

superseded UK Biodiversity Action Plan (BAP) as a Priority Species. The day flying Forester Moth is a local species in the UK. The larvae feed on Common Sorrel *Rumex acetosa*, Sheep's Sorrel *R. acetosella* and possibly other *Rumex* species. The moth is considered to be sensitive to loss through agricultural intensification (Waring and Townsend, 2003).

No moth species protected under UK or international law were recorded during the survey.

## Fieldwork

### Moth survey

A list of all moth species recorded during the survey is included in Appendix 1, Table 5. The table lists both larger (macro) moths and micro-moth species recorded on each of the five survey dates and according to the trap(s) from which each species was recorded. The table also includes the current conservation status of each species. All species designated as Species of Principal Importance under Section 41 of the NERC Act, 2007 recorded, together with Red Data Book species and species currently listed as Nationally Scarce, are summarised in Appendix 2, Table 6.

In total, 293 species of moth were recorded from a total of 19 Mercury Vapour and two Actinic moth trapping events over the survey period. Of the 293 species, a total of 174 were macro moths and 119 micro moth species.

Of the species recorded one species of micro moth *Calamotropha paludella* is currently classified under the Nationally Scarce B category and a further 24 species are classed as Species of Principal Importance under Section 41 of the NERC Act. Three additional species of micro moth including the Willow Ermine *Yponomeuta orrella*, Leek Moth *Acrolepiopsis assectella* and the micro moth *Mompha lacteella* were all species which had been proposed (post 1984) as being Nationally Rare (pRDB<sup>3</sup>) species in the UK. However, in a review of the conservation status of microlepidoptera in Britain by Davis (2012), the conservation statuses of these and other British micro moths have been revised based on changes in recorded knowledge of microlepidoptera at that time. The revised designations are putative at the current time; however, the proposed statuses of the three species are as follows:

- Willow Ermine – Nationally Local
- Leek Moth – Nationally Local
- *Mompha lacteella* – Nationally Scarce (B category)

In addition 49 species classed as Nationally Local were recorded (51 if Willow Ermine and Leek Moth are included).

### Nationally Scarce

- Bulrush Veneer *Calamotropha paludella*

A single brooded species which flies in June to September. Habitat affinities include fens, marshes, broads and the margins of flooded gravel pits. The larvae feed on reedmaces *Typha spp.* *C. paludella* was said to be expanding its UK range (Sterling and Parsons, 2012) Note: Common Reedmace or Bulrush *Typha latifolia* was

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<sup>1</sup> pRDB 3 – species are likely to appear in the Red Data Book and be categorised as rare.

recorded within some of the wetter parts of the site. Two specimens of Bulrush Veneer were recorded from Trap 2 (T02) situated in Field 12 on 18<sup>th</sup> July, 2014.<sup>2</sup>

***pRDB3 (see revised status above)***

- Willow Ermine *Yponomeuta orreola*

Willow Ermine is a single brooded species typically occurring as an adult from mid July to mid August. The habitat includes river valleys and plantations where the foodplants White Willow *Salix alba* and Grey Willow *S. cinerea* grow. The UK population of Willow Ermine can be significantly increased in some years by immigrants (Sterling and Parsons, 2012). Note: Grey Willow was abundant on site. Four individuals in total were recorded during 2014. One individual in Trap 4 (T04) situated in Field F10 on 18<sup>th</sup> July and three in T04 on 1<sup>st</sup> August 2014.

- Leek Moth *Acrolepiopsis assectella*
- The Leek Moth is a double brooded species in the UK. Adults can be found in any month of the year, peaking in late summer and autumn. The species is primarily associated with gardens and allotments where the larvae feed on cultivated onions, leeks and garlic. The moth is increasing its UK range northwards (Sterling and Parsons, 2012). A single Leek Moth specimen was recorded from Trap 1 (T01) situated in Field F12 on 1<sup>st</sup> August, 2014. *Mompha lacteella*

*Mompha lacteella* is a single brooded species occurring from May to July. The moth is associated with woodland and waste-ground habitat, where the larvae are leafminers on the leaves of willowherbs *Epilobium* spp. Broad-leaved Willowherb *E. montana* and possibly Great Willowherb *E. hirsutum* are cited. *Mompha lacteella* is described as 'rare' in Sterling and Parsons (2012). Both Broad-leaved and Great Willowherb were abundant on site. Two specimens of *Mompha lacteella* were recorded in total during the survey. Both specimens were recorded from Trap 2 (T02) situated in Field 12, one on 18<sup>th</sup> July, the second on 1<sup>st</sup> August, 2014.

***NERC Act (2007) Section 41, Species of Principal Importance***

- Oak Hook-tip *Watsonalla binaria*

Oak Hook-tip is a double brooded species flying between May to June and again between late July and mid September. The favoured habitat is oak woodland, but also occurs in hedgerows, parkland and gardens. The larvae feed predominately on Pedunculate Oak *Quercus robur* and Sessile Oak *Q. petraea*. Oak Hook-tip is still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Small Emerald *Hemistola chrysoprasaria*

Small Emerald is a single brooded species on the wing from late June to early August. It occurs in most habitats where the larval foodplant Old Man's Beard *Clematis vitalba* grows, tending to be on chalk or limestone geology, including hedgerows and scrub on downland, open woodland and some gardens were it

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<sup>2</sup> Note: Due to the nature of MV light trapping, moths can be attracted from adjacent areas. Also many species are mobile and likely to move between habitat areas and also use different habitat elements at different life stages. Therefore, field number and trap number/location and number of specimens of a given species are strictly presented as information only and all records should be based on a site level rather than a field/trapping location level.

may feed on cultivated *Clematis* species. Small Emerald is a local species in the UK (Waring and Townsend, 2003). Records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Blood-vein *Timandra comae*

Blood-vein usually is normally double brooded, with a partial third sometimes occurring in the south of its UK range. It flies between May to early July; early July to mid September and mid September to November. It occurs in a range of mainly damp habitats supporting rank, herb-rich vegetation including hedgerows, ditches, woodland rides, wet meadows and gardens. Its foodplants include docks *Rumex* spp., Common Orache *Atriplex patula*, Knotgrass *Polygonum aviculare* and probably other species. (Waring and Townsend, 2003). Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Shaded Broad-bar *Scotopteryx chenopodiata*

Shaded Broad-bar is a single brooded species flying from late June to August. It occurs in a wide range of grassy habitats hedgerows, calcareous grassland, neutral meadows, acid heathland, woodland rides, rough roadside verges, coastal sand dunes and some suburban gardens near these habitats. The larvae feed on a range of clovers *Trifolium* spp. and vetches. (Waring and Townsend, 2003). Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Small Phoenix *Ecliptopera silaceata*

Small Phoenix is double brooded occurring as an adult from May to June and late July to August. Favoured habitats include woodland rides and glades, but found wherever the larval foodplants which include willowherbs *Epilobium* spp. and Enchanter's Nightshade *Circaea lutetiana*, grow, in gardens, overgrown allotments, hedgerows and roadside verges etc. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Grass Rivulet *Perizoma albulata*

Grass Rivulet is single brooded flying from May to early July. Favoured habitat includes grassland, usually on calcareous soil, dune slacks and coastal shingle. Larvae feed within the ripening seed pods of Yellow Rattle *Rhinanthus minor*. Small Emerald is a local species in the UK (Waring and Townsend, 2003). Records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Buff Ermine *Spilosoma luteum*

Buff Ermine is a single brooded moth which flies from mid May to July. The species is found in a wide range of habitat including gardens, hedgerows, parks and woodland. The larvae feed on a wide range of herbaceous species including Common Nettle *Urtica dioica*, as well as woody species such as Honeysuckle *Lonicera periclymenum*, Hop *Humulus lupulus*, Wild Plum *Prunus domestica*, Barberry *Berberis vulgaris* and birches *Betula* spp. Still a common and widespread species in England (Waring and Townsend, 2003), but

records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Cinnabar *Tyria jacobaeae*

Cinnabar is a single brooded species with a long flight period which spans from mid May to early August. This dayflying species is most abundant in well-drained, rabbit grazed grassland, including sand dunes and heathland, but also in many other open habitats including woodland rides and gardens. The larvae feed mainly on Common Ragwort *Senecio jacobaeae*, as well as other closely related species including Groundsel *S. vulgaris*. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Small Square-spot *Diarsia rubi*

Small Square-spot has two generations a year in southern England, flying from May to early June and August to September. Small Square-spot is most abundant in damp woodland and other marshy places, including damp pasture. The larvae feed on a wide range of herbaceous plants including Dandelion *Taraxacum* agg., docks *Rumex* spp. and Foxglove *Digitalis purpurea*. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Dot Moth *Melanchra persicariae*

Dot Moth is a single brooded species which flies from late June to August. The moth is frequent in gardens and hedgerows and occurs in a wide range of open and wooded habitats. Larvae feed on a wide range of wild and cultivated herbaceous and woody plants including Common Nettle *Urtica dioica*, Hop *Humulus lupulus* amongst others. Dot moth is widespread and common in southern England, becoming more local further north (Waring and Townsend, 2003). Records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only)

- Shoulder-striped Wainscot *Mythimna comma*

Shoulder-striped Wainscot is a single brooded species which flies from late May to late July. The species favours swamps and marshy habitats, but also occurs in grasslands, some gardens and damp woodland. The larvae feed on grasses, including Cock's-foot *Dactylis glomerata*. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Deep-brown Dart *Aporophyla lutulenta*

Deep-brown Dart is a single brooded species with an autumn flight period, adults being found from September to October. Open habitat is favoured, on calcareous and light sandy soils, but also on clays, including permanent pasture, hay meadows, downland, heathland, coastal sand dunes, rough grassland and some gardens. Larvae feed on a range of woody and herbaceous species including grasses. Broad-leaved Dock *Rumex obtusifolius* and Sorrel *Rumex acetosa* amongst recorded foodplants. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Green-brindled Crescent *Allophyes oxycanthae*

Green-brindled Crescent is another single brooded species with an autumn flight season. Adults are on the wing from September to November. Favoured habitats include broadleaved woodland, scrub, hedgerows and grassland. Larval foodplants include Hawthorn *Crataegus monogyna*, Midland Hawthorn *Crataegus laevigata*, Blackthorn *Prunus spinosa*, Crab-apple *Malus sylvestris*, Dog Rose *Rosa canina*, Plum *Prunus domestica* and other woody species. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Beaded Chestnut *Agrochola lychnidis*

Beaded Chestnut is another single brooded species with an autumn flight season. Adults are on the wing from September to early November. Habitats include Broadleaved woodland, scrub, hedgerows, grassland, heathland, gardens and many other situations. Larval foodplants include various herbaceous species including buttercups *Ranunculus* spp., clovers *Trifolium* spp. and Chickweed *Stellaria alsine*. Larger larvae feed on broadleaved shrubs and trees, especially Hawthorn *Crataegus monogyna*. A common species which is prone to large annual fluctuations in number (Waring and Townsend, 2003). Still a common and widespread species in England, but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Sallow *Xanthia icteritia*

Sallow a single brooded species with adults flying from September to October. The favoured habitats include broadleaved woodland, carr, marshes and fen. The Sallow is also recorded from heathland and moorland and other habitats supporting Grey Willow *Salix cinerea* and poplars *Populus* spp. Early instar larvae feed on the catkins of Grey Willow and poplars, later on herbaceous plants such as docks *Rumex* spp. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Grey Dagger *Acronicta psi*

Grey Dagger is typically single brooded with adults flying from mid May to July, occasionally individuals from a partial second generation occur in September to October. Occurs in most habitats particularly woodland, hedgerows and gardens, and scrub in many situations including heathland, calcareous grassland and fens. Larvae feed on a wide range of deciduous trees and shrubs including Blackthorn *Prunus spinosa*, Hawthorn *Crataegus monogyna*, Apple *Malus domestica*, birches *Betula* spp., limes *Tilia* spp. elms *Ulmus* spp. and Rowan *Sorbus aucuparia*. Still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Mouse Moth *Amphipyra tragopoginis*

Mouse Moth has a single generation, adults flying between July and September (occasionally into October). Occurs in a wide range of habitats including gardens, woodland, sand-dunes, moorland and fens. Larvae feed on the leaves and sometimes flowers of a wide range of wild and cultivated herbaceous plants including Salad Burnet *Sanguisorba minor*, Teasel *Dipsacus fullonum*, Mugwort *Artemisia vulgaris* and Fennel *Foeniculum vulgare* as well as woody species including willows *Salix* spp. and Hawthorn *Crataegus*

*monogyna*. Mouse Moth is still a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Dusky Brocade *Apamea remissa*

Dusky Brocade is single brooded, flying from June to July. Habitats include grassy places including gardens, damp pasture, drier calcareous grasslands, hedgerows and open woodland. The larvae feed on grasses including Reed Canary Grass *Phalaris arundinacea* and Cock's-foot *Dactylis glomerata*. Dusky Brocade is a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Large Nutmeg *Apamea anceps*

Large Nutmeg is single brooded, flying from June to July. Habitats include usually dry, calcareous grassland; also pasture, arable farmland, some gardens and woodland rides and edges. Occasionally in habitats on more poorly-drained clays. Larval foodplants include grasses such as Cock's-foot *Dactylis glomerata* and cereal crops. Large Nutmeg is a local species in the UK (Waring and Townsend, 2003). Records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Rosy Minor *Mesoligia literosa*

Rosy Minor is single brooded, flying from mid July to late August. Occurs in a variety of open calcareous habitats, including grassland, fens, scrub, gardens, coastal cliffs and sand dunes. Larvae feed on various grasses including Lyme Grass *Leymus arenarius*, Marram *Ammophila arenaria*, Cock's-foot *Dactylis glomerata* and also ceareal crops and sedges. Rosy Minor is a common species particularly occurring in coastal habitats and calcareous areas inland (Waring and Townsend, 2003). Records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Rosy Rustic *Hydraecia micacea*

Rosy Rustic is single brooded, flying from August to October. Occurs in a wide range of habitats including gardens, disturbed weedy places, hedgerow bases, pasture, fens, marshes and woodland rides. Larvae feed on a wide range of low-growing plants including Broad-leaved Dock *Rumex obtusifolius*, Ribwort Plantain *Plantago lanceolata*, Hedge Woundwort *Stachys sylvatica* amongst others. Rosy Rustic is a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Large Wainscot *Rhizedra lutosa*

Large Wainscot Rustic is single brooded, flying from August to October. Habitat includes reedbed and ditches supporting stands of Common Reed *Phragmites australis*, the moth breeds in the drier parts and margins not where there is permanent standing water. Larvae develop inside the roots and stem bases of Common Reed *Phragmites australis*. The Large Wainscot is a common and widespread species in suitable habitat in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Rustic *Hoplodrina blanda*

The Rustic usually has a single generation with moths flying from June to mid August. Occasionally there is a partial second generation in October in southern England. The Rustic occurs in a wide range of lowland habitats including urban areas. The larvae feed on a wide range of herbaceous plants including Chickweeds *Stellaria* spp, docks *Rumex* spp and plantains *Plantago* spp. The Rustic is a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

- Mottled Rustic *Caradrina morpheus*

Mottled Rustic usually has a single generation with moths flying from June to mid August. Occasionally there is a partial second generation in October in southern England. It occurs in most lowland situations including gardens, farmland, grassland, heathland, scrub, woodland and many coastal habitats. Larvae feed on a range of herbaceous plants including Common Nettle *Urtica dioica*, docks *Rumex* spp., goosefoots *Chenopodium* spp., teasels *Dipsacus* spp. and Hedge Bedstraw *Galium mollugo*. Also Goat Willow *Salix caprea* and Hop *Humulus lupulus*. Mottled Rustic is a common and widespread species in England (Waring and Townsend, 2003), but records suggest it has declined in recent years, hence its inclusion as a Species of Principal Importance (research only).

