Ballard Meadow

Insect Survey

Survey and Report by
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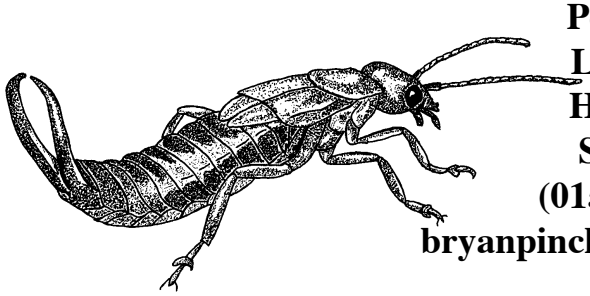
October 2020



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Ballard Meadow,
New Milton, Hampshire

Insect Survey 2020

CONTENTS

1.1 Summary

This report summarises the results of survey work to record the terrestrial insect species present in Ballard Meadow and adjacent woodland in New Milton, Hampshire.

Six visits were made, one each in April to September 2020 to record terrestrial insects in a number of orders.

Survey involved sweep-netting the available vegetation and some direct searching for species at flowers across the whole site. Insect groups covered by the survey are presented in Section 1.3.

Tables showing the species recorded are presented in Section 1.4.

Species were identified in the field wherever possible, but due to identification difficulties with some species, some were retained and identified with the aid of a microscope. Reference material has been retained in the collection of the surveyor, surplus material will be donated to the collections of the National Biodiversity Data Centre, Waterford, Eire and/or Portsmouth City Museum Service.

Addtional Species of non-invertebrate are recorded in Section 1.5.

An overview of the results is presented in Section 1.6.

Recommendations for further insect survey are presented in Section 1.7.

Management recommendations are not provided as these are suitably covered by the management plan.

This survey was commissioned and funded by the Friends of Ballard Water Meadow and New Milton Town Council.

1.2 Introduction

Ballard Water Meadow and Woodland is a 2.73 hectare grassland and 1.52 hectare woodland located in New Milton, Hampshire. Grid Reference SZ241956.
Both the meadow and woodland are afforded SINC status and are leased by New Milton Town Council for nature conservation and public recreation. The meadow is an example of relic unimproved New Forest grassland, while the woodland is considered to be ancient semi-natural woodland (Lord, 2020).

The major habitats available are the unimproved grassland of meadow, which in places is dry and others wet at certain times of the year. A seasonal stream runs along the eastern border of the site and seasonal ditches divide the site. The woodland strip on the west of the site comprises mainly Oak (*Quercus rober*) with deciduous and evergreen scrub understory. A limited amount of ground flora is present in the woodland. On the whole, the meadow and woodland are on gently sloping ground running from north-west to south-east.

No survey of the terrestrial insects has previously been undertaken other than a regular butterfly transect.

Six visits were made to record the terrestrial insects. The data collected forms the basis of this report. Survey visits were undertaken on 23rd April, 19th May, 25th June, 21st July, 20th August and 14th September 2020.

Survey involved sweep-netting the available vegetation and some direct searching at flowers with a standard sweep/insect net.

1.3 Survey Groups and Methodology

Survey was largely undertaken by means of sweep-netting the vegetation with the aim of dislodging species resting on foliage or feeding at flowers. Occasionally direct searching (where species with known plant hosts may be present) was employed as the main survey technique. Some species, such as the lepidoptera (butterflies) and odonata (dragonflies and damselflies) were primarily recorded flying through/around the survey area. Without thorough searches for their larval stages many species in these groups, itis often difficult to determine which are breeding on site and those which are casual users of the site for feeding, roosting or hibernating.

The following insect groups were surveyed/recorded and their reason for attention in this survey highlighted:

Mecoptera: Scorpion flies
Only three species are recorded in Britain all can be found in most habitats, adults are often recorded in abundance. Larvae feed on decaying matter.

Neuroptera: Lacewings and allies
The majority of species are aphid feeders in their larval stage, adults can usually be found resting on vegetation during the day.

Odonata: Dragonflies and Damselflies
All species develop in watercourses where they are predatory on other invertebrates. Adult males fly long distances, often away from water to feed, females stay close to water courses and pools. While adults are easy to record in any habitat, breeding on a site can only be proven if searches are made for the larval stages or exuviae.

Orthoptera: Bush Crickets and Grasshoppers and allies
Many species are specific to wetland habitats and structured grassland with some scrub element.

Heteroptera: True Bugs (terrestrial species)
Many species in this group are host plant specific where they feed on plant sap, a number of species are predatory on other insects, they are best surveyed by sweep-netting vegetation.

Trichoptera: Caddisflies
All species are aquatic in their larval stage with adults flying in suitable terrestrial habitat nearby.

Lepidoptera: Butterflies
A number of species are specific to grassland habitat but are usually reliant on established and relatively undisturbed habitats, all species were recorded on a casual basis.

Diptera: Hoverflies
A number of species are specific to wetland, grassland and scrub habitats but the majority are generalist in their habitats.

Diptera: Larger Brachycera (Snipeflies, Horseflies, Soldierflies, Robberflies and Beeflies)
A number of species are specific to wetland habitats. In the larval stages they live either as parasites in and on other insects, within decaying plant matter or in mud.

Diptera: Snail-killing Flies
All of the species feed within the shells of specific snail species and occasionally slugs, usually in wetland habitats, only a few species live in drier habitats where they develop in terrestrial snails.

Diptera: Picture-winged Flies
All of the species are plant host specific developing as maggots within plant stems, flowerheads or seed heads.

Diptera: Conopid Flies
All of the species in this family parasitise solitary and social bees and wasps, either at their nest sites or by searching for adults foraging at flowers.

Diptera: Tachinid Flies
All of the species are parasites that spend their larval stages feeding within or on other insects e.g. lepidoptera caterpillars and shieldbugs.

Hymenoptera: Aculeates
Many bee, ant and wasp species nest in bare soils in warm sunny locations, each female bee or wasp excavates a series of burrows to provision them with nectar and/or pollen or live prey for their growing larvae to feed on. All species feed at flowers for nectar or pollen, while many species also feed on terrestrial invertebrates which are captured at flowers. Ants often nest in warm, highly thermophilic sites in grassland or bare and sparsely vegetated substrates.

Coleoptera: Only a limited number of coleoptera groups were surveyed for, these were Ladybirds. Soldier Beetles, Malachite Beetles and Longhorn Beetles, no other beetle groups were encountered during the survey.

