# INVERTEBRATE SURVEY REPORT

## FEBRUARY 2025

**Stairfoot Quarry**
Sandy Gate Lane,
Ardsley,
Barnsley,
S71 5AW

URBAN GREEN

# QUALITY MANAGEMENT

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| **Project No.:** | UG1773 | | | | |
| **Project:** | Stairfoot Quarry | | | | |
| **Location:** | Sandy Gate Lane, Ardsley, Barnsley, S71 5AW | | | | |
| **Title:** | Invertebrate Survey Report | | | | |
| **Document Type:** | INV | **Issue No.:** | 01 | | |
| **Date:** | October 2023 | | | | |
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**Revision Status:**

| Rev: | Date: | Issue/Purpose/ Comment: | Prepared: | Checked: |
|---|---|---|---|---|
| 02 | 12/02/2025 | Amendment to report to reflect update to planning application boundary | Olivia Jones | Jake Healy |
| | | | | |

# CONTENTS



# Tables and Figures

# 1 Executive Summary

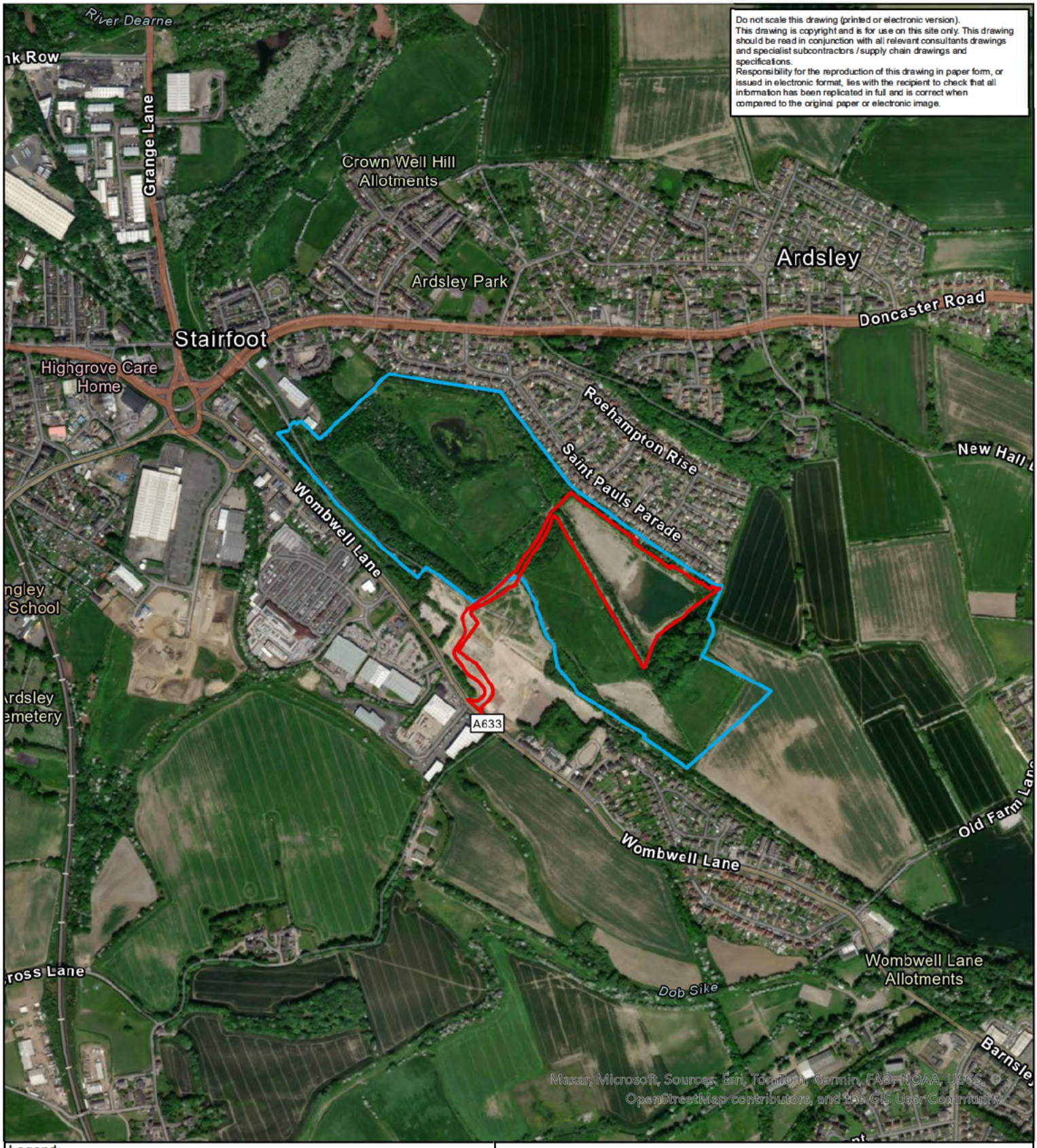
1.1.1.1 Green Earth Developments (Group) Ltd is proposing to develop land at Stairfoot Quarry in Ardsley, Barnsley (hereafter referred to as 'the site'). The proposals include an ecological restoration scheme after an operation period as an inert waste landfill site.

1.1.1.2 Urban Green has been appointed to complete Invertebrate Surveys and a Report of the site. A Preliminary Ecological Appraisal (PEA) was conducted at the site by Urban Green on 22nd March 2023. Further surveys, in the form of invertebrate surveys to identify and assess presence was recommended, focusing on the presence of notable invertebrates and any habitats which were deemed most likely to support invertebrates within the site.

1.1.1.3 Urban Green appointed Andy Jukes, BSc (Hons), MCIEEM FRES, of Conops Entomology Ltd. to undertake invertebrate surveys. The surveys were undertaken between May and September 2023 following those recommended in the Natural England guidance document '*Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation*' (Drake *et al.*, 2007). In some instances, a bespoke method has been created for the site assessment but still retains the overall approach to assessing features and habitats for conservation assessment. The bespoke methods relate to the extent of the free-ranging sampling.

1.1.1.4 A total of 268 species were recorded within the survey area, with nine species having a national status (which may be later revised). The tall sward and scrub habitats onsite were deemed an area of high species diversity, with 110 species recorded within this habitat type.

1.1.1.5 The proposed development is assessed as having a relatively minor impact on the invertebrate assemblage found using the Survey Area, though compensatory planting and other enhancement recommendations have been made.






