waders). Local Wildlife Sites (LWS) have no statutory protection. However, LWS may support habitats and species of national significance, or they may be of more local importance. They are recognised for their local, regional and national wildlife value and for public enjoyment and scientific research. In Oxfordshire there are 363 Local Wildlife Sites covering 2% of the County. There are 993.7ha in total of Lowland Meadow in Oxfordshire (TVERC, 2009).

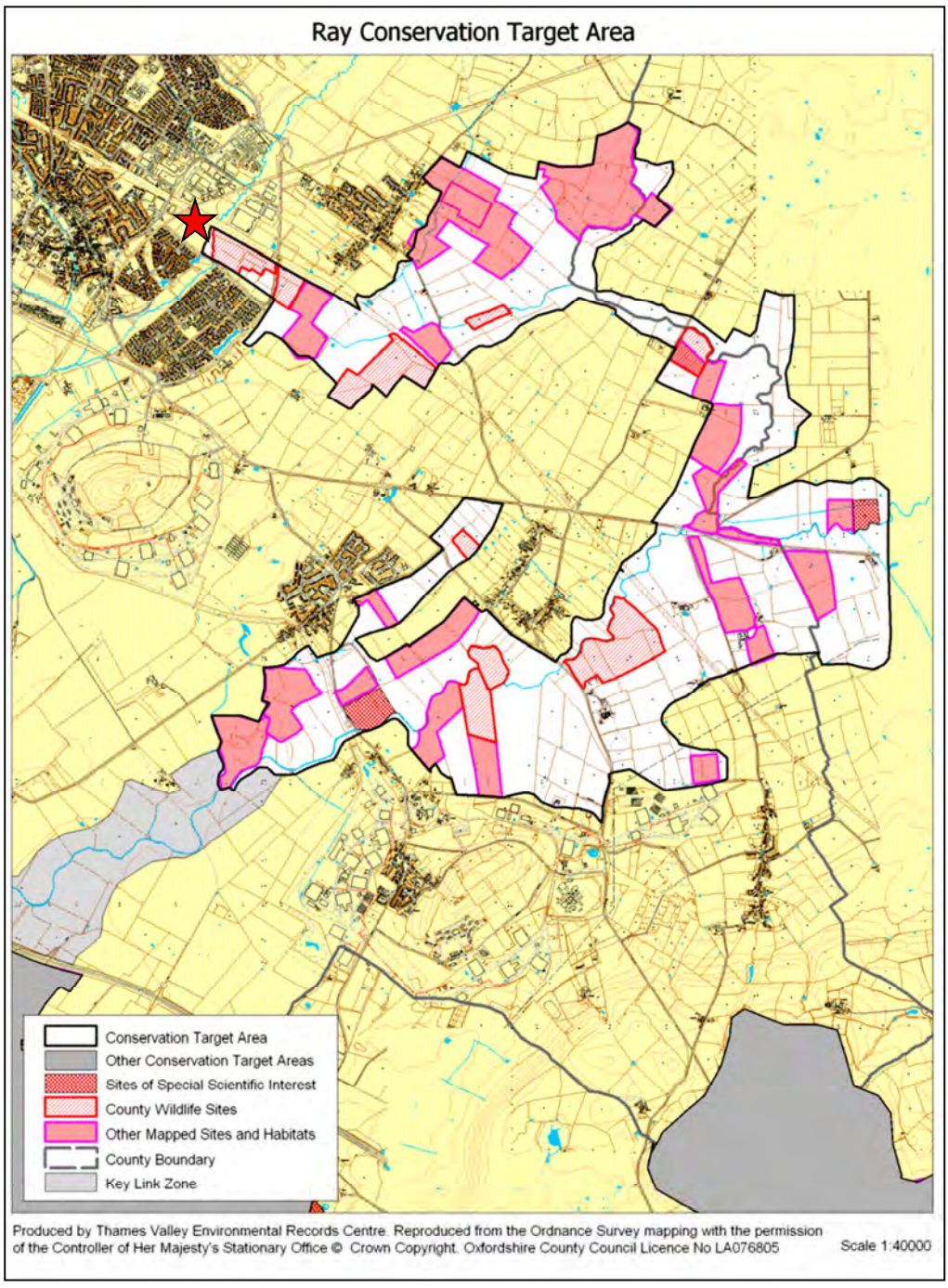


**Figure 24 The Ray Conservation Target Area. Gavray Drive is situated at the extreme North West corner (red star).**

### 3.9.1 Wildlife Site criteria

The Wildlife Site criteria follow broadly the 'Ratcliffe approach'. This is set out in Fig. 25 below (taken directly from the Wildlife Criteria document from TVERC), with threshold scores shown at the bottom of the Figure.

| Criterion | Evidence from surveys | Does the site qualify under this criterion? |
|---|---|---|
| **Core Criteria** | | |
| 1. Naturalness (habitats) | Presence of UKBAP priority habitats | Qualifies under either core criteria 1 or 2 AND |
| 2. Rare or exceptional features (principally for species) | Presence of substantial population or assemblage of species as defined by the species criteria. See the specific information for what would be considered under this criterion in the Species section. | |
| 3. Size or extent of features (habitat or population) | Does the site hold a substantial amount (≥ 3%) of the county resource of the habitat (or habitat mosaics) or species which it is being put forward for? OR is it a large site supporting a range of habitat types?<br>AND<br>Is the site ecologically viable? Are the minimum viable ecological units for the habitat(s) or the lifecycle requirements of the species present?<br><br>NB. If the resource is less than the smallest viable unit for the BAP habitat it has been selected for, the site will not meet this criterion | EITHER one or both of criteria 3 or 4 |
| 4. Diversity (numbers of species or habitats) | Follow species guidelines and consider in context of the number of habitats the site supports. | |
| 5. Connectivity within the landscape | Presence of green links or in close proximity to other areas of semi-natural habitat. Part of wider area used by meta-population of a species | OR two or more of contextual criteria 5-9 |
| 6. Fragility | Sensitive species populations or habitats prone to loss from external influences such as climate change or land management change (does not include at risk from new development). | |
| 7. Recorded history and cultural associations | Historic use of the site known and important to local community. Part of regular survey/monitoring programme | |
| 8. Value for appreciation of nature | Good access/greatly increase the aesthetic of the area | |
| 9. Value for learning | Current use by schools, local groups or proximity to education centres and access | |
| **Does the site qualify for LWS selection?** | **YES/NO (qualifies by having: one of 1 OR 2 & at least one of 3 OR 4 alternatively one of 1 OR 2 & two or more contextual criteria)** | |

**Figure 25 The Ratcliffe criteria used to aid selection of LWS designation in Oxford County (TVERC, 2009).**

In terms of this study of grasslands alone, it is only possible to comment on numbers 1-5 with some certainty (Table 7). On the basis of these, in relation to the grasslands only, it still qualifies for LWS selection. This is for containing LBAP and UK BAP Lowland Meadow habitat, on its size (> 0.25ha for Lowland Meadow), general diversity and its connectivity to the wider landscape (Ray Conservation Target area).

Table 7 LWS criteria for selection in relation to the grasslands of Gavray Drive.

| Criterion | Evidence from surveys | Does the site qualify under this criterion? |
|---|---|---|
| **1. Naturalness (habitats)** | Contains Lowland Meadow (LBAP), encompassing wet meadow (MG9 and MG10). There is a weak association with MG4 (UK BAP). | Satisfies habitat definition 4.3 |
| **2. Rare or exceptional features** | No UK priority BAP plant species. Contains 18 out of 54 lowland meadow species specified by TVERC. | X |
| **3. Size or extent** | The extent of the Lowland Meadow *sensu lato* is roughly 4.4ha | ✓ |
| **4. Diversity** | Diverse flora (154 grassland species, covering dry meadow and wet grassland). | ✓ |
| **5. Connectivity with the landscape** | Is contained within the Ray Conservation Target Area, designed to increase and connect The Lowland Meadow and Grazing Marsh BAP habitat. | ✓ |
| **Does the site qualify for LWS selection?** | Yes, qualifies under 1, 3 and 4. | |

### *3.9.2 Comment*

In relation to the grassland habitats on this site, some comments may be made with regard to these criteria. Naturalness relates to the relative influence of man on the habitats present. Overall, sites that have one or more of the UK BAP Priority Habitats of good quality should be selected under this criterion. In addition, sites with good quality, non-UK BAP Priority habitats in a more built environment setting can be selected under this criterion. This last comment is relevant to Gavray Drive, as the site sits within the largely built-up area of Bicester.

Larger sites will be looked on more favourably as they are usually richer in wildlife than smaller ones and are likely to accommodate more habitat- and species diversity. Such sites may be necessary to support sustainable populations of some species which require a minimum foraging area or territory, or which operate successfully only within a metapopulation (e.g. great crested newts). Gavray Drive is a relatively large site (15.6ha). Connectivity with semi-natural habitat in the surrounding landscape is already addressed with the inclusion of Gavray Drive in the Ray Conservation Target Area (Fig. 24). Use of the site as a wildlife resource by the community is also an important factor. This site has a public right of way going through it and is used regularly by walkers.

