Report of an invertebrate assessment of land at Great Oak, Staffordshire

Paul Lee MSc CEnv MIEEM
ARACHNE ECOLOGY LTD

8 February 2013

EXECUTIVE SUMMARY

- The invertebrate fauna of the Great Oak site was sampled on 2nd-3rd April, 18th -19th June and 17th-18th July 2012 through a combination of spot sampling, hand searching, sweep netting, beating and vane trapping.

- A minimum of 114 species of invertebrate were recorded..

- No species listed in UK or European legislation were detected.

- The invertebrate fauna of the land at Great Oak includes broad assemblage types associated with the field layers of a grassland and scrub habitat matrix (ISIS code F2) and an unshaded early successional habitat mosaic (ISIS code F1). Wetland and wood decay assemblages were represented also. The most important of the specific assemblage types detected was that associated with a rich flower resource (ISIS code F002). The assemblages are not of national significance.

- The Great Oak site is significant as invertebrate habitat at a local level and possibly at district level. Even with further survey it is highly unlikely that the site would be shown to be of county significance or higher.

- Habitat loss is considered the main threat to the invertebrate fauna arising from development at Great Oak.

- It is suggested that, as mitigation for the loss of habitat, the development plan aims to provide for improved habitat features of value to invertebrates post development. Increased pollen and nectar resources would be the most beneficial feature. The retention on site of wood from felled trees is recommended as a resource for dead wood associated invertebrates.

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1. AIMS AND METHODS

1.1 Aims and objectives

The main aim of the reported work was to provide an assessment of the terrestrial invertebrate fauna of an area of land at Great Oak, Audley, Staffordshire. The boundaries of the land in question are marked on the maps in Appendix 1. A previous scoping study had identified an area of habitat around a pond used by anglers and a number of mature hedgerow trees as having the greatest potential value to invertebrate species assemblages. The work reported aimed to provide an assessment of the likely value of the whole site through detailed survey of these two aspects.

These aims were to be achieved by way of the following objectives:-

- to identify the presence of any species assemblages of high potential value in a local, regional or national context
- to identify any invertebrate species of conservation importance including legally protected, s41 Priority Species, RDB and nationally scarce invertebrates present at the time of the site visits

1.2 Methods

An initial habitat quality assessment of the site was completed on 2nd and 3rd April 2012. Whilst undertaking the walkover habitat assessment some invertebrates were collected and notes were made of species observed in the field. The invertebrate fauna of the angling pond area was sampled on 19th June and 17th July 2012 through a combination of spot sampling, hand searching and sweep netting. Although the intention was that visits should take place during spells of warm (at least 13°C), sunny conditions with low wind levels, the poor summer meant that the weather conditions during these visits were sub optimal. The invertebrate fauna of the hedgerow trees was sampled through a combination of beating on 19th June and vane trapping between 18th June and 18th July 2012.

Standardised samples were collected in line with the protocols established during the development by Natural England of the Invertebrate Species-habitat Information System (Drake *et al*, 2007). Under this system samples are standardised by the length of time spent using a technique at a defined location as outlined below.

Beating

Each sample comprised thirty minutes of collecting from one tree, using sharp raps with a broom handle to dislodge invertebrates from the lower branches and foliage into a net. These samples were taken in June.

Hand searching

Each sample comprised a total of thirty minutes collecting from an area roughly 20m x 20m. Six collecting points within the area were searched for five minutes each. Searching involved turning over stones and logs and grubbing amongst grass roots and plant litter. Three samples were taken from around the pond in June.

Spot sampling

Each sample comprised a standardised thirty minutes of using a net to collect large and active species (or observation of readily identifiable species) from an area roughly 20m x 20m. Collecting

points mainly comprised plants in flower but areas of bare substrate were also targeted. Three samples were taken from around the pond in June and a further six samples were taken in July.

Sweep netting
Each sample comprised a standardised ten minutes spent sweeping a heavy canvas net or a light cotton net through herbaceous vegetation during a random walk within an area roughly 20m x 20m. The net was inspected and emptied after every ten to twenty sweeps. Three samples were taken with each net type in June.

Vane trapping
One trap was placed in each tree, at between 3m and 4m above ground level. Four of the trees sampled were Oak *Quercus robur*, the remaining two were indeterminate species of willow *Salix* spp. The traps were put in place on 18th June and emptied and removed on 18th July 2012.

These techniques were selected to target coleoptera (especially ground beetles, rove beetles, leaf beetles and weevils), aculeate hymenoptera (bees, wasps and ants), diptera (especially hoverflies) hemiptera (true bugs) and araneae (spiders) as key groups of invertebrates likely to be exploiting the available resources. Some identification of invertebrates was carried out in the field but the majority of the samples were sorted and identified in the laboratory. Where possible specimens were identified to species and voucher specimens of the more interesting species were retained.

2. RESULTS

2.1 Species richness
The majority of the invertebrate specimens collected from the Great Oak site were identified to species level but several specimens could only be determined to genus or to species aggregate. A minimum of 114 species of invertebrate were recorded during the three visits reported here. These species and their conservation statuses are listed in Table 1 and full details of all the records of the species are given in Appendix 2.

