Kent Sussex Ecology

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North Kent Woods and Downs Candidate NNR: Diptera, Arachnida and Odonata Assessment

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Chris Bentley &

Luke Wallace ACIEEM

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1.0. INTRODUCTION

1.1. PROJECT OVERVIEW

1.1.1. The Kent Downs National Landscape Unit commissioned Kent Sussex Ecology to carry out an assessment of Diptera, Arachnida and Odonata datasets regarding the potential creation of a National Nature Reserve in north Kent. These groups are collectively referred to as the 'target group' throughout this report, with the collective boundaries of the various sites comprising the potential NNR referred to as the 'target area'.

1.1.2. The information within this report will be used in two ways; to inform a management framework that will guide future habitat works and to help build a case for the ecological significance of the area, ultimately entailing the declaration of an NNR.

1.1.3. Specifically, the brief for the assessment, and subsequent work, included:

- A desktop assessment of known species in the area to identify priority species (or problem species) for the candidate NNR;
- Identifying key areas for priority species within the NNR boundary;
- Recommendations for further survey work;
- Walkover surveys and habitat assessment of particular sites;
- Recommendations for site-specific enhancements and priority locations for further survey work, and;
- Recommendations for landscape-scale enhancements to benefit priority species.

1.1.4. The assessment was undertaken by Chris Bentley, who has a BSc (Hons) Zoology from the University of Leeds and an MSc in Invertebrate Ecology from the University of Durham, and has been involved with entomology for over 40 years. In this time, Chris has undertaken long-term invertebrate monitoring, written several local guides to insects (including for Odonata) and added at least 25 species to the Sussex county list, including three species new to Britain. Chris's primary interests include all three of the target groups, and he is currently the county recorder for Diptera in Sussex.

1.1.5. The final report was edited and produced by Luke Wallace; a qualified (BSc Ecology and Conservation) and CIEEM-accredited ecologist with over 15 years in the field of ecology and extensive experience in the production and review of ecology reports.

1.2. THE PROJECT AREA AND RECORD DATA

1.2.1. The geographical area for the potential NNR encompasses 19 different sites (see Fig. 1) and covers a total area of approximately 2242 hectares. The associated record dataset for this area was supplied by the Kent and Medway Biological Record Centre (KMBRC). The assessment of the record data was supported by site visits to 17 of these sites during the month of July 2024 (see table below). The site surveys, in combination with an analysis of the record data, informed the conclusion and recommendations within this report.

1.2.2. Site visit dates:

Site	Date
Shorne Woods Country Park	Continuous*
Cobham Hall School	N/A
Cobham Woods	02/07/2024
Court Woods	N/A
Cuxton & Cobham Woodland Project	02/07/2024
Ranscombe Farm	28/06/2024
Ashenbank Wood	15/06/2024
Jeskyns Community Woodland	15/06/2024
Shorne Common Rough	10/07/2024
Rochester & Cobham Park Golf Club	02/07/2024
Silverhand Estate	26/07/2024
West Park	15/07/2024
South Ashenbank Wood	15/07/2024
Great Crabbles Wood	10/07/2024
Crabbles Bottom	10/07/2024
Holborough Woodlands	05/08/2024
Shorne Pasture	10/07/2024
Scalers Hill Wood	15/07/2024
Camer Park	26/07/2024

*Visits made regularly throughout 2024 due to a separate ongoing project at this site.

1.2.3. Regarding the record data, there are effectively two systems of defining conservation status in use in the UK; Red Data Book (RDB) Conservation Status and IUCN-type Red Data Book Conservation Status Categories, both of which are detailed further on. In the UK, statuses are in the process of being upgraded from the former to the latter. In the following analysis, any conservation status that is written in brackets is now thought to be out of date.

1.2.4. Red Data Book (RDB) 'conservation status categories' are based on the number of 10km squares the species was recorded in, with a baseline from the 1970s. The categories are:

- RDB 1 – Occurs in 5 or less 10km squares.
- RDB 2 – Occurs in 6 – 10 10km squares.
- RDB 3 – Occurs in 11 – 15 10km squares.
- RDB K – Suspected, but not definitely known, to be in one of the above categories.
- Notable – Occurs in 1-100 10km squares. Often further subdivided into:
  - Nationally Scarce A – Occurs in 16 – 30 10km squares.
  - Nationally Scarce B – Occurs in 31 to 100 10km squares.

1.2.5. The more recent IUCN (International Union) for the Conservation of Nature-type Red Data Book conservation status categories is largely based on 'perceived threat', which includes rates of decline and current distribution. These categories are:

- Regionally Extinct (RE). See the group-appropriate Red List for criteria. In general, a sufficiently long time has elapsed since the last record of this species.
- Critically Endangered (CE). Species with a very severe decline in population trend or geographic range within the area considered.
- Endangered (EN). Species with a severe decline in population trend or geographic range within the area considered.
- Vulnerable (VU). Species with a marked decline in trend or geographic range within the area considered.
- Lower Risk (LR). Unlikely to become endangered or extinct in the near future.
- Near Threatened (NT). Species which are suspected to qualify for Vulnerable, but where the data does not quite support such a category.
- Least Concern (LC). Species which show no marked negative population trend or geographic range.

1.2.6. In addition, GB rarity status is based on the number of 10km squares in which a species has been recorded, with those occurring in 1 to 15 10km squares graded as Nationally Rare and those occurring in 16 to 100 graded as Nationally Scarce.

1.2.7. In England, many of the rarest and most threatened species are listed under Section 41 (S41) of the 2006 Natural Environment and Rural Communities (NERC) Act. This includes 1150 species identified as requiring action under the UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. The list of UK BAP priority species was originally created between 1995 and 1999, and subsequently updated in response to the Report on the Species and Habitat Review in 2007. These plans generally included actions covering surveying, monitoring, research, site management and protection.

1.3. LIMITATIONS AND CONSTRAINTS

1.3.1. There were several limitations in undertaking this assessment, which included:

- A lack of Odonata records, with only 48 records available for the sites overall and no notable species;
- Some notable records only had a four figure-grid reference attached to them, meaning they could not be easily attributed to a particular site;
- Statistical analysis was not used in the assessment of the record data to determine significance;
- Two sites, Cobham Hall School and Court Wood, were not visited in preparation for this assessment. Additionally, due to practical reasons, every habitat within each site could not be visited.
- Methodologies and approaches for past surveys were unknown at the time of writing;
- Management plans for the various sites across the target area were not reviewed for this report, and;
- The designation status of various groups and individual species may not currently reflect the actual status (as detailed in the section above).