#### **ISIS output (macro moths only)**

The results returned from ISIS are included in Appendix 1, Table 7. Results are discussed in full in the Discussion section. Note ISIS analysis excludes certain groups from analysis, whilst all the Larger Moths families are supported by ISIS, micro moths are not. Therefore analysis is based on the 174 larger moths recorded out of the recorded total of 293 moths.

#### **ISIS output (ISIS output including 2014 moth data combined with third party results of general invertebrate surveys summarised in Plant,2013).**

In order to add context to the overall knowledge of the site in terms of its recorded invertebrate fauna as a whole, the moth data collected during the current survey has been combined with third party general invertebrate data collected on site during Colin Plant's survey of the site (2005 and 2013) and butterfly transect data presented in Redhead (2011). The results of this analysis is presented, following the 2014 moth only ISIS output in Appendix 1, Table 6 and considered in the Discussion section following the 2014 moth only discussion.

## **7. Discussion**

### **Habitat**

#### **Landscape Scale**

The Landscape to the south and east of Bicester is characterised by lowland meadow and wet grassland/floodplain grazing marsh which comprises the alluvial floodplain of the River Ray. The habitats of greatest nature conservation value within close proximity to the site include unimproved floodplain wet grassland habitats such as the ridge and furrow grassland at Arncott Bridge Meadows SSSI and wet meadows at Long Herdon Meadow SSSI and the Wendlebury Meads and Mansmoor Closes SSSI. Whilst none of these sites are particularly close to Gavray Drive Meadows, being between 3.5 and 5.8 km from the site, they

collectively form a valuable network of stepping stone habitats within an otherwise, agriculturally improved landscape of relatively low conservation value. Gavray Drive Meadows LWS and other LWS such as Meadows northwest of Blackthorn Hill, both support herb-rich, wet grassland complementary to the wet meadow SSSIs discussed above. Whilst the grassland habitats within the site were for the most part found to be in suboptimal condition during 2014, due to management neglect in recent years, the site may potentially contribute to delivery of nature conservation targets in the wider landscape.<sup>3</sup>

On a landscape scale, Gavray Drive Meadows also forms part of the Ray Conservation Target Area (CTA). CTAs identify the most important areas for wildlife conservation in Oxfordshire, where targeted conservation action will have the greatest benefit. BBOWT *et al* (2014). The habitats characterising the Ray CTA include the alluvial floodplain meadows of the River Ray and comprise primarily Lowland Meadows and Wet Grassland/Floodplain Grazing Marsh.

Rich and well structured hedgerows with Brown and Black Hairstreak butterflies are also characteristic (BBOWT *et al* (2014)). Moths or invertebrate species are not cited as forming an important component of the biodiversity within these habitats, however, descriptions relating to landscape conservation tend to focus primarily on landscape and habitat, rather than species assemblages.

In general, moths are a comparatively mobile taxon, many species being capable of movement between sites within reasonably close proximity on a landscape scale. However, less common and declining species frequently have specialised habitat requirements and can, therefore, only persist within a landscape which supports a sufficiently robust and accessible network of sympathetically managed habitat patches.

Certain species identified within the current survey, the Nationally Scarce Bulrush Veneer *Calamotropha paludella*, for example, have specific habitat requirements and wet meadows such as those at Gavray Drive Meadows, provide compositional elements in terms of foodplant diversity and habitat structure necessary to support such species which are lacking within areas of intensively managed farmland.

#### **Within site scale**

The habitat within the survey area comprises a series of meadows enclosed by species-rich hedgerows with mature standards, in particular veteran, or near veteran, Pedunculate Oaks. The scrub edge and mature standards provided a range of niches for moths associated with arboreal habitats and woody species, including specialist feeders on epiphyte growth and wood decay habitats. The grassland varied in degree of species richness, however, characteristic species of wet grassland communities such as MG4 hay meadows and pasture were present in the sward, with herbs, generally found in botanically diverse wet grasslands such as Great Burnet *Sanguisorba officinalis*, being present. Wet grasslands of this type can provide habitat for uncommon invertebrate and moth assemblages.

In terms of condition, much of the open grassland appeared to be in a state of succession from managed pastureland towards tall ruderal habitat and scrub. At the time of survey the grassland was still relatively species-rich, with a range of herbs providing potential foodplants and nectar resources for both specialist and generalist moths and invertebrate assemblages as a whole.

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<sup>3</sup> Local Wildlife Sites are described in BBOWT *et al* (2014) as being 'sites of substantive nature conservation value or geographic interest'



The nuances between the wetter and drier patches of grassland and shelter and varied structure provided by the scrub/grassland edge habitat also exhibited valuable habitat features beneficial to moths and other invertebrate taxa at the time of survey. Current or recent management was unclear however and it seems likely that traditional management practices such as grazing and/or hay-cutting had ceased leading to increased rankness and scrub encroachment.

## **Moths recorded**

### **UK context**

The 24 Species of Principal Importance recorded during the survey were for the most part widespread species selected for Section 41 status due to a recorded decline rather than being rare species *per se*. Research conducted by Butterfly Conservation, summarised in Butterfly Conservation (2013), in which the conservation status of a number of larger British moths was assessed over a forty year period between 1968 to 2007 reported a 40 percent decline in the status of larger moths in the southern half of Britain.

Of the larger moths recorded during the current Gavray Drive Meadows survey, species including Rosy Minor *Mesoligia literosa*, Lacky *Malacosoma neustria*, Grass Rivulet *Perizoma albulata*, Large Nutmeg *Apamea anceps*, Beaded Chestnut *Agrochola lychnidis* and Dot Moth *Melanchra persicariae* are all listed in Butterfly Conservation (2013) as having declined by over 90 percent over the forty year period.

Small Square-spot *Diarsia rubi*, Rosy Rustic *Hydraecia micacea*, Sallow *Xanthia icteritia*, Mouse Moth *Amphipyra tragoponis*, Mottled Rustic *Caradrina morpheus*, Large Wainscot *Rhizedra lutosa*, Green-brindled Crescent *Allophytes oxyacanthae*, Deep-brown Dart *Aporophyla lutulenta*, Buff Arches *Habosyne pyritoides*, Rustic *Hoplodrina blanda*, Oak Hook-tip *Watsonalla binaria*, Gothic *Naenia typica*, Heart and Dart *Agrotis exclamationis* and Black Rustic *Aporophyla nigra* have declined by between 75 and 87 percent over this period.

Butterfly Conservation state that ‘the causes of change amongst Britain’s moths are not yet fully understood, but cite ‘Habitat changes, especially those related to agricultural intensification, changing woodland management and urbanisation’ as having had ‘substantial, largely negative impacts on moths’. Other potential negative factors cited include ‘nutrient enrichment and light pollution’ however, the extent to which these factors affect moth populations is described by Butterfly Conservation (2013) as being ‘unclear’.

### **County (Oxfordshire) Context**

All 24 species listed as Species of Principal Importance under Section 41 of the NERC Act have been previously recorded from Oxfordshire and are listed in a spreadsheet of ‘protected and notable species’ compiled by TVERC (2014).

It is likely that the majority of these moths are still well distributed in suitable habitat throughout the county as the list includes species which, for the most part, are still relatively common in suitable habitat, despite the significant recorded decline of these species.

### **Nationally Scarce and Red Data Book species**

In contrast to the county list, few moth species afforded a significant conservation status are documented within the TVERC data search conducted for the purpose of the Gavray Drive Meadows site. All records are for Species of Principal Importance and only 13 moth species in total are documented. The majority of the records being recorded from Bicester Airport, over a kilometre from the site. However, all but four of these

species were recorded at Gavray Drive Meadows during the current (2014) survey, together with an additional 15 Species of Principal Importance.

Moth records from Plant (2013) include additional Species of Principal Importance, not recorded within the TVERC data, including the Nationally Local Forester *Adscita statives* and the Mother Shipton *Callistege mi*, both of which are dayflying moths, less likely to be attracted to light traps.

Of the more uncommon species recorded, the Nationally Scarce Bulrush Veneer *Calamotropha paludella*, recorded during the current survey is included on the Oxfordshire list, was not represented within the TVERC data search on a site level (or 2km radius) level. There is a record for approximately 35km north of the site from around Stoke Goldington, however, it is uncertain whether there are more local records of this wetland specialist.

Of the remaining uncommon micro moths recorded during the 2014 survey, it is uncertain whether the micro moths *Mompha lacteella* (status revision recommended to Nationally Scarce in Davis, 2012), the Willow Ermine *Yponomeuta rorrella* (pRDB3 status revision recommended to Nationally Local in Davis, 2012) or the Leek Moth *Acrolepiopsis assectella* (pRDB3 status revision recommended to Nationally Local in Davis, 2012) have been formerly recorded within the county. None of these species are listed on the Oxfordshire 'protected and notable species' list or the project-specific TVERC search, however, these would have been filtered out of these lists due to the putative nature of their designations.

General scrutiny of available data suggests a general lack of recording effort in the Bicester area, both in terms of moths and invertebrate fauna in general. The number of uncommon species recorded during Plant's 2013 survey substantiates this argument.

### **ISIS analysis**

ISIS categorises species into assemblages using a two level hierarchy. Broad Assemblage Types (BATs) and Specific Assemblage Types (SATs). BATs are a comprehensive series of assemblage types that are characterised by more widespread species. They can be expressed in lists from a wide range of sites (Lott, 2009).

'SATs are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value. Since 2008 there has also been a third category of assemblage types that cut across this classification. They are mainly defined by lists of species dependent on a particular environmental resource, such as flowers as a source of pollen and nectar' (Lott, 2009).

'SATs have intrinsic value for nature conservation and were designed to be used in setting invertebrate conservation objectives on SSSIs. They can be selected as features of interest, when they are well expressed in existing data. The "% of national species pool" score can be used to do this when a large body of data exists for a SSSI. A score of over 10% for most wetland SATs and over 6% for most non-wetland SATs indicates that it is of national significance' (Lott, 2009).

### **Significance of BATs recorded for Moth survey data only**

Of the Broad Assemblage Types (BATs) resulting from the ISIS analysis conducted only two A1 – Arboreal Canopy and F2 – Grassland and Scrub Matrix, comprised the requisite number of species needed to exceed

the threshold of 15 species<sup>4</sup> required for Rarity Scores<sup>5</sup>, which are subsequently used to assess Favourable Condition Status<sup>6</sup>, to be assigned.

#### A1 – Arboreal Canopy

- This assemblage type is characterised by a wide range of invertebrates, with butterflies and moths being the largest group in terms of numbers of species (Lott *et al*, 2007a).
- The assemblage type is found in the canopy of trees and shrubs irrespective of their density and occupies space that overlaps with other arboreal assemblage types. It is found in situations that range from woodland and scrub through to isolated open-grown trees and shrubs. (Lott *et al*, 2007a).

The Arboreal Canopy BAT recorded was well represented in terms of species with a Species Richness score of 60. However, the Rarity Score of 125 falls below the threshold of 160 required for this assemblage to achieve Favourable Condition Status. Favourable Condition Status in the context of ISIS is based on an invertebrate assemblage being a qualifying feature for SSSI status.

#### F2 – Grassland and Scrub Matrix

- This assemblage type is characterised by a wide range of invertebrates (Lott *et al*, 2007a).
- The assemblage type is dominant in areas of dense herbage or partial shade where a humid microclimate is maintained at ground level. Dominance by woody plants is limited by exposure, grazing or cutting of vegetation, but they often form an important component of the habitat. Semi-natural systems supporting important examples of this assemblage type include heath grassland, moorland, hay meadows, scattered scrub and woodland edge (Lott *et al*, 2007a).

The Grassland and Scrub Matrix BAT recorded achieved a Species Richness score of 28, comfortably achieving the >15 threshold for assignment of a Rarity Score. The Rarity Score of 121 falls below the threshold of 160 required for this assemblage to achieve Favourable Condition Status.