2.2 Species of nature conservation concern
The status given for each species in Table 1 is based on information from a number of sources. For most of the species recorded the status information has been extracted from the RECORDER 3 software and to a lesser extent the ISIS software. These species are often described as common but a distinction is made here between truly common species, which are widespread and abundant in a wide range of habitats and geographical regions, and more local species which may be abundant where they occur but have a restricted distribution, often in a particular habitat or geographical region.

No species were recorded with designations of RDB or Nationally Scarce (Notable A or Notable B) as listed in the published red data books (Shirt, 1987; Bratton, 1991) and the subsequent conservation reviews of particular taxonomic groups commissioned by JNCC. The latest version of JNCC's Conservation Designations Spreadsheet was also consulted (accessed online at http://jncc.defra.gov.uk/page-3408) to check for species listed under the Habitats Directive, the Wildlife and Countryside Act 1981 and the Natural Environment and Rural Communities Act 2006 (Species of Principal Importance in England - section 41). No species listed in UK or European legislation were detected on the site.

Table 1: List of invertebrate species recorded from the Great Oak site

Common name	Species	Status
Smooth Woodlouse	*Oniscus asellus*	Common
Striped Woodlouse	*Philoscia muscorum*	Common
Rough Woodlouse	*Porcellio scaber*	Common
Snake millipede	*Ommatoiulus sabulosus*	Common
White-legged Millipede	*Tachypodoiulus niger*	Common
Snake millipede	*Cylindroiulus punctatus*	Common
Earth centipede	*Geophilus flavus*	Common
Stone centipede	*Lithobius forficatus*	Common
Stone centipede	*Lithobius variegatus*	Common
Centipede	*Cryptops hortensis*	Common
Comb foot spider	*Theridion sisyphium*	Common
Comb foot spider	*Enoplognatha ovata s.l.*	Common
Money spider	*Maso sundevalli*	Common
Money spider	*Erigone atra*	Common
Money spider	*Lepthyphantes* sp.	
Orb web spider	*Larinioides cornutus*	Common
Orb web spider	*Araniella cucurbitina*	Common
Long-jawed spider	*Tetragnatha extensa*	Common
Long-jawed spider	*Tetragnatha montana*	Common
Long-jawed spider	*Metellina mengei*	Common
Nursery Web Spider	*Pisaura mirabilis*	Common
Wolf spider	*Pardosa amentata*	Common
Wolf spider	*Pardosa pullata*	Common
Crab spider	*Xysticus* sp.	
Foliage spider	*Clubiona* sp.	
Harvestman	*Platybunus triangularis*	Common
Harvestman	*Dicranopalpus ramosus*	Local
Azure Damselfly	*Coenagrion puella*	Common
Blue-tailed Damselfly	*Ischnura elegans*	Common
Large Red Damselfly	*Pyrrhosoma nymphula*	Common
Slender Groundhopper	*Tetrix subulata*	Local
Common Earwig	*Forficula auricularia*	Common
Ground beetle	*Bembidion properans*	Common
Ground beetle	*Pterostichus nigrita*	Common
Ground beetle	*Pterostichus minor*	Common
Ground beetle	*Ophonus rufibarbis*	Common
Ground beetle	*Badister bullatus*	Common
Beetle	*Ptomaphagus subvillosus*	Common
Rove beetle	*Haploglossa villosula*	Common
Rove beetle	*Anotylus tetracarinatus*	Common
Rove beetle	*Tachyporus hypnorum*	Common
Rove beetle	*Gabrius breviventer*	Common
Click beetle	*Aplotarsus incanus*	Common
Click beetle	*Athous haemorrhoidalis*	Common
Soldier beetle	*Cantharis rufa*	Common
Soldier beetle	*Rhagonycha fulva*	Common
Soldier beetle	*Rhagonycha limbata*	Common
Fan-bearing Wood-borer	*Ptilinus pectinicornis*	Local
Common Malachite Beetle	*Malachius bipustulatus*	Common
16-spot Ladybird	*Tytthaspis 16-punctata*	Local
7-spot Ladybird	*Coccinella 7-punctata*	Common
2-spot Ladybird	*Adalia bipunctata*	Common
Beetle	*Dienerella filiformis*	Common
Thick-legged Flower Beetle	*Oedemera nobilis*	Common
Green Dock Beetle	*Gastrophysa viridula*	Common
Thistle Tortoise Beetle	*Cassida rubiginosa*	Common
Broad-nosed weevil	*Liophloeus tessulatus*	Common
Common Leaf Weevil	*Phyllobius pyri*	Common