Ladybirds
Ladybirds occur in a range of habitats with few species being specific to this habitat. Due to the ease of recording and identifying the group they were recorded on a casual basis.

Soldier Beetles
This group of mainly predatory species contain a number of brightly-coloured adults which can be found, often in numbers at flowers and are often encountered in sweep-net samples.

Malachite Beetles
A small group of attractively coloured beetles that are predatory as larvae but feed on pollen as adults, they are often common in sweep-net samples.

Longhorn Beetles
A large group of often brightly coloured beetles that in most species develop as larvae inside dead timber or plant stems. Adults are often encountered nectaring at flowers.

1.4. Species Recorded

The following tables show all insects recorded during the survey. The species lists and nomenclature follow the most recently available checklists for each group. The hoverfly checklist is currently in the process of being reorganised so for ease, species are presented here in alphabetical order.

The Meadow

Major forage resources (nectar and pollen) available across the meadow as a whole during the first two months of the survey period and comprised Blackthorn (*Prunus spinosa*), Hawthorn (*Crateagus monogyna*), Dandelion (*Taraxacum officinale* agg.), Hemlock Water-dropwort (*Oenanthe crocata*), Buttercup (*Ranunuculus* sp). During the middle two months, Bird's Foot Trefoil (*Lotus* sp), Hogweed (*Heracleum sphondylium*), Hemlock Water-dropwort, White Clover (*Trifolium repens*) and Meadowsweet (*Filipendula ulmaria*) were dominant. In the final two months of the survey forage resources had diminished markedly, leaving just a few small areas of Bird's Foot Trefoil, Hogweed, Black Knapweed (*Centaurea nigra*) and Meadowsweet. By the time of the August visit much of the grassland was dry and parched except for the south-east corner of the South meadow. A section of each of the Middle and North meadows was cut in late August.

1.4.1 South Meadow

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Mecoptera: Scorpion flies						
Panorpa communis		*	*			
Neuroptera: Lacewings						
Chrysopa perla				*		
Chrysoperla carnea			*	*		
Odonata:Dragonflies						
Brachytron pratense		*				
Aehsna mixta					*	
Orthoptera: Bush Crickets						
Conocephalus discolor			*	*	*	*
Grasshoppers						
Chorthippus albomarginatus				*		
Chorthippus brunneus				*	*	*
Chorthippus parallelus		*	*	*	*	*
Heteroptera: True Bugs						
Closterotomus norvegicus			*			
Lygcorius pabulinus			*			
Lygus rugulipennis			*			
Stenotus binotatus			*			
Leptopterna dolobrata		*	*	*		
Notostira elongata						*
Stenodema calcarata			*	*	*	
Trignotylus ruficornis			*			
Heterotoma planicornis			*	*		
Macrotylus solitarius			*	*		
Plagiongnathus arbustorum		*		*		
Nabis flavommarginatus						*

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Coreus marginatus	*				*	*
Myrmus miriformis					*	
Eurygaster testudinaria		*	*		*	
Aelia acuminata		*			*	
Dolycoris baccarum		*	*			
Piezodorus lituratus					*	
Palomena prasina					*	*
Lepidoptera: Butterflies						
Ochlodes venata			*			
Pieris brassicae		*	*	*	*	
Pieris rapae				*		
Anthocharis cardamines	*					
Lycaena phlaeas						*
Polyommatus icarus				*		
Celastrina argiolus	*					
Vanessa atalanta					*	
Polygonia c-album	*					
Pararge aegeria	*					
Pyronia tithonus				*	*	
Maniola jurtina			*	*	*	
Diptera: Hoverflies						
Cheilosia albitarsis	*					
Cheilosia illustrata				*		
Cheilosia pagana					*	
Episyrphus balteatus			*			
Eristalis arbustorum				*		
Eristalis intricarius		*				
Eristalis pertinax	*					
Eristalis tenax	*	*			*	
Eumerus funeralis		*		*		
Eupeodes luniger				*		
Helophilus pendulus	*					*
Melanostoma mellinum	*	*		*		
Melanostoma scalare	*	*		*		
Myathropa florea		*		*		
Paragus haemorrhous				*		
Platycheirus albimanus	*					
Sphaerophoria scripta				*	*	
Syritta pipiens				*		
Syrphus ribesii				*		
Diptera: Larger Brachycera						
Chrysopils asiliformis				*		
Chrysopilus cristatus		*				
Rhagio scolopaceus		*		*		
Chloromyia formosa			*	*		
Sargus flavipes						*
Leptogaster cylindrica		*				
Diptera: Snail-killing Flies						
Ilione albiseta		*				*
Tetanocera arrogans						*

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Diptera: Picture-winged Flies						
Terellia colon		*				
Diptera: Tachinid Flies						
Eriothrix rufomaculata			*	*	*	*
Phasia obesa			*	*		
Hymenoptera: Aculeates						
Ants						
Lasius niger		*				
Social Wasps						
Dolichovespula media					*	
Vespula rufa						*
Vespula germanica					*	
Vespula vulgaris			*	*	*	*
Solitary Wasps						
Nysson spinosus		*				
Solitary Bees						
Hylaeus communis			*			
Hylaeus confusus			*	*		
Andrean nigroeanea		*				
Andrena haemorrhoa	*					
Andrena subopaca		*				
Halictus tumulorum					*	*
Lasioglossum albipes					*	
Lasioglossum calceatum	*	*	*			
Lasioglossum minutissimum				*		
Sphecodes geofrellus				*		
Osmia spinulosa			*			
Megachile willughbiella			*			
Nomada flava	*					
Social Bees						
Bombus lapidarius			*	*		
Bombus lucorum m				*		
*Bombus lucorum/terrestris^*	*		*			
Bombus pascuorum	*	*	*	*	*	
Bombus terrestris m				*		
Bombus vestalis				*		
Apis mellifera		*	*	*		
Coleoptera: Soldier Beetles						
Cantharis rustica		*				
Cantharis nigra			*			
Cantharus nigricans			*			
Rhagonycha fulva				*		
Malachite Beetles						
Malachius bipustulatus			*			
Ladybirds						
Propylea 14-punctata		*	*	*		
Coccinella 7-punctata			*	*	*	
Longhorn Beetles						
Rutpela maculata			*	*		