Legend:
- Red Line Boundary
- Ownership

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|---|---|---|---|
| Client: Green Earth Developments (Group) Ltd | Issue: 01 | Figure: 01 | |
| Project: Stairfoot Quarry | Scale @ A4: 1:10,000 | | |
| Title: Site Context | Approved by: CL | Checked by: JH | |
| Drawing Ref: UG_1773_SITE_CONTEXT | Author: CL | Date: 07/08/2024 | |

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# 2 Introduction

## 2.1 Background to the Scheme

2.1.1.1 Green Earth Developments (Group) Ltd is proposing to develop land at Stairfoot Quarry in Ardsley, Barnsley.

2.1.1.2 The proposals include an ecological restoration scheme after an operation period as an inert waste landfill site. The proposals include the restoration of Yew Tree Quarry, through the infill of non-hazardous excavated soil materials. It is understood that the operation phase of the development will last for approximately 111 weeks and will require the following activities:

- Vegetation removal
- Breaking of ground
- Use of heavy machinery, including ~80 HGV tippers per day,
- Infill of quarry, and other associated activities

2.1.1.3 Urban Green has been appointed to complete Invertebrate Surveys and a Report of the site. Further surveys, in the form of invertebrate surveys were recommended to further assess the site for likely presence/absence of invertebrates within the site.

2.1.1.4 Conops Entomology Ltd was commissioned in March 2023 by Urban Green to undertake a survey of the land at Stairfoot Quarry prior to works.

2.1.1.5 The scope of this survey is to undertake an invertebrate assessment of land at Stairfoot Quarry that may be impacted by a proposed development. The assessment appraised the key habitats and/or features of the site through the recording of invertebrates. The data is used to assess the value to invertebrates of those habitats or features to evaluate the Survey Area for its importance as an invertebrate resource. From the collection of data and subsequent assessment and valuation, suitable recommendations can then be made to mitigate for habitat loss from the proposals.

## 2.2 Site Context

2.2.1.1 The site is located at National Grid Reference SE 38138 05192 and comprises a total area of approximately 4.3ha, however, the Survey Area includes all land within the client's ownership comprising 29.1ha (See Figure 1).

2.2.1.2 The site is located in the rural-urban fringe of Barnsley, approximately 3km south-east of the town centre. The site is bound by residential properties to the north, and arable land to the east, with industrial and commercial units to the south and west. Doncaster Road (A635) present approximately 270m north of the site. The wider landscape is dominated by urban development to the north and west while large expanses of open arable land are present to the east and south, including areas of woodland to the south. The River Dearne is located approximately 1.2km north of the site.

# 3 Methods and Timings

## 3.1 Invertebrate Survey Methodology

3.1.1.1 The invertebrate survey utilised a combination of methods, which are detailed below:

- **Sweep netting:** This method provides the main proportion of the survey element and is the most efficient method for cataloguing a site's invertebrate resource. Sweep netting involves the use of a long-handled sweep net being swept over vegetation such as stands of grasses or flowers, or along scrub fringes to gather invertebrate material.

- **Spot sampling**: Spot sampling is employed to collect large, conspicuous invertebrates such as bees and wasps from flowering plants, and to supplement the sweep samples. Spot sampling is often the most effective method for recording species from high-fidelity niches.

- **Beating:** Trees and scrub are beaten to dislodge any invertebrates on the leaves and branches. These are collected from a white sheet, and the contents retained for later examination.

- **Vacuum sampling:** Suction sampling for ground running beetles and bugs was undertaken during all visits apart from the final September visit. Sampling was undertaken on short turf and bare ground areas, and areas with tussocky swards.

**Table 1. Summary of weather conditions and results**

| Date | Surveyor names | Weather conditions |
|---|---|---|
| 23/05/2023 | Andy Jukes | Sunny (2 okta cloud cover), 18°C, Moderate breeze (4 Beaufort wind scale) |
| 09/06/2023 | Andy Jukes | Sunny (2 okta cloud cover), 18°C, Moderate breeze (4 Beaufort wind scale) |
| 28/06/2023 | Andy Jukes | Sunny (2 okta cloud cover), 21°C, Moderate breeze (4 Beaufort wind scale) |
| 18/07/2023 | Andy Jukes | Sunny (3 okta cloud cover), 18°C, Gentle breeze (3 Beaufort wind scale) |
| 01/08/2023 | Andy Jukes | Sunny and Cloudy (6 okta cloud cover), 18°C, Moderate breeze (4 Beaufort wind scale) |
| 07/09/2023 | Andy Jukes | Sunny (2 okta cloud cover), 26°C, Light breeze (2 Beauford wind scale) |

## 3.2 Constraints to the Survey

3.2.1.1 It is not possible to provide accurate population size without undertaking detailed capture, mark and release surveys which require a substantial effort. However, it is possible to provide an indication of the relative population sizes by using peak counts of observed reptiles (if applicable).

3.2.1.2 2023 experienced extremes in weather from a dry and cold spring to a hot and dry June followed by a wet July and August, off the back of 2022, which saw a protracted drought and a series of heatwaves. Little to no rain for many months over the two years coupled with extreme heat events has widely been reported as having a significant impact on invertebrate numbers. This rapid decline of invertebrates results in difficulty recording species diversity, as many species are now operating at very low densities and numbers.

3.2.1.3 Results therefore are on average lower than expected, and species lists are broadly dominated by common species. It is still possible to reflect fairly the value of a site, though, through the analysis and discussion, and by using the experience of the invertebrate ecologist.

# 4 Results

## 4.1 Data Search

4.1.1.1 The data search returned six records of notable invertebrates, comprising Cinnabar (*Tyria jacobaeae*), Lattered Heath moth (*Semiothsia clathrata*), Dingy Skipper (*Erynnis tages*) and Small Heath (*Coenonympha pamphilus*). The closest record concerns a small heath butterfly located approximately 320m south of the site in 2021.

4.1.1.2 All species records returned are listed on Section 41 of the Natural Environment and Rural Communities Act (NERC) 2006. Dingy skipper and small heath butterfly are further listed on the Barnsley LBAP.

### 4.1.2 SATs

4.1.2.1 Table 2 provides a breakdown of the site's invertebrates and their habitat preferences, highlighting any species of significance recorded during the surveys.

4.1.2.2 Tables 3 and 4 have been generated using the Pantheon software package. Pantheon is an analytical tool developed by Natural England and the Centre for Ecology & Hydrology to assist invertebrate nature conservation in England. Site data in the form of species lists can be imported into Pantheon, which then analyses the species within the lists, assigning them to habitats and resources. Pantheon also consigns the most up-to-date national status to the species where it is available.

4.1.2.3 Pantheon is also capable of other outputs such as Specific Assemblage Types (SATs) (see Table 4).

4.1.2.4 A SAT is characterized by stenotopic species (those that can withstand only a narrow range of environmental conditions). SATs are therefore more tightly defined than 'habitats' or 'resources' and sit within a parent habitat or Broad Assemblage Type (BAT). More than one SAT can sit within a parent BAT. The information obtained from Pantheon can then be used to assign quality to sites and their features, assist in management decisions, and facilitate requirement for further surveys, where required and appropriate.

