ECOSA
Ecological Survey & Assessment Limited

HAVANT THICKET WINTER WATER STORAGE RESERVOIR

ECOLOGICAL SURVEYS 2005 & 2006

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Invertebrate, Bird, Mammal, Reptile, Amphibian and Botanical Surveys
Management Plans • Habitat Appraisal • Marine • NVC • EcIA

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HAVANT THICKET WINTER WATER STORAGE RESERVOIR

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1.0 INTRODUCTION

1.1 Background to Development

Ecological Survey & Assessment Limited (ECOSA) have been contracted by Portsmouth Water Limited (Portsmouth Water) to carry out ecological surveys of their land at Havant Thicket, Rowlands Castle, Hampshire. The site is centered on National Grid Reference (NGR): SU 716 098.

The ecological surveys are required as a result of Portsmouth Water's plan to promote and construct a winter storage reservoir for public water supply purposes on company owned land located at Havant Thicket. The reservoir is expected (depending on the final design) to hold approximately 8.7 million cubic metres of raw water pumped from Portsmouth Water's existing sources at Havant and Bedhampton Springs. The reservoir will be approximately one mile long and half a mile wide. Water from the reservoir will be treated at the existing Farlington Water Treatment Works on Portsdown Hill, Cosham, although it may be necessary to add some pre-treatment processes at Farlington or on an alternative site.

The legislation which is relevant to the protected species discussed within this report is provided in Appendix 1.

1.2 Site Setting

The site consists of an area of approximaltey 160 hectares of open grassland and woodland with hedgerows and ditches. To the south of the site lies 'The Avenue' comprising an area of designated ancient semi-natural woodland. Middle Clearing is an area of designated ancient semi-natural woodland located to the west of the site; however, this woodland has been replanted although it is uncertain when this replanting occurred. Figure 1 shows the names of the areas of the site used throughout this report.

The site is located within a generally suburban setting with the towns of Havant and Rowlands Castle to the east, south and west. George Staunton Country Park is located to the south of the site and comprising of broad-leaved woodland of Havant Thicket. To the east lies Hammond's Lands Copse. To the north, the site is bounded by Havant Thicket, a designated ancient semi-natural woodland managed by the Forestry Commission.

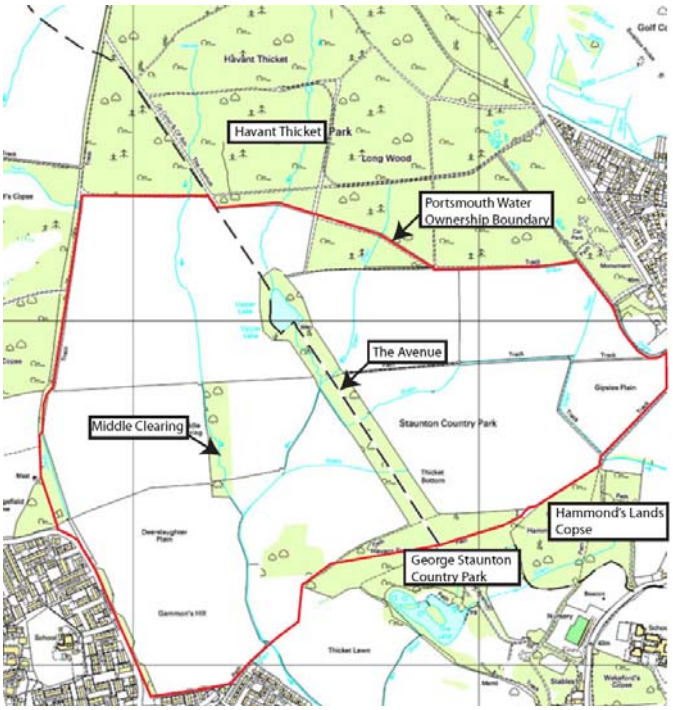


Figure 1 Havant Thicket Place Names

1.3 Ecological Survey Work

During 2005 and 2006 ECOSA carried out an extensive range of ecological surveys that included vegetation, birds, bats, badger *Meles meles*, dormouse *Muscardinus avellanarius*, reptiles, great crested newt *Triturus cristatus*, invertebrates and water vole *Arvicola terrestris*. The survey work carried out in 2005 considered all of the above mentioned species, whilst the 2006 surveys focused on areas where data was felt to be less complete following the 2005 surveys. This report presents the findings of the 2005 and 2006 ecological surveys.

1.4 Consultations

Consultations have been carried out with Hampshire Bat Group, Hampshire Biodiversity Information Centre and Hampshire Ornithological Society. The results of these consultations are discussed in Section 3.0 of this report and a copy of the data received from Hampshire Biodiversity Information Centre and Hampshire Ornithological Society is provided in Appendix 2.

2.0 METHODS

2.1 Introduction

This section outlines the methodology used during the various ecological surveys carried out during 2005 and 2006.

2.2 Bats

2.2.1 Survey Personnel

During the 2005 survey season bat transects were walked on 19th and 23rd June, 6th and 7th July, 10th and 11th August and 14th September 2005 by Simon Colenutt (Natural England Licence No. 20031453), Trevor Codlin (Natural England Licence No. 20062342), Paul Derbyshire and Tristan Norton of ECOSA. In 2006 bat transects were walked on 28th May, 18th June, 22nd July and 29th August by Simon Colenutt and Trevor Codlin. All surveyors involved in the bat survey work are experienced bat workers.

2.2.2 Bat Transect Survey Methodology

On each occasion 2 surveyors walked a predetermined transect route recording any bats encountered (Map 1). Each surveyor used a Pettersson D240x time expansion or a Duet frequency division bat detector[1] with any registrations recorded using Sony minidisc recorders for analysis later using the latest version of Batsound (v3.31) or Sonobat® (v2.5.6). The site was divided into five different transect routes with each transect walked on at least 2 occasions. All bat registrations were plotted onto a field map.

2.2.3 Bat Detectors

Modern bat detectors (Pettersson D240x) slow down the echolocation made by bats (usually by 10x). This can then be recorded, using an external recorder, and fed into a piece of analysing software. During the current survey Batsound® (v3.31) and Sonobat® (v2.5.6) was used. Once the recording is opened within the software it is displayed as a sonogram; the sonograms displayed in this report highlight the difference in echolocation between different bat species. The top window shows the amplitude, this indicates the level of the sound being fed into the software. The lower window (spectogram) indicates the frequency of the call (y axis) plotted against the time (x axis), and the variation in colour indicates the power of the call. From this it is possible to analyse parameters of the echolocation such as its peak frequency, duration and time between calls, allowing species identification.

[1] Duet frequent division bat detectors were not used during the 2006 surveys, these being replaced by Pettersson D240x detectors.

2.3 Great Crested Newt (GCN)

The 2005 great crested newt survey concentrated on all ponds on or immediately adjacent to the site. In 2006 the area of survey was extended to include all ponds within 500 metres (m) of the site. This was required since the species' terrestrial habitat is protected for 500m beyond a breeding pond.

2.3.1 Egg Searches

The egg search surveys consisted of a slow methodical search of marginal vegetation for folded leaves in which newt eggs are placed. When eggs were located, the first five were unwrapped to confirm identity, but thereafter the leaf was angled so that the egg could be seen between the fold, thereby avoiding the exposure of the egg and increasing risk of predation and exposure to ultra violet light. Egg searches were carried out between mid-April and early June in 2005 and 2006.

2.3.2 Bottle Traps

The bottle traps consisted of a 1 litre plastic bottle with the neck end cut off and inverted into the bottle. Each bottle was secured beneath the water with the lower end of the bottle above the water surface and the neck end inclined downwards, resulting in a trapped air pocket. Newts readily enter bottle traps and this is an effective way of recording presence particularly in turbid or vegetation-covered ponds. During 2005 bottle traps were set in the Upper Pond at the northern end of The Avenue on the nights of 10th May and 2nd June. This method was not used during 2006 since many of the ponds surveyed had a high degree of public access and would have been prone to disturbance and vandalism. However, a number of the ponds surveyed had empty drink bottles within them, and during each survey all of the bottles were removed from the ponds, checked for the presence of amphibians and then removed from the site.

2.3.3 Torch Searches

Torch searches were carried out during the hours of darkness using a one million candlepower torch. In clear water this can be a very simple and effective way of detecting the presence of newts. In 2005 torch searches were conducted on 16th April, 10th May and 2nd June. In 2006 torch surveys were carried out on 21st April, 15th and 24th May and 13th June.

2.3.4 Netting

Netting was carried out at all the ponds throughout the course of the 2005 and 2006 survey period. This method was considered a suitable survey technique particularly where dense vegetation or murky water reduce the effectiveness of the torch survey.

2.4 Reptiles

In 2005 a total of 50 reptile refugia were placed around the site at locations considered suitable for reptiles. The refugia consisted of pieces of corrugated tin and felt that was cut in sizes of approximately 75 x 75 centimetres (cm). During 2005 the refugia were checked whenever an ecologist visited the site and any reptiles encountered were recorded. On 5 occasions between May and October 2005 the site was walked slowly and steadily and suitable areas inspected for basking reptiles. Reptiles were also recorded during the course of other species surveys. All surveys were conducted on days that were suitable for reptile activity (i.e. warm, sunny). During 2006 no targeted surveys were carried out since the data collected in 2005 was considered sufficiently detailed, however, refugia were inspected and visual searches of potential basking areas were carried out during the course of the other 2006 surveys.

2.5 Badger

Since it is illegal to use heavy machinery within 30m of a badger sett, in 2005 a survey was conducted of all areas of the site looking for any evidence of badger activity. The site was investigated for evidence of badger setts, trails, latrines and footprints. During 2006 no targeted surveys were carried out, however, surveyors remained aware of the possible presence of badgers.

2.6 Dormouse

2.6.1 Dormouse Tubes/Boxes

In 2005 a total of 68 dormouse tubes and 96 dormouse boxes were erected during early June in locations that provided suitable habitat for dormice. The boxes/tubes were placed in rows of 6 through The Avenue area. In addition, 3 rows of 12 boxes were erected to the south of The Avenue. These boxes were inspected on 4 occasions in 2005. In 2006 these tubes and boxes were examined on 3 occasions between May and October.

2.6.2 Nut Searches

Dormice, when feeding, gnaw hazel *Corylus avellana* nuts in a characteristic way leaving distinctive marks around the gnawed area. It is therefore possible to identify their presence by using this method. Where nuts had been eaten by rodent species, they were examined to assess whether they had been gnawed by dormice.

During 2005 nut searches were carried out in October. In 2006 a total of 4 nut searches were carried out during October and November, throughout The Avenue and the northern sections of Hammonds Lands Copse and Havant Thicket.

2.7 Water Vole

All ditches and ponds on the site were investigated for field signs and signs of residence of water vole. Field signs include latrines, trails, feeding remains and footprints. Field surveys were carried out during the summer of 2005 and the ditches were also investigated during July 2006.

2.8 Vegetation

The vegetation survey involved the division of the site into habitat survey areas and some of these areas were further subdivided during the course of the survey to correspond with individual fields. Each area of grassland was labelled A to H and woodlands were labelled W1 to W3. A list of species present was compiled for each survey area and relative frequency estimated using the DAFOR scale (where D=Dominant, A=Abundant, F=Frequent, O=Occasional, and R=Rare). Main watercourses and hedgerows were treated as separate survey areas. The species lists compiled for watercourses and hedgerows have been referenced using letter and number codes, relating to an adjacent main survey area. Notes were made on the composition, structure and management of the vegetation and the likely National Vegetation Classification (NVC) communities present. Quadrats were taken in selected areas to sample the range of vegetation types present. The location of these was recorded using a Global Positioning System (GPS) receiver. The vegetation surveys were carried out over 6 visits in 2005 and 2006 between 1st May and 8th September.

2.9 Invertebrates

Survey methods for invertebrates were confined to visual searching, the use of a hand net or pooter to capture individual species, sweeping vegetation, beating foliage and grubbing. All survey work was conducted in suitable weather conditions for invertebrates (i.e. warm and sunny). In 2005 the invertebrate surveys commenced in April, with the final visit in late August. Invertebrate surveys were not conducted in 2006 as the 2005 surveys were considered to be sufficiently detailed.

2.10 Birds

2.10.1 Winter Birds

During the winter of 2005/06 a transect route was walked on 6 occasions. This transect route encompassed each of the different habitat types. All bird species were recorded with particular attention paid to any Red and Amber Listed species. The survey began

approximately 1 hour after dawn to ensure that the survey area was covered at the most active time for birds. During the course of the survey Leica 8 x 32 binoculars were used.

2.10.2 Breeding Birds

Breeding bird surveys consisted of a surveyor walking the site noting any singing or displaying birds. In addition, all incidental records of singing or displaying birds were recorded whilst carrying out other surveys. In 2005 breeding bird surveys were carried out on 1st, 16th and 21st May and 2nd June. No common breeding bird surveys were carried out in 2006 since the survey data was considered sufficient.

The 2006 breeding bird surveys were limited to recording the number of breeding pairs of the European nightjar *Caprimulgus europaeus*. All areas of the site and the surrounding habitat were surveyed listening for the distinctive churring call of the species, once heard an attempt was made to locate the territory. The territories recorded were then plotted on a map. Nightjar surveys were carried out on 5th and 12th June and 12th and 21st July.

2.11 Limitations

Due to the extended timescales of the surveys, few limitations occurred. Limitations that have been identified relate entirely to the heavy use by members of the public of parts of the site.

2.11.1 Reptile refugia need to be placed in areas that receive sunlight, this generally means that they are often visible to the public. Some refugia placed on site were regularly disturbed or moved by members of the public, although this may not have caused a significant problem as the survey recorded large numbers of reptiles.

2.11.2 A combination of dormouse boxes and tubes were used during the surveys in 2005. Unfortunately many of these boxes were either removed or vandalised by members of the public utilising the woodland. It was also apparent that a member of the public was regularly opening the boxes, as often the lids had been removed and were not fitted back correctly. This level of disturbance is likely to have dissuaded dormice from using the boxes. Many of the boxes were used by nesting birds which again would have dissuaded dormice from using them. During 2006 the remaining boxes and tubes were inspected, these were subject to reduced levels of disturbance.

2.11.3 In addition, the grey squirrel *Sciurus carolinensis* is a naturalized species that competes with the dormouse for hazel nuts. Grey squirrels are able to digest unripe hazel nuts and will strip a plant before dormice are able to utilise them as they require ripe hazel nuts. As well as

preventing the dormouse from feeding up for hibernation, this problem also limits the effectiveness of hazel nut searches, because the number of nuts eaten by dormice is often very low in areas where grey squirrel is present. This can make hazelnuts eaten by dormouse almost impossible to locate.

3.0 RESULTS

3.1 Introduction

This section discusses the results of the 2005 and 2006 ecological survey work. Reference should be made to Maps 1-15.

3.2 Bats

3.2.1 Consultation Records

Hampshire Bat Group was consulted in 2005 for bat records within and adjacent to the site. The exact data search area is shown in Figure 2.

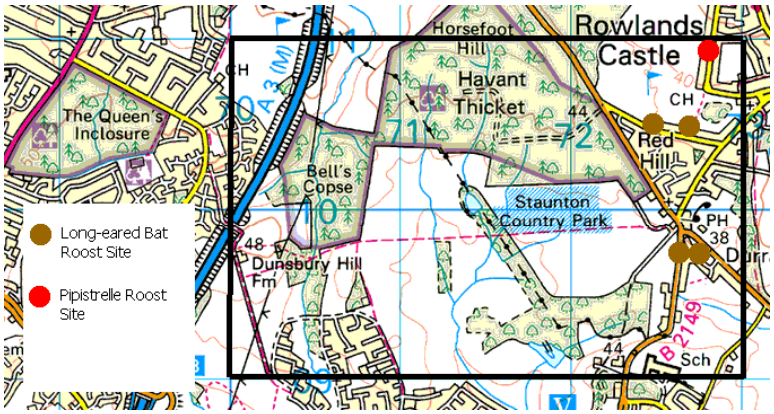


Figure 2 Location of Bat Roosts within Area of Data Search (black border) provided by Hampshire Bat Group

Table 1 presents the Hampshire Bat Group records for bat roosts and grounded bats (sick or injured) recorded at Havant Thicket and its environs. However, the date of recording was not provided for these records.

Table 1 Hampshire Bat Group Records of Bats at Havant Thicket

Bat Species	Record Type	National Grid Reference for Record
Pipistrelle	Roost	SU 727 109
Brown long-eared Bat	Roost	SU 727 097
Brown long-eared Bat	Roost	SU 726 099
Brown long-eared Bat	Roost	SU 726 104
Brown long-eared Bat	Roost	SU 724 104
Pipistrelle	Grounded Bat	SU 728 109
Whiskered/Brandt's	Grounded Bat	SU 728 110
Brown Long-eared	Grounded Bat	SU 723 093
Noctule	Grounded Bat	SU 718 092

Other species of bat recorded in the area of search by HBG, which did not have specific information provided were that of serotine, whiskered and Natterer's. Figure 2 shows the location of the known roost sites as provided by Hampshire Bat Group.

3.2.2 Survey Results

During the 2005 and 2006 ECOSA surveys 7 species of bat have been confirmed with 1 possible. The confirmed species include common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus,* noctule *Nyctalus noctula,* whiskered/Brandt's bat *Myotis mystacinus/brandtii*, and Natterer's *Myotis nattereri* were all recorded regularly with long-eared species *Plecotus* species[2] and serotine *Epiesicus serotinus* recorded occasionally. During a bat transect carried out on 12th July 2006 a recording was made of a bat which is considered to be a possible Bechstein's *Myotis bechsteinii*. This record was recorded within The Avenue.

Feeding activity was as expected for each species with noctule bats recorded foraging over much of the site, common and soprano pipistrelles recorded feeding along the woodland edges and within the woodland blocks as were the Natterer's and long-eared bat species. Serotine bats were usually restricted to the western edge of the site foraging around the street lights of the nearby housing estate at Leigh Park.

The species accounts outlined below summarise the records of the different species and highlight the key foraging areas. Reference should be made to Figures 3-10 and Maps 2-7.

[2] There are 2 species of long-eared bat, the brown long-eared *Plecotus auritus* and the grey long-eared *Plecotus austriacus*, these are not reliably separated in the field and no attempt has been made to separate them as part of the current survey.

Common Pipistrelle

The common pipistrelle is one of the most common species within the British Isles and is widely distributed across the country as far north as the Orkneys (Bat Conservation Trust, 2000).

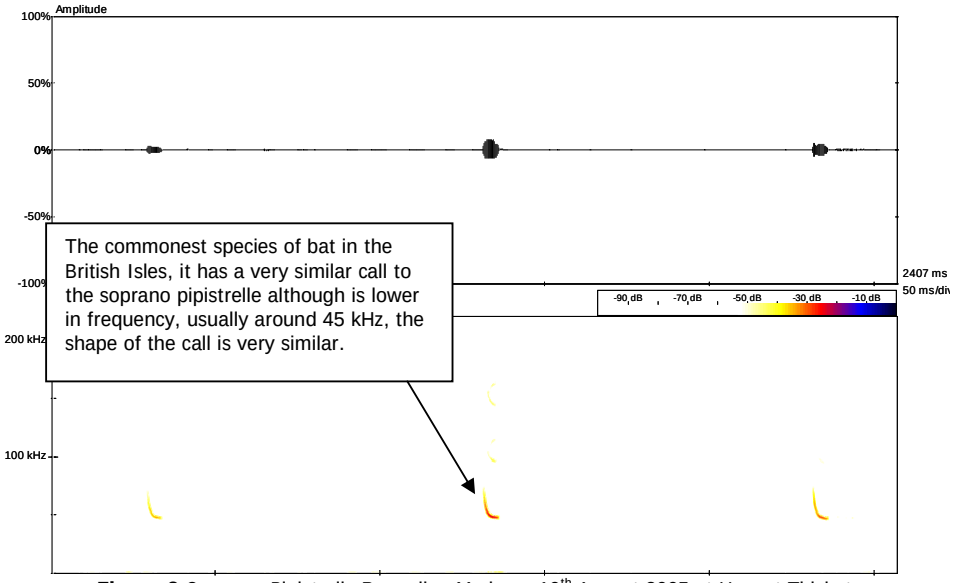


Figure 3 Common Pipistrelle Recording Made on 10th August 2005 at Havant Thicket

The common pipistrelle (Figure 3) was by far the most common species recorded on the site, and large numbers of bats were recorded on all of the survey dates. These records were widely distributed across the site (Map 2). Bats were regularly recorded in groups of 2 or 3 during the surveys in June and July with groups of 4 or 5 recorded in August and September, possibly indicating family parties feeding together. Wherever woodland or hedgerows occurred the common pipistrelle was recorded. The only areas where bat activity was low for this species were the areas of open grassland. It is considered that between 30 and 40 bats may have been utilising the site on any given night through the survey period. During the survey conducted on 7th July 2005 a bat was seen to emerge from the northern end of Middle Clearing in the west of the site soon after sunset. This may indicate that bats are roosting within trees in Middle Clearing.

Soprano Pipistrelle

This species is widely distributed across Britain and Ireland except the Shetlands and Western Isles of Scotland (Bat Conservation Trust, 2000).

