raucus*	NS
Coleoptera	Curculionidae	*Otiorhynchus singularis*	None
Coleoptera	Curculionidae	*Parathelcus pollinarius*	None
Coleoptera	Curculionidae	*Philopedon plagiatum*	Local
Coleoptera	Curculionidae	*Phyllobius maculicornis*	Local
Coleoptera	Curculionidae	*Phyllobius pomaceus*	None
Coleoptera	Curculionidae	*Phyllobius pyri*	None
Coleoptera	Curculionidae	*Phyllobius virideaeris*	Local
Coleoptera	Curculionidae	*Rhinoncus leucostigma*	None
Coleoptera	Curculionidae	*Romualdius angustisetulus*	Local
Coleoptera	Curculionidae	*Scolytus mali*	NS
Coleoptera	Curculionidae	*Sitona lineatus*	None
Coleoptera	Curculionidae	*Stenocarus ruficornis*	NS
Coleoptera	Curculionidae	*Strophosoma melanogrammum*	None
Coleoptera	Curculionidae	*Trichosirocalus troglodytes*	None
Coleoptera	Dermestidae	*Anthrenus verbasci*	None
Coleoptera	Dytiscidae	*Colymbetes fuscus*	None
Coleoptera	Elateridae	*Agriotes obscurus*	None
Coleoptera	Elateridae	*Agriotes pallidulus*	None
Coleoptera	Elateridae	*Agrypnus murinus*	Local
Coleoptera	Elateridae	*Athous haemorrhoidalis*	None
Coleoptera	Elateridae	*Dalopius marginatus*	None
Coleoptera	Elateridae	*Hemicrepidius hirtus*	Local
Coleoptera	Elateridae	*Melanotus villosus*	None
Coleoptera	Elateridae	*Procraerus tibialis*	Rare
Coleoptera	Elateridae	*Stenagostus rhombeus*	Local
Coleoptera	Eucnemidae	*Ephiphanis cornutus*	None
Coleoptera	Geotrupidae	*Typhaeus typhoeus*	Local
Coleoptera	Hydrophilidae	*Hydrobius fuscipes*	None
Coleoptera	Hydrophilidae	*Sphaeridium bipustulatum*	None
Coleoptera	Hydrophilidae	*Sphaeridium lunatum*	None
Coleoptera	Hydrophilidae	*Sphaeridium marginatum*	None
Coleoptera	Latridiidae	*Cartodere bifasciata*	Local

Order	Family	Taxon	Status
Coleoptera	Latridiidae	*Corticarina minuta*	none
Coleoptera	Leiodidae	*Anisotoma humeralis*	Local
Coleoptera	Leiodidae	*Catops fuliginosus*	None
Coleoptera	Leiodidae	*Leiodes rufipennis*	None
Coleoptera	Lucanidae	*Dorcus parallelipipedus*	Local
Coleoptera	Malachiidae	*Malachius bipustulatus*	None
Coleoptera	Miridae	*Notostira elongata*	None
Coleoptera	Mordellidae	*Mordellistena neuwaldeggiana*	NS
Coleoptera	Mordellidae	*Mordellochroa abdominalis*	Local
Coleoptera	Mycetophagidae	*Mycetophagus piceus*	Local
Coleoptera	Nitidulidae	*Cychramus luteus*	Local
Coleoptera	Nitidulidae	*Epuraea melanocephala*	None
Coleoptera	Nitidulidae	*Meligethes aeneus*	None
Coleoptera	Nitidulidae	*Meligethes nigrescens*	None
Coleoptera	Nitidulidae	*Meligethes planiusculus*	None
Coleoptera	Oedemeridae	*Oedemera lurida*	Local
Coleoptera	Oedemeridae	*Oedemera nobilis*	None
Coleoptera	Phalacridae	*Olibrus aeneus*	None
Coleoptera	Phalacridae	*Olibrus corticalis*	None
Coleoptera	Phalacridae	*Olibrus liquidus*	Local
Coleoptera	Phalacridae	*Stilbus testaceus*	None
Coleoptera	Ptinidae	*Anobium punctatum*	None
Coleoptera	Ptinidae	*Dorcatoma flavicornis*	NS
Coleoptera	Ptinidae	*Ochina ptinoides*	Local
Coleoptera	Ptinidae	*Ptilinus pectinicornis*	None
Coleoptera	Pyrochroidae	*Pyrochroa serraticornis*	None
Coleoptera	Salpingidae	*Salpingus planirostris*	None
Coleoptera	Scarabaeidae	*Acrossus rufipes*	None
Coleoptera	Scarabaeidae	*Aphodius ater*	None
Coleoptera	Scarabaeidae	*Aphodius granarius*	Local
Coleoptera	Scarabaeidae	*Aphodius prodromus*	None
Coleoptera	Scarabaeidae	*Onthophagus joannae*	Local
Coleoptera	Scarabaeidae	*Phyllopertha horticola*	None