4.1.2.5 The Survey Area is moderately large and has a variety of habitats. However, there is a lack of niche variation across the Survey Area, as reflected in the SAT analysis, although two are noted as being in a favourable condition.

4.1.2.6 The F002 SAT 'rich flower resource' possesses 22 species (where the threshold for favourable status is 15). This is a strong total and highlights the extensive flowery character of the Survey Area. The most prominent locations are the early successional and tall, perennial sward patchworks.

4.1.2.7 The scrub fringe SAT (F001) is also in a favourable status, with 13 species of association (where the threshold is 11). This is thought to be a strong total for the Survey Area, given the limited scrub diversity. It also possesses a single species of conservation value, the leaf beetle Cryptocephalus parvulus (NS).

4.1.2.8 The saproxylic assemblage bark and sapwood decay (A212) holds a species-of-fidelity total of 9 (where the threshold is 19). This resource of invertebrates is not significant but highlights the lack of deadwood features in the Survey Area and an area for possible enhancements as part of any compensation for impacts to the site through a proposed development.

4.1.2.9 Although there are significant areas of 'brownfield' habitat, the corresponding bare sand and chalk SAT (F111) is not well represented in the Survey Area. A total of eight species are recorded (where the threshold is 13), but the Survey Area does possess a species of conservation value, the small heath butterfly (Coenonympha pamphilus).

4.1.2.10 There are other SATs noted by the analysis, but they are represented by only one or two species of fidelity and not thought to be intrinsic to the assessment.

4.1.2.11 The majority of the Survey Area comprised hedgerows, standing water and ponds, woodland, and associated deadwood habitats, which could provide suitable invertebrate habitat.

## 4.2 Species

4.2.1.1 The survey of the Survey Area recorded 268 species and nine species identified by Pantheon as being of value, five of which are more common now than their status suggests, so in time, this number would be revised downwards as further status reviews are completed. A full species list is shown in Appendix 2.

**Table 2. Species of importance**

| Scientific Name | Vernacular Name | National/local status | Habitat Preferences and Species Notes |
|---|---|---|---|
| *Agelastica alni* | Alder leaf beetle | Data Deficient; Nationally Rare* | Feeds on alders (Alnus spp.). Now very common throughout England and no longer deserving of a nationally significant status. |
| *Ceraleptus lividus* | A true bug | Nationally Scarce | Associated with calcareous grasslands and open short swards with trefoils and clovers (Fabaceae). |
| *Coenonympha pamphlius* | Small heath butterfly | NERC Act Section 41; Near Threatened | Open swards with fine-leaved grasses. |
| *Cryptocephalus parvulus* | A leaf beetle | Nationally Scarce | Feeds on birch (Betula spp.) along scrub fringes. |
| *Hylaeus signatus* | A yellow-faced bee | Notable b* | Feeds on mignonettes. Strongly associated with brownfield sites and may be more common than status suggests. |
| *Nomada fucata* | A nomad bee | Notable a* | Parasite on the mining bee Andrena flavipes. It is now much more common than status suggests. |
| *Polydrusus formosus* | A weevil | Notable b* | A scrub and woodland edge species. Now much more common than its status suggests and no longer deserving of a nationally significant status. |
| *Rhinocyllus conicus* | A weevil | Notable b* | Feeds on vetches (Vicia spp.) on open short swards. Now more common than its status suggests. |

| Scientific Name | Vernacular Name | National/local status | Habitat Preferences and Species Notes |
|---|---|---|---|
| *Saldula pallipes* | A ground bug | Nationally Scarce | Muddy drawdown margins to open water bodies. |

4.2.1.2 Owing to the challenging weather conditions of 2023, the list of species is slightly shorter than expected, but there is still a strong cross-section of species that are reflective of the habitats within the Survey Area. The important species on the lists are species associated with flowery sites and also species synonymous with scrub fringe interfaces with open flowery habitats.

4.2.1.3 The majority of the scarce species are associated with the brownfield-type habitats in the Survey Area, whether open short swards or flowery habitats. The true bug *Ceraleptus lividus* is an interesting species, as it is typically associated with calcareous grasslands and short swards with plentiful trefoils and/or clovers.

4.2.1.4 Although not a species of national significance, the large mining bee *Andrena labialis* was also recorded in the Survey Area. It also requires strong patches of trefoils and clovers. It is a species that is predominantly southern in its distribution but is expanding northwards, and this site may be at its northern limits of its current range. It has a very strong population in the Survey Area, though contained solely in the northern quarry 'bowl'.

4.2.1.5 The leaf beetle Cryptocephalus parvulus (NS) is a species that feeds on birch (Betula spp.). It prefers the interface of birch with open habitats and was again recorded in the northern quarry 'bowl'; however, this feature juxtaposition is present in other areas of the Survey Area, so it may also be more widespread.

## 4.3 Site Assessment Summary

4.3.1.1 The survey recorded 268 species from the target groups, including nine species of importance. This constitutes 3.3% of the total species recorded.

4.3.1.2 The overall number of species recorded is slightly lower than expected but is still a strong list. The lists are dominated by common and local species, with only 3.3% of species having a nationally significant status. There is thought to be a strong list of moderate-fidelity species to brownfields and flowery sward sites.

4.3.1.3 The Survey Area has a range of habitat types from secondary and planted woodland to early successional mosaics and tall, flowery swards. As the Survey Area is large with significant areas of each habitat, the number of species for each broad biotope is quite strong, but the lack of niche variation is a current inhibitor to a greater diversity of species, including a richer assemblage of scarce and high-fidelity species.

4.3.1.4 Despite this, the Survey Area is significant, as it possesses species that are indicative of post-industrial land and also sites with strong flowery swards. This flowery element is thought to be quite important. These two habitats are not commonplace in the countryside and seldom in close proximity to one another, the mosaic often restricted to urban areas/landscapes, and it is the juxtaposition of the two that enables many of the species present within the Survey Area to be at strong population levels. One such example is Andrena labiata, a species that nests in bare ground but forages from trefoil-rich grasslands.

4.3.1.5 The wetland element is not expressed significantly in the analysis, but its presence is important. It includes a range of wetland flies and bugs, including Saldula pallipes (NS). The

importance of the large pond at the north of the Survey Area is that, besides its intrinsic value for wetland invertebrates, during periods of high temperatures and heatwaves, a permanent water supply is essential to even invertebrates of typically dry and parched habitats such as brownfields. Therefore, complex and robust sites such as this, with a wide range of features, even those that have not been considered intrinsic to some species previously, are becoming more valuable as the availability of water as rain or dew becomes more unreliable and permanent water sources become a more important site attribute.