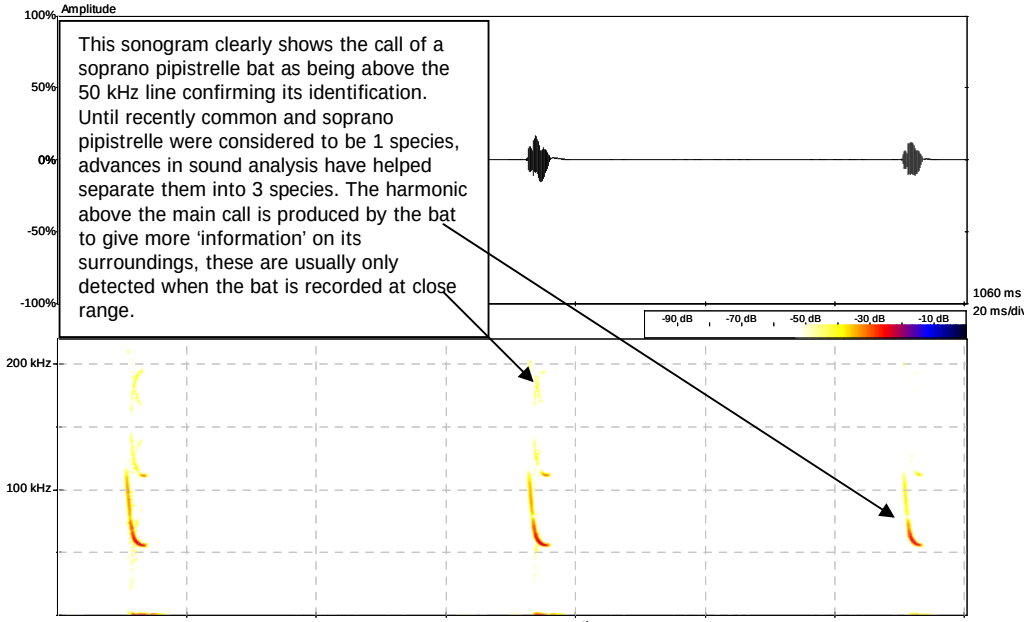


Figure 4 Soprano Pipistrelle Recording Made 11th August 2005 at Havant Thicket

Levels of activity for this species were considerably lower than for the common pipistrelle, with bats recorded either in singles or pairs. The soprano pipistrelle (Figure 4) tends to prefer a more aquatic habitat, and this was borne out by several records of the species around the Upper Pond (Map 3). Where bats were recorded away from the Upper Pond they were noted feeding within The Avenue and around the woodland edges, with singles feeding around Middle Clearing in the west of the site. Although bat activity was fairly low for this species it was still recorded on all of the surveys carried out. It is considered that no more than 5 soprano pipistrelle were feeding on the site on any night during the survey period.

Noctule

This species is restricted to England, Wales and south-west Scotland, and is principally a tree roosting species.

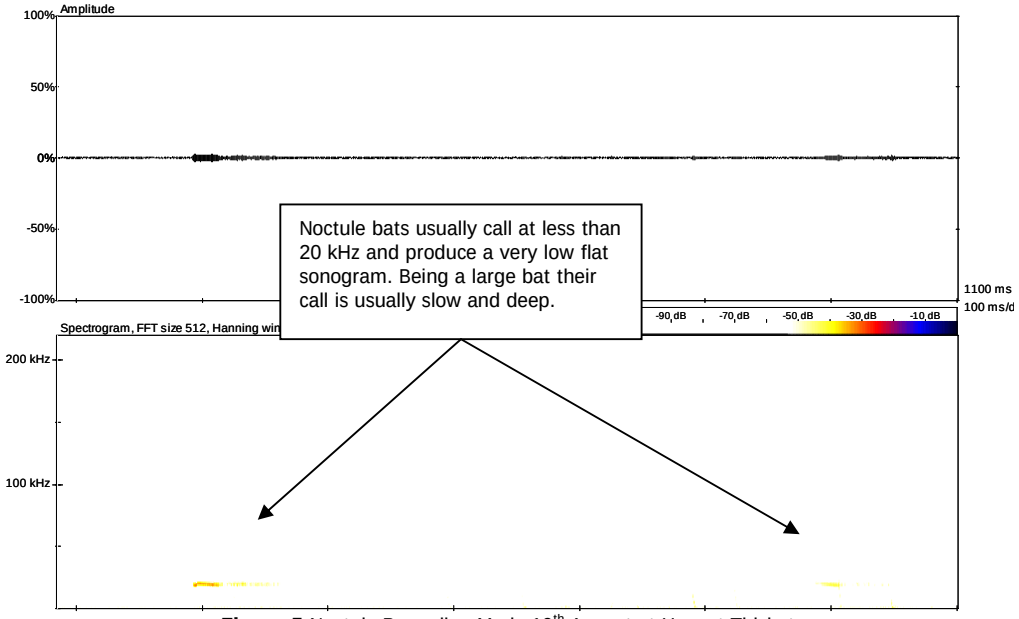


Figure 5 Noctule Recording Made 10th August at Havant Thicket

Noctule bats (Figure 5) are often the first to appear in an evening often emerging whilst it is still light. When feeding they fly high above trees and meadows foraging over great distances. Noctule bats were recorded throughout the summer with records of between 1 and 3 bats. Key foraging areas were located to the south-east of the site with up to 3 bats foraging over the fields with mature pedunculate oak to the south of the survey area on 23rd June 2005 (Map 4). Bats were regularly recorded early in the evening and it is considered highly probable that a roost is present witin the mature oak in this area. Single bats were recorded foraging along the south-western woodland edge and along the western side of The Avenue. Recorded activity was highest over the western side of the site with bats recorded foraging over fields just south of the survey area, and also around Middle Clearing. On 7th July 2005 a single bat was seen to emerge from the southern end of Middle Clearing indicating that Noctules are roosting within this wood. In addition a hole within a tree in the south of the site has a hole with extensive staining indicating the presence of a roost. Further more, 2 noctule were regulalrly seen flying around this tree providing strong evidence that this maybe a roost. It is considered that between 5 and 10 bats may utilise the site for foraging.

Serotine

The serotine is restricted to the south and south-east of England with a worrying trend of summer roosts declining and being abandoned in the east.[3] Serotines rarely roost in trees preferring man-made structures, particularly for breeding. They are considered a fairly sedentary species often using their breeding sites for hibernation.

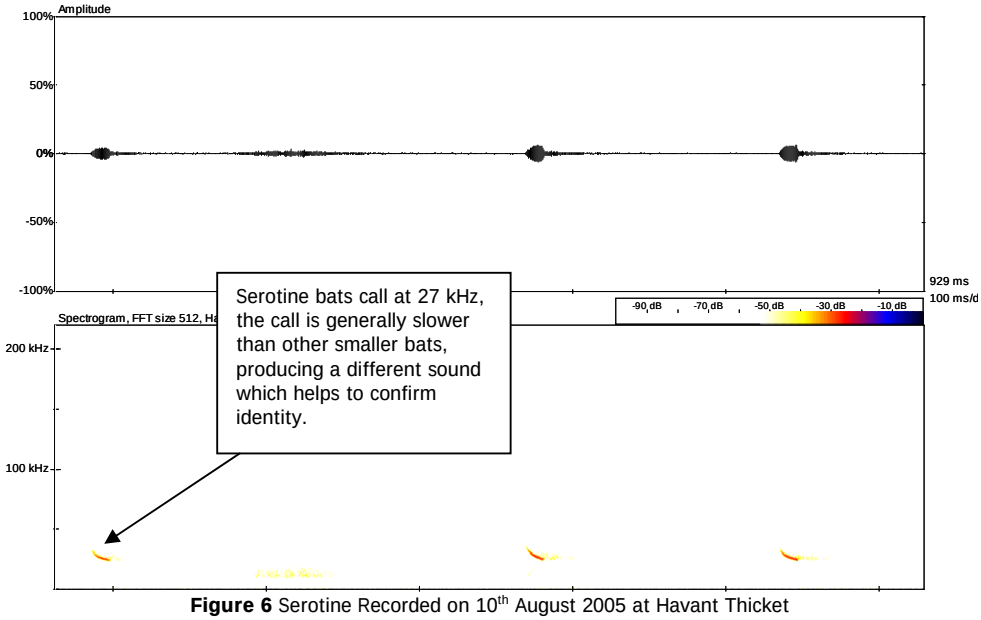


Figure 6 Serotine Recorded on 10th August 2005 at Havant Thicket

This species was invariably recorded foraging on the western site boundary around the street lights of Leigh Park (Map 5). Up to 3 bats were recorded in this area on any 1 night. Records across the rest of the site were scarce with occasional bats along the north-eastern site boundary and in the vicinity of The Avenue (Figure 6). It is estimated that approximately 5 bats utilised the site for foraging.

Natterer's Bat

Of the 5 species of *Myotis* bat recorded in Britain the Natterer's is one of the most widespread and common. Recent data suggests that the species may in fact be increasing, although it is considered that this may be due to an increase in recording and more advanced bat detectors. Natterer's bats can be found in a number of woodland habitats from open parkland and large gardens to dense woodland.

[3] Richardson, P..(2000) *Distribution atlas of bats in Britain and Ireland,* Bat Conservation Trust

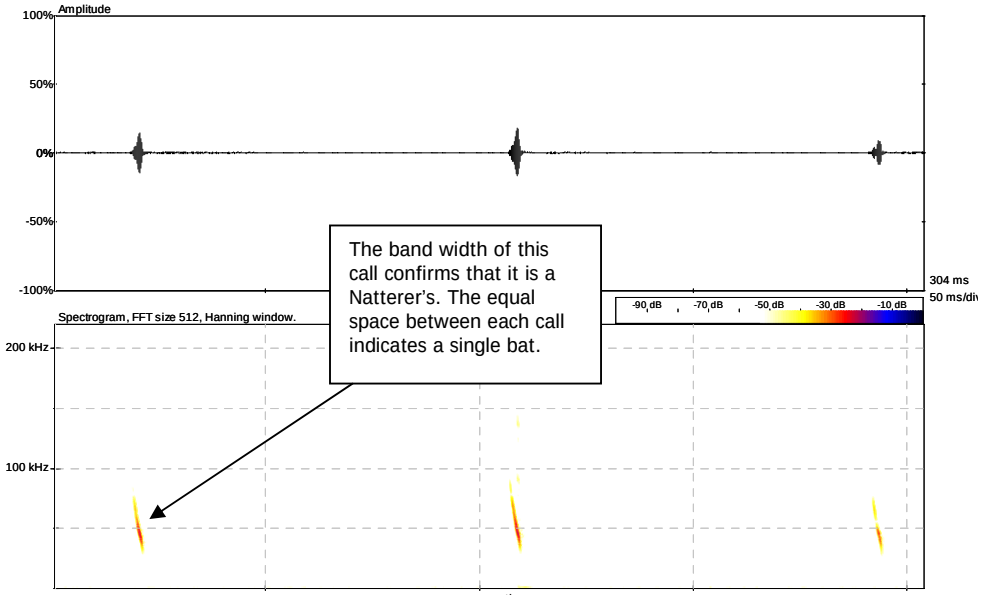


Figure 7 Natterer's Bat Recorded on 14th September 2005 at Havant Thicket

Bats that were considered to be Natterer's were recorded over much of the site on all of the survey dates (Figure 7 and Map 6). The eastern entrance gate and boundaries bordering the north and south of the site were the most regular areas for the species. A single Natterer's bat was regulalrly recorded emerging from the cottage at the eastern site entrance beside the Staunton Arms public house. Middle Clearing in the west of the site often produced records of this species, usually around its south-eastern corner. The Avenue produced many registrations of this species with a peak of 4 bats recorded, it is highly probable that a roost is present within The Avenue. It is estimated that a minimum of 10 bats forage on the site.

Whiskered/Brandts

The structure of the call of most *Myotis* bat species make them very difficult to separate from one another, although with a close bat and little background noise it is possible. Whiskered and Brandt's bats can only be separated in the hand so when identification is based only on a sound recording they are usually referred to as whiskered/Brandts (Figure 8).

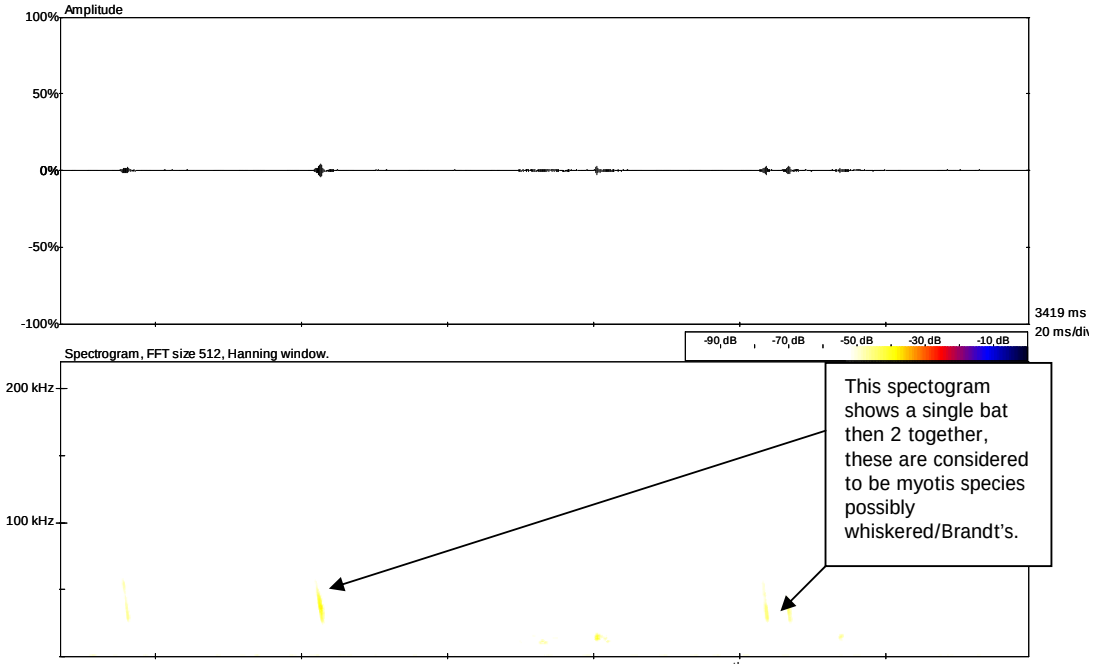


Figure 8 Myotis Species Recorded at Havant Thicket on 10th August 2005

Bats considered to be either whiskered or Brandt's bats were regularly recorded in small numbers within The Avenue and were especially frequent around the Upper Pond in the northern end of The Avenue, a peak of 3 bats was recorded in this area (Map 6). It is probable that a roost is present within mature trees in this area. It is estimated that approximately 3-5 bats forage on the site.

Bechstein's Bat

The Bechstein's bat is one of Britain's rarest bats and is largely restricted to central southern England. It is mainly a tree roosting species utilizing pieces of flaking bark or small holes, often high up on a tree. Bechstein's bats forage using a similar method to long-eared bats, whereby animals forage very close to the vegetation listening for any insect movement. It is this style of feeding, which requires that they emit a very quiet echolocation, combined with their preference of foraging in or around the tree canopy, which makes them very difficult to locate. During a bat transect carried out on the 12th July 2006 a recording was made (Figure 9) of a bat in The Avenue which is considered to be a Bechstein's bat.

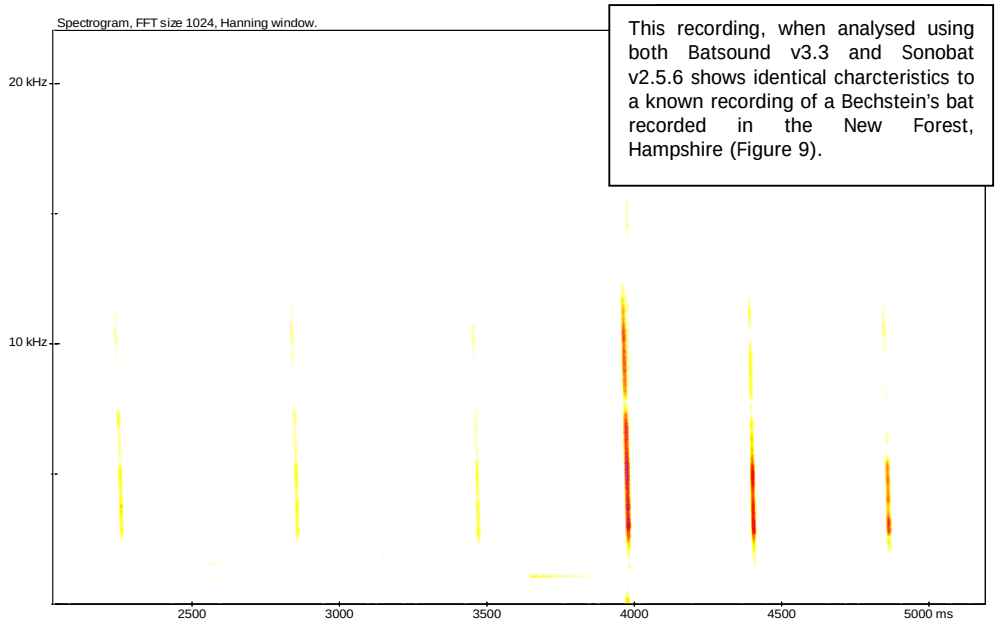


Figure 9 Possible Bechstein's Bat Recorded at Havant Thicket on 12th July 2006

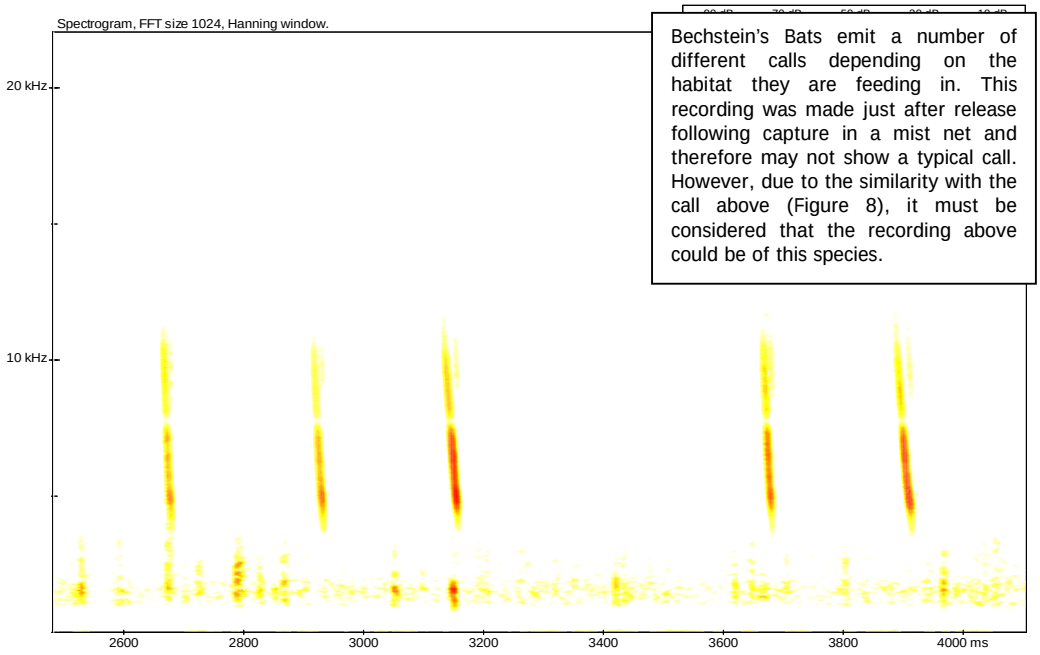


Figure 10 Bechstein's Bat Recorded in the New Forest During 2006

The sonograms in Figures 9 and 10 not only look identical but also sound identical when played back on the time expansion setting using the 2 different types of analysing software used by ECOSA.

Myotis Bats

Unidentified bats of the genus *Myotis* were recorded throughout the site, being mainly found along the edge of areas of woodland or foraging along corridors within woodland (Map 6).

The key areas for *Myotis* bats are The Avenue, Middle Clearing to the west of the site, the woodland along the south-eastern edge of the site, the woodland edge adjacent to the eastern entrance gate beside the Staunton Arms public house.

Long-Eared Bat

Long-eared bats are difficult species to record during bat transects due to their quiet echolocation and style of feeding. They feed using a method called gleening, whereby they silently approach a tree or shrub flying very close to it listening for prey. Long-eared bats have become very dependant on man-made buildings as roost sites.