## 3.10 Habitat hectares approach

A field by field analysis was requested for LWS and LBAP status. To do this objectively, a method called the Habitat Hectares approach was used. This is an Australian method for assessing the quality, condition or status of stands of native vegetation (Parkes, Newell, & and Cheal, 2003) using a scoring system. This method is an objective assessment of vegetation quality which is both reliable and repeatable. This is defined as the degree to which the current vegetation differs from a benchmark representing the characteristics of a mature and undisturbed stand of the same vegetation community.

The benchmark in UK terms is the NVC classification. The Habitat Hectares method attempts to assess the evidence of the long term viability of the stand. It does this by looking at particular perennials present. Other factors which contribute to the score are whether the area is disturbed or not e.g. the presence of weeds and the encroachment of scrub. The approach also deals with patch size which is incorporated into the other scores, as larger patches would have a better prognosis for survival. Multiplying the 'habitat score' by the area of the stand offers a quality-quantity measure that is termed a 'habitat hectare'.

For this site, six habitat measures were chosen to represent the quality of the habitats present:

- the presence of weeds and shrubs in the grassland areas (scored negatively),
- a recognisable NVC grassland community(ies) or sub-community(ies) present,
- the species diversity of each field,
- the presence or absence of characteristic species such as devil's bit scabious and great burnet in each field, as these two species were indicative of the persistence of good quality lowland grassland, and characteristic of U4 and MG4 grassland respectively.

A final category was created which gave a negative marking for whether the field experienced 'edge effects', where the majority of the field edge was adjacent to a road and suffered as a result from disturbance and/or increased neglect.

The presence of scrub and weed species, and species diversity was reduced to scales ranging from 1-3. Grassland NVC communities, if present, were added together for each field.

The final measure was to multiply this total 'habitat' score by the size of the individual field. This was calculated from Google earth, and the 'habitat hectare' result is achieved (Table 8). A bar chart of the results is shown in Fig. 26.

Table 8 Scores for calculating the 'habitat hectares' for each field at Gavray Drive

| Field no. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weeds and Shrubs | -2 | -3 | -1 | -3 | -3 | -2 | -1 | -1 | -1 | -2 | -2 | -1 |
| NVC | 1 | 0 | 2 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Diversity | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 2 |
| *Succisa* | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Sanguisorba* | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| Edge effects | 0 | 0 | 0 | -1 | -1 | -1 | 0 | 0 | 0 | -1 | 0 | 0 |
| Total score | 2 | 1 | 2 | 1 | 1 | 2 | 5 | 1 | 1 | 1 | 3 | 3 |
| Hectares | 0.69 | 0.38 | 1.02 | 0.42 | 0.49 | 0.78 | 0.61 | 1.18 | 1.05 | 1.09 | 1.34 | 1.74 |
| Habitat hectares | 1.38 | 0.38 | 2.04 | 0.42 | 0.49 | 1.56 | 3.05 | 1.18 | 1.05 | 1.09 | 4.02 | 5.22 |

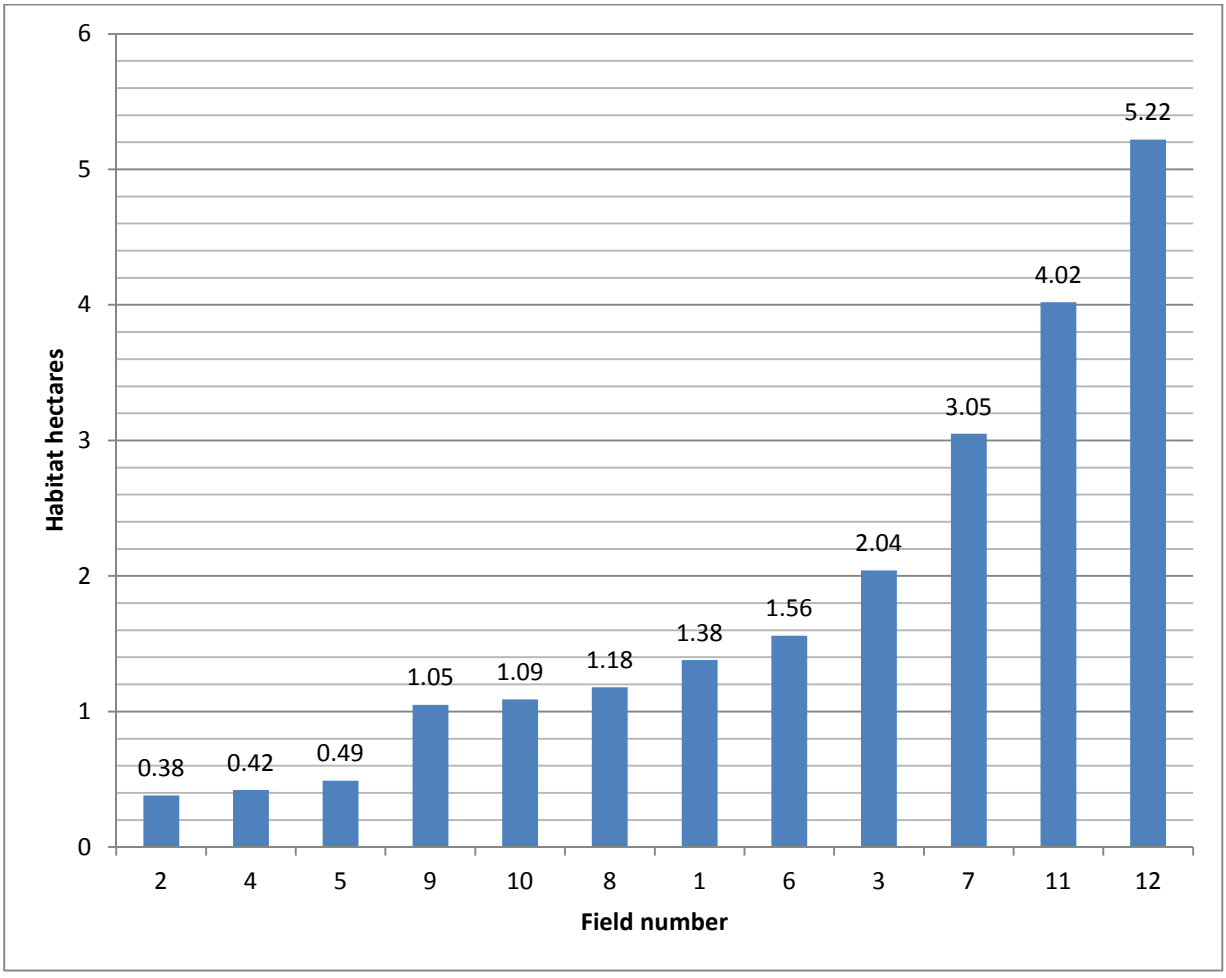


Figure 26 The 'habitat hectares' for each field surveyed in Gavray Drive.

Fields 2, 4 and 5 yielded the smallest scores as these were small fields, had scrubbed up most severely, and also did not contain sufficient area of grassland to survey for NVC. Fields

8, 9 and 10 follow as the next lowest scoring. These did have NVC communities present, but were relatively species-poor. Field 10 was very disturbed also. The remainder of the Fields 1, 6, 3, 7, 11 and 12, habitat hectares start to rise steeply in the bar chart, with Fields 7, 11, and 12 showing the best scores (Fig. 26).

Fields 1 and 3 are not currently recognised as LBAP within the site, although they both contain the wet grassland community MG10. Field 3 has a mixture of wet grassland in the furrows, and dry hay meadow on the ridges. This is more akin to the UK BAP Priority Habitat, Floodplain Grazing Marsh, which is also an LBAP. Using the Habitat Hectares approach, a revised LWS field selection based on LBAP criteria for Lowland Grassland is shown in Table 9.

**Table 9 A revised LWS selection based on the Habitat hectares approach.**

| Field number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LWS | Yes | No | Yes | No | No | Yes | Yes | No | No | No | Yes | Yes |

## 3.11 Overall comments

This study was commissioned to assess the botanical status of grassland within the Oxford LBAP at Gavray Drive, Bicester. The site at Gavray Drive is very varied and consists of three fields being cut for hay, but the remaining nine fields have scrubbed up to a greater or lesser extent over the last ten years. This would have been hay cutting in some fields and grazing in others. Part of the site has been designated as LBAP for the UK Priority habitat Lowland Meadow. At the national level, this would encompass three NVC grassland communities; MG4 Great Burnet – Meadow Foxtail Floodplain Grassland , MG5 Common Knapweed - Crested Dog's-Tail Meadows and MG8 Crested Dog's-Tail - Marsh Marigold Grassland. The only grassland type at Gavray Drive for which it was designated is MG4, described by Rodwell (Rodwell, British Plant Communities Volume 3., 1998) as a lowland grassland characteristic of traditional hay meadows on seasonally flooded land with alluvial soils.

