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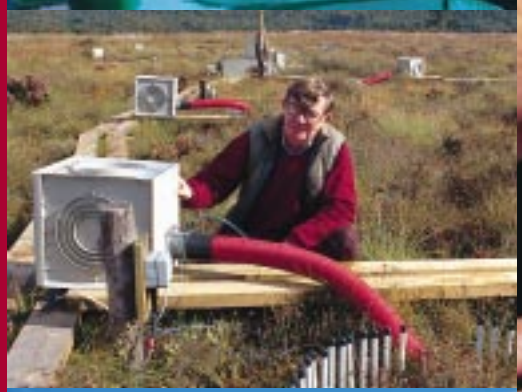

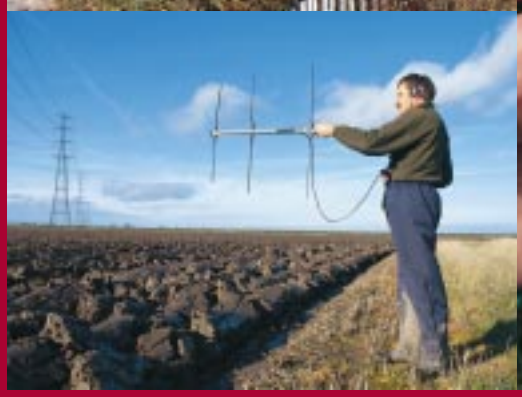

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Review of the diet and micro-habitat values for wildlife and the agronomic potential of selected grassland plant species

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Summary

Grasslands cover 5.6 million ha of agricultural land in the UK. The intensification of management practices over the last 50 years has increased productivity, but has had significant impacts on grassland biodiversity. Much work has focussed on the restoration of the remaining species-rich areas of grassland. However, in order to meet the requirements of wide-ranging farmland species, consideration needs to be given to methods of enhancing the diversity of species-poor grasslands dominated by ryegrass.

The aim of the project was to review two important aspects of any attempts to increase wildlife on improved, relatively fertile grasslands. These issues are firstly, the value to invertebrates, birds and other vertebrates of particular grassland plants that could be introduced into such swards or maintained in them, and secondly the agronomic potential of such species, so that the fit of these swards into viable farming or equine business can begin to be assessed.

A list of 56 plant species considered to be of wildlife value was selected, primarily comprising species that either occur in grasslands on soils of moderate to high fertility, or which studies have shown have the potential to establish and persist in such grasslands undergoing management for the enhancement of botanical diversity. The selected plant species consisted of 14 grass species, 11 legumes and 31 other forb species.

Information was collected on the associations between the selected plant species and insects, including herbivores and pollinators. Data was also gathered on the value of the plant species to bird diets, both directly through the provision of foliage and seeds, and indirectly through the supply of invertebrate food.

Information was also gathered from agronomic literature on the feed value of the plant species, any impacts on animal health and their productivity in grazed and mown grassland management systems. In addition, data on the success of establishment of the species in grassland restoration experiments was collected.

Plant species supporting specialist associations with greater than 70 insect species were found among the grass species, the legumes and the other forb species. Most insects forming associations were classified as general shoot feeders, feeding on a range of above-ground plant parts. However, significant numbers of species dependent on the presence of stems or reproductive structures were found for the legumes (Fabaceae) and composite forbs (Asteraceae). *Cirsium* species, including pernicious grassland weed species included in the study supported some of the highest numbers of associated invertebrates.

The review of the importance of the plant species for provision of direct (seeds, foliage) diet items for birds showed that large-seeded forb species, ie vetches (*Vicia* spp.) and smaller-seeded species particularly docks (*Rumex* spp.), plantain (*Plantago* spp.) and buttercups (*Ranunculus* spp.) and the foliage of clover (*Trifolium* spp.) were important diet items for farmland bird species. The plant species with the highest number of specialist insect associations (*Dactylis glomerata*, *Festuca ovina* and *Lotus corninculatus*) provided one possible measure of the diversity of insect taxa important in bird diets, although different plant species had higher numbers of general insect associations (*Taraxacum officinale* and *Rumex* spp.).

The review has highlighted a group of grassland species that have diet and microhabitat value for insects and birds and have useful agronomic characteristics in terms of productivity and feed value. This group includes grasses (*Dactylis glomerata* and *Festuca* spp.), and legumes (*Lotus corniculatus*, *Trifolium pratense, T. repens* and *Vicia sativa*). Some of these have been established successfully in experiments on the restoration of grassland diversity while others are agriculturally-sown species. *Lotus corniculatus* and *Festuca ovina* are probably the most difficult to establish in more fertile swards. Other forbs, such as *Achillea millefolium, Centaurea nigra,* and *Plantago lanceolata* are of high value for wildlife and are reasonably easy to establish but have lower values for livestock production. The *Cirsium* species have high value for wildlife but along with other pernicious grassland weeds are actual management problems rather than of being of benefit for livestock production. *Rumex acetosa* poses less of a weed problem than *R. crispus* and *R. obtusifolius,* if not present in quantity, and is able to grow in fertile grasslands.

For a significant element of the diet and microhabitat value of the identified grasses, legumes and other forbs to be realised, it is necessary to allow them to develop stems, flowers and seed heads. Thus, rotational grazing and/or infrequent mowing are the optimum management regimes. However, allowing the development of structural heterogeneity in the sward canopy can compromise the agronomic value of the sward. Research is needed on the relative balance between potential biodiversity gains and agronomic implications of relaxing grazing, mowing and fertilizer inputs in areas of improved grassland.

Given the management constraints on the provision of beneficial diet items and microhabitats, along with the high biodiversity value of some of the grassland weed species included in the study, it may be more beneficial to focus management aimed at promoting biodiversity on portions of fields, including field margins, for grasslands used for agricultural production. Research is needed to identify the optimal size, density and landscape positioning of such features.

The study identified a large number of insect species for which only limited information on microhabitat requirements is available. Whilst systematically acquiring data on the ecology of insect species may be useful for species of conservation concern, it is clearly impractical for the large number of common or widespread insect species listed in this review.

Research might be better focussed on providing management tools that promote spatial and temporal heterogeneity in grassland swards. Such tools might include modified mowing regimes, use of mixed stocking or particular livestock types (including horses), and the use of farm yard manure. Such heterogeneity is likely to lead to diversity in botanical composition, canopy structure and spatial patterning within fields, thus providing a range of microhabitats for associated species of grassland fauna.

The review pointed to major gaps in the understanding of the value of grassland plant species beyond conventional livestock production, in particular their potential role in improving the sustainability of pastoral systems and value for enhancing the suitability of species-poor grasland for horse grazing. If the area devoted to livestock grazing declines, identifying opportunities for biodiversity enhancement in non-agricultural grasslands is likely to become increasingly important. There is now increasing interest in the secondary dietary attributes of pasture species in terms of their ability to contribute towards animal health and nutrition and to affect the qualities of meat and dairy products from livestock for human nutrition.

There is also a need to identify livestock production systems that can meet the demands imposed by changes in climate. The role of multi-species swards is one promising area. Many forbs and some grasses can utilise lower soil horizons for water, or exploit temporal niches for regeneration, and thereby provide a degree of resilience to drought, or ability to recover from floods, compared to the predominant grassland species which are currently grown. This review has confirmed the high value of legumes for invertebrates and birds. The wider use of grass/legume mixes as forage crops has the potential for multiple benefits, including not only biodiversity benefits but also reduced fertilizer inputs and enhanced soil characteristics. Research is needed on the suitability of novel grass/legume mixes and their potential utility in the face of climate change. The introduction of legumes into established swards is likely to yield similar benefits. In this situation, research is needed on methods to promote the persistence of introduced legume species.