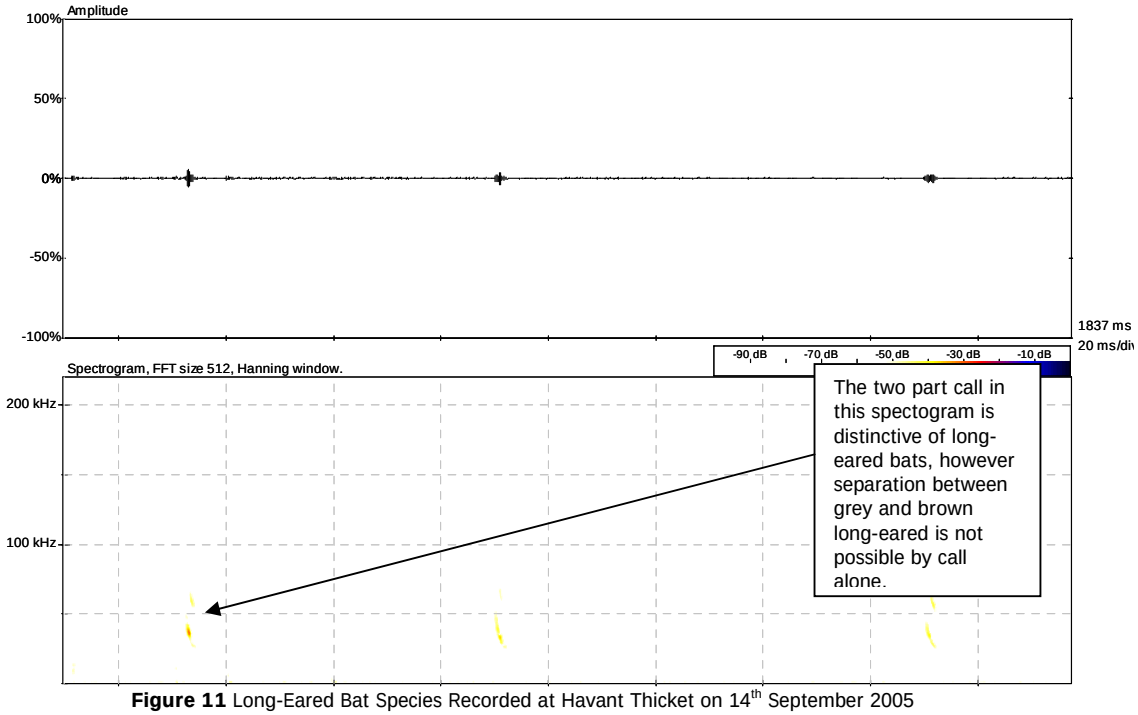


Figure 11 Long-Eared Bat Species Recorded at Havant Thicket on 14th September 2005

During the surveys at Havant, long-eared bats were recorded foraging along The Avenue and the woodland strip running along the southern site boundary (Figure 11, Map 7). The number of animals recorded was low. However, this is by no means an indication of the population size since the species is very difficult to detect.

3.3 Great Crested Newt

Map 8 shows the location of ponds surveyed during 2005 and 2006. During the surveys no great crested newts were recorded at the site. In addition a Hampshire Biodiversity Information Centre consultation provided no records for the species within and adjacent to the site.

However, it should be noted that the Upper Pond supports a good population of palmate

newt *Triturus helveticus*. A maximum of 38 animals were recorded on 18th May 2005, many of these being egg laying females. Palmate newt were common in ponds within Havant Thicket to the north of the site with some ponds, particularly those to the north-east of the site having counts of over 50 animals on regular occasions. Up to 10 smooth newt *Triturus vulgaris* were recorded in woodland ponds to the south-east of the site. The fishing lake within the George Staunton Country Park located to the south of the site is stocked with a high density of fish and there were no records of amphibians from this pond. The pond connected to the stream within Bells' Copse located to the west of the site recorded no amphibibians. The larger pond located within Bell's Copse recorded up to 10 palmate newt.

3.4 Reptiles

During the surveys 4 species of reptile were recorded, these include adder *Vipera berus*, grass snake *Natrix natrix*, slow worm *Anguis fragilis* and common lizard *Lacerta vivipara.* The highest concentration of reptiles was in the vicinity of The Avenue in the centre of the site. Large numbers of grass snake, slow worm and common lizard were recorded under the refugia scattered along this woodland edge and along linking ditches and hedgerows. The location of reptile records is shown on Map 9.

Grass Snake

Records of grass snake were concentrated around The Avenue. The western edge of the strip was particularly favoured with up to 8 animals recorded beneath refugia and basking along the woodland edge on 3rd May 2005. This high concentration of animals suggests that a communal hibernacula may be present in the vicinity. This may be amongst roots of trees within the adjacent woodland. The species was commonly recorded around the Upper Pond where palmate newt may form an important food source. Animals were regularly observed foraging within the leaf litter on the woodland floor, one animal in particular was observed foraging amongst hazel stools for approximately 25 minutes on 3rd June 2005 and it is probable that this animal was hunting for rodents. The ditches to the north and to the north-east of The Avenue also provided important foraging areas for the species.

On 13th August 2005 up to 6 female grass snake were recorded within a pile of dumped farm manure located to the east of The Avenue. At least 3 of these animals were egg laying within the manure pile. This clearly forms an important egg laying site for the species and it is possible that a large proportion of females from the population egg lay within this pile.

It is extremely difficult to estimate the number of animals present within this population since the number of double counts of animals is not known, however, this is clearly a very important population which may number in excess of 30 animals.

Adder

The adder was mainly confined to the north-eastern boundary of the site with up to 6 individuals recorded basking on 19th May 2005 with a peak of 4 animals in this area on 18th June 2006. A single animal was recorded along the main track in the eastern area of fields on 13th August 2006. On 18th May 2006 2 animals were recorded along the main track, indicating that a small population is present in this area. The population of animals present on the site may number between 10 and 15 animals.

Common Lizard

The common lizard is widely distributed across the site, although concentrations were recorded along the western side of The Avenue, along the boundary of the site with Havant Thicket and along the ditch that extends north to Havant Thicket from the east of The Avenue. Juvenile animals were recorded during August 2005 and 2006, proving that the species breeds on site. A peak number of 48 indivduals was recorded during the survey of 9th June 2005. It is very difficult to estimate the numbers of species present at the site although it is considered that population size may be in the region of 100-200 animals.

Slow Worm

Slow worm were mainly recorded along the southern boundary of the site, usually under refugia although they were also recorded basking along the woodland edge. Good numbers were recorded along the western edge of The Avenue. Up to 12 juveniles have been recorded, proving that the species breeds on site. The peak number on a single survey visit was 27 recorded on 1st June 2005. Numbers of the species are difficult to estimate, although may number 50-100 animals.

3.5 Badger

The only evidence of badger activity recorded during the 2005 and 2006 surveys was that of badgers entering the site via the northern boundary. No setts or latrines were recorded within the site boundaries. In 2006 a single, newly excavated hole, located within The Avenue were of the correct dimensions for the species, although there was no conclusive evidence that badgers were resident here. The nearest known badger sett is located in The Holt to the north-east of the site between Rowlands Castle and Horndean.

3.6 Dormouse

During the 2005 dormouse tube and box surveys no evidence of dormouse was recorded (Map 10 shows the location of tubes and boxes erected). However, in 2006 a nest constructed by a dormouse was recorded within a box located in the centre of The Avenue. Unfortunately when the nest was recorded the box had previously been tampered with and

the lid removed, and as a result no animals were present. The nest consisted of a tightly woven ball of honeysuckle *Lonicera periclymenum*, with fresh hazel leaves present, the nest filled the interior of the nestbox. This type of nest is consistent with that made by dormouse.

During the course of the nut searches carried out during 2005 and 2006 there were no records of hazel nut considered to have been gnawed by dormice.

3.7 Water Vole

There was no evidence of water vole present on the site. The recording of evidence of mink on the site would mean that water vole is less likely to be present.

3.8 Vegetation

The location of quadrat samples is shown on Map 11. Vegetation survey areas and features are referenced on Map 12. Species lists and quadrat data are presented in Appendices 3 and 4.

3.8.1 Dry to Damp Grassland

The majority of the site consists of damp, or locally dry, semi-improved grassland, mostly conforming to the wide NVC sub-community MG6a (see Table 2 for full NVC names). Quadrats C1, C2, D1, D2, and E1 sampled this vegetation. At the time of the survey, horses were grazing Areas C, D and F, so that much of the grassland was short, with damper areas supporting abundant fleabane *Pulicaria dysenterica*, which had been left, ungrazed. Areas A and B, and parts of G also support similar grassland, although this was moderately long to rank in places.

The grassland is dominated by common bent *Agrostis capillaris*, with frequent Yorkshire-fog *Holcus lanatus* and occasional to locally frequent creeping bent *A. stolonifera*, perennial rye-grass *Lolium perenne* and crested dog's-tail *Cynosurus cristatus.* Over much of the site the grassland supports scattered to locally dense soft rush *Juncus effusus* and compact rush *J. conglomeratus*, these areas representing a gradation to rush pasture MG10a (Appendix 4, quadrat A1). The sward is generally herb-poor, with the most frequent species after fleabane being common bird's-foot-trefoil *Lotus corniculatus,* hoary ragwort *Senecio erucifolius* and red clover *Trifolium pratense* in drier areas and creeping buttercup *Ranunculus repens* and lesser spearwort *R. flammula* in damper areas. Oval sedge *Carex ovalis* is widespread in damper areas. In places, the dry grassland approaches MG5a, however other typical species of that sub-community, in particular common knapweed *Centaurea nigra* and oxeye daisy *Leucanthemum vulgare* are absent from the majority of the site.

Lack of grazing in better-drained parts of the site has resulted in a rank sward dominated by false oat-grass *Arrhenatherum elatius* and/or cock's-foot *Dactylis glomerata*, with patches of creeping thistle *Cirsium arvense*. Under the NVC this is classified as MG1a, although red fescue *Festuca rubra*, a component of the sub-community, is replaced by creeping bent (Appendix 4, quadrat B2). MG1b also occurs locally on the site (e.g. along hedgebanks and horse-dunged areas). The largest area of MG1a occurs on the higher ground forming the south-western part of area H (Gammon's Hill).

Table 2 Full Names of NVC Types

Notation	NVC Name (English names of species given in brackets)
MG1a	*Arrhenatherum elatius* grassland, *Festuca rubra* sub-community (False Oat-grass, Red Fescue)
MG1b	*Arrhenatherum elatius* grassland, *Urtica dioica* sub-community (False Oat-grass, Common Nettle)
MG5a	*Cynosurus cristatus-Centaurea nigra* grassland, *Lathyrus pratensis* sub-community (Crested Dog's-tail, Common Knapweed, Meadow Vetchling)
MG6a	*Cynosurus cristatus-Lolium perenne* grassland, typical sub-community (Crested Dog's-tail, Perennial Rye-grass)
MG9b	*Holcus lanatus-Deschampsia cespitosa* grassland, *Arrhenatherum elatius* sub-community (Yorkshire-fog, Tufted Hair-grass, False Oat-grass)
MG10a	*Holcus lanatus-Juncus effusus* rush-pasture, *Juncus effusus* sub-community (Yorkshire-fog, Soft Rush)
MG10b	*Holcus lanatus-Juncus effusus* rush-pasture, *Juncus inflexus* sub-community (Yorkshire-fog, Hard Rush)
MG12a	*Festuca arundinacea* grassland, *Holcus lanatus* sub-community (Tufted Hair-grass, Yorkshire-fog)
MG13	*Agrostis stolonifera-Alopecurus geniculatus* grassland (Creeping Bent, Marsh Foxtail)
M23a	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community (Soft Rush, Sharp-flowered Rush, Marsh Bedstraw)
M23b	*Juncus effusus/acutiflorus-Galium palustre* rush-pasture, *Juncus effusus* sub-community (Soft Rush, Sharp-flowered Rush, Marsh Bedstraw)
S22	*Glyceria fluitans* water-margin vegetation (Floating Sweet-grass)
S23	Other water margin vegetation
W4a	*Betula pubescens-Molinia caerulea* woodland, *Dryopteris dilatata-Rubus fruticosus* sub-community (Downy Birch, Purple Moor-grass, Broad Buckler-fern, Bramble)
W6	*Alnus glutinosa-Urtica dioica* woodland (Alder, Common Nettle)

W10a	*Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, typical sub-community (Pedunculate Oak, Bracken, Bramble)
W10c	*Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, *Hedera helix* sub-community (Pedunculate Oak, Bracken, Bramble, Common Ivy).

Damper, rank grassland occurs in several areas, particularly the western edge of F, the southern end of A2, the northern half of H and fields B3 and G2. Apart from field H, these support occasional to frequent tufted hair-grass *Deschampsia cespitosa*, in a sward that represents a gradation between MG6a/MG10a and MG9b (Appendix 2, quadrat G1). Tufted hair-grass does not become dominant anywhere on the site. In Area H there is an extensive area of damp grassland with abundant tall fescue *Festuca arundinacea*, in addition to creeping bent and Yorkshire-fog (Appendix 4, quadrat H1). This is herb-poor and does not conform to any NVC stand type, though may presumably be approaching tall fescue grassland MG12a.

3.8.2 Wet Grassland, Rush Pasture, Marsh and Wetland Vegetation

Main Grassland Areas

Rushes *Juncus* spp. are frequent over the areas of semi-improved grassland as described above, and also form denser clumps along spring lines, in damp hollows and in waterlogged areas next to watercourses. These areas are usually characterised by the presence of marsh thistle *Cirsium palustre*. In the wetter areas, sharp-flowered rush *J. acutiflorus* and lesser spearwort are locally frequent and other occasional species include large bird's-foot-trefoil *Lotus pedunculatus*, square-stemmed St. John's-wort *Hypericum tetrapterum*, marsh pennywort *Hydrocotyle vulgaris* and willowherb *Epilobium* species.

These areas of rush pasture and marsh are generally base-poor and under the NVC fall between MG10a and M23b. Those areas with frequent lesser spearwort approach M23b (Appendix 4, quadrat B3), but stands of soft rush with creeping buttercup will be closer to MG10a (Appendix 4, quadrats B1 and F1). The related sub-community M23a is usually more species-rich and probably does not occur on the site.

Also present are areas of slightly base-rich rush pasture and marshy vegetation, characterised by clumps of hard rush *Juncus inflexus* and locally abundant hairy sedge *Carex hirta*. This vegetation occurs as small pockets within larger areas of rush pasture (e.g. next to the watercourse Bd1), in area B3 and in a larger area of waterlogged ground in the south-east of area H. It approaches MG10b. A further area along the western boundary of field F (Thicket Bottom) also includes abundant water mint *Mentha aquatica* and a little lesser pond-sedge

Carex acutiformis, with *Cirsium palustre* absent (Appendix 4, quadrat F2). This is probably best defined as M23b, although may be tending towards other 'fen meadow' mire communities.

Small areas of MG13 grassland occur in the south-east and north-east corners of H, close to the streams, in B3 and locally within other areas. This vegetation consists of short grassland that is normally flooded in winter, and dominated by creeping bent and marsh foxtail *Alopecurus geniculatus*. Small sweet-grass *Glyceria declinata* also occurs in the area in the north-east of H. These areas have not been separately mapped on Map 12.

Watercourse and Ditches

Where not shaded by trees, most of the small watercourses and ditches over the site support a species-rich marshy vegetation, with mixtures of taller grasses, rushes, fleabane and locally frequent wetland species, including water mint *Mentha aquatica* and gypsywort *Lycopus europaeus*. Other species include wild angelica *Angelica sylvestris*, meadowsweet *Filipendula ulmaria* (uncommon), ragged-robin *Lychnis flos-cuculi* and square-stemmed St John's-wort *Hypericum tetrapterum*. Several of the ditches also support a range of other noteworthy herbaceous species, such as tormentil *Potentilla erecta*, betony *Stachys officinalis* and sneezewort *Achillea ptarmica*. Ditch Fd, which is particularly rich, also supports frequent dwarf gorse *Ulex minor*, a little heather *Calluna vulgaris* and at least two bushes of eared willow *Salix aurita* along its banks.

The ditch vegetation does not conform to a single NVC type; it generally falls under the rush pasture types (MG10a, MG10b, M23b) with wetter areas having elements of S22 and S23. One stand in ditch Hd was sampled (Appendix 4, quadrat H2).

Open Water

Upper Lake has reduced in size to a small pond from the area shown on Ordance Survey maps. It is dominated by white water-lily *Nymphea alba*, with some rushes and wetland species growing around the margins, including marsh pennywort, marsh bedstraw *Galium palustre*, common spike-rush *Eleocharis palustris*, lesser spearwort and bog St. John's-wort *Hypericum elodes*.

Water troughs at the corners of fields C and D support Common Duckweed *Lemna minor*.

3.8.3 Woodland and Scrub

Area W1 is a strip of designated ancient woodland extending north-west from George Staunton Countrypark. It consists of typical acid oak-hazel woodland, with small pockets of

wet woodland where the streams cross and a larger area of damp acid birch/willow woodland at the northern end, within the former Upper Lake. The main area of woodland has mature pedunculate oak *Quercus robur* standards, with an understorey of hazel *Corylus avellana*, holly *Ilex aquifolium* and hawthorn *Crataegus monogyna* and a field layer dominated by bramble *Rubus fruticosus* and bracken *Pteridium aquilinum* (W10a). There are also areas where bluebell *Hyacinthoides non-scripta*, wood anemone *Anemone nemorosa* and wood sorrel *Oxalis acetosella* are abundant, these species are more frequent to the south. In damper areas there is occasional ash *Fraxinus excelsior* and dense ivy on the ground (W10c). The wet woodland consists of alder *Alnus glutinosa* and grey willow *Salix cinerea*, with stands of pendulous sedge *Carex pendula* below (W6). The damp acid woodland is similar, but also supports frequent downy birch. The field layer here is characterised by remote sedge *Carex remota*, with occasional ferns. In terms of the NVC, this woodland lies between W6 and W4a.

Area W2 (Middle Clearing) designated as ancient semi-natural woodland but now consists of a pedunculate oak plantation, with a sparse shrub layer of hazel and hawthorn and a grass-dominated field layer. The flora along the stream and under the woodland is moderately diverse, and supports a number of ancient woodland plants, such as southern woodrush *Luzula forsteri*, wood sedge *Carex sylvatica* and primrose *Primula vulgaris*, suggesting that the wood was replanted on an ancient woodland site.

Area W3 is similar to W2, in that it is an oak plantation with a sparse shrub layer and grassy field layer. Butcher's-broom *Ruscus aculeatus*, giant fescue *Festuca gigantea* and wood sedge were recorded here.

Areas of scrub occur along ditches and field boundaries. This is frequently composed of dominant grey willow, with occasional goat willow or mixtures of bramble, gorse, bracken and oak saplings on dry, acidic banks, supporting occasional or frequent wood sage *Teucrium scorodonia*, slender St. John's-wort *Hypericum pulchrum*, tormentil *Potentilla erecta* and common dog-violet *Viola riviniana*. The latter vegetation is mainly W25b, but other NVC scrub and underscrub types may also be present in small areas or along parts of field boundaries. The willow-dominated scrub (which probably does not conform to any NVC type) occurs along parts of Bd1, Bd2, Bd3, Cd2, Db, Fd and Hd; whilst W25b scrub occurs along Ab, Cb, Cd2, Dd, Eb and Fd. Note that some areas of W25 and other scattered scrub which coincide with ditch lines are not shown on the vegetation map (Map 12).

3.9 Invertebrates

A full list of all insect species recorded during the course of the invertebrate surveys is included as Appendix 5. A number of the species encountered are considered to be Nationally

Scarce or Red Data Book species. These are marked accordingly within Appendix 5 and are discussed in greater detail below. Map 13 shows the location of scarce species of invertebrate recorded at the site.

Orthoptera

The long-winged conehead *Conocephalus discolor* was swept with some regularity from rank grassland across the site. Although still confined to southern coastal counties in Britain, current trends suggest that the long-winged conehead is expanding within its range. Formerly a very rare insect nationally, long-winged conehead appears to be flourishing and is forming new colonies.

Lepidoptera

Small numbers of the silver-washed fritillary *Argynnis paphia*, a Nationally Scarce species, were seen flying through The Avenue during late June and July 2005. Larvae of this species feed on dog violet *Viola riviniana*, which is present along some of the ride margins within the woodland. The larval food plant is susceptible to over-shading so ride management and clearing work is likely to benefit the host plant and in turn the butterfly population. The silver-washed fritillary is in decline both nationally and locally and is classed as a National Biodiversity Action Plan (BAP) species of conservation concern.

The white admiral *Ladoga camilla*, although not considered Nationally Scarce or threatened, is another woodland butterfly worthy of mention, since it appears to also be in considerable national and local decline. This butterfly was recorded within The Avenue during late June and July 2005. Larvae of this species feed on Honeysuckle although they only utilise plants in very densely shaded areas. Thus over-clearing within a wood can result in the demise of this butterfly.

Diptera

Several specimens of the hunchbacked fly *Ogcodes pallipes* were swept from birch bordering a drainage ditch to the north-east of The Avenue on 27th June 2005. Larvae of this species develop as internal parasites of spiders, perhaps particularly *Clubiona* spp. The adult fly has reduced or absent mouthparts and is incapable of feeding; inevitably this results in the adults not living for more than a few days. Records for *O. pallipes* are largely from southern England, extending northwards to Northamptonshire and Glamorgan. Falk (1991a) notes very few post 1960 records and records a decline over recent decades. Stubbs & Drake (2001) claim that records are sparse within its range, and suggest that many records are associated with chalk or limestone grasslands. *O pallipes* is classified as Nationally Scarce (N).