4.3.1.6 Owing to the comparatively strong list of species, the Survey Area and varied site features are considered to be of some value (see Site evaluation section), and as such, a number of recommendations are put forward in the Recommendations section to offset any impacts from a proposed development.

4.3.1.7 The key with any invertebrate compensation is to create mosaics that include interfaces and strong juxtapositions of habitats and features, as it is these that generate the opportunities to species indicative of brownfield sites, including many of those of value at the site.

# 5 Evaluation and Enhancement

## 5.1 Summary

5.1.1.1 The Survey Area comprises or is thought to comprise (see Limitations section), a moderately high invertebrate fauna but only includes nine species with a nationally significant status, although five are no longer considered scarce or threatened. The valuation of the Survey Area takes into consideration the range of species recorded, including the scarce species, the overall assemblages, and the importance of the habitats to the species. It also considers the context of the year's weather, the site, and/or its species in relation to the local area and further afield. From considering the above summary information and data collected from the surveys, it is suggested that any impact on the site's key features and species should be considered to be of District (low) importance.

5.1.1.2 The Survey Area is considered to be of District (low) importance and not one of a higher status, owing to the site only possessing four realistically nationally significant species, and the site does currently lack significant variation to support many more scarce species. The Survey Area though is large and has significant areas of habitat including open mosaics and flowery grassland. These support strong populations of local species and some with a nationally significant status. It is therefore not thought appropriate for the site to be considered of a lower valuation.

5.1.1.3 The scrub and tall sward habitat is thought to be the area with the highest invertebrate diversity, with 110 species of invertebrate being recorded within this habitat category.

5.1.1.4 The proposed works are to be restricted to the planning application boundary, which is a much smaller area than that of the Survey Area. To that end, impacts on the invertebrate assemblage recorded within the Survey Area, is thought to be relatively minor.

5.1.1.5 The proposed works will require the clearance of relatively small areas of woodland and scrub, given the context of the Survey Area. As detailed previously, the areas of scrub habitat are thought to be the habitats with highest invertebrate diversity. As such, it is recommended that post development designs for the scheme include compensatory planting, detailed below.

## 5.2 Enhancements

5.2.1.1 All invertebrate-related mitigation should be undertaken on **low-fertility soils.**

5.2.1.2 As the Survey Area and its key species are associated with a range of features, a complex mosaic of features is required to support the invertebrates that currently use the site.

5.2.1.3 The success of any mitigation for loss of part or all of the site's key features will be dependent on incorporating key features in juxtaposition with one another and creating features that are **abundant**, **extensive**, and **optimal**.

Flowering swards

5.2.1.4 As the Survey Area is noted for its rich flower resource, particularly the Fabaceae element, it will be important to provide as rich a flowering resource as possible for the site's invertebrates. Flowering areas should be sown/planted with an appropriate mix of flowering

plants. This mix should benefit the pollen- and nectar-foraging invertebrates, and therefore include the following:

- common bird's-foot trefoil (*Lotus corniculatus*);
- common knapweed (*Centaurea nigra*);
- bush vetch (*Vicia cracca*);
- tufted vetch (*Vicia sepium*);
- hawkbits (*Leontodon* spp.);
- hawkweeds (*Hieracium* spp.);
- labiates (Lamiaceae);
- ragwort (*Jacobaea vulgaris*);
- meadow vetchling (*Lathyrus pratensis*);
- other trefoils (Fabaceae);
- other vetches (*Vicia* spp.);
- viper's bugloss (*Echium vulgare*);
- common fleabane (*Pulicaria dysentarica*);
- ox-eye daisy (*Leucanthemum vulgare*);
- yellow rattle (*Rhinanthus minor*);
- red clover (*Trifolium pratense*); and
- woundworts (*Stachys* spp.).

5.2.1.5 The flowering swards should have a very high density of flowers. Most standard mixes do not have a high enough proportion of flowering plants that are suitable for invertebrate mitigation, so a bespoke mix or additional ordering of supplementary flower seed or plugs is advised. On-site resources can also be used.

5.2.1.6 To complement the flowery swards, creating patches of open bare ground adjacent to them would be of benefit for the short sward and bare ground species.

### Open, patchy bare ground

5.2.1.7 The presence of an open, flowery sward with patches of bare ground is an important feature in the Survey Area.

5.2.1.8 To be successful, the mosaic should be exposed to full sun for much of the day, including the key period between 10:00 and 16:00, and be created on nutrient-poor subsoils to promote a patchy sward dominated by flowering plants. Some of these substrates should be gravelly, made from partly crushed builders' rubble, chalk, or limestone ballast. A mixture of all three may be beneficial, as it will provide nuance to the composition of the substrate and resulting flora composition. Other areas can comprise compacted, fine sandy material for ground-nesting bees and wasps.

5.2.1.9 Bare ground should comprise approximately 30% of the overall habitat mosaic.

5.2.1.10 A mosaic of fine-leaved grasses and a range of flowering plants are required to fulfil the requirements of the open flowery mosaics. It is likely that a 'one stop' commercially sourced seed mixture may not be suitable, but a bespoke mix will be required.

5.2.1.11 The following plant species should be included as part of the short turf sward:

- common bird's-foot trefoil (*Lotus corniculatus*);
- hawkbits (*Leontodon* spp.);
- other low-growing yellow Asteraceae;
- other trefoils (Fabaceae);
- other vetches (*Vicia* spp.); and
- red clover (*Trifolium pratense*).

5.2.1.12 Fine-leaved grasses as part of the mosaic should include the following native grass families to benefit small heath butterflies:

- Fescues (*Festuca* species); and
- Bents (*Agrostis* species)

### Scrub fringe

5.2.1.13 Scrub is an important interface with open flowery habitats and short turf/bare ground.

5.2.1.14 It is also important for deadwood beetles and flies that utilize its spring blossom as adults.

5.2.1.15 Scrub, or any trees, should not shade out important areas of flowery areas or bare ground/short turf. Where scrub is needed to produce an interface, it should be positioned on the northern side of the mosaic.

5.2.1.16 Where additional scrub planting is required, only use native species. The following species provide a continuity of flowers from early spring to summer:

- apples (*Malus domestica* agg.);
- blackthorn (*Prunus spinosa*);
- cherry plum (*Prunus cerasifera*);
- field maple (*Acer campestre*);
- hawthorn (*Crataegus monogyna*);
- plums (*Prunus domestica* agg.);
- rowan (*Sorbus aucuparia*); and
- willows (*Salix* spp.).