The Local Wildlife Site citation was updated in 2003. No mention was made in this document of the presence of MG4 *per se*, but it was still described as 'Lowland meadows (Hay meadow)'. Many of the species associated with MG4 were mentioned in the citation, but two indicator species; pepper saxifrage (*Silaum silaus*) and sneezewort (*Achillea ptarmica*), located in Field 11, were not recorded in this study. The site was surveyed in 2002 by CPM in relation to a planning proposal for housing. There was a good comprehensive species list for all the fields referred to in this study, but very few quadrats were taken (10 only) in only two fields.

The main aim of this report was to carry out an extensive botanical survey of the grasslands present, using quadrats. To maintain as much objectivity as possible, the data from the

quadrats were entered into several vegetation software analysis packages. Ordination techniques were employed to analyse the vegetation data – this was carried out to identify quadrats and associated species' abundances that were similar in nature, and hence form natural groupings where they were more similar to each other. The next step was to use the output from these ordination techniques to assign NVC classes to the quadrats of similar grouping. This was done using MAVIS, a program which matches quadrats inputted to NVC communities, giving a percentage similarity to original NVC communities in the process.

The ordination techniques showed that the vegetation sampled fell into two main grassland groups; a wetter grassland group and a more dry grassland group. The drier grassland group then differentiated into a neutral grassland group, usually associated with the species composition of hay meadows, and a more acid grassland group more associated with grazing pasture.

When MAVIS was applied to the ordination groups, the wetter grassland group was most closely aligned to MG10 *Holcus lanatus - Juncus effusus* rush pasture. The rest of the quadrats all fell loosely into MG9 *Holcus lanatus - Deschampsia cespitosa* grassland. Further analysis showed that there was a weak association of the neutral hay meadow group with MG4 (44%), and another weak association within the acid grassland group of U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* group (42.79%). The hay meadows (Fields 8, 9, and 3), showed a match with MG6b (MG6 *Lolium perenne – Cynosurus cristatus* grassland, MG6b *Arrhenatherum elatius* sub-community) (53.67%) but was still considered a 'poor' match in NVC analysis.

None of the classifications reached what would be described as a 'good' match to any of the NVC communities using the techniques described here. Despite carefully locating quadrats to fulfill the criteria for effective NVC sampling, poor matches were found everywhere. This probably reflects the transitional state of nearly all the grassland communities encountered in this study.

In terms of the LWS designation, the site does not really conform to the strict UK definition of MG4 Lowland Meadow Priority habitat. There are hints that this NVC community could be restored as there was a weak match through the analysis in MAVIS. Acid grassland has not been confirmed in the County but some fields, notably Field 7, had species present of an acid grassland association. This would fall into an acid variant of Hay Meadow as described within County Wildlife Site Criteria. However, the LWS takes a more loose approach to designating County Level Lowland Meadow and includes wet grassland (MG9 and MG10), and seasonally flooded neutral grassland (MG4 and MG8). The former is very well represented in this site, but does not conform to a UK Priority Habitat type. If the strict definition is adhered to at the UK level, then this site does not qualify in its present condition. If the looser definition is followed as in the Oxfordshire LBAP, then it does qualify – as far as grasslands are concerned.

There is a proviso in the NVC definition for MG4 however which bears recounting here as it is highly relevant. Firstly, very few quadrats have been taken to identify MG4 within the NVC publication itself. Only 22 sites have been identified throughout the UK. This is partly due to the changes in management which has seen the demise of this grassland habitat, even before the NVC was compiled. The description states that this grassland may grade into several other grassland types if neglected, and lack of management will "initiate successions to other grassland types". It can however remain dormant in the soil for years and can recolonise fields from margins or ditch edges. Significantly, if it is not mown – as is the case here- it will grade into stands of *Holcus lanatus – Deschampsia cespitosa* community, namely MG9. As MG9 is the major NVC community type found throughout the site, lack of appropriate management may have caused the demise of MG4 on this site in the short term. Its affinities are somewhat mixed and it appears to straddle MG5 (*Centaurea nigra – Cynosurus cristatus* grassland) and MG1 type communities (*Arrhenatherum elatius* grassland) and even grassy poor fens. This reflects the rather particular combination of treatment factors which maintains MG4 on alluvium in Britain.

In terms of identifying the current value of individual fields for LWS selection, the Habitat Hectares approach was employed. This is an objective method, incorporating important habitat features with the area of the fields in question. This is a somewhat artificial approach as it doesn't take into account the relative proximity of the fields to each other, so at the landscape scale it may be unworkable. However, it did make sense in terms of the actual state of the fields on site today.

## 3.12 Constraints

In terms of the distribution of NVC communities on site, it was very difficult to assign spatial certainty to their coverage in the individual fields surveyed. The NVC map provided in this study is indicative of the NVC communities present but lacking in the fine detail at the field level. It was very difficult to map the NVC communities accurately in the field as it was not possible to immediately assign NVC communities while surveying. This was partly due to time constraints but also to the fact that the grassland communities are in transition to scrub and thus it was too difficult to map the grassland types accurately. It is tempting to assign NVC communities in the field while surveying, but the subsequent analysis of the quadrats was much more objective and superseded any subjective assignation of NVC in the field.

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# 5. Appendix 1 Quadrat photographs

| | |
|---|---|
| Quadrat 1 Field 11 |  |
| Quadrat 2 Field 11 |  |
| Quadrat 3 Field 11 |  |

| | |
|---|---|
| Quadrat 4 Field 11 |  |
| Quadrat 5 Field 11 |  |
| Quadrat 6 Field 11 | No photo |
| Quadrat 7 Field 12 |  |

| | |
|---|---|
| Quadrat 8 Field 12 |  |
| Quadrat 9 Field 12 |  |
| Quadrat 10 Field 12 |  |

| | |
|---|---|
| Quadrat 11 Field 12 |  |
| Quadrat 12 Field 9 |  |
| Quadrat 13 Field 9 |  |

| | |
|---|---|
| Quadrat 14 Field 9 |  |
| Quadrat 15 Field 8 |  |
| Quadrat 16 Field 8 |  |

| | |
|---|---|
| Quadrat 17 Field 8 |  |
| Quadrat 18 Field 3 |  |
| Quadrat 19 Field 3 |  |

| | |
|---|---|
| Quadrat 20 Field 3 |  |
| Quadrat 21 Field 10 |  |
| Quadrat 22 Field 10 |  |

| | |
|---|---|
| Quadrat 23 Field 10 |  |
| Quadrat 24 Field 10 |  |
| Quadrat 25 Field 1 |  |

| | |
|---|---|
| Quadrat 26 Field 1 |  |
| Quadrat 27 Field 1 |  |
| Quadrat 28 Field 7 (rabbit grazed) |  |

| | |
|---|---|
| Quadrat 29 Field 7 |  |
| Quadrat 30 Field 7 |  |
| Quadrat 31 Field 7 |  |

| | |
|---|---|
| Quadrat 32 Field 7 |  |
| Quadrat 33 Field 7 |  |
| Quadrat 34 Field 6 |  |

| | |
|---|---|
| Quadrat 35 Field 6 |  |
| Quadrat 36 Field 6 |  |
| Quadrat 37 Field 6 |  |