Small numbers of the hoverfly *Criorhina asilica* were recorded in The Avenue, where adults could be observed visiting holly flowers in spring. This species is primarily associated with ancient semi-natural woodland in Southern England. Larvae of *C. asilica* develop in rotten wood; Beech appears to be particularly favoured. Falk (1991a) cites some 65 post 1960 sites for the species, and notes the requirement for a continuity of dead wood.

A second Nationally Scarce species of *Criorhina*, *C. ranunculi*, was also recorded from The Avenue. This early spring species was found in mid April 2005, when small numbers of adults could be observed visiting the blossom of willow and blackthorn around the wood margins. Larvae of *C. ranunculi* develop in dead wood. Falk (1991a) cites some 40 post 1960 records, mainly from southern England, although the species is known to occur sparingly as far north as Scotland.

The hoverfly *Xanthandrus comtus* was recorded from The Avenue on 8th August 2005. Larvae prey upon the gregarious caterpillars of certain micro-moths. Records are widely scattered through Britain, although *X. comtus* appears to be predominantly southern in its distribution. Ball & Morris (2000) suggest that the species may be a migrant from the continent, although personal observations by the current author on the Isle of Wight suggest that this is not the case, at least in the south of its range. *X. comtus* appears susceptible to fluctuations in population density and is currently becoming more frequent after a period of great scarcity. It should be noted, however, that the author has seen very few specimens in the last two seasons.

Two specimens of the Nationally Scarce hoverfly *Xylota florum* were recorded on July 14th 2005 sunbathing upon birch leaves within The Avenue. This Nationally Scarce species develops in rotting wood within damp areas of woodland. Most records are from the old deciduous woodlands of central and southern England, and heathland sites in south-east England.

Several specimens of the picture-winged fly *Myopites inulaedyssentericae* were swept from stands of the host plant fleabane. Larvae of *M. inulaedyssentericae* develop in the seed heads of the plant. It was most frequent on plants bordering the main bridleway to the east of The Avenue. Although officially classified as Rare (RDB3) by Falk (1991a), *M. inulaedyssentericae* has recently undergone a considerable northward range expansion, and would probably be downgraded in any future status review (Clemons, 2003). It has now been recorded from over 70, 10km squares, mainly in south-east England.

The Rare (RDB3) tachinid fly *Gymnosoma rotundatum* was collected during general sweeping in the grasslands to the north of The Avenue. This fly is considered as Rare by Falk & Ismay (in prep), and Belshaw (1993) cites only 14 British records, with most of these coming from Sussex and Surrey. Larvae are parasitic upon pentatomid bugs of the genus *Palomena*. It is possible that *G. rotundatum* is currently increasing in frequency, since the author has also recorded this species from a Sussex site in 2005. Most records for *G. rotundatum* are from dry sandy areas on downland or heathland.

Hymenoptera

The Nationally Scarce (Nb) club-horned sapyga *Sapyga clavicornis* proved to be relatively frequent during June, when adults could be observed investigating nest holes of the bee *Chelostoma florisomne*, which were common on the decaying fence posts bordering the main east to west bridleway. Larvae of *S. clavicornis* develop in the nests of *C. florisomne* and bees of the genus *Osmia*. Modern records for *S. clavicornis* exist for approximately 40, 10km. squares (Edwards, 1998).

The small mining bee *Lasioglossum malachurum* was found to be present in low densities in the drier parts of the grassland. This species requires warm, light, disturbed soils in which to nest, and is primarily associated with the southern coastal counties of England. *L. malachurum* appears to have suffered a recent population decline, particularly at inland sites. (Falk, 1991b).

The mining bee *Melitta tricincta* was recorded in late summer. A number of males were seen flying rapidly around the flowers of red bartsia *Odontites verna* around NGR: SU 71967 09876, on the main east to west bridleway. Females of *M. tricincta* are monolectic, collecting all their pollen provisions from the flowers of red bartsia. *M. tricincta* is associated with chalk grassland and open woodland on chalky soils, although the host plant is not confined to these situations. *M. tricincta* is most common in south and south-east England.

The Nationally Scarce (Nb) bee *Osmia bicolor* was encountered around the edge of The Avenue. Females of *O. bicolor* build their nests in empty snail shells. Pollen is collected from a variety of plant species. Most records of *O. bicolor* are from southern England and South Wales, where it is mainly associated with calcareous grassland or woodland on chalk or limestone soils.

Arachnida

The Nationally Scarce (Na) Orb Web Spider *Argiope bruennichi* was present in some numbers within the grassland areas, perhaps being most common in the dry ditches lining the main

east to west bridleway. This species is a comparatively recent colonist from continental Europe; it was first recorded in England in the 1920's. Nationally, *A. bruennichi* is now encountered in rank grassland in southern and central England.

3.10 Birds

3.10.1 Breeding Birds

The species recorded during the breeding bird surveys carried out during the summer of 2005 are presented in Table 3. The locations of breeding bird territories are presented on Map 14.

Table 3 Species of Breeding Bird Recorded During the 2005 Survey

Species	No. of Singing/Displaying Individuals
Blackbird *Turdus merula*	5 singing males were located on the site, 3 along the western border, 1 in the south-western corner of The Avenue and 1 along the eastern boundary of the site. All territories were located in suitably scrubby habitats.
Blackcap *Sylvia atricapilla*	6 singing males were located singing in suitable habitat for breeding. The western and eastern boundaries and The Avenue proved to be the most popular areas.
Blue Tit *Parus caeruleus*	19 singing males were recorded throughout the site.
Buzzard *Buteo buteo*	Birds were recorded displaying over the woodland to the north-east of the site.
Chiffchaff *Phyloscopus collybita*	9 singing males were recorded in suitable habitat throughout the northern half of the site.
Chaffinch *Fringilla coelebs*	11 singing males were recorded within the woodland areas of the site.
Coal Tit *Parus ater*	2 singing males were recorded. 1 male recorded at the northern end of The Avenue and the other in the woodland strip in the north-eastern corner of the site.
Dunnock *Prunella modularis*	5 singing males were recorded in what was considered to be suitable habitat. Territories were located within The Avenue and in hedgerows along the eastern boundary of the site.
Green Woodpecker *Picus viridis*	2 males were recorded calling one another within the woodland strip to the south of The Avenue, and within The Avenue. No other territories were located.
Goldcrest *Regulus regulus*	The only record was of a single territory within the woodland strip to the south of The Avenue.
Goldfinch *Carduelis carduelis*	A pair was recorded holding territory to the north-west of the site.
Great-spotted Woodpecker	4 birds were recorded on territories, 2 along The Avenue and 2 within the woodland to the west of the site.

Dendrocopus major	
Greenfinch *Carduelis chloris*	4 singing males were recorded. 1 male was located towards the northern tip of The Avenue, the other 3 were from the east of the site.
Great Tit *Parus major*	14 territories were recorded in suitable habitat throughout the site.
Garden Warbler *Sylvia borin*	2 singing males were recorded. 1 was located within The Avenue, the other in the scrub close to the small copse in the south-west of the site.
House Sparrow *Passer domesticus*	Birds were located in the hedgerow to the south west of the site.
Jay *Garrulus glandarius*	The only breeding territories located were of 2 birds calling within the woodland copse to the south of The Avenue.
Lapwing *Vanellus vanellus*	A pair was located on the damp meadow located to the east of The Avenue.
Long-tailed Tit *Aegitholos caudatus*	5 pairs were located within The Avenue and to the east and north of the site.
Mistle Thrush *Turdus viscivorous*	A male was singing from an oak tree located in the north-west corner of the site.
Meadow Pipit *Anthus pratensis*	6 pairs were located within the grassland, 4 in meadows to the east of The Avenue and 1 pair in the area between Middle Clearing and The Avenue and the other in the north west corner of the site.
Nuthatch *Sitta europaea*	5 territories were located within most of the large areas of woodland on site.
Robin *Erithacus rubecula*	13 territories were located in suitable habitat throughout the site.
Rook *Corvus frugilegus*	A rookery consisting of at least 35 nests was located within Middle Clearing.
Sky lark *Aluada arvensis*	7 territories were located within the grassland areas to the east and north-west of the site.
Stonechat *Saxicola torquata*	3 pairs were located on the site. 2 were located along hedgerows to the east of the site, the other was located between Middle Clearing and The Avenue in the west of the site.
Sparrowhawk *Accipiter nisus*	A single pair was located within the copse to the north-west of the site.
Song Thrush *Turdus philomelos*	A good population of this declining species was recorded from the site. 10 territories were located; most of these were from the boundaries of the site with a pair also holding territoty within The Avenue.
Sedge Warbler *Acrocephaus schnoenobaenus*	A single bird was recorded singing from the hedge running in a south-westerly direction from the west side of The Avenue.
Treecreeper *Certhia familiaris*	Birds were recorded from The Avenue and the woodland on the western most boundary of the site.
Tawny Owl	A bird was recorded from the woodland strip located to the south of The

Strix aluco	Avenue.
Wood Pigeon *Columba palumbus*	13 territories were located in suitable habitat throughout the site.
Wren *Troglodytes troglodytes*	17 birds were located singing from areas that were suitable to support a breeding pair.
Willow Warbler *Phylloscopus trochilus*	8 singing males were located in suitable breeding habitat throughout the survey period.
Yellowhammer *Emberiza citrinella*	A singing male was located along the hedgerow to the north of the site.

3.10.2 Winter Birds

Winter bird activity was thinly distributed over the site with The Avenue producing the highest number and most diverse range of species. However, most of the BTO Red and Amber listed species were recorded along the wet ditches or within the grassland in line with their habitat preferences. The species accounts below detail those species listed on the Red and Amber listing with a brief summary of their on site status. For a full list of species recorded during the survey see Appendix 6**.**

Common Teal

Common teal *Anas crecca* appears on the Amber list due a >20% decline in the north-west European non-breeding populations. Two records of a single bird were recorded on 31st January 2006 in the ditches running north to south from The Avenue and Middle Clearing.

Kestrel

Kestrel *Falco tinnunculus* appears on the amber list as it has undergone a moderate (25-49%) decline in its UK breeding population over the last 25 years, and because it has an unfavourable conservation status in Europe. Records were of single birds feeding over the horse grazed field in the north east of the site on 29th December 2005 and another feeding over the western meadow on 21st February 2006. On 10th March 2006 a pair was recorded hunting over the meadows to the east of The Avenue.

Lapwing

Lapwing *Vanellus vanellus* appears on the Amber list as it has undergone a moderate (25-49%) decline in breeding population over the last 25 years, and because more than 20% of the European non-breeding population occurs in the UK. A single bird was recorded flying in a south-easterly direction over the site on 29th December 2005. On 10th March 2006 four birds were present feeding on the meadows in the south-east of the site. These birds appeared to be paired suggesting that they may be past breeders returning.

Eurasian Woodcock

Eurasian Woodcock *Scolopax rusticola* appears on the Amber list due to a 25-49% decline in the UK breeding population, and contraction in breeding range over the last 25 years and because of an unfavourable conservation status in Europe. A single bird was flushed from the north-west corner of the site whilst walking the winter bird transect route.

In addition, Eurasian Woodcock were also recorded at the site during the Nightjar surveys carried out in 2006, a total of four roding (displaying) birds were recorded, in line with the Hampshire Ornithological Society data available for the period 1993-2004, when the mean number of birds roding was 4.

Snipe

Snipe *Gallinago gallinago* appears on the Amber list as it has undergone a moderate (25-49%) decline in breeding population over the last 25 years. Three birds were recorded feeding along the wet ditch running from north to south towards Middle Clearing in the west of the site on 29th December. Two birds were recorded on the 31st January 2006, one in the ditch running north to south from the northern tip of The Avenue, and another bird was flushed from the rush pasture located just east of the southern end of The Avenue.

Eurasian Curlew

Eurasian curlew *Numenius arquata* appears on the Amber list due to an unfavourable conservation status in Europe and due to the fact that more than or equal to 20% of the European breeding and wintering population is located in the UK. The only record of this species was of a single bird feeding in the meadows to the east of the site on 10th March 2006.

Black-headed Gull

Black-headed Gull *Larus ridibundus* appears on the Amber list due to a 25-49% decline in the UK breeding population over the last 25 years and that more than 50% of the UK breeding population is located in 10 or fewer sites. Birds were recorded flying over the site during each of the winter bird surveys, however the only records of birds feeding on site relate to 2 birds on 29th December 2005, and 7 birds on 21st February 2006. Both records were from the west of the site.

Stock Dove

Stock Dove *Columba oenas* appears on the amber list because >20% of the European breeding population occurs in the UK. Single birds were recorded in the vicinity of Middle

Clearingon 29th December 2005 and 10th March 2006, three birds flew west from Middle Clearingon 31st January 2006.

Green Woodpecker

Green woodpecker*Picus viridus* appears on the Amber list as it has an unfavourable conservation status in Europe. Birds were recorded during each of the winter bird surveys with 2 on 29th December 2005, 2 on 31st January and a single bird on 21st February and 10th March 2006. All records relate to birds feeding within the vicinity of the southern end of The Avenue or from the small copse located to the south-east of Middle Clearing. Five birds were recorded in total.

Skylark

Skylark *Alauda arvensis* appears on the Red list as it has undergone a rapid (>50%) decline in UK breeding population over the last 25 years and because it has an unfavourable conservation status in Europe. Birds were recorded during each of the winter bird surveys, with 2 on 29th December 2005, 3 on 31st January, 9 on 21st February and 5 on 10th March 2006. Birds were recorded from most of the grassland areas throughout the site. The increase in numbers during the February count was due to birds being more active as they were displaying and setting up territories. It is possible that these birds were present throughout the winter but were feeding and keeping low in the grass.

Meadow Pipit

Meadow pipit *Anthus pratensis* appears on the Amber list as it has undergone a moderate (25-49%) decline in breeding population over the last 25 years (the recent trend is of a >50% decline but this is only provisional). This species was recorded in small numbers throughout the site on each of the winter bird surveys. The main feeding area was within the horse grazed field in the northeast of the site; approximately 60 birds were recorded feeding amongst the horses on 29th December 2005 and 31st January 2006. By March 2006 the flock size reduced to around 40 birds. Smaller flocks of 14 and 22 individuals were located feeding between the wet ditch in the south west of the site and Middle Clearing on 29th December 2005, and in the vicinity of the ditch running north from Middle Clearingon 31st January 2006. It is estimated that as many as 100 birds were using the site throughout the winter months.

Dunnock

Dunnock *Prunella modularis* appears on the Amber list due to a 25-49% decline in the UK breeding population over the last 25 years. Perhaps surprisingly, the only records of this species relate to 2 birds feeding by the eastern entrance, and a single bird feeing in the wet ditch running south from Middle Clearing. Both records were from 21st February 2006.

Stonechat

Stonechat *Saxicola torquata* appears on the Amber list as it has an unfavourable conservation status in Europe. Three birds were recorded on 29th December 2005, 21st February and 10th March 2006. All records relate to birds feeding around the horse grazed field in the north east of the site, except for a single bird located feeding between Middle Clearing and The Avenue on 21st February 2006.

Song Thrush

Song Thrush *Turdus philomelos* appears on the Red list as it has undergone a rapid (>50%) decline in UK breeding population over the last 25 years. Birds were recorded throughout the site on each of winter bird surveys with a maximum of 5 on 29th December 2005 and 31st January 2006. Feeding activity was mainly recorded along the wet ditches running throughout the site, but also from within the horse grazed field in the north-east of the site.

Redwing

Redwing *Turdus iliacus* appears on the Amber list due to a five-year mean of 1-300 breeding pairs in the UK. Birds were recorded on the 31st January and the 21st February 2006, by far the largest count being of at least 100 birds feeding on the woodland floor of The Avenue during the January survey.

Mistle Thrush

Mistle Thrush *Turdus viscivorous* appears on the Amber list due to a 25-49% decline in the UK breeding population over the last 25 years. A single bird was recorded during the February count and three birds during the March count, feeding in the west of the site.

Fieldfare

Fieldfare *Turdus pilaris* appears on the Amber list as it has undergone a moderate (25-49%) decline over the last 25 years, and because over a 5-year mean there have been only 1–300 breeding pairs in the UK. A maximum of 20 birds was recorded on 2 occasions; on 29th December 2005 20 birds were recorded feeding in the small copse in the south-west of the site, and on 21st February 2006 a flock of 20 birds were located feeding within The Avenue towards the southern end. Another record relates to just 2 birds feeding within the paddock in the north-west of the site.

Goldcrest

Goldcrest *Regulus regulus* appears on the Amber list as it has undergone a moderate (25-49%) decline over the last 25 years (the recent trend is of a >50% decline but this is only provisional). Two birds were recorded feeding in a yew tree *Taxus bacata* within The Avenue

on 29th December 2005 and again on 31st January 2006. On 10th March 2006 2 birds were located feeding at the northern end of The Avenue.

Marsh Tit

Marsh Tit *Parus palustris* appears on the Red list due to a >50% in the UK breeding population over the last 25 years. Two birds were recorded on 29th January 2006 feeding within The Avenue, no other records of this species were made.

Lesser Redpoll

Lesser Redpoll *Carduelis flammea* appears on the Amber list as it has undergone a moderate (25-49%) decline over the last 25 years (the recent trend is of a >50% decline but this is only provisional) and because >20% of the European breeding population occurs in the UK. Three birds were located feeding in a birch tree towards the southern end of The Avenue on 29th December 2005.

Bullfinch

Bullfinch *Pyrrhula pyrrhula* appears on the Red list as it has undergone a rapid (>50%) decline in UK breeding population over the last 25 years. Five birds were recorded on 29th December 2005 feeding throughout the site, one was recorded in the hedgerow east of The Avenue, 2 were recorded feeding along the ditch line directly west of the same corridor and two more were recorded feeding in the hedge row running along the eastern boundary. Two birds were recorded on 21st February 2006 feeding along the northern boundary just east of The Avenue.

Reed Bunting

Reed Bunting *Emberiza schoeniclus* appears on the Red list as it has undergone a rapid (>50%) decline in UK breeding population over the last 25 years. A single bird was recorded in the wet meadow directly south-west of Middle Clearing in the west of the site on 29th December 2005 and 10th March 2006. On 21st February 2006 5 birds were recorded in the same location.

3.10.3 Nightjar Survey

The nightjar *Caprimulas europaeus* is a summer visitor from Africa, usually arriving in May and departing in September. It breeds from late May to August and the males sing (churr) from mid-May to mid-August, mainly in June. It breeds principally in open pine forest, especially found conifer plantations and felled areas, and on lowland heathland, although it was once more widespread in Great Britain, breeding in open, sandy mixed and deciduous woods, and on open rough ground such as commons, downs and dunes. The main reason

for its long-term decline in Britain, as well as Europe, is habitat loss. The partial recovery of the breeding population which was detected during the 1992 census was attributed to an increase in suitable breeding habitat due to the rise in clearfell forestry.

During the survey Nightjars were heard and/or seen in the following areas, see Map 15 for locations:

- A singing male was heard at the eastern end of the large clearing at Long Wood on 3 out of 4 visits. On the third visit when the male was heard, it was also heard wing-clapping (displaying). On the second visit, when the male was heard, a female was also seen, perched then flying west. On the first visit, males were heard approximately 100m to the north-west and 100m to the east of this presumed territory. These may involve the same male as that within the territory or possibly one or two more territorial males, although no more than one bird was heard in this area on any single occasion, and hence it seems reasonable to assume the presence of just one territorial male.

- A singing male was heard at the north-western end of the thicket, west of Horsefoot Hill, on 2 out of 4 visits. On the third visit, when the male was heard, it was also heard wing-clapping (displaying).

- A singing male was heard at the north-eastern end of the thicket, north-east of Horsefoot Hill, on three out of four visits. On the second visit a female was also seen in this presumed territory. On the first and third visits a singing male was heard approximately 100m to the west and on the third visit a singing male was heard approximately 100m to the south. These may involve the same male as that within the presumed territory or possibly 1-2 more territorial males, although no more than one bird was heard in this area on any single occasion and hence it seems reasonable to assume the presence of just one territorial male.

- A singing male was heard on one visit singing in the north-west of Havant Thicket at NGR: SU 709 107. Although the vegetation is much higher here than in other suitable-looking areas Nightjars do nest in medium-high plantations with trees over 5m in height and this may represent an additional, fourth territory.

Not all suitable-looking breeding habitat on the site appeared to be occupied. No birds were heard or seen in the southern end of the cleared area at the eastern end of the site. The two clearings in Bell's Copse, apart from some wide grassy strips, were choked with bracken and some gorse, and therefore considered to be of sub-optimal quality for breeding birds.

Based on a Hampshire Ornithological Society data search for the site a total of 3, possibly 4, singing, territorial males meets the mean for the years 1993-2004 (3.25), in which a minimum of 1 and a maximum of 5 were recorded, the peak of 5 in 2002 being followed by the just single birds in 2003-2004, and precede by a steady 3 - 4 over the 9 years back to 1993.