The four other BATs recorded from ISIS analysis of the 2014 moth data including; A2 – Wood Decay (4 species), W3 – Permanent Wet Mire (3 species), F1 - Unshaded Early Successional Mosaic (2 species) and F3

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<sup>4</sup> 15 is the figure the authors of ISIS have set as a threshold of robustness in terms of the minimum number of species required in a sample. Lott *et al*, 2007 state that: 'A score based on a smaller number of species runs the risk of being unduly influenced by the presence of just one very rare species. Therefore it is recommended that the first visibility threshold is set to 15 when interpreting species in CMS.

<sup>5</sup> The rarity score itself is based on a version of the Species Quality Index (SQI) which is automatically calculated within the ISIS spreadsheet. It is based on the average of all the individual species' rarity scores in an assemblage (so all the species from the commonest to the most rare are taken into account). Rarity Scores used in ISIS were based mainly on the accepted UK conservation designations of species at the time of development. In some cases, grid square occupancy was used as a basis to define status in cases where species conservation status had not been defined.

<sup>6</sup> Favourable Condition Status is a measure of the condition of a feature defined as being of importance within the designation of site (usually a SSSI). In terms of ISIS, Favourable Condition targets are based on thresholds set by Natural England (based on expert evaluation and research) for a given assemblage to be of National Importance in conservation terms. In the case of BATs and SATs, Favourable Condition Status is based on the species assemblages recorded within a particular habitat, rather than the perceived condition of the habitat. In theory, sympathetic management prescriptions of the habitat for which a given BAT or SAT was associated within a site management plan, could improve conditions for a given species assemblage, leading to a subsequent improvement in terms of Favourable Condition Status over time.

– Shaded Field and Ground Layer (1 species); were represented by too few species for a robust analysis using ISIS.

#### **Significance of SATs recorded for Moth survey data only**

Of the Specific Assemblage Types (SATs) from the 2014 macro moth data only two assemblages, A215 – Epiphyte Fauna and W314 – Reedfen and Pools were identified.

In ISIS the Epiphyte Fauna SAT is characterised mainly by bugs (Hemiptera) and moths (Lepidoptera)(Lott *et al*, 2007b).

This assemblage type is found on the surface of trunks and branches of trees and shrubs. It includes grazers of epiphytes such as algae, lichens and mosses, as well as their predators and parasites. Some epiphyte feeders are also found on epiphytes growing on rocks and boulders (Lott *et al*, 2007b).

In terms of Favourable Condition Assessment criteria, the recorded SAT score recorded for Epiphyte Fauna for moth (2014) only data was four. As this exceeds the SAT threshold of three required to achieve Favourable Condition, the Epiphyte Fauna SAT occurring at Gavray Drive Meadows can be said to be of National Significance, from a sample exclusively comprising moths. The Epiphyte species recorded comprise 20 percent of the UK epiphyte fauna as identified for the Epiphyte SAT.

The epiphytic moths recorded during the survey primarily include species of the family Arctiidae and genus *Eilema* known as Footmen. The larvae of footmen typically feed on lichens and algae on the branches of trees and shrubs, certain species feeding on mosses.

Several local species of footman were recorded during the survey including the Orange Footman *Eilema sorocula* and Buff Footman *E. depressa*. Both species are associated mainly with long established broadleaved woodland (Waring and Townsend, 2003), or more mature trees such as Oak *Quercus* spp. and Beech *Fagus sylvatica*. The Scarce Footman *E. complana* also feeds on lichen and algae, but its larvae feed on a broader range of substrates including rocks and posts as well as branches and the Four-dotted Footman *Cybosia mesomella* feeds on the stems and branches of Sallows *Salix cinerea/caprea* and other trees and shrubs (Waring and Townsend, 2003).

All the species of Footman recorded on the site also have, to a greater or lesser extent, an affinity with wetland habitats. Another lichen and moss feeding moth closely related to the footmen is the Round-winged Muslin *Thumatha senex*, this local species often feeds on lichens and mosses growing on the ground, where it occurs in marshes, fens and other wetland habitats.

More diverse epiphyte communities tend to occur in more mature habitats with a long history of woodland, or significant numbers of mature woody species. The mature oak standards and mature hedgerow understorey trees are likely to be important to the epiphyte fauna on site.

W314 – Reedfen and Pools. Only two species classified within the Reedfen and Pools SAT as recognised in ISIS. The Reedfen and Pools Falls community, therefore, falls well below the Favourable Condition Status threshold of 10 for this community and comprises only two percent of the recognised species pool for this assemblage.

The Reedfen and Pools assemblage type is characterised by a number of groups, but especially two-winged flies and also beetles (Lott *et al*, 2007b). A low score may therefore be expected from data represented by a

non-target group such as moths. Species likely to be included within this SAT are those with a dependence on wetter habitats and Lott *et al*, 2007b cite stands of *Phragmites* or *Cladium* on peat, or the wetter areas of fen meadow. Silky Wainscot *Chilodes maritimus*, a local species of moth recorded during the survey which is associated with the drier parts of reedbeds, where the larvae develop in the stems of Common Reed *Phragmites australis*.

#### **Significance of BATs recorded for Moth survey data and Plant, 2013 data combined**

In order to add context to the overall knowledge of the site in terms of invertebrates as a whole, the moth data collected during the current survey has been combined with general invertebrate data collected during Colin Plant's survey of the site (2005 and 2013).

Of the Broad Assemblage Types (BATs) resulting from the ISIS analysis conducted by combining site specific data recorded by Plant, 2013 with the moth survey data collected in 2014. Six of the recorded BATs including F2 – Grassland and Scrub Matrix, A1 – Arboreal Canopy, F1 – Unshaded Early Successional Mosaic, W3 – Permanent Wet Mire, W2 – Mineral Marsh and Open Water and A2 – Wood Decay comprised the requisite number of species needed to exceed the threshold of 15 species required for Rarity Scores, which are subsequently used to assess Favourable Condition Status, to be assigned.

As with the moth only data, none of the assemblages achieved the Rarity Score threshold to achieve Favourable Condition Status. However, the scores of several of the assemblages came close to achieving significant Rarity Scores. In ISIS a large sample size does not necessarily correspond to a high Rarity Score for a given BAT and scores can be depressed if samples are made up of a large number of generalist species. The highest recruitment in terms of species richness was recorded for F2 – Grassland and Scrub Matrix, with a total of 288 species being recorded within this assemblage. However, the recorded Rarity Score was 125, only marginally exceeding the Rarity Score of 121 recorded for only 28 species attributed to this category for the moth only data.

For the A1 - Arboreal Canopy assemblage, the 60 attributed to this community recorded produced a Rarity Score of 125 for the moth only data, whilst the 120 species attributed to the Arboreal Canopy BAT using combined data produced a Rarity Score of only 123.

Achieving a Rarity Score of 153 from 47 attributed species, the F1 – Unshaded Early Successional Mosaic Assemblage recorded fell just short of achieving the Favourable Condition Status threshold for this BAT which is set at 160.

W3 – Permanent Wet Mire was represented by 42 species with combined data and a Rarity Score of 164, again reasonably close to the Rarity Score Threshold of 180 set for this BAT.

Somewhat fewer species were affiliated to the W2 – Mineral Marsh and Open Water and A2 – Wood Decay assemblages, which were represented by 27 species each. In the case of these BATs, the recorded Rarity Scores fell short of the Rarity Score Thresholds. Mineral Marsh and Open Water achieved a Rarity Score of 130, against a threshold of 150 and the result for the Wood Decay Assemblage was 165, the threshold required to achieve Favourable Condition Status from combined data being 190.

#### **Significance of SATs recorded for Moth survey data and Plant, 2013 data combined**

Of the Specific Assemblage Types (SATs) resulting from the combined site specific data recorded by Plant, 2013 and the moth survey data collected in 2014, representatives from a total of 15 SAT assemblages were recorded. Of these eight, assemblages were poorly represented achieving SAT scores of one or two, in most

cases falling far short of the SAT Thresholds set for the community and constituting a percentage of two or fewer of the recorded species pool for the corresponding assemblage.

Of the well represented and higher scoring SATs, two achieved Favourable Condition Status from combined survey data. As with the moth 2014 data only, the A215- Epiphyte Fauna also achieved Favourable Condition Status from the combined data. In this instance a SAT score of six was recorded, compared with the threshold score of three required to achieve Favourable Condition Status and the recorded Epiphyte Fauna comprised 30 percent of the total species pool for this assemblage. Whilst it should be noted that the total species pool varies considerably between both SAT and BAT assemblages, this result further substantiates the site as supporting an Epiphyte Fauna of National Importance according to ISIS.

The other SAT achieving Favourable Condition Status and as such occurring at sufficient resolution to be considered Nationally Important from combined data, was the F001 - Scrub Edge Assemblage. For the Scrub Edge Assemblage the recorded SAT score of 14 comfortably exceeded the SAT Threshold score of 10. The species recorded from this assemblage comprised eight percent of the community as a whole (Note: A score of over 10% for most wetland SATs and over 6% for most non-wetland SATs indicates that it is of national significance'. Lott, 2009).

The F001 - Scrub Edge Assemblage is an example of the third category of assemblage types added to ISIS in 2008, that cut across the SAT classification. 'They are mainly defined by lists of species dependent on a particular environmental resource, such as flowers as a source of pollen and nectar' (Lott, 2009).

Another example of resource-based SAT, F002 – Rich Flower Resource achieved a SAT score of 14, equalling the assemblage threshold of 14. However, Rich Flower Resource assemblage, comprising six percent of the resource pool for this SAT fell narrowly below the 'National Significance' threshold of over six percent.

The remaining SATs represented fell well below the thresholds of 10 percent for most wetland SATs and over six percent for most non-wetland SATs and included small numbers of specialist invertebrates representing a range of specialist wetland and non-wetland assemblages.

### **Survey Limitations**

The following limitations were

- The survey was based on five visits, spanning the period between mid-June to early October. Whilst relatively few additional species are recorded beyond October and whilst peak survey times include the mid summer months of June and July, spring emerging specialists will in some instances have been missed by the late commencement of the project. However, the survey represents, by far, the most comprehensive known moth survey conducted on the site and the sampling protocol has been sufficiently robust to enable analysis and interpretation of site data using ISIS.
- Micro moth families are not supported within ISIS. A significant proportion of the total recorded species list from the survey comprised micro moths which are not recognised within ISIS. Interpretation of the conservation significance of these species can therefore only be evaluated on the basis of rarity, which in itself is generally considered to be a less satisfactory basis for invertebrate site assessment than assemblage-based indices such as ISIS.

## **8. Evaluation**

## Species status

The key findings of the current survey can be summarised as follows:

- A total of 293 moth species were recorded from a total of 19 mercury vapour trappings and an additional two Actinic trappings, conducted over five dusk until dawn sampling events between mid-June and early October, 2014.
- Of the species recorded, 174 species from larger moth families were recorded in total and 119 species from families known as micro moths.

In terms of conservation designations:

- 24 moth species listed as Species of Principal Importance under Section 41 of the NERC Act (2006) were recorded during the survey. These species whilst not receiving statutory protection in the UK, constitute a material consideration in English planning law.
- One species listed as Nationally Scarce (B category) on the JNCC Taxon Designations spreadsheet (JNCC, 2014) the Bulrush Veneer *Calamotropha paludella* was recorded.
- An additional species of micro moth *Mompha lacteella* formerly listed as proposed Nationally Rare (pRDB3) has been revised in a 2012 review of the status of microlepidoptera in Britain (Davis, 2012), but is awaiting formal approval.
- Two further species of micro moth Willow Ermine *Yponomeuta rorrella* and Leek Moth *Acrolepiopsis assectella* had been proposed (post 1984) as being Nationally Rare (pRDB3), but have been putatively revised to Nationally Local in Davis (2012).
- 49 species (51 if Willow Ermine and Leek Moth are included) classed as Nationally Local in the UK were recorded.

## ISIS analysis

The following Broad Assemblage Types (BATs) identified as comprising more than the threshold of 15 species were recorded during the survey:

- A1 – Arboreal Canopy - (Recorded Rarity Score: 125; Rarity Score Threshold: 170)
- F2 – Grassland and Scrub Matrix - (Recorded Rarity Score: 121; Rarity Score Threshold: 160)

Neither BAT achieved the required Rarity Score Threshold to achieve 'Favourable Condition Status' as would be required if the invertebrate population was a monitorable feature of a SSSI. i.e. of National Importance.

The following Specific Assemblage Types (SATs) identified as comprising more than the threshold of 15 species were recorded during the survey:

- A215 – Epiphyte Fauna (Favourable Condition Status achieved)
- W314 – Reedfen and Pools (Falls below favourable condition status threshold)

Of these the Epiphyte Fauna SAT achieved Favourable Condition Status and therefore can be considered to be of National Importance in terms of ISIS. This score would pass an invertebrate assemblage if it was set as a feature or attribute of an SSSI.

The Reedfen and Pools SAT fell below the threshold for Favourable Condition Status.

## Third Party Survey Findings (Plant, 2013 and Redhead, 2011 (in Plant, 2013))

## Species status

The key findings of the third party surveys conducted for the purpose of this project can be summarised as follows:

In terms of conservation designations:

- Three butterfly species and four moth species listed as Species of Principal Importance under Section 41 of the NERC Act (2006) have been recorded on site post 2009 in Plant, 2013 and Redhead (2011) . Two of the moth species, Shaded Broad Bar *Scotopteryx chenopodiata* and Bloodvein *Timandra comae* were also recorded during the 2014 survey.
- Two species, the Black Hairstreak *Satyrium pruni* and White-letter Hairstreak *Satyrium w-album* classed as Nationally Endangered using post-2001 IUCN guidelines have been recorded on site. Black Hairstreak was recorded during a Butterfly Conservation survey of the site in 2010; this species had also been recorded prior to that year on site. White-letter Hairstreak was recorded on the site during 2006.
- One species, the Brown Hairstreak *Thecla betulae* classed a Nationally Vulnerable using post-2001 IUCN guidelines was recorded during a Butterfly Conservation survey of the site in 2010. This species had also been recorded prior to that year on site.
- One species, the Small Heath *Coenonympha pamphilus* classed as Lower-risk Near Threatened using post-2001 IUCN guidelines was recorded in 2013 by Plant (2013).
- 24 species listed as Nationally Scarce were recorded in 2005 and 2013 surveys combined in Plant (2013).