Common name	Species	Status
Broad-nosed weevil	*Sitona suturalis*	Common
Willow Gall Weevil	*Archarius salicivorus*	Common
Weevil	*Dorytomus rufatus*	Local
Weevil	*Dorytomus taeniatus*	Common
Flower bug	*Anthocoris* sp.	
Mirid bug	*Orthocephalus saltator*	Common
Mirid bug	*Stenodema laevigata*	Common
Mirid bug	*Lygocoris rugicollis*	Common
Planthopper	*Neophilaenus exclamationis*	Common
Lacewing	*Micromus variegatus*	Common
Common Blue	*Polyommatus icarus*	Common
Meadow Brown	*Maniola jurtina*	Common
Red ant	*Myrmica rubra*	Common
Red ant	*Myrmica sabuleti*	Common
Black ant	*Lasius niger*	Common
Black ant	*Formica fusca*	Common
Jewel wasp	*Cleptes semiauratus*	Local
Potter wasp	*Odynerus spinipes*	Local
Solitary wasp	*Rhopalum coarctatum*	Common
Mining bee	*Andrena bicolor*	Common
Bumblebee	*Bombus terrestris/lucorum*	Common
Buff-tailed Bumblebee	*Bombus terrestris*	Common
White-tailed Bumblebee	*Bombus lucorum*	Common
Garden Bumblebee	*Bombus hortorum*	Common
Tree Bumblebee	*Bombus hypnorum*	Local
Red-tailed Bumblebee	*Bombus lapidarius*	Common
Carder Bee	*Bombus pascuorum*	Common
Early Bumblebee	*Bombus pratorum*	Common
Honey Bee	*Apis mellifera*	Common
Hoverfly	*Platycheirus albimanus*	Common
Hoverfly	*Chrysotoxum festivum*	Local
Marmalade Hoverfly	*Episyrphus balteatus*	Common
Hoverfly	*Sphaerophoria scripta*	Common
Hoverfly	*Syrphus ribesii*	Common
Hoverfly	*Cheilosia illustrata*	Common
Hoverfly	*Rhingia campestris*	Common
Hoverfly	*Neoascia podagrica*	Common
Hoverfly	*Eristalis arbustorum*	Common
Hoverfly	*Eristalis horticola*	Common
Hoverfly	*Eristalis interruptus*	Common
Hoverfly	*Eristalis intricarius*	Common
Hoverfly	*Eristalis pertinax*	Common
Drone Fly	*Eristalis tenax*	Common
Hoverfly	*Helophilus pendulus*	Common
Hoverfly	*Myathropa florea*	Common
Hoverfly	*Volucella pellucens*	Common
Hoverfly	*Syritta pipiens*	Common
Yellow Dung Fly	*Scathophaga stercoraria*	Common
Noon Fly	*Mesembrina meridiana*	Common
Reticulated Slug	*Deroceras reticulatum*	Common
Black Slug	*Arion ater* agg.	Common
Dusky Slug	*Arion subfuscus*	Common
Garden Snail	*Cornu aspersum*	Common
Brown-lipped Snail	*Cepaea nemoralis*	Common
Tree Slug	*Lehmannia marginata*	Common
Leopard Slug	*Limax maximus*	Common
Waxy Glass-snail	*Aegopinella nitidula*	Common

3. DISCUSSION

3.1 Introduction

Assessments of the quality of an invertebrate fauna are difficult to quantify. The two most widely used criteria when assessing the value of a habitat and its fauna are species diversity and rarity. When dealing with invertebrates, species diversity is usually measured in terms of species richness as the abundance data required to calculate other indices are rarely available or obtainable. Both species richness and the number of rare species recorded will be dependent on the level of sampling effort. Eyre and Rushton (1989) developed an index known as the Species Quality Index (SQI) that was claimed to be independent of sampling effort but is dependent on both species richness and rarity scores. However, Williams (2000) and Lott, Procter & Foster (2002) have since identified weaknesses in such approaches. An older method of assessing the invertebrate fauna of a site relies on ecological considerations rather than rarity scores. Such an Index of Ecological Continuity (IEC) was first proposed by Rose (1986) for assessing epiphytic lichen floras. English Nature (2005) stated that any invertebrate survey should result in a classification of the significance of the quality of the site. Outline guidance on criteria for assessing significance was provided but has since been developed in greater detail by others. One such set of criteria has been used to assess the significance of the Great Oak site. A recent tool for comparing the invertebrate species assemblages on different sites, the Invertebrate Species-habitat Information System (ISIS), is now being used and refined by Natural England (Webb and Lott, 2006). When assessing invertebrate assemblages, ISIS incorporates aspects of species richness, ecological fidelity and rarity scores.

3.2 Species richness

The ideal period for surveying many of the invertebrate groups important in assessing site quality would cover the whole of the time from April to October. The reported survey covered only the first half of this key period and thus would not be expected to give a full representation of the invertebrate fauna, especially the dead wood associated fauna, of the Great Oak site. In addition, a major factor limiting all invertebrate survey in 2012 was the very early start to spring in March followed by a prolonged cool and very wet period lasting throughout summer. This appeared to have a detrimental effect on invertebrate populations in general. Many of the common species normally active in spring and early summer were not apparent during the site visit in June, presumably having been affected by the wind, rain and low temperatures. The conditions in July were little better but brief spells of sunshine increased the number of species of flying insects recorded during the visit, although only common species were seen.

The reported species richness of 114 would have been increased in more favourable conditions as many species regarded as common even in poor habitats were not observed during the survey. However, even considering the conditions, the species richness results from this survey are relatively low, especially as a wide range of taxonomic groups were sampled, suggesting that the Great Oak site has limited importance for its invertebrate fauna.

3.3 Species of nature conservation concern

As noted above, no species of interest were detected on the site.