Nightjars have been observed during bat surveys foraging over the grassland to the east and west of The Avenue with particularly favoured areas being the east edge of Middle Clearing and the extensive area of grassland to the east of The Avenue. The site may provide an important foraging area for nightjar breeding at Havant Thicket. Radio-tagging studies on Nightjars in Thetford Forest, Norfolk and Suffolk, showed that individual birds forage up to 2km away from the clearings in which they nest, commuting to other young plantation and areas of grassy heathland. Similar research in Wareham Forest, Dorset, where the heathland is different, showed that individual birds forage up to 7km away from where they nest, and prefer to do so in deciduous woodland (of which there is not much in Thetford Forest), including orchards and large gardens. They were also flying such distances to forage over wetland areas such as streams, ponds and water meadows.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 Introduction

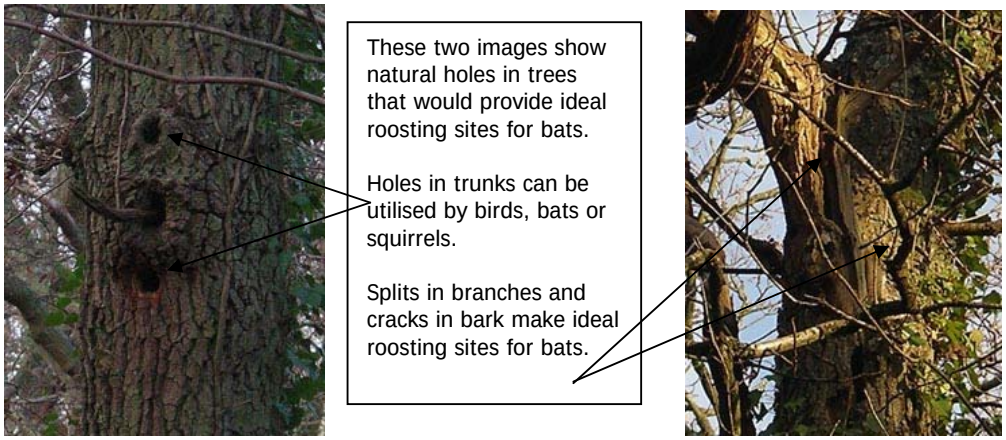
This section discusses the findings and implications of the 2005 and 2006 survey results. This section also provides an overview of the mitigation that may be required during the construction and development of the reservoir. However, ECOSA are not currently aware of the full proposals for the site and this section should only be considered as an outline of possible mitigation.

4.2 Bats

During the surveys conducted in 2005 and 2006 7 species of bat were confirmed at the site, with 1 possible species.

Where suitable habitat was present bat foraging activity was usually high for the commoner species, with more uncommon species recorded in key areas throughout the site. The most productive areas for foraging were those adjacent to woodland strips with adjoining hedgerows, these are discussed below:

- The Avenue produced the largest number of animals and most diverse range of species. It is apparent from the data gathered that bats are using the gap created by the central footpath and the fringes where the fields meet The Avenue as foraging areas. Based on the level of activity it is highly likely that bats are roosting in trees (such as those shown in Figures 12 & 13) within The Avenue as they offer numerous opportunities for roosting.



Figures 12 & 13 Examples of Potential Tree Bat Roosting Sites

- Middle Clearing to the west of the site produced a high level of activity with bats recorded foraging around the woodland margins. Both common pipistrelle and noctule bat were seen to emerge from Middle Clearing very early in the evening indicating that they were roosting within it. The hedgerows leading to and from Middle Clearing proved to be important commuting routes for bats to access other areas of the site.

- The northern boundary of the site where the grassland meets the conifer woodland of Havant Thicket produced a high level of bat activity.

- The southern boundary of the site where the grassland meets woodland and the hedgerow running west from the eastern entrance gate was very productive for bat activity. Natterer's, common pipistrelle, long-eared and noctule were all recorded in this area often in numbers of between 2 and 3 individuals. It is possible that some of the bats recorded in this area are roosting in the cottage by the eastern site entrance, as the first registrations were often recorded early in the evening.

- Bats were recorded foraging along the western boundary often in the vicinity of the streetlights. The only records for serotine bats were from this area possibly indicating that they may be roosting in one of the houses nearby.

4.2.1 Impacts and Mitigation

The areas of woodland on the site provide significant roosting opportunities for bats and possible roosts have been identified in Middle Clearing. The loss of woodland areas for foraging and roosting, particularly that of The Avenue, and is likely to have a significant impact on bats in the local area.

The loss of bat roosts will require that a Natural England licence is obtained. The granting of a Natural England licence will require that a mitigation scheme is implemented that will maintain the status of bats in the area. This will involve the replacement of lost roost sites. This is likely to be achieved through the erection of bat boxes in surrounding areas of woodland, the number of these being dependent on the number of roosts to be lost. However, it is considered appropriate to over provide these so as to increase the roosting resource for bats in the area. At present it is considered that 100 bat boxes erected in surrounding woodland areas would be suitable.

The loss of foraging habitat for bats will need to be considered carefully and may in-part, determine the management of habitat surrounding the reservoir. Management of this habitat

may involve management of grassland, planting of scrub, creation of graded and sinuous woodland margins etc. This management would be aimed at increasing the invertebrate food source.

Felling of trees on the site will need to be carried out using safe working procedures in order to avoid injury to bats that may be roosting within them. This may involve the inspection of holes and splits by a licensed bat worker followed by safe felling procedures whereby any limbs or sections of trunk with suitable roosting areas are carefully lowered to the ground.

Further survey work will be required in the coming summer survey seasons to adequately locate bat roosts within trees in The Avenue.

4.3 Great Crested Newt

There was no evidence of great crested newt identified during the site surveys and therefore no licensing issues will apply. However, repeat surveys will be required in the spring season prior to the start of construction.

4.3.1 Impacts and Mitigation

The species has not been recorded from the site and therefore no mitigation will be necessary. However, palmate newts are present in the Upper Pond and translocation of these animals should be carried out. This would involve ring fencing the Upper Pond during the winter and placing pitfall traps around this fencing. Newts returning to the Upper Pond in the spring would fall into these traps and could be moved to a new breeding pond. It may be necessary to excavate a new pond in surrounding areas to support these animals.

4.4 Reptiles

All 4 common species of reptile (grass snake, adder, common lizard and slow worm) are present on site, with reptile activity recorded generally across the site. The number of recorded animals was high in several key areas. The most important areas are that of The Avenue which supported good numbers of three species, grass snake, slow worm and common lizard, with the north-east corner of the site and the main track to the east of The Avenue supporting a population of adder.

Guidelines[4] (Table 4) suggest that sites that support 3 or more species of reptile or an exceptional population of a single species should be considered as a Key Reptile Site. Based on these criteria the site supports an exceptional population of grass snake, common lizard and slow worm, with adder represented by a good population.

[4] Hill, D., Fasham, M., Tucker, G., Shewry, M., & Shaw, P. (2005) *Handbook of Biodiversity Methods: Survey, Evaluation and Monitoring*, Cambridge

Table 4 Evaluation Criteria Developed for Assessing Reptile Populations

	Low Population	Good Population	Exceptional Population
Grass snake	<5	5-10	>10
Common lizard	<5	5-10	>20
Slow worm	<5	5-20	>20
Adder	<5	5-10	>10

Due to the estimated size and the diversity of the community present it will be essential to establish the numbers of animals present in order to develop a sufficient and robust mitigation strategy. Such a study will enable the population to be accurately assessed, suitable receptor sites for a translocated population to be identified and adequate management instigated in these areas.

4.4.1 Impacts and Mitigation

Mitigation for reptiles is likely to be extensive, although the full extent of this will not be known until population sizes are assessed. Currently the populations of reptiles on site are considered to be large. There will be an obligation to rescue these animals from the construction area. This will involve erecting reptile proof fencing around the construction area and capturing animals from this area using a combination of artificial refugia and visual capture.

Animals removed from the site will need to be placed into suitable surrounding habitat. This habitat will need to be capable of supporting an increased population and as a result it may be necessary to instigate habitat management in surrounding areas. It is unlikely that the habitat under Portsmouth Water's ownership and surrounding the proposed reservoir would be capable of supporting the entire population of reptiles removed from the development footprint. As a result it may be necessary to instigate management outside of the site boundaries, perhaps on Forestry Commission land (with their prior consent). Such management may include clearance of woodland and scrub, creation of grassy areas within woodland, creation of hibernacula made from timber piles etc.

4.5 Badger

There is evidence of limited badger activity to the north of the site where badgers are entering the site. In addition a possible small sett was recorded within The Avenue.

4.5.1 Impacts and Mitigation

No mitigation is considered necessary, however, the presence of badgers at the site should be monitored and an updating survey carried out in the winter prior to the commencement of construction.

4.6 Dormouse

In 2006 a dormouse nest was recorded within a box located within The Avenue. No other evidence of dormouse has been recorded from the site, however this may be due to the high level of disturbance to the tubes and boxes by the general public.

The species is protected under European Law and in order to produce an adequate impact assessment a complete understanding of its status in the area is required. It is proposed that a high number of tubes and boxes should be placed in woodland areas on and surrounding the site. These should be placed away from paths but where this is unavoidable these should be placed at approximately 3m so that they are above sight lines and reaching points of members of the public.

4.6.1 Impacts and Mitigation

The entire area of woodland within The Avenue is to be lost to the proposed reservoir. This would result in the loss of dormouse populations at the site. It will be a requirement to obtain a Natural England licence for the removal of this woodland since it provides habitat for European Protected species. A requirement of this licence will be that the population status of the species is maintained. This may be achieved through translocation of the animals to existing woodland adjacent to the site and creation of additional woodland areas that would provide additional habitat. The extent of woodland replacement will depend on the number of animals present within The Avenue. However, it must be considered that newly planted woodland may take between 10-15 years before it provides suitable habitat for dormice.

4.7 Water Vole

The species is not present at the site and as a result a discussion of impacts and mitigation is not considered necessary.

4.8 Vegetation

The main areas of importance at the site are the species rich ditches and ditch banks to the east of the site, The Avenue which is designated as semi-natural ancient woodland and a number of more species rich areas of grassland.

4.8.1 Impacts and Mitigation

Mitigation for the loss of higher value grassland vegetation communities may require that some of these are translocated to areas of retained habitat on the site. Higher value vegetation communities could also be translocated to areas adjacent to the site although this would require landowner consent. Receptor sites would need to be as similar as donor sites in terms of soil moisture content and pH as is possible, which may require the translocation of sub-soil and top-soil layers from the donor site.

The Avenue is designated as ancient woodland, if the selected reservoir design results in the removal of The Avenue then mitigation for its loss should be provided. The translocation of ancient woodland areas has in the past generally proved to be difficult. However it is understood that the Forestry Commission may be prepared to allow a suitably sized area of its land to the north to be used not only for habitat mitigation. This mitigation would include the planting of native broad-leaved species. In addition, if ground conditions are suitable it maybe appropriate to transfer the top soil from the Avenue to a mitigation area. This would result in the transefer of the seedbank including bluebells, wood anemone and other ancient woodland indicators.

4.9 Invertebrates

The survey recorded 2 Red Data Book species and 12 species of Nationally Scarce status, which considering the size of the site is a rather low total. One National BAP species of conservation concern was recorded.

Nonetheless, The Avenue produced a number of faithful semi-natural woodland indicator species with restricted distributions in Britain. These were most evident in the hoverfly fauna, where the species *Brachyopa scutellaris*, *Criorhina asilica*, *C. floccosa* , *C. ranunculi*, *Xylota florum* and *X. sylvarum* are considered by Stubbs (1982) to be indicator species for this habitat. Additionally the Awl fly *Xylophagus ater* is considered to be confined to this habitat, as are the woodland butterflies the White Admiral and the silver-washed Fritillary. A number of the beetles recorded are associated with deciduous woodland, but these are not necessarily confined to ancient semi-natural woodland situations.

One of the limiting factors affecting invertebrate fauna of The Avenue is the densely shaded nature of the wood. Apart from the main ride running through the middle of The Avenue, most of the rest of this area is heavily shaded. The resulting ground flora is impoverished, and nectar sources are scant, being largely confined to the margins of the main ride and the woodland edges. The latter contain much *Salix*, which is a useful spring source of pollen and nectar, but there is little to forage from once the *Salix* has finished flowering.

The grassland areas have suffered from agricultural improvement in the past; this is reflected by the relatively limited ground flora. Much of the grassland consists of a tall sward of rank grass, providing very few nesting opportunities for ground nesting Hymenoptera. However, species entirely dependent upon a single plant species were represented by the bee *Melitta tricincta* on Red Bartsia and the picture-winged fly *Myopites inulaedyssentericae* on common fleabane, indicating some degree of long term stability at least within parts of the site.

4.9.1 Impacts and Mitigation

It is unlikely that significant mitigation will be required for invertebrates, however management of surrounding habitats should be sympathetic and consider the more important species of invertebrate.

4.10 Birds

The loss of the site to the reservoir will result in significant impact to populations of birds in the local area. Most significantly the site supports a number of Red and Amber listed species and provides important feeding habitat for a population of nightjar present within Havant Thicket.

4.10.1 Impacts and Mitigation

A comprehensive mitigation package should be devised so as to minimise impact on breeding birds and to improve foraging opportunities. In summary this should include:

- All vegetation removal (in particular grassland and hedgerow removal) should be carried out between September and February, inclusive, so as to avoid the breeding bird season. Should clearance need to be carried out outside of these months then there will be a requirement for an ecologist to supervise the work and any active nests would need to be retained within a buffer until nests are no longer in use.

- Disturbance to retained grassland, scrub and woodland should be minimised and in order for this to be carried out it would be highly advantageous to compile a working procedure that illustrated those areas of significant value where disturbance must be minimised and safe working procedures followed.

- All hedgerow and grassland removal should be mitigated by planting or sympathetic management of an area of equivalent or greater extent.

4.11 Mitigation Strategy

ECOSA has not been provided with full details of the proposed development to date and as a result guidance on impact and mitigation provided above is necessarily brief and provided in outline. However, a comprehensive mitigation strategy should be devised, and this should be aimed at offsetting the impacts to the features of interest identified. It should be considered that mitigation will require extensive areas of land in order to offset impacts to reptiles, birds, vegetation and dormice. In the case of mitigating for the potential loss of The Avenue, the Forestry Commission have land located to the north of the site, and if an agreement can be reached this area of land may offer the opportunity to off set the impact of the loss of the

ancient woodland within The Avenue. In terms of local habitat enhancement, the reservoir development will provide the opportunity to create rare freshwater wetland habitat within the site.

MAPS 1- 15

Map 1 Bat Survey Transect Route

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 1 **Route of Bat Transect and Stopping Points**

- Three Minute Stopping Points
- Transect Route

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Map 2 Common Pipistrelle Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 2 Summary of Common Pipistrelle Activity

KEY

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probably Roost Site
- x2 Number of Bats Regularly Observed

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Map 3 Soprano Pipistrelle Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 3 Summary of Soprano Pipistrelle Activity

KEY

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probable Roost Site

N

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Map 4 Noctule Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 4 Summary of Noctule Activity

KEY

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probable Roost Site

N

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Map 5 Serotine Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 5 Summary of Serotine Bat Activity

KEY

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probable Roost Site

N

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Map 6 Myotis Bat Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 6 Summary of Myotis Bat Activity

KEY

- Natterer's Bat
- Whiskered/Brandt's Bat
- Bechstein's Bat
- Unidentified Myotis Bat

Bat Activity (colour for each species corresponds to those above)

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probable Roost Site

N

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Map 7 Long-eared Bat Activity

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 7 Summary of Long-Eared Bat Activity

KEY

- Foraging Bats- Circular
- Foraging Bats- Linear
- Commuting Bats
- Probable Roost Site

N

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Map 8 Ponds Surveyed for GCN

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 8 Ponds Surveyed for Great Crested Newt

KEY

- Location of Havant Thicket Ponds
- Location of Upper Lake
- Location of Woodland Ponds to the South-East
- Location of Fishing Lake
- Location of Ponds within Bell's Copse

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Map 9 Location of Reptile Records

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Map 9 Location Of Reptile Records

KEY

- Adder
- Grass Snake
- Common Lizard
- Slow Worm

N

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Map 10 Location of Dormouse Tubes and Boxes

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 10 Location of Dormouse Tubes & Boxes

KEY

B Boxes Erected in Lines of Six

T Tubes Erected in Lines of Twelve and Eight

N

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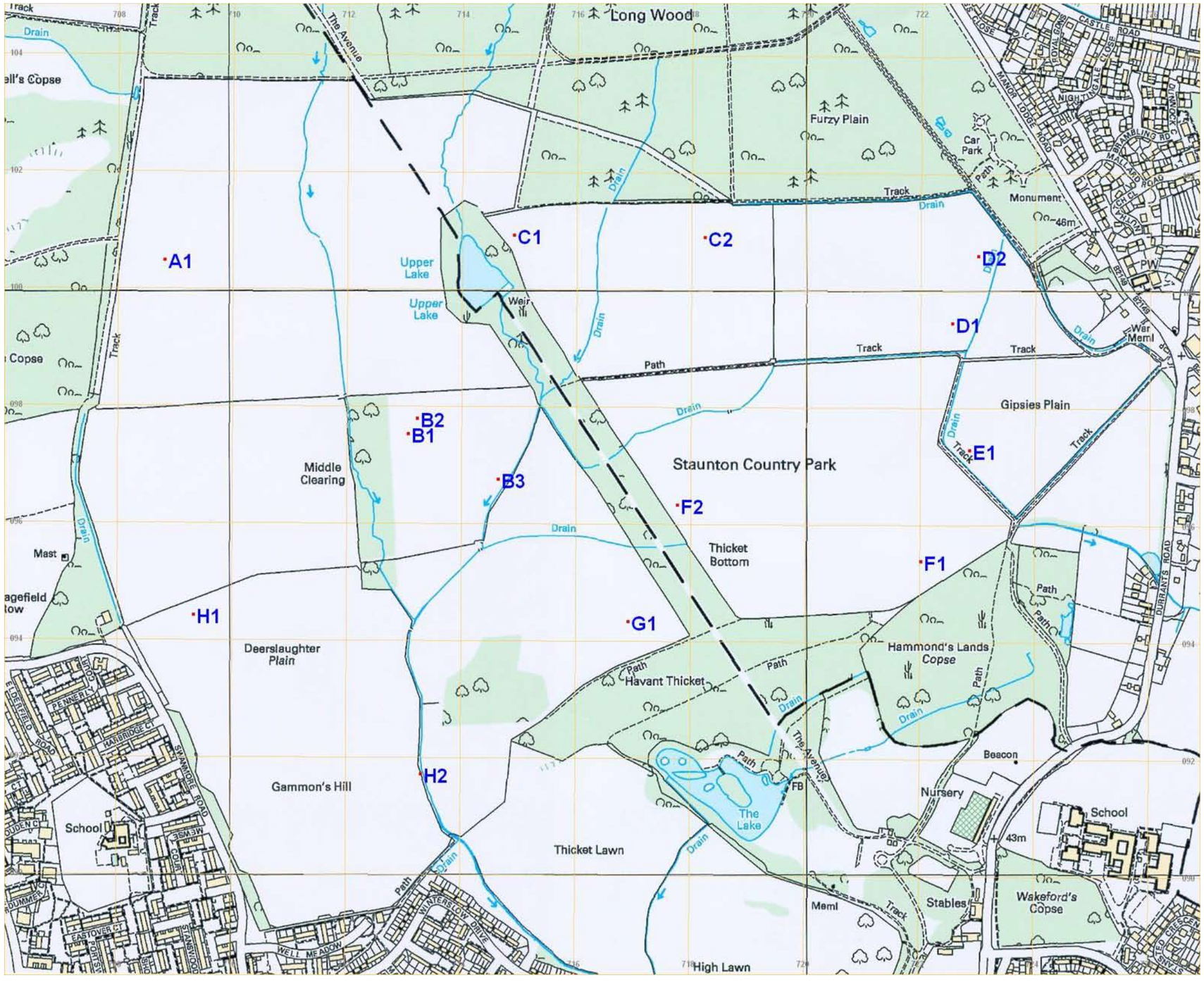
Map 11 Location of Vegetation Quadrats

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 11 Location of Vegetation Quadrats