## ISIS analysis

Plant, 2013 identified the following Broad Assemblage Types (BATs) identified as comprising more than the threshold of 15 species from data collected during 2013 combined with 2005 and Redhead (2011) butterfly data:

- Grassland and Scrub Matrix
- Unshaded Early Successional Mosaic
- Arboreal Canopy
- Permanent Wet Mire
- Mineral Marsh and Open Water
- Wood Decay

None of the recorded BATs achieved the threshold scores for Favourable Condition status.

One SAT was recorded by Plant as achieving Favourable Condition Status:

- Scrub edge

## Evaluation of Conservation importance based on 2014 recorded moth survey data

The survey area comprising Gavray Drive Meadows to the south-east of the Langford Brook is currently subject to the Local Wildlife Site status and comprises part of the Ray Conservation Target Area (CTA). These are non-statutory designations which do, nevertheless, constitute material consideration in terms of planning law.



Whilst none of the Broad Assemblage Types recorded achieved Favourable Condition Status, the BATs serve to illustrate the habitat affinities of the bulk of larger (macro) moth species recorded.

As expected, the best represented BAT on site was Arboreal Canopy, implying that a large number of the macro moths are associated with tree and scrub species on site these being important as foodplants for the larvae of these species. The only other BAT comprising a significant number of species, Grassland and Scrub Matrix is another BAT which may have been expected to occur on a site where grassland and scrub edge habitat is a feature.

Allied to the woody element of these BATs, the Epiphyte Fauna SAT, includes species which are mainly grazers of lichen and algae on branches and trunks of trees. Species recorded within this assemblage included Orange Footman and Buff Footman, are both species with a strong affinity to mature woodland or habitat supporting a number of mature and/or veteran oaks and other broadleaved trees.

These findings reasonably reflect the composition and quality of the wooded components of the site in particular and reaffirm the importance of the maturity of habitat and therefore, the relatively irreplaceable nature of the mature trees present. The recorded Reedfen and Pools SAT assemblage indicates an affinity to the other significant habitats present on the site, i.e. the wetland components.

Amongst the least common species recorded during the moth survey was the Nationally Scarce Bulrush Veneer *Calamotropha paludella*. As this species is a micro moth, it is not recognised in ISIS and this species together with several other micro moths recorded have an affinity to wetland habitats. Although it has not been officially designated at the current time, a second species has been recommended as Nationally Scarce in a 2012 review by Davis (2012). *Mompha lacteella* is described as 'rare' in Sterling and Parsons (2012).

The site was found to support 24 moth species listed as Species of Principal Importance under Section 41 of the NERC Act (2006). The species recorded on site were mostly common and widespread species in England, listed due to having been recorded to have significantly declined in the UK over recent decades.

On the basis of the habitat quality, findings of the ISIS analysis and rarity values of the moth species recorded, the site can be considered to be of Regional Significance for the moth assemblage recorded during the 2014 survey. The presence of a SAT (Epiphyte Fauna) achieving Favourable Condition Status is significant. Lott, 2009 states that 'SATs are characterised by ecologically restricted species and are generally only expressed in lists from sites with conservation value'. The size of the site, habitats supported and position in the site in a wider landscape increase the value from an entomological point as a stepping stone. However, the grassland elements of the site were becoming somewhat rank, subject to increasing degrees of scrub encroachment as a result of management neglect in the site's recent history. Sympathetic management would be required to maximise the potential of the site from both entomological and botanical perspectives.

### **Evaluation of Conservation importance based on 2014 recorded moth survey data combined with third party invertebrate data in Plant (2013) and butterfly data from Redhead (2011).**

Moth data combined with the invertebrate data recorded by Plant (2013) and butterfly data from Redhead (2011) expresses a more complete picture of the conservation value of Gavray Drive Meadows for invertebrates as a whole. Plant (2013) stated that 'there is a high incumbent invertebrate ecology interest at Gavray Drive'.

The findings of the current moth survey add resolution to the findings conducted within the earlier surveys.

If taken together, the key statistics in terms of recorded conservation status of the site's invertebrate fauna are as follows:

- 29 species of Principal Importance have been recorded for the site.
- 2 species classed as Nationally Endangered using Post-2001 IUCN guidelines were recorded.
- 1 species classed as Nationally Vulnerable using Post-2001 IUCN guidelines were recorded.
- 25 species classed as Nationally Scarce (or 26 species if *Mompha lacteella* is included) were recorded.
- Six Broad Assemblage Types (BATs) were represented by a significant number of species. These included: Grassland and Scrub Matrix, Unshaded Early Successional Mosaic, Arboreal Canopy, Permanent Wet Mire, Mineral Marsh and Open Water, Wood Decay.
- Two Specific Assemblage Types (SATs) A215 - Epiphyte Fauna and F001 - Scrub Edge Assemblage were recorded which achieved Favourable Condition Status and comprised a sufficiently high proportion to be considered as assemblages of National Importance.
- The survey area comprising Gavray Drive Meadows to the south-east of the Langford Brook is currently subject to the Local Wildlife Site status and comprises part of the Ray Conservation Target Area (CTA) These are non-statutory designations which do, nevertheless constitute material consideration in terms of planning law.

In terms of the combined findings the recorded invertebrate fauna of the site can be considered to be at least of Regional Importance and with appropriate conservation management a fauna of National Importance may be achieved on site.

## 9. Recommendations

The trees, hedgerow and grassland habitats are not replicable in terms of like for like habitat creation due to the maturity of these habitats and the recorded fauna of the site is reflective of the quality of these features. However, in its current state, it was evident that the site as a whole was in a state of succession due to lack of management in recent years. It is understood that the site was historically managed as hay meadow and this fits with a former MG4 NVC profile, which arguably reflects the kind of grassland community which may have historically characterised the site.

At the time of survey much of the grassland was observed to be rank and the over dominance of coarse grasses such as Yorkshire Fog *Holcus lanatus*, False Oat Grass *Arrhenatherum elatius*, Tufted Hairgrass *Deschampsia cespitosa* and Cock's-foot *Dactylis glomerata* had already compromised the botanical integrity of the sward. In addition to this, scrub including in particular Blackthorn *Prunus spinosa* and Bramble *Rubus fruticosus* agg was clearly becoming established in areas of former grassland, spreading outwards from the margins of hedgerows as well as seeding in open areas.

Without restorative management and the instigation of a regular and sympathetic management regime, the integrity of the grassland will inevitably downgrade further and would ultimately succeed to scrub habitat. Whilst many invertebrate species and assemblages benefit to some extent, from the juxtaposition of grassland to scrub and woody marginal habitats, the maintenance of open areas is also fundamental to many of these species. Butterflies such as Black Hairstreak and Brown Hairstreak are examples of species which require a strong, interconnected resource of Blackthorn and Buckthorn *Rhamnus cathartica* scrub but also require open grassland habitats, provided warm, sheltered microhabitats.

## **Management suggestions**

It is clear that grassland management is required as a matter of urgency to prevent wholesale loss of this habitat to succession. Management through reinstating a late summer/early autumn (post seed-setting) hay cutting regime would seem appropriate. Whilst some invertebrate species may be compromised by restorative management, these are likely to be more mobile generalists. Specialist fauna associated with species-rich wet grassland, would ultimately benefit from management to restore the botanical element of the habitat. It is likely that a more herb-rich seed bank is still present within the sward and reseedling may not be necessary.

From an entomological perspective, restorative scrub management should be undertaken with due sensitivity, to ensure the structure of scrub outwards from the hedgerows is undertaken on a phased, rotational basis over several winters, rather than being undertaken at once. Whilst management would seek to cut hedgerows back to something approximating to their original footprint, some gradation of scrub from the margins should be maintained. Where possible, features beneficial to warmth-loving lepidoptera and other invertebrates such as scallops could be instated.

The use of herbicides should be avoided where possible during restorative management and/or should be confined to spot treatments of cleared scrub stumps.

If the site is recommended for development, retention and sustained sympathetic management of the existing network of hedgerows and standard trees on site would be necessary to ensure continuity of habitat quality both on site and in the wider landscape. As many species of invertebrate require the use of different habitat elements at different times, both in their daily activity and during different stages of their lifecycles, sufficient elements of habitat representative of the site as a whole would need to be provided for and where possible, enhanced through appropriate management. It would also be necessary for the extant hydrological integrity of the site to be maintained.

Once restoration had been achieved, a sympathetic management regime should be instigated and continued as part of a sustainable programme in the long term.

## **Management Planning**

Before restorative management can commence, a management plan should be produced following standard management planning principles, which included detailed management specifications appropriate for the existing site and any additional areas of compensation habitat.

Before actions can be specified, key biodiversity 'Features' and 'Objectives' for management would need to be defined and conservation targets identified. In terms of management planning, the invertebrate fauna of the existing site is of sufficient interest for it to be considered as a Feature of the site in management planning terms. The overarching invertebrate 'Feature' could be broken down further into subcategories called 'Attributes' in management planning terms. These may be based on the significant SATs and BATs resulting from the ISIS analyses described in this report and the findings of Plant (2013).

The more significant BAT and SAT scores included within this report would provide readily available baseline thresholds from which future monitoring of management planning 'Attributes' could be achieved. Monitorable 'Attributes' of an overarching Invertebrate Assemblage 'Feature', could be hard-wired into the

management plan. Suggested monitorable SAT 'Attributes' could include 'Epiphyte Fauna' and 'Scrub Edge' assemblages; BAT Attributes could include (in order of significance): 'Grassland and Scrub Matrix', 'Unshaded Early Successional Mosaic', 'Arboreal Canopy', 'Permanent Wet Mire', 'Mineral Marsh and Open Water' and 'Wood Decay'.

Findings of management would provide a feedback loop to inform how successful management of the various management planning Features and Attributes had been and provide a basis for resetting and fine-tuning of management targets.

Funding would be required to produce the management plan and subsequently achieve the various restorative and management targets within and these elements would require careful, long term budgeting. Funding could be secured as part of the proposed mitigation. The actions targeted within the management planning process would need to be achievable in order to be successful.

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## 11. Appendices

### Appendix 1 – Tables

Table 1 – Mercury vapour trap locations

NB: MV = Mercury Vapour; PAC = Peter Cranswick (refers to trap ownership); JHM = Jon Mellings (refers to trap ownership).

Trap	Habitat	Location	Grid ref	21 <sup>st</sup> Jun			18 <sup>th</sup> Jul			1 <sup>st</sup> Aug			22 <sup>nd</sup> Aug			3 <sup>rd</sup> Oct		
T01	Grassland: neutral: semi-improved	On edge of herb fen in northwest field	SP5969222358	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC
T02	Grassland: neutral: semi-improved	On edge of northwest field, near gap in hedge to field to south	SP5964322361	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC	125W	MV	PAC
T03	Grassland: neutral: unimproved	50m into NW corner of southeastern field (on chippings pile)	SP5994622007	125W	MV	PAC				125W	MV	PAC	125W	MV	PAC	125W	MV	PAC
T04	Fen	50m from eastern hedge of field of rush-pasture	SP5990222028	125W	MV	JHM												
T05	Grassland: neutral: unimproved	40m into southwest field, near gap in hedge to field to north	SP5963222308				125W	MV	PAC									
T06	Scrub: scattered	Under oak tree north of gap in hedge at west end of 'field'	SP5986922297				8W	Actinic	PAC									
T07	Scrub: scattered	Under large oak 50m to west of T07	SP5991822279				8W	Actinic	PAC									
T08	Grassland: neutral: semi-improved	Eastern end of scrubby field (grid estimated from map)	SP59932204							125W	MV	JHM	125W	MV	JHM	125W	MV	JHM