1.4.1 Middle Meadow

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Neuroptera: Lacewings						
Chrysopa perla			*			
Chrysoperla carnea				*		
Odonata:Dragonflies						
Aeshna mixta					*	
Orthoptera: Bush Crickets						
Conocephalus discolor						*
Leptophyes punctatissima			*			
Grasshoppers						
Chorthippus brunneus				*	*	*
Chorthippus parallelus			*	*	*	*
Dermaptera: Earwigs						
Forficula auricularia					*	
Heteroptera: True Bugs						
Dicyphus epilobii				*		
Closterotomus norvegicus			*			
Apolygus lucorum			*			
Apolygus spinolae			*			
Stenotus binotatus			*	*		
Leptopterna dolobrata		*	*			
Stenodema calcarata			*	*		
Trignotylus ruficornis			*			
Heterotoma planicornis			*			
Macrotylus solitarius			*	*		
Plagiognathus arbustorum		*	*	*		
Coreus marginatus	*	*	*	*	*	*
Rhopalus subrufus			*			
Eurygaster testudinaria				*	*	
Aelia acuminata				*	*	*
Podops inuncta						*
Dolycoris baccarum		*				
Zicrona caerulea				*		
Lepidoptera: Butterflies						
Thymelicus sylvestris			*			
Pieris brassicae	*			*	*	
Pieris rapae					*	*
Anthocharis cardamines	*					
Polyommatus icarus					*	
Celastrina argiolus	*					
Vanessa atalanta						*
Pararge aegeria					*	
Pyronia tithonus				*		
Maniola jurtina			*	*		
Trichoptera: Caddisflies						
Limnephilus lunulatus		*				
Diptera: Hoverflies						
Episyrphus balteatus		*	*			
Eristalis pertinax	*					
Eristalis tenax	*					

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Eupeodes corollae					*	
Helophilus pendulus	*					
Melanostoma mellinum	*			*		
Melanostoma scalare	*			*		*
Platycheirus rosarum		*				
Scaeva pyraustri			*			
Sphaerophoria scripta				*	*	
Syritta pipiens			*	*		
Diptera: Larger Brachycera *Sargus flavipes*					*	
Machimus cingulatus			*			
Diptera: Snail-killing Flies *Ilione albiseta*		*				*
Diptera: Picture-winged Flies *Chaetostomella cylindrica*				*		
Diptera: Conopid Flies *Sicus ferrugineus*			*	*		
Diptera: Tachinid Flies *Eriothrix rufomaculata*				*	*	
Phasia obesa				*		
Hymenoptera: Aculeates Ants *Lasius niger*				*		
Social Wasps *Vespula vulgaris*				*	*	*
Solitary Bees *Andrena haemorrhoa*	*					
Andrena flavipes			*			
Andrena subopaca		*	*	*		
Andrena dorsata	*					
Halictus tumulorum			*	*	*	
Lasioglossum calceatum		*	*		*	
Lasioglossum minutissimum				*		
Lasioglossum morio			*	*		
Osmia leaiana			*			
Social Bees *Bombus lucorum/terrestris^*				*		
Bombus pascuorum		*		*	*	
Apis mellifera	*	*	*		*	
Coleoptera: Soldier Beetles *Rhagonycha fulva*			*	*		
Malachite Beetles *Malachius bipustulatus*		*				
Ladybirds *Propylea 14-punctata*			*			
Harmonia axyridis					*	*
Coccinella 7-punctata			*	*		
Tytthaspis 16-punctata				*		
Subcoccinella 24-punctata			*			
Longhorn Beetles *Rutpela maculata*				*		

1.4.1 North Meadow

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Neuroptera: Lacewings						
Chrysoperla carnea			*	*		
Odonata:Dragonflies						
Aeshna mixta					*	
Sympetrum striolatum						*
Orthoptera: Bush Crickets						
Conocephalus discolor			*	*	*	*
Leptophyes punctatissima			*	*		
Grasshoppers						
Chorthippus brunneus				*	*	
Chorthippus parallelus			*	*	*	
Heteroptera: True Bugs						
Closterotomus norvegicus			*			
Apolygus lucorum				*		*
Stenotus binotatus			*			
Leptopterna dolobrata			*			
Stenodema calcarata			*			
Trignotylus ruficornis		*	*			
Plagiognathus arbustorum			*	*		
Macrotylus solitarius					*	
Coreus marginatus			*	*	*	*
Eurygaster testudinaria					*	*
Palomena prasina						*
Lepidoptera: Butterflies						
Ochlodes venata			*			
Pieris brassicae	*	*	*	*	*	*
Pieris rapae			*	*	*	
Neozephyrus quercus				*		
Celastrina argiolus		*				
Inachis io			*	*		
Pararge aegeria		*				
Pyronia tithonus				*		
Maniola jurtina			*	*	*	
Diptera: Hoverflies						
Cheilosia pagana					*	
Episyrphus balteatus		*		*	*	
Eristalis pertinax	*					
Eristalis tenax	*					
Eumerus funeralis					*	
Helophilus pendulus	*					
Melanostoma mellinum	*			*		
Melanostoma scalare	*			*	*	*
Platycheirus rosarum		*				
Sphaerophoria scripta				*	*	
Syritta pipiens			*			
Diptera: Larger Brachycera						
Chrysopilus cristatus			*	*		

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Diptera: Snail-killing Flies *Ilione albiseta*						*
Tetanocera arrogans				*		
Diptera: Picture-winged Flies *Xyphosia miliaria*					*	
Diptera: Tachinid Flies *Phasia obesa*				*		
Hymenoptera: Aculeates Social Wasps *Vespula germanica*					*	*
Vespula vulgaris					*	*
Solitary Bees *Hylaeus communis*			*			
Andrena subopaca				*		
Halictus tumulorum				*		
Lasioglossum calceatum					*	
Lasioglossum minutissimum				*		
Osmia bicornis	*					
Nomada flavoguttata		*				
Social Bees *Bombus pascuorum*				*	*	*
Bombus terrestris m			*			
Apis mellifera			*			
Coleoptera: Soldier Beetles *Cantharus nigricans*			*			
Rhagonycha fulva			*	*		
Malachite Beetles *Malachius bipustulatus*		*				
Ladybirds *Propylea 14-punctata*		*	*	*		
Coccinella 7-punctata			*	*		
Subcoccinella 24-punctata			*			
Longhorn Beetles *Grammoptera ruficornis*		*				
Rutpela maculata			*			

Bombus lucorum/terrestris^ = workers only seen, these two species can only be separated when queens or males are seen.
Bombus lucorum m, *Bombus terrestris* m - males seen for identification.