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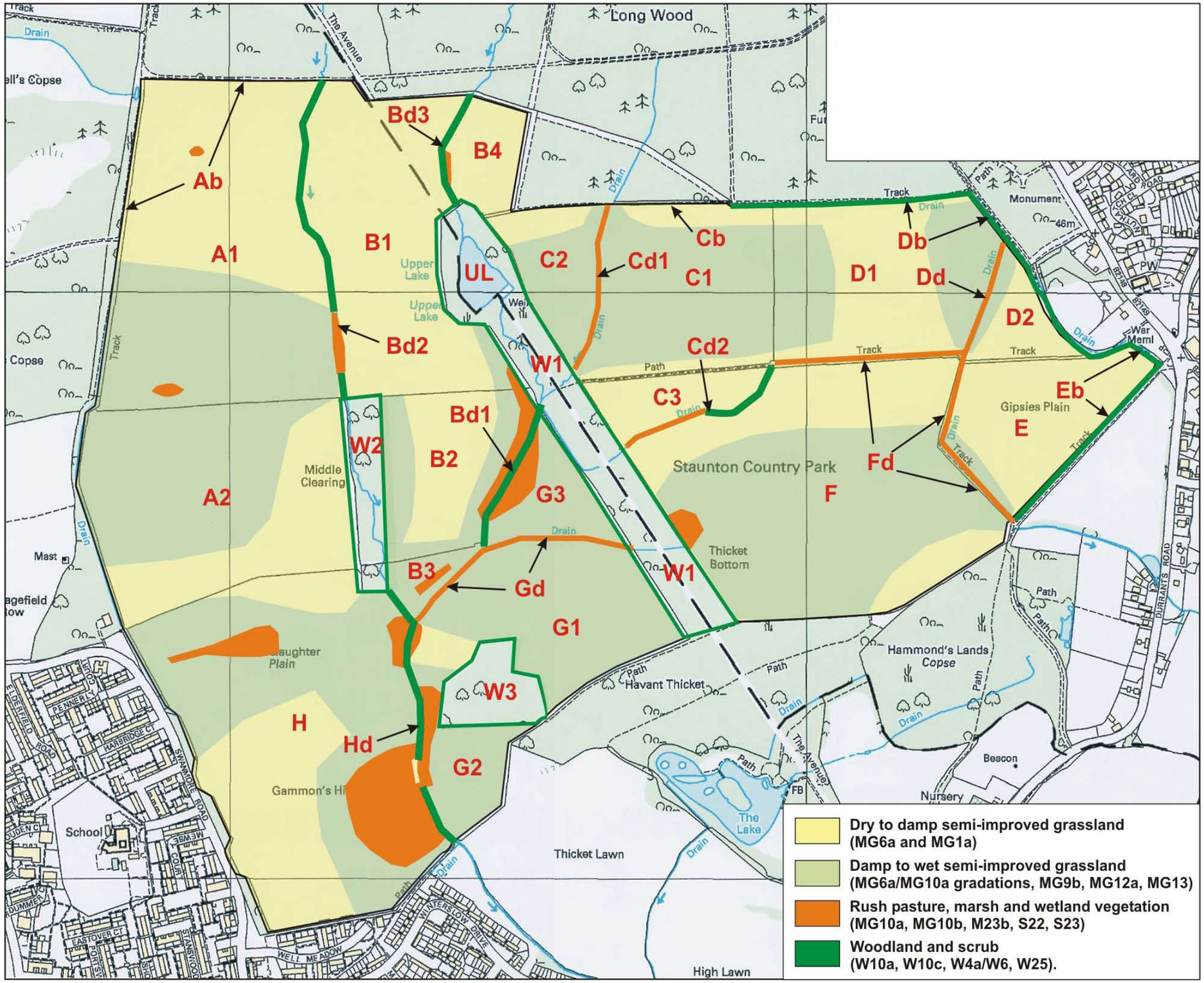
Map 12 Vegetation Communities

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 12 Location of Target Notes and Main NVC Communities



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Map 13 Location of Key Invertebrate Records

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 13 Location of Key Invertebrate Records

1. Ogcodes pallipes
2. Criorhina asilica
3. Xylota florum
4. Myopites inulaedyssentericae
5. Sapyga clavicornis
6. Melitta tricinta
7. Silver washed frit
8. Criorhina ranunculi
9. Xanthandnes comitus
10. Gymnosoma rotundatum
11. Argiope brueunichii
12. Lasioglossum malachurum

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Map 14 Location of Breeding Birds

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 14 Location of Breeding Bird Territories

B	Blackbird
BC	Blackcap
BT	Blue Tit
BZ	Buzzard
CC	Chiffchaff
CH	Chaffinch
CT	Coal Tit
D	Dunnock
GF	Goldfinch
G	Green Woodpecker
GC	Goldcrest
GL	Grey Wagtail
GS	Great-spotted Woodpecker
GR	Greenfinch
GT	Great Tit
GW	Garden Warbler
HS	House Sparrow
J	Jay
L	Lapwing
LT	Long-tailed Tit
M	Mistle Thrush
MP	Meadow Pipit
NU	Nuthatch
R	Robin
RO	Rook
S	Skylark
SC	Stonechat
SH	Sparrowhawk
ST	Song Thrush
SW	Sedge Warbler
TC	Treecreeper
TO	Tawny Owl
WP	Woodpigeon
WR	Wren
WW	Willow Warbler
Y	Yellowhammer
	Woodland

N

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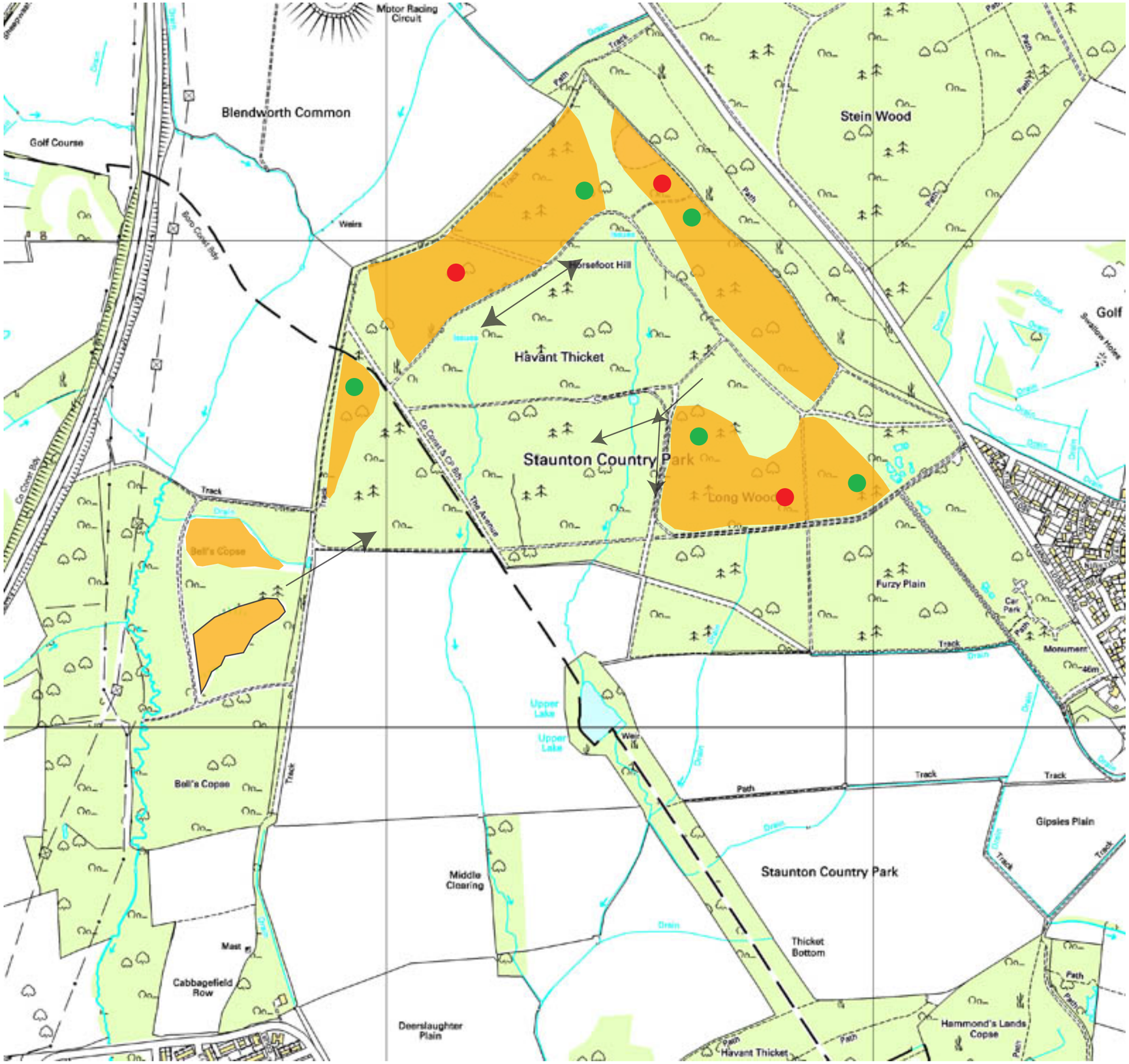
Map 15 Location of Nightjar Territories

HAVANT THICKET WINTER STORAGE RESERVOIR

Map 15 Location of Nightjar Territories



KEY

- Nightjar Heard During 2 Surveys
- Nightjar Heard on 1 Survey
- Suitable Areas for Breeding Nightjar
- Woodcock Activity Recorded during Nightjar Survey

N

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APPENDICES

Appendix 1 Protected Species and the Law

Introduction

This Appendix provides the legislative background to the species considered during the field survey. In addition to the legal framework attention has been paid to species with a UK Biodiversity Action Plan (BAP). These plans were formulated by the Government in 1994 and set out a broad strategy and objectives for enhancing and conserving species and habitats in the UK for the next 20 years. In 1995 the UK Steering group published a report including detailed proposals for the UK's most critical species and habitats. These plans now provide a framework for biodiversity conservation and provides the UK commitment to the Biodiversity Convention signed in Rio in 1992.

European Protected Animals[5]

In England, all bat species, wild birds, dormice and great crested newts are fully protected under the Wildlife and Countryside Act 1981 through inclusion in Schedule 5. In addition these specoies are protected under the Conservation (Natural Habitats, &c.) Regulations 1994 which implements the EC Habitats Directive 92/43/EEC in the United Kingdom.

Taken together, these legislative instruments make it illegal to carry out the following activities:

1. deliberately or recklessly capture or kill any wild animal of a European protected species;
2. deliberately or recklessly disturb any such animal;
3. deliberately or recklessly take or destroy eggs of any such wild animal;
4. damage or destroy a breeding site or resting place of such a wild animal;
5. deliberately pick, collect, cut, uproot or destroy a wild plant of a European protected species; and
6. keep, transport, sell or exchange, or offer for sale or exchange, any live or dead wild animal or plant of a European protected species, or any part of, or anything derived from such a wild animal or plant.

Any activity that would result in a contravention of the above legislation would require a licence to avoid committing an offence. Natural England has powers to grant a licence for the following purposes:

[5] Summarised from www.defra.gov.uk

- preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; or

- preventing the spread of disease; or

- preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property or to fisheries.

In addition, Natural England can only issue a licence if it is satisfied that the activity meets one of the above purposes and is also satisfied of the following;

- that there is no satisfactory alternative; and

- that the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

In order to determine whether an activity requires a licence, Natural England advises that the guidance of a consultant ecologist is sought. However, Natural England offer the following advice as a guide:

- A licence is needed if the consultant ecologist, on the basis of survey information and specialist knowledge of the species concerned, considers that on balance the proposed activity is reasonably likely to result in an offence under regulation 39; or

- If the consultant ecologist, on the basis of survey information and specialist knowledge of the species concerned, considers that on balance the proposed activity is reasonably unlikely to result in an offence under regulation 39 then no licence is required. However, in these circumstances Natural England would urge that reasonable precautions be taken to minimise the effect on European protected species should they be found during the course of the activity. If they are found then work should cease and an application be made to the Wildlife Licensing Unit at Natural England, Bristol.

Great Crested Newt

In addition to the above legislation the licensing authority for works where development may affect great crested newts. It is generally taken that terrestrial habitat within 500m of a breeding pond will function as habitat for the animals and as a result is covered by the legislative framework. Licences are most likely to be issued where there are strong social and economic issues linked to the proposed development. However, such licences are likely to

require mitigation/compensation proposals that benefit the species, such as additional habitat creation and beneficial habitat management.

Common Reptiles

All common reptile species (grass snakes, adders, common lizards and slow worms) native to Britain are protected by the Wildlife & Countryside Act, 1981 (as amended). This legislation makes it illegal to intentionally kill or injure a common reptile. As a result, reptiles must be removed from areas of development and relocated onto suitable release sites before any site works can commence.

Badgers[1]

Badgers and their setts are protected under the Protection of Badgers Act 1992, which makes it illegal to kill, injure or take badgers or to interfere with a badger sett. Interference with a sett includes blocking tunnels or damaging the sett in any way. The Act defines a badger sett as '*Any structure or place, which displays signs indicating the current use by a badger'* and Natural England take this definition to include seasonally used setts. The legislation does not directly protect badger habitat or foraging grounds.

Where works are likely to disturb a badger sett, it is necessary to obtain a licence from the relevant Statutory Nature Conservation Agency, in compliance with the 1992 Protection of Badgers Act. In England this would be obtained from Natural England.

Licences cannot be issued retrospectively so an application should be made at least one month in advance of the proposed work. Work that disturbs badgers without a licence is illegal.

Natural England currently administers licence applications for the following purposes:

- the purpose of preventing serious damage to land, crops, poultry or any other form of property, to kill or take badgers, or to interfere with a badger sett;

- the purpose of any agricultural or forestry operation, to interfere with a badger sett;

- the purpose of any operation (whether by virtue of the Land Drainage Act 1991 or otherwise) to maintain or improve any existing watercourse or drainage works, or to construct new works required for the drainage of any land, including works for the purpose of defence against sea water or tidal water, to interfere with a badger sett.

In terms of development which will result in interference with a badger sett, the following activities are considered licensable by Natural England when carried out within certain distances of sett entrances:

- Use of very heavy machinery within 30 metres of any entrance to an active sett, e.g. earth scrapers.
- Use of lighter machinery (particularly for any digging operation) within 20 metres, e.g. operation of a JCB.
- Light work, such as hand digging, within 10 metres.

Water Vole

The water vole is included on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) but only in respect of Section 9(4)(a). This section affords protection to "any structure or place which any wild animal included in Schedule 5 uses for shelter or protection" but does not protect the voles themselves. There is also no provision for licensing the intentional destruction of vole burrows for development or maintenance operations.

Vegetation

Section 13 of the Wildlife and Countryside Act 1981 identifies measures for the protection of wild plants. It prohibits the unauthorised and intentional uprooting of any wild plant species and forbids any picking, uprooting or destruction of plants listed on Schedule 8. It also prohibits the sale, etc, or possession for the purpose of sale of any plants on Schedule 8 or parts or derivatives of Schedule 8 plants. It provides certain defences, e.g. provision to cover incidental actions that are an unavoidable result of an otherwise lawful activity.

Invertebrates

A number of invertebrate species are legally protected under schedule 5 of the Wildlife and Countryside Act 1981(as amended). Within this act is states that, with certain exception and exemptions, it is an offence (without a licence) to:

- intentionally to take animals listed on Schedule 5 from the wild;
- intentionally to kill or injure these wild animals;
- to possess any of these wild animals (live or dead, including all stages: eggs, caterpillars and pupae, as well as adults) or any part or derivative of them;
- intentionally or (in England and Wales) recklessly to damage, destroy or obstruct the places these animals use for shelter and protection;
- intentionally or (in England and Wales) recklessly to disturb these animals when they are using such places; and

- to trade in any of these wild animals (live or dead) or any part of them (see below).

Anyone found guilty of any of these offences could be fined or even imprisoned. In any proceedings, the animal in question is presumed to be wild unless (on the balance of probabilities) the contrary is shown to be the case.

Some animals are given only partial protection under the Wildlife and Countryside Act. For example:

- Selling many butterfly species is illegal, but collecting common butterflies is generally not an offence unless it is carried out on a protected site.

However all of the species listed are extremely rare and localised, as a result an assessment of a site is usually based on the number of species present within the following criteria. Additionally, some of the species found are included in the National Biodiversity Action Plan (BAP) species listings. Again, these are clearly marked in Appendix 1.

Status Category Definitions and Criteria

RDB 1 - Endangered

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

Species which are known or believed to occur as only a single population within one 10km square of the National Grid.
Species which only occur in habitats known to be particularly vulnerable
Species which have shown a rapid or continuous decline over the last twenty years and are now estimated to exist in five or fewer 10km squares.

Species which are possibly extinct but have been recorded in the 20th century and if rediscovered would need protection.

RDB 2 - Vulnerable

Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating.

Species declining throughout their range.
Species in vulnerable habitats.

RDB 3 - Rare

Taxa with small populations that are not at present Endangered or Vulnerable, but are at risk

Species which are estimated to exist in only fifteen or fewer post 1970 10km squares. This criterion may be relaxed where populations are likely to exist in over fifteen 10km squares but occupy small areas of especially vulnerable habitat.

Nationally Scarce (Na)

Taxa which do not fall within the RDB categories but which are none - the - less uncommon in Great Britain and thought to occur in 30 or fewer 10km squares of the National Grid.

Nationally Scarce (Nb)

Taxa which do not fall within the RDB categories but which are none - the - less uncommon and thought to occur in between 31 and 100 10km squares of the national Grid.

Nationally Scarce (N)

Species which are estimated to occur within the range of 16 to 100 10km squares.

Wild Birds[6]

The Wildlife & Countryside Act 1981 (as amended) is domestic legislation for Great Britain that repeals existing wildlife legislation such as:

- Protection of Birds Acts 1954 to 1967; and
- Conservation of Wild Creatures and Wild Plants Act 1975.

The Act covers the provisions made in these previous acts and provides additional provision for species and countryside protection. The Act is the primary legislation in Great Britain for the protection of flora, fauna and the countryside. The Act includes the UK's domestic implementation of the species protection of the European Directive on the Conservation of Wild Birds (79/409).

Under the Wildlife and Countryside Act 1981 all birds, their nests and eggs are protected by law and it is thus an offence, with certain exceptions to intentionally:

- Kill, injure or take any wild bird.
- Take, damage or destroy the nest of any wild bird while it is in use or being built.
- Take or destroy the egg of any wild bird.

[6] www.naturenet.net

- Have in one's possession or control any wild bird (dead or alive) or any part of a wild bird which has been taken in contravention of the Act or the Protection of Birds Act 1954.
- Have in one's possession or control any egg or part of an egg which has been taken in contravention to the Act. This includes items taken or killed before the passing of the Act.
- Have in one's possession or control any live bird of prey of any species in the world (with the exception of vultures and condors) unless it is registered and ringed in accordance with the Secretary of State's regulations.
- Have in one's possession or control any bird of a species occurring on Schedule 4 of the Act unless registered (and in some cases ringed) in accordance with the Secretary of State's regulations.
- Disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

Appendix 2 Data Search Results

23-dec-2005 Odonata - dragonflies and damselflies
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Aeshna cyanea	SU715107			1993		Collins, C.B.	Havant Thicket
Aeshna mixta	SU715107			1993		Collins, C.B.	Havant Thicket
Anax imperator	SU715107			1993		Collins, C.B.	Havant Thicket
Coenagrion puella	SU715107			1993		Collins, C.B.	Havant Thicket
Cordulia aenea	SU715107			1993		Collins, C.B.	Havant Thicket
Enallagma cyathigerum	SU715107			1993		Collins, C.B.	Havant Thicket
Ischnura elegans	SU715107			1993		Collins, C.B.	Havant Thicket
Libellula depressa	SU715107			1993		Collins, C.B.	Havant Thicket
Orthetrum cancellatum	SU715107			1993		Collins, C.B.	Havant Thicket
Pyrrhosoma nymphula	SU715107			1993		Collins, C.B.	Havant Thicket
Sympetrum striolatum	SU715107			1993		Collins, C.B.	Havant Thicket

23-dec-2005 Lepidoptera Rhopalocera - butterflies - records up to circa 1992 only
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Aglais urticae	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Anthocharis cardamines	SU71-09-			1970		Habens, R.	Bedhampton,N of
Aphantopus hyperantus	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Aricia agestis	SU71-09-			1970		Habens, R.	Bedhampton,N of
Boloria euphrosyne	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Boloria selene	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Celastrina argiolus	SU71-09-			1970		Habens, R.	Bedhampton,N of
Coenonympha pamphilus	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Colias croceus	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Erynnis tages	SU71-09-			1970		Habens, R.	Bedhampton,N of
Gonepteryx rhamni	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Inachis io	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Lasiommata megera	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Limenitis camilla	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Lycaena phlaeas	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Lysandra coridon	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Maniola jurtina	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Neozephyrus quercus	SU71-09-			1970		Habens, R.	Bedhampton,N of
Ochlodes faunus	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Pararge aegeria	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Pieris brassicae	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Pieris napi	SU71-09-			1970		Habens, R.	Bedhampton,N of
Pieris rapae	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Polygonia c-album	SU71-09-			1969	+	Habens, R.	Bedhampton,N of
Polyommatus icarus	SU71-09-			1969	+	Habens, R.	Bedhampton,N of

Pyrgus malvae	SU71-09-	1969 + Habens, R.	Bedhampton,N of
Pyronia tithonus	SU71-09-	1969 + Habens, R.	Bedhampton,N of
Thymelicus sylvestris	SU71-09-	1969 + Habens, R.	Bedhampton,N of
Vanessa atalanta	SU71-09-	1969 + Habens, R.	Bedhampton,N of
Vanessa cardui	SU71-09-	1969 + Habens, R.	Bedhampton,N of

23-dec-2005 Mammals
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Sciurus carolinensis	SU71-09-			1967		Portsmouth City Museums	Havant Thicket
Talpa europaea	SU72-09-	27	12	1965		Morris, P.	Havant
Vulpes vulpes	SU72-09-	18	07	1968		Portsmouth City Museums	Rowlands Castle
Oryctolagus cuniculus	SU72-10-		06	1968		Portsmouth City Museums	Havant Thicket
Plecotus	SU73-10-			1982	C	NCC Printout (TMJ)	Rowlands Castle
Plecotus	SU73-10-	01	01	1984		NCC Printout (TMJ)	
Plecotus	SU73-10-			1984		NCC Printout (TMJ)	Rowland Castle