Contents

1 Introduction

1.1 Background

The management and productivity of lowland grassland in Britain has been transformed in the last 50 years largely through greater fertilizer inputs, improved drainage, reseeding with a small number of grass species and the replacement of hay with silage as the principal means of forage conservation (Frame 2000). Technological developments in silage production have enabled the harvesting of forages with a higher water content than hay, which in turn has allowed greater flexibility in the timing and frequency of cutting (Vickery and others 2001) Increased productivity has also allowed higher stocking densities to be supported.

Such changes in management practice have had major impacts on the botanical composition and canopy structure of agricultural grasslands (Jones & Hayes 1999, Chamberlain and others 2000, Vickery and others 2001), creating species poor and structurally uniform swards of low conservation value (Tallowin and others 2005). Declines in populations of higher plants (Yeo and others 1998, Blackstock and others 1999, Jones & Hayes 1999), and farmland birds (Wilson and others 1999, Vickery and others 2001) have been attributed to intensification of grassland management.

Invertebrates are a key functional component of grassland systems. In addition to their own intrinsic conservation value, they contribute to key ecosystem functions such as pollination, decomposition and nutrient cycling, and provide food resources for mammals and farmland birds. Coinciding with changes in grassland management over the last 50 years, invertebrates have shown a parallel decline in abundance and diversity (Duffey and others 1974, Morris 1978, Asher and others 2001).

A wide range of declining farmland birds depend exclusively or partly on grassland habitats (Perkins and others 2000, Vickery and others 2001, Atkinson and others 2002). Intensification of grassland management over the last 50 years has undoubtedly played an important role in the recent declines of farmland birds (Chamberlain and others 2000, Fuller 2000). Reductions in the species diversity and structural complexity of grassland plant communities, along with declines in invertebrate abundance and diversity, have impoverished the nesting and foraging habitat for many bird species.

A number of recent studies have improved our understanding of the relationship between grassland management and food resources for birds (eg Atkinson and others 2005, Buckingham and others 2006). In general, these suggest that species that feed on foliar invertebrates or forb seeds are negatively affected by modern grassland management practices that reduce the structural complexity and species diversity of the sward (Vickery and others 2001, Atkinson and others 2005).

In contrast, birds that feed on soil invertebrates may be tolerant to modern management practices as these practices tend to maintain short swards so increase accessibility of the soil to birds. It is possible that soil compaction as a result of high stocking density and/or mechanical management may reduce the abundance, acitivity or accessibility of invertebrates, although rather little is known about this and bird habitat relationships suggest it may be relatively unimportant in dry grassland. Poor soil penetrability does reduce the foraging success of waders in wet grassland (eg Vickery and others 2001) and also of Yellow Wagtails *Motacilla flava* in arable systems (J. Gilroy, pers. comm.).

Until recently, most research on the conservation of grassland biodiversity has focussed on the restoration and maintenance of species-rich habitats. However, the Biodiversity Action Plan and the farmland birds PSA target relate to wide-ranging species of pastoral landscapes, such as skylark, yellowhammer, bats and bumblebees. Consequently, there is a need to identify management practices that promote faunal biodiversity on the vast area of agriculturally-improved grassland in the UK.

Whilst management options for promoting the faunal diversity of arable landscapes have been well researched, and prescriptions developed for incorporation into agri-environment schemes, few options exist for enhancing the biodiversity of improved grasslands. Within the new Entry Level Environmental Stewardship Scheme, early uptake in pastoral areas has focussed on prescriptions for reduced inputs. However, the biodiversity benefits of such options may take a considerable time to become apparent. Consequently, there is a requirement to identify more interventionist methods for enhancing the diversity of agriculturally-improved grasslands, rather than relying on natural colonisation processes.

1.2 Scope of the report

The aim of the project was to review two important aspects of any attempts to increase wildlife on improved, relatively fertile grassland, identified in the National Vegetation Classification (Rodwell 1992) as *Lolium-Cynosurus* or *Lolium* grasslands (MG6 and MG7). These issues are firstly, the value to invertebrates, birds and other vertebrates of particular grassland plants that could be introduced into such swards or maintained in them, and secondly the agronomic potential of such species, so that the fit of these swards into viable farming or equine business can begin to be assessed.

The objectives of the project were:

(a) To review, collate, summarise and interpret information in the literature and from other primary and secondary sources on the diet value and micro-habitat value of selected grassland plants for invertebrates, birds and other vertebrates.
(b) To assess the agronomic potential of these plant species including how their management for herbage production may need to be tailored to maximise their value for wildlife;
(c) From the information gained in the study, to produce recommendations for further research requirements and, if possible, outline novel management options to trial based on introduction of selected plant species, where necessary, and subsequent management to maintain their value for wildlife.

2 Methods

2.1 Selection of plant species

In order to ensure that the species selected for consideration were relatively common on a range of soil types across the UK, data on the frequency of grassland plants in broad grassland habitats (improved, neutral, calcareous, acid, wet) sampled as part of the Countryside Survey 2000 were used to compile an initial list. The frequency of species in the main plots (X plots) was considered, as these were randomly positioned within each of the CS2000 survey squares (Haines-Young and others 2000). In addition, a number of forb species known to establish well in grassland enhancement schemes, along with some legumes of known agricultural value, were considered.

A preliminary list of candidate species was drawn up, comprising relatively robust species that have the ability to establish and persist in managed grasslands of moderate to high fertility. In addition, a preliminary assessment of the value of each selected species to a number of taxa was carried out by team members, using a subjective scale reflecting the number of specialist associations with insects and value for providing food resources for birds.

Candidate species were grouped into three categories: grasses, leguminous forbs and non-leguminous forbs. Criteria for selecting the final list of species were agreed by the project steering group which comprised plant, insect and bird ecologists and agronomists. The primary criterion was:

- Ability to establish and persist in grasslands of reasonably high fertility, based on data from the National Vegetation Classification (Rodwell 1992), Countryside Survey 2000 (Haines-Young and others 2000) and previous research (Pywell and others 2003)

Secondary criteria were:

- Likely value as a diet item for grassland fauna, based on previous research, expert opinion and the Ecological Flora of the British Isles database (Fitter & Peat 1994).
- Likely agronomic value (productivity, response to grazing/mowing), based on previous research (eg Isselstein 1993, Peeters 2004, Frame 2005) and expert opinion.

Based on these criteria, the project group selected the final list of species. A total of 56 plant species were chosen and are listed in Table 1. The selected list included species typical of a range of edaphic conditions defined by soil moisture and pH. A few species were included that are only rarely found in more fertile grasslands, however they were regarded as worth investigating as borderline species for consideration in species-poor, semi-improved grasslands on low-fertility soils or where particular soil wetness characteristics occur.

Table 1 List of plant species selected for inclusion in the review (nomenclature follows Stace 1997 and Dony, Jury & Perring 1986).