The Woodland

Major forage resources (nectar and pollen) were limited throughout the survey period, during the first two months of the survey period Bluebell (*Endymion non-scriptus*), Green Alkanet (*Pentaglossis sempervirens*) and Foxglove were the dominant sources. Bramble (*Rubus fruticosus* agg.) and Foxglove dominated during the middle two months and by the end of the survey there were no major forage resources available.
The woodland at present is rather too shady and has too much understorey to be of great value to invertebrates in general, the lack of ground flora through shading is one driving force of this. However, with the changes taking place, under the direction of the management plan, to implement glade creation and the resurrection of a coppice regime things should improve greatly for invertebrates over the coming years and further survey will hopefully provide evidence for this.

1.4.1 North Woodland

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Mecoptera: Scorpion flies *Panorpa communis*					*	
Neuroptera: Lacewings *Chrysoperla carnea*			*			
Odonata: Dragonflies *Cordulegaster boltonii*					*	
Orthoptera: Bush Crickets *Leptophyes punctatissima*				*		
Heteroptera: True Bugs *Heterotoma planicornis*			*			
Psallus quercus		*				
Anthocoris nemorum			*			
Lepidoptera: Butterflies *Pieris napi*	*					
Pararge aegeria					*	
Pyronia tithonus				*		
Maniola jurtina			*			
Diptera: Hoverflies *Baccha elongata*	*					
Dasysyrphus albostriatus		*				
Eristalis tenax			*			
Helophilus pendulus					*	
Melanostoma scalare	*					
Myathropa florea	*	*	*	*		
Platycheirus albimanus	*	*				
Volucella pellucens			*			
Diptera: Larger Brachycera *Chrysopilus cristatus*				*		
Hymenoptera: Aculeates Social Wasps *Vespula vulgaris*				*	*	*
Solitary Bees *Hylaeus communis*				*		
Andrena subopaca			*			
Andrena dorsata	*					
Osmia bicornis	*					

Group/ Date	23 Apr	19 May	25 Jun	21 Jul	20 Aug	14 Sept
Nomada flava	*					
Social Bees						
Bombus hypnorum			*			
Bombus terrestris m			*			
Bombus vestalis			*			
Apis mellifera			*			

1.4.1 Middle Woodland

Group/ Date	23 Apr	19 May	25 Jun	21 Jul	20 Aug	14 Sept
Orthoptera: Bush Crickets						
Leptophyes punctatissima		*				
Heteroptera: True Bugs						
Apolygus lucorum				*		
Lepidoptera: Butterflies						
Pieris brassicae	*					
Vanessa atalanta			*			
Pararge aegeria					*	
Maniola jurtina				*		
Diptera: Hoverflies						
Epistrophe eligans	*					
Episyrphus balteatus			*			
Eupeodes corollae		*				
Melanostoma scalare	*					
Myathropa florea				*	*	*
Platycheirus albimanus				*		
Sphaerophoria scripta				*		
Syrphus ribesii				*		
Syrphus vitripennis			*			
Hymenoptera: Aculeates						
Solitary Wasps						
Trypoxylon figulus				*		
Ectemnius cephalotes				*		
Social Wasps						
Vespa crabro			*			
Vespula vulgaris					*	*
Solitary Bees						
Hylaeus confusus			*			
Andrena haemorrhoa	*		*			
Andrena subopaca		*				
Nomada flava	*					
Social Bees						
Bombus pascuorum				*		
Bombus pratorum		*				
Bombus sylvestris		*				
Bombus vestalis			*			
Apis mellifera			*	*		
Coleoptera: Longhorn Beetles						
Rutpela maculata				*		

1.4.1 South Woodland

Group/ Date	**23 Apr**	**19 May**	**25 Jun**	**21 Jul**	**20 Aug**	**14 Sept**
Lepidoptera: Butterflies						
Pieris brassicae						*
Pieris rapae			*	*	*	
Celastrina argiolus		*				
Diptera: Hoverflies						
Episyrphus balteatus			*			
Myathropa florea				*	*	
Platycheirus albimanus	*					
Syrphus torvus			*			
Hymenoptera: Aculeates						
Social Wasps						
Vespula germanica					*	*
Vespula vulgaris				*	*	*
Solitary Bees						
Andrena haemorrhoa		*				
Andrena flavipes			*			
Andrena subopaca		*				
Osmia bicornis	*	*				
Social Bees						
Bombus hortorum		*	*			
Bombus jonellus		*				
Bombus pascuorum	*	*		*		
Bombus pratorum	*					
Apis mellifera	*	*	*	*		

Bombus lucorum/terrestris^ = workers only seen, these two species can only be separated when queens or males are seen. *Bombus lucorum* m, *Bombus terrestris* m - males seen for identification.

1.5 Additional Species Recorded

While invertebrates were the primary survey group, species from other orders were to be noted as they were encountered.

A single Common Lizard (*Zootoca vivipara*) was recorded in the South Meadow on 14th September.

1.6 Discussion

Before any meaningful conclusions can be drawn from the survey data it must be borne in mind that small, island sites like this will always have low populations and numbers of species present than those which are connected to, or part of a wider landscape scale habitat or series of habitats. It must be borne in mind that there will also always be a dominance of more common, widespread and generalist species present which often range over great distances, have more than one generation per year and, due to their often generalist habitat requirements are able to colonise small sites relatively easily.

A secondary consideration must also be the weather during the survey period and any extremes of weather prior to the survey being undertaken. In this instance, the winter of 2019/20 was the wettest on record, while April and May 2020 were two of the warmest and driest on record. The remainder of the summer 2020 was generally average with some periods of unsettled weather and on occasion in June and August extreme heat for a few days. The wet winter followed a previous wet winter and summer of drought in 2019 and the knock-on effects of these weather events leads to a significant effect on the range of species recorded. However, a number of positives can be gained from the survey with the numbers and range of species which were recorded as already present.
Table 1 shows the number of species of each group recorded in both the meadow and the woodland and the total combined against the number of currently recognised British species.

Table 1
Number of species recorded against number of British species

Survey Group	Meadow	Woodland	Total No. combined	No. of British sp
Mecoptera; Scorpion Flies	1	1	1	3
Neuroptera; Lacewings	2	1	2	46
Odonata; Dragonflies	3	0	3	23
Orthoptera; Bush Crickets	2	1	2	11
Grasshoppers	3	0	3	11
Dermaptera; Earwigs	1	0	1	4
Heteroptera; True Bugs	25	4	27	488*
Trichoptera; Caddisflies	1	0	1	199
Lepidoptera; Butterflies	15	8	16	59
Diptera; Hoverflies	22	15	28	265
Larger Brachycera	7	1	7	159
Snail-killing Flies	2	0	2	67
Picture-winged Flies	3	0	2	73
Conopid Flies	1	0	1	24
Tachinid Flies	2	0	2	247
Hymenoptera; Ants	1	0	1	53
Social Wasps	4	3	5	9
Solitary Wasps	1	2	3	126
Solitary Bees	18	8	18	224
Social Bees	6	9	10	23
Coleoptera; Soldier Beetles	4	0	4	25
Malachite Beetles	1	0	1	2
Ladybirds	5	0	5	46
Longhorn Beetles	2	1	2	67

*Heteroptera; True Bugs, this total is for terrestrial species only.