| | |
|---|---|
| Quadrat 38 Field 6 |  |
| Quadrat 39 Field 6 |  |

# 6. Appendix 2 Quadrat data as entered into Decorana

| Sp./Field number | 1A 11 | 2A 11 | 3A 11 | 4A 11 | 5A 11 | 6A 11 | 7A 12 | 8A 12 | 9A 12 | 10 A12 | 11 A12 | 12 A9 | 13 A9 | 14 A9 | 15 A8 | 16 A8 | 17 A8 | 18 A3 | 19 A3 | 20 A3 | 21 A10 | 22 A10 | 23 A10 | 24 A10 | 25 A1 | 26 A1 | 27 A1 | 28 A7 | 29 A7 | 30 A7 | 31 A7 | 32 A7 | 33 A7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Achi mill | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Agro capi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 | | 30 | 20 | 20 |
| Agro stol | | | | | | | | | | | | | | | | | | | | | | | | | | 5 | | 50 | | 20 | | | |
| Ajug rept | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | 1 | | | |
| Alop prat | 40 | 40 | 35 | | 30 | 20 | 30 | | 5 | | 10 | 15 | 35 | 35 | 35 | 5 | 25 | 5 | 1 | | 5 | 80 | | | | | | | 25 | 3 | | | |
| Ange sylv | | 3 | | 2 | | | | | | | 30 | | | | | | | | | | | | | | | | | | | | | | |
| Anth odor | 5 | | | | 5 | | 5 | | | | | | | 15 | 5 | 30 | 10 | 1 | | 5 | | | | | | | | | 2 | 3 | | | |
| Arrh elat | 35 | 40 | 10 | 3 | 10 | | | | | | 70 | 30 | 15 | | 5 | | 5 | | | | 40 | 10 | | | 5 | | | 1 | | | | | |
| Arte vulg | 1 | | | | | | | | | | | | | | | | | | | | | | | | 2 | 1 | | | | | | | |
| Call cusp | | | | | | | | | | | | | | | | | | | | | | | | | | 25 | | | | | | | |
| Card prat | | | | | | | | | | | | | 2 | | | | 5 | 1 | 1 | 1 | | | | | | | | | | | | | |
| Care acut | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Care hirt | | | | | | | | | 3 | 1 | | | | | | | | | | | | | | | 30 | | | 5 | | | 5 | 10 | 10 |
| Care otru | | | | | | | | | | | | | | | | 3 | 1 | | | | | | | 10 | | 50 | | | | | | | |
| Care oval | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Care pani | | | | | | | | | | | | | | | | | | | | | | | | | 5 | | | | | | | | |
| Cent nigr | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cera font | | | | | 1 | | | | | | | 10 | | 1 | | 1 | | | | | | | | | 2 | | | | | | | | |
| Cirs arve | 1 | 1 | 1 | | 2 | 2 | 1 | | 1 | | 2 | 2 | 2 | | 1 | | 1 | | | 5 | | 1 | | | | | | 2 | | | 1 | 5 |
| Cirs palu | | | | | | | 1 | | | | | | | | | | | | | | | | | | 10 | 10 | | 5 | 2 | | | | |
| Dact glom | 5 | | 10 | | | | | | | | | | | 1 | 1 | | 2 | | | | 5 | | | | | | | | 5 | | | | |
| Desc cesp | | | 2 | 5 | | 30 | 5 | | 2 | 5 | | | | | 25 | | | 75 | 50 | | | | | | | | | | 5 | | | 10 | 5 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Epil cili | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 1 |
| Epil hirs | 1 | 2 | | | | | | | 40 | | 10 | | | | | | | | | | | 5 | | | 1 | 5 | | | | | | | |
| Epil mont | | | | 40 | | 30 | | 2 | 5 | | 5 | | | | | | | | | | | | 1 | | 1 | | | | | | | | |
| Fest ovin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | 40 | | | |
| Fest rubr | | 5 | 15 | 3 | 15 | 20 | | | 5 | | | 5 | 2 | 10 | 5 | 10 | | | | | | | | | | 3 | | 1 | 5 | 5 | | | |
| Fili ulma | | | 2 | 80 | 5 | | | 10 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gali apar | | | | | | | | | | | | 1 | | | | | | | | | | 1 | | | | | | | | | | | |
| Gali palu | | | | | | | | 3 | | | | | | | | | | | | | | | | | | | | | 2 | 1 | | | |
| Glec hede | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | | | |
| Glyc flui | | | | | | | | | | | | | | | | | | | | | | | 90 | | | | 80 | | | | | | |
| Glyc maxi | | | | | | | | 50 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hera spho | | | 1 | | 2 | 5 | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Holc lana | | 6 | 5 | | 10 | | | | | | | 5 | 15 | 15 | 10 | 15 | | | | | 5 | | 2 | 5 | 15 | | | 5 | 10 | 10 | 50 | 20 | 20 |
| Iris pseu | | | | | | | | | | | | | | | | | | | | | | | 3 | | 1 | | 10 | | | | | | |
| Junc arti | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | | |
| Junc cong | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | | | | | | | |
| Junc effu | | | | | | | | | | | | | | | | | | | 60 | 40 | | | 5 | 10 | | | 5 | | | | | | |
| Lact viro | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lath prat | 5 | | | | | 5 | | | | | | | | | | | 10 | | | | | | | | | | | | | | 1 | 1 | |
| Leon autu | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | |
| Lotu corn | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Lotu pedu | | | | | | | | | | | | | | | | | | | | 10 | | | | | | | | | | | | | |
| Luzu camp | | | | | 1 | | | | | | | | | | | 2 | | | | | | | | | | | | | | 5 | | | 1 |
| Lych flos | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Phal arun | | | | | | | | 50 | 1 | 100 | | | | | | | | | | | | | | | | | | | | | | | |
| Picr echi | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poa prat | | | | | | | | | 5 | | | | | 1 | | 1 | 2 | | | | 25 | | | 1 | | 1 | | 3 | | 5 | | | |
| Pote anse | | | | | | | | 1 | 45 | | | | | | | | | | | | | | | | | | | | | | | | |
| Pote erec | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 10 | 10 | 50 | 50 | 10 |
| Pote rept | | | | | | | | | | | | | | | | | 2 | | | | 5 | | | | | | | | | | | | |
| Pote ster | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Ranu acri | | | | | | | | | | | | 2 | 2 | 40 | 10 | 15 | 20 | | 2 | | 2 | | | | | | | | | | | | |
| Ranu fica | | | 1 | | | | | | | | | | 4 | | | | 5 | | | | | | | | | | | | | | | | |
| Ranu repe | 1 | | | | | | 5 | | | | | | 10 | | | | | 5 | 1 | 5 | | | 5 | 40 | 15 | | 10 | 2 | | | | | |
| Rhyt squa | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 25 | | | |
| Rubu frut | | | | | | | | | | | | | | | | | | | | 5 | | | | | | | | | 1 | | | | |
| Rume acet | | | 5 | 2 | 10 | 10 | 1 | | 10 | | | 30 | 15 | 10 | 10 | | 15 | 5 | 5 | | | | | | | | | 5 | 2 | 1 | | | |
| Rume cris | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | |
| Rume sang | | | | | | | | | | | | | | | | | | | | | | | | 1 | | 2 | 1 | | | | | | |
| Sang offi | | 5 | 15 | 5 | 25 | 5 | | | | | | | | | | | | | | | | | | | | | | 5 | | 1 | | | |
| Scler puru | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 20 | | | |
| Sola dulc | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stac beto | | | | | | | | | | | | | | | | | | | | | | | | | | | | 3 | 3 | 3 | 5 | 30 | 20 |
| Stel gram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| Succ prat | | | | | | | | | | | | | | | | | | | | | | | | | | | | 15 | 5 | 7 | 10 | | |
| Trif prat | | | | | | | | | | | | | | | | 50 | | | | | 20 | | | | 5 | | | | | | | | |
| Trif repe | | | | | | | | | | | | | | | | | | | | | 5 | | | | 5 | | | | | | | | |
| Urti dioi | | 2 | | | | | | | | | | | | 1 | | | | | | 30 | | 5 | | | | | | | | | | | |
| Vici crac | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vici hirs | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | | |

# 7. Appendix 3 – GPS coordinates for all quadrats

| Quadrat number | x | y |
|---|---|---|
| Q1F11 | 459622 | 222297 |
| Q2F11 | 459616 | 222271 |
| Q3F11 | 459682 | 222236 |
| Q4F11 | 459670 | 222262 |
| Q5F11 | 459715 | 222249 |
| Q6F11 | 459761 | 222210 |
| Q7F12 | 459663 | 222383 |
| Q8F12 | 459707 | 222369 |
| Q9F12 | 459716 | 222369 |
| Q10F12 | 459698 | 222343 |
| Q11F12 | 459625 | 222403 |
| Q12F9 | 459847 | 222205 |
| Q13F9 | 459835 | 222205 |
| Q15F8 | 459961 | 222180 |
| Q16F8 | 459954 | 222154 |
| Q17F8 | 459946 | 222126 |
| Q18F3 | 460046 | 222099 |
| Q19F3 | 460031 | 222107 |
| Q20F3 | 460029 | 222083 |
| Q21F10 | 459775 | 222136 |
| Q22F10 | 459825 | 222074 |
| Q23F10 | 459908 | 222024 |
| Q25F1 | 459984 | 221953 |
| Q26F1 | 460003 | 221921 |
| Q27F1 | 459915 | 222027 |
| Q28F7 | 459927 | 222241 |
| Q29F7 | 459903 | 222263 |
| Q30F7 | 459878 | 222267 |
| Q31F7 | 459973 | 222215 |
| Q32F7 | 459970 | 222220 |
| Q33F7 | 459986 | 222214 |
| Q34F6 | 459667 | 222439 |
| Q35F6 | 459694 | 222421 |
| Q36F6 | 459684 | 222440 |
| Q37F6 | 459751 | 222398 |
| Q38F6 | 459783 | 222377 |
| Q39F6 | 459817 | 222367 |

# 8. Appendix 4 - Two-way ordered Table from TWINSPAN

```
                233333333222       12  11111112211222
                90145672367848912350067123564934781 25
65  Rume san  ------2-2----------------------2---11  11
62  Rubu fru  ---3------1----------------------3---  11
60  Ranu rep  ----34--32-----1------34---3--4-13354  11
47  Lotu ped  ----3-2--------------------------4---  11
40  Junc eff  ---------------------------------55343  101
37  Iris pse  ------------------------------1---2-4  101
34  Glyc flu  ----------------------------------5-5  101
15  Care otr  -------------------------1-2--5---4-  101
74  Urti dio  ----------------2---3---1--------5---  100
36  Holc lan  5555455-4344----3343---444--434---23-  011
23  Desc ces  -4335--55-3-32---2---53--5-5----5----  011
20  Cirs arv  -13434-222---12111221212-11------3---  011
68  Sene jac  ---2---2-----------------------------  010111
52  Phle pra  -------3-----------------------------  010111
45  Loli per  -----2--3----------------------------  010111
41  Junc inf  ------5-----------------------------  010111
27  Fest aru  -------55----------------------------  010111
24  Epil cil  -214--42-----------------------------  010111
13  Care dis  ------5-5----------------------------  010111
56  Pote rep  ---4---4-----------------2--3-------  010110
38  Junc art  4-----------------------------------  010110
14  Care hir  3445324443---2----------------5------  010110
 2  Agro cap  555545555-5--------------------------  010110
69  Stac bet  355------222-------------------------  010101
55  Pote ere  554-------44-------------------------  010101
71  Succ pra  4--------433-------------------------  010100
70  Stel gra  -----------1-------------------------  010100
67  Scler pu  -----------5-------------------------  010100
61  Rhyt squ  -----------5-------------------------  010100
46  Lotu cor  ---------1---------------------------  010100
```