Grasses		**Non leguminous forbs**	
Agrostis capillaris L.	Common bent	*Achillea millefolium* L.	Yarrow
Agrostis stolonifera L.	Creeping bent	*Cardamine pratensis* L.	Cuckooflower
Alopecurus pratensis L.	Meadow foxtail	*Centaurea nigra* L.	Common knapweed
Anthoxanthum odoratum L.	Sweet vernal-grass	*Cerastium fontanum* Baumg.	Common mouse-ear
Cynosurus cristatus L.	Crested Dog's-tail	*Cirsium arvense* (L.) Scop.	Creeping thistle
Dactylis glomerata L.	Cock's-foot	*Cirsium palustre* (L.) Scop.	Marsh thistle
Festuca ovina L.	Sheep's-fescue	*Cirsium vulgare* (Savi) Ten.	Spear thistle
Festuca pratensis Huds.	Meadow fescue	*Filipendula ulmaria* (L.) Maxim	Meadowsweet
Festuca rubra L.	Red fescue	*Galium palustre* L.	Common marsh-bedstraw
Holcus lanatus L.	Yorkshire-fog	*Galium saxatile* L.	Heath bedstraw
Lolium perenne L.	Perennial rye-grass	*Galium verum* L.	Lady's bedstraw
Phleum pratense L.	Timothy	*Hypochaeris radicata* L.	Cat's-ear
Poa pratensis L.	Smooth meadow-grass	*Leontodon autumnalis* L.	Autumn hawkbit
Poa trivialis L.	Rough meadow-grass	*Leontodon hispidus* L.	Rough hawkbit
		Leucanthemum vulgare Lam.	Oxeye daisy
		Plantago lanceolata L.	Ribwort plantain
		Potentilla reptans L.	Creeping cinquefoil
		Primula veris L.	Cowslip
		Prunella vulgaris L.	Selfheal
Legumes		*Ranunculus acris* L.	Meadow buttercup
Lathyrus pratensis L.	Meadow vetchling	*Ranunculus repens* L.	Creeping buttercup
Lotus corniculatus L.	Common Bird's-foot-trefoil	*Rhinanthus minor* L.	Yellow rattle
Lotus pedunculatus Cav.	Greater Bird's-foot-trefoil	*Rumex acetosa* L.	Common sorrel
Medicago lupulina L.	Black medick	*Rumex acetosella* L.	Sheep's sorrel
Medicago sativa L.	Lucerne	*Rumex crispus* L.	Curled dock
Onobrychis viciifolia Scop.	Sainfoin	*Rumex obtusifolius* L.	Broad-leaved dock
Trifolium dubium Sibth.	Lesser trefoil	*Sanguisorba minor* Scop.	Salad burnet
Trifolium pratense L.	Red clover	*Senecio jacobaea* L.	Common ragwort
Trifolium repens L.	White clover	*Taraxacum officinale* agg.	Dandelion
Vicia cracca L.	Tufted vetch	*Urtica dioica* L.	Common nettle
Vicia sativa L.	Common vetch	*Veronica chamaedrys* L.	Germander speedwell

2.2 Ecological characteristics of the selected plant species

Information on the ecological characteristics of the selected plant species was collated. This comprised information on:

- The distribution of the plant species in relation to broad habitat types and edaphic conditions (Haines-Young and others 2000, Hill and others 1999, Rodwell 1992);
- The size, canopy structure, leaf phenology, competitive ability and productivity of the species (Grime, Hodgson & Hunt 1988, Biological Flora of the British Isles);
- The flowering phenology and regeneration strategy of the species (Grime, Hodgson & Hunt 1988, Biological Flora of the British Isles);
- The success of establishment in grassland enhancement schemes and the availability of seed of wild and agricultural seed suppliers (Pywell and others 2003, Walker and others 2005).

2.3 Diet and microhabitat value for invertebrates

The focus of the review was on the diet and microhabitat value of the selected plant species. General associations between invertebrate taxa and particular types of vegetation structure (eg flower stems, tussocks) were not considered as part of this review, unless the literature identified clear association with one of the selected plant species. Information on the species associated with the selected plant species was collected for the following insect taxa: Coleoptera, Diptera, Hemiptera (Auchenorrhyncha, Sternorrhyncha and Heteroptera), Hymenoptera (Aculeata and Symphyta), Lepidoptera and Thysanoptera. Phytophagous taxa comprising largely generalist feeders (eg Orthoptera, Mollusca) were excluded from the study, as were predatory groups (eg Araneae) and detritivores, as the occurrence of associations with particular plant species could not be established.

For each of the selected groups, a range of sources was consulted, including standard monographs and keys and research papers published in scientific journals. The sources are listed in Appendix 1. Associations were recorded in a database if the source material mentioned the plant species or genus in the description of host plants. In addition to taxonomic information on the associated insects (including synonyms), the following data were collected, where available:

- Host specificity, principal host, subsidiary hosts, plant microhabitat
- Geographical distribution, conservation status, preferred habitats
- Phenology, larval and pupal types
- Adults visitation to flowers (Aculeata)

To aid the collation and summarising of the data, information on associations was entered into an Access database. Each record in the database corresponds to an individual source of information for a particular association. Consequently, information about a single insect species may appear in more than one record. In addition, many insect species are associated with more than one host plant.

The plant:insect associations identified were classified according to the degree of specificity. The following categories were used:

- M Monophagous (or monolectic for Aculeata)
- O Oligophagous (or oligolectic for Aculeata), subdivided into:
  - OG Associated with species within a single Genus
  - OT Associated with species within a single Tribe (Fabaceae and Asteraceae only)
  - OF Associated with species within a single Family
  - O Associated with fewer than five plant species in different families
- P Polyphagous (or polylectic for Aculeata)

Oligophagous insect species associated with a small number of plant species were noted using numerical subscripts (eg OG_3 for an insect species associated with three plant species in the same genus; O_2 for insect species associated with two plant species in different families). Polyphagous species were only recorded if at least one of the 56 plant species was listed as a

host in the source document. For the larger plant families, notably the grasses (Poaceae) and composites (Asteraceae), the use of this criteria means that the database underestimates the number of species which are restricted to feeding on a specific plant family (ie classified as OF). Such species were only recorded if one of the selected plant species was specifically listed in the source document. For example, a record stating '*feeds on Festuca rubra and other grass species*' would have been recorded in the database, whereas a record stating '*feeds on a range of grass species*' would not.

The focus of the review was on characterising the diversity of specialist associations with the selected plant species, to provide an estimate of likely biodiversity benefits of the presence of the plant species in the sward. Information on the relationship between the abundance of the host plant and the abundance of its associated insect fauna is extremely rare in the published literature, as is data on the preferences of insect species with more than one associated plant species. However, insect abundance data from a number of grassland enhancement experiments was used to illustrate an approach for quantifying the relationship between the abundance of phytophagous insect species and their host plant species.

2.4 Diet value for birds

This section of the study focussed on the relative benefits to birds of introducing certain key plant species into agricultural grass swards. Management practices that increase the species diversity of the grass sward are also likely to lead to increases in structural complexity and as such they may benefit birds in three ways. First, there may be a direct value of the plant as a food resource, either as seeds or green material. Second, there may be an indirect value of the plant as a food resource through increased abundance of the associated invertebrate fauna. Third, there may be changes in prey accessibility if the presence of the plant results in changes in sward structure. The direct and indirect food resource value of the 56 selected plant species were considered for a suite of farmland birds, encompassing a wide range of functional and ecological groups. Published information on plant and invertebrate components of the diet of farmland birds was consulted, along with information derived from the review of insect:plant associations, to derive a broad ranking of the plants in terms of their potential value to birds in grassland habitats.

2.4.1 Direct value of the selected plant species as food for birds

The value of the 56 plant species as direct food resources for a total of 42 species of farmland birds was evaluated. These included bird species considered in a review by Wilson and others (1999), additional grassland species as defined by Atkinson and others (2002) and any other species present in the farmland bird indicator (Vickery and others 2004) that have been recorded as taking plant material (Table 2). In addition to considering this group as a whole we also considered separately the sub-set of species comprising the Farmland Bird Indicator. This is the group of birds used to define the Public Service Agreement (PSA), adopted by Defra in 2000 (Vickery and others 2004) and are referred to here as PSA species. The direct value of the selected plant species was assessed simply as the number of bird species for which it was present (or important) in the diet either as green material or seeds.

Table 2 Farmland bird species known to include plants in the diet (green material or seeds) considered in the assessment of the direct food value of the 56 selected plant species. These species are defined as farmland birds either in Wilson and others 1999 or Atkinson and others 2002.