### Deadwood

**5.2.1.17** It is recommended that the woodlands be retained. Where any areas cannot be retained, rework the tree trunks on site as deadwood features. They should be retained in as large a volume as possible (i.e. do not section them up into short 'logs').

5.2.1.18 Tree trunks can be placed in semi-shade and full sun to benefit the widest range of invertebrates. The majority should be simply dragged to the edge of a woodland to keep them as intact and whole as possible. Some can be inserted into the ground to replicate standing deadwood.

### Wetlands

5.2.1.19 Ponds should form part of the overall mosaic of habitats being retained or created. They should be in a cluster and range in size and profile to provide a wide range of opportunities and drawdown zone profiles.

5.2.1.20 Broadly, large ponds with significant drawdown zones are of greatest benefit. Low-lying wet areas that develop into marshy grassland around the ponds will be of added value.

# 6 References


Anon. (2008) Acalypterate keys. Unpublished test keys. Dipterists Forum.

Ball, S. (2005) *Hoverfly Recording Scheme*. Available at: www.hoverfly.org.uk

d'Annis Fonseca, E.C.M. (1978) *Diptera Orthorrhapha Brachyycera – Dolichopodidae*. Royal Entomological Society of London, London.

Drake, C.M. *et al*. (2007) *NERR005. Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation*. Natural England, Peterborough.

Falk, S. (2015) *Field Guide to the Bees of Great Britain and Ireland*. British Wildlife Publishing, Totnes.

Hubble, D.S. (2014) *A Review of the Scarce and Threatened Beetles of Great Britain: the Leaf Beetles and Their Allies. Species Status No. 19*. Natural England Commissioning Reports, Number 161.

Lott, D. *et al*. (2007) *ISIS. Invertebrate Species-Habitat Information System, 2010 Build*. Natural England, Peterborough.

Richards, O.W. (1980) *Scolioidea, Vespoidea and Sphecoidea: Hymenoptera, Aculeata*. Royal Entomological Society, London.

Shirt, D.B. (1987) *British Red Data Books: 2. Insects*. Nature Conservancy Council, Peterborough.

Stubbs, A.E. (2002) *British Hoverflies*. British Entomological and Natural History Society, Reading.

Stubbs, A.E. and Drake, M. (2001) *British Soldierflies and Their Allies*. British Entomological and Natural History Society, London.

Webb, J., Heaver, D., Lott, D., Dean, H.J., van Breda, J., Curson, J., Harvey, M.C., Gurney, M., Roy, D.B., van Breda, A., Drake, M., Alexander, K.N.A. and Foster, G. (2017). *Pantheon – Database Version 3.7.6* [online]. Available at: http://www.brc.ac.uk.

# Appendix 1 – Relevant Legislation

### The Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 is the primary legislation for species protection in the UK. Key provisions relevant to invertebrates include:

- Schedule 5: Lists species that receive protection from killing, injury, and disturbance.
- Protection of habitats: Prevents destruction of places used for shelter or breeding by protected invertebrates.
- Review and updates: Species can be added or removed based on conservation status.

Notable invertebrates listed under Schedule 5 include the Fisher's Estuarine Moth (*Gortyna borelii lunata*), Southern Damselfly (*Coenagrion mercuriale*), and the Large Blue Butterfly (*Phengaris arion*).

### The Conservation of Habitats and Species Regulations 2017 (as amended) (Habitats Regulations)

This legislation transposes the EU Habitats Directive into UK law and provides strong protection for species listed in:

- Annex II (species requiring designation of Special Areas of Conservation)
- Annex IV (species in need of strict protection)

Protected invertebrates under this regulation include the White-clawed Crayfish (*Austropotamobius pallipes*) and the Large Blue Butterfly (*Phengaris arion*).

### The Natural Environment and Rural Communities (NERC) Act 2006

Section 41 of this Act requires public bodies to consider biodiversity conservation when performing their functions. It lists priority invertebrate species for conservation, such as:

- Noble Chafer (*Gnorimus nobilis*)
- Stag Beetle (*Lucanus cervus*)
- Marsh Fritillary (*Euphydryas aurinia*)

## Appendix 2 – Full SAT Tables

**Resource-usage table (taken from Webb et al., 2017)**

| Broad Biotope | Habitat | No. of species | No. of species with conservation status (excluding research-only moths) | Species with conservation status (excluding research-only moths) |
|---|---|---|---|---|
| *Open Habitats* | *tall sward & scrub* | *110* | *1* | *Cryptocephalus parvulus (NS)* |
| *Open Habitats* | *short sward & bare ground* | *54* | *5* | *Rhinocyllus conicus (Nb*); Ceraleptus lividus (NS); Nomada fucata (Na*); Hylaeus signatus (Nb*); Coenonympha pamphilus (S41)* |
| *Tree-associated* | *arboreal* | *27* | *3* | *Agelastica alni (DD; NR*); Cryptocephalus parvulus (NS); Polydrusus formosus (Na*)* |
| *Tree-associated* | *shaded woodland floor* | *20* | – | – |
| *Wetland* | *marshland* | *13* | *1* | *Saldula pallipes (NS)* |
| *Tree-associated* | *decaying wood* | *12* | – | – |
| *Wetland* | *acid & sedge peats* | *11* | – | – |
| *Wetland* | *running water* | *5* | – | – |
| *Wetland* | *wet woodland* | *3* | – | – |
| *Tree-associated* | *wet woodland* | *3* | – | – |
| *Coastal* | *saltmarsh* | *1* | – | – |

**Accepted as being more common than this status suggests; likely to be downgraded.*

SAT table (taken from Webb *et al.*, 2017)

| Broad biotope | SAT | SAT code | No. of species | No. of species with conservation status (excluding research-only moths) | Conservation status | Reported condition* |
|---|---|---|---|---|---|---|
| open habitats | rich flower resource | F002 | 22 | 2 | *Nomada fucata* (Na*); *Hylaeus signatus* (Nb*) | Favourable (22 species, 15 required) |
| open habitats | scrub edge | F001 | 13 | 1 | *Cryptocephalus parvulus* (NS) | Favourable (13 species, 11 required) |
| tree-associated | bark & sapwood decay | A212 | 9 | – | – | Unfavourable (9 species, 19 required) |
| open habitats | open short sward | F112 | 8 | 2 | *Coenonympha pamphilus* (S41); *Rhinocyllus conicus* (Nb*) | Unfavourable (8 species, 13 required) |
| open habitats | bare sand & chalk | F111 | 3 | – | – | Unfavourable (3 species, 19 required) |
| tree-associated | heartwood decay | A211 | 1 | – | – | Unfavourable (1 species, 6 required) |
| open habitats | scrub-heath & moorland | F003 | 1 | – | – | Unfavourable (1 species, 9 required) |

*Accepted as being more common than this status suggests; likely to be downgraded.