1.6.1 Notes on the Insect Groups Recorded

Mecoptera and Neuroptera
Two small insect groups of which few species are recorded on any site, the three species recorded here are all common and widespread and to be expected. Further survey over time could well see a number of other lacewings being recorded, particularly if nocturnal moth-trapping is undertaken.

Odonata
The presence of only three species is perhaps not surprising given the lack of permanent water of any great depth on site. All three species are wide ranging as adults, and only the Golden-ringed Dragonfly (*Cordulegatser boltonii*) preferring to ovisposit in running water. All odonata species range far and wide from their breeding areas, but their presence in the survey suggests there is ample insect prey to maintain them on site.

Orthoptera
Both bush cricket species recorded are typical inhabitants of long and often damp grassland (Long-winged Conehead *Conocephalus discolor*) and scrubby grassland and woodland edge (Speckled Bush Cricket *Leptophyes punctatissima*). Both would have been expected to be present given the habitats available. Similarly, the three grasshopper species recorded are all grassland specialists with no particular grassland type requirements, and all would have been expected to occur. It is possible that Dark Bush Cricket (*Pholidoptera griseoaptera*) and Oak Bush Cricket (*Meconema thalassinum*) will yet be found in the woodland and scrub. A continuation of the cutting/grazing regime of the grassland and retention of scrub edge should ensure all these species persist on site.

Trichoptera
Only a single species of Caddisfly was recorded, this is a common and widespread species which can be found in almost any habitat and will even breed in stagnant and slightly polluted water bodies. The absence of permanent water on site will dramatically reduce the number of species likely to be recorded here.

Heteroptera
All of the Heteroptera (true bugs) species recorded can be considered to be present in most habitats, almost all species recorded feed on plant sap, with a few exceptions which feed on other invertebrates - e.g. the Blue Shieldbug *Zicrona caerulea* which eats flea-beetles . Numbers of all species recorded were notably low and this is most likely a reflection on the mild wet winter preventing proper hibernation and the drought conditions of previous summers, and the period April-May during this survey, reducing the available plant sap for many species to feed on. With only 27 of 488 terrestrial species recorded there is still scope for a large number of other species to be recorded.

Lepidoptera
The sixteen butterflies species were typical of any kind of habitat, with the exception of the single Purple Hairstreak recorded, none are tied to grassland habitat and without thorough searches for the caterpillars it is not possible to report which are breeding on site. The Purple Hairstreak breeds solely on Oak and the specimen seen in the North Meadow is likely to have come from the neighbouring woodland. There is still scope of a few more species to be recorded through further survey.

Diptera - Hoverflies
A good selection of hoverflies was recorded but they were all largely generalist species of a broad range of habitats. There is a high likelihood that a number of other species could be recorded.

Diptera - Larger Brachycera (Snipeflies, Horseflies, Soldierflies, Robberflies and Beeflies)
Amongst the larger brachycera the presence of *Sargus flavipes* was the most surprising, this is a species of old grassland and one which I encounter infrequently during surveys. They have a

preference for damp/wet grassland sites, the species flies late in the summer and the larvae develop in cow dung, so the introduction of cattle grazing in late summer is important for this species. All other species recorded are largely species of generalist habitats, The bulk of the Larger Brachycera are wetland specialists and the recent drought conditions and the drying of the meadow in summer will limit the number of species likely to be recorded in the future.

Diptera - Snail-killing Flies
Almost all species of snail-killing fly require aquatic snails as hosts for larval development, so the drying of the site, along with many others in the south in the past few years is quite detrimental to this group. The two species recorded are amongst the most widespread of the group and have no specific aquatic snail hosts. Further survey could reveal more species but the regular drying of the site will limit the potential number considerably. Maintaining high water levels would be essential to maintaining populations of their mollusc hosts and the presence of a healthy population of snail-killing flies.

Diptera - Picture-winged Flies
All of the picture-winged flies develop inside plant stems and flower/seed heads. Summer grazing (and wholesale mowing) is hugely detrimental to this group in removing their breeding and overwintering sites and forage resources for the adults. Two of the three species recorded develop in the flowerheads of Black Knapweed (*Chaetostomella cylindrica* and *Terellia colon*) which was abundant on site and so not unexpected while the third species *Xyphosia miliaria* develops in the stems of Greater Burdock (*Arctium lappa)*. It is likely that other species could still be recorded with further survey.

Diptera - Conopid Flies
The presence of conopid flies is usually a good indicator of a strong presence of their host solitary and social bees and wasps and an abundance of forage resources. *Sicus ferrugineus*, recorded here is the most common and widespread species and can be found in most habitats. There are one or two other species of conopid fly which could yet be found in the grassland, and one in the woodland due to the presence of a variety of potential host species being present.

Diptera - Tachinid Flies
The two species of tachinid fly recorded are all common and widespread and can be found in most habitats, although *Eriothrix rufomaculata* is no longer as abundant as it was ten years ago (*pers obs*). Both species recorded parasitise either heteropteran bugs or the caterpillars of moths. There is the potential for a large number of other species to occur.

Hymenoptera - Ants, Bees and Wasps
The hymenoptera were well represented and this can be accounted for by the varied nature of the sward - a mosaic of short, tall, dense and sparse across the whole site. There are also areas of bare ground and standing dead wood with beetle exit holes which are required for breeding by a significant number of species. Finally the presence of forage resources available throughout the period from April to September (a result of late summer grazing). Bare ground for breeding will be utilised by different species of bee and wasp - facing all points of the compass, and will vary between species requiring vertical slopes and those requiring flat ground. All of these requirements are currently catered for, the abundant sparse vegetation in the drier parts of the grassland are hugely important. Areas of standing dead wood on the eastern boundary of the grassland, and in the woodland provide an important range of nesting habitat for solitary species. Extra provision could be made by drilling holes tot he depth of a drill-bit in cut dead wood in the woodland ranging in diameter from 2mm-10mm to cater for a range of species.