3.4 Species assemblages

An attempt to identify any important invertebrate species assemblages present on the site was made using the 2010 version of Natural England's ISIS software. This software also enabled an objective analysis of the quality of the species assemblages to be undertaken. ISIS recognises a series of broad species assemblage types (BAT) that are sensitive to changes in two key factors influencing invertebrate distribution; hydrology and disturbance levels. Table 2 shows the broad assemblage types recognised by ISIS from the species list for the Great Oak site.

In addition to recognising assemblage types, ISIS also assesses the quality of each assemblage by calculating a rarity score based on the SQI for the species list from that assemblage type rather than from the site list as a whole. As with any of the systems developed for assessing the quality of an invertebrate fauna, the results produced by ISIS are to some extent dependent on sampling effort and the length of species lists. For this reason, although the system will recognise BATs containing fewer species, a minimum threshold of fifteen species is recommended when calculating a rarity score. There are thresholds for rarity scores included in the current version that allow assemblages of national significance to be recognised. These thresholds differ for the different assemblages and will be subject to further testing and review in the future. Consideration of Table 2 shows that the combined rarity scores and species richness for all of the BATs fall below the threshold values for nationally significant assemblages.

Table 2: *Invertebrate species broad assemblage types (identified by ISIS) represented at Great Oak*

Broad assemblage type	ISIS Code	Rarity score		No. of BAT species	
		Actual	Threshold	Actual	Threshold
Grassland & scrub matrix	F2	104	160	28	15
Unshaded early successional mosaic	F1	-	160	15	15
Permanent wet mire	W3	-	180	13	15
Arboreal canopy	A1	-	170	8	15
Mineral marsh	W2	-	150	5	15
Wood decay	A2	-	190	4	15
Shaded field & ground layer	F3	-	200	3	15

At this point in time no rarity score thresholds have been included in ISIS for the purposes of identifying assemblages of regional or local significance. Until further testing of the national thresholds has been undertaking it would be premature to set thresholds for these lower levels of importance. It should be stressed that ISIS is still under development and analysis of this same data in future may produce some differences.

Table 3: Invertebrate species specific assemblage types (identified by ISIS) represented at Great Oak

Specific assemblage type	ISIS Code	No. of SAT species	
		Actual	Threshold
Rich flower resource	F002	9	14
Heartwood decay	A211	2	6
Open short sward	F112	2	12
Scrub edge	F001	1	10
Bark & sapwood decay	A212	1	19

In addition to recognising broad assemblage types ISIS also identifies specific assemblage types (SATs) whose members are dependent on a much narrower range of resources or environmental conditions than are defined by the broad assemblage types. The species making up these specific assemblage types are therefore specialists, often indicators of good quality habitat and often at least

locally scarce species. ISIS assesses the quality of these specialist assemblages against thresholds of species richness which differ for the different assemblages and will be subject to further testing and review in the future. Consideration of Table 3 shows that although the pollen and nectar resources around the angling pond and the dead wood resources of the hedgerow trees support the predicted specialist assemblages, all of the SATs identified fall below the threshold values for nationally significant assemblages.

Table 4: Criteria defining significance of invertebrate habitat in Britain, but excluding all parts of Ireland

Significance	**Description**	**Minimum qualifying criteria**
International	European important site	Internationally important invertebrate populations present **or** containing RDB 1 (Endangered) species **or** containing any species protected under European legislation **or** containing habitats that are threatened or rare at the European level (including, but not exclusively so, habitats listed on the EU *Habitats Directive*).
National	UK important site	Achieving SSSI invertebrate criteria (NCC, 1989) **or** containing RDB2 (Vulnerable) **or** containing viable populations of RDB 3 (Rare) species **or** containing viable populations of any species protected under UK legislation **or** containing habitats that are threatened or rare nationally (Great Britain).
Regional (for border sites, both regions must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the region in question	Habitat that is scarce or threatened in the region **or** which has, or is reasonably expected to have, the presence of an assemblage of invertebrates including at least ten Nationally Scarce species **or** at least ten species listed as Regionally Scarce for the *Natural England* region in question in the Recorder database or elsewhere **or** a combination of these categories amounting to ten species in total.
County (for border sites, both counties must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the county in question	Habitat that is scarce or threatened in the county **and/or** which contains or is reasonably expected to contain an assemblage of invertebrates that includes viable populations of at least five Nationally Scarce species **or** viable populations of at least five species regarded as Regionally Scarce by the county records centre and/or field club.
District	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the administrative District	A rather vague definition of habitats falling below county significance level, but which may be of greater significance than merely Local. They include sites for which Nationally Scarce species in the range from 1 to 4 examples are reasonably expected but not yet necessarily recorded and where this omission is considered likely to be partly due to under-recording.
Local	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the affected and neighbouring Parishes	Habitats or species unique or of some other significance within the local area.
Low significance	—	Although almost no area is completely without significance these are the areas with nothing more than expected “background” populations of common species and the occasional Nationally Local species.

3.5 Significance of invertebrate habitat

C.W. Plant Associates have produced a set of criteria and explanatory text to define the significance of invertebrate habitat in Britain, but excluding all parts of Ireland (see Table 4). Within each of the geographical categories, the significance may be Moderate, High or Very High (there is no "Low Significance" category - such sites are already defined by the Evaluation Table). The application of Moderate, High or Very High significance at each geographical level is based on a wide number of factors and does not sit well with a table of pre-defined rules. Additionally, within a site of particular geographical significance, different component parts may have differing levels of actual significance.