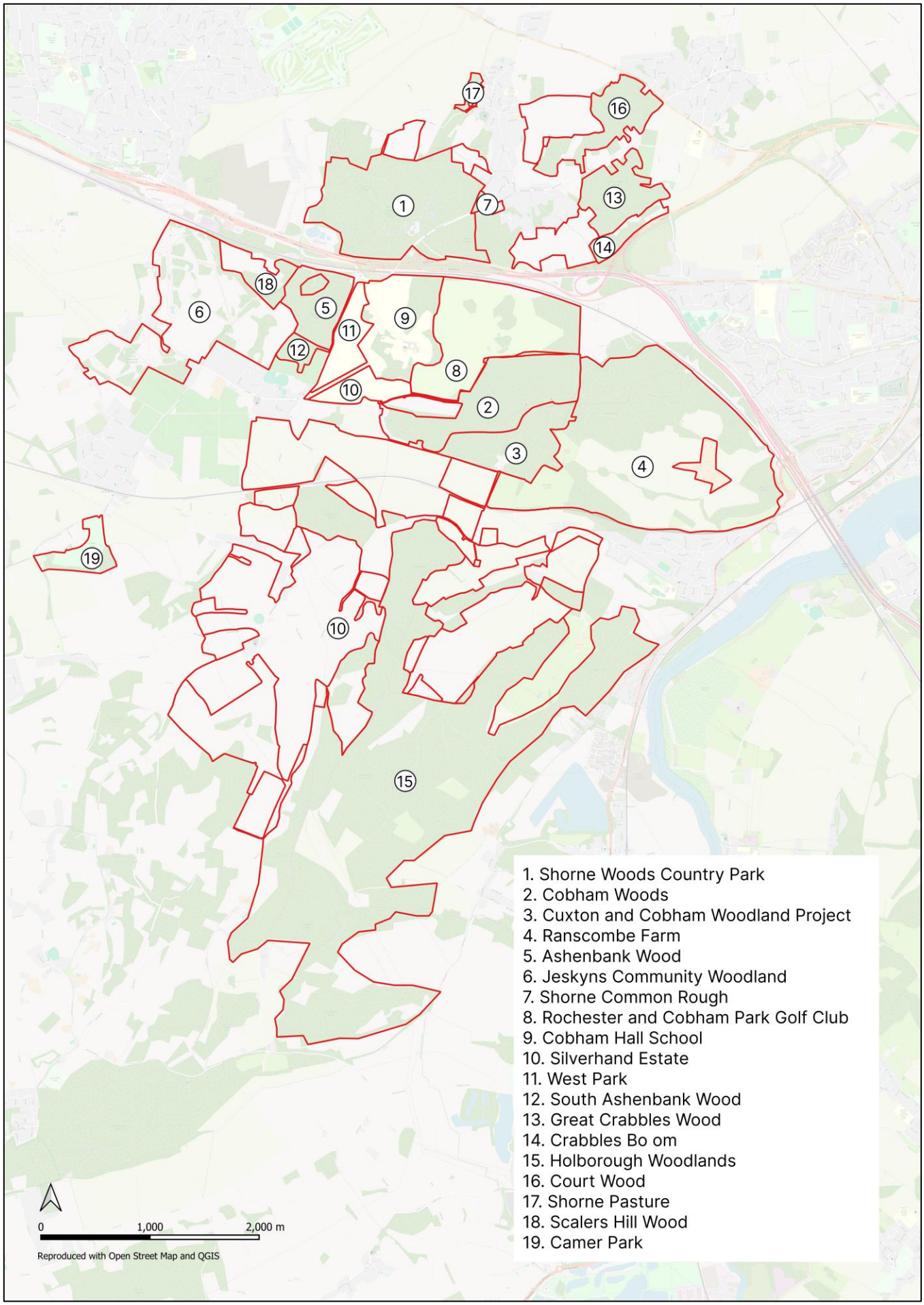


Figure 1. The NNR site boundaries.

2.0. PRIORITY SPECIES

2.1. SPECIES LIST

2.1.1. The table below contains the notable Diptera and Araneae, extracted from the KMBRC dataset, listed below in order of designation status (starting with the highest priority):

Order	Species	Designation	Ecology
spider (Araneae)	*Gonatium paradoxum*	Nationally Rare; Endangered	Mainly on dry heathland and chalk grassland, also amongst heather in rides in ancient woodland. A very rare species in the UK with modern records only from Kent, Sussex and Surrey (Harvey *et. al.* 2017).
spider (Araneae)	*Phaeocedus braccatus*	Nationally Rare; Vulnerable	Found mainly on open calcareous grassland, though it can also occur on heathland and coastal vegetated shingle. Largely confined to southern and south-eastern England and East Anglia in the UK (Harvey *et. al.* 2017).
spider (Araneae)	*Trichoncus saxicola*	Nationally Rare; Vulnerable	Occurs mainly on fairly tall calcareous grassland, though also on heathland and shingle. Most records are from central southern England extending to both the south east and south west and with an isolated record in south-west Wales and an old (pre-1980) record from south-west Scotland (Harvey *et. al.* 2017).
insect - true fly (Diptera)	*Leptarthrus vitripennis*	Nationally Rare	Adults are predatory, while the larvae are unknown but are assumed to develop as soil predators. In south-east England this species is largely confined to chalk grassland, though it occurs in a range of non-calcareous habitats elsewhere in Britain, including woodland (Stubbs & Drake, 2001). Widely distributed in Britain, with records extending to northern Scotland (NBN Trust, 2024).
spider (Araneae)	*Zelotes petrensis*	Nationally Rare	Found in a wide range of dry, open habitats, including chalk grassland, heathland and shingle. Most modern records are from adjacent areas of Surrey and Hampshire, though it also occurs in East Anglia and has been recorded as far north as Staffordshire. (Harvey *et. al.* 2017).

insect - true fly (Diptera)	*Cistogaster globosa*	(RDB1)	This species is a parasitoid of pentatomid bugs, with the main host in the UK probably *Aelia acuminata* (Belshaw, 1993). Once considered a rarity, it is now widespread in southern England, with records reaching as far as North Yorkshire in the east and north Wales in the west (NBN Trust, 2024).
Insect - true fly (Diptera)	*Chetostoma curvinerve*	(RDB2)	The larval host of this species is unknown, but it is almost certainly frugivorous (White, 1988). Scattered records in England north to Lancashire and also recorded from south Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Erioptera bivittata*	(RDB2)	Associated with brackish habitats with exposed organic mud and stunted vegetation, though it is also tolerant of lower salinity. Adults can be found up to 2.4km inland (Stubbs, 2021). Coastal in south-east and southern England and East Anglia, with a concentration of records around the mouth of the Thames (NBN Trust, 2024).
insect - true fly (Diptera)	*Hemyda vittata*	(RDB2)	Usually found in broadleaved woodland, this species has been bred from the Bronze Shieldbug (*Troilus luridus*) in the UK and likely also attacks other species of pentatomid bug (Belshaw, 1993). Mainly southern and south eastern England and East Anglia, with records extending north to Yorkshire (NBN Trust, 2024).
insect - true fly (Diptera)	*Freraea gagatea*	(RDB3)	Associated with dry grassland and heathland, this species has been reared from the ground beetle *Harpalus tardus* in the UK and probably also attacks related species (Belshaw, 1993). Scattered records in southern and south-eastern England and East Anglia, with an isolated record in north Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Gymnosoma rotundatum*	(RDB3)	The adult is found on downland or heathland with scattered scrubs, while the larva is an internal parasitoid of various pentatomid bugs (Belshaw, 1993). Seemingly widespread in south-east England but very rare elsewhere, with a handful of records in East Anglia and one in north Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Myopites inulaedyssentericae*	(RDB3)	In the UK this species is associated with a small number of composites, mainly Common Fleabane (*Pulicaria dysenterica*) where the larvae develop in the flower heads (White, 1988). Mainly southern and south- eastern England and East Anglia, with records extending to south Wales and Yorkshire (NBN Trust, 2024) (NBN Trust, 2024).

insect - true fly (Diptera)	*Rhipidia uniseriata*	(RDB3)	Associated with decaying timber, mainly large rot holes in living trees but also large rotting logs (Stubbs, 2021). Widespread in southern and central England, with records extending north to Yorkshire and also occurring in south Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Chrysopilus laetus*	Nationally Scarce; Near Threatened	Associated with old woodland where the larvae breed in rot holes in deciduous trees (Stubbs & Drake, 2001). Once confined to Windsor Forest in Berkshire/Surrey, his species is now far more widespread in southern England, with records extending to Cornwall and north to Lancashire (NBN Trust, 2024).
insect - true fly (Diptera)	*Scenopinus niger*	Nationally Scarce; Near Threatened	This species is associated with ancient woodland, parkland and wood pasture where the larvae (which are assumed to be predatory) live in the rotten heart wood of deciduous trees (Stubbs & Drake, 2001). Scattered records in southern and central England and Wales, with outliers in northern Scotland and Northern Ireland (NBN Trust, 2024).
spider (Araneae)	*Ozyptila claveata*	Nationally Scarce; S41 Priority Species	Found mainly on short calcareous grassland (and occasionally sand dunes). This species is largely confined to southern and south-eastern England in the UK, though it does extend into the south-west and there is an isolated record for the Isle of Man (Harvey *et. al.* 2017).
insect - true fly (Diptera)	*Empis woodi*	Nationally Scarce (Lower Risk)	Found in a range of habitats including on open chalk grassland, old broadleaved woodland, parkland and a suburban garden The larval biology is unknown though closely related species are predatory in damp soil, dead wood or fungi. A localised but widespread species in the UK (NBN Trust, 2024).
insect - true fly (Diptera)	*Agathomyia boreella*	Nationally Scarce (Lower Risk)	In Finland larvae have been reared from the bracket fungi *Antrodiella pallescens* and *A. faginea*. Widespread in England and Wales but usually found in low numbers and easily overlooked (Chandler, 2017).
insect - true fly (Diptera)	*Brachypeza armata*	Nationally Scarce (Lower Risk)	Found in wooded habitats around dead wood bearing Oyster Mushrooms (*Pleurotus* sp.). In the UK larvae have been reared from *Pleurotus ostreatus*. This species is widely distributed in Wales and England north to Yorkshire and Cumbria. (Chandler, 2022)
insect - true fly (Diptera)	*Exechiopsis membranacea*	Nationally Scarce (Lower Risk)	A species of woodland, carr and wetlands where the larvae probably develop in soft fungi (Falk & Chandler, 2005) This species is widespread in England north to Yorkshire, with a few records in the Scottish Highlands (Chandler, 2022)