Order	Family	Taxon	Status
Coleoptera	Scarabaeidae	*Teuchestes fossor*	None
Coleoptera	Scirtidae	*Cyphon coarctatus*	None
Coleoptera	Scirtidae	*Prionocyphon serricornis*	Local
Coleoptera	Scraptiidae	*Anaspis fasciata*	None
Coleoptera	Scraptiidae	*Anaspis maculata*	None
Coleoptera	Scraptiidae	*Anaspis regimbarti*	None
Coleoptera	Scraptiidae	*Anaspis thoracica*	NS
Coleoptera	Silphidae	*Ablattaria laevigata*	Local
Coleoptera	Silphidae	*Nicrophorus humator*	None
Coleoptera	Silphidae	*Nicrophorus investigator*	None
Coleoptera	Silphidae	*Oiceoptoma thoracicum*	Local
Coleoptera	Silphidae	*Phosphuga atrata*	None
Coleoptera	Staphylinidae	*Aleochara curtula*	None
Coleoptera	Staphylinidae	*Anotylus rugosus*	None
Coleoptera	Staphylinidae	*Anthobium unicolor*	None
Coleoptera	Staphylinidae	*Atheta fungi*	None
Coleoptera	Staphylinidae	*Atrecus affinis*	None
Coleoptera	Staphylinidae	*Bisnius sordidus*	None
Coleoptera	Staphylinidae	*Drusilla canaliculata*	None
Coleoptera	Staphylinidae	*Hapalaraea pygmaea*	Local
Coleoptera	Staphylinidae	*Hygronoma dimidiata*	Local
Coleoptera	Staphylinidae	*Ocypus brunnipes*	None
Coleoptera	Staphylinidae	*Ocypus nitens*	NS
Coleoptera	Staphylinidae	*Othius punctulatus*	None
Coleoptera	Staphylinidae	*Oxyporus rufus*	Local
Coleoptera	Staphylinidae	*Oxytelus laqueatus*	None
Coleoptera	Staphylinidae	*Pella limbata*	Local
Coleoptera	Staphylinidae	*Philonthus addendus*	Local
Coleoptera	Staphylinidae	*Philonthus cognatus*	None
Coleoptera	Staphylinidae	*Philonthus decorus*	None
Coleoptera	Staphylinidae	*Platydracus stercorarius*	Local
Coleoptera	Staphylinidae	*Quedius cruentus*	None
Coleoptera	Staphylinidae	*Quedius fuliginosus*	None

Order	Family	Taxon	Status
Coleoptera	Staphylinidae	*Quedius fumatus*	Local
Coleoptera	Staphylinidae	*Quedius lateralis*	Local
Coleoptera	Staphylinidae	*Quedius levicollis*	None
Coleoptera	Staphylinidae	*Quedius picipes*	None
Coleoptera	Staphylinidae	*Scaphidium quadrimaculatum*	Local
Coleoptera	Staphylinidae	*Stenus cicindeloides*	None
Coleoptera	Staphylinidae	*Tachinus rufipes*	None
Coleoptera	Staphylinidae	*Tachyporus hypnorum*	None
Coleoptera	Staphylinidae	*Tasgius ater*	None
Coleoptera	Staphylinidae	*Tasgius globulifer*	None
Coleoptera	Staphylinidae	*Tasgius morsitans*	Local
Coleoptera	Staphylinidae	*Xantholinus longiventris*	None
Coleoptera	Tenebrionidae	*Lagria hirta*	None
Coleoptera	Tenebrionidae	*Pseudocistela ceramboides*	NS
Coleoptera	Throscidae	*Aulonothroscus brevicollis*	Rare
Dermaptera	Forficulidae	*Forficula auricularia*	None
Diptera	Asilidae	*Dioctria baumhaueri*	Local
Diptera	Asilidae	*Dioctria rufipes*	Local
Diptera	Asilidae	*Dysmachus trigonus*	Local
Diptera	Asilidae	*Leptogaster cylindrica*	None
Diptera	Asilidae	*Machimus cingulatus*	Local
Diptera	Asilidae	*Neoitamus cyanurus*	Local
Diptera	Bibionidae	*Bibio johannis*	None
Diptera	Bibionidae	*Bibio marci*	None
Diptera	Bombylidae	*Bombylius major*	None
Diptera	Conopidae	*Sicus ferrugineus*	Local
Diptera	Dolichopodidae	*Dolichopus popularis*	None
Diptera	Ptychopteridae	*Ptychoptera albimana*	None
Diptera	Ptychopteridae	*Ptychoptera lacustris*	Local
Diptera	Scathophagidae	*Scathophaga stercoraria*	None
Diptera	Sciomyzidae	*Coremacera marginata*	Local
Diptera	Stratiomyidae	*Chloromyia formosa*	None
Diptera	Stratiomyidae	*Sargus bipunctatus*	None