## Appendix 3 - Full species data

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Adalia bipunctata* | Coccinellidae | Coleoptera | |
| *Adonia variegata* | | | |
| *Aelia acuminata* | Pentatomidae | Hemiptera | |
| *Agelastica alni* | Chrysomelidae | Coleoptera | Data Deficient; Nationally Rare* |
| *Aglais io* | Nymphalidae | Lepidoptera | |
| *Aglais urticae* | Nymphalidae | Lepidoptera | |
| *Agriotes obscurus* | Elateridae | Coleoptera | |
| *Altica palustris* | Chrysomelidae | Coleoptera | |
| *Amara familiaris* | Carabidae | Coleoptera | |
| *Amara plebeja* | Carabidae | Coleoptera | |
| *Amara tibialis* | Carabidae | Coleoptera | |
| *Amblytylus nasutus* | Miridae | Hemiptera | |
| *Ancistrocerus nigricornis* | Vespidae | Hymenoptera | |
| *Andrena bicolor* | Andrenidae | Hymenoptera | |
| *Andrena flavipes* | Andrenidae | Hymenoptera | |
| *Andrena labialis* | Andrenidae | Hymenoptera | |
| *Andrena minutula* | Andrenidae | Hymenoptera | |
| *Andrena nitida* | Andrenidae | Hymenoptera | |
| *Andrena scotica* | Andrenidae | Hymenoptera | |
| *Andrena scotica* | | | |
| *Anomoia purmunda* | Tephritidae | Diptera | |
| *Anoplius nigerrimus* | Pompilidae | Hymenoptera | |
| *Anthocharis cardamines* | Pieridae | Lepidoptera | |
| *Anthocoris gallarum-ulmi* | Anthocoridae | Hemiptera | |
| *Anthocoris nemoralis* | Anthocoridae | Hemiptera | |
| *Anthocoris nemorum* | Anthocoridae | Hemiptera | |
| *Anthonomus rubi* | Curculionidae | Coleoptera | |
| *Aphantopus hyperantus* | Nymphalidae | Lepidoptera | |
| *Apion frumentarium* | Apionidae | Coleoptera | |
| *Argyra leucocephala* | Dolichopodidae | Diptera | |
| *Athous bicolor* | Elateridae | Coleoptera | |
| *Athous haemorrhoidalis* | Elateridae | Coleoptera | |
| *Austrolimnophila ochracea* | Limoniidae | Diptera | |
| *Autographa gamma* | Noctuidae | Lepidoptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Bembidion articulatum* | Carabidae | Coleoptera | |
| *Bembidion lunulatum* | Carabidae | Coleoptera | |
| *Bembidion obtusum* | Carabidae | Coleoptera | |
| *Bembidion properans* | Carabidae | Coleoptera | |
| *Beris clavipes* | Stratiomyidae | Diptera | |
| *Berytinus (Berytinus) minor* | Berytidae | Hemiptera | |
| *Berytinus (Berytinus) montivagus* | Berytidae | Hemiptera | |
| *Bombus (Thoracobombus) pascuorum* | | | |
| *Bombus hypnorum* | Apidae | Hymenoptera | |
| *Bombus lapidarius* | Apidae | Hymenoptera | |
| *Bombus pratorum* | Apidae | Hymenoptera | |
| *Bombus terrestris* | Apidae | Hymenoptera | |
| *Bruchus rufimanus* | Chrysomelidae | Coleoptera | |
| *Calliopum aeneum* | Lauxaniidae | Diptera | |
| *Calvia quattuordecimguttata* | Coccinellidae | Coleoptera | |
| *Cantharis decipiens* | Cantharidae | Coleoptera | |
| *Cantharis flavilabris (=nigra auctt.)* black scutellum | Cantharidae | Coleoptera | |
| *Cantharis lateralis* | Cantharidae | Coleoptera | |
| *Cantharis rustica* | Cantharidae | Coleoptera | |
| *Capsus ater* | Miridae | Hemiptera | |
| *Cassida rubiginosa* | Chrysomelidae | Coleoptera | |
| *Celastrina argiolus* | Lycaenidae | Lepidoptera | |
| *Ceraleptus lividus* | Coreidae | Hemiptera | Nationally Scarce |
| *Cerceris rybyensis* | Crabronidae | Hymenoptera | |
| *Chaetostomella cylindrica* | Tephritidae | Diptera | |
| *Chamaepsila rosae preocc.* | Psilidae | Diptera | |
| *Cheilosia bergenstammi* | Syrphidae | Diptera | |
| *Cheilosia vernalis* | Syrphidae | Diptera | |
| *Chloromyia formosa* | Stratiomyidae | Diptera | |
| *Chorisops tibialis* | Stratiomyidae | Diptera | |
| *Chorthippus brunneus* | Acrididae | Orthoptera | |
| *Chrysolina hyperici* | Chrysomelidae | Coleoptera | |
| *Chrysopilus cristatus* | Rhagionidae | Diptera | |
| *Chrysops relictus* | Tabanidae | Diptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Chrysotoxum bicinctum* | Syrphidae | Diptera | |
| *Chrysotoxum festivum* | Syrphidae | Diptera | |
| *Closterotomus norwegicus* | Miridae | Hemiptera | |
| *Coccinella septempunctata* | Coccinellidae | Coleoptera | |
| *Coenonympha pamphilus* | Nymphalidae | Lepidoptera | Near Threatened; Section 41 Priority Species |
| *Colletes daviesanus* | Colletidae | Hymenoptera | |
| *Conocephalus fuscus* | Conocephalidae | Orthoptera | |
| *Contacyphon laevipennis* | Scirtidae | Coleoptera | |
| *Coreus marginatus* | Coreidae | Hemiptera | |
| *Corizus hyoscyami* | Rhopalidae | Hemiptera | |
| *Crepidodera aurata* | Chrysomelidae | Coleoptera | |
| *Crepidodera fulvicornis* | Chrysomelidae | Coleoptera | |
| *Crepidodera plutus* | Chrysomelidae | Coleoptera | |
| *Crossocerus capitosus* | Crabronidae | Hymenoptera | |
| *Crossocerus podagricus* | Crabronidae | Hymenoptera | |
| *Cryptocephalus fulvus* | Chrysomelidae | Coleoptera | |
| *Cryptocephalus parvulus* | Chrysomelidae | Coleoptera | NS |
| *Dasysyrphus albostriatus* | Syrphidae | Diptera | |
| *Deraeocoris (Deraeocoris) ruber* | Miridae | Hemiptera | |
| *Deraeocoris (Knightocapsus) lutescens* | Miridae | Hemiptera | |
| *Dicyphus (Dicyphus) epilobii* | Miridae | Hemiptera | |
| *Dilophus febrilis* | Bibionidae | Diptera | |
| *Dioctria atricapilla* | Asilidae | Diptera | |
| *Dioctria linearis* | Asilidae | Diptera | |
| *Dioctria rufipes* | Asilidae | Diptera | |
| *Dioctria rufipes* | | | |
| *Dolichopus griseipennis* | Dolichopodidae | Diptera | |
| *Dolichopus trivialis* | Dolichopodidae | Diptera | |
| *Dolichopus ungulatus* | Dolichopodidae | Diptera | |
| *Dolichopus wahlbergi* | Dolichopodidae | Diptera | |
| *Dolichovespula sylvestris* | Vespidae | Hymenoptera | |
| *Dolycoris baccarum* | Pentatomidae | Hemiptera | |
| *Dorytomus tortrix* | Curculionidae | Coleoptera | |
| *Elasmostethus interstinctus* | Acanthosomatidae | Hemiptera | |
| *Empis albohirta* | Empididae | Diptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Empis livida* | Empididae | Diptera | |
| *Empis nuntia* | Empididae | Diptera | |
| *Empis stercorea* | Empididae | Diptera | |
| *Empis tessellata* | Empididae | Diptera | |
| *Empis trigramma* | Empididae | Diptera | |
| *Enallagma cyathigerum* | Coenagrionidae | Odonata | |
| *Epistrophe eligans* | Syrphidae | Diptera | |
| *Episyrphus balteatus* | Syrphidae | Diptera | |
| *Eriothrix rufomaculata* | Tachinidae | Diptera | |
| *Eristalis arbustorum* | Syrphidae | Diptera | |
| *Eristalis intricaria* | Syrphidae | Diptera | |
| *Eupeodes luniger* | Syrphidae | Diptera | |
| *Eupeodes luniger* | Syrphidae | Diptera | |
| *Eurygaster testudinaria* | Scutelleridae | Hemiptera | |
| *Exomias pellucidus* | Curculionidae | Coleoptera | |
| *Forficula auricularia* | Forficulidae | Dermaptera | |