insect - true fly (Diptera)	*Mycetophila caudata*	Nationally Scarce (Lower Risk)	Found in woodland, broadleaved, coniferous and mixed, the larvae probably developing in lignicolous fungi. Originally thought to be restricted to Scotland in the UK, this species has now been found at several sites in south-east England (Falk & Chandler, 2005).
insect - true fly (Diptera)	*Mycetophila lastovkai*	Nationally Scarce (Lower Risk)	Adults are associated with broad-leaved woodland, the larvae probably developing in lignicolous fungi (Falk & Chandler, 2005). This species is widespread in south-west England and Wales, with records from Middlesex and Kent further East and a single record from Scotland (Chandler, 2022).
insect - true fly (Diptera)	*Mycetophila lubomirskii*	Nationally Scarce (Lower Risk)	Adults are associated with broad-leaved woodland, the larvae probably developing in lignicolous fungi (Falk & Chandler, 2005). There are scattered records of this species in England and several sites in Scotland (Chandler, 2022).
insect - true fly (Diptera)	*Mycomya parva*	Nationally Scarce (Lower Risk)	Found mainly in dry broadleaved woodland and older hedges where the larvae are associated with fungi on dead wood. There are scattered records from mainland Britain (Falk & Chandler, 2005).
insect - true fly (Diptera)	*Oedalea apicalis*	Nationally Scarce (Lower Risk)	Most records are from old woodlands where the larvae are probably predatory in rotten wood. In the UK, there are scattered records for this species in southern and central England. (Falk & Crossley, 2005).
insect - true fly (Diptera)	*Platypalpus divisus*	Nationally Scarce (Lower Risk)	Mainly associated with woodland, though also recorded from bog and coastal sites. Adults are predatory, while immature stages are unknown but are probably also predatory. Scarce but widely distributed in England as far north as Lancashire, with records also from north and central Wales (Falk & Crossley, 2005).
insect - true fly (Diptera)	*Sceptonia flavipuncta*	Nationally Scarce (Lower Risk)	Associated with woodland, the precise biology of this species is poorly known. This species is local in southern England, with records extending to Wales and Scotland (Falk & Chandler, 2005, Chandler, 2020).
insect - true fly (Diptera)	*Sciophila interrupta*	Nationally Scarce (Lower Risk)	Associated with damp, broad-leaved woodland. The precise larval biology is unknown though closely related species form mucilaginous tubes on the surface of fungi where they are considered to feed on spores. Scattered records in England north to Lancashire and two in south Wales (Falk & Chandler, 2005).

insect - true fly (Diptera)	*Tachypeza fuscipennis*	Nationally Scarce (Lower Risk)	Mainly found in old broadleaved woodland or fen where there has been a continuity of dead wood. Both adults and larvae are predatory, the latter developing in rotten wood or in debris in hollowed out trees. Scattered records in England as far north as Lancashire, with a cluster of records in northern Scotland (Falk & Crossley, 2005).
insect - true fly (Diptera)	*Trichonta fragilis*	Nationally Scarce (Lower Risk)	Associated with damp broadleaved wood. The precise biology is unknown but larvae of related species develop in fungi encrusting dead wood. There are scattered records in England, several in Scotland and one in Wales. (Falk & Chandler, 2005).
insect - true fly (Diptera)	*Australachalcus melanotrichus*	Nationally Scarce	Associated with rot holes in deciduous trees where the larvae develop (Alexander, 2019). Scattered records in southern, eastern and central England and Wales and also recorded in Northern Ireland (NBN Trust, 2024).
insect - true fly (Diptera)	*Cheilosia barbata*	Nationally Scarce	Associated with calcareous woodland, scrub and grassland, though also found in woodlands on clay. The larval food-plant is unknown though may be Wild Parsnip (*Pastinaca sativa*). Mainly recorded from southern England, though with records extending to the south-west and northern England. (Hoverfly Recording Scheme, 2024)
Spider (Araneae)	*Marpissa muscosa*	Nationally Scarce	This species is usually found on standing wood, whether it be under the bark of trees or in cracks on fence posts. Widespread in south-eastern England with scattered records to the north and west and with an isolated record in mid-Scotland (Harvey *et. al.* 2017).
Insect – true fly (Diptera)	*Myolepta dubia*	Nationally Scarce	Larvae develop in rot holes in trees, so this species is often found in old woodland. However, it has also been found in fenland and on chalk pits. Widespread in southern and central England (Hoverfly Recording Scheme, 2024)
insect - true fly (Diptera)	*Chrysotus cupreus*	Nationally Scarce	Associated with wetland habitats. Scattered records throughout England and Wales north to Cumbria (NBN Trust, 2024).
insect - true fly (Diptera)	*Eupachygaster tarsalis*	Nationally Scarce	Associated with decaying timber of various species, usually deciduous, mainly Beech (*Fagus sylvaticus*) but also Scots Pine (*Pinus sylvestris*), where the larvae develop in rot holes or other decaying wood (Stubbs & Drake, 2001). Largely confined to southern England and East Anglia though with records extending into Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Hercostomus nigrilamellatus*	Nationally Scarce	Associated with the decaying wood, though there appears to be little information on the precise ecology of this species. Scattered records in England and Wales north to Lancashire and an isolated records in northern Scotland (NBN Trust, 2024).

insect - true fly (Diptera)	*Odontomyia ornata*	Nationally Scarce	In the UK, this species is virtually confined to freshwater grazing marshes where the larvae can be found in wide (greater than 1m) ditches with a structurally diverse cover of floating vegetation that are cleared out on a cycle of about five years (Stubbs & Drake, 2001). Scattered records in southern Britain, with a concentration around the Gwent and Somerset Levels, coastal East Anglia and East Sussex/West Kent.
insect - true fly (Diptera)	*Symphoromyia immaculata*	Nationally Scarce	Mainly found on warm, dry, calcareous grassland with some scrub (Stubbs & Drake, 2001). There is evidence to suggest that it is associated with older, well-established grassland. Found in southern and eastern England, with records extending north to Yorkshire and along the south coast of Wales (NBN Trust, 2024).
spider (Araneae)	*Agyneta simplicitarsis*	Nationally Scarce	Found largely on calcareous grassland or grazing marsh in the UK, where it is confined to southern England (Harvey *et. al.* 2017).
spider (Araneae)	*Araeoncus crassiceps*	Nationally Scarce	Occurs in a wide range of often damp habitats, including litter, heathland and tidal debris. Mainly northern and western in Britain, with very few modern records for South-East England (Harvey *et. al.* 2017).
spider (Araneae)	*Atypus affinis*	Nationally Scarce	Associated with unimproved open habitats such as heathland or chalk grassland. Widely distributed in Britain, but commonest in southern England (Harvey *et. al.* 2017).
spider (Araneae)	*Cheiracanthium virescens*	Nationally Scarce	Associated with sparsely vegetated areas in heathland, grassland waste ground or dunes. A scattered distribution in Britain but widespread only in South East England (Harvey *et. al.* 2017).
spider (Araneae)	*Cicurina cicur*	Nationally Scarce	This species occurs in a range of habitats, often associated with dark, damp situations such as woodland litter or caves, but also with more open habitats, occasionally on chalk. Widespread in parts of Eastern and Southern England, with single records in Scotland and Wales (Harvey *et. al.* 2017).
spider (Araneae)	*Coelotes terrestris*	Nationally Scarce	Found in woodland under fallen wood or in litter, sometimes in banks. The vast majority of records are from South East England where it is not uncommon, with scattered records away from this area (Harvey *et. al.* 2017).
spider (Araneae)	*Hypsosinga albovittata*	Nationally Scarce	Widely distributed in Britain, with records extending to northern Scotland, though scattered outside of southern, south-east East England and East Anglia. Associated with open habitats, particularly on chalk (Harvey *et. al.* 2017).