Order	Family	Taxon	Status
Diptera	Syrphidae	*Chrysotoxum bicinctum*	Local
Diptera	Syrphidae	*Chrysotoxum cautum*	Local
Diptera	Syrphidae	*Eristalis arbustorum*	None
Diptera	Syrphidae	*Eristalis nemorum*	None
Diptera	Syrphidae	*Eristalis pertinax*	None
Diptera	Syrphidae	*Eristalis tenax*	None
Diptera	Syrphidae	*Eumerus strigatus*	None
Diptera	Syrphidae	*Helophilus pendulus*	None
Diptera	Syrphidae	*Melanostoma scalare*	None
Diptera	Syrphidae	*Merodon equestris*	None
Diptera	Syrphidae	*Sphaerophoria scripta*	None
Diptera	Syrphidae	*Syritta pipiens*	None
Diptera	Syrphidae	*Syrphus ribesii*	None
Diptera	Syrphidae	*Syrphus torvus*	None
Diptera	Syrphidae	*Volucella pellucens*	None
Diptera	Syrphidae	*Xanthogramma pedissequum*	Local
Diptera	Syrphidae	*Xylota segnis*	None
Diptera	Syrphidae	*Xylota sylvarum*	Local
Diptera	Tabanidae	*Haematopota crassicornis*	Local
Diptera	Therevidae	*Thereva nobilitata*	None
Diptera	Tipulidae	*Ctenophora pectinicornis*	NS
Glomerida	Glomeridae	*Glomeris marginata*	None
Hemiptera	Acanthosomatidae	*Elasmostethus interstinctus*	None
Hemiptera	Anthocoridae	*Anthocoris nemoralis*	None
Hemiptera	Aphrophoridae	*Aphrophora alni*	None
Hemiptera	Aphrophoridae	*Neophilaenus campestris*	None
Hemiptera	Aphrophoridae	*Philaenus spumarius*	None
Hemiptera	Cicadellidae	*Adarrus ocellaris*	None
Hemiptera	Cicadellidae	*Agallia consobrina*	None
Hemiptera	Cicadellidae	*Agallia venosa*	Local
Hemiptera	Cicadellidae	*Aphrodes makarovi*	None
Hemiptera	Cicadellidae	*Athysanus argentarius*	Local
Hemiptera	Cicadellidae	*Eupelix cuspidata*	None

Order	Family	Taxon	Status
Hemiptera	Cicadellidae	*Eupteryx urticae*	None
Hemiptera	Cicadellidae	*Euscelis incisus*	None
Hemiptera	Cicadellidae	*Idiocerus vittifrons*	Local
Hemiptera	Cicadellidae	*Macropsis scotti*	None
Hemiptera	Coreidae	*Coreus marginatus*	None
Hemiptera	Coreidae	*Coriomeris denticulatus*	None
Hemiptera	Cydnidae	*Tritomegas bicolor*	Local
Hemiptera	Cynidae	*Legnotus limbosus*	None
Hemiptera	Delphacidae	*Stenocranus minutus*	None
Hemiptera	Hydrometridae	*Hydrometra stagnorum*	None
Hemiptera	Lygaeidae	*Graptopeltus lynceus*	NS
Hemiptera	Lygaeidae	*Heterogaster urticae*	None
Hemiptera	Lygaeidae	*Ischnodemus sabuleti*	None
Hemiptera	Lygaeidae	*Megalonotus chiragra*	None
Hemiptera	Lygaeidae	*Nysius ericae*	None
Hemiptera	Lygaeidae	*Peritrechus geniculatus*	None
Hemiptera	Lygaeidae	*Scolopostethus affinis*	None
Hemiptera	Miridae	*Atractotomus magnicornis*	None
Hemiptera	Miridae	*Capsus ater*	None
Hemiptera	Miridae	*Leptopterna dolabrata*	None
Hemiptera	Miridae	*Liocoris tripustulatus*	None
Hemiptera	Miridae	*Lygus pratensis*	Rare
Hemiptera	Miridae	*Lygus rugulipennis*	None
Hemiptera	Miridae	*Phytocoris varipes*	None
Hemiptera	Miridae	*Stenodema calcarata*	None
Hemiptera	Miridae	*Stenodema laevigata*	None
Hemiptera	Miridae	*Stenotus binotatus*	None
Hemiptera	Nabidae	*Himacerus mirmicoides*	None
Hemiptera	Nabidae	*Nabis ferus*	None
Hemiptera	Nabidae	*Nabis flavomarginatus*	None
Hemiptera	Nepidae	*Nepa cinerea*	None
Hemiptera	Pentatomidae	*Aelia acuminata*	Local
Hemiptera	Pentatomidae	*Dolycoris baccarum*	None