Using the significance criteria, the results of the visits to the Great Oak site suggest that it has at least Moderate Local Significance for its invertebrate fauna (based on the presence of both the local species associated with the rich floral resources around the angling pond and the hedgerow trees) and could conceivably be considered of District Significance with further survey. It seems highly unlikely that the survey area has a fauna of County Significance.

4. IMPACTS AND MITIGATION

Usually the major impact on the invertebrate fauna would be the loss of habitat and this would be minimised by redesigning the development to avoid the loss of the most important habitat features. It seems unlikely that the areas surveyed would be left untouched by an opencast development.

Possible approaches to mitigation include improving the habitat in any areas that are left untouched or creating new habitat where possible. These approaches are likely to prove more viable. Increasing the pollen and nectar resources through reduction in grazing pressure on undeveloped land may be feasible and reseeding following development using conservation mixes would add even more to the value.

Ideally, hedgerow trees removed prior to development would be retained on site as dead wood to allow emergence of developing insects and potential colonisation by a different assemblage of invertebrates - the species associated with logs differ from those associated with standing dead wood. To prevent removal from the site as firewood and to maintain environmental conditions for insect larvae, the logs created from the trees would be as large as could be handled.

5. CONCLUSIONS

- The invertebrate fauna of the land at Great Oak is dominated by broad assemblage types associated with the field layers of a grassland and scrub habitat matrix (ISIS code F2) and an unshaded early successional habitat mosaic (ISIS code F2). Smaller numbers of species associated with the arboreal canopy (ISIS code A1), wood decay (ISIS code A2) and wetlands (ISIS codes W2 and W3) were noted also. These assemblages are not of national significance.

- The invertebrate fauna of the land at Great Oak includes specific assemblage types associated with a rich flower resource (ISIS code F002), scrub edge (ISIS code F001), open short sward (ISIS code F112), heartwood decay (ISIS code A211) and bark & sapwood decay (ISIS code A212). These assemblages are not of national significance.

- No species of conservation concern were recorded from the land at Great Oak.

- Overall, the Great Oak site is significant as invertebrate habitat at a local level and possibly at district level. Even with further survey it is highly unlikely that the site would be shown to be of higher significance.

- Habitat loss is considered the main threat to the invertebrate fauna arising from development at Great Oak.

- Improving pollen and nectar resources post development and retaining felled wood on parts of the site unaffected by the development are suggested as potential mitigation.

6. REFERENCES

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APPENDIX 1: SITE MAP

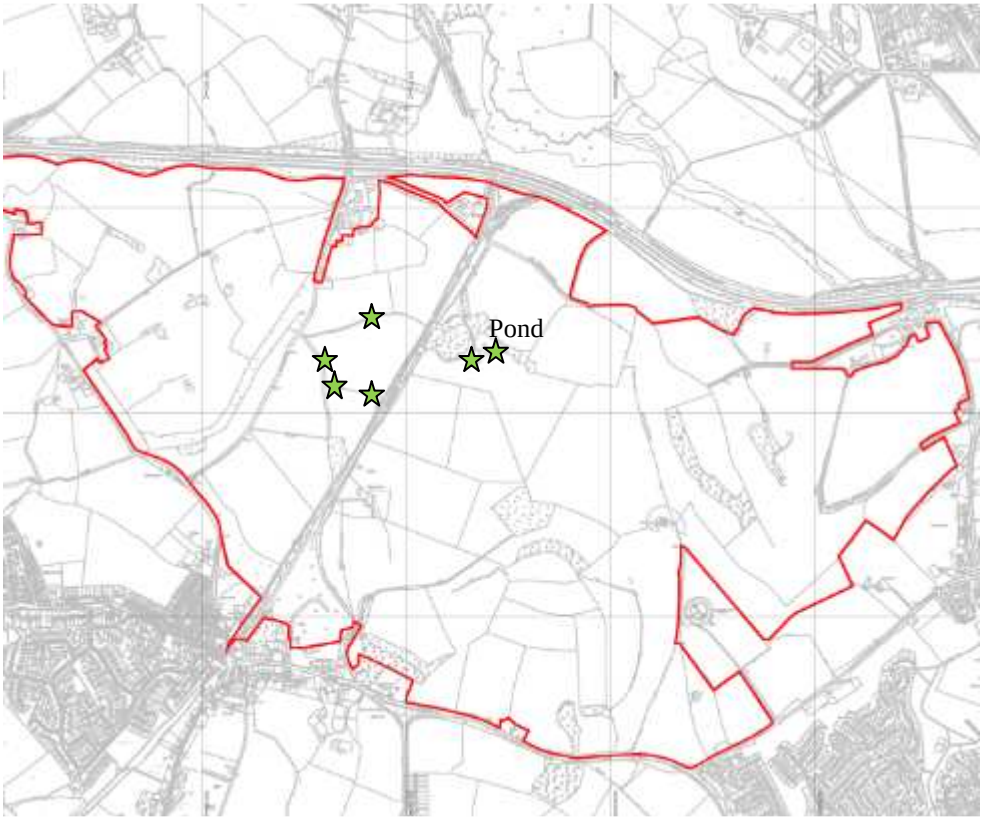

Figure 1: Great Oak site showing location of angling pond and hedgerow trees included in sample (☆)