spider (Araneae)	*Hypsosinga sanguinea*	Nationally Scarce	Normally associated with damp heathland, though it has also been recorded from tall calcareous grassland. Largely confined to southern England in the UK (Harvey *et. al.* 2017).
spider (Araneae)	*Hyptiotes paradoxus*	Nationally Scarce	Mainly associated with evergreen trees and shrubs, particularly Yew (*Taxus baccata*). There are scattered records in Britain, mostly from southern England but also extending to Wales and north-west England (Harvey *et. al.* 2017).
spider (Araneae)	*Myrmarachne formicaria*	Nationally Scarce	A species of grassland habitats, largely chalk but also saltmarsh, dunes, coastal shingle and fens. In the UK this species is confined to South East England (Harvey *et. al.* 2017).
spider (Araneae)	*Panamomops sulcifrons*	Nationally Scarce	Occurs in a range of habitats including chalk grassland, flood and hay meadows and flood and tidal debris. Widespread in central and southern England but absent in the south-west and very scattered in the north and parts of the east and south (Harvey *et. al.* 2017).
spider (Araneae)	*Parapelecopsis nemoralioides*	Nationally Scarce	Mainly associated with sandy habitats, particularly on the coast, but also on chalk grassland in West Kent (Silverhand Estate) and shingle. Almost entirely coastal in Britain, mainly England and Wales but with records extending up to northern Scotland (Harvey *et. al.* 2017).
spider (Araneae)	*Philodromus longipalpis*	Nationally Scarce	Largely associated with woodland, particularly old oak (*Quercus* sp.) in open situations, but also found on heathers. Occurs at widely scattered sites in southern England (Harvey *et. al.* 2017).
spider (Araneae)	*Phrurolithus minimus*	Nationally Scarce	Occurs mainly on open, stony chalk grassland, though it has also been found in open woodland. Largely confined to South East England, particularly the North Downs (Harvey *et. al.* 2017).
spider (Araneae)	*Sibianor aurocinctus*	Nationally Scarce	Found on dry, sparsely vegetated ground in a range of habitats with short vegetation. In the UK, this species is largely confined to South East England (Harvey *et. al.* 2017).
spider (Araneae)	*Walckenaeria furcillata*	Nationally Scarce	Found in a range of habitats including deciduous woodland, calcareous grassland, heathland and fens. In the UK it is widespread in England and Wales, though it is more widespread in South East England (Harvey *et. al.* 2017).
spider (Araneae)	*Walckenaeria monoceros*	Nationally Scarce	Under stones and detritus on open habitats such as sand-hills, coastal shingle and heathland. Widespread in the UK, though with a patchy distribution (Harvey *et. al.* 2017).

spider (Araneae)	*Xysticus bifasciatus*	Nationally Scarce	Found under stones or in low vegetation on chalk grassland or occasionally heaths. Widespread in southern central England with scattered records elsewhere (Harvey *et. al.* 2017).
spider (Araneae)	*Trematocephalus cristatus*	Nationally Scarce	Occurs on the foliage of various trees in a variety of situations, including woodland, heathland, parkland and gardens. Historically confined to Surrey, Sussex and West Kent, though its range appears to have expanded in recent years (Harvey *et. al.* 2017).
insect - true fly (Diptera)	*Orthoceratium sabulosum*	Nationally Scarce	Mainly associated with coastal habitats with a strong preference for brackish and salt marshes (Pollet & Starc, 2018) though it does occasionally turn up in woodlands. Largely coastal in southern and eastern England, north and south Wales and northern England (NBN Trust, 2024).
spider (Araneae)	*Araniella inconspicua*	Nationally Scarce	A woodland species, found particularly on oaks and evergreens. In the UK found mainly in southern England (Harvey *et. al.* 2017).
spider (Araneae)	*Ballus chalybeius*	Nationally Scarce	Associated with woodland and scrub. Not uncommon in south-east England but scattered elsewhere, with records extending to Lincolnshire and North Wales (Harvey *et. al.* 2017).
spider (Araneae)	*Haplodrassus silvestris*	Nationally Scarce	In woodland in litter or under stones. Widely distributed in the UK but more frequent in south-east England (Harvey *et. al.* 2017).
insect - true fly (Diptera)	*Madiza britannica*	pNationally Scarce; pVulnerable	Found in old broad-leaved woodland and other habitats with a long continuity of dead wood and old/ diseased trees. The larvae appear to develop in rotten wood detritus and have been reared from Elm (*Ulmus* sp.) and Poplar (*Populus* sp.). Scattered records in England north to Cheshire and Derbyshire (Falk *et. al.* 2016).
insect - true fly (Diptera)	*Dorycera graminum*	pNationally Scarce; pNear Threatened; S41 Priority Species	Associated with herb-rich unimproved meadows, often in association with old broad-leaved woodland where the larvae may develop in decaying vegetable matter. In the UK records there are scattered record in England south of a line from the Wash to the Severn (Falk *et. al.* 2016).

insect - true fly (Diptera)	*Blaesoxipha plumicornis*	pNationally Scarce; pNear Threatened	Found in a range of habitats where the larval host (various species of grasshopper) occur. This is a local species in south-eastern England, with records largely restricted to the south of a line between the Wash and the mouth of the River Severn (Falk, 2024a).
insect - true fly (Diptera)	*Lispocephala brachialis*	pNationally Scarce; pNear Threatened	Recorded from broadleaved woodland, the biology of this species is unknown, but the larvae probably live in running water among bryophytes (Falk *et.al.* in prep, as cited in Ball, 2010). Scattered records in southern and central England and Wales, extending north to Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Clusia tigrina*	pNationally Scarce	Associated with old trees in parklands/hedgerows, this species one of the few scarce dead-wood Diptera known to prefer parkland or otherwise isolated large trees. The larvae develop in in soft, decayed sapwood of broadleaved trees. Scattered records largely in southern and central England, but extending up to North Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Dasiops trichosternalis*	pNationally Scarce	Found in ancient broadleaved woodland where the larvae are probably predatory under the bark of rotting wood. (Falk *et. al.* 2016). There are scattered records for this species throughout England, Wales and Scotland (MacGowan & Rotheray, 2008)
insect - true fly (Diptera)	*Eustalomyia hilaris*	pNationally Scarce	A nest parasite of various solitary wasps that nest in decaying trees and shrubs. In the UK this species is confined to southern England with the vast majority of records from the south-east (NBN Trust, 2024).
insect - true fly (Diptera)	*Fannia clara*	pNationally Scarce	Little information on the habitat preferences of the adult though larvae are associated with birds' nests including Little Owl (*Athene noctua*) and Grey Heron (*Ardea cinerea*) in the UK (Fonseca, 1968). Largely restricted to southern and south-east England, East Anglia and south Wales, but also with a record in northern Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Fannia speciosa*	pNationally Scarce	Little information on the habitat preferences of the adult, though Fonseca (1968) mentions a pupa in soil from Wytham Wood. The larvae, in common with the genus as a whole, probably feed on decaying organic material (Rozkošny *et. al.* 1997). Scattered records in southern, south-east and central England, East Anglia and south Wales extending to Cumbria in the north (NBN Trust, 2024).
insect - true fly (Diptera)	*Fannia subpubescens*	pNationally Scarce	Little information on the habitat preferences of the adult, though the larvae, in common with the genus as a whole, probably feed on decaying organic material (Rozkošny *et. al.*

			1997). Mostly restricted to south-east England, East Anglia and south Wales, with an outlier in northern Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Lasiambia brevibucca*	pNationally Scarce	Develops in rot-holes in living veteran trees; has also been reared from sappy horse chestnut bark at Moccas Park (Alexander 2019). Scattered records in southern and central England and South Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Megamerina dolium*	pNationally Scarce	Usually associated with old broad-leaved woodland with plenty of lying dead wood, where the larvae are predaceous under the bark. Widespread in England and Wales, though becoming scattered in the north (NBN Trust, 2024).
insect - true fly (Diptera)	*Mydaea maculiventris*	pNationally Scarce	Associated with old broadleaved woodland, the larvae have been reared from Bracket Fungus (*Polyporus squamosus*) where they are predators on other invertebrates (Falk *et.al.* in prep, as cited in Ball, 2010). Few modern records from southern and central England and Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Oecothea praecox*	pNationally Scarce	Found in a range of habitats, though with a major requirement for the presence of burrows/sets/earths of various mammals such as Rabbit (*Oryctolagus cuniculus*), Badger (*Meles meles*) and Fox (*Vulpes vulpes*) in which the larvae develop. Scattered records in England and Wales, but also recorded in the Outer Hebrides (Falk *et. al.* 2016, NBN. 2024).
insect - true fly (Diptera)	*Oscinimorpha arcuata*	pNationally Scarce	Associated with grasslands with tall swards, the larvae boring into the culms of grasses (Ellis, 2024). Largely confined to south-eastern and eastern England, extending to northern England and South Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Phaonia falleni*	pNationally Scarce	Found in rich fens and marshy and wet broadleaved woodland, particularly where Alder (*Alnus* sp.) is abundant, though the precise biology is unknown (Falk *et.al.* in prep, as cited in Ball, 2010). Scattered records in England extending north to Cumbria, widespread in Wales and with a cluster of records in northern Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Phaonia laeta*	pNationally Scarce	The predaceous larvae have been found in rot holes in Birch (*Betula* sp.) and Sweet Chestnut (*Aesculus hippocastanum*), and a sap run on a *Ribes* sp. (Falk *et.al.* in prep, as cited in Ball, 2010). Very local in England, with scattered records extending to Yorkshire and also recorded in north Wales.