Order	Family	Taxon	Status
Hemiptera	Pentatomidae	*Eurydema oleracea*	Local
Hemiptera	Pentatomidae	*Palomena prasina*	None
Hemiptera	Pentatomidae	*Pentatoma rufipes*	None
Hemiptera	Rhopalidae	*Rhopalus parumpunctatus*	NS
Hemiptera	Rhopalidae	*Rhopalus subrufus*	Local
Hemiptera	Rhopalidae	*Stictopleurus abutilon*	None
Hemiptera	Scutelleridae	*Eurygaster testudinaria*	Local
Hemiptera	Thyreocoridae	*Thyreocoris scarabaeoides*	Local
Hemiptera	Tingidae	*Acalypta parvula*	None
Hemiptera	Tingidae	*Kalama tricornis*	Local
Hygrophila	Lymnaeidae	*Stagnicola fuscus*	None
Hymenoptera	Andrenidae	*Andrena alfkenella*	Rare
Hymenoptera	Andrenidae	*Andrena bicolor*	None
Hymenoptera	Andrenidae	*Andrena dorsata*	None
Hymenoptera	Andrenidae	*Andrena flavipes*	None
Hymenoptera	Andrenidae	*Andrena fulva*	None
Hymenoptera	Andrenidae	*Andrena haemorrhoa*	None
Hymenoptera	Andrenidae	*Andrena minutula*	None
Hymenoptera	Andrenidae	*Andrena nigroaenea*	None
Hymenoptera	Andrenidae	*Andrena nitida*	None
Hymenoptera	Andrenidae	*Andrena proxima*	Local
Hymenoptera	Andrenidae	*Andrena subopaca*	None
Hymenoptera	Andrenidae	*Lasioglossum albipes*	None
Hymenoptera	Apidae	*Apis mellifera*	None
Hymenoptera	Apidae	*Bombus hortorum*	None
Hymenoptera	Apidae	*Bombus hypnorum*	None
Hymenoptera	Apidae	*Bombus lapidarius*	None
Hymenoptera	Apidae	*Bombus pascuorum*	None
Hymenoptera	Apidae	*Bombus pratorum*	None
Hymenoptera	Apidae	*Bombus sylvestris*	None
Hymenoptera	Apidae	*Bombus terrestris*	None
Hymenoptera	Apidae	*Bombus vestalis*	None
Hymenoptera	Apidae	*Nomada fucata*	NS

Order	Family	Taxon	Status
Hymenoptera	Apidae	*Nomada goodeniana*	None
Hymenoptera	Apidae	*Nomada marshamella*	None
Hymenoptera	Apidae	*Nomada panzeri*	None
Hymenoptera	Apidae	*Nomada ruficornis*	None
Hymenoptera	Apidae	*Nomada zonata*	None
Hymenoptera	Chrysididae	*Chrysis illigeri*	NS
Hymenoptera	Chrysididae	*Pseudomalus auratus*	None
Hymenoptera	Colletidae	*Colletes succinctus*	None
Hymenoptera	Colletidae	*Hylaeus communis*	None
Hymenoptera	Colletidae	*Hylaeus dilatatus*	Local
Hymenoptera	Crabronidae	*Ammophila sabulosa*	None
Hymenoptera	Crabronidae	*Ancistrocerus parietinus*	Local
Hymenoptera	Crabronidae	*Cerceris arenaria*	None
Hymenoptera	Crabronidae	*Cerceris quinquefasciata*	Rare
Hymenoptera	Crabronidae	*Cerceris ruficornis*	Local
Hymenoptera	Crabronidae	*Cerceris rybyensis*	None
Hymenoptera	Crabronidae	*Crossocerus megacephalus*	None
Hymenoptera	Crabronidae	*Crossocerus ovalis*	None
Hymenoptera	Crabronidae	*Entomognathus brevis*	None
Hymenoptera	Crabronidae	*Lindenius panzeri*	Local
Hymenoptera	Crabronidae	*Mellinus arvensis*	None
Hymenoptera	Crabronidae	*Nysson dimidiatus*	NS
Hymenoptera	Crabronidae	*Oxybelus uniglumis*	None
Hymenoptera	Crabronidae	*Pemphredon lugubris*	None
Hymenoptera	Crabronidae	*Philanthus triangulum*	Rare
Hymenoptera	Crabronidae	*Psenulus pallipes*	None
Hymenoptera	Crabronidae	*Rhopalum coarctatum*	None
Hymenoptera	Crabronidae	*Tachysphex pompiliformis*	None
Hymenoptera	Crabronidae	*Trypoxylon attenuatum*	None
Hymenoptera	Formicidae	*Formica fusca*	None
Hymenoptera	Formicidae	*Lasius niger*	None
Hymenoptera	Formicidae	*Myrmica ruginodis*	None
Hymenoptera	Formicidae	*Myrmica scabrinodis*	None