33 Glec hed ----------2---------- 010100

32 Gali pal ----------21---------- 010100

28 Fest ovi ----------45---------- 010100

4 Ajug rep ---------2-1---------- 010100

3 Agro sto ---------5-5----------3----- 010100

30 Fili ulm ---35-4-----5----23---------- 01001

25 Epil hir ----4-45-----5412---3---------13----- 01001

48 Luzu cam --1--------3------1---------2-------- 01000

29 Fest rub ---3-5-4313323--3443-5-243--4--2----- 01000

21 Cirs pal ---2--3--32----------1-------44----- 01000

35 Hera sph -------3------1--12--3---------- 00111

22 Dact glo -------4--3----3-4------112--3------- 00111

8 Arrh ela -------551--2-5554454--4-33--53------ 00111

66 Sang off ---------3-13---345--3---------- 00110

43 Lath pra -11----------3-----3----4---------- 00110

6 Ange syl -------2----2-5-2---------- 00110

76 Vici hir ----------11----- 001011

44 Leon aut ----------11----- 001011

39 Junc con ----------4----- 001011

10 Call cus ----------5----- 001011

9 Arte vul ----------1----------21----- 001011

77 Vici sat ----------2------ 001010

73 Trif rep ----------33------ 001010

72 Trif pra ----------553------ 001010

51 Picr ech ----------1------ 001010

17 Care pan ----------3------ 001010

64 Rume cri ----------3---------- 001001

57 Pote ste ----------1---------- 001001

54 Pote ans ----------5---------- 001001

50 Phal aru ----------1---------- 001001

49 Lych flo ----------1---------- 001001

19 Cera fon ----------14----1---1-2------ 001001

16 Care ova ----------3---------- 001001

12 Care acu ----------3---------- 001001

5 Alop pra -----1-2--52-34555545555555333--1---- 001001

78 Fest lol ----------1---------- 001000

75 Vici cra ----------1---------- 001000

59 Ranu fic ----------1-----2--3---------- 001000

42 Lact vir ----------1---------- 001000

31 Gali apa ----------11---------- 001000

18 Cent nig ----------1---------- 001000

1 Achi mil ----------1---------- 001000

63 Rume ace -----132-32124---345-4144443----3---- 0001

53 Poa prat ---------2-3-3----------1-2-15-1---1- 0001

11 Card pra ----------2--31----11--- 0001

7 Anth odo ----------22---3--3---3-43415----3--- 0001

58 Ranu acr ----------2---2545-42--2---- 0000

26 Epil mon ----------533------5--------1---1-- 0000

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00000000011100000000000000000001

000111111 0000000000000000111

000011 0001111111111111

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# Annex EDP 3
# Weather Conditions Recorded During 2013 Reptile Surveys

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**Gavray Drive, Bicester – Reptile Surveys Weather Conditions**

| Date | Visit No. | Start/ Finish time | Cloud cover (%) | Air temp. range (°C) | Refugia temp. range (°C) | Wind speed (Beaufort) | Precipitation (during survey) | Recent weather (last 48 hrs) |
|---|---|---|---|---|---|---|---|---|
| 05/06/13 | 1 | 11:00-14:31 | 60 | 16.3-23.0 | 18.8-27.0 | 3 | - | Hot, sunny and dry |
| 07/06/13 | 2 | 11:52-15:31 | 40 | 20.2-25.9 | 26.8-39.0 | 0-2 | - | Hot, sunny and dry |
| 20/06/13 | 3 | 17:00-18:33 | 100 | 18.3-19.6 | 18.7-21.4 | 2 | - | Warm and humid |
| 27/06/13 | 4 | 11:10-16:10 | 50 | 16.6-19.1 | 17.1-27.1 | 2 | Drizzle and rain after 15:30 | Warm and dry |
| 02/07/13 | 5 | 13:27-17:15 | 100 | 14.5-17.5 | 17.2-19.7 | 2 | Some light rain | Sunny intervals, hot |
| 12/07/13 | 6 | 10:34-12:15 | 95 | 17.7-23.8 | 19.2-25.6 | 0 | - | Hot, sunny and dry (25+) |
| 19/07/13 | 7 | 06:15-09:50 | <1 | 13.7-21.6 | 14.2-28.4 | 1-2 | - | Hot, sunny and dry |
| 24/07/13 | 8 | 08:30-13:20 | 90-30 | 18.6-28.7 | 19.4-34.7 | 1 | - | Hot and sunny, thunder and rain |
| 02/08/13 | 9 | 10:43-13:00 | 100-30 | 19-24 | 21.1-34.6 | 1-3 | - | Hot and sunny/Rain |
| 08/08/13 | 10 | 09:15-11:40 | 45 | 19.2-23.6 | - | 2 | - | Dry and sunny, colder at night |
| 19/08/13 | 11 | 10:45-15:00 | 60 | 17.2-21.9 | 21.1-27.1 | 3 | - | Sunny spells, breezy and mild |
| 22/08/13 | 12 | 10:50-13:40 | 90 | 19.2-21.6 | 22.5-28.7 | 0-2 | - | Hot and sunny |
| 29/08/13 | 13 | 10:30-15:00 | 20 | 19.3-20.8 | - | 3 | - | Dry and mild |
| 05/09/13 | 14 | 09:00-14:00 | 10 | 17.9-26.0 | 18.9-20.1 | 1 | - | Hot and dry |
| 10/09/13 | 15 | 09:30-14:30 | 20-100 | 13.4-17.4 | 11.7-20.6 | 3 | - | Rain |

| Date | Visit No. | Start/ Finish time | Cloud cover (%) | Air temp. range (°C) | Refugia temp. range (°C) | Wind speed (Beaufort) | Precipitation (during survey) | Recent weather (last 48 hrs) |
|---|---|---|---|---|---|---|---|---|
| 16/09/13 | 16 | 12:00-16:00 | 5 | 14.3-15.3 | 15.2-27.1 | 5 | - | Heavy rain |
| 20/09/13 | 17 | 10:40-15:01 | 10-70 | 15.0-17.2 | 20.4-31.2 | 2-3 | - | - |
| 25/09/13 | 18 | 11:05-14:53 | 100 | 16.4-18.0 | 18.7-26.6 | 0-1 | - | - |
| 27/09/13 | 19 | 10:10-15:56 | 5-90 | 14.3-16.2 | 19.5-26.6 | 2-4 | - | - |
| 01/10/13 | 20 | 10:00-15:00 | 100 | 15.6-18.1 | 17.0-25.1 | 3-4 | - | - |

# Annex EDP 4
# Terrestrial Invertebrate Survey
# Colin Plant Associates (UK)
# BS/2789/13 November 2013

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Commissioned by
**EDP**
**The Environmental Dimension Partnership**
Tithe Barn, Barnsley Park Estate,
Barnsley,
Cirencester,
Gloucestershire,
GL7 5EG

# GAVRAY DRIVE BICESTER

# TERRESTRIAL INVERTEBRATE SURVEY

# 2013

Report number BS/2789/13
November 2013

Prepared by

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**ACKNOWLEDGEMENTS**

Colin Plant Associates (UK) are pleased to credit the input of the following personnel:

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Tristan Bantock
Colin W. Plant

Identification of samples has been undertaken by many parties, prominent amongst which are

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Peter R. Harvey (Grays, Essex)*
Edward Milner (Crouch End, London)*
Colin W. Plant
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# 1 INTRODUCTION AND METHODOLOGY

## 1.1 Introductory comments and Historical background to the invertebrate survey

1.1.1 During the year 2013, **Colin Plant Associates (UK)** were commissioned by **EDP** to undertake an investigation of terrestrial invertebrates on land to the north of Gavray Drive, Bicester in Oxfordshire.

1.1.2 A similar survey had been commissioned from Colin Plant Associates during the year 2005 by another party. However, data from that survey is now eight years old and whilst many species recorded then might still be present in 2013, overall it is likely that habitat changes will have occurred that render the earlier work "out of date". Indeed, our 2005 survey, whilst identifying that the network of edge habitats were then of high value to the invertebrate community, cautioned this with the suggestion that "… in the longer term some management of the hedge and field mosaic will become necessary in order to prevent the area developing into scrub and woodland".

1.1.3 The present survey was, therefore, designed to provide a comprehensive data set of information gained by active survey during 2013.