Social Wasps
The five species of social wasp were recorded and this represents over half of the British species, they

could easily be found feeding on site both for nectar and pollen and live insect prey for their nests. No nests were found on site, but the presence of adults on site indicates an abundance of insect prey to provision them and suitable nest sites nearby.

Solitary Wasps
Solitary wasps were rather poorly represented considering the available habitats present and the relative abundance of nectar and pollen and potential invertebrate prey. All require insect prey to provision their nests and nectar and pollen as adults for daily activity. It is likely that many more species could be recorded.

Solitary Bees
The eighteen species of solitary bee recorded all require an abundance of forage resources for food and nest provisioning, plus bare ground or dead wood to nest in. Three of the species *Nomada flava*, *N. flavoguttata* and *Sphecodes geofrellus* are cuckoos in the nests of other ground nesting solitary bees. All species recorded are typical of most habitats and all can be considered common and widespread and can generally be found throughout the summer. All require either bare ground or standing dead wood for nesting, and forage resources throughout the period March to October. It is likely that further species could be recorded.

Social Bees
The bumblebee species recorded can all be considered common and widespread in most habitats and all could have been expected to be present, but have all suffered declines in the past fifteen years or so. Two of those recorded (*Bombus sylvestris* and *B. vestalis*) are cuckoo species taking over the nests of *B. pratorum* and *B. terrestris* respectively (Pinchen 2006). The presence of these cuckoos suggest that populations of their hosts are strong, while low numbers of many of the other bumblebee species seen during the survey points to further evidence of their long-term declines (*pers obs*).

Coleoptera - Soldier Beetles
All four of the soldier beetle species recorded are amongst our most common and widespread species and can be found in almost any habitat. Other species are likely to be present.

Ladybirds
All of the ladybird species recorded can be found in most habitats. Three of the species recorded feed on aphids in both the adult and larval stages, while the Sixteen-spot Ladybird *Tytthaspis 16-guttata* feeds on pollen, nectar and fungi and the Twenty-four spot Ladybird *Subcoccinella 24-punctata* feeds on mould in the sward thatch layer.

Conclusion
Overall, the range and variety of species recorded is very satisfying and presents a picture of the site being rich in insect diversity. On the whole, despite the relatively small size of the site, and its isolation from other species rich sites there is a good mix of habitats and insect species present. If further survey were undertaken it is highly likely that a greater number of insect species could be recorded.

1.7 Recommendations for Further Survey

There are three options available with regard to further survey of this reserve;

Option 1 To re-survey annually

This enables rapid monitoring of population changes to be made and also allows a fuller species list to be obtained. Annual survey is particularly useful when weather conditions have been adverse prior to and/or during the first survey season. Species recorded in the first year after or during a run of poor weather are often the more common, widespread and generalist species which are typically abundant on any site and capable of persisting at relatively low densities. Species which by their very nature are more scarce on any given site usually occur in very low numbers and densities and take far longer to recover population declines brought about by adverse weather.
Annual monitoring enables further regular opportunities to record rare species which may only be recorded once or twice, to enable them to be confirmed as breeding on any given site, or to suggest that perhaps the single specimen was simply a visitor or vagrant. Opportunities for recording other scarce or rare species are more likely through annual survey. Annual survey also allows new arrivals to the site to be monitored in their colonisation.
Annual monitoring is also valuable when major management changes are being incorporated, and enables species numbers and populations to be assessed during the management operations to ensure that such management is not having a detrimental affect on populations.

Annual survey should be continued for a minimum of three years and a maximum of five years, after which survey should change to once every three years.

Option 2 To re-survey at three year intervals (third year survey)

This enables population changes to be monitored at short intervals to ensure that management changes are not detrimental to the bulk of the species present. Third year monitoring is useful to confirm the continued presence of scarce or rarer species and to monitor any recent arrivals between surveys. Third year survey also ensures that where scarce or rare species are present in low numbers and can only be identified using voucher specimens, that odd specimens taken will not be detrimental to the overall population. There is a danger that annual survey of low-level populations may have an adverse affect on them.
Third year monitoring is useful where only minimal management changes are undertaken and can determine whether management works need to be reviewed, changed or amended before populations of scarce species greatly decline or are lost.
If this option were chosen the next survey year should be 2023.

Option 3 To re-survey at five year intervals (fifth year survey)

Fifth year survey is useful only where minor management changes are being implemented and the site is relatively stable as a habitat. However, due to the annual life cycles of the majority of insect groups this level and timespan of monitoring can often be too long to notice if populations of certain species are declining and management needs revising to ensure their continued presence on the site.
Fifth year survey is only recommended in exceptional cases.
If this option were chosen the next survey year should be 2025.

In all instances the range of insect groups surveyed should remain the same to provide consistency.

1.8 Acknowledgements

I would like to thank The Friends of Ballard Water Meadow and New Milton Town Council for commissioning and funding the survey. I would also like to thank Bob Lord for useful discussions regarding the site during the survey.

1.9 References

The following references were used for identification of species recorded during the survey and information relating the site.