Order	Family	Taxon	Status
Hymenoptera	Halictidae	*Halictus rubicundus*	None
Hymenoptera	Halictidae	*Lasioglossum calceatum*	None
Hymenoptera	Halictidae	*Lasioglossum lativentre*	None
Hymenoptera	Halictidae	*Lasioglossum leucopus*	None
Hymenoptera	Halictidae	*Lasioglossum leucozonium*	None
Hymenoptera	Halictidae	*Lasioglossum morio*	None
Hymenoptera	Halictidae	*Lasioglossum parvulum*	None
Hymenoptera	Halictidae	*Lasioglossum punctatissimum*	None
Hymenoptera	Halictidae	*Lasioglossum quadrinotatum*	NS
Hymenoptera	Halictidae	*Lasioglossum rufitarse*	Local
Hymenoptera	Halictidae	*Lasioglossum villosulum*	None
Hymenoptera	Halictidae	*Sphecodes crassus*	NS
Hymenoptera	Halictidae	*Sphecodes ephippius*	None
Hymenoptera	Halictidae	*Sphecodes longulus*	NS
Hymenoptera	Halictidae	*Sphecodes monilicornis*	None
Hymenoptera	Mellitidae	*Dasypoda hirtipes*	NS
Hymenoptera	Pompilidae	*Anoplius viaticus*	Local
Hymenoptera	Pompilidae	*Dipogon subintermedius*	None
Hymenoptera	Pompilidae	*Priocnemis susterai*	Local
Hymenoptera	Tenthredinidae	*Tenthredo scrophulariae*	None
Hymenoptera	Tiphiidae	*Tiphia femorata*	Local
Hymenoptera	Vespidae	*Gymnomerus laevipes*	Local
Hymenoptera	Vespidae	*Vespula vulgaris*	None
Isopoda	Armadillidiidae	*Armadillidium vulgare*	None
Isopoda	Asellidae	*Asellus aquaticus*	None
Isopoda	Philoscidae	*Philoscia muscorum*	None
Isopoda	Porcellionidae	*Porcellio scaber*	None
Ixoda	Ixodidae	*Ixodes ricinus*	None
Julida	Julidae	*Cylindroiulus punctatus*	None
Julida	Julidae	*Julus scandinavius*	None
Julida	Julidae	*Ommatoiulus sabulosus*	None
Julida	Julidae	*Ophyiulus pilosus*	None
Julida	Julidae	*Tachypodoiulus niger*	None

Order	Family	Taxon	Status
Lepidoptera	Adelidae	*Adela reaumurella*	None
Lepidoptera	Adelidae	*Nematopogon metaxella*	None
Lepidoptera	Adelidae	*Nemophora degeerella*	None
Lepidoptera	Adelidae	*Nemophora fasciella*	SPI
Lepidoptera	Argyresthiidae	*Argyresthia goedartella*	None
Lepidoptera	Blastobasidae	*Blastobasis adustella*	None
Lepidoptera	Blastobasidae	*Blastobasis lacticolella*	None
Lepidoptera	Choreutidae	*Anthophila fabriciana*	None
Lepidoptera	Cosmopterigidae	*Limnaecia phragmitella*	None
Lepidoptera	Crambidae	*Acentria ephemerella*	None
Lepidoptera	Crambidae	*Agriphila straminella*	None
Lepidoptera	Crambidae	*Agriphila tristella*	None
Lepidoptera	Crambidae	*Anania coronata*	None
Lepidoptera	Crambidae	*Anania hortulata*	None
Lepidoptera	Crambidae	*Calamotropha paludella*	None
Lepidoptera	Crambidae	*Cataclysta lemnata*	None
Lepidoptera	Crambidae	*Catoptria pinella*	None
Lepidoptera	Crambidae	*Chilo phragmitella*	None
Lepidoptera	Crambidae	*Chrysoteuchia culmella*	None
Lepidoptera	Crambidae	*Crambus lathoniellus*	None
Lepidoptera	Crambidae	*Crambus perlella*	None
Lepidoptera	Crambidae	*Donacaula forficella*	None
Lepidoptera	Crambidae	*Elophila nymphaeata*	None
Lepidoptera	Crambidae	*Eudonia lacustrata*	None
Lepidoptera	Crambidae	*Evergestis pallidata*	None
Lepidoptera	Crambidae	*Nomophila noctuella*	None
Lepidoptera	Crambidae	*Nymphula stagnata*	None
Lepidoptera	Crambidae	*Parapoynx stratiotata*	None
Lepidoptera	Crambidae	*Pleuroptya ruralis*	None
Lepidoptera	Crambidae	*Pyrausta despicata*	None
Lepidoptera	Crambidae	*Scoparia ambigualis*	None
Lepidoptera	Crambidae	*Scoparia basistrigalis*	None
Lepidoptera	Crambidae	*Sitochroa verticalis*	None

Order	Family	Taxon	Status
Lepidoptera	Crambidae	*Udea olivalis*	None
Lepidoptera	Crambidae	*Udea prunalis*	None
Lepidoptera	Depressariidae	*Agonopterix heracliana*	None
Lepidoptera	Drepanidae	*Drepana falcataria*	None
Lepidoptera	Drepanidae	*Thyatira batis*	None
Lepidoptera	Elachistidae	*Elachista maculicerusella*	None
Lepidoptera	Erebidae	*Cybosia mesomella*	Local
Lepidoptera	Erebidae	*Eilema complana*	Local
Lepidoptera	Erebidae	*Eilema griseola*	None
Lepidoptera	Erebidae	*Eilema lurideola*	None
Lepidoptera	Erebidae	*Euclidia glyphica*	None
Lepidoptera	Erebidae	*Euproctis similis*	None
Lepidoptera	Erebidae	*Hypena proboscidalis*	None
Lepidoptera	Erebidae	*Laspeyria flexula*	Local
Lepidoptera	Erebidae	*Leucoma salicis*	Local
Lepidoptera	Erebidae	*Lymantria monacha*	Local
Lepidoptera	Erebidae	*Miltochrista miniata*	Local
Lepidoptera	Erebidae	*Orgyia antiqua*	None
Lepidoptera	Erebidae	*Phragmatobia fuliginosa*	None
Lepidoptera	Erebidae	*Rivula sericealis*	None
Lepidoptera	Erebidae	*Spilosoma lutea*	SPI
Lepidoptera	Erebidae	*Thumatha senex*	Local
Lepidoptera	Erebidae	*Tyria jacobaeae*	SPI
Lepidoptera	Erebidae	*Zanclognatha tarsipennalis*	None
Lepidoptera	Gelechiidae	*Helcystogramma rufescens*	None
Lepidoptera	Gelechiidae	*Metzneria metzneriella*	None
Lepidoptera	Gelechiidae	*Monochroa palustrellus*	NS
Lepidoptera	Geometridae	*Abraxas grossulariata*	None
Lepidoptera	Geometridae	*Alcis repandata*	None
Lepidoptera	Geometridae	*Aplocera plagiata*	Local
Lepidoptera	Geometridae	*Biston betularia*	None
Lepidoptera	Geometridae	*Cabera pusaria*	None
Lepidoptera	Geometridae	*Campaea margaritaria*	None