**Table 2 - Trap location habitat descriptions**

Trapping location	Field No.	Date	Description
T01	F12	01/08/2014	Rank, damp semi-improved grassland grasses predominately Yorkshire Fog <i>Holcus lanatus</i> with Tufted Hair Grass <i>Deschampsia cespitosa</i> with Hairy Sedge <i>Carex hirta</i> and herbs including Silverweed <i>Potentilla anserina</i> , Meadowsweet <i>Filipendula ulmaria</i> , Great Burnet <i>Sanguisorba officinalis</i> , Hoary Ragwort <i>Senecio erucifolius</i> , Creeping Cinquefoil <i>Potentilla reptans</i> , Wild Angelica <i>Angelica sylvestris</i> and Marsh Thistle <i>Cirsium palustre</i> . High proportion of tall sward/ruderal species such as Greater Willowherb <i>Epilobium hirsutum</i> with Bramble <i>Rubus fruticosus</i> agg. in sward. Scrub including saplings of Ash <i>Fraxinus excelsior</i> , Crack Willow <i>Salix fragilis</i> and Grey Willow <i>Salix cinerea</i> scrub encroaching within sward. Field boundaries with mature trees including Pedunculate Oak <i>Quercus robur</i> and Crack Willow <i>Salix fragilis</i> . Sward height approximately 50cm.
T02	F12	01/08/2014	Damp, rough damp grassland, rather rank with tussock forming Tufted Hair Grass <i>Deschampsia cespitosa</i> , Yorkshire Fog <i>Holcus lanatus</i> , and Red Fescue <i>Festuca rubra</i> and scattered scrub predominately including Grey Willow <i>Salix cinerea</i> , Pedunculate Oak <i>Quercus robur</i> , Bramble <i>Rubus fruticosus</i> agg. and Common Dog Rose <i>Rosa canina</i> . Grassland with tall herb vegetation including Greater Willowherb <i>Epilobium hirsutum</i> , Meadowsweet <i>Filipendula ulmaria</i> , Hard Rush <i>Juncus inflexus</i> and occasional Wild Angelica <i>Angelica sylvestris</i> and shorter species including Hairy Sedge <i>Carex hirta</i> , Creeping Cinquefoil <i>Potentilla reptans</i> , Silverweed <i>P. anserina</i> , Common Sorrel <i>Rumex acetosa</i> , Creeping Buttercup <i>Ranunculus repens</i> , Creeping Thistle <i>Cirsium arvense</i> and Spear Thistle <i>Cirsium vulgare</i> . Sward height range approximately 30-80cm; scattered scrub approximately 5% cover. Wooded boundary with mature standards including Crack Willow <i>Salix fragilis</i> , Pedunculate Oak, Ash <i>Fraxinus excelsior</i> with Blackthorn <i>Prunus spinosa</i> , Buckthorn <i>Rhamnus catharica</i> , Hawthorn <i>Crataegus monogyna</i> and Grey Willow.
T03	F1	01/08/2014	Rough grassland with tall ruderals (Great Willowherb <i>Epilobium hirsutum</i> ) and scrub. Grassland with grasses including Yorkshire Fog <i>Holcus lanatus</i> , False Oat Grass <i>Arrhenatherum elatius</i> , Creeping Bent Grass <i>Agrostis stolonifera</i> , with Compact Rush <i>Juncus conglomeratus</i> and herbs including Greater bird's-foot-trefoil <i>Lotus pedunculatus</i> , Meadow Vetchling <i>Lathyrus pratensis</i> , Tufted Vetch <i>Vicia cracca</i> , Curled Dock <i>Rumex crispus</i> , Teasel <i>Dipsacus fullonum</i> and Marsh Thistle <i>Cirsium palustre</i> . Scrub encroachment with woody species including predominately Bramble <i>Rubus fruticosus</i> agg. Grey Willow <i>Salix cinerea</i> and Common Dog Rose <i>Rosa canina</i> , with Blackthorn <i>Prunus spinosa</i> , Hawthorn <i>Crataegus monogyna</i> and sapling Pedunculate Oak <i>Quercus robur</i> and Ash <i>Fraxinus excelsior</i> .
T04	F10	01/08/2014	Rough, damp grassland as T03. Woody species in boundary hedges with Hawthorn <i>Crataegus monogyna</i> , Blackthorn <i>Prunus spinosa</i> , Field Maple <i>Acer campestre</i> , Pedunculate Oak <i>Quercus robur</i> , Ash <i>Fraxinus excelsior</i> , Grey Willow <i>Salix cinerea</i> and Hazel <i>Corylus avellana</i> .
T05	F11	01/08/2014	Rough grassland with tall ruderal and scrub, bounded by hedgerows with a diverse range of native woody species as T01 and T02.
T06	F7	01/08/2014	Traps set beneath mature Pedunculate Oak <i>Quercus robur</i> .
T07	F7	01/08/2014	Traps set beneath mature Pedunculate Oak <i>Quercus robur</i> .
T08	F8	01/08/2014	Rough grassland and tall ruderal, with evidence of recent scrub clearance. Sward height approximately 50cm. Trap located on pile of chippings.

**Table 3 – Data input notes and scoring definitions in ISIS (from Drake *et al*, 2007)**

**The ISIS spreadsheet application (from Drake *et al*, 2007).**

In order to assess an assemblage, a species list must be pasted into the first column of the ISIS 'data entry' sheet. Only scientific binomial names are accepted. It is important to delete any previous species lists first as contamination of the new list by the old may lead to serious errors. When assessing an assemblage from an SSSI for CSM, this species list would normally be produced by combining four separate samples.

In the data entry sheet, ISIS gives information on each species relating to its BAT, SAT and rarity score. If there is an error message, there could be two reasons. Firstly, the species name may belong to a taxonomic group that is not represented in the species index. In this case, no further action need be taken. Secondly, the species name may have been mistyped or a non-standard name used. In either case, the name should be corrected before proceeding. Once a species list has been successfully entered, the results can be viewed in the ISIS 'results' sheet. The SAT table gives the code and the name of any SATs that have been recognised in the species list, together with a series of scores.

**Scores used by ISIS** - The following scores are generated for SATs:

- The '**weighted species score**' is used for setting CSM targets. ISIS identifies any assemblage type whose score meets the default threshold for assessing assemblage types in favourable condition. The '**weighted species score**' is usually equal to the number of species coded to that SAT, but in some SATs species are weighted for their fidelity to the SAT.
- The '**No. spp.**' score is a simple count of the species coded to that SAT.
- The '**percentage of national species pool**' score is the 'No. spp.' count divided by the total number of species coded to that SAT.
- The '**related BAT rarity score**' is the rarity score of the parent BAT (a score that is also returned in the BAT table).

**A different set of scores are generated for BATs** - The BAT table returns the code and name of all the BATs that have been recognised in the species list together with a series of scores.

- The '**representation score**' measures the relative importance of the BAT in the species list on a scale of 1 to 100. It is designed as a coarse measure of ecological change at a small scale, for example in management units. The first visibility threshold can usefully be reduced to a lower value for this purpose. At larger scales it is influenced by sample site selection and merely reports which habitats have been sampled. The second visibility threshold prevents the expression of BATs whose '**representation score**' might be inflated by closely related BATs.
- The '**rarity score**' is the average of all the individual species rarity scores in the assemblage. The rarity scores of individual species are often derived from their designated conservation status, but in some groups it is taken from an analysis of the number of 10km squares the species occupies, according to data held in the appropriate national recording scheme. It is therefore a version of the Species Quality Index.
- '**BAT species richness**' is the number of recorded species that are characteristic of that BAT.
- 'IEC' is the Index of Ecological Continuity, a score that is used exclusively for saproxylic assemblages.

It is recommended that SATs rather than BATs should be used as features of interest for CSM. However, some invertebrate assemblages of interest are not found in SATs and these can be covered by the more comprehensive BAT classification (e.g. Arboreal Canopy, has no nested SATs). In these cases the BAT 'rarity score' should be used to assess condition. If this score meets the default threshold, 'fav' is returned in the 'Condition' column. Over fifteen species must be used in the calculation to produce a robust BAT 'rarity score'. A score based on a smaller number of species runs the risk of the score being unduly influenced by the presence of just one very rare species. Therefore, it is recommended that the first visibility threshold is set to 15 when interpreting species lists for CSM.



**Table 4 – Moth species records extracted from TVERC data search**

Common Name	Scientific Name	Date	Grid Ref	Location	Further Location info	Data Origin	UK Legislation	European Legislation	Global IUCN Red List	UK Red List	UK BAP Status 2007	NERC Act 2006
Ghost Moth	<i>Hepialus humuli</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Oak Hook-tip	<i>Watsonalla binaria</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Small Phoenix	<i>Ecliptopera silaceata</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
White Ermine	<i>Spilosoma lubricipeda</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Buff Ermine	<i>Spilosoma luteum</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Cinnabar	<i>Tyria jacobaeae</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Cinnabar	<i>Tyria jacobaeae</i>	24/06/2002	SP602 220	Gavray Drive Meadows	Gavray Drive field 22 (renamed field 17)	OLWS					Priority Sp.	Section 41 Sp.
Small Square-spot	<i>Diarsia rubi</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Broom Moth	<i>Melanchra pisi</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Shoulder-striped Wainscot	<i>Mythimna comma</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Knot Grass	<i>Acronicta rumicis</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Dusky Brocade	<i>Apamea remissa</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Large Nutmeg	<i>Apamea anceps</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.
Mottled Rustic	<i>Caradrina morpheus</i>	06/06/2004	SP600 240	Bicester Airfield	explosives dump area	LN					Priority Sp.	Section 41 Sp.

**Table 5 – Total species recorded, number of individuals recorded for all traps all survey dates sorted by conservation status**

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Watsonalla binaria</i>	Oak Hook-tip	1	1	1	5%		1				NERC s41 Species of Principal Importance; Common
<i>Hemistola chrysoprasaria</i>	Small Emerald	1	1	1	5%		1				NERC s41 Species of Principal Importance; Local
<i>Timandra comae</i>	Blood-vein	31	3	8	38%	15		15	1		NERC s41 Species of Principal Importance; Common
<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	19	3	8	38%		6	12	1		NERC s41 Species of Principal Importance; Common
<i>Ecliptopera silaceata</i>	Small Phoenix	9	2	5	24%		6	3			NERC s41 Species of Principal Importance; Common
<i>Perizoma albulata</i>	Grass Rivulet	1	1	1	5%	1					NERC s41 Species of Principal Importance; Local
<i>Spilosoma luteum</i>	Buff Ermine	1	1	1	5%		1				NERC s41 Species of Principal Importance; Common
<i>Tyria jacobaeae</i>	Cinnabar	12	2	4	19%	11	1				NERC s41 Species of Principal Importance; Common
<i>Diarsia rubi</i>	Small Square-spot	22	3	6	29%	2		1	19		NERC s41 Species of Principal Importance; Common
<i>Melanchra persicariae</i>	Dot Moth	15	2	4	19%	2	13				NERC s41 Species of Principal Importance; Common
<i>Mythimna comma</i>	Shoulder-striped Wainscot	2	1	2	10%	2					NERC s41 Species of Principal Importance; Common
<i>Aporophyla lutulenta</i>	Deep-brown Dart	1	1	1	5%					1	NERC s41 Species of Principal Importance; Common
<i>Allophyes oxyacanthae</i>	Green-brindled Crescent	8	1	3	14%					8	NERC s41 Species of Principal Importance; Common
<i>Agrochola lychnidis</i>	Beaded Chestnut	19	1	4	19%					19	NERC s41 Species of Principal Importance; Common
<i>Xanthia icteritia</i>	Sallow	14	1	3	14%					14	NERC s41 Species of Principal Importance; Common
<i>Acronicta tridens/psi</i>	Dark/Grey Dagger	7	3	6	29%	1	3	3			NERC s41 Species of Principal Importance; Common
<i>Amphipyra tragopoginis</i>	Mouse Moth	4	3	4	19%		1	1	2		NERC s41 Species of Principal Importance; Common
<i>Apamea remissa</i>	Dusky Brocade	3	1	3	14%	3					NERC s41 Species of Principal Importance; Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Apamea anceps</i>	Large Nutmeg	2	1	2	10%	2					NERC s41 Species of Principal Importance; Local
<i>Mesoligia literosa</i>	Rosy Minor	2	1	2	10%		2				NERC s41 Species of Principal Importance; Common
<i>Hydraecia micacea</i>	Rosy Rustic	7	2	5	24%				4	3	NERC s41 Species of Principal Importance; Common
<i>Rhizedra lutosa</i>	Large Wainscot	1	1	1	5%					1	NERC s41 Species of Principal Importance; Common
<i>Hoplodrina blanda</i>	Rustic	17	2	7	33%		11	6			NERC s41 Species of Principal Importance; Common
<i>Caradrina morpheus</i>	Mottled Rustic	14	2	5	24%	13	1				NERC s41 Species of Principal Importance; Common
<i>Yponomeuta rorrella</i>	Willow Ermine	4	2	4	19%		1	3			pRDB3
<i>Acrolepiopsis assectella</i>	Leek Moth	1	1	1	5%			1			pRDB3
<i>Mompha lacteella</i>		2	2	2	10%		1	1			pRDB3
<i>Calamotropha paludella</i>	Bulrush Veneer	2	1	2	10%		2				Nb
<i>Caloptilia semifascia</i>		2	1	2	10%		2				Local
<i>Recurvaria leucateella</i>		3	1	3	14%		3				Local
<i>Athrips mouffetella</i>		1	1	1	5%		1				Local
<i>Blastodacna hellerella</i>		5	2	5	24%	1	4				Local
<i>Cochylis hybridella</i>		3	2	3	14%	2	1				Local
<i>Hedya salicella</i>		5	2	3	14%	3	2				Local
<i>Ancylis achatana</i>		15	2	8	38%	9	6				Local
<i>Gypsonoma dealbana</i>		12	1	5	24%		12				Local
<i>Eucosma obumbratana</i>		1	1	1	5%		1				Local
<i>Agriphila selasella</i>		3	2	2	10%		1	2			Local
<i>Catoptria falsella</i>		2	1	2	10%		2				Local
<i>Eudonia pallida</i>		3	2	3	14%	2				1	Local
<i>Pyrausta aurata</i>		1	1	1	5%		1				Local
<i>Phlyctaenia perlucidalis</i>		10	1	3	14%	10					Local
<i>Euzophera pinguis</i>		3	2	3	14%		1	2			Local
<i>Cyclophora punctaria</i>	Maiden's Blush	5	2	3	14%		2	3			Local
<i>Cyclophora linearia</i>	Clay Triple-lines	2	2	2	10%			1	1		Local