Species		Status	Long-term trend[1]	UK listing[2]	Ref/source
Blue tit	*Parus caeruleus*	Resident	Shallow increase	Green	Atkinson
Brambling	*Fringilla montifringilla*	Winter		Green	Wilson
Brent goose	*Branta bernicla*	Winter		Amber	Atkinson
Bullfinch	*Pyrrhula pyrrhula*	Resident	Rapid decline	Red	Wilson
Carrion crow	*Corvus corone*	Resident	Rapid increase	Green	Atkinson
Chaffinch	*Fringilla coelebs*	Resident	Shallow increase	Green	Wilson
Cirl bunting	*Emberiza cirlus*	Resident	Increase after steep decline*	Red	Wilson
Collared dove	*Streptopelia decaocto*	Resident	Rapid increase	Green	Wilson
Corn bunting	*Milaria calandra*	Resident	Rapid decline	Red (P)	Wilson
Curlew	*Numenius arquata*	Resident	Possible decline	Amber	Atkinson
Dunnock	*Prunella modularis*	Resident	Moderate decline	Amber	Wilson
Fieldfare	*Turdus pilaris*	Winter		Amber	Atkinson
Golden plover	*Pluvialis apricaria*	Winter	Possible decline	Green	Wilson
Goldfinch	*Carduelis carduelis*	Resident	No trend	Green (P)	Wilson
Great tit	*Parus major*	Resident	Moderate increase	Green	Atkinson
Greenfinch	*Carduelis chloris*	Resident	Shallow increase	Green (P)	Wilson
Grey partridge	*Perdix perdix*	Resident	Rapid decline	Red (P)	Wilson
House sparrow	*Passer domesticus*	Resident	Rapid decline	Red	Wilson
Jackdaw	*Corvus monedula*	Resident	Moderate increase	Green (P)	Atkinson
Lapwing	*Vanellus vanellus*	Resident	Moderate decline	Amber (P)	Wilson
Linnet	*Acanthis cannabina*	Resident	Rapid decline	Red (P)	Wilson
Magpie	*Pica pica*	Resident	Rapid increase	Green	Atkinson
Meadow pipit	*Anthus pratensis*	Resident	Moderate decline	Amber	Wilson
Mistle thrush	*Turdus viscivorus*	Resident	Moderate decline	Amber	Wilson
Pheasant	*Phasianus colchicus*	Resident	Moderate increase	Stocked sp	Wilson
Quail	*Coturnix coturnix*	Summer	Fluctuating*	Red	Wilson
Red-legged partridge	*Alectoris rufa*	Resident	Moderate decline	Stocked sp	Wilson
Reed bunting	*Emberiza schoeniclus*	Resident	Moderate decline	Red (P)	Wilson
Rook	*Corvus frugilegus*	Resident	Moderate increase	Green (P)	Atkinson
Skylark	*Alauda arvensis*	Resident	Rapid decline	Red (P)	Wilson
Snipe	*Gallinago gallinago*	Resident	Possible decline	Amber	Atkinson
Song thrush	*Turdus philomelos*	Resident	Rapid decline	Red	Wilson
Starling	*Sturnus vulgaris*	Resident	Rapid decline	Red (P)	Wilson
Stock dove	*Columba oenas*	Resident	Rapid increase	Amber (P)	Wilson
Stone curlew	*Burhinus oedicnemus*	Summer	Increase after steep decline*	Red	Wilson
Tree pipit	*Anthus trivialis*	Summer	Rapid decline	Amber	Atkinson
Tree sparrow	*Passer montanus*	Resident	Rapid decline	Red (P)	Wilson
Turtle dove	*Streptopelia turtur*	Summer	Rapid decline	Red (P)	Wilson
Whitethroat	*Sylvia communis*	Summer	Rapid decline	Green (P)	Vickery
Wood pigeon	*Columba palumbus*	Resident	Rapid increase	Green (P)	Wilson
Woodlark	*Lullula arborea*	Summer	Increase	Red	Atkinson
Yellowhammer	*Emberiza citrinella*	Resident	Rapid decline	Red (P)	Wilson

Sources:

1. Long term breeding population trend is taken from http://www.bto.org/birdtrends2004/index.htm
   Blanks signify no trend data available (wintering populations)
2. UK listing from http://www.bto.org/research/pop_trends/state_uk_birds.htm and *RSPB
   P= PSA species (see Vickery and others 2004).

Several sources of published information relating to bird diet were used. First, previous reviews by Buxton and others (1998), Wilson and others (1999 and updated), Boatman (2001) and Holland and others (2006). In many cases the primary literature was also consulted, usually to ascertain whether a particular plant species, rather than family or genera, had been recorded in the diet. The main primary literature was the Handbook of the Birds of Europe, the Middle East and North Africa; The Birds of the Western Palearctic (BWP) (Cramp 1985, 1988, Cramp & Perrins 1994a, b, Cramp & Simmons 1983). Many of the most recent single species studies were reviewed in Holland and others (2006), but experts in farmland bird research at the Central Science Laboratory, Game Conservancy Trust Royal Society for the Protection of Birds and the Universities of Oxford, East Anglia, Newcastle, Reading and Leeds were also consulted to ensure any more recent studies or information in press has been included.

Following the procedure adopted by Wilson and others (1999), a food taxon was considered present in the diet of a bird species if it was recorded in any of the studies reviewed. A food taxon was considered as important either if it comprised a mean of at least 5% of the diet over all quantitative studies reviewed, or if any descriptive study considered it of dietary importance at some point in the year. The inherent biases in this approach are described in detail in Wilson and others (1999). Essentially they arise from the fact that different studies use different methods and have been carried out in different seasons, geographical locations and habitats. There is no simple way to correct for these differences but over a large number of studies they are unlikely to bias the broad patterns in the results.

2.4.2 Indirect value of selected plant species as food

The indirect value of a plant species will depend on its value as a host plant for insects known to be important in the diet of farmland birds. To quantify this indirect value we used results presented in previous sections documenting the number of mono- and oligo-specific insect species associations identified for each plant species. Using data presented in Wilson and others (1999) and Holland and others (2006) insects that are not known to be important in the diet of farmland birds were excluded from these data. This resulted in a figure for the number of insects known to be important prey for birds associated with each of the 56 plant species.

It is possible to use these data to derive similar scores as those used for the direct value by converting these data into the number of bird species known to take these insects. However, a lack of taxonomic detail for insects means this would reduce differences between plant species and represent a poorer index of the relative value. For example, suppose two plant species supported insects within three taxa, say Chrysomelidae, Auchenorrhyncha and Lepidoptera, but one supported a much larger number of species within one of these groups. Since invertebrate prey are rarely, if ever recorded, in bird diets at species level both these plants would be scored as indirectly providing for the same number of farmland bird species.

For this reason, we have used data on the number of invertebrate prey species associated with each plant as an index of the indirect food value of each species. The suitability of this as an index of diet quality or quantity, is difficult to assess. The optimal measure would be abundance or biomass but these data are not available. Few studies have related the diversity of species in the diet to the quality of that diet. Instead, work has tended to focus on key species rather than diet breadth. Higher diversity may result in food being available for a longer period of time with seasonal peaks in different invertebrate species. In general, for the

purpose of this study it represents the best quantitative index that can be derived from available data.

2.5 Diet and microhabitat value for other vertebrates

Consideration of the literature revealed no relevant information on the diet or microhabitat value of the selected plant species for mammals, such as Roe Deer *Capreolus capreolus*, Brown Hare *Lepus europaeus,* bats and a range of small mammals such as Field Vole *Microtus agrestis* and Wood Mouse *Apodemus sylvaticus*. The following sources on small mammal populations in UK farmland were consulted Corbet & Harris (1991), Jensen (1993), Macdonald and others (2000), Tattersall and others (1997, 1998, 1999, 2000, 2001, 2002, 2003), Tew and others (1992) and Todd and others (2000). Most small mammals are generalist feeders and populations are related to habitat structure and surrounding land use, rather than the particular botanical composition of grassland swards.