## 1.2 Terrestrial invertebrate sampling methodology

1.2.1 Five site visits were commissioned; in fact to compensate for generally poor weather conditions in 2013 the site was sampled on 6 occasions, on 1st June, 18th June, 14th July, 21st August, 23rd September and 8th October 2013, in order to obtain maximum possible coverage. All visits commenced during satisfactory weather conditions (sunshine, calm and not actively raining), although these conditions did not last for the full duration of the two June visits. On dates when sampling was cut short with the arrival of rain, surveyors returned to the site later the same day to resume surveying.

1.2.3 On most occasions, two persons were involved in each site visit, although in total three different surveyors, with different specialist skills, were involved overall in order to maximise the potential for recording different invertebrate groups.

1.2.4 Within the constraints discussed below, terrestrial invertebrate sampling was undertaken by direct observation and by the following active sampling methods:

- **Sweep-netting.** A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species.

- **Beating trees and bushes.** A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. Black or white trays are used depending upon which group of invertebrates has been targetted for search. Insects are collected from the tray using a pooter – a mouth-operated suction device.

- **Suction Sampling** consists of using a converted leaf blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species, which do not fly readily or which live in deep vegetation. It is particularly productive for Coleoptera, some Diptera and Arachnida.

1.2.5 We also undertook passive sampling through the use of pitfall traps.

- **Pitfall trapping.** Vending-machine cups or similar are placed in the ground with the rim flush with, or slightly below, the surface. A fluid is added, containing ethylene glycol, sodium chloride and formalin with a little detergent to reduce surface tension. Traps may be covered or uncovered and are typically left in position for a month at a time. Invertebrates simply fall into the traps. This is the single most effective means of recording ground beetles (Carabidae) but is also effective for rove beetles (Staphylinidae), some other beetle groups, spiders and most non-insect soil-dwelling arthropods. Unlike pan traps, pitfall can be left *in* situ for a couple of weeks before they need to be examined.

1.2.6 Traps were established on the second site visit (18th June) and operated throughout the survey period with samples collected during each site visit.

1.2.7 We operated pitfall traps in fields 2, 4, 6, 7 and 12. It should be noted that pitfall trapping was designed, only, to obtain a representative sample of the invertebrate fauna and for this reason we did not establish an extensive network of such traps in every site compartment.

**Aquatic Invertebrate Sampling**

1.2.8 Sampling of aquatic habitats presented a small challenge. Former ponds were either dry or nearly so during the sampling period such that the aquatic invertebrates normally present would have either migrated away or else entered dormant phases deep in the damp mud. Water was present in some ditches and as flooding on terrestrial fields. These areas were sampled using a pond net, with mesh diameter 0.75mm) as an underwater sweep net, taking care to ensure that as many potentially different habitat types were included (e.g., shaded and exposed, shallow and deep). In the ditches, which were deemed likely to be wet on a semi-permanent basis we also dredged debris to the bank and sifted through this by hand to collect any invertebrates that were visible.

1.2.9 Samples of aquatic invertebrates were preserved in dilute alcohol and retained for laboratory examination.

## 1.3 Survey constraints

1.3.1 Survey results are likely to have been affected by the distinctly atypical general weather pattern of the entire year and indeed by that of the previous year of 2012 which was, apparently, the wettest on record.

1.3.2 The weather during the first half of the year 2013, January to June, was atypically cold and wet as a consequence of a global change in weather pattern, led by a southwards shift of the Jet Stream in the upper atmosphere. As a direct consequence, numbers of invertebrates appeared to be severely depressed. Several species failed to appear at all. Numerical catches in moth traps, which provide a relatively quantitative comparison of insect numbers, were down in the order of 95% across southern Britain in both May and June and many common species were reported as absent from traps across Britain.

1.3.3 At the start of July, however, the weather switched to become atypically hot and sunny; importantly, the overnight temperatures were also raised. This triggered a resurgence of invertebrate activity. During August the weather pattern returned to near “normal, but there were extensive periods of atypically heavy and persistent rain and these increased again in September and October, both of which saw the return of colder than usual nights. The latter month also saw some exceptional winds.

1.3.4 Although invertebrate numbers in general appear to have recovered from July onwards, there was a knock-on effect with some species remaining apparently absent and others in low number. A great

many species appeared two or even three weeks after their expected season, which meant that in some cases targetted searches at the "correct" time were unproductive. This general effect continued throughout the autumn survey period and is of some relevance interpretation of the species list.

1.3.5 Our overall "tally" of species at Bicester is undoubtedly lower than we had hoped for at the start of the project. Nevertheless, we are of the opinion that it is fully adequate for the purpose of performing an evaluation of current ecological value.

## 2 RESULTS OF TERRESTRIAL INVERTEBRATE SAMPLING

### 2.1 Overview

2.1.1 A full list of all recorded invertebrate species is presented as Appendix 1. This combines species recorded in both 2005 and 2013; the year of the latest report (2005 or 2013) is indicated. The total number of species recorded is presented within the summary table below. The greater number of invertebrate species recorded on the site in 2013 is considered to be as a result of the far greater survey effort applied in 2013 compared to 2005.

| Parameter | Quantity |
|---|---|
| | |
| species recorded in 2005 survey | 331 |
| species recorded in 2013 survey | 427 |
| species not seen since 2005 | 172 |
| **Combined list (2005 & 2013)** | **599** |

2.1.3 A small number of invertebrate species (hairstreak butterflies) found by third parties on the site but not encountered by us (most likely because of the necessary restrictions on the number and timing of our own visits in combination with generally poor weather), are excluded from this initial analysis because the data was not made available to us until after our draft report had been prepared. These additional records are discussed separately, below and are included in the overall site analysis.

2.1.2 The inventory is annotated with formal National Status codes where these are better than "nationally common"; these status codes are explained in Appendix 2.

2.1.3 Finally, the inventory is also annotated with the primary ecological associations of the recorded species, where this information is available and reliable.

### 2.2 Species of conservation interest recorded

2.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species are now examined in detail in relation to the Gavray Drive site.

Legally Protected Species

2.2.2 No invertebrate species that are afforded direct legal protection under any UK or European legislation were encountered during either survey; none are likely to have been overlooked at this site in spite of the serious constraints imposed by the adverse weather situation.

UK Biodiversity Action Plan (UK BAP) Priority Species/Section 41 Species

2.2.3 UK BAP priority species were those that were identified as being the most threatened and requiring conservation action under the UK Biodiversity Action Plan (UK BAP). The original list of UK BAP priority species was created between 1995 and 1999. In 2007, however, a revised list was produced, following a 2-year review of the priority species and habitats lists. Following the review, the list of

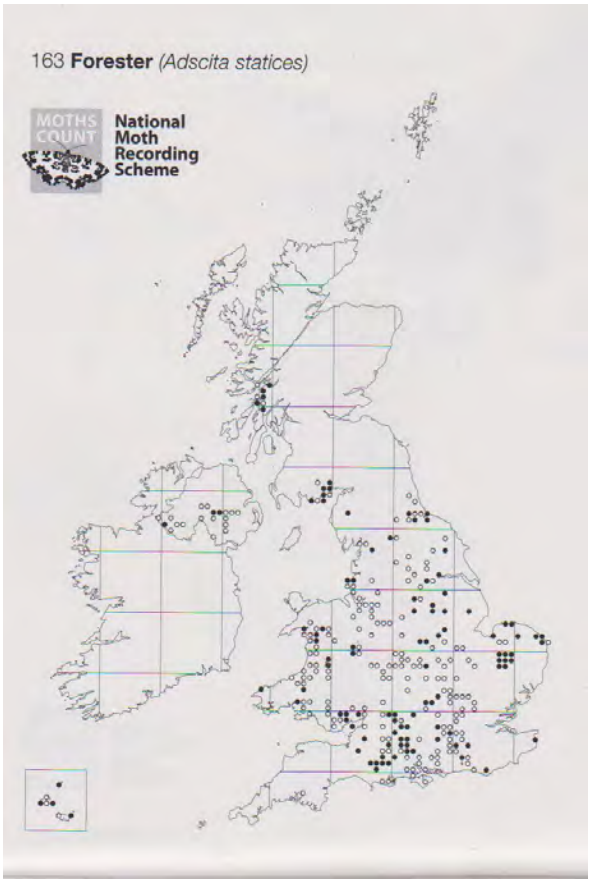
UK BAP priority species increased from less than 600 to 1150. In total, 123 species no longer met the criteria for selection, and were therefore de-listed.

2.2.4 As a result of devolution, and new country-level and international drivers and requirements, much of the work previously carried out by the UK BAP is now focussed at a country-level rather than a UK-level, and the UK BAP has recently (July 2012) been succeeded by the *UK Post-2010 Biodiversity Framework*. The full list of priority invertebrate species can be viewed at *http://jncc.defra.gov.uk/page-5169*.

2.2.5 The UK list of priority species remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England and Wales these statutory lists are presented in *The Natural Environment & Rural Communities Act, 2006*: Section 41. *List of Species of Principal Importance for Conservation of Biological Diversity in England* and Section 42: *List of Species of Principal Importance for Conservation of Biological Diversity in Wales*.