Order	Family	Taxon	Status
Lepidoptera	Geometridae	*Camptogramma bilineata*	None
Lepidoptera	Geometridae	*Chloroclystis v-ata*	None
Lepidoptera	Geometridae	*Colostygia pectinataria*	None
Lepidoptera	Geometridae	*Crocallis elinguaria*	None
Lepidoptera	Geometridae	*Ectropis bistortata*	None
Lepidoptera	Geometridae	*Epirrhoe alternata*	None
Lepidoptera	Geometridae	*Eulithis prunata*	None
Lepidoptera	Geometridae	*Eulithis pyraliata*	None
Lepidoptera	Geometridae	*Eupithecia haworthiata*	Local
Lepidoptera	Geometridae	*Hemithea aestivaria*	None
Lepidoptera	Geometridae	*Hydriomena furcata*	None
Lepidoptera	Geometridae	*Hypomecis punctinalis*	None
Lepidoptera	Geometridae	*Idaea aversata*	None
Lepidoptera	Geometridae	*Idaea biselata*	None
Lepidoptera	Geometridae	*Idaea dimidiata*	None
Lepidoptera	Geometridae	*Idaea fuscovenosa*	Local
Lepidoptera	Geometridae	*Idaea vulpinaria*	None
Lepidoptera	Geometridae	*Lomaspilis marginata*	None
Lepidoptera	Geometridae	*Opisthograptis luteolata*	None
Lepidoptera	Geometridae	*Ourapteryx sambucaria*	None
Lepidoptera	Geometridae	*Pasiphila rectangulata*	None
Lepidoptera	Geometridae	*Peribatodes rhomboidaria*	None
Lepidoptera	Geometridae	*Perizoma alchemillata*	None
Lepidoptera	Geometridae	*Petrophora chlorosata*	None
Lepidoptera	Geometridae	*Philereme vetulata*	Local
Lepidoptera	Geometridae	*Plagodis dolabraria*	Local
Lepidoptera	Geometridae	*Plemyria rubiginata*	None
Lepidoptera	Geometridae	*Scopula imitaria*	None
Lepidoptera	Geometridae	*Selenia dentaria*	None
Lepidoptera	Geometridae	*Thera britannica*	None
Lepidoptera	Geometridae	*Timandra comae*	SPO
Lepidoptera	Geometridae	*Xanthorhoe montanata*	None
Lepidoptera	Geometridae	*Xanthorhoe quadrifasiata*	Local

Order	Family	Taxon	Status
Lepidoptera	Geometridae	*Xanthorhoe spadicearia*	None
Lepidoptera	Gracillariidae	*Caloptilia semifascia*	None
Lepidoptera	Hepialidae	*Hepialus humuli*	SPI
Lepidoptera	Hepialidae	*Korscheltellus lupulina*	None
Lepidoptera	Hepialidae	*Triodia sylvina*	None
Lepidoptera	Hesperiidae	*Thymelicus lineola*	None
Lepidoptera	Lasiocampidae	*Euthrix potatoria*	None
Lepidoptera	Lasiocampidae	*Lasiocampa quercus*	Local
Lepidoptera	Lycaenidae	*Polyommatus icarus*	None
Lepidoptera	Momphidae	*Mompha epilobiella*	None
Lepidoptera	Momphidae	*Mompha ochraceella*	None
Lepidoptera	Noctuidae	*Abrostola tripartita*	None
Lepidoptera	Noctuidae	*Agrotis exclamationis*	None
Lepidoptera	Noctuidae	*Agrotis segetum*	None
Lepidoptera	Noctuidae	*Anarta trifolii*	None
Lepidoptera	Noctuidae	*Apamea lithoxylaea*	None
Lepidoptera	Noctuidae	*Apamea monoglypha*	None
Lepidoptera	Noctuidae	*Apterogenum ypsillon*	None
Lepidoptera	Noctuidae	*Autographa gamma*	None
Lepidoptera	Noctuidae	*Axylia putris*	None
Lepidoptera	Noctuidae	*Celaena leucostigma*	Local
Lepidoptera	Noctuidae	*Cerapteryx graminis*	None
Lepidoptera	Noctuidae	*Chortodes fluxa*	Local
Lepidoptera	Noctuidae	*Colocasia coryli*	None
Lepidoptera	Noctuidae	*Cosmia trapezina*	None
Lepidoptera	Noctuidae	*Craniophora ligustri*	Local
Lepidoptera	Noctuidae	*Diachrysia chrysitis*	None
Lepidoptera	Noctuidae	*Diarsia mendica*	None
Lepidoptera	Noctuidae	*Eremobia ochroleuca*	None
Lepidoptera	Noctuidae	*Euplexia lucipara*	None
Lepidoptera	Noctuidae	*Hoplodrina alsines*	None
Lepidoptera	Noctuidae	*Hoplodrina ambigua*	None
Lepidoptera	Noctuidae	*Hoplodrina blanda*	SPI