APPENDIX 2: SURVEY RECORDS

Species	Status	Grid	Recorder	Identifier	Dy	Mo	Year	Abundance	Sampling method
Woodlice									
Oniscus asellus	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Oniscus asellus	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Oniscus asellus	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Philoscia muscorum	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Philoscia muscorum	Common	SJ816516	P Lee	P Lee	19	6	2012	adults	Hand searching
Philoscia muscorum	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Porcellio scaber	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Porcellio scaber	Common	SJ816516	P Lee	P Lee	19	6	2012	adults	Hand searching
Porcellio scaber	Common	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Millipedes									
Tachypodoiulus niger	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Tachypodoiulus niger	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Ommatoiulus sabulosus	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Cylindroiulus punctatus	Common	SJ81685165	P Lee	P Lee	19	6	2012	female	Beating
Centipedes									
Geophilus flavus	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Lithobius forficatus	Common	SJ816516	P Lee	P Lee	19	6	2012	male, female	Hand searching
Lithobius variegatus	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Cryptops hortensis	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Spiders									
Theridion sisyphium	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Enoplognatha ovata s.l.	Common	SJ816517	P Lee	P Lee	19	6	2012	subadults	Sweeping
Maso sundevalli	Common	SJ81665165	P Lee	P Lee	19	6	2012	male	Beating
Erigone atra	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Erigone atra	Common	SJ81285163	P Lee	P Lee	17	7	2012	male	Vane trap
Lepthyphantes sp.		SJ81685165	P Lee	P Lee	19	6	2012	immatures	Beating
Larinioides cornutus	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Sweeping
Araniella cucurbitina	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Tetragnatha extensa	Common	SJ816516	P Lee	P Lee	19	6	2012	male, female	Sweeping
Tetragnatha montana	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Metellina mengei	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Sweeping
Pisaura mirabilis	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Sweeping
Pardosa amentata	Common	SJ81685163	P Lee	P Lee	2	4	2012	female	Hand searching

Species	Status	Grid	Recorder	Identifier	Dy	Mo	Year	Abundance	Sampling method
Spiders									
Pardosa amentata	Common	SJ816516	P Lee	P Lee	19	6	2012	3 females	Hand searching
Pardosa amentata	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Hand searching
Pardosa pullata	Common	SJ816517	P Lee	P Lee	19	6	2012	male	Hand searching
Xysticus sp.		SJ816516	P Lee	P Lee	19	6	2012	subadult	Sweeping
Clubiona sp.		SJ816517	P Lee	P Lee	19	6	2012	subadult	Sweeping
Harvestmen									
Platybunus triangularis	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Hand searching
Dicranopalpus ramosus	Local	SJ81665165	P Lee	P Lee	19	6	2012	immature	Beating
Dragonflies & damselflies									
Coenagrion puella	Common	SJ816516	P Lee	P Lee	19	6	2012	male	Spot sample
Ischnura elegans	Common	SJ816516	P Lee	P Lee	19	6	2012	male	Spot sample
Ischnura elegans	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Ischnura elegans	Common	SJ81715167	P Lee	P Lee	17	7	2012	male. female	Spot sample
Pyrrhosoma nymphula	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Spot sample
Grasshoppers & crickets									
Tetrix subulata	Local	SJ816517	P Lee	P Lee	19	6	2012	adult	Sweeping
Earwig									
Forficula auricularia	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Beetles									
Bembidion properans	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Hand searching
Pterostichus nigrita	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Hand searching
Pterostichus minor	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Hand searching
Ophonus rufibarbis	Common	SJ816517	P Lee	P Lee	19	6	2012	male	Hand searching
Badister bullatus	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Hand searching
Ptomaphagus subvillosus	Common	SJ81685165	P Lee	P Lee	17	7	2012	male	Vane trap
Haploglossa villosula	Common	SJ81475174	P Lee	P Lee	17	7	2012	adult	Vane trap
Anotylus tetracarinatus	Common	SJ81475174	P Lee	P Lee	17	7	2012	male	Vane trap
Tachyporus hypnorum	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Tachyporus hypnorum	Common	SJ81685165	P Lee	P Lee	17	7	2012	adult	Vane trap
Gabrius breviventer	Common	SJ816516	P Lee	P Lee	19	6	2012	male	Hand searching
Aplotarsus incanus	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Athous haemorrhoidalis	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Athous haemorrhoidalis	Common	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating

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Beetles									
Cantharis rufa	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Rhagonycha fulva	Common	SJ81655169	P Lee	P Lee	17	7	2012	adult	Spot sample
Rhagonycha fulva	Common	SJ81635174	P Lee	P Lee	17	7	2012	adult	Spot sample
Rhagonycha fulva	Common	SJ81715167	P Lee	P Lee	17	7	2012	adult	Spot sample
Rhagonycha limbata	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Ptilinus pecticornis	Local	SJ81685165	P Lee	P Lee	19	6	2012	female	Beating
Ptilinus pecticornis	Local	SJ81425154	P Lee	P Lee	17	7	2012	female	Vane trap
Ptilinus pecticornis	Local	SJ81685165	P Lee	P Lee	17	7	2012	2 females	Vane trap
Malachius bipustulatus	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Sweeping
Tytthaspis 16-punctata	Local	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Coccinella 7-punctata	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Spot sample
Adalia bipunctata	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Dienerella filiformis	Common	SJ81685165	P Lee	P Lee	17	7	2012	adult	Vane trap
Oedemera nobilis	Common	SJ816516	P Lee	P Lee	19	6	2012	females	Sweeping
Oedemera nobilis	Common	SJ816517	P Lee	P Lee	19	6	2012	females	Sweeping
Gastrophysa viridula	Common	SJ816516	P Lee	P Lee	19	6	2012	females	Sweeping
Cassida rubiginosa	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Sweeping
Cassida rubiginosa	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Sweeping
Liophloeus tessulatus	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Sweeping
Phyllobius pyri	Common	SJ81665165	P Lee	P Lee	19	6	2012	adult	Beating
Sitona suturalis	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Sweeping
Archarius salicivorus	Common	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Dorytomus rufatus	Local	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Dorytomus taeniatus	Common	SJ816516	P Lee	P Lee	19	6	2012	adults	Sweeping
Dorytomus taeniatus	Common	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Bugs									
Anthocoris sp.		SJ81685165	P Lee	P Lee	17	7	2012	female	Vane trap
Orthocephalus saltator	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Sweeping
Stenodema laevigata	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Sweeping
Lygocoris rugicollis	Common	SJ81685165	P Lee	P Lee	19	6	2012	adult	Beating
Neophilaenus exclamationis	Common	SJ816517	P Lee	P Lee	19	6	2012	male	Sweeping
Lacewing									
Micromus variegatus	Common	SJ81475174	P Lee	P Lee	17	7	2012	female	Vane trap

Species	Status	Grid	Recorder	Identifier	Dy	Mo	Year	Abundance	Sampling method
Butterflies									
Polyommatus icarus	Common	SJ816516	P Lee	P Lee	19	6	2012	female	Spot sample
Polyommatus icarus	Common	SJ816517	P Lee	P Lee	19	6	2012	2 males. 1 female	Spot sample
Polyommatus icarus	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Polyommatus icarus	Common	SJ81655169	P Lee	P Lee	17	7	2012	female	Spot sample
Maniola jurtina	Common	SJ81655169	P Lee	P Lee	17	7	2012	adult	Spot sample
Ants									
Myrmica rubra	Common	SJ81665165	P Lee	P Lee	17	7	2012	worker	Vane trap
Myrmica sabuleti	Common	SJ816517	P Lee	P Lee	19	6	2012	workers	Hand searching
Lasius niger s.s.	Common	SJ816516	P Lee	P Lee	19	6	2012	workers	Hand searching
Lasius niger s.s.	Common	SJ816517	P Lee	P Lee	19	6	2012	workers	Sweeping
Formica fusca	Common	SJ816516	P Lee	P Lee	19	6	2012	worker	Sweeping
Formica fusca	Common	SJ816517	P Lee	P Lee	19	6	2012	worker	Hand searching
Wasps									
Cleptes semiauratus	Local	SJ81475174	P Lee	P Lee	17	7	2012	male	Vane trap
Odynerus spinipes	Local	SJ816516	P Lee	P Lee	19	6	2012	female	Spot sample
Rhopalum coarctatum	Common	SJ81685165	P Lee	P Lee	17	7	2012	male	Vane trap
Bees									
Andrena bicolor	Common	SJ81715167	P Lee	P Lee	17	7	2012	male, female	Spot sample
Bombus terrestris/lucorum	Common	SJ816516	P Lee	P Lee	19	6	2012	workers	Spot sample
Bombus terrestris/lucorum	Common	SJ816517	P Lee	P Lee	19	6	2012	workers	Spot sample
Bombus terrestris/lucorum	Common	SJ81715167	P Lee	P Lee	17	7	2012	workers	Spot sample
Bombus terrestris/lucorum	Common	SJ81635174	P Lee	P Lee	17	7	2012	workers	Spot sample
Bombus terrestris	Common	SJ81685163	P Lee	P Lee	2	4	2012	queen	Field observation
Bombus terrestris	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Bomus terrestrris	Common	SJ81635174	P Lee	P Lee	17	7	2012	male	Spot sample
Bombus lucorum	Common	SJ81635174	P Lee	P Lee	17	7	2012	male	Spot sample
Bombus hortorum	Common	SJ816516	P Lee	P Lee	19	6	2012	queen, worker	Spot sample
Bombus lapidarius	Common	SJ816516	P Lee	P Lee	19	6	2012	workers	Spot sample
Bombus lapidarius	Common	SJ816517	P Lee	P Lee	19	6	2012	worker	Spot sample
Bombus lapidarius	Common	SJ81655169	P Lee	P Lee	17	7	2012	worker	Spot sample
Bombus lapidarius	Common	SJ81635174	P Lee	P Lee	17	7	2012	worker	Spot sample