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Scopula immutata</i>	Lesser Cream Wave	2	1	2	10%		2				Local
<i>Scopula floslactata</i>	Cream Wave	16	1	2	10%		16				Local
<i>Idaea trigeminata</i>	Treble Brown Spot	7	3	6	29%	1	5	1			Local
<i>Idaea emarginata</i>	Small Scallop	1	1	1	5%		1				Local
<i>Philereme vetulata</i>	Brown Scallop	1	1	1	5%	1					Local
<i>Perizoma bifaciata</i>	Barred Rivulet	1	1	1	5%			1			Local
<i>Eupithecia haworthiata</i>	Haworth's Pug	2	2	2	10%		1	1			Local
<i>Acasis viretata</i>	Yellow-barred Brindle	1	1	1	5%			1			Local
<i>Plagodis dolabraria</i>	Scorched Wing	2	1	2	10%	2					Local
<i>Apeira syringaria</i>	Lilac Beauty	1	1	1	5%	1					Local
<i>Deilephila porcellus</i>	Small Elephant Hawk-moth	1	1	1	5%	1					Local
<i>Clostera curtula</i>	Chocolate-tip	2	2	2	10%		1	1			Local
<i>Leucoma salicis</i>	White Satin	3	2	3	14%	2	1				Local
<i>Thumatha senex</i>	Round-winged Muslin	46	2	5	24%	41	5				Local
<i>Cybosia mesomella</i>	Four-dotted Footman	2	1	2	10%	2					Local
<i>Eilema sororcula</i>	Orange Footman	1	1	1	5%	1					Local
<i>Eilema complana</i>	Scarce Footman	51	2	7	33%		45	6			Local
<i>Eilema depressa</i>	Buff Footman	1	1	1	5%		1				Local
<i>Naenia typica</i>	Gothic	1	1	1	5%		1				Local
<i>Craniophora ligustri</i>	Coronet	2	2	2	10%		1	1			Local
<i>Parastichtis ypsilon</i>	Dingy Shears	3	2	2	10%	1	2				Local
<i>Cosmia pyralina</i>	Lunar-spotted Pinion	5	1	3	14%		5				Local
<i>Apamea ophiogramma</i>	Double Lobed	4	1	3	14%		4				Local
<i>Hoplodrina ambigua</i>	Vine's Rustic	5	1	3	14%				5		Local
<i>Chilodes maritimus</i>	Silky Wainscot	1	1	1	5%		1				Local
<i>Bena bicolorana</i>	Scarce Silver-lines	3	1	2	10%		3				Local
<i>Nycteola revayana</i>	Oak Nycteoline	1	1	1	5%		1				Local
<i>Lygephila pastinum</i>	Blackneck	5	1	1	5%	5					Local
<i>Laspeyria flexula</i>	Beautiful Hook-tip	6	2	3	14%	5	1				Local
<i>Paradrina clavipalpis</i>	Pale Mottled Willow	2	1	1	5%	2					Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Monopis weaverella</i>		6	2	4	19%		2	4			Common
<i>Bucculatrix ulmella</i>		1	1	1	5%			1			Common
<i>Caloptilia rufipennella</i>		1	1	1	5%		1				Common
<i>Aspilapteryx tringipennella</i>		4	2	3	14%		1	3			Common
<i>Cameraria ohridella</i>		2	1	2	10%			2			Common
<i>Argyresthia brockeella</i>		1	1	1	5%		1				Common
<i>Argyresthia goedartella</i>		3	2	3	14%		2	1			Common
<i>Argyresthia albistria</i>		2	1	2	10%			2			Common
<i>Yponomeuta evonymella</i>	Bird-cherry Ermine	18	2	6	29%		15	3			Common
<i>Yponomeuta plumbella</i>		2	2	2	10%		1	1			Common
<i>Paraswammerdamia albicapitella</i>		1	1	1	5%				1		Common
<i>Paraswammerdamia nebulella</i>		5	2	5	24%	1	4				Common
<i>Prays fraxinella</i>	Ash Bud Moth	2	1	1	5%			2			Common
<i>Ypsolopha scabrella</i>		1	1	1	5%		1				Common
<i>Epermenia falciformis</i>		5	1	2	10%			5			Common
<i>Coleophora mayrella</i>		1	1	1	5%		1				Common
<i>Elachista canapennella</i>		17	3	6	29%		3	13	1		Common
<i>Elachista maculicerusella</i>		30	2	4	19%		6	24			Common
<i>Batia lunaris</i>		3	1	3	14%		3				Common
<i>Batia unitella</i>		19	2	7	33%		15	4			Common
<i>Hofmannophila pseudospretella</i>	Brown House Moth	5	2	5	24%		4	1			Common
<i>Carcina quercana</i>		7	2	3	14%		4	3			Common
<i>Agonopterix heracliana</i>		1	1	1	5%		1				Common
<i>Agonopterix alstromeriana</i>		1	1	1	5%		1				Common
<i>Teleiodes vulgella</i>		1	1	1	5%		1				Common
<i>Bryotropha terrella</i>		3	2	3	14%		2	1			Common
<i>Scrobipalpa costella</i>		2	2	2	10%		1			1	Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Brachmia blandella</i>		6	2	5	24%	1	5				Common
<i>Helcystogramma rufescens</i>		28	4	9	43%	2	19	5		2	Common
<i>Blastobasis adustella</i>		7	2	5	24%		3	4			Common
<i>Batrachedra praeangusta</i>		5	1	3	14%		5				Common
<i>Mompha raschkiella</i>		1	1	1	5%		1				Common
<i>Mompha ochraceella</i>		6	1	3	14%		6				Common
<i>Mompha subbistrigella</i>		1	1	1	5%				1		Common
<i>Mompha epilobiella</i>		3	2	3	14%		2	1			Common
<i>Limnaecia phragmitella</i>		23	1	4	19%		23				Common
<i>Cochylimorpha straminea</i>		1	1	1	5%			1			Common
<i>Agapeta hamana</i>		6	2	4	19%		5	1			Common
<i>Aethes cnicana</i>		28	1	4	19%	28					Common
<i>Pandemis cerasana</i>	Barred Fruit-tree Tortrix	17	3	7	33%	1	12	4			Common
<i>Pandemis heparana</i>	Dark Fruit-tree Tortrix	1	1	1	5%		1				Common
<i>Clepsis spectrana</i>	Cyclamen Tortrix	1	1	1	5%		1				Common
<i>Clepsis consimilana</i>		1	1	1	5%		1				Common
<i>Epiphyas postvittana</i>	Light Brown Apple Moth	2	2	2	10%		1			1	Common
<i>Lozotaenia forsterana</i>		1	1	1	5%	1					Common
<i>Ditula angustiorana</i>	Red-barred Tortrix	6	2	5	24%		5	1			Common
<i>Pseudargyrotoza conwagana</i>		9	1	4	19%		9				Common
<i>Eulia ministrana</i>		1	1	1	5%		1				Common
<i>Aleimma loeflingiana</i>		8	2	5	24%	6	2				Common
<i>Tortrix viridana</i>	Green Oak Tortrix	21	1	4	19%	21					Common
<i>Acleris forsskaleana</i>		5	2	5	24%		3	2			Common
<i>Acleris holmiana</i>		2	1	2	10%		2				Common
<i>Acleris rhombana</i>	Rhomboid Tortrix	3	3	3	14%		1		1	1	Common
<i>Acleris variegana</i>	Garden Rose Tortrix	8	4	5	24%		1	2	1	4	Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Celypha striana</i>		3	2	3	14%	1	2				Common
<i>Celypha lacunana</i>		112	4	15	71%	32	14	29	37		Common
<i>Hedya pruniana</i>	Plum Tortrix Marbled Orchard	11	1	3	14%	11					Common
<i>Hedya nubiferana</i>	Tortrix	1	1	1	5%	1					Common
<i>Lobesia abscisana</i>		17	2	6	29%		11	6			Common
<i>Bactra lancealana</i>		6	2	3	14%		1	5			Common
<i>Eudemis profundana</i>		1	1	1	5%		1				Common
<i>Rhopobota naevana</i>	Holly Tortrix	9	2	5	24%		8	1			Common
<i>Zeiraphera isertana</i>		7	1	3	14%		7				Common
<i>Epiblema uddmanniana</i>	Bramble Shoot Moth	8	3	7	33%	3	4	1			Common
<i>Epiblema roborana</i>		5	2	4	19%	3		2			Common
<i>Epiblema costipunctana</i>		1	1	1	5%		1				Common
<i>Eucosma campoliliana</i>		2	2	2	10%		1	1			Common
<i>Eucosma cana</i>		18	3	8	38%	9	8	1			Common
<i>Spilonota ocellana</i>	Bud Moth	8	2	3	14%		7	1			Common
<i>Lathronympha strigana</i>		1	1	1	5%				1		Common
<i>Pammene fasciana</i>		3	1	3	14%		3				Common
<i>Cydia splendana</i>		40	2	8	38%		17	23			Common
<i>Chrysoteuchia culmella</i>	Garden Grass-veneer	159	3	10	48%	5	148	6			Common
<i>Crambus perlella</i>		2	2	2	10%	1	1				Common
<i>Agriphila straminella</i>		217	3	11	52%		23	192	2		Common
<i>Agriphila tristella</i>		19	2	8	38%			10	9		Common
<i>Agriphila geniculea</i>		4	1	1	5%				4		Common
<i>Acentria ephemerella</i>	Water Veneer	3	2	2	10%		1	2			Common
<i>Scoparia pyralella</i>		15	2	4	19%	14	1				Common
<i>Scoparia ambigualis</i>		15	2	6	29%	13	2				Common
<i>Dipleurina lacustrata</i>		7	2	4	19%	2	5				Common
<i>Eudonia mercurella</i>		12	2	7	33%		7	5			Common
<i>Parapoynx stratiotata</i>	Ringed China-mark	1	1	1	5%			1			Common
<i>Cataclysta lemnata</i>	Small China-mark	1	1	1	5%		1				Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Eurrhynx hortulata</i>	Small Magpie	2	1	2	10%		2				Common
<i>Phlyctaenia coronata</i>		1	1	1	5%		1				Common
<i>Udea lutealis</i>		4	2	3	14%		1	3			Common
<i>Udea prunalis</i>		5	2	4	19%		3	2			Common
<i>Pleuroptya ruralis</i>	Mother of Pearl	82	3	9	43%		38	43	1		Common
<i>Hypsopygia costalis</i>	Gold Triangle	2	2	2	10%		1			1	Common
<i>Endotracha flammealis</i>		12	3	5	24%		8	2		2	Common
<i>Acrobasis consociella</i>		4	2	3	14%		2	2			Common
<i>Trachycera advenella</i>		12	3	8	38%		3	7	2		Common
<i>Phycita roborella</i>		7	2	5	24%		5	2			Common
<i>Phycitodes binaevella</i>		1	1	1	5%		1				Common
<i>Marasmarcha lunaedactyla</i>		1	1	1	5%		1				Common
<i>Malacosoma neustria</i>	Lackey	10	1	4	19%	10					Common
<i>Euthrix potatoria</i>	Drinker	42	2	5	24%	40	2				Common
<i>Cilix glaucata</i>	Chinese Character	6	3	4	19%		4	1	1		Common
<i>Thyatira batis</i>	Peach Blossom	1	1	1	5%		1				Common
<i>Habrosyne pyritoides</i>	Buff Arches	8	2	5	24%	6	2				Common
<i>Tethea ocellaris</i>											
<i>octogesimea</i>	Figure of Eighty	1	1	1	5%	1					Common
<i>Hemithea aestivaria</i>	Common Emerald	1	1	1	5%	1					Common
<i>Scopula imitaria</i>	Small Blood-vein	1	1	1	5%	1					Common
<i>Idaea biselata</i>	Small Fan-footed Wave	4	1	1	5%		4				Common
<i>Idaea aversata</i>	Riband Wave	40	3	9	43%	3	21	16			Common
<i>Xanthorhoe spadicearia</i>	Red Twin-spot Carpet	12	2	6	29%		6	6			Common
<i>Epirrhoe alternata</i>	Common Carpet	4	2	3	14%		1	3			Common
<i>Camptogramma bilineata</i>	Yellow Shell	2	2	2	10%	1	1				Common
<i>Eulithis pyraliata</i>	Barred Straw	1	1	1	5%	1					Common
<i>Chloroclysta siterata</i>	Red-green Carpet Common Marbled	4	1	1	5%					4	Common
<i>Chloroclysta truncata</i>	Carpet	11	3	6	29%	1			1	9	Common



Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Cidaria fulvata</i>	Barred Yellow	1	1	1	5%	1					Common
<i>Plemyria rubiginata</i>											
<i>rubiginata</i>	Blue-bordered Carpet	1	1	1	5%	1					Common
<i>Hydriomena furcata</i>	July Highflyer	13	3	7	33%	1	10	2			Common
<i>Perizoma alchemillata</i>	Small Rivulet	1	1	1	5%		1				Common
<i>Eupithecia exiguata</i>	Mottled Pug	1	1	1	5%	1					Common
<i>Eupithecia centaureata</i>	Lime-speck Pug	3	2	2	10%		1	2			Common
<i>Eupithecia absinthiata</i>	Wormwood Pug	1	1	1	5%	1					Common
<i>Eupithecia assimilata</i>	Currant Pug	1	1	1	5%		1				Common
<i>Eupithecia subfuscata</i>	Grey Pug	1	1	1	5%	1					Common
<i>Eupithecia succenturiata</i>	Bordered Pug	1	1	1	5%		1				Common
<i>Chloroclystis v-ata</i>	V-Pug	2	1	2	10%			2			Common
<i>Pasiphila rectangulata</i>	Green Pug	6	2	5	24%	3	3				Common
<i>Aplocera efformata</i>	Lesser Treble-bar	1	1	1	5%		1				Common
<i>Abraxas grossulariata</i>	Magpie Moth	15	2	5	24%		1	14			Common
<i>Lomaspilis marginata</i>	Clouded Border	61	3	8	38%	30	30	1			Common
<i>Macaria liturata</i>	Tawny-barred Angle	1	1	1	5%			1			Common
<i>Opisthograptis luteolata</i>	Brimstone Moth	21	5	10	48%	4	5	5	6	1	Common
<i>Epione repandaria</i>	Bordered Beauty	1	1	1	5%					1	Common
	Canary-shouldered										
<i>Ennomos alniaria</i>	Thorn	4	2	4	19%		2	2			Common
<i>Selenia dentaria</i>	Early Thorn	5	1	5	24%		5				Common
<i>Selenia tetralunaria</i>	Purple Thorn	1	1	1	5%		1				Common
<i>Crocallis elinguarina</i>	Scalloped Oak	13	2	6	29%		9	4			Common
<i>Ourapteryx sambucaria</i>	Swallow-tailed Moth	4	2	3	14%	1				3	Common
<i>Colotois pennaria</i>	Feathered Thorn	1	1	1	5%					1	Common
<i>Biston betularia</i>	Peppered Moth	1	1	1	5%	1					Common
<i>Peribatodes</i>											
<i>rhomboidaria</i>	Willow Beauty	16	4	8	38%		1	11	3	1	Common
<i>Alcis repandata</i>	Mottled Beauty	11	2	4	19%	10	1				Common
<i>Cabera exanthemata</i>	Common Wave	13	4	6	29%	1	2	4	6		Common
<i>Lomographa temerata</i>	Clouded Silver	4	1	2	10%	4					Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Laothoe populi</i>	Poplar Hawk-moth	11	4	10	48%	2	4	3	2		Common
<i>Deilephila elpenor</i>	Elephant Hawk-moth	10	1	3	14%	10					Common
<i>Phalera bucephala</i>	Buff-tip	2	2	2	10%	1	1				Common
<i>Furcula furcula</i>	Sallow Kitten	7	3	4	19%		5	1	1		Common
<i>Notodonta ziczac</i>	Pebble Prominent	7	3	5	24%	1	5		1		Common
	Lesser Swallow										
<i>Pheosia gnoma</i>	Prominent	1	1	1	5%				1		Common
<i>Pterostoma palpina</i>	Pale Prominent	4	2	3	14%		3	1			Common
<i>Euproctis similis</i>	Yellow-tail	8	3	7	33%	1	5	2			Common
<i>Eilema griseola</i>	Dingy Footman	40	2	7	33%		23	17			Common
<i>Eilema lurideola</i>	Common Footman	14	3	5	24%	1	12	1			Common
<i>Phragmatobia fuliginosa</i>	Ruby Tiger	5	1	3	14%		5				Common
<i>Nola cucullatella</i>	Short-cloaked Moth	6	2	6	29%	2	4				Common
<i>Agrotis segetum</i>	Turnip Moth	1	1	1	5%	1					Common
<i>Agrotis clavis</i>	Heart and Club	7	1	4	19%	7					Common
<i>Agrotis exclamationis</i>	Heart and Dart	113	3	8	38%	89	23	1			Common
<i>Agrotis puta</i>	Shuttle-shaped Dart	8	2	5	24%		3	5			Common
<i>Axylia putris</i>	Flame	1	1	1	5%	1					Common
<i>Ochropleura plecta</i>	Flame Shoulder	88	4	14	67%	11	4	45	28		Common
	Large Yellow				100						
<i>Noctua pronuba</i>	Underwing	145	5	21	%	13	16	25	73	18	Common
	Lesser Yellow										
<i>Noctua comes</i>	Underwing	50	4	12	57%		32	12	1	5	Common
	Broad-bordered Yellow										
<i>Noctua fimbriata</i>	Underwing	6	1	3	14%		6				Common
	Lesser Broad-bordered										
<i>Noctua janthe</i>	Yellow Underwing	67	3	10	48%		9	34	24		Common
<i>Noctua interjecta</i>	Least Yellow										
<i>caliginosa</i>	Underwing	4	2	4	19%		2	2			Common
	Setaceous Hebrew										
<i>Xestia c-nigrum</i>	Character	14	4	9	43%	1		3	7	3	Common
<i>Xestia triangulum</i>	Double Square-spot	23	2	7	33%	13	10				Common
<i>Xestia sexstrigata</i>	Six-striped Rustic	59	1	4	19%				59		Common
<i>Xestia xanthographa</i>	Square-spot Rustic	18	2	7	33%				15	3	Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Lacanobia oleracea</i>	Bright-line Brown-eye	36	3	8	38%	25	10	1			Common
<i>Mythimna conigera</i>	Brown-line Bright Eye	8	3	4	19%	1	5	2			Common
<i>Mythimna ferrago</i>	Clay	1	1	1	5%		1				Common
<i>Mythimna impura</i>	Smoky Wainscot	109	3	12	57%	17	77	15			Common
<i>Mythimna pallens</i>	Common Wainscot	3	3	3	14%	1			1	1	Common
<i>Cucullia umbratica</i>	Shark	1	1	1	5%	1					Common
<i>Aporophyla nigra</i>	Black Rustic	5	1	4	19%					5	Common
<i>Lithophane leautieri hesperica</i>	Blair's Shoulder-knot	1	1	1	5%				1		Common
<i>Dichonia aprilina</i>	Merveille du Jour	1	1	1	5%					1	Common
<i>Dryobotodes eremita</i>	Brindled Green	3	1	2	10%					3	Common
<i>Agrochola lota</i>	Red-line Quaker	2	1	2	10%					2	Common
<i>Omphaloscelis lunosa</i>	Lunar Underwing	84	1	4	19%					84	Common
<i>Xanthia aurago</i>	Barred Sallow	4	1	4	19%					4	Common
<i>Xanthia togata</i>	Pink-barred Sallow	10	1	3	14%					10	Common
<i>Acronicta megacephala</i>	Poplar Grey	3	2	3	14%	2	1				Common
<i>Acronicta leporina</i>	Miller	1	1	1	5%	1					Common
<i>Cryphia domestica</i>	Marbled Beauty	4	2	3	14%		2	2			Common
<i>Amphipyra pyramidea</i>	Copper Underwing	1	1	1	5%			1			Common
<i>Amphipyra berbera svenssoni</i>	Svensson's Copper Underwing	2	2	2	10%		1		1		Common
<i>Thalpophila matura</i>	Straw Underwing	2	1	1	5%			2			Common
<i>Euplexia lucipara</i>	Small Angle Shades	1	1	1	5%	1					Common
<i>Phlogophora meticulosa</i>	Angle Shades	3	2	3	14%	2				1	Common
<i>Cosmia trapezina</i>	Dun-bar	16	2	6	29%		14	2			Common
<i>Apamea monoglypha</i>	Dark Arches	183	4	15	71%	97	67	17	2		Common
<i>Apamea lithoxylaea</i>	Light Arches	24	2	5	24%	23	1				Common
<i>Apamea epomidion</i>	Clouded Brindle	1	1	1	5%	1					Common
<i>Mesoligia furuncula</i>	Cloaked Minor	8	2	3	14%		4	4			Common
<i>Photodes minima</i>	Small Dotted Buff	22	2	9	43%	10	12				Common
<i>Chortodes pygmina</i>	Small Wainscot	1	1	1	5%					1	Common
<i>Luperina testacea</i>	Flounced Rustic	1	1	1	5%				1		Common

Taxon	Vernacular	Individuals	Dates	Traps*	%	21-Jun-14	18-Jul-14	01-Aug-14	22-Aug-14	03-Oct-14	Status
<i>Gortyna flavago</i>	Frosted Orange	2	2	2	10%				1	1	Common
<i>Hoplodrina alsines</i>	Uncertain	50	3	10	48%	36	13	1			Common
<i>Protodeltote pygarga</i>	Marbled White Spot	1	1	1	5%	1					Common
<i>Diachrysia chrysitis</i>	Burnished Brass	10	3	6	29%	7	1		2		Common
<i>Autographa pulchrina</i>	Beautiful Golden Y	1	1	1	5%	1					Common
<i>Autographa jota</i>	Plain Golden Y	1	1	1	5%	1					Common
<i>Abrostola tripartita</i>	Spectacle	10	3	5	24%		3	6	1		Common
<i>Catocala nupta</i>	Red Underwing	1	1	1	5%				1		Common
<i>Scoliopteryx libatrix</i>	Herald	1	1	1	5%		1				Common
<i>Rivula sericealis</i>	Straw Dot	33	4	9	43%	2	1	27		3	Common
<i>Hypena proboscidalis</i>	Snout	7	3	4	19%	2	4			1	Common
<i>Zanclognatha tarsipennalis</i>	Fan-foot	1	1	1	5%		1				Common
<i>Herminia grisealis</i>	Small Fan-foot	1	1	1	5%		1				Common
<i>Plutella xylostella</i>	Diamond-back Moth	43	3	6	29%		41	1	1		Migrant
<i>Udea ferrugalis</i>	Rusty-dot Pearl	1	1	1	5%				1		Migrant
<i>Autographa gamma</i>	Silver Y	7	4	5	24%		1	4	1	1	Migrant
<i>Cnephasia sp.</i>	Cnephasia species	1	1	1	5%				1		Unknown
<i>Acleris laterana/comariana</i>		34	2	4	19%		8	26			Unknown
<i>Acleris ferrugana/notana</i>		9	2	2	10%		1	8			Unknown
<i>Oligia strigilis</i> agg.	Marbled Minor agg.	27	1	4	19%	27					Unknown
<i>Mesapamea secalis</i> agg.	Common Rustic agg.	181	3	12	57%		59	115	7		Unknown
Total number of species		<b>294</b>				<b>109</b>	<b>197</b>	<b>114</b>	<b>49</b>	<b>39</b>	
Number of species as proportion of total species list						37.1%	67.0%	38.8%	16.7%	13.3%	
<b>Additions to the species list</b>							<b>139</b>	<b>15</b>	<b>15</b>	<b>16</b>	
Additional species as proportion of catch							70.6%	13.2%	30.6%	41.0%	
<b>Species recorded on only one date</b>		<b>147</b>				<b>42</b>	<b>64</b>	<b>13</b>	<b>12</b>	<b>16</b>	
<b>Total individuals**</b>		<b>3698</b>				<b>838</b>	<b>1327</b>	<b>962</b>	<b>345</b>	<b>226</b>	
Number of traps		21				4	5	4	4	4	

<b>Taxon</b>	<b>Vernacular</b>	<b>Individuals</b>	<b>Dates</b>	<b>Traps*</b>	<b>%</b>	<b>21-Jun-14</b>	<b>18-Jul-14</b>	<b>01-Aug-14</b>	<b>22-Aug-14</b>	<b>03-Oct-14</b>	<b>Status</b>
Number of MV/Actinic traps		19/2				4/0	3/2	4/0	4/0	4/0	
Average number of species per trap		49.6				55.5	89	52.8	22.5	18.8	
Average number of individuals per trap**		176				210	265	241	86	57	
Mean number of traps in which species was found		3.5				2	2.3	1.9	1.8	1.9	
Number of species found in all traps		1				21	17	12	8	6	
Number of species recorded in only one trap		95				52	87	54	30	21	

**Table 6 – NERC Section 41 Species of Principal Importance, Red Data Book and Nationally Scarce species recorded**

<b>Taxon</b>	<b>Vernacular</b>	<b>Status</b>
<i>Hemistola chrysoprasaria</i>	Small Emerald	NERC s41 Species of Principal Importance; Local
<i>Perizoma albulata</i>	Grass Rivulet	NERC s41 Species of Principal Importance; Local
<i>Apamea anceps</i>	Large Nutmeg	NERC s41 Species of Principal Importance; Local
<i>Watsonalla binaria</i>	Oak Hook-tip	NERC s41 Species of Principal Importance; Common
<i>Timandra comae</i>	Blood-vein	NERC s41 Species of Principal Importance; Common
<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	NERC s41 Species of Principal Importance; Common
<i>Ecliptopera silaceata</i>	Small Phoenix	NERC s41 Species of Principal Importance; Common
<i>Spilosoma luteum</i>	Buff Ermine	NERC s41 Species of Principal Importance; Common
<i>Tyria jacobaeae</i>	Cinnabar	NERC s41 Species of Principal Importance; Common
<i>Diarsia rubi</i>	Small Square-spot	NERC s41 Species of Principal Importance; Common
<i>Melanchra persicariae</i>	Dot Moth	NERC s41 Species of Principal Importance; Common
<i>Mythimna comma</i>	Shoulder-striped Wainscot	NERC s41 Species of Principal Importance; Common
<i>Aporophyla lutulenta</i>	Deep-brown Dart	NERC s41 Species of Principal Importance; Common
<i>Allophyes oxyacanthae</i>	Green-brindled Crescent	NERC s41 Species of Principal Importance; Common
<i>Agrochola lychnidis</i>	Beaded Chestnut	NERC s41 Species of Principal Importance; Common
<i>Xanthia icteritia</i>	Sallow	NERC s41 Species of Principal Importance; Common
<i>Acronicta tridens/psi</i>	Dark/Grey Dagger	NERC s41 Species of Principal Importance; Common
<i>Amphipyra tragopoginis</i>	Mouse Moth	NERC s41 Species of Principal Importance; Common
<i>Apamea remissa</i>	Dusky Brocade	NERC s41 Species of Principal Importance; Common
<i>Mesoligia literosa</i>	Rosy Minor	NERC s41 Species of Principal Importance; Common
<i>Hydraecia micacea</i>	Rosy Rustic	NERC s41 Species of Principal Importance; Common
<i>Rhizedra lutosa</i>	Large Wainscot	NERC s41 Species of Principal Importance; Common
<i>Hoplodrina blanda</i>	Rustic	NERC s41 Species of Principal Importance; Common
<i>Caradrina morpheus</i>	Mottled Rustic	NERC s41 Species of Principal Importance; Common
<i>Yponomeuta rorrella</i>	Willow Ermine	pRDB3 (downgraded to Nationally Local in Davis, 2012)
<i>Acrolepiopsis assectella</i>	Leek Moth	pRDB3 (downgraded to Nationally Local in Davis, 2012)
<i>Mompha lacteella</i>	-	pRDB3 (downgraded to Nationally Scarce in Davis, 2012)
<i>Calamotropha paludella</i>	-	Nb

Table 7 – ISIS output for Gavray Drive Moth Data (note: Macro moth families only supported by ISIS)

The specific assemblage types represented in this list are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	4	fav	20	
W314	reedfen and pools	2		2	

All SATs scoring more than zero are listed

The broad assemblage types represented in this list are as follows:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
A1	arboreal canopy	20	125		60	
F2	grassland & scrub matrix	10	121		28	
A2	wood decay	1			4	0
W3	permanent wet mire	1			3	
F1	unshaded early successional mosaic	1			2	
F3	shaded field & ground layer	0			1	