2.6 Agronomic potential of selected plant species

Standard ecological reference sources, such as the Biological Flora of the British Isles and Comparative Plant Ecology (Grime and others 1988), were used to gather information on some characteristics of agronomic importance. Nineteen of the selected species have BFBI accounts. All but three of the selected species have a Comparative Plant Ecology account (Grime and others 1996). All of the Poaceae are covered in Wild and Sown Grasses (Peeters, 2004). In addition, a comprehensive search of bibliographic databases (eg ISI Web of Science, CAB Abstracts) was undertaken, supplemented by a search of "grey" literature.

Information on the following agronomic characteristics was extracted:

- Productivity, diet value for livestock, nutrient content
- Seasonality of forage availability
- Effects on silage production
- Ability to regrow/reflower after grazing or cutting
- Rooting depth, drought tolerance, effects on soil structure
- Presence of health promoting compounds
- Problems for livestock (toxicity, other impacts on animal health)

The literature searched for the review is listed in Appendix 2.

3 Diet and microhabitat value

3.1 Ecological characteristics of selected plant species

Characteristics of the selected plant species relating to morphology, productivity and phenology are summarised as part of the review of agronomic potential in Section 5.

3.1.1 Distribution in agriculturally improved grasslands

With some exceptions, the selected species occur in the samples of agriculturally-improved or semi-improved grasslands in the National Vegetation Classification (NVC) tables and / or Countryside Survey 2000 (CS2000) datasets (Table 3). The two legume species lucerne (*Medicago sativa*) and sainfoin (*Onobrychis viciifolia*), which are not in these datasets, were included in the selected list because of their potential to combine both biodiversity and agronomic value. Three forb species in the selected list occur in neither the NVC tables for MG6 and MG7, nor the improved grassland samples of the CS2000 (*Leucanthemum vulgare, Primula veris, Sanguisorba minor*). These were retained in the list of plant species used for this review as they are widely sown in grassland enhancement schemes, the first two species relatively successfully in neutral grasslands. Some species are relatively rarely encountered in more fertile grasslands, eg *Galium* spp., but were included as borderline species for consideration in species-poor, semi-improved grasslands on low-fertility soils or where particular soil wetness conditions occur. The most frequent species in the CS2000 samples that were not included in the selected list were *Bellis perennis* and *Stellaria media*. Preliminary analysis suggested that *Bellis perennis* has few specific faunal associations, while *Stellaria media* is more associated with regularly-disturbed arable habitats rather than grasslands.

3.1.2 Success of use in enhancement of grassland diversity

Seed of native forb and grass species has been used in grassland habitat restoration for a number of decades. In the early years, the use of such practices was confined to land undergoing reclamation from extractive industries or in urban areas (Gilbert & Anderson 1998). From the mid 1980s, an increasing amount of seed has been sown in order to enhance the diversity of agricultural grasslands, promoted by agri-environment scheme payments. However, the use of native provenances of forb and grass seed is limited, with annual sales of approximately 20-30 tonnes between 1993 and 2002, compared with 20,000 tonnes of agricultural seed (Walker and others 2004).

A considerable body of research has been carried out on the enhancement of botanical diversity in agricultural grasslands since the introduction of the agri-environment schemes. A recent review of 25 experiments concerned with restoration of species-rich grassland on ex-arable land or agriculturally-improved grassland has quantified the performance of sown species (Pywell and others 2003). The results of the study for the species selected for this review are shown in Table 4. Data are provided on seed supply along with the persistence in the sward and temporal trend in abundance. Although management regimes differed between the sites used for the experiments, all of the sites were undergoing management for the promotion of botanical diversity.

Table 3 Occurrence of selected species in different types of grassland and with Ellenberg indicator values for soil conditions (see legend on following page for details).

	NVC tables		CS2000 (frequency)		Ellenberg indicator values		
	MG6	MG7	X plots	Y plots	Water	pH	Nitrogen
Grasses							
Agrostis capillaris	III (1-8)	II (2-7)	41	34	5	4	4
Agrostis stolonifera	I (1-9)	I (1-8)	43	36	6	7	6
Alopecurus pratensis	I (1-7)	II (1-8)	15	5	5	6	7
Anthoxanthum odoratum	II (1-7)	I (3-8)	21	21	6	4	3
Cynosurus cristatus	V (2-8)		36	20	5	6	4
Dactylis glomerata	III (1-8)	IV (1-8)	46	40	5	7	6
Festuca ovina	I (2-7)		3	6	5	4	2
Festuca pratensis	I (1-4)	II (1-8)	2		6	6	6
Festuca rubra	IV (1-9)	II (1-8)	25	37	5	6	5
Holcus lanatus	IV (1-8)	III (1-8)	66	65	6	6	5
Lolium perenne	V (1-8)	V (1-9)	92	47	5	6	6
Phleum pratense pratense	I (1-4)	II (1-7)	40	12	5	7	6
Poa pratensis	III (1-5)	II (1-9)	26	15	5	6	5
Poa trivialis	II (1-7)	II (2-8)	39	30	6	6	6
Legumes							
Lathyrus pratensis	I (1-5)	I (2-4)	2	8	6	6	5
Lotus corniculatus			8	14	4	6	2
Lotus pedunculatus			2	5	8	6	4
Medicago lupulina	I (1-5)		2	3	4	8	4
Medicago sativa					4	6	5
Onobrychis viciifolia					4	8	3
Trifolium dubium	I (2-8)	I (1-8)	8	5	4	6	5
Trifolium pratense	II (1-7)	II (1-7)	18	10	5	7	5
Trifolium repens	V (1-9)	III (1-8)	81	35	5	6	6
Vicia cracca		I (2-4)	1	3	6	7	5
Vicia sativa		I (1-5)	1	2	4	7	4
Non leguminous forbs							
Achillea millefolium	II (1-5)	I (1-9)	21	11	5	6	4
Cardamine pratensis	I (1-2)	I (1-3)	9	7	8	5	4
Centaurea nigra	I (1-4)		4	12	5	6	5
Cerastium fontanum	IV (1-5)	II (1-4)	54	27	5	5	4
Cirsium arvense	III (1-5)	I (1-6)	41	28	6	7	6
Cirsium palustre			5	5	8	5	4
Cirsium vulgare	I (1-3)	I (1-4)	27	9	5	6	6
Filipendula ulmaria			9	6	8	6	5
Galium palustre			2	4	9	5	4
Galium saxatile			3	4	6	3	3
Galium verum			1	2	4	6	2
Hypochaeris radicata	I (2-5)	I (1-6)	9	8	4	5	3
Leontodon autumnalis	II (1-4)	I (2-3)	11	8	6	6	4
Leontodon hispidus			3	4	4	7	3
Leucanthemum vulgare					4	7	4
Plantago lanceolata	III (1-6)	II (1-5)	23	25	5	6	4
Potentilla reptans	I (2-7)		4	7	5	7	5
Primula veris					4	7	3
Prunella vulgaris	I (1-5)		14	10	5	6	4
Ranunculus acris	III (1-5)	I (1-6)	29	15	6	6	4
Ranunculus repens	I (1-7)	I (1-8)	69	43	7	6	7
Rhinanthus minor	I (3-5)				5	6	4
Rumex acetosa	II (1-4)	II (1-4)	33	30	5	5	4
Rumex acetosella			5	5	5	4	3
Rumex crispus			44	3	6	7	6
Rumex obtusifolius	I (1-4)	I (1-6)	14	13	5	7	9
Sanguisorba minor					4	8	3
Senecio jacobaea			10	10	4	6	4
Taraxacum officinale agg.	II (1-3)	III (1-5)	66	29	5	7	6
Urtica dioica			21	24	6	7	8
Veronica chamaedrys	I (1-2)		10	11	5	6	5

Table 3 Legend

National Vegetation Classification

Figures show the frequency and abundance of the selcted plant species in the tables for NVC communities MG6 (*Cynosurus cristatus-Centaurea nigra* grassland) and MG7 (*Lolium perenne* grasslamds) (Rodwell 1992). No values for overall frequency are given in Rodwell (1992) for MG7, so a weighted average of the frequencies of each sub-community is given instead. Note that a species has to occur at 5% frequency or more in a sub-community to be included in the tables.