23-dec-2005 Neuroptera - lacewings and allies
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Atlantoraphidia maculicollis	SU718108	12	07	1990		Dobson, J.	Havant

23-dec-2005 Diptera:Craneflies - incomplete dataset
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Tanyptera atrata	SU73-10-	05	06	1941		Unknown	Rowlands Castle

23-dec-2005 Diptera:Brachycera - soldier-flies, horse-flies and allies
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Hybomitra bimaculata	SU73-10-	04	06	1950		Clark, D.J.	Rowland's Castle

23-dec-2005 Amphibians and Reptiles
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Triturus cristatus	SU73-10-			1984		Mary Swan's amphibian records	ROWLAND'S CASTLE
Triturus helveticus	SU73-10-			1984		Mary Swan's amphibian records	ROWLAND'S CASTLE

Triturus vulgaris	SU73-10-	1984	Mary Swan's amphibian records	ROWLAND'S CASTLE

23-DEC-05 Vascular Plants
Page 1

SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Carex pendula	SU71-09-			1997		Hollins, R.	Gammon's Hill
Carex sylvatica	SU71-09-			1997		Hollins, R.	Gammon's Hill
Carpinus betulus	SU71-09-			1997		Hollins, R.	Gammon's Hill
Euphrasia anglica	SU711092	30	06	1959		Westrup, A.W.	
Galium palustre	SU71-09-			1997		Hollins, R.	Gammon's Hill
Hordeum secalinum	SU71-09-			1997		Hollins, R.	Gammon's Hill
Juncus articulatus	SU71-09-			1997		Hollins, R.	Gammon's Hill
Lysimachia punctata	SU71-09-			1997		Hollins, R.	Gammon's Hill
Myriophyllum spicatum	SU719091			1500	+	Hollins, J.R.W.	Gammon's Hill
Nymphaea alba	SU71-09-			1997		Hollins, R.	Gammon's Hill
Oenanthe pimpinelloides	SU71-09-			1997		Hollins, R.	Gammon's Hill
Aira praecox	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Blechnum spicant	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Blechnum spicant	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Calamagrostis epigejos	SU71-10-			1998		Hollins, R.	Havant Thicket
Carex binervis	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Carex pilulifera	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Castanea sativa	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Deschampsia flexuosa	SU71-10-			1998		Hollins, R.	Havant Thicket
Dryopteris affinis	SU71-10-			1998		Hollins, R.	Havant Thicket
Dryopteris carthusiana	SU719103			1500	+	Hollins, J.R.W.	Havant Thicket
Dryopteris carthusiana	SU719103	17	06	1999		Hollins, J.R.W.	Havant Thicket
Eleocharis palustris	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Eleocharis palustris	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Eleogiton fluitans	SU71-10-	01	01	1985		Hampshire County Council	Upper Lake, Rowlands Castle
Eleogiton fluitans	SU71-10-			1985		Hampshire County Council	Rowlands Castle
Equisetum arvense	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Festuca pratensis	SU71-10-			1998		Hollins, R.	Havant Thicket
Filipendula ulmaria	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Hieracium	SU71-10-			1997		Hollins, R.	Manor Lodge Road
Holcus mollis	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Hypericum elodes	SU71-10-	01	01	1985		Hampshire County Council	Upper Lake, Rowlands Castle
Hypericum elodes	SU71-10-			1985		Hampshire County Council	Rowlands Castle
Juncus acutiflorus	SU71-10-			1997		Hollins, R.	Manor Lodge Road
Juncus articulatus	SU71-10-			1997		Hollins, R.	Manor Lodge Road
Juncus bufonius	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Juncus bufonius	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Juncus bulbosus	SU71-10-			1998		Hollins, R.	Havant Thicket
Larix decidua x kaempferi (L.	SU71-10-			1998		Hollins, R.	Havant Thicket
Lathyrus nissolia	SU71-10-			1998		Hollins, R.	Havant Thicket
Luzula forsteri	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Lychnis flos-cuculi	SU71-10-			1998		Hollins, R.	Havant Thicket

Malus sylvestris s.l.	SU71-10-	1998	Hollins, R.	Havant Thicket
Nymphaea alba	SU71-10-	1998	Hollins, R.	Havant Thicket
Poa pratensis s.l.	SU71-10-	1500 +	Hampshire Flora Group	Havant Thicket (W)
Poa trivialis	SU71-10-	1997	Hollins, R.	Manor Lodge Road
Polygala serpyllifolia	SU71-10-	1500 +	Hampshire Flora Group	Havant Thicket (W)
Polygala serpyllifolia	SU715104 13 05	1999	Hollins, J.R.W.	Havant Thicket
Rosa canina agg.	SU71-10-	1500 +	Hampshire Flora Group	Havant Thicket (W)
Scutellaria minor	SU719103 17 06	1999	Hollins, J.R.W.	Havant Thicket

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SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Thuja plicata	SU71-10-			1997		Hollins, R.	Manor Lodge Road
Typha latifolia	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Vicia sativa	SU71-10-			1500	+	Hampshire Flora Group	Havant Thicket (W)
Vicia sativa subsp. segetalis	SU71-10-	16	05	1999		Hampshire Flora Group	Havant Thicket(W)
Euphrasia nemorosa	SU718110	07	09	1957		Elwell, G.	
Glyceria declinata	SU71-11-			1998		Hollins, R.	Horsefoot Hill
Hypericum humifusum	SU716113	16	06	1998		Hollins, J.R.W.	Horsefoot Hill
Lathyrus linifolius	SU71-11-			1997		Hollins, R.	Horsefoot Hill
Leontodon autumnalis	SU71-11-			1997		Hollins, R.	Horsefoot Hill
Luzula multiflora	SU71-11-			1998		Hollins, R.	Horsefoot Hill
Luzula pilosa	SU71-11-			1997		Hollins, R.	Horsefoot Hill
Lycopodium clavatum	SU715114	01	01	1975		Bowman, R.P.	Havant Forest N edge
Lycopodium clavatum	SU71-11-			1975		Rowe, J.	Havant Thicket
Persicaria hydropiper	SU716112	28	08	1998		Hollins, J.R.W.	Horsefoot Hill
Solidago virgaurea	SU71-11-			1997		Hollins, R.	Horsefoot Hill
Daphne laureola	SU72-09-			1997		Hollins, R.	Durrants
Galium uliginosum	SU72-09-			1997		Hollins, R.	Durrants
Kickxia elatine	SU72-09-			1997		Hollins, R.	Durrants
Larix decidua	SU720090		04	1998		Hollins, J.R.W.	Durrants
Lychnis flos-cuculi	SU72-09-			1997		Hollins, R.	Durrants
Agrostis canina	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Agrostis canina	SU72-10-	16	05	1999		Hampshire Flora Group	Havant Thicket
Aira caryophyllea	SU72-10-			1998		Hollins, R.	Manor Lodge Road
Alopecurus geniculatus	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Alopecurus geniculatus	SU723102	16	05	1999		Hollins, J.R.W.	Manor Lodge Road
Calluna vulgaris	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Carex binervis	SU723102	16	05	1999		Hollins, J.R.W.	Manor Lodge Road
Carex laevigata	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Carex laevigata	SU72-10-	16	05	1999		Hampshire Flora Group	Havant Thicket
Carex ovalis	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Carex ovalis	SU723102	16	05	1999		Hollins, J.R.W.	Manor Lodge Road
Carpinus betulus	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Chamaemelum nobile	SU725108			1500	+	Rowe, J.	Rowlands Castle Golf Course
Chamaemelum nobile	SU725108	15	06	1999		Rowe, J.	Rowlands Castle Golf Course
Cryptomeria japonica	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Danthonia decumbens	SU725108			1500	+	Rowe, J.	Rowlands Castle Golf Course
Epilobium hirsutum	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Epipactis helleborine	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Erica tetralix	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Festuca filiformis	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket

Festuca filiformis	SU723102 16 05 1999	Hollins, J.R.W.	Manor Lodge Road
Frangula alnus	SU72-10- 1997	Hollins, R.	Manor Lodge Road
Hydrocotyle vulgaris	SU72-10- 1997	Hollins, R.	Manor Lodge Road
Lemna minor	SU72-10- 1998	Hollins, R.	Manor Lodge Road
Linaria purpurea	SU72-10- 1997	Hollins, R.	Manor Lodge Road
Lolium multiflorum	SU723102 16 05 1999	Hollins, J.R.W.	Manor Lodge Road
Lolium perenne	SU72-10- 1997	Hollins, R.	Manor Lodge Road
Lotus pedunculatus	SU72-10- 1997	Hollins, R.	Manor Lodge Road

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SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Luzula multiflora	SU723103	16	05	1957		Westrup, A.W.	
Lysimachia nemorum	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Myriophyllum aquaticum	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Myriophyllum aquaticum	SU72-10-	16	05	1999		Hampshire Flora Group	Havant Thicket
Orchis morio	SU725108			1500	+	Rowe, J.	Rowlands Castle GC
Orchis morio	SU725108	15	06	1996		Rowe, J.	Rowlands Castle Golf Course
Phleum bertolonii	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Potamogeton natans	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Potamogeton natans	SU72-10-	16	05	1999		Hampshire Flora Group	Havant Thicket
Potentilla anserina	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Potentilla sterilis	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Prunus laurocerasus	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Pulmonaria officinalis	SU72-10-			1500	+	Hampshire Flora Group	Havant Thicket
Pulmonaria officinalis	SU72-10-	16	05	1999		Hampshire Flora Group	Havant Thicket
Quercus rubra	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Ribes nigrum	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Rumex acetosa	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Rumex conglomeratus	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Salix alba	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Sorbus aucuparia	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Torilis japonica	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Tsuga heterophylla	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Vinca minor	SU72-10-			1997		Hollins, R.	Manor Lodge Road
Carex pallescens	SU72-11-			1998		Hollins, R.	The Holt east
Epilobium obscurum	SU726118	22	07	1998		Hollins, J.R.W.	The Holt East
Erophila verna s.l.	SU721119	19	04	1960		Westrup, A.W.	
Galium palustre	SU72-11-			1998		Hollins, R.	The Holt east
Lactuca virosa	SU72-11-			1998		Hollins, R.	The Holt
Stellaria uliginosa	SU72-11-			1998		Hollins, R.	The Holt east
Vulpia bromoides	SU72-11-			1998		Hollins, R.	The Holt East
Asplenium ruta-muraria	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Carex divulsa subsp. divulsa	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Chenopodium album	SU737098		10	1997		Hollins, J.R.W.	Wade Court
Clinopodium vulgare	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Galium verum	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Melampyrum pratense	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Milium effusum	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Oenanthe fistulosa	SU734090	13	08	1960		Westrup, A.W.	Rowlands Castle
Oenothera glazioviana	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Papaver somniferum	SU73-09-			1997		Hollins, R.	Mays Coppice Farm
Pinus nigra	SU73-09-			1997		Hollins, R.	Mays Coppice Farm

Prunus laurocerasus	SU73-09-	1997	Hollins, R.	Mays Coppice Farm
Symphytum asperum x officinale	SU73-09-	1997	Hollins, R.	Mays Coppice Farm
Typha latifolia	SU73-09-	1997	Hollins, R.	Mays Coppice Farm
Alisma plantago-aquatica	SU73-10-	1997	Hollins, R.	Rowlands Castle
Anemone nemorosa	SU73-10-	1997	Hollins, R.	The Sling
Arctium minus	SU73-10-	1997	Hollins, R.	Rowlands Castle
Cardamine flexuosa	SU73-10-	1997	Hollins, R.	Rowlands Castle

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SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Cardamine pratensis	SU73-10-			1997		Hollins, R.	The Sling
Carduus crispus	SU73-10-			1997		Hollins, R.	Rowlands Castle
Carduus nutans	SU73-10-			1997		Hollins, R.	Rowlands Castle
Cirsium arvense	SU73-10-			1997		Hollins, R.	Rowlands Castle
Cirsium palustre	SU73-10-			1997		Hollins, R.	Rowlands Castle
Hypericum androsaemum	SU73-10-			1997		Hollins, R.	Rowlands Castle
Lactuca serriola	SU73-10-			1997		Hollins, R.	Rowlands Castle
Linaria vulgaris	SU73-10-			1997		Hollins, R.	Rowlands Castle
Lotus corniculatus	SU73-10-			1997		Hollins, R.	Rowlands Castle
Luzula pilosa	SU73-10-			1997		Hollins, R.	The Sling
Lycopus europaeus	SU73-10-			1997		Hollins, R.	Rowlands Castle
Medicago arabica	SU73-10-			1997		Hollins, R.	Rowlands Castle
Mentha spicata	SU73-10-			1997		Hollins, R.	Rowlands Castle
Persicaria maculosa	SU73-10-			1997		Hollins, R.	Rowlands Castle
Pinus radiata	SU73-10-			1997		Hollins, R.	Rowlands Castle
Ranunculus acris	SU73-10-			1997		Hollins, R.	Rowlands Castle
Ranunculus flammula	SU73-10-			1997		Hollins, R.	Rowlands Castle
Rhododendron ponticum	SU73-10-			1997		Hollins, R.	Rowlands Castle
Ribes rubrum	SU73-10-			1997		Hollins, R.	Rowlands Castle
Sambucus nigra	SU73-10-			1997		Hollins, R.	Rowlands Castle
Silaum silaus	SU73-10-			1997		Hollins, R.	Rowlands Castle
Silene dioica	SU73-10-			1997		Hollins, R.	Rowlands Castle
Stellaria graminea	SU73-10-			1997		Hollins, R.	Rowlands Castle
Tilia cordata x platyphyllos (	SU73-10-			1997		Hollins, R.	Rowlands Castle
Vicia sepium	SU73-10-			1997		Hollins, R.	Rowlands Castle
Viscum album	SU73-10-			1971			
Alliaria petiolata	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Aphanes arvensis agg.	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Asplenium ruta-muraria	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Barbarea vulgaris	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Brassica napus	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Bromus hordeaceus	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Cardamine hirsuta	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Chenopodium bonus-henricus	SU730116	23	06	1959		Westrup, A.W.	
Galium odoratum	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Geranium molle	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Malva moschata	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Melissa officinalis	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Pilosella officinarum	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Rumex crispus	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Sagina procumbens	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Sherardia arvensis	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm
Silene latifolia	SU73-11-			1997		Hollins, R.	Woodhouse Ashes Farm

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SPECIES	GRIDREF	DA	MO	YEAR	D	RECORDER	LOCALITY
Cephaloziella divaricata	SU71-10-	10	09	1957		Paton, Mrs J.A.	Havant thicket
Pogonatum aloides	SU71-10-	10	09	1957		Paton, Mrs J.A.	Havant Thicket
Pogonatum aloides	SU72-10-	10	09	1957		Paton, Mrs J.A.	Havant Thicket
Leptodictyum riparium	SU733090	10	09	1957		Paton, Mrs J.A.	Emsworth Common

Appendix 3 Vascular Plant Species Lists

Refer to Map 1 for survey area codes. **G ind** = species associated with unimproved grasslands in Hampshire, **W ind** = ancient woodland vascular plant species.
D = dominant, A = abundant, F = frequent, O = occasional, R = rare, P = present, L = locally.

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Achillea millefolium	Yarrow							R									R						
Achillea ptarmica	Sneezewort	y														R			R				
Agrostis canina	Velvet Bent					LF																	
Agrostis capillaris	Common Bent			F-D		D		D		D	P		D		A		D	A		LF	A	A	
Agrostis stolonifera	Creeping Bent			F-D		F		LA		A			LA		F		A	F-D			F	R	
Ajuga reptans	Bugle								R		O	R					R						
Alisma plantago-aquatica	Water-plantain																		LF				
Alnus glutinosa	Alder						R								R				R		R		
Alopecurus geniculatus	Marsh Foxtail					O												LA					
Angelica sylvestris	Wild Angelica						O		F							O	R		R				
Anthoxanthum odoratum	Sweet Vernal-grass			R		O							R					R					
Arrhenatherum elatius	False Oat-grass			LA		LD			LF		P		A					O					
Athyrium filix-femina	Lady Fern						R													O			
Betula pendula	Silver Birch				O														O	R			
Betula pubescens	Downy Birch						F		O		O								P	F-LD			LF
Bromopsis ramosa	Hairy-brome		y						O												F		
Bromus hordeaceus	Soft-brome									R			R										
Calluna vulgaris	Heather										R												
Calystegia sepium	Hedge Bindweed															R							
Cardamine pratensis	Cuckooflower					R																	
Carex acutiformis	Lesser Pond-sedge														R								
Carex hirta	Hairy Sedge					LA		R	R	R		R	R		LF		R	LA	R				
Carex ovalis	Oval Sedge			P		R									O		R						
Carex pendula	Pendulous Sedge																			R			
Carex pilulifera	Pill Sedge																	R					
Carex remota	Remote Sedge		y				R											R	R	LF	F		
Carex sylvatica	Wood Sedge		y																		F	R	
Carex viridula ssp. oedocarpa	Common Yellow-sedge														R								
Castanea sativa	Sweet Chestnut																			R			
Centaurea nigra	Common Knapweed			R		R		R		R			R		R	LF	R	R	R				
Centaurium erythrea	Common Centaury							R															

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Cerastium fontanum	Common Mouse-ear			O		F		O		O					R		R	O					
Chamerion angustifolium	Rosebay Willowherb										R												
Chenopodium polyspermum	Many-seeded Goosefoot			R-LF											R			P					
Circaea lutetiana	Enchanter's-nightshade																						
Cirsium arvense	Creeping Thistle			LA		F		O		LA			R		LF		P	LF					
Cirsium palustre	Marsh Thistle			R		F		LF	O	O	O	R			R		LF	R					
Cirsium vulgare	Spear Thistle					O							R		R								
Clematis vitalba	Traveller's-joy								R														
Corylus avellana	Hazel								R											O	O	R	
Crataegus monogyna	Hawthorn						O		R					O					O	O	F	O	
Crataegus monogyna (seedling/sapling)	Hawthorn				O				R				R										
Cynosurus cristatus	Crested Dog's-tail			R		O		O		F			F					F				R	
Cytisus scoparius	Broom							R										R	R				
Dactylis glomerata	Cock's-foot			F-LA		A				R			LF					A			O	F	
Deschampsia cespitosa	Tufted Hair-grass			O		LF	R		P		R	F	O-LA		R	F	A	LF		R	O	O	
Digitalis purpurea	Foxglove								P		O									R			
Dryopteris dilatata	Broad Buckler-fern										R									R			
Dryopteris filix-mas	Male Fern										O									R			
Eleocharis palustris	Common Spike-rush																						P
Epilobium hirsutum	Great Willowherb								R										R				
Epilobium parviflorum	Hoary Willowherb					R											R		R				
Epilobium tetragonum	Square-stalked Willowherb			R		R		R	R						R		R	R					
Equisetum arvense	Field Horsetail						R			P	O	LF			R								
Equisetum telmateia	Great Horsetail						R		R														
Euphorbia amygdaloides	Wood Spurge		y		R														R				
Fagus sylvatica	Beech						R													R			
Festuca arundinacea	Tall Fescue					O											A	A					
Festuca gigantea	Giant Fescue		y																			R	
Festuca pratensis	Meadow Fescue					P																	
Festuca rubra	Red Fescue					R																	
Filipendula ulmaria	Meadowsweet						R												R				

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Frangula alnus	Alder-buckthorn		y								R												
Fraxinus excelsior (seedling/sapling)	Ash														O						R		
Galium mollugo	Hedge Bedstraw							R						R									
Galium palustre	Marsh Bedstraw								O			P				R			R	R	R		P
Galium saxatile	Heath Bedstraw							R															
Geranium dissectum	Cut-leaved Crane's-bill												R										
Geranium molle	Dove's-foot Crane's-bill					R																	
Glechoma hederacea	Ground-ivy						R													LF			
Glyceria declinata	Small Sweet-grass																	R					
Glyceria fluitans	Floating Sweet-grass						R										P		F/LA		LF		
Gnaphalium uliginosum	Marsh Cudweed			P		R		R		R					R			R					
Hedera helix	Ivy						LF				A								R	A		O	
Hieracium sp. agg.	Hawkweed species								R		R							R					
Holcus lanatus	Yorkshire-fog			F		A		F		A	R		A		O-LA		A	A		O	F	F	
Holcus mollis	Creeping Soft-grass		y	O		F																	
Hordeum secalinum	Meadow Barley	y								R						LF							
Hydrocotyle vulgaris	Marsh Pennywort	y				LA	R		LF											R			LF
Hypericum elodes	Bog St John's-wort																						LF
Hypericum pulchrum	Slender St John's-wort								R		R	R			R			R					
Hypericum tetrapterum	Square-stalked St John's-wort						R											R					
Hypochaeris radicata	Cat's-ear			LF		O		O		O	R		O				R	LF					
Ilex aquifolium	Holly		y																R	O	O	F	
Juncus acutiflorus	Sharp-flowered Rush			LF		O	O		O	O					LF		R	LF					
Juncus bufonius agg.	Toad Rush																		R				LD
Juncus conglomeratus	Compact Rush			O		O-F	F	O	F				LF		A	F	F	R					
Juncus effusus	Soft Rush			A		F		O-F	LD	F	F	A			A		F	F-LD	F	O	LF		LF
Juncus inflexus	Hard Rush					LF	O			R			R		O		LA	LF	LA				
Lathyrus pratensis	Meadow Vetchling																	R					
Lemna minor	Common Duckweed							R		R													
Leontodon autumnalis	Autumn Hawkbit							LA															
Leucanthemum vulgare	Oxeye Daisy																						
Ligustrum vulgare	Wild Privet																				R		