Order	Family	Taxon	Status
Lepidoptera	Noctuidae	*Ipimorpha subtusa*	Local
Lepidoptera	Noctuidae	*Lacanobia oleracea*	None
Lepidoptera	Noctuidae	*Luperina testacea*	None
Lepidoptera	Noctuidae	*Mesapamea secalis*	None
Lepidoptera	Noctuidae	*Mesoligia furuncula*	None
Lepidoptera	Noctuidae	*Mythimna conigera*	None
Lepidoptera	Noctuidae	*Mythimna ferrago*	None
Lepidoptera	Noctuidae	*Mythimna impura*	None
Lepidoptera	Noctuidae	*Mythimna pallens*	None
Lepidoptera	Noctuidae	*Noctua comes*	None
Lepidoptera	Noctuidae	*Noctua fimbriata*	None
Lepidoptera	Noctuidae	*Noctua orbona*	SPI
Lepidoptera	Noctuidae	*Noctua pronuba*	None
Lepidoptera	Noctuidae	*Ochropleura plecta*	None
Lepidoptera	Noctuidae	*Oligia fasciuncula*	None
Lepidoptera	Noctuidae	*Oligia strigilis agg.*	None
Lepidoptera	Noctuidae	*Parastichtis suspecta*	Local
Lepidoptera	Noctuidae	*Thalpophila matura*	None
Lepidoptera	Noctuidae	*Xestia c-nigrum*	None
Lepidoptera	Noctuidae	*Xestia triangulum*	None
Lepidoptera	Noctuidae	*Xestia xanthographa*	None
Lepidoptera	Nolidae	*Earias clorana*	Local
Lepidoptera	Notodontidae	*Pterostoma palpina*	None
Lepidoptera	Nymphalidae	*Aglais urticae*	None
Lepidoptera	Nymphalidae	*Aphantopus hyperantus*	None
Lepidoptera	Nymphalidae	*Coenonympha pamphilus*	None
Lepidoptera	Nymphalidae	*Inachis io*	None
Lepidoptera	Nymphalidae	*Maniola jurtina*	None
Lepidoptera	Nymphalidae	*Pararge aegeria*	None
Lepidoptera	Nymphalidae	*Polygonia c-album*	None
Lepidoptera	Nymphalidae	*Vanessa atalanta*	None
Lepidoptera	Nymphalidae	*Vanessa cardui*	None
Lepidoptera	Oecophoridae	*Crassa unitella*	None

Order	Family	Taxon	Status
Lepidoptera	Peleopodidae	*Carcina quercana*	None
Lepidoptera	Pieridae	*Anthocharis cardamines*	None
Lepidoptera	Pieridae	*Gonepteryx rhamni*	None
Lepidoptera	Pieridae	*Pieris brassicae*	None
Lepidoptera	Pieridae	*Pieris napi*	None
Lepidoptera	Pieridae	*Pieris rapae*	None
Lepidoptera	Plutellidae	*Plutella xylostella*	None
Lepidoptera	Pterophoridae	*Emmelina monodactyla*	None
Lepidoptera	Pterophoridae	*Platyptilia pallidactyla*	None
Lepidoptera	Pterophoridae	*Pterophorus pentadactyla*	None
Lepidoptera	Pterophoridae	*Scythropia crataegella*	None
Lepidoptera	Pyralidae	*Acrobasis repandana*	None
Lepidoptera	Pyralidae	*Acrobasis suavella*	None
Lepidoptera	Pyralidae	*Aphomia sociella*	None
Lepidoptera	Pyralidae	*Endotricha flammealis*	None
Lepidoptera	Pyralidae	*Galleria mellonella*	None
Lepidoptera	Pyralidae	*Homoeosoma sinuella*	None
Lepidoptera	Pyralidae	*Pempelia palumbella*	None
Lepidoptera	Pyralidae	*Phycita roborella*	None
Lepidoptera	Sphingidae	*Deilephila elpenor*	None
Lepidoptera	Sphingidae	*Laothoe populi*	None
Lepidoptera	Tineidae	*Tinea semifulvella*	None
Lepidoptera	Tortricidae	*Acleris forsskaleana*	None
Lepidoptera	Tortricidae	*Aethes rubigana*	None
Lepidoptera	Tortricidae	*Agapeta hamana*	None
Lepidoptera	Tortricidae	*Aleimma loeflingiana*	None
Lepidoptera	Tortricidae	*Ancylis achatana*	None
Lepidoptera	Tortricidae	*Aphelia paleana*	None
Lepidoptera	Tortricidae	*Apotomis betuletana*	None
Lepidoptera	Tortricidae	*Archips xylosteana*	None
Lepidoptera	Tortricidae	*Bactra furfurana*	None
Lepidoptera	Tortricidae	*Bactra lancealana*	None
Lepidoptera	Tortricidae	*Celypha lacunana*	None