Frequency based on frequency of occurrence in 155 (MG6) and 111 (MG7) samples:

I	1-20% of samples
II	21-40% of samples
III	41-60% of samples
IV	61-80% of samples
V	81-100% of samples

Abundance showing the range of cover values in the same samples using the Domin abundance scale:

1	<4% with few individuals
2	<4% with several individuals
3	<4% with many individuals
4	4-10%
5	11-25%
6	26-33%
7	34-50%
8	51-75%
9	76-90%
10	91-100%

Countryside Survey 2000

Figures show the frequency of occurrence in vegetation samples from improved grassland in England and Wales. The 'X' plots comprise a sample of 595 plots of 200m^2, randomly positioned within the 1km grid squares used for the survey, and the 'Y' plots comprise a sample of 305 plots of 4m^2 in targeted locations within the 1km grid squares (Haines-Young and others 2000).

Ellenberg Values

Ellenberg soil indicator values for British plants (Hill and others 1999) for the selected species. Values between the numbers listed below represent intermediate scores:

Moisture

3 Dry site indicator, more often found on dry ground than in moist places
5 Moist site indicator, manily on fresh soils of average dampness
7 Dampness indicator, mainly on constantly moist or damp, but not on wet soils
9 Wet site indicator, often on water saturated, badly aerated soils

Reaction

3 Acidity indicator, mainly on acid soils, but exceptionally also on nearly neutral ones
5 Indicator of moderately acidic soils, only occasionally found on very acid or on neutral to basic soils
7 Indicator of weakly acid to weakly basic conditions, never found on very acid soils
9 Indicator of basic reaction, always found on calcareous or other high pH soils

Nitrogen

3 Indicator of more or less infertile soils
5 Indicator of sites of intermediate fertility
7 Plant often found in richly fertile places
9 Indicator of extremely rich situations, such as cattle resting places or near polluted rivers

Table 4 Seed supply and success in grassland enhancement schemes of some of the selected plant species (data from reviews by Pywell and others 2003 and Walker and others 2004). Selected species not included in these reviews are not listed, blank cells mean no data available.

	Seeds /g	Agric varieties?	Cost (£/kg)	Cost (£/kg)	Supply*	Establ**	Trend***
Grasses							
Agrostis capillaris	15,000	Yes	50	16	4		
Agrostis stolonifera	15,000	Yes		15	3		
Alopecurus pratensis	500	Yes	80	60	3	4	+
Anthoxanthum odoratum	1,000		150		4	5	++
Cynosurus cristatus	1,500	Yes	50	8	5	5	++
Dactylis glomerata	1,000	Yes	30	5	4		
Festuca ovina	1,000	Yes	45	6	5	2	-
Festuca pratensis	500	Yes	50	5	4		
Festuca rubra	1,000	Yes	45	5	5	5	+
Holcus lanatus	4,000	Yes	45	20			
Lolium perenne	500	Yes	5	5	4		
Phleum pratense pratense	2,000	Yes	5	5	3	5	0
Poa pratensis	3,000	Yes		5	4	4	-
Poa trivialis	4,000	Yes	50	5			
Legumes							
Lathyrus pratensis	60		320			2	-
Lotus corniculatus	500	Yes	190	10		3	- -
Lotus pedunculatus	2,000		190				
Medicago lupulina	400	Yes	85	7		2	- -
Medicago sativa		Yes					
Onobrychis viciifolia		Yes	61	8			
Trifolium dubium			84			2	+
Trifolium pratense	750	Yes	85	12		3	0
Trifolium repens		Yes		16			
Vicia cracca	60		270			1	0
Vicia sativa	50	Yes	90				
Non legume Forbs							
Achillea millefolium	6,000		85		1	4	++
Cardamine pratensis					1		
Centaurea nigra	400		150		3	3	+
Filipendula ulmaria	1,000		140		2		
Galium saxatile						1	+
Galium verum	1,900		85		3	1	- -
Hypochaeris radicata			280		1	3	+
Leontodon autumnalis			160		2		
Leontodon hispidus	900		320			2	- -
Leucanthemum vulgare	2,000		85		4	5	++
Plantago lanceolata	300		60		2	4	+
Primula veris	1,000		240		1	1	++
Prunella vulgaris	1,000		105		3	4	+
Ranunculus acris	400		85		3	1	-
Rhinanthus minor	300		190				
Rumex acetosa	2,000		150		2	4	0
Rumex acetosella	2,500		390			1	+
Sanguisorba minor	300		85		3	1	- -
Veronica chamaedrys			2500				

* Average annual supply of native provenance seed from wildflower seed suppliers (Walker and others 2004)
1, <500 kg; 2, 50-1000 kg; 3, 1000-1500 kg 4, 1500-2000 kg 5, >2000 kg nd, no data

** Success of establishment index after 4 years (Pywell and others 2003):
1, 0.02-0.05 (low); 2, 0.05-0.10; 3, 0.10-0.25; 4, 0.25-0.50; 5, 0.50-1.00 (high)

*** Trend in abundance (Pywell and others 2003):
--, < -0.75 -, -0.75 to -0.25 0, -0.25 to 0.25 +, 0.25 to 0.75 ++, >0.75

3.2 Identification of insect:plant associations

As a result of the literature review, a total of 5,268 references to interactions between the 56 plant species and insect species in the 9 selected taxa were identified. From these, a total of 2,603 monophagous/monolectic or oligophagous/oligolectic associations between an insect species and a plant species were identified. This total underestimates the number of oligophagous species feeding on a broad range of grasses, as such species were only included if one or more of the selected grass species was specifically mentioned in the source. Monophagous/monolectic or oligophagous/oligolectic associations are hereafter referred to as 'specific associations'. Polyphagous/polylectic associations are considered later in this section.

3.2.1 Distribution of specific associations between insect taxa

Plant species supporting a wide range of specific associations with insects were identified in all three plant groups. Of the 56 plant species considered, 12 had 70 or more associations (Table 5). Full details of the associations are given in Appendix 3.

Table 5 Plant species from the four groups with the highest numbers of mono- or oligo-specific associations (number of specific associations in parentheses).

Grasses	**Legumes**	**Non leguminous forbs**
Dactylis glomerata (105)	*Lotus corniculatus* (104)	*Cirsium arvense* (87)
Festuca ovina (98)	*Trifolium repens* (93)	*Cirsium vulgare* (76)
Festuca rubra (91)	*Trifolium pratense* (90)	*Achillea millefolium* (74)
Poa pratensis (75)	*Trifolium dubium* (70)	*Cirsium palustre* (70)
Festuca pratensis (65)	*Lotus pedunculatus* (59)	*Rumex acetosella* (64)

Lolium perenne, the most widespread and abundant agricultural grass in improved grassland, had one of the lowest numbers of insect associations among the grasses, although *Alopercurus pratensis*, *Anthoxanthum odoratum* and *Cynosurus cristatus* had fewer associations. In contrast, *Trifolium repens*, the most commonly sown agricultural legume, had the second highest number of associations among the legumes. Overall, across the groups, the grasses and legume groups contained a greater proportion of representatives having high numbers of insect associations, compared to the other forbs group.

The largest number of reported specific associations was between plants and Lepidopteran larvae (Table 6), comprising 30% of all associations. The plant species with the greatest diversity in such associations were grasses (Poaceae), legumes (Fabaceae), composites (Asteraceae), bedstraws (*Galium* spp.) and docks or sorrels (*Rumex* spp.). The number of specific associations with grass species was high among the Elachistidae, Noctuidae, Pyralidae and Satyridae. Amongst the forbs, the families Geometridae and Gelechiidae contributed to the high number of associations with *Galium* spp and *Rumex* spp. respectively.