Species	Status	Grid	Recorder	Identifier	Dy	Mo	Year	Abundance	Sampling method
Bees									
Bombus lapidarius	Common	SJ81715167	P Lee	P Lee	17	7	2012	workers	Spot sample
Bombus hypnorum	Local	SJ816516	P Lee	P Lee	19	6	2012	workers	Spot sample
Bombus hypnorum	Local	SJ816517	P Lee	P Lee	19	6	2012	worker	Spot sample
Bombus pascuorum	Common	SJ816516	P Lee	P Lee	19	6	2012	queen, worker	Spot sample
Bombus pascuorum	Common	SJ816517	P Lee	P Lee	19	6	2012	worker	Spot sample
Bombus pascuorum	Common	SJ81655169	P Lee	P Lee	17	7	2012	workers	Spot sample
Bombus pascuorum	Common	SJ81635174	P Lee	P Lee	17	7	2012	workers	Spot sample
Bombus pratorum	Common	SJ81655169	P Lee	P Lee	17	7	2012	worker	Spot sample
Apis mellifera	Common	SJ816516	P Lee	P Lee	19	6	2012	workers	Spot sample
Apis mellifera	Common	SJ816517	P Lee	P Lee	19	6	2012	worker	Spot sample
Apis mellifera	Common	SJ81715167	P Lee	P Lee	17	7	2012	workers	Spot sample
Apis mellifera	Common	SJ81655169	P Lee	P Lee	17	7	2012	workers	Spot sample
Hoverflies									
Platycheirus albimanus	Common	SJ81655169	P Lee	P Lee	17	7	2012	2 males	Spot sample
Platycheirus albimanus	Common	SJ81635174	P Lee	P Lee	17	7	2012	4 males, 1 female	Spot sample
Platycheirus albimanus	Common	SJ81715167	P Lee	P Lee	17	7	2012	2 males	Spot sample
Chrysotoxum festivum	Local	SJ81635174	P Lee	P Lee	17	7	2012	male	Spot sample
Episyrphus balteatus	Common	SJ81685165	P Lee	P Lee	17	7	2012	male	Vane trap
Episyrphus balteatus	Common	SJ81655169	P Lee	P Lee	17	7	2012	adults	Spot sample
Episyrphus balteatus	Common	SJ81635174	P Lee	P Lee	17	7	2012	adults	Spot sample
Episyrphus balteatus	Common	SJ81715167	P Lee	P Lee	17	7	2012	adults	Spot sample
Sphaerophoria scripta	Common	SJ81635174	P Lee	P Lee	17	7	2012	2 females	Spot sample
Syrphus ribesii	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Syrphus ribesii	Common	SJ81715167	P Lee	P Lee	17	7	2012	male	Spot sample
Syrphus ribesii	Common	SJ81635174	P Lee	P Lee	17	7	2012	2 males	Spot sample
Cheilosia illustrata	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Rhingia campestris	Common	SJ81715167	P Lee	P Lee	17	7	2012	female	Spot sample
Neoascia podagrica	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis arbustorum	Common	SJ81655169	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis horticola	Common	SJ81655169	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis interruptus	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample

Species	Status	Grid	Recorder	Identifier	Dy	Mo	Year	Abundance	Sampling method
Hoverflies									
Eristalis interruptus	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis intricarius	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Eristalis pertinax	Common	SJ816517	P Lee	P Lee	19	6	2012	3 males, 1 female	Spot sample
Eristalis pertinax	Common	SJ81655169	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis pertinax	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis pertinax	Common	SJ81715167	P Lee	P Lee	17	7	2012	female	Spot sample
Eristalis tenax	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Spot sample
Helophilus pendulus	Common	SJ81655169	P Lee	P Lee	17	7	2012	male	Spot sample
Myathropa florea	Common	SJ816517	P Lee	P Lee	19	6	2012	female	Spot sample
Volucella pellucens	Common	SJ816517	P Lee	P Lee	19	6	2012	male	Spot sample
Volucella pellucens	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Syritta pipiens	Common	SJ816517	P Lee	P Lee	19	6	2012	male	Spot sample
Other Flies									
Scathophaga stercoraria	Common	SJ81685165	P Lee	P Lee	17	7	2012	adults	Vane trap
Scathophaga stercoraria	Common	SJ81305156	P Lee	P Lee	17	7	2012	adults	Vane trap
Scathophaga stercoraria	Common	SJ81425154	P Lee	P Lee	17	7	2012	adults	Vane trap
Scathophaga stercoraria	Common	SJ81475174	P Lee	P Lee	17	7	2012	adults	Vane trap
Scathophaga stercoraria	Common	SJ81665165	P Lee	P Lee	17	7	2012	adults	Vane trap
Mesembrina meridiana	Common	SJ81635174	P Lee	P Lee	17	7	2012	female	Spot sample
Molluscs									
Deroceras reticulatum	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Deroceras reticulatum	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Deroceras reticulatum	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Arion ater agg.	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Arion ater agg.	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Arion subfuscus	Common	SJ816516	P Lee	P Lee	19	6	2012	adults	Hand searching
Cornu aspersum	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Cepaea nemoralis	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching
Lehmannia marginata	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Limax maximus	Common	SJ81685163	P Lee	P Lee	2	4	2012	adult	Hand searching
Limax maximus	Common	SJ816516	P Lee	P Lee	19	6	2012	adult	Hand searching
Aegopinella nitidula	Common	SJ816517	P Lee	P Lee	19	6	2012	adult	Hand searching