Order	Family	Taxon	Status
Lepidoptera	Tortricidae	*Cochylimorpha straminea*	None
Lepidoptera	Tortricidae	*Cochylis hybridella*	None
Lepidoptera	Tortricidae	*Cydia splendana*	None
Lepidoptera	Tortricidae	*Cydia ulicetana*	None
Lepidoptera	Tortricidae	*Dichrorampha petiverella*	None
Lepidoptera	Tortricidae	*Dichrorampha vancouverana*	None
Lepidoptera	Tortricidae	*Ditula angustiorana*	None
Lepidoptera	Tortricidae	*Endothenia quadrimaculana*	None
Lepidoptera	Tortricidae	*Epagoge grotiana*	None
Lepidoptera	Tortricidae	*Epiblema foenella*	None
Lepidoptera	Tortricidae	*Epiblema scutulana*	None
Lepidoptera	Tortricidae	*Epiblema uddmanniana*	None
Lepidoptera	Tortricidae	*Eucosma cana*	None
Lepidoptera	Tortricidae	*Eucosma conterminana*	None
Lepidoptera	Tortricidae	*Eucosma hohenwartiana*	None
Lepidoptera	Tortricidae	*Eucosma obumbratana*	None
Lepidoptera	Tortricidae	*Grapholita compositella*	None
Lepidoptera	Tortricidae	*Gypsonoma dealbana*	None
Lepidoptera	Tortricidae	*Hedya nubiferana*	None
Lepidoptera	Tortricidae	*Hedya pruniana*	None
Lepidoptera	Tortricidae	*Notocelia roborana*	None
Lepidoptera	Tortricidae	*Notocelia trimaculana*	None
Lepidoptera	Tortricidae	*Pandemis cerasana*	None
Lepidoptera	Tortricidae	*Pandemis heparana*	None
Lepidoptera	Tortricidae	*Phalonidia manniana*	None
Lepidoptera	Tortricidae	*Ptycholoma lecheana*	None
Lepidoptera	Tortricidae	*Spilonota ocellana*	None
Lepidoptera	Tortricidae	*Tortrix viridana*	None
Lepidoptera	Yponomeutidae	*Yponomeuta evonymella*	None
Lepidoptera	Zygaenidae	*Zygaena filipendulae*	None
Lithobiomorpha	Lithobiidae	*Lithobius forficatus*	None
Mecoptera	Panorpidae	*Panorpa communis*	None
Mecoptera	Panorpidae	*Panorpa germanica*	None

Order	Family	Taxon	Status
Odonata	Coenagrionidae	*Enallagma cyathigerum*	None
Opiliones	Phalangiidae	*Platybunus triangularis*	None
Opiliones	Phalangiidae	*Dicranopalpus ramosus sensu lato*	None
Opiliones	Sclerasomatidae	*Leiobunum rotundum*	None
Orthoptera	Acrididae	*Chorthippus albomarginatus*	Local
Orthoptera	Acrididae	*Chorthippus brunneus*	None
Orthoptera	Acrididae	*Chorthippus parallelus*	None
Orthoptera	Acrididae	*Omocestus viridulus*	None
Orthoptera	Tetrigidae	*Tetrix subulata*	Local
Orthoptera	Tetrigidae	*Tetrix undulata*	None
Orthoptera	Tettigoniidae	*Conocephalus discolor*	Local
Orthoptera	Tettigoniidae	*Conocephalus dorsalis*	Local
Orthoptera	Tettigoniidae	*Leptophyes punctatissima*	None
Orthoptera	Tettigoniidae	*Meconema thalassinum*	None
Orthoptera	Tettigoniidae	*Metrioptera roeselii*	Local
Orthoptera	Tettigoniidae	*Pholidoptera griseoaptera*	None
Polydesmida	Polydesmidae	*Polydesmus angustus*	None
Polydesmida	Polydesmidae	*Polydesmus coriaceus*	None
Pulmonata	Helicidae	*Cepaea nemoralis*	None
Pulmonata	Helicidae	*Cernuella virgata*	DD
Pulmonata	Helicidae	*Trichia striolata*	None
Pulmonata	Limacidae	*Limax maximus*	None
Pulmonata	Vitrinidae	*Vitrina pellucida*	None
Pulmonata	Zonitidae	*Oxychilus helveticus*	None
Rhaphidioptera	Raphidiidae	*Phaeostigma notata*	None
Trichoptera	Limnephilidae	*Glyphotaelius pellucidus*	None

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