insect - true fly (Diptera)	*Sarcophaga subulata*	pNationally Scarce	Appears to favour lushly vegetated and humid habitats such as woods and marshes. In the UK the larva has been reared from a Gypsy Moth pupa (*Lymantria dispar*). Widespread but localised in southern England and south Wales with records north to Derbyshire and Cheshire (Falk, 2024b).
insect - true fly (Diptera)	*Ctenophora pectinicornis*	(Notable)	This species is associated with ancient woodland and parkland where the larvae develop in large pieces of rotting timber, particularly heart wood in the shattered end of broken trunks but also fallen boughs and rotten sap wood (Stubbs, 2021). Widespread in southern and central England and Wales, with records extending into Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Gnophomyia viridipennis*	(Notable)	Closely associated with Poplar (*Populus* sp.) in various habitats both natural and synanthropic, the larvae developing under the bark of fallen trunks (Stubbs, 2021). Widespread in England north to Yorkshire with a few records in south Wales and an isolated record in northern Scotland (NBN Trust, 2024).
insect - true fly (Diptera)	*Goniglossum wiedemanni*	(Notable)	Larvae of this species develop in the fruit of White Bryony (*Bryonia dioica*) (White, 1988). An uncommon species with scattered records in southern and central England and south Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Merzomyia westermanni*	(Notable)	Larvae of this species develop in the flower heads of Hoary Ragwort (*Jacobaea erucifolia*) and occasionally Common Ragwort (*J. vulgaris*) (White, 1988). Scattered records in southern England and East Anglia extending north to Yorkshire and west to south Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Norellia spinipes*	(Notable)	Probably a relatively recent colonist to the UK, this species is found mainly in deciduous woodlands or gardens where it is associated daffodils (*Narcissus* sp.), the larvae mining the leaves of the host plant (Ball, 2014). Scattered records in southern and central England north to Yorkshire (NBN Trust, 2024).
insect - true fly (Diptera)	*Pherbellia annulipes*	(Notable)	Associated with old shaded woodlands on calcareous soils, particularly Beech (*Fagus sylvaticus*) or Alder (*Alnus* sp.) where the larvae develop as parasitoids in various snails, including *Discus rotundatus*. Restricted to southern England and Wales in the UK (NBN Trust, 2024).
insect - true fly (Diptera)	*Sarcophaga arcipes*	(Notable)	Associated with chalk and limestone habitats where the larvae are parasites of terrestrial helicid snails (Falk, 2024c). In England there are scattered records in the south, with an

			outlier in the south-west and a smattering of records up to south Durham, while there is a single record in south Wales (NBN Trust, 2024).
insect - true fly (Diptera)	*Tetanocera phyllophora*	(Notable)	This species is generally found at the margins of wet woodland, often where there is a calcareous influence. In common with related species, the larvae are predators of various, mainly terrestrial molluscs. Widespread but local in England and Wales and also in Scotland north of Edinburgh (Ball, 2017).
insect - true fly (Diptera)	*Tipula helvola*	(Notable)	Associated with woods on dry soils (Stubbs, 2021). Widespread in southern England and relatively common in many areas, with records extending to Wales and North-west England (NBN Trust, 2024).
insect - true fly (Diptera)	*Tipula livida*	(Notable)	The full ecology of this species is unknown, though larvae have been found in sandy soil under leaf litter in woods (Stubbs, 2021). Widespread in southern England and East Anglia, but infrequent, with records extending north to north-west England (NBN Trust, 2024).
insect - true fly (Diptera)	*Geomyza breviseta*	pData Deficient	Largely restricted to calcareous grassland where the larvae probably develop in grasses (the species has been recorded from *Poa trivialis* and *Dactylis glomerata* in the UK). There are scattered records in England north to Yorkshire and several coastal sites in north and west Wales (Falk *et. al.* 2016)
insect - true fly (Diptera)	*Asilus crabroniformis*	S41 Priority Species	Associated with various grazed habitats, the larvae are probably predaceous feeding on invertebrate larvae in dung, usually cow, but also horse and rabbits, while the adults feed on a wide range of invertebrates. Largely confined to southern England and West Wales in the UK, though with scattered records extending up to North Yorkshire (NBN Trust, 2024).
insect - true fly (Diptera)	*Lipsothrix nervosa*	S41 Priority Species	This species occurs in fen carr and calcareous or rich seepages (Stubbs, 2021) and while once considered a rarity it has been found to be widespread in southern England and south Wales (NBN Trust, 2024).

2.2. RECORD DATA SUMMARY

2.2.1. There were 265 records of notable species, i.e., species with a conservation designation, regarding the target groups. This comprised approximately 6% of the total records available (4405). The conservation designations ranged from nationally rare (the highest possible designation) to Section 41 'priority species' (the lowest).

2.2.2. Nine sites have no notable records for any group and, as mentioned in the introduction, there are no records of notable Odonata for any site, with only 48 of the records (comprising 15 species) of this group within the entire KMBRC dataset available for the target area.

2.2.3. The table below summarises the number of notable records for the target groups at each site, with a visual representation of this data below (Fig. 2) and in Section 2.1.3 (Fig. 3, page 19).

Site	Size (ha)	Araneae	Diptera	Odonata	Total
Shorne Woods Country Park	123.90	3	18	-	21
Cobham Woods	77.14	-	12	-	12
Cuxton & Cobham Woodland Project	46.20	-	15	-	15
Ranscombe Farm	264.88	-	12	-	12
Ashenbank Wood	29.05	3	26	-	29
Jeskyns Community Woodland	140.60	-	2	-	2
Shorne Common Rough	1.95	-	-	-	-
Rochester & Cobham Park Golf Club	100.64	-	1	-	1
Cobham Hall School	61.70	-	-	-	-
Silverhand Estate	662.75	19	5	-	24
West Park	21.46	-	-	-	-
South Ashenbank Wood	7.58	-	-	-	-
Great Crabbles Wood	33.72	1	1	-	2
Crabbles Bottom	11.64	-	-	-	-
Holborough Woodlands	581.70	13	2	-	15
Court Wood	38.08	-	-	-	-
Shorne Pasture	2.54	-	-	-	-
Scalers Hill Wood	18.74	-	-	-	-
Camer Park	18.10	-	-	-	-

2.2.4. The distribution of the record data is likely dictated by survey effort bias, and is not necessarily the complete range of these notable species, or indeed a full representation of the invertebrate diversity, across the target area. This assumption is reinforced by no apparent discernible difference between the distribution of Diptera and Araneae records, with the vast majority of notable record of both having the same localities (see Fig. 2); however, a statistical test was not undertaken to confirm or refute this assumption. Additionally, no analysis was carried out regarding record data proportionate to size of the various sites, which also may influence how the data is interpreted.

2.2.5. A final note when observing the spatial distribution on the maps below is that a range of grid references were used, ranging from four-figure references to eight-figure references, with some reference points encompasses numerous data records.