2.2.6 Two such Priority Species were recorded in the broader survey, although Marsh Fritillary butterfly (*Euphydryas aurina)* is, without any doubt, absent in 2013. These two taxa are as follows:

**The Forester Moth (*Adscita statices*)** is a metallic green species about the size of a postage stamp. In spite of the foodplant being various species of docks (*Rumex*) the moth is absent from significant areas of the country. The caterpillar feeds internally, within the rootstock of the dock plant and so is not easily found, but under-recording is thought to play a relatively minor part in the lack of solid black dots (post 1999 reports) in the following distribution map, taken from Hill *et al* (2010):




Map symbols are positioned in the 10-kilometre squares of the Ordnance Survey's national grid system. Post-1999 data are shown as black dots. Open circles indicates sites where it was present but where it has probably become extinct. The overall pattern of decline is visually obvious. We found Forester moths at the Gavray Drive site in both 2005 and 2013, indicating an established and stable population here.

2.2.7 **Marsh Fritillary butterfly *Euphydryas aurinia*** was recorded on the site during 2005; the information is correct and this report writer saw and photographed the larval "nest" on a Devil's-bit Scabious (*Succisa pratensis*) plant in August 2005. However, there is now abundant evidence to support the suggestion that that this was an artificial importation to the site by a member of the public. The species did not establish a breeding population, which is scarcely surprising since, if site conditions were right for it, it would have been present "under its own steam". Awareness of this former record is important; of equal value is our professional opinion that it is quite absent in 2013.

2.2.8 It is of ecological interest that the original list of UK Biodiversity Action Plan Priority Species *of moths* was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present. However, the second section is a list of 69 species that have declined in population strength by a significant amount in the past 25 years. These were defined as "not yet rare" and were flagged as UK BAP species "**for research only**". It is unfortunate that this list has been incorporated into the current priority listing process and that these species are now therefore of statutory interest.

2.2.9 Three such "Research Only" moth species are so far recorded; it is very likely that overnight moth recording at the site would establish the presence of several others. Th recorded species are tabulated below:

| Species | English name | Caterpillar feeds on | last seen |
|---|---|---|---|
| | | | |
| *Callistege mi* | Mother Shipton | coarse grasses, including reeds | 2013 |
| *Scotopteryx chenopodiata* | Shaded Broad-bar | vetches and clovers | 2013 |
| *Timandra comae* | Blood-vein | Polygonaceae | 2013 |

2.2.10 All three of these species are widespread across the whole site, favouring edge habitats made by the transition between hedgerow and grassland where the caterpillar food plants are most frequent and the hedges provide a sheltered micro-climate.

Red Data Book Species

2.2.11 One of the recorded species was listed in the British Red Data Books (Shirt, 1987; Bratton, 1991). Formerly listed in Category 3 (Rare) this is now called "Near Threatened".

**The Small Heath Butterfly *Coenonympha pamphilus*** is a grassland species that has declined in recent years. It was added to the UK BAP list at the end of 2007 though there are disagreements over the need for this action. In some areas it remains widespread, though it has declined numerically.

At Gavray Drive we recorded it in 2005 but not in 2013. However, we mention it here because we consider that there is a very high likelihood that it remains present and that our failure to find it was a direct consequence of atypical weather during the flight period.

Nationally Scarce Species

2.2.12 A total of 9 species recorded in 2013 species are designated as "Nationally Scarce" (see Appendix 2). A further fifteen Nationally Scarce species recorded in 2005 were not found again in 2013; as with many other species this might be a result of under-recording in the poor weather of 2013 so they are mentioned below for completeness. The site total is, therefore, 24 species.

2.2.13 Four of these species are included in former Nationally Notable Na category (see Appendix 2) and were found in 2013.

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Conocephalus discolor* | Long-winged Cone-head | coarse vegetation on the coast, but recently it has colonised inland sites |
| *Longitarsus parvulus* | a flea beetle | feeds on many plant species |
| *Rhinocyllus conicus* | Thistle Head Weevil | associated with seed heads of thistles |
| *Tachyporus formosus* | a rove beetle | amongst moss and litter |

2.2.14 A further three in the former Nationally Notable Na category were recorded in 2005 and not 2013, but are specifically mentioned here as they are judged likely to remain present and overlooked as a consequence of the survey constraints stated above:

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Agrilus sinuatus* | the Hawthorn Jewel Beetle | larvae tunnel under the bark of old hawthorn branches |
| *Hylaeus cornutus* | a yellow-faced bee | nests inside the stems of herbaceous plants, mostly in perennial species |
| *Lasius brunneus* | banded tree ant | nests on old oaks and perhaps other trees |

2.2.15 Five of the Nationally Scarce species encountered during 2013 were formerly included in the Nationally Notable Nb category (see Appendix 2).

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Meligethes rotundicollis* | pollen beetle | Mainly found in the south. The ecology of this beetle is currently unclear |
| *Metrioptera roeselii* | Roesel's Bush-cricket | long grassland |
| *Phytoecia cylindrica* | a longhorn beetle | larvae feed in stems of Umbelliferae |
| *Stenus oscillator* | a rove beetle | amongst moss and litter in marshy places |
| *Thamiocolus viduatus* | a weevil | on Stachys palustris in marshy places |

2.2.16 A further 9 in the former Nationally Notable Na category were recorded in 2005 and not 2013, but are specifically mentioned here as most, perhaps all, are judged likely to remain present and overlooked as a consequence of the survey constraints stated above:

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Bembidion gilvipes* | a ground beetle | marshland and damp riverbanks |
| *Lasioglossum malachurum* | a solitary bee | ground nesting species - prefers soils with a clay component |
| *Longitarsus dorsalis* | a flea beetle | Ragworts (Senecio species) - a southern species |
| *Lythraria salicariae* | loosestrife flea beetle | yellow loosestrife |
| *Oxyna parietina* | a picture-winged fly | mugwort - the larvae boring inside the stems |
| *Philonthus fumarius* | a rove beetle | ecology unclear - probably a scavenger |
| *Podagrica fuscicornis* | a leaf beetle | mallow (Malva species) |
| *Pyrochroa coccineus* | the Black=headed Cardinal beetle | larvae feed in dead timber |
| *Sepedophilus pedicularius* | a rove beetles | fen and bog habitats |

2.2.17 Finally, three Nationally scarce but uncategorised Diptera (former Nationally Notable N category (see Appendix 2) were recorded in 2005 and not refound in 2013.

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Merzomyia westermanni* | a picture-winged fly | various ragwort species |
| *Micropeza lateralis* | a stilt-legged fly | rough herbage/edge habitats - rarely far from water |
| *Stratiomys potamida* | a soldier fly | well-vegetated water-bodies |

Nationally Local Species

2.2.18 Thirty of the recorded species in 2013 are listed formally as Nationally Local (see Appendix 2). These are tabulated below with their primary ecological associations:

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Acupalpus dubius* | a ground beetle | damp moss, damp litter and similar habitats |
| *Agapanthia villosoviridescens* | a longhorn beetle | larvae feed internally in plant stems, including in thistles |
| *Altica oleracea* | a leaf beetle | widely polyphagous |
| *Aphthona euphorbiae* | a leaf beetle | widely polyphagous |
| *Apolygus lucorum* | | low plants |
| *Cassida vibex* | a tortoise beetle | knapweed, thistles etc |
| *Centrotus cornutus* | a plant hopper | oak, aspen and other sapling trees |

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Cordylepherus viridis* | a malachite beetle | a common grassland species |
| *Coremacera marginata* | a snail-killing fly | dry habitats, especially grasslands |
| *Crepidodera plutus* | a leaf beetle | Willows, especially Crack Willow - rarely on poplars |
| *Curculio glandium* | a weevil | Oak trees - in developing acorns |
| *Dolichopus wahlbergi* | a dance fly | larvae require damp habitat |
| *Epitrix pubescens* | a leaf beetle | associated with woody nightshade |
| *Hygronoma dimidiata* | a rove beetle | amongst moss and litter in marshy places |
| *Hypsosinga pygmaea* | a spider | grassland (especially calcareous) and low vegetation |
| *Kelisia guttulifera* | a plant hopper | on sedges in dry grassland |
| *Kelisia ribauti* | a plant hopper | associated with marshes, especially if base-poor |
| *Magdalis ruficornis* | a weevil | rosaceous trees and shrubs. Widespread but in the north confined to old woods |
| *Mordellistena variegata* | a tumbling flower beetle | unknown ecology |
| *Oedemera lurida* | a beetle | a common grassland species |
| *Paluda flaveola* | a plant hopper | tall grassland in moist and usually shaded sites |
| *Pilophorus perplexus* | a plant bug | predatory on deciduous trees |
| *Poecilus cupreus* | copper ground beetle | open grassy habitats - usually where damp |
| *Rhopalus subrufus* | a plant bug | St John's Wort (*Hypericum perforatum*) |
| *Scellus notatus* | a dance fly | predatory species in woodland and scrub, the adults predatory |
| *Sepedon sphegea* | a snail-killing fly | predatory on water snails |
| *Stenocranus major* | a plant hopper | Phalaris arundinacea in marshy places |
| *Stenus cicindeloides* | a rove beetle | usually in marshy places |
| *Tetragnatha montana* | a spider | trees and bushes |
| *Xanthogramma pedisequum s.str.* | a hoverfly | larvae feed in ants nests |