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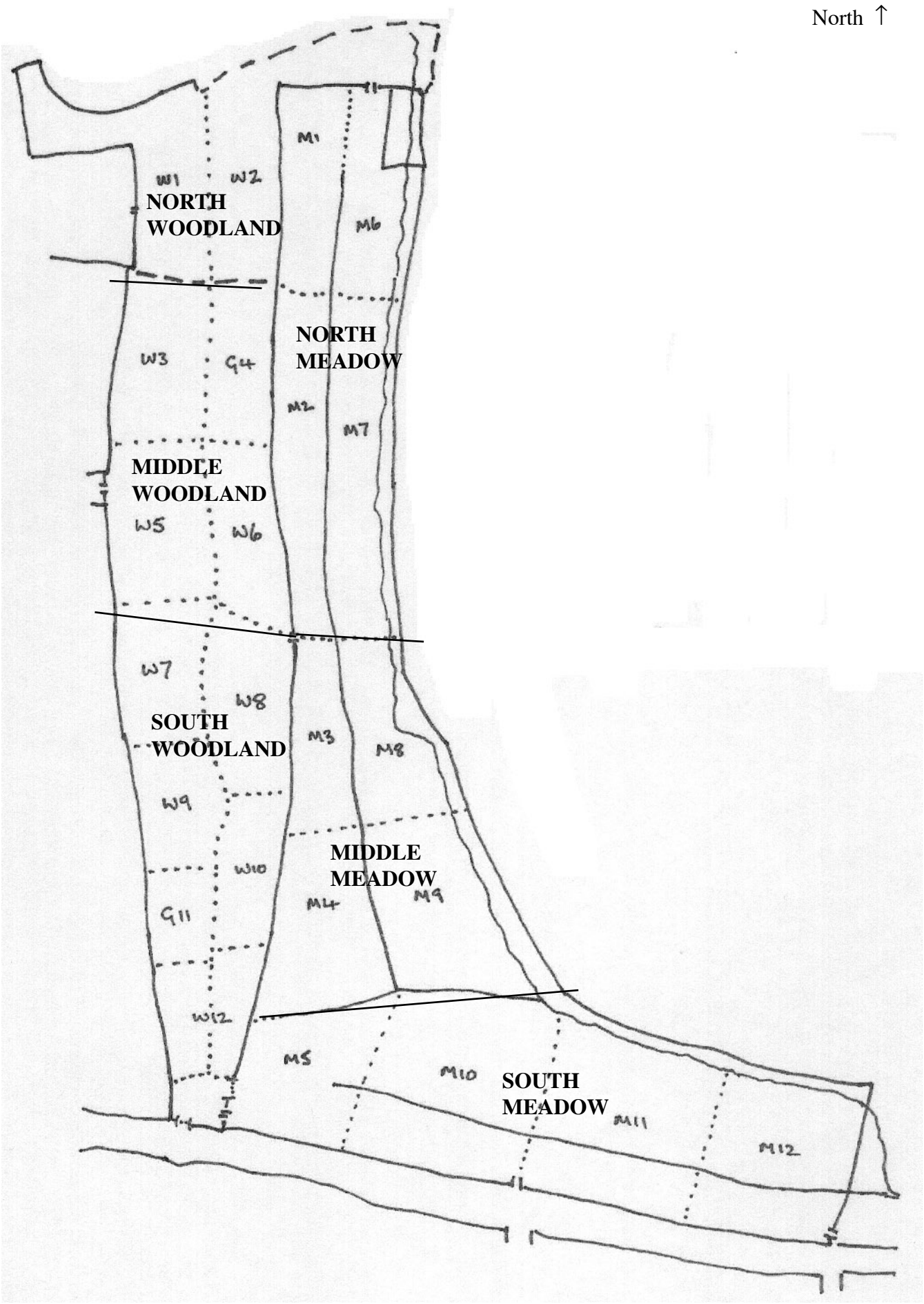
Map showing all sections covered by the survey



Appendices

Appendix 1 All species recorded in the meadow

The following is a list of all the species recorded in the North, Middle and South Meadows.

Mecoptera: Scorpion flies
Panorpa communis
Neuroptera: Lacewings
Chrysopa perla
Chrysoperla carnea
Odonata:Dragonflies
Brachytron pratense
Aehsna mixta
Sympetrum striolatum
Orthoptera: Bush Crickets
Conocephalus discolor
Leptophyes punctatissima
Grasshoppers
Chorthippus albomarginatus
Chorthippus brunneus
Chorthippus parallelus
Dermaptera: Earwigs
Forficula auricularia
Heteroptera: True Bugs
Dicyphus epilobii
Closterotomus norvegicus
Apolygus lucorum
Apolygus spinolae
Lygcorius pabulinus
Lygus rugulipennis
Stenotus binotatus
Leptopterna dolobrata
Notostira elongata
Stenodema calcarata
Trignotylus ruficornis
Heterotoma planicornis
Macrotylus solitarius
Plagiongnathus arbustorum
Nabis flavommarginatus
Coreus marginatus
Rhopalus subrufus
Myrmus miriformis
Eurygaster testudinaria
Aelia acuminata
Podops inuncta
Dolycoris baccarum
Piezodorus lituratus
Palomena prasina
Zicrona caerulea
Lepidoptera: Butterflies
Ochlodes venata
Thymelicus sylvestris
Pieris brassicae
Pieris rapae
Anthocharis cardamines
Lycaena phlaeas
Neozephyrus quercus
Polyommatus icarus
Celastrina argiolus
Vanessa atalanta
Inachis io
Polygonia c-album
Pararge aegeria
Pyronia tithonus
Maniola jurtina
Trichoptera: Caddisflies
Limnephilus lunultatus
Diptera: Hoverflies
Cheilosia albitarsis
Cheilosia illustrata
Cheilosia pagana
Episyrphus balteatus
Eristalis arbustorum
Eristalis intricarius
Eristalis pertinax
Eristalis tenax
Eumerus funeralis
Eupeodes corollae
Eupeodes luniger
Helophilus pendulus
Melanostoma mellinum
Melanostoma scalare
Myathropa florea
Paragus haemorrhous
Platycheirus albimanus
Platycheirus rosarum
Scaeva pyraustri
Sphaerophoria scripta
Syritta pipiens
Syrphus ribesii
Diptera: Larger Brachycera
Chrysopils asiliformis
Chrysopilus cristatus
Rhagio scolopaceus
Chloromyia formosa
Sargus flavipes
Machimus cingulatus
Leptogaster cylindrica
Diptera: Snail-killing Flies
Ilione albiseta
Tetanocera arrogans
Diptera: Picture-winged Flies
Chaetostomella cylindrica
Terellia colon
Xyphosia miliaria
Diptera: Conopid Flies
Sicus ferrugineus
Diptera: Tachinid Flies
Eriothrix rufomaculata
Phasia obesa
Hymenoptera: Aculeates
Ants
Lasius niger
Social Wasps
Dolichovespula media
Vespula rufa
Vespula germanica
Vespula vulgaris
Solitary Wasps
Nysson spinosus
Solitary Bees
Hylaeus communis
Hylaeus confusus
Andrean nigroeanea
Andrena haemorrhoa
Andrena flavipes
Andrena subopaca
Andrena dorsata
Halictus tumulorum
Lasioglossum albipes
Lasioglossum calceatum
Lasioglossum minutissimum
Lasioglossum morio
Sphecodes geofrellus
Osmia leaiana
Osmia spinulosa
Megachile willughbiella
Nomada flava
Nomada flavoguttata
Social Bees
Bombus lapidarius
Bombus lucorum
Bombus pascuorum
Bombus terrestris
Bombus vestalis
Apis mellifera
Coleoptera: Soldier Beetles
Rhagonycha fulva
Cantharis rustica

Cantharis nigra
Cantharus nigricans
Rhagonycha fulva
Malachite Beetles
Malachius bipustulatus
Ladybirds
Propylea 14-punctata
Harmonia axyridis
Coccinella 7-punctata
Tytthaspis 16-punctata
Subcoccinella 24-punctata
Longhorn Beetles
Grammoptera ruficornis
Rutpela maculata

Appendix 2 All species recorded in the woodland

The following is a list of all the species recorded in the North, Middle and South woodlands.