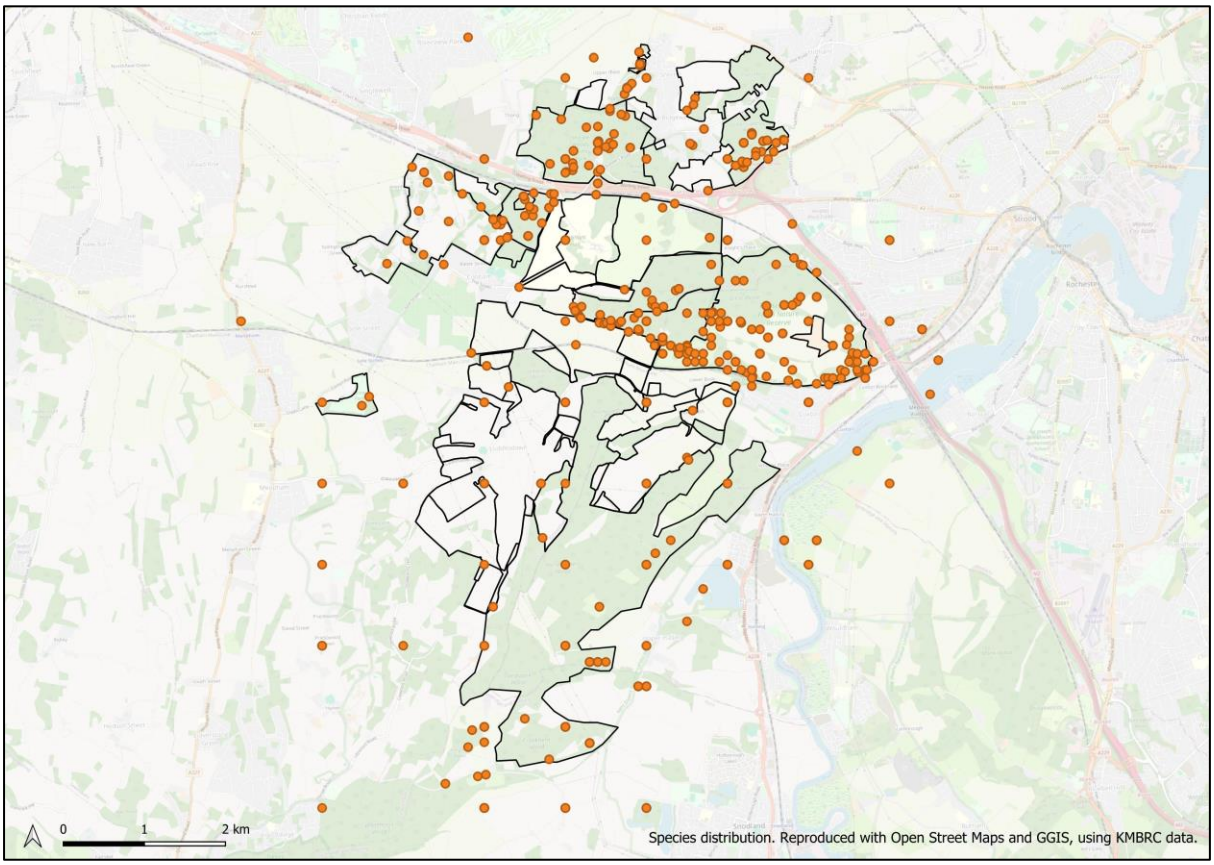


Figure 2. The distribution of all KMBRC Diptera and Araneae records within the target area.

2.3. HEATMAP DISTRIBUTION

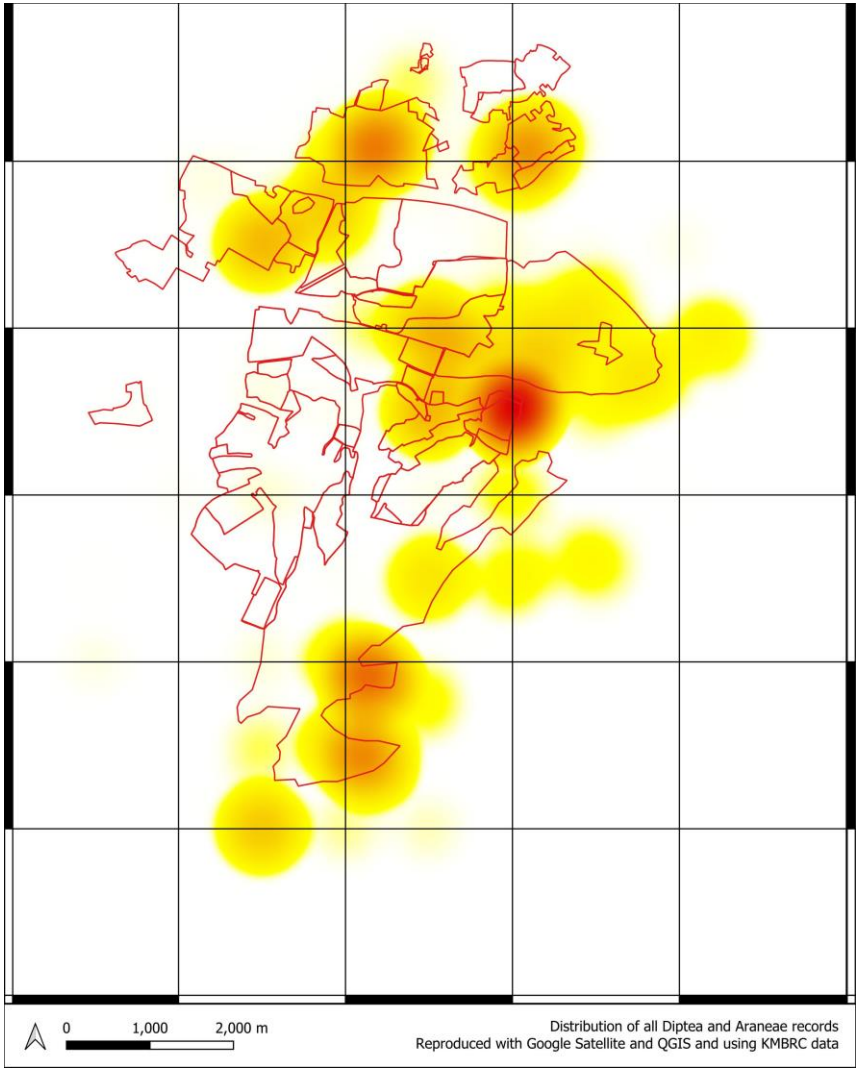
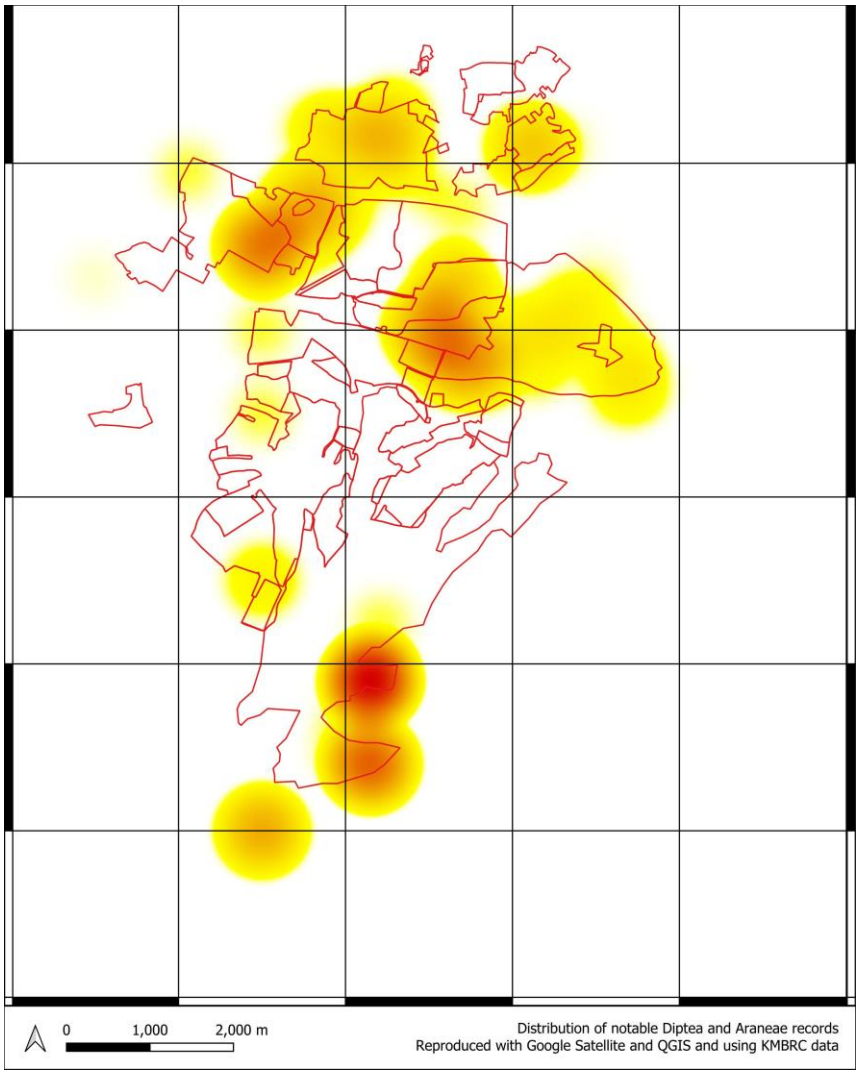


Figure 3. Left: The distribution of *all* Diptera and Araneae within the target area (4405 records).



Right: The distribution of *notable* Diptera and Araneae within the target area (265 records).