Rarity scores are shown only for BATS represented by more than 15 species in the assemblage / fauna being analysed

Technical statistics:

Number of species	294
Number of errors in species list	0

**Table 8 - ISIS output for Gavray Drive Moth Data combined with 3<sup>rd</sup> party data collected by Plant (2005-2013) data and butterfly transect data**

**The specific assemblage types represented in this list are as follows:**

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	6	fav	30	165
F001	scrub edge	14	fav	8	
F002	rich flower resource	14		6	
W221	litter-rich fluctuating marsh	2		5	130
F112	open short sward	9		5	153
W314	reedfen and pools	5		4	164
A212	bark & sapwood decay	14		3	165
W313	moss and tussock fen	1		2	164
W126	seepage	1		2	
A211	heartwood decay	2		1	165
F006	dung	1		1	
M311	saltmarsh	1		1	
W312	Sphagnum bog	1		1	164
F111	bare sand & chalk	2		0	153
F003	scrub-heath & moorland	1		0	

All SATs scoring more than zero are listed

**The broad assemblage types represented in this list are as follows:**

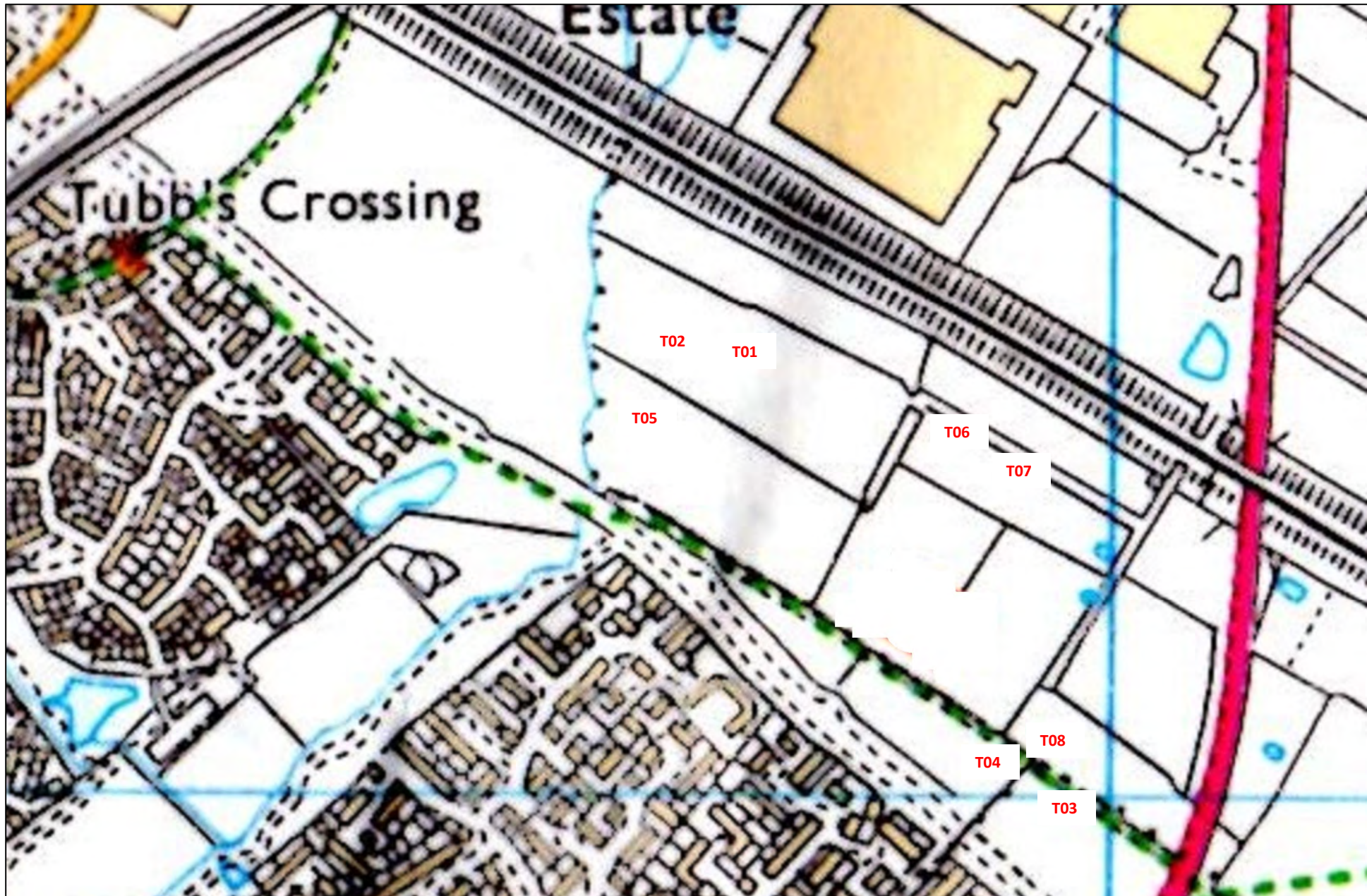
BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness	IEC
F2	grassland & scrub matrix	32	125		288	
A1	arboreal canopy	13	123		120	
F1	unshaded early successional mosaic	5	153		47	
W3	permanent wet mire	5	164		42	
W2	mineral marsh & open water	3	130		27	
A2	wood decay	3	165		27	1
W1	flowing water	1			6	
F3	shaded field & ground layer	1			5	
M3	saltmarsh, estuary & mud flat	0			2	

Rarity scores are shown only for BATS represented by more than 15 species in the assemblage / fauna being analysed

**Technical statistics:**

Number of species	902
Number of errors in species list	0





**Appendix 2 - Figures**

Figure 1- Moth trap locations



## **Annex EDP 6 Ray Conservation Target Area**

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## **Ray CTA (Conservation Target Area)**

The alluvial floodplain of the River Ray extending along a number of small tributary streams and including some areas of land between these streams. This area extends into Buckinghamshire. The area extends onto the clay to included known areas of wet grassland and the main areas of ridge and furrow.

**Joint Character Area:** Thames and Avon Vales

**Landscape Types:** Alluvial Lowland with some areas of Clay Vale.

**Geology:** Mainly alluvium along the Ray. Alluvium is also present in narrow bands along the small streams and there are Oxford Clay mudstones away from the streams and river.

**Topography.** Flat riverside land.                      **Area of CTA:**                      1192 hectares

### **Biodiversity:**

- Lowland Meadow. The key habitat in this area. It is found in a number of SSSIs and Local Wildlife Sites mainly at least partly on the alluvium. North-west of Blackthorn Hill there is a larger group of meadows which are largely on the Oxford Clay. Remnants of this habitat are found elsewhere especially between Bicester and Blackthorn Hill and in some meadows in Buckinghamshire including BBOWT's recent addition to their Upper Ray Meadows Reserve at Leaches Farm.
- Wet Grassland/Floodplain Grazing Marsh. Wet grassland is found in meadows along with lowland meadow habitat with remnants elsewhere. Parts of the BBOWT Upper Ray Reserves have been restored to floodplain grazing marsh.
- Hedgerows. Some rich and well structured hedgerows with brown and black hairstreak.
- Ponds at Leaches Farm BBOWT reserve.
- Other Species: true fox sedge is found in a number of sites in the area.

**Access:** Largely restricted to bridleways and footpaths. There are a number of BBOWT nature reserves. Dorothy Bolton Meadow & Leaches Meadow currently have no public access, whilst Long Herdon & Grange are accessed via a public footpath. Access routes to a further two BBOWT reserves at Cow Leys and Leaches Farm are by existing public footpaths.

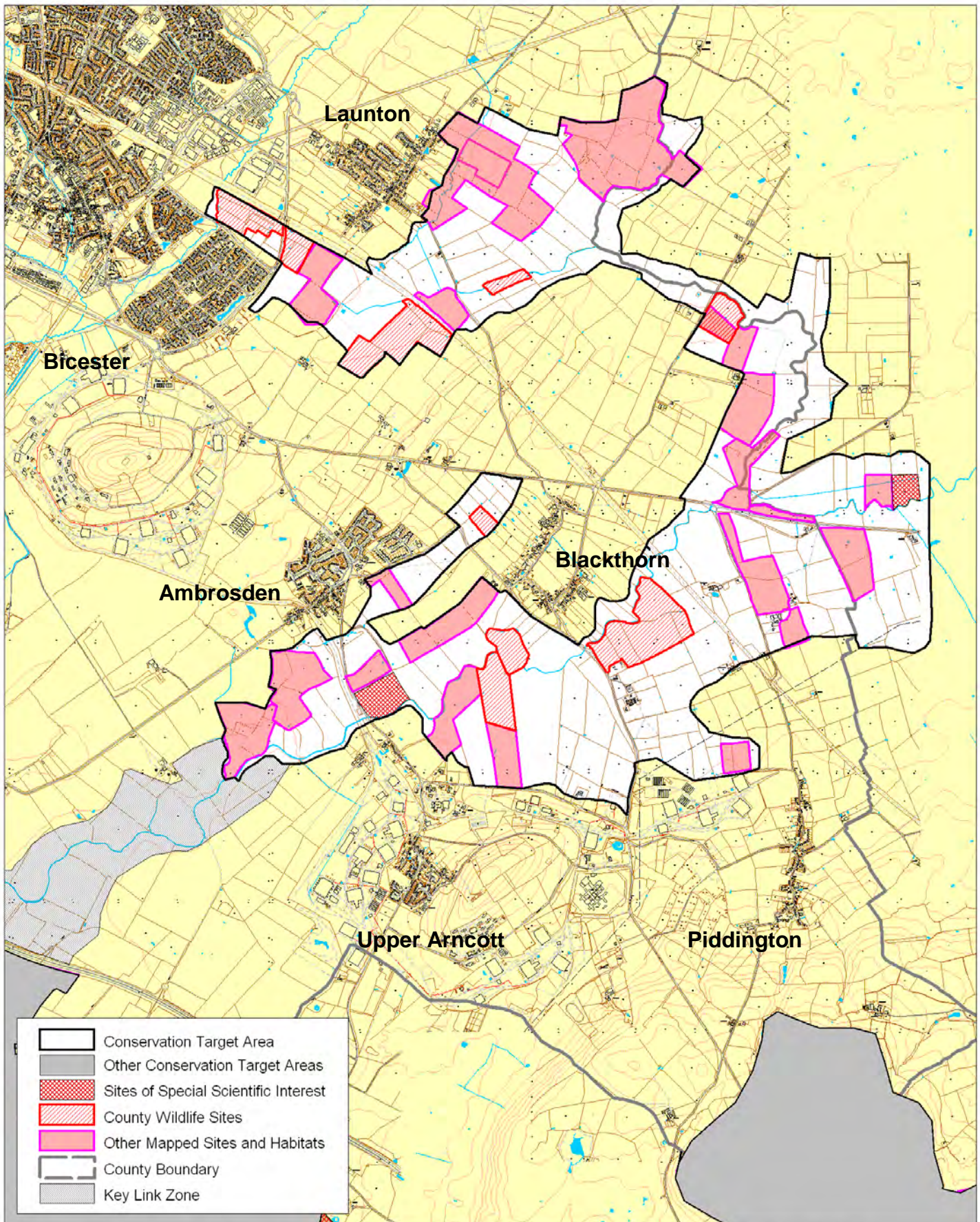
**Archaeology:** Extensive ridge and furrow.

### **Oxfordshire Biodiversity Action Plan Targets associated with this CTA:**

1. Lowland meadow – management<sup>1</sup>, restoration and creation (with a focus on MG4 hay meadows).
2. Floodplain grazing marsh - management, restoration and creation (with a focus on breeding waders).
3. Reedbed – creation.
4. Ponds – creation (particularly of pond complexes).
5. Hedgerows – management (good management of existing hedgerows on short and long-term rotation, which will benefit brown and black hairstreaks and other wildlife).
6. Rivers – management and restoration (resource protection of watercourses to maintain and improve water quality).

<sup>1</sup> "Management" implies both maintaining the quantity, and maintaining and improving the quality of existing BAP habitat and incorporates the following target definitions: "Maintaining extent" and "Achieving Condition".

# Ray Conservation Target Area



**Area of BAP habitat present in CTA (from TVERC BAP Habitat GIS layer 5/2010) and 2015 BAP Habitat Targets for this CTA**

<b>Ray CTA</b>	<b>Lowland Calcareous Grassland</b>	<b>Lowland Dry Acid Grassland</b>	<b>Lowland Meadows</b>	<b>Coastal and Floodplain Grazing Marsh</b>	<b>Eutrophic Standing Waters</b>	<b>Lowland Fens</b>	<b>Reedbeds</b>	<b>Lowland Beech and Yew Woodland</b>	<b>Lowland Mixed Deciduous Woodland</b>	<b>Wet Woodland</b>	<b>Wood - Pasture and Parkland</b>	<b>Traditional Orchards</b>
Area of BAP Habitat in CTA (ha)			105.8	10.6					1.1			
% of CTA area			8.9	0.9					0.1			
% of county resource			9.8	0.2					0.0			
<b>2015 BAP targets</b> (hectares)	<b>Lowland Calcareous Grassland</b>	<b>Lowland Dry Acid Grassland</b>	<b>Lowland Meadows</b>	<b>Coastal and Floodplain Grazing Marsh</b>	<b>Eutrophic Standing Waters – No targets for 2015</b>	<b>Lowland Fens</b>	<b>Reedbeds</b>	<b>Native Woodland</b>			<b>Wood - Pasture and Parkland</b> <small>Targets not divided by CTA</small>	<b>Traditional Orchards - No targets for 2015</b>
Maintenance (to be determined)	-	-	-	-	-	-	-	-			-	-
Achieving Condition (to be determined)	-	-	-	-	-	-	-	-			-	-
Restoration			22		-		-				-	-
Creation			5		-	-					-	-

**Annex EDP 7**  
**Gavray Drive Meadows LWS Citation**