| *Galerucella lineola* | Chrysomelidae | Coleoptera | |
| *Galerucella sagittariae* | Chrysomelidae | Coleoptera | |
| *Grammoptera ruficornis* | Cerambycidae | Coleoptera | |
| *Grypocoris (Lophyromiris) stysi* | Miridae | Hemiptera | |
| *Halictus tumulorum* | Halictidae | Hymenoptera | |
| *Heterotoma planicornis* | Miridae | Hemiptera | |
| *Heterotoma planicornis* | Miridae | Hemiptera | |
| *Hilara discoidalis* | Empididae | Diptera | |
| *Himacerus (Anaptus) major* | Nabidae | Hemiptera | |
| *Himacerus (Aptus) mirmicoides* | Nabidae | Hemiptera | |
| *Himacerus (Himacerus) apterus* | Nabidae | Hemiptera | |
| *Hybos culiciformis* | Hybotidae | Diptera | |
| *Hybos femoratus* | Hybotidae | Diptera | |
| *Hylaeus brevicornis* | Colletidae | Hymenoptera | |
| *Hylaeus signatus* | Colletidae | Hymenoptera | Notable b* |
| *Hypera postica* | Curculionidae | Coleoptera | |
| *Kleidocerys resedae* | Lygaeidae | Hemiptera | |
| *Lagria hirta* | Tenebrionidae | Coleoptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Lamproscatella sibilans* | Ephydridae | Diptera | |
| *Lasioglossum calceatum* | Halictidae | Hymenoptera | |
| *Lasioglossum morio* | Halictidae | Hymenoptera | |
| *Lasioglossum villosulum* | Halictidae | Hymenoptera | |
| *Lasius niger* | Formicidae | Hymenoptera | |
| *Leptogaster cylindrica* | Asilidae | Diptera | |
| *Leptopterna dolabrata* | Miridae | Hemiptera | |
| *Limonia nigropunctata* | Limoniidae | Diptera | |
| *Limonius poneli* | Elateridae | Coleoptera | |
| *Lindenius albilabris* | Crabronidae | Hymenoptera | |
| *Lygocoris (Neolygus) viridis* | Miridae | Hemiptera | |
| *Macroglossum stellatarum* | Sphingidae | Lepidoptera | |
| *Malachius bipustulatus* | Malachiidae | Coleoptera | |
| *Malthinus flaveolus* | Cantharidae | Coleoptera | |
| *Maniola jurtina* | Nymphalidae | Lepidoptera | |
| *Mecinus pascuorum* | Curculionidae | Coleoptera | |
| *Mecinus pyraster* | Curculionidae | Coleoptera | |
| *Megachile centuncularis* | Megachilidae | Hymenoptera | |
| *Megaloceroea recticornis* | Miridae | Hemiptera | |
| *Megalonotus chiragra* | Lygaeidae | Hemiptera | |
| *Meiosimyza rorida* | Lauxaniidae | Diptera | |
| *Melanogaster hirtella* | Syrphidae | Diptera | |
| *Melanogaster hirtella* | Syrphidae | Diptera | |
| *Melanostoma mellinum* | Syrphidae | Diptera | |
| *Meligethes aeneus* | Nitidulidae | Coleoptera | |
| *Merodon equestris* | Syrphidae | Diptera | |
| *Microchrysa polita* | Stratiomyidae | Diptera | |
| *Microlestes minutulus* | Carabidae | Coleoptera | |
| *Minettia fasciata* | Lauxaniidae | Diptera | |
| *Minettia fasciata* | Lauxaniidae | Diptera | |
| *Minettia longipennis* | Lauxaniidae | Diptera | |
| *Myrmus miriformis* | Rhopalidae | Hemiptera | |
| *Nedyus quadrimaculatus* | Curculionidae | Coleoptera | |
| *Nemotelus nigrinus* | Stratiomyidae | Diptera | |
| *Nephrotoma appendiculata* | Tipulidae | Diptera | |
| *Nephrotoma flavescens* | Tipulidae | Diptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Nomada fabriciana* | Apidae | Hymenoptera | |
| *Nomada flavoguttata* | Apidae | Hymenoptera | |
| *Nomada fucata* | Apidae | Hymenoptera | Notable a* |
| *Notiophilus substriatus* | Carabidae | Coleoptera | |
| *Notostira elongata* | Miridae | Hemiptera | |
| *Nysius huttoni* | Lygaeidae | Hemiptera | |
| *Ochlodes sylvanus* | Hesperiidae | Lepidoptera | |
| *Ocydromia glabricula* | Hybotidae | Diptera | |
| *Oedemera lurida* | Oedemeridae | Coleoptera | |
| *Oedemera nobilis* | Oedemeridae | Coleoptera | |
| *Olibrus aeneus* | Phalacridae | Coleoptera | |
| *Olibrus liquidus* | Phalacridae | Coleoptera | |
| *Orthonotus rufifrons* | Miridae | Hemiptera | |
| *Osmia leaiana* | Megachilidae | Hymenoptera | |
| *Pachygaster leachii* | Stratiomyidae | Diptera | |
| *Palomena prasina* | Pentatomidae | Hemiptera | |
| *Paragus haemorrhous* | Syrphidae | Diptera | |
| *Pararge aegeria* | Nymphalidae | Lepidoptera | |
| *Parydra aquila* | Ephydridae | Diptera | |
| *Parydra coarctata* | Ephydridae | Diptera | |
| *Pemphredon inornata* | Crabronidae | Hymenoptera | |
| *Pentatoma rufipes* | Pentatomidae | Hemiptera | |
| *Phasia obesa* | Tachinidae | Diptera | |
| *Phasia pusilla* | Tachinidae | Diptera | |
| *Phyllobius maculicornis* | Curculionidae | Coleoptera | |
| *Phyllobius pyri* | Curculionidae | Coleoptera | |
| *Pieris brassicae* | Pieridae | Lepidoptera | |
| *Pieris napi* | Pieridae | Lepidoptera | |
| *Pieris rapae* | Pieridae | Lepidoptera | |
| *Pipizella viduata* | Syrphidae | Diptera | |
| *Plagiodera versicolora* | Chrysomelidae | Coleoptera | |
| *Plagiognathus (Plagiognathus) arbustorum* | Miridae | Hemiptera | |
| *Plagiognathus (Plagiognathus) chrysanthemi* | Miridae | Hemiptera | |
| *Platycheirus clypeatus* | Syrphidae | Diptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Poecilobothrus nobilitatus* | Dolichopodidae | Diptera | |
| *Polydrusus formosus* | Curculionidae | Coleoptera | Notable a* |
| *Polyommatus icarus* | Lycaenidae | Lepidoptera | |
| *Propylea quattuordecimpunctata* | Coccinellidae | Coleoptera | |
| *Psallus (Hylopsallus) perrisi* | Miridae | Hemiptera | |
| *Psallus (Mesopsallus) ambiguus* | Miridae | Hemiptera | |
| *Pseudochorthippus parallelus* | Acrididae | Orthoptera | |
| *Ptilinus pectinicornis* | Ptinidae | Coleoptera | |
| *Pyronia tithonus* | Nymphalidae | Lepidoptera | |
| *Rhagonycha fulva* | Cantharidae | Coleoptera | |
| *Rhagonycha nigriventris* | Cantharidae | Coleoptera | |
| *Rhinocyllus conicus* | Curculionidae | Coleoptera | Notable b* |
| *Rhopalus (Rhopalus) subrufus* | Rhopalidae | Hemiptera | |
| *Rhyzobius litura* | Coccinellidae | Coleoptera | |
| *Roeseliana roeselii* | Tettigoniidae | Orthoptera | |
| *Rutpela maculata* | Cerambycidae | Coleoptera | |
| *Saldula pallipes* | Saldidae | Hemiptera | Nationally Scarce |
| *Scaeva pyrastri* | Syrphidae | Diptera | |
| *Scellus notatus* | Dolichopodidae | Diptera | |
| *Scymnus frontalis* | Coccinellidae | Coleoptera | |
| *Scymnus frontalis sensu lato* | Coccinellidae | Coleoptera | |
| *Scymnus haemorrhoidalis* | Coccinellidae | Coleoptera | |
| *Seioptera vibrans* | Ulidiidae | Diptera | |
| *Sicus ferrugineus* | Conopidae | Diptera | |
| *Sitona lineatus* | Curculionidae | Coleoptera | |
| *Sphaerophoria interrupta* | Syrphidae | Diptera | |
| *Sphaerophoria scripta* | Syrphidae | Diptera | |
| *Sphecodes geoffrellus* | Halictidae | Hymenoptera | |
| *Stenodema (Stenodema) laevigata* | Miridae | Hemiptera | |
| *Stenopterapion meliloti* | Apionidae | Coleoptera | |
| *Stenus clavicornis* | Staphylinidae | Coleoptera | |
| *Stenus similis* | Staphylinidae | Coleoptera | |