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Lolium perenne	Perennial Rye-grass			P		R		O		O			O				P	LA					
Lonicera periclymenum	Honeysuckle						R	R	O		F					O				F	R		
Lotus corniculatus	Bird's-foot-trefoil			LF		O-LF		O		O		P	R		O-F		O	LF					
Lotus pedunculatus	Greater Bird's-foot-trefoil			R		O			R								R	LF	LF				
Luzula forsteri	Southern Wood-rush		y																		R		
Luzula multiflora	Heath Wood-rush																				R		
Lychnis flos-cuculi	Ragged-Robin																		O				
Lycopus europaeus	Gypsywort						O										R		F	R			
Lysimachia nemorum	Yellow Pimpernel		y																	LF			
Lysimachia nummularia	Creeping-Jenny														R								
Lythrum portula	Water-purslane																	R					
Matricaria discoides	Pineappleweed									R								R					
Matricaria recutita	Scented Mayweed			R				R		O													
Mentha aquatica	Water Mint						F-A		F			LF			LA	O			F		R		
Milium effusum	Wood Millett		y																	R			
Moehringia trinervia	Three-nerved Sandwort		y																			LF	
Molinia caerulea	Purple Moor-grass	y																		R			
Myosotis laxa	Tufted Forget-me-not																	R	R				
Myosotis sp.	Forget-me-not species																			O			
Nymphea alba	White Water-lily																						D
Odontites vernus	Red Bartsia															R							
Oenanthe pimpinelloides	Corky-fruited Water-dropwort	y																R					
Oxalis acetosella	Wood Sorrel																			R			
Persicaria amphibia	Amphibious Bistort																						
Persicaria maculosa	Redshank									R													
Phleum pratense	Timothy			LF		R		R		R			F		O		P	R	R				
Phragmites australis	Common Reed														R								
Pinus nigra	Corsican Pine																			O			
Plantago lanceolata	Ribwort Plantain			R		R		LF		R			R					R-LF					
Plantago major	Greater Plantain			R		R		R		R			R				R	R	R				
Poa trivialis	Rough Meadow-grass																			O			
Polygonum aviculare	Knotgrass							R		R								R					

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Populus sp.	Aspen/Grey Poplar							R												O			
Populus tremula (seedling)	Aspen			R	R																		
Potamogeton polygonifolius	Bog Pondweed						R																
Potentilla anglica / P. x mixta	Tormentil hybrids							LA							R			R					
Potentilla anserina	Silverweed									R					R	LF		R					
Potentilla erecta	Tormentil							R			R	O			R	O							
Potentilla reptans	Creeping Cinquefoil																						
Potentilla sterilis	Barren Strawberry						R																
Primula vulgaris	Primrose		y																				
Prunella vulgaris	Selfheal							P		R									R		R		
Prunus spinosa	Blackthorn						O					F		O		O			O				
Pteridium aquilinum	Bracken				A				F		A	LF				LF				F			
Pulicaria dysenterica	Common Fleabane			LA		O-LA		A	LA	LF		LF	LF		LA	F	O	LF	O				
Quercus cerris (seedling/sapling)	Turkey Oak			R	O							R				O							
Quercus cerris (tree)	Turkey Oak						R		R														
Quercus robur (seedling/sapling)	Pedunculate Oak			O	F	R		R		O	O			LF	O		P	O					
Quercus robur (tree)	Pedunculate Oak			R			R	O		R	P							O		F	D	D	
Ranunculus acris	Meadow Buttercup					LF				O					R			R					
Ranunculus bulbosus	Bulbous Buttercup																						
Ranunculus flammula	Lesser Spearwort			R		LA		LF				R			LF		O	R	R	O			LF
Ranunculus repens	Creeping Buttercup			F		A		A		F			LF		A		O	LF	R	F		O	
Rorippa nasturtium-aquaticum	Water-cress																		R				
Rosa arvensis	Field Rose		y				R				R					P			R		O		
Rosa canina	Dog Rose						R							R		P			O		R		
Rosa sp.	Rose species						R		P			R			R								
Rubus fruticosus agg.	Bramble			R	F		O	O	F	R	A	A	R	D	R	A			F	A		O	
Rumex acetosa	Common Sorrel			R		R			R	R							R	R					
Rumex conglomeratus	Clustered Dock																R	R					
Rumex crispus	Curled Dock			O		O		F		F			O		O		O	F					
Rumex obtusifolius	Broad-leaved Dock																				R		
Rumex sanguineus	Wood Dock						LF		LF										O		F	O	
Ruscus aculeatus	Butcher's-broom		y																			O	
Salix aurita	Eared Willow								R														
Salix caprea	Goat Willow						R		R										R				

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Salix cinerea subsp. oleifolia	Grey Willow			R	F	A	LD	O	F			LF			R	A			F-D	LD			LD
Scrophularia auriculata	Water Figwort						R					R					R		R		R		
Scrophularia nodosa	Common Figwort						R		P		R										R		
Scutellaria minor	Lesser Skullcap								R						R								
Senecio erucifolius	Hoary Ragwort	y		O		O		A	P	O			R				O	O	R				
Senecio jacobaea	Ragwort								P	R					R			R					
Senecio vulgaris	Groundsel			R			R																
Solanum dulcamara	Bittersweet								R										R				
Solanum nigrum	Black Nightshade																	R					
Solidago virgaurea	Golden-rod		y								R												
Sonchus asper	Prickly Sow-thistle			R											R								
Sparganium erectum	Branched Bur-reed						R												LF				R
Stachys officinalis	Betony	y	y						O														
Stachys palustris	Marsh Woundwort															O							
Stachys sylvatica	Hedge Woundwort						R													R			
Stellaria graminea	Lesser Stitchwort					R													R				
Stellaria holostea	Greater Stitchwort							R												LF			
Stellaria uliginosa	Bog Stitchwort																						
Succisa pratensis	Devil's-bit Scabious	y						R								O							
Taraxacum sp. agg.	Dandelion			R		R		R		R			R				P	LF					
Taxus baccata	Yew										O									O			
Teucrium scorodonia	Wood Sage								F		F	P				O			R				
Trifolium dubium	Lesser Trefoil									R													
Trifolium pratense	Red Clover			R						O-LF			R				P	P					
Trifolium repens	White Clover							R		R			O				P	R					
Tussilago farfara	Colt's-foot															R							
Ulex europeaus	Gorse			R	LF		R				F	O		O		O							
Urtica dioica	Common Nettle								R			R	R								R	P	
Veronica beccabunga	Brooklime						R												O		R		
Veronica chamaedrys	Germander Speedwell							R													O		
Veronica officinalis	Heath Speedwell																	R					
Vicia cracca	Tufted Vetch																R	R					
Vicia hirsuta	Hairy Tare												R										
Vicia sativa agg.	Common Vetch					R							R										

Species	English name	G ind	W ind	A	Ab	B	Bd	C	Cd	D	Db	Dd	E	Eb	F	Fd	G	H	Hd	W1	W2	W3	UL
Vicia tetrasperma	Smooth Tare					LF						R											
Viola riviniana	Common Dog Violet								R		O	LF						P		R	LF	R	

Appendix 4 Vegetation Survey Quadrat Data

Domin Scale: 10: 91-100%, 9: 76-90%, 8: 51-75%, 7: 34-50%, 6: 26-33%, 5: 11-25%, 4: 4-10%, 3: many, 2: several, 1: few.

Area/Q. no.	**A1**	**B1**	**B2**	**B3**	**C1**	**C2**	**D1**	**D2**	**E1**	**F1**	**F2**	**G1**	**H1**	**H2**
Grid reference (SU)	7088 1004	7130 0975	7132 0977	7146 0967	7149 1009	7182 1009	7225 0994	7230 1006	7228 0972	7220 0953	7177 0963	7169 0943	7093 0944	7133 0917
Date	20/8	16/8	16/8	8/9	16/8	20/8	18/8	18/8	18/8	18/8	18/8	8/9	20/8	20/8
Sample size	2 x 2m	5 x 5m	2 x 2m	5 x 5m	2 x 2m	2 x 2m	2 x 2m	2 x 2m	2 x 2m	2 x 2m	2 x 2m	5 x 5m	2 x 2m	2 x 2m
Est. mean veg height (cm)	30	40	30	50	25	15	15	10	40	20	70	30	30	60
NVC type	MG6a-MG10a	MG10a	MG1-MG6	M23b-MG10b	dry MG6a	damp MG6a	dry MG6a	damp MG6a	damp MG6a	MG10a	MG10b-M23b	damp MG6a	MG13 variant?	MG10b-S23
Agrostis canina				1										
Agrostis capillaris	8	5	8	4	9	8	10	3	6	6		9	3	
Agrostis stolonifera	5	3				6	1	10	5	7	1		8	
Arrhenatherum elatius									1					
Carex acutiformis											near			
Carex hirta				1							3			
Carex ovalis										1		1		
Cerastium fontanum			1		1								1	
Chenopodium polyspermum												1		
Cirsium arvense			4				4							
Cirsium palustre				1										
Cynosurus cristatus			1	1				1	4					
Dactylis glomerata	2		7											
Deschampsia cespitosa									near	6		4		1
Festuca arundinacea												4	5	
Glyceria fluitans														2
Holcus lanatus	3	4		3	3	3	2	2	2		1	4	3	1
Hypochaeris radicata			1											
Juncus acutiflorus				4						3	4			
Juncus conglomeratus	5						1		near		2	2		
Juncus effusus	4	8		6		2		2		6	4	1		2
Juncus inflexus				2							1			8
Lolium perenne						1		near	1					
Lotus corniculatus					1	1	1					1	1	
Lotus pedunculatus														3
Lychnis flos-cuculi														1

Area / Q. no.	**A1**	**B1**	**B2**	**B3**	**C1**	**C2**	**D1**	**D2**	**E1**	**F1**	**F2**	**G1**	**H1**	**H2**
Lycopus europaeus														4
Mentha aquatica											4			4
Myosotis laxa														near
Phleum pratense			1						2	1				
Pulicaria dysenterica					7	8		5	5		8		2	2
Ranunculus flammula		3		2						3		1		
Ranunculus repens	6	4	1	1	4	4		4		5		1		1
Rorippa nasturtium-aquaticum														4
Rumex crispus					1		1							
Salix cinerea														2
Senecio erucifolius	1	1			4	2								
Tree seedling				1			1			1	1	1		
Trifolium pratense					2									
Trifolium repens							1	near						
Veronica beccabunga														1
Total no. of spp.	**8**	**7**	**8**	**11**	**9**	**9**	**9**	**7**	**8**	**10**	**10**	**12**	**7**	**14**

Appendix 5 List of Invertebrate Species Recorded

Species		BAP listing
ORTHOPTERA	(Grasshoppers & Crickets)	
Conocephalus dorsalis		
Conocephalus discolor		Nationally Scarce (Na)
Leptophyes punctatissima		
Meconema thalassina		
Pholidoptera griseoaptera		
Tetrix undulata		
DERMAPTERA	(Earwigs)	
Forficula auricularia		
HEMIPTERA	(True Bugs)	
ACANTHOSOMIDAE	(Shield bugs)	
Elasmostethus interstinctus		
COREIDAE	(Squash bugs)	
Coreus marginatus		
LEPIDOPTERA	(Butterflies & moths)	
BUTTERFLIES		
Anthocharis cardamines	Orange Tip	
Argynnis paphia	Silver - washed Fritillary	Nationally Scarce (N) BAP SOCC
Coenonympha pamphilus	Small heath	
Gonepteryx rhamni	Brimstone	
Ladoga camilla	White Admiral	
Maniola jurtina	Meadow Brown	
Melanargia galathea	Marbled White	
Pararge aegeria	Speckled Wood	
Pieris brassicae	Large White	
Pieris rapae	Small White	
Pyronia tithonus	Gatekeeper	
Thymelicus sylvestris	Small skipper	
MIRIDAE	(Capsid bugs)	
Dryophilocoris flavoquadrimaculatus		
Harpocera thoracica		
PENTATOMIDAE	(Shield bugs)	
Aelia acuminata		
MEGALOPTERA	(Alder flies)	
Sialis lutaria		
ODONATA	(Dragonflies & Damselflies)	
Aeshna cyanea		
Common Red Damsel		
Libellula depressa		
Sympertrum striolatum		
DIPTERA	(True Flies)	

ACROCERIDAE	(Hunchback flies)	
Ogcodes pallipes		Nationally Scarce (N)
STRATIOMYIDAE	(Soldierflies)	
Beris chalybata		
Chloromyia formosa		
RHAGIONIDAE	(Snipeflies)	
Chrysopilus cristatus		
Rhagio scolopacea		
Rhagio tringarius		
TABANIDAE	(Horseflies)	
Haematopota pluvialis		
Tabanus bromius		
EMPIDIDAE	(Empid flies)	
Empis tesselata		
DOLICHOPODIDAE	(Long headed flies)	
Dolichopus nubilis		
Dolichopus wahlbergi		
Hercostomus gracilis		
ASILIDAE	(Robberflies)	
Dioctria linearis		
Leptogaster cylindrica		
XYLOPHAGIDAE	(Awl flies)	
Xylophagus ater		
BOMBYLIIDAE	(Beeflies)	
Bombylius major		
SYRPHIDAE	(Hoverflies)	
Baccha elongata		
Brachyopa scutellaris		
Cheilosia albitarsis s.l.		
Cheilosia variabilis		
Chrysotoxum festivum		
Criorhina asilica		Nationally Scarce (N)
Criorhina floccosa		
Criorhina ranunculi		Nationally Scarce (N)
Dasysyrphus albostriatus		
Dasysyrphus venustus		
Epistrophe eligans		
Episyrphus balteatus		
Eristalis nemorum		
Eristalis pertinax		
Eristalis tenax		
Eupeodes corollae		
Eupeodes latifasciatus		
Helophilus pendulus		
Leucozona lucorum		
Melanogaster hirtella		
Meligramma cincta		

Melanostoma mellinum		
Melanostoma scalare		
Myathropa florea		
Neoascia podagrica		
Neocnemodon vitripennis		
Parasyrphus punctulatus		
Pipiza bimaculata		
Pipiza noctiluca		
Platycheirus albimanus		
Platycheirus rosarum		
Rhingia campestris		
Sphaerophoria scripta		
Sphaerophoria taeniata		
Syritta pipiens		
Syrphus ribesii		
Syrphus vitripennis		
Volucella pelluscens		
Xanthandrus comtus		Nationally Scarce (N)
Xylota florum		Nationally Scarce (N)
Xylota segnis		
Xylota sylvarum		
CONOPIDAE	(Thick - headed flies)	
Physocephala rufipes		
TEPHRITIDAE	(Picture - winged flies)	
Anomoyia purmunda		
Myopites inulaedyssentericae		Rare (RDB3)
Tephritis neesii		
Tephritis vespertina		
BIBIONIDAE	(Fever flies)	
Bibio lanigerus		
Bibio marci		
Dilophus febrilis		
SCATHOPHAGIDAE	(Dung flies)	
Scathophaga stercoraria		
TACHINIDAE	(Tachinid flies)	
Eriothrix rufomaculata		
Gymnosoma rotundatum		Rare (RDB3)
Tachina fera		
HYMENOPTERA	(Bees, Wasps & Allies)	
SYMPHYTA	(Sawflies)	
Aglaostigma aucupariae		
Aglaostigma fulvipes		
Arge ustulata		
Eutomostethus ephippium		
Mesoneura opaca		
Tenthredo mesomelas		
Tenthredo temula		
CHRYSIDIDAE	(Cuckoo wasps)	

Trichrysis cyanea

SAPYGIDAE (Sapygid wasps)
Sapyga clavicornis Nationally Scarce (Nb)

FORMICIDAE (Ants)
Lasius niger

VESPIDAE (Social wasps)
Dolichovespula sylvestris
Vespa crabro
Vespula vulgaris

SPHECIDAE (Solitary wasps)
Argogorytes mystaceus
Crossocerus podagricus
Ectemnius cephalotes
Ectemnius continuus
Passaloecus corniger
Pemphredon lethifer
Pemphredon lugubris

ANDRENIDAE (Mining bees)
Andrena chrysosceles
Andrena dorsata
Andrena flavipes
Andrena haemorrhoa
Andrena minutula
Andrena scotica

HALICTIDAE (Mining & Cuckoo bees)
Lasioglossum calceatum
Lasioglossum malachurum Nationally Scarce (Nb)
Lasioglossum morio
Sphecodes puncticeps

MELITTIDAE (Mining bees)
Melitta tricincta Nationally Scarce (Nb)

MEGACHILIDAE (Solitary bees)
Chelostoma florisomne
Megachile versicolor
Osmia bicolor Nationally Scarce (Nb)

ANTHOPHORIDAE (Flower & Nomad bees)
Anthophora plumipes
Nomada fabriciana
Nomada flava
Nomada flavoguttata
Nomada panzeri

APIDAE (Social & Cuckoo bees)
Apis mellifera
Bombus lapidarius
Bombus lucorum
Bombus pascuorum
Bombus pratorum

Bombus terrestris

COLEOPTERA (Beetles)

ATTELABIDAE (Leaf rolling weevils)
Apoderus coryli

CANTHARIDAE (Soldier beetles)
Cantharis nigra
Cantharis pellucida
Cantharis rustica
Malthodes minimus
Rhagonycha fulva
Rhagonycha lignosa

CERAMBYCIDAE (Longhorn beetles)
Anoplerda livida
Grammoptera ruficornis
Leptura melanura
Rhagium mordax
Strangalia maculata

COCCINELLIDAE (Ladybirds)
Coccinella 7 - punctata
Micraspis 16 - punctata
Propylea 14 - punctata

CURCULIONIDAE (Weevils)
Barypeithes pellucidus
Curculio nucum

ELATERIDAE (Click beetles)
Agriotes acuminatus
Agriotes pallidulus
Athous haemorrhoidalis
Dalopius marginatus

MELYRIDAE (Flower beetles)
Malachius bipustulatus

PYROCHROIDAE (Cardinal beetles)
Pyrochroa serraticornis

SCARABAEIDAE (Dung beetles and Chafers)
Aphodius equestris
Aphodius sphacalatus

ARACHNIDA

ARGIOPIDAE (Orb web Spiders)
Argiope bruennichi Nationally Scarce (Na)

Appendix 6 List of Species Recorded During the Winter Bird Survey

1.	Common Pheasant *Phasianus colchicus*	
2.	Grey Heron *Ardea cinerea*	
3.	Mallard *Anas platyrhynchos*	
4.	Common Teal *Anas crecca*	Amber listed
5.	Eurasian Sparrowhawk *Accipiter nisus*	
6.	Common Buzzard *Buteo buteo*	
7.	Common Kestrel *Falco tinnunculus*	Amber listed
8.	Northern Lapwing *Vanellus vanellus*	Amber listed
9.	Common Snipe *Gallinago gallinago*	Amber listed
10.	Woodcock *Scolopax rusticola*	Amber listed
11.	Eurasian Curlew *Numenius arquata*	Amber listed
12.	Black-headed Gull *Larus ridibundus*	Amber listed
13.	Stock Pigeon *Columba oenas*	Amber listed
14.	Common Wood Pigeon *Columba palumbus*	
15.	Eurasian Collared Dove *Streptopelia decaocto*	
16.	Green Woodpecker *Picus viridis*	Amber listed
17.	Great Spotted Woodpecker *Dendrocopos major*	
18.	Sky Lark *Alauda arvensis*	Red & Amber listed
19.	Meadow Pipit *Anthus pratensis*	Amber listed
20.	Winter Wren *Troglodytes troglodytes*	
21.	Dunnock *Prunella modularis*	Amber listed
22.	European Robin *Erithacus rubecula*	
23.	Stonechat *Saxicola torquata*	Amber listed
24.	Common Blackbird *Turdus merula*	
25.	Fieldfare *Turdus pilaris*	Amber listed
26.	Song Thrush *Turdus philomelos*	Red listed
27.	Goldcrest *Regulus regulus*	Amber listed
28.	Long-tailed Tit *Aegithalos caudatus*	
29.	Coal Tit *Parus ater*	
30.	Blue Tit *Cyanistes caeruleus*	
31.	Great Tit *Parus major*	
32.	Marsh Tit *Parus palutris*	Red listed
33.	Wood Nuthatch *Sitta europaea*	
34.	Eurasian Treecreeper *Certhia familiaris*	
35.	Eurasian Jay *Garrulus glandarius*	
36.	Black-billed Magpie *Pica pica*	
37.	Eurasian Jackdaw *Corvus monedula*	

38. Rook *Corvus frugilegus*
39. Carrion Crow *Corvus corone*
40. Chaffinch *Fringilla coelebs*
41. European Greenfinch *Carduelis chloris*
42. European Goldfinch *Carduelis carduelis*
43. Lesser Redpoll *Carduelis flammea* Amber listed
44. Common Bullfinch *Pyrrhula pyrrhula* Red listed
45. Reed Bunting *Emberiza schoeniclus* Red listed