3.0. PRIORITY AREAS

3.1. OVERVIEW

3.1.1. There are two main habitat types within the study area; grassland and woodland, with good examples of calcareous grassland (an internationally rare habitat) for the former and ancient woodland for the latter (an 'irreplaceable' habitat according to national policy). The below sections expand on where these habitats are across the sites, how they relate to existing records of Diptera and Araneae, and where future survey efforts should be focused.

3.2. GRASSLAND HABITAT

3.2.1. Around 60 species of rare and uncommon Diptera are associated with lowland calcareous grassland (Buglife, 2024a), ten of which, *Geomyza breviseta, Myopites inulaedyssentericae, Oscinimorpha arcuata, Asilus crabroniformis, Leptarthrus vitripennis, Symphoromyia immaculata, Cheilosia barbata, Sarcophaga arcipes, Cistogaster globosa* and *Gymnosoma rotundatum* are represented among the existing records.

3.2.2. Good-quality (mostly) calcareous grassland was observed on the Silverhand Estate and at Holborough Woodlands – Crookhorn Woods. Similarly, areas of chalk grassland are present within Cobham Woods and Ranscombe Farm (although these were not visited as part of this assessment). It is recommended that these areas are subject to targeted surveys for Diptera to understand if this rare habitat supports an equally rare array of dipterans across more of the target area.

3.2.3. Calcareous grassland also supports around 35 species of notable spider, (Buglife, 2024a), seven of which, *Gonatium paradoxum*, *Sibianor aurocinctus*, *Hypsosinga sanguinea*, *Myrmarachne formicaria*, *Phaeocedus braccatus*, *Trichoncus saxatilis* and *Zelotes pedestris* are represented among the existing records. While spider surveys have been conducted at Silverhand Estate - South Hill Upper Malling and Holborough Woodlands – Crookhorn Wood (the latter having a reasonably sizeable list of Araneae), it is recommended that further arachnid surveys are undertaken on other areas of calcareous grassland elsewhere within Silverhand Estate and the other sites with this habitat, as listed above.

3.2.4. In addition to survey recommendations at the aforementioned sites, the grassland within Crabbles Bottom and Jeskyns Community Woodland (discussed further in Section 4.2) should also be surveyed for both groups.

3.3. WOODLAND HABITAT

3.3.1. As with calcareous grassland, lowland deciduous woodland (particularly ancient woodland and wood pasture) supports a range of specialist Diptera and Araneae. Lowland wood pasture alone is home to around 80 species of rare and uncommon Diptera and Araneae (Buglife, 202b), only seven of which, the spiders *Haplodrassus silvestris, Marpissa muscosa* and *Philodromus praedatus* and the flies *Myolepta dubia,*

Ctenophora pectinicornis, Eustalomyia hilaris and Phaonia laeta are represented among the existing records.

3.3.2. Of note, five out of these seven species were added to the list from the 2024 site visits for this assessment, suggesting invertebrates in this habitat have been under-recorded in the past.

3.3.3. The ancient woodland within the Holborough Woodlands complex lacks any survey data and, as this woodland habitat should be of ecological interest, surveys for both groups at this site are recommended. Ranscombe Farm woods, Cuxton & Cobham Woodland Project, South Ashenbank, Great Crabbles and Court Wood also contain areas of ancient woodland, which should be subject to survey effort for the target groups. Of note, some of the woodland is Sweet Chestnut Coppice, either currently managed (Cobham Wood, Ranscombe Farm) or relict (South Ashenbank Wood Great Crabbles Wood), which is likely to be less ecological productive than oak/ash woodland.

3.3.4. Both Rochester & Cobham Park Golf Club and Camer Park contain a small number of ancient trees with heart rot and decaying limbs. Therefore, it is recommended that targeted surveys are undertaken for saproxylic Diptera. This could be achieved using inexpensive methods, such as vane traps. Old orchard trees in Crabbles Bottom and the relict coppice in South Ashenbank Wood may also be good for saproxylic invertebrates and worth surveying for notable Diptera.

3.3.5. Scalers Hill Wood, Shorne Common Rough, West Park and Shorne Pasture were judged to be relatively uninteresting regarding their potential for notable araneaeids and dipterans (although some old coppice/clearance stools were noted at Scalers Hill Wood, so there is potential for saproxylic invertebrate interest).

4.0. RECOMMENDATIONS

4.1. OVERVIEW

4.1.1. Below are a series of site-specific and landscape-scale recommendations to improve the landscape for the target groups, as well as for invertebrates more generally, throughout the target area. The site-specific recommendations have been made with an attempt to focus on the target groups of Diptera, Araneae and Odonata. The landscape-scale section focuses on enhancing the landscape for invertebrates in general.

4.1.2. These recommendations are informed by the information in the chapters above, published literature, online resources and the experience of the authors. It is important to note that a review of management plans for the respective site was not part of this study and was beyond the scope of this assessment. As such, the following recommendations are based on on-site observations.

4.1.3. The management of some sites, such as that of calcareous grassland at the Silverhand Estate, appears to be well-informed and effective (with the re-creation and maintenance of high-quality chalk grassland being a priority at this site). As such, these have not been referenced below as management recommendations for these sites is unnecessary.

4.2. SITE-SPECIFIC ENHANCEMENTS

4.2.1. **Ranscombe Farm**

The ground flora habitat within Ranscombe Farm (primarily focused around increasingly rare arable weeds) is the primary ecological interest at this site. However, the Sweet Chestnut Coppice within Broad Oak Wood, Birch Wood and Great Wood could benefit from more interventional management, including thinning out and species diversification (although it is appreciated that there are limitations on how much can be removed, as per communications with the respective site manager). Where possible, deer-exclusion measures should be implemented.

4.2.2. **Crabbles Bottom**

There are some potentially interesting areas of grassland in Crabbles Bottom, which should be maintained by cutting or grazing (this latter would require some fence restoration in some places). There also appears to be some relict grassland at the eastern end of Crabbles Bottom, which could potentially be restored and opened up by the removal of scrub.

Much of the woodland in Crabbles Bottom is very dense and ecologically-uninteresting. Therefore, it is recommended that this is thinned to create a more open and varied woodland structure. Ideally, this would include deer deterrent or exclusion measures. The old orchard trees may also benefit from such management, as would parts of Great Crabbles Wood, South Ashenbank Wood and Cuxton & Cobham Woodlands Project, but further surveys would be needed before such changes occur.

4.2.3. **Jeskyns Community Woodland**

Some of grassland at Jeskyns Community Woodland could be subject to a more effective cutting/grazing regime, which could include management on rotation and creating areas of bare ground (beneficial for odonatan, dipterans and some araneaeids). It is considered that there are some opportunities to create excellent areas of nectar and pollen sources for invertebrates, which would complement the surrounding woodland habitat (for which many pollinating species will need to complete their lifecycle). While Jeskyns may not encompass significant areas of mature woodland, it is highlighted that the orchard habitat on-site will become incredibly valuable to invertebrates as it develops.

4.2.4. **Camer Park**

It is recommended that some areas of amenity grassland at Camer Park are managed to encourage nectar sources, which does not have to include tall 'meadow grassland' if the amenity aesthetic is required; simply cutting slightly higher would allow low lying forbs, such as clovers and birds foot trefoil, to establish. Other areas could be cut on rotation to allow for longer grassland. Where possible, varied 'edge habitats' should be encouraged where grassland and woodland meet.

4.2.5. **Holborough Woods - Crookhorn Wood**

The grasslands observed here appear to be getting a bit rank and appear quite homogeneous. As above, it is recommended that this grassland habitat is managed by collect-cutting or winter-grazing, and creating a mosaic of habitats including bare ground, short turf, longer grassland and scrub.

4.2.6. **Shorne Woods Country Park**

It is recommended that woodland clearings are managed to minimise the dominant grass/bracken and encourage a more diverse and abundant wildflower interest as pollen and nectar sources for dipterans (which would then go on to provide more of a food source for Araneae and Odonata). Primarily, this can be achieved through the cut-and-collect method (outside of the flowering season) and green haying from local wildflower-rich habitat. Seeding from reputable wild-sourced seed mixes is also an option.

In general, the management of veteran trees at Shorne Woods is considered good. Any future management here should wait until surveys have been undertaken to ascertain what, if any, important species are present. It was noted that regeneration through the planting of understorey species is taking place on-site in some areas. However, as mentioned several times in this section (and below in Section 4.3.) discouraging deer browsing will contribute to both a richer ground-flora and understorey habitat.