| Scientific name | Family | Order | National status |
|---|---|---|---|
| *Stictopleurus punctatonervosus* | Rhopalidae | Hemiptera | |
| *Syntormon denticulatum* | Dolichopodidae | Diptera | |
| *Syritta pipiens* | Syrphidae | Diptera | |
| *Syrphus ribesii* | Syrphidae | Diptera | |
| *Syrphus torvus* | Syrphidae | Diptera | |
| *Syrphus vitripennis* | Syrphidae | Diptera | |
| *Tachyporus dispar* | Staphylinidae | Coleoptera | |
| *Tachyporus hypnorum* | Staphylinidae | Coleoptera | |
| *Tasgius globulifer* | Staphylinidae | Coleoptera | |
| *Tatianaerhynchites aequatus* | Rhynchitidae | Coleoptera | |
| *Tephritis formosa* | Tephritidae | Diptera | |
| *Tephritis ruralis* | Tephritidae | Diptera | |
| *Tephritis vespertina* | Tephritidae | Diptera | |
| *Terellia ruficauda* | Tephritidae | Diptera | |
| *Terellia serratulae* | Tephritidae | Diptera | |
| *Thymelicus sylvestris* | Hesperiidae | Lepidoptera | |
| *Tipula oleracea* | Tipulidae | Diptera | |
| *Tipula vernalis* | Tipulidae | Diptera | |
| *Tricholauxania praeusta* | Lauxaniidae | Diptera | |
| *Tychius meliloti* | Curculionidae | Coleoptera | |
| *Tyria jacobaeae* | Erebidae | Lepidoptera | |
| *Urophora cardui* | Tephritidae | Diptera | |
| *Urophora stylata* | Tephritidae | Diptera | |
| *Vanessa atalanta* | Nymphalidae | Lepidoptera | |
| *Volucella bombylans* | Syrphidae | Diptera | |
| *Volucella inanis* | Syrphidae | Diptera | |
| *Volucella pellucens* | Syrphidae | Diptera | |
| *Zygaena lonicerae* | Zygaenidae | Lepidoptera | |

**Widely accepted as being much more common than this status suggests; likely to be downgraded.*