2.2.19 Twenty Nationally Local (see Appendix 2) species were last recorded at the site in 2005. These are tabulated below with their primary ecological associations:

| Species | English name | Ecological associations |
|---|---|---|
| | | |
| *Acidia cognata* | a picture-winged fly | Tussilago and Petasites plants - mining the leaves |
| *Arge pagana* | a sawfly | host plant associations are currently unclear |
| *Ceratapion carduorum* | a seed weevil | Thistles |
| *Ceutorhynchus pyrrhorhynchus* | a weevil | Sisymbrium |
| *Conocephalus dorsalis* | Short-winged Cone-head | formerly at damp coastal sites it is now found in a variety of inland habitats |
| *Conops quadrifasciatus* | a conopid fly | Parasitic on bumble bee *Bombus lucorum* - wherever the host bee is found |
| *Eupeodes latifasciatus* | a hoverfly | Damp grassland |
| *Melanargia galathea* | Marbled White | tall calcareous grassland |
| *Micropeza corrigiolata* | a stilt-legged fly | Larva feeds in root nodules of *Pisum sativum*, *Trifolium pratense* and *Medicago sativa* |
| *Notiophilus palustris* | a ground beetle | damp habitats are preferred |
| *Phasia pusilla* | a parasitic fly | Parasite of plant bugs in Europe but British hosts unknown. |
| *Physocephala rufipes* | a conopid fly | parasitic fly on various species of bee |
| *Sicus ferrugineus* | a conopid fly | parasitic fly on bumble bees |
| *Sphenella marginata* | a picture-winged fly | on various ragwort species, in late summer and autumn |
| *Taeniapion urticarium* | a weevil | nettles - larvae feed inside stem nodes |
| *Tephritis cometa* | a picture-winged fly | larvae gall the flowers of creeping thistle |
| *Tetanocera arrogans* | a snail-killing fly | predatory on a range of terrestrial and aquatic snails in marshy habitats |
| *Thecophora atra* | a conopid fly | a parasite of solitary bees |
| *Toxoneura (Palloptera) muliebris* | a picture-winged fly | larva develops under bark |
| *Urophora quadrifasciata* | a picture-winged fly | larva galls the flowers of *Centaurea nigra* |

Other species of interest

2.2.20 Surveys aimed specifically at looking for selected species of butterflies were undertaken by various third parties during 2011. These butterflies were specifically excluded from our own surveys during 2013; we did not encounter them because we did not select dates that would have been appropriate.

2.2.21 Data from these third party surveys were made available to us after the completion of our own surveys for other invertebrate groups. We have examined the documents provided and we conclude that the data obtained in 2011 are valid, reliable and may be regarded as current (may be treated as if applying to year 2013).

2.2.22 Map 3 presents a summary of the 2011 survey for **White-letter Hairstreak butterfly (*Strymonidia w-album*),** whose caterpillars are restricted to Elm (*Ulmus*) trees. White-letter Hairstreak is listed in Schedule 41 of the NERC Act (2006) as a Species of Principal Importance in England).

2.2.24 Survey was also undertaken for **Brown Hairstreak (*Thecla betulae*)** and **Black Hairstreak (*Satyrium pruni*)**, both of which are also Species of Principal Importance in England. The third party report of this work is appended here as Appendix 3.

2.2.25 The inclusion of these data on butterflies renders this present report fully comprehensive in terms of available invertebrate information. We are not aware of any other invertebrate related data for the Gavray Drive site.

# 3 RESULTS OF AQUATIC INVERTEBRATE SAMPLING

## 3.1 Overview

3.1.1 The locations of a watercourse and five ponds at Gavray Drive are presented in Map 2. These are as follows:

| | |
|---|---|
| W | watercourse (stream) forming eastern boundary of field 13 with smaller fields 6, 12 and 11; |
| A | east end of field 7; |
| B | north-east corner of field 8; |
| C | north edge of field 14; |
| D | east edge of field 15; |
| E | southern corner of field 16. |

3.1.2 Three of these ponds, C, D and E, lie outside the area of survey indicated to us in Map 1. Ponds A and B are within our survey area but were more or less dry during 2013 and did not generate any aquatic invertebrates during sampling.

3.1.3 During the first two visits we encountered flood water – in ditches surrounding some fields and as accumulations in wheel ruts created by a tractor. These were also sampled, because such temporary habitats are known to be able to support a particular, unique assemblage of water beetles; many of these species will be those displaced from other areas by flooding, by desiccation or other factors and so may have direct bearing on the site's overall ecology.

3.1.4 The stream that crosses the site runs almost completely under the cover of a tree canopy and so is entirely shaded. As a consequence, there is a marked lack of emergent and riparian floral communities. The water is barely a few centimetres deep in most sections and flows rather slowly over a bare gravel substrate. We sampled extensively, but could find relatively few invertebrates.

# 4 DISCUSSION OF RESULTS

## 4.1 Introductory comments

4.1.1 The 2013 survey has been remarkably successful at updating records of species from 2005; of the 127 not rediscovered an informal glance at the list suggests that at least half are probably overlooked.

4.1.2 The 2013 survey also added a significant number of new species to the inventory. However, this is not especially surprising as the original survey was undertaken within a rather limited seasonal window. The present assemblage, recorded at Appendix 1, provides a more than adequate representative sample of species upon which to base a reliable assessment of ecological interest. The additional third party data on butterflies makes a significant contribution,

## 4.2 Terrestrial invertebrates

4.1.3 The site presents a varied mosaic of grassland, woodland, scrub and edge-zone habitats that combine to satisfy the multiple requirements of a wide range of invertebrate species.

4.1.2 Each of these component parts makes a significant contribution to the overall mosaic and with this in mind is unwise, from an ecological standpoint, to attempt to apply too much locality detail. Invertebrates are, as a group, highly mobile. The place where a particular species was found is not necessarily, if ever, the only place that is important for its continued presence; the actual area required will always be much larger

4.1.3 Therefore, whilst botanically-based habitat categorisations may or may not be appropriate, we are unable to attribute specific levels of invertebrate interest to individual parts of the site. It is significantly more appropriate to examine the overall habitat structure of the site and to define habitat types that will make a significant contribution wherever they are found within the boundary. This is the basis of the Invertebrate Species-habitats Information System (ISIS) which is the favoured approach to interpreting invertebrate site data.

## 4.3 Invertebrate Species-habitats Information System

4.3.1 The Invertebrate Species-habitats Information System (ISIS) is a tool used to undertake common standards monitoring (i.e. monitors the condition of invertebrate assemblages), scores them based on the invertebrate assemblage types present (similar to how the National Vegetation Classification is used to assess plant communities) and evaluates their conservation value *within context*.

4.3.2 The ISIS assemblage types are defined by lists of characteristic species that are generally found together in nature. Broad assemblage types (BATs) are a comprehensive series of assemblage types that are characterised by more widespread species. Specific assemblage types (SATs) are characterised by ecologically restricted or stenotopic species of intrinsic nature conservation value.

4.3.3 We have undertaken the analysis at three levels:

- on the 2005 data alone
- on the 2013 data alone
- on the combined list including the third party butterfly data.

4.3.4 The results of these analyses are presented below. These results ar direct output from the siftware without editing or interpretation:

4.3.5 The **Broad Assemblage Types (BATs)** identified by ISIS are as follows:

**2005 data only**

| BAT name | Representation (1-100) | Rarity score | Condition | BAT species richness |
|---|---|---|---|---|
| grassland & scrub matrix | 15 | 125 | | 140 |
| unshaded early successional mosaic | 4 | 147 | | 34 |
| arboreal canopy | 3 | 100 | | 23 |
| permanent wet mire | 2 | 163 | | 16 |

**2013 data only (includes butterfly data)**

| BAT name | Representation (1-100) | Rarity score | Condition | BAT species richness |
|---|---|---|---|---|
| grassland & scrub matrix | 19 | 118 | | 185 |
| arboreal canopy | 5 | 117 | | 46 |
| permanent wet mire | 2 | 143 | | 23 |
| unshaded early successional mosaic | 2 | 150 | | 22 |
| mineral marsh & open water | 2 | 130 | | 20 |
| wood decay | 1 | | | 15 |

**2005 & 2013 data combined (includes butterfly data)**

| BAT name | Representation (1-100) | Rarity score | Condition | BAT species richness |
|---|---|---|---|---|
| grassland & scrub matrix | 22 | 124 | | 249 |
| arboreal canopy | 5 | 114 | | 57 |
| unshaded early successional mosaic | 4 | 157 | | 44 |
| permanent wet mire | 3 | 159 | | 32 |
| mineral marsh & open water | 2 | 133 | | 21 |
| wood decay | 2 | 144 | | 19 |