Associations between plants and phytophagous beetles comprised 21% of all specific associations identified in the review. The diversity of specialist herbivores was greatest for the legumes, especially *Lotus corniculatus, Trifolium pratense* and *Trifolium repens*, with most of the species being weevils (Apionidae and Curculionidae). Amongst the forbs, *Rumex* spp., *Cirsium* spp., and *Plantago lanceolata* all had large numbers of associated beetles, comprising a diverse range of weevils and leaf beetles (Chrysomelidae).

Of the remaining groups, members of the Asteraceae supported the greatest diversity of specific associations with flies (Diptera), grasses had the highest numbers of specific associations with leafhoppers (Auchenorrhyncha) and aphids (Sternorrhyncha), while *Galium* spp. had the largest number of specific associations with true bugs (Heteroptera). *Filipendula ulmaria* was the only plant species associated with a diverse assemblage of Symphyta. *Ranunculus* spp. and *Taraxacum officinale* had the highest numbers of monolectic and oligolectic aculeates (Aculeata).

Table 6 All specific associations (monospecific and oligospecific) of the 56 plant species arranged by insect taxa.

	Coleo.	Dipter.	Hemiptera			Hymenoptera		Lepid.	Thysa.	**Total**
Grasses			Auch.	Heter.	Stern.	Acul.	other			
Agrostis capillaris			18	3	19			11		**51**
Agrostis stolonifera		4	6	1	20			12		**43**
Alopecurus pratensis		3		3	7				1	**14**
Anthoxanthum odoratum		3	2		3			2		**10**
Cynosurus cristatus		1			1			1		**3**
Dactylis glomerata	2	17	13	1	16		1	51	4	**105**
Festuca ovina	2	6	21	1	26		1	41		**98**
Festuca pratensis	2	7	9	1	22		1	23		**65**
Festuca rubra	2	7	21	4	28		1	28		**91**
Holcus lanatus		14	14	3	13			14	1	**59**
Lolium perenne	1	9	4	1	7			3		**25**
Phleum pratense pratense		7	2	4	9		2	8		**32**
Poa pratensis	3	7	9	2	20		3	31		**75**
Poa trivialis	1	10	6	2	15		2	26		**62**
Legumes										
Lathyrus pratensis	19	10			2		1	11	2	**45**
Lotus corniculatus	37	8			6	4	1	44	4	**104**
Lotus pedunculatus	21	3		1	4	1		28	1	**59**
Medicago lupulina	16	5		6	2			8		**37**
Medicago sativa	15	6		4	3	5		12		**45**
Onobrychis viciifolia	7	2				4		3		**16**
Trifolium dubium	35	8		2	1			24		**70**
Trifolium pratense	40	12		3	6	4		25		**90**
Trifolium repens	39	14		5	4	2	2	27		**93**
Vicia cracca	28	9			2	1		12	4	**56**
Vicia sativa	28	6			1	2		9	4	**50**
Non leguminous forbs										
Achillea millefolium	10	21	1	4	12	2		21	3	**74**
Cardamine pratensis	6	1				1		5		**13**
Centaurea nigra	9	21		3	3	4		23		**63**
Cerastium fontanum				2	1			8		**11**
Cirsium arvense	26	25		6	9	3		17	1	**87**
Cirsium palustre	21	18		7	6	1		16	1	**70**
Cirsium vulgare	21	21		6	6	2		19	1	**76**
Filipendula ulmaria	2	6	2		1	2	9	3		**25**
Galium palustre	3	5		8	6			22	3	**47**
Galium saxatile	3	3		9	6			21	1	**43**
Galium verum	3	3		10	7		1	22	2	**48**
Hypochaeris radicata	3	15			5	2		1	2	**28**
Leontodon autumnalis	2	10			5	1				**18**
Leontodon hispidus	1	7			3	2				**13**
Leucanthemum vulgare	7	20		3	11	2		10		**53**
Plantago lanceolata	25	2	1		4		1	9	1	**43**
Potentilla reptans	2	2		1	1	3		3		**12**
Primula veris		1			1			2		**4**
Prunella vulgaris	2	1			1	1		2		**4**
Ranunculus acris	8	14			3	7	3	1		**36**
Ranunculus repens	9	12			5	7	3	1	1	**38**
Rhinanthus minor		1			1			4		**6**

	Coleo.	Dipter.	Hemiptera			Hymenoptera		Lepid.	Thysa.	**Total**
Rumex acetosa	17	5	1		9		2	18		**52**
Rumex acetosella	20	4	1		`1		2	25		**64**
Rumex crispus	16	6	1		9		2	14	3	**51**
Rumex obtusifolius	14	6	1		9		2	14	3	**49**
Sanguisorba minor	1	2			2			3		**8**
Senecio jacobaea	8	22		1	1	8		12	5	**57**
Taraxacum officinale	3	13			8	7		14	2	**47**
Urtica dioica	7	7	4	12	4			13	1	**48**
Veronica chamaedrys	6	2	1		1	2		2		**14**

Table 7 Monospecific (monophagous and monolectic) associations of the 56 plant species arranged by insect taxa.

	Coleo.	Dipt.	Hemiptera			Hymenoptera		Lepid.	Thysa.	Total
Grasses			Auch.	Heter.	Stern.	Acul.	other			
Agrostis capillaris										
Agrostis stolonifera					1					**1**
Alopecurus pratensis		1							1	**2**
Anthoxanthum odoratum			1							**1**
Cynosurus cristatus										
Dactylis glomerata		8	1		1			1		**11**
Festuca ovina			1		1			1		**3**
Festuca pratensis										
Festuca rubra		1								**1**
Holcus lanatus		1								**1**
Lolium perenne		1								**1**
Phleum pratense pratense		2			1					**3**
Poa pratensis			1							**1**
Poa trivialis		2								**2**
Legumes										
Lathyrus pratensis	1	5			1					**7**
Lotus corniculatus	4	4			1	1	1	5		**16**
Lotus pedunculatus								2		**2**
Medicago lupulina		3		2	1					**6**
Medicago sativa		2				1				**3**
Onobrychis viciifolia	1	1				1		1		**4**
Trifolium dubium										
Trifolium pratense	1				2			1		**4**
Trifolium repens	1	2					2	1		**6**
Vicia cracca		3							1	**4**
Vicia sativa										
Non leguminous forbs										
Achillea millefolium		6	1					5	1	**13**
Cardamine pratensis										
Centaurea nigra	1	1		1		1		3		**7**
Cerastium fontanum								1		**1**
Cirsium arvense	2	1			2			1		**6**
Cirsium palustre										
Cirsium vulgare								1		**1**
Filipendula ulmaria		3	2				5	2		**12**
Galium palustre		1						1	1	**3**
Galium saxatile								1		**1**
Galium verum				1	1			1	1	**4**
Hypochaeris radicata	1	5								**6**
Leontodon autumnalis	1	1								**2**
Leontodon hispidus										
Leucanthemum vulgare	1	6		2	1			4		**14**
Plantago lanceolata	1	1	1		1		1	1		**6**
Potentilla reptans										
Primula veris										
Prunella vulgaris	1	1			1			1		**4**
Ranunculus acris		3								**3**
Ranunculus repens	1	1			1				1	**4**

	Coleo.	Dipt.	Hemiptera			Hymenoptera		Lepid.	Thysa.	Total
Rhinanthus minor								2		**2**
Rumex acetosa					1					**1**
Rumex acetosella	2				3			7		**12**
Rumex crispus								1		**1**
Rumex obtusifolius								1		**1**
Sanguisorba minor					1					**1**
Senecio jacobaea		1		1				4		**6**
Taraxacum officinale		1			1			1		**3**
Urtica dioica	1	3	1		2			3		**10**
Veronica chamaedrys								1		**1**

3.2.2 Degree of specificity in plant:insect associations

Monophagous or monolectic associations were found for 46 of the 56 selected plant species (Table 7). In general, the plant species with the greatest number of specific (ie mono- or oligo-specific) associations also had the highest number of monospecific associations (*Dactylis glomerata* 11 out of 105 associations; *Lotus corniculatus* 16/104; *Achillea millefolium* 13/74; *Rumex acetosella* 12/64). Monospecific associations were under-represented in common pasture legumes (*Trifolium pratense* 4/90*, T. repens* 6/93). The proportion of specific associations that were monospecific was high for a number of selected forbs with few congeneric species in the UK flora (Table 8). Overall across groups, the grasses group had the smallest proportion of representatives with high numbers of mono-specific associations, compared to legumes and other forbs.