Mecoptera: Scorpion flies
Panorpa communis
Neuroptera: Lacewings
Chrysoperla carnea
Orthoptera: Bush Crickets
Leptophyes punctatissima
Heteroptera: True Bugs
Apolygus lucorum
Heterotoma planicornis
Psallus quercus
Anthocoris nemorum
Lepidoptera: Butterflies
Pieris brassicae
Pieris napi
Pieris rapae
Celastrina argiolus
Vanessa atalanta
Pararge aegeria
Pyronia tithonus
Maniola jurtina
Diptera: Hoverflies
Baccha elongata
Dasysyrphus albostriatus
Epistrophe eligans
Episyrphus balteatus
Eristalis tenax
Eupeodes corollae
Helophilus pendulus
Melanostoma scalare
Myathropa florea
Platycheirus albimanus
Sphaerophoria scripta
Syrphus ribesii
Syrphus torvus
Syrphus vitrepennis
Volucella pellucens
Diptera: Larger Brachycera
Chrysopilus cristatus
Hymenoptera: Aculeates
Solitary Wasps
Trypoxylon figulus
Ectemnius cephalotes
Social Wasps
Vespa crabro
Vespula germanica
Vespula vulgaris
Solitary Bees
Hylaeus communis
Hylaeus confusus
Andrena haemorrhoa
Andrena flavipes
Andrena subopaca
Andrena dorsata
Osmia bicornis
Nomada flava
Social Bees
Bombus hortorum
Bombus hypnorum
Bombus jonellus
Bombus pascuorum
Bombus pratorum
Bombus sylvestris
Bombus terrestris
Bombus vestalis
Apis mellifera
Coleoptera: Longhorn Beetles
Rutpela maculata

Appendix 3 All species recorded combined

The following is a list of all the species recorded across the whole site.

Mecoptera: Scorpion flies
Panorpa communis
Neuroptera: Lacewings
Chrysopa perla
Chrysoperla carnea
Odonata:Dragonflies
Brachytron pratense
Aehsna mixta
Cordulegatser boltonii
Sympetrum striolatum
Orthoptera: Bush Crickets
Conocephalus discolor
Leptophyes punctatissima
Grasshoppers
Chorthippus albomarginatus
Chorthippus brunneus
Chorthippus parallelus
Dermaptera; Earwigs
Forficula auricularia
Heteroptera: True Bugs
Dicyphus epilobii
Closterotomus norvegicus
Apolygus lucorum
Apolygus spinolae
Lygcorius pabulinus
Lygus rugulipennis
Stenotus binotatus
Leptopterna dolobrata
Notostira elongata
Stenodema calcarata
Trignotylus ruficornis
Heterotoma planicornis
Macrotylus solitarius
Plagiongnathus arbustorum
Psallus quercus
Nabis flavommarginatus
Anthocoris nemorum
Coreus marginatus
Rhopalus subrufus
Myrmus miriformis
Eurygaster testudinaria
Aelia acuminata
Podops inuncta
Dolycoris baccarum
Piezodorus lituratus
Palomena prasina
Zicrona caerulea

Lepidoptera: Butterflies
Ochlodes venata
Thymelicus sylvestris
Pieris brassicae
Pieris napi
Pieris rapae
Anthocharis cardamines
Lycaena phlaeas
Neozephyrus quercus
Polyommatus icarus
Celastrina argiolus
Vanessa atalanta
Inachis io
Polygonia c-album
Pararge aegeria
Pyronia tithonus
Maniola jurtina
Trichoptera; Caddisflies
Limnephilus lunultatus
Diptera: Hoverflies
Baccha elongata
Cheilosia albitarsis
Cheilosia illustrata
Cheilosia pagana
Dasysyrphus albostriatus
Epistrophe eligans
Episyrphus balteatus
Eristalis arbustorum
Eristalis intricarius
Eristalis pertinax
Eristalis tenax
Eumerus funeralis
Eupeodes corollae
Eupeodes luniger
Helophilus pendulus
Melanostoma mellinum
Melanostoma scalare
Myathropa florea
Paragus haemorrhous
Platycheirus albimanus
Platycheirus rosarum
Scaeva pyraustri
Sphaerophoria scripta
Syritta pipiens
Syrphus ribesii
Syrphus torvus
Syrphus vitrepennis
Volucella pellucens

Diptera: Larger Brachycera
Chrysopils asiliformis
Chrysopilus cristatus
Rhagio scolopaceus
Chloromyia formosa
Sargus flavipes
Machimus cingulatus
Leptogaster cylindrica
Diptera: Snail-killing Flies
Ilione albiseta
Tetanocera arrogans
Diptera: Picture-winged Flies
Chaetostomella cylindrica
Terellia colon
Xyphosia miliaria
Diptera: Conopid Flies
Sicus ferrugineus
Diptera: Tachinid Flies
Eriothrix rufomaculata
Phasia obesa
Hymenoptera: Aculeates
Ants
Lasius niger
Social Wasps
Vespa crabro
Dolichovespula media
Vespula rufa
Vespula germanica
Vespula vulgaris
Solitary Wasps
Nysson spinosus
Trypoxylon figulus
Ectemnius cephalotes
Solitary Bees
Hylaeus communis
Hylaeus confusus
Andrean nigroeanea
Andrena haemorrhoa
Andrena flavipes
Andrena subopaca
Andrena dorsata
Halictus tumulorum
Lasioglossum albipes
Lasioglossum calceatum
Lasioglossum minutissimum
Lasioglossum morio
Sphecodes geofrellus
Osmia leaiana

Osmia spinulosa
Megachile willughbiella
Nomada flava
Nomada flavoguttata
Social Bees
Bombus hortorum
Bombus hypnorum
Bombus jonellus
Bombus lapidarius
Bombus lucorum
Bombus pascuorum
Bombus sylvestris
Bombus terrestris
Bombus vestalis
Apis mellifera
Coleoptera: Soldier Beetles
Rhagonycha fulva
Cantharis rustica
Cantharis nigra
Cantharus nigricans
Rhagonycha fulva
Malachite Beetles
Malachius bipustulatus
Ladybirds
Propylea 14-punctata
Harmonia axyridis
Coccinella 7-punctata
Tytthaspis 16-punctata
Subcoccinella 24-punctata
Longhorn Beetles
Grammoptera ruficornis
Rutpela maculata