4.3. LANDSCAPE SCALE ENHANCEMENTS

4.3.1. Connectivity

While invertebrates (particularly Diptera) are more mobile than most groups, some species, such as wingless (female) Glow-worms *Lampyris noctiluca*, are known to be relatively sedentary and do not colonise new areas easily. Consequently, physical habitat connectivity is important to maintain for invertebrate interest. Maintaining habitat connectivity also reinforces habitat resilience to adverse impacts, such as tree pests and disease, which will have indirect impacts on invertebrate populations. Fragmentation of this habitat should be discouraged.

4.3.2. Habitat Diversity

While predominately a woodland and grassland complex, the addition of more ponds and wetlands across the target area would be important for the life cycle of Odonata, from egg-laying and larval development to adult emergence. Creating a network of wetlands and ponds can significantly enhance Odonata populations and contribute to overall biodiversity. Wetlands would also increase the wider landscape's ecosystem service value in the form of flood reduction downstream and an improvement in water quality.

In addition to the especially important woodland (ancient, orchard and pasture) and calcareous grassland, Ranscombe Farm's increasingly rare arable weed habitat is likely to support notable species of Diptera and Araneae. Given the insular and rare nature of this particular type of habitat, as well as the richness of its more conventional chalk grassland, it is recommended that green haying exercises take place to establish new areas of this threatened habitat.

4.3.3. Deadwood

Within, or close to, all habitats across the target area, deadwood should be an encouraged feature. Numerous invertebrate groups, including many dipterans, will require deadwood in which to complete their larval stage. Many araneaeids will utilise deadwood in various forms, such as *Marpissa muscosa*, which mostly occurs under loose bark on dead trees (or other forms of 'dead' wood). Furthermore, 'standing' deadwood is considered a highly valuable feature for a range of invertebrates and, where possible, any sizeable trees that present issues should be reduced instead of felled, or even 'strapped' to living trees (as exemplified at Ashenbank Woods) to maintain standing deadwood habitat.

4.3.4. Light Pollution

Artificial light disrupts the behaviour of invertebrates, disorientating some, e.g., moths, deterring others, e.g., Dermaptera, and generally impacting insect circadian rhythms. Negatively impacting an area's invertebrate populations in this manner adversely impacts entire ecosystems. As such, it is highlighted that an NNR designation would be helpful in obtaining greater protection in this respect. Specifically, 'zones of influence' and 'dark sky' areas could be developed and implemented as part of local strategies. Practical measures could also be implemented to reduce light (and noise) pollution, such as the provision of earth bunds and the planting of (native) tree belts.

4.3.5. **Pesticides and Herbicides**

The mass application of pesticides and herbicides, not just within the surrounding agricultural land but also from government agencies, should be limited. This includes the use of chemical sprays on arable fields, the use of wormers regarding livestock treatment, and vegetation suppression on roads and pathways. Of note, organically-grazing cattle (which was known to occur at Ashenbank Wood, where a low density of organically-grazed cattle was/is used to maintain wood pasture), leads to entire invertebrate ecosystems around cow dung, which would lead to improved conditions for rare Diptera known in the area, e.g., *Asilus crabroniformis*. Another result of environments free from pesticides and herbicides is greater pollinator populations (of which Diptera are a significant part of), which should improve agricultural outputs in the wider landscape.

4.3.6. **Deer and Squirrel Control**

One of the most significant impacts on the quality of woodland habitats is over-browsing by the unchecked deer population, which tends to prevent regeneration while reducing the structural diversity of habitats, including a reduction in ground-floral diversity and abundance. On the limited number of site visits, no areas of woodland were observed to possess notable ground-flora. This is compared to other woodland in the north/west Kent area, where an absence of deer usually correlates with a rich ground-flora composition, featuring species such as Yellow Arch-angel *Lamium galeobdolon* and Greater Stitchwort *Stellaria holostea*.

Fenced areas to completely exclude deer are the most desirable and effective option to negate the adverse impact of deer browsing. However, it is recognised that this is not always implementable due to other factors, such as expense and local by-laws. Dead-hedging is another method used to deter deer from certain areas. While this method is not as effective as deer-fencing, it can act to encourage deer away from particular areas.

To a lesser extent, Grey Squirrels *Sciurus carolinenesis* can be damaging to woodland ecosystems. There are not many methods, other than targeted culling or trapping, that can reduce squirrel pressure. The introduction of Pine Martens *Martes martes* could also assist by displacing Grey Squirrels.

4.3.7. **Grassland Management**

The neutral, calcareous and acidic grassland would all benefit from a mowing regime that maintains poor soil fertility and increases wildflower interest. This is primarily achieved by mowing outside of the flowering season (or winter-only organic grazing) and collecting the arisings to maintain low soil fertility (although it is recognised that summer grazing, such as is implemented at Shorne Woods, also has benefits).

On areas where grazing is not practical, cutting from late September is the best approach and some areas should be left unmown. Alternatively, a partial cut can be taken early in June with the remainder cut later in July, again to ensure some continuity of nectar sources (Suffolk Wildlife Trust 2023).

4.3.8. **Woodland Management**

Much of the woodland observed was dominated by Sweet Chestnut coppice. Managing chestnut coppice on a 15–25-year rotation is generally considered to be commercially viable (primarily for post-rail fencing), but allowing this habitat to get too mature, or keeping it too young, entails little value. Moreover, coppiced chestnut woodland will only have reasonable biodiversity value if a healthy ground-flora can develop and be maintained. As stated above, deer browsing and other 'uncontrolled' herbivorous pressure can render these habitats ecologically uninteresting by suppressing ground-flora and shrub establishment. Therefore, deer should be deterred from newly-coppiced areas where possible.

In general terms, a reduction in Sweet Chestnut woodland in favour for more traditional Oak/Ash woodland habitat is desirable when looking to increase invertebrate populations and overall ecological interest.

4.3.9. **Repeated Surveying and Monitoring**

It is recommended that a full baseline invertebrate survey is carried out across the target area, with standardised and replicable methodologies used. Repeat surveys can then be carried out every five years or so to assess invertebrate population trends and understand if management regimes have been effective in enhancing biodiversity.

5.0. SUMMARY

5.1. Of the 4405 records available for the three invertebrate target groups, 265 of these contained notable Diptera and Araneae, which equates to c.6% of the record dataset. Some of these species are considered nationally rare and threatened. Notable Odonata records were completely absent from the dataset, possibly reflecting both the lack of survey effort in the past and the lack of suitable freshwater habitat within the target area.

5.2. Ten out of the 19 sites in the target area are responsible for the notable species of Diptera and Araneae, with Silverhand Estate, Ashenbank Woods and Shorne Woods Country Park each having at least 20 notable records. Survey effort bias is postulated as the reason for these concentrations of records due to the perceived distribution of the record data set as a whole. However, it is noted that sites encompass good examples of calcareous grassland and ancient woodland/wood pasture; both of which are relatively rare habitats that are known to support high levels of biodiversity when managed effectively.

5.3. There are many invertebrate specialists that are associated with primary habitat types found throughout the target area, i.e., calcareous grassland and ancient woodland/wood pasture. It is considered that only a small proportion of these species are reflected in the datasets, with a significant number of these species added during the 2024 survey efforts, including site visits as part of this assessment. This suggests an under-recording of invertebrates in these habitats on-site.

5.4. Standardised surveying across all sites should be undertaken to understand species distribution for all target groups, with a focus on the surveying within the most significant habitat types, such as calcareous grassland and ancient woodland. Odonata surveys should be undertaken to establish a more reliable baseline for this group. Importantly, methodology should be standardised so repeat surveying maximises the accuracy and reliability of the data.

5.5. Regarding management recommendations, no further comments have been made regarding Silverhand Estate, Cobham Woods and Ramscombe Farm. These sites appear to be maximising biodiversity value through effective habitat and well-informed management, which will entail benefits for the Diptera and Araneae. For the remainder of the sites, various management recommendations have been made for the benefit of the target groups, and invertebrates more generally. For many of the woodland sites, excluding deer and thinning out Sweet Chestnut would likely improve the habitat significantly. For grassland areas, keeping soil fertility low (for greater wildflower diversity) and ensuring the presence of bare ground, would benefit the three target groups.

5.6. More broadly, on a landscape scale, ensuring light pollution and pesticide/herbicide use are kept to an absolute minimum, both within and around the target area, is crucial to maintaining healthy populations of invertebrates. Increasing deadwood and wildflower habitat throughout, as well as decreasing deer browsing where possible, is recommended.

APPENDIX A: REFERENCES

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