Table 8 Selected plant species with the highest proportion of monospecific associations.

Plant species	**No. monospecific associations**	**Total number of mono- and oligospecific associations**	**% monospecific**
Prunella vulgaris	4	4	100%
Filipendula ulmaria	12	25	48%
Rhinanthus minor	2	6	33%
Leucanthemum vulgare	14	53	26%
Onobrychis viciifolia	4	16	25%
Hypochaeris radicata	6	28	21%

3.2.3 Feeding locations on the selected plant species

Of the specific associations recorded for the selected plant species, 2,504 (96%) were phytophagous, the remainder comprising associations with pollen and nectar feeding aculeate Hymenoptera. For each phytophagous insect:plant association, the feeding locations within the plant were categorised (Table 9). The majority of insect associations (59%) were classified as 'general/unspecified', that is, the literature source did not identify a specific feeding location or microhabitat within the plant. This reflects the large number of insect species feeding generally across a range of above-ground plant parts, including leaves, stems, buds and inflorescences. Such associations were especially frequent amongst Lepidopteran larvae feeding on grasses (Poaceae), bedstraws (*Galium* spp.) and docks and sorrels (*Rumex* spp.). The numbers of associations in this category is also high as it was used if the source material did not identify a particular microhabitat for above-ground feeding taxa. The category also includes insect species using different parts of the plant during different stages in their life history, for example weevils with foliar-feeding adults and root-feeding larvae.

The next most frequent group, comprising 11% of associations, were those involving insects feeding on inflorescences, seedheads or seeds. Many species feeding on these structures have larvae which develop as the inflorescence and seed head develop. For simplicity, these

feeding locations have been combined for presentation in Table 9. Information on species feeding exclusively on flowers or seeds is given in Appendix 3. The numbers of insect species in this group was greatest for plants in the Asteraceae (eg *Achillea millefolium, Centaurea nigra, Cirsium arvense, Senecio jacobaea*) and Fabaceae (eg *Lotus corniculatus, Trifolium pratense, Trifolium repens, Vicia cracca, Vicia sativa*). Of those plant species with a less diverse fauna, seed- and flower- feeders comprised an important proportion of reported associations for *Cerastium fontanum* and *Rhinanthus minor*. Reported flower / seed associations were generally low for grasses compared to the other groups.

Table 9 Feeding location for the 2,504 monophagous and oligophagous associations, showing number of insect species and percentage of specialist phytophagous insect fauna.

Feeding location:	Flower/ seedhead		Leaf miner		Leaf		Stem		Stem base/ root crown		Root		General/ unspecified	
Grasses														
Agrostis capillaris	**2**	*4%*			**6**	*12%*					**3**	*6%*	**40**	*78%*
Agrostis stolonifera			**4**	*9%*	**6**	*14%*					**3**	*7%*	**30**	*70%*
Alopecurus pratensis	**2**	*14%*	**2**	*14%*	**1**	*7%*							**9**	*64%*
Anthoxanthum odoratum			**1**	*10%*	**1**	*10%*	**2**	*20%*					**6**	*60%*
Cynosurus cristatus			**1**	*33%*									**2**	*67%*
Dactylis glomerata	**6**	*6%*	**8**	*8%*	**13**	*12%*	**7**	*7%*	**6**	*6%*	**1**	*1%*	**64**	*61%*
Festuca ovina			**4**	*4%*	**11**	*11%*	**3**	*3%*	**3**	*3%*	**4**	*4%*	**73**	*74%*
Festuca pratensis			**5**	*8%*	**7**	*11%*	**2**	*3%*	**1**	*2%*	**4**	*6%*	**46**	*71%*
Festuca rubra	**1**	*1%*	**4**	*4%*	**9**	*10%*	**3**	*3%*	**4**	*4%*	**4**	*4%*	**66**	*73%*
Holcus lanatus			**8**	*14%*	**10**	*17%*	**4**	*7%*			**1**	*2%*	**36**	*61%*
Lolium perenne			**4**	*16%*	**1**	*4%*	**4**	*16%*			**1**	*4%*	**15**	*60%*
Phleum pratense pratense	**3**	*9%*	**3**	*9%*	**3**	*9%*							**23**	*72%*
Poa pratensis			**7**	*9%*	**9**	*12%*	**2**	*3%*	**3**	*4%*	**2**	*3%*	**52**	*69%*
Poa trivialis			**9**	*15%*	**6**	*10%*	**2**	*3%*	**1**	*2%*	**2**	*3%*	**42**	*68%*
Legumes														
Lathyrus pratensis	**11**	*27%*	**3**	*7%*	**2**	*4%*	**1**	*2%*			**3**	*7%*	**24**	*53%*
Lotus corniculatus	**18**	*18%*	**1**	*1%*	**3**	*3%*	**2**	*2%*	**1**	*1%*	**16**	*16%*	**59**	*59%*
Lotus pedunculatus	**8**	*14%*			**4**	*7%*					**10**	*17%*	**36**	*62%*
Medicago lupulina	**1**	*3%*	**2**	*5%*	**6**	*16%*	**1**	*3%*	**1**	*3%*	**5**	*14%*	**21**	*57%*
Medicago sativa	**2**	*5%*	**3**	*8%*	**6**	*15%*	**1**	*3%*			**6**	*15%*	**22**	*55%*
Onobrychis viciifolia	**4**	*33%*			**1**	*8%*	**2**	*17%*			**2**	*17%*	**3**	*25%*
Trifolium dubium	**6**	*9%*	**2**	*3%*	**8**	*11%*	**2**	*3%*			**7**	*10%*	**45**	*64%*
Trifolium pratense	**13**	*15%*	**2**	*2%*	**8**	*9%*	**3**	*3%*	**1**	*1%*	**8**	*9%*	**51**	*59%*
Trifolium repens	**17**	*19%*	**3**	*3%*	**8**	*9%*	**2**	*2%*	**1**	*1%*	**7**	*8%*	**53**	*58%*
Vicia cracca	**13**	*24%*	**3**	*5%*	**3**	*5%*	**4**	*7%*			**7**	*13%*	**25**	*45%*
Vicia sativa	**13**	*31%*	**2**	*4%*	**2**	*4%*	**3**	*6%*			**5**	*10%*	**21**	*44%*
Non leguminous forbs														
Achillea millefolium	**13**	*18%*	**6**	*8%*	**7**	*10%*	**6**	*8%*	**3**	*4%*	**3**	*4%*	**34**	*47%*
Cardamine pratensis			**1**	*8%*	**1**	*8%*					**2**	*17%*	**6**	*50%*
Centaurea nigra	**16**	*27%*	**6**	*10%*	**4**	*7%*	**3**	*5%*	**2**	*3%*	**5**	*8%*	**23**	*39%*
Cerastium fontanum	**5**	*45%*											**6**	*55%*
Cirsium arvense	**16**	*19%*	**10**	*12%*	**4**	*5%*	**3**	*4%*	**3**	*4%*	**8**	*10%*	**40**	*70%*
Cirsium palustre	**13**	*19%*	**6**	*9%*	**5**	*7%*	**3**	*4%*	**3**	*4%*	**6**	*9%*	**33**	*48%*
Cirsium vulgare	**2**	*4%*	**5**	*9%*	**4**	*7%*	**3**	*5%*	**3**	*5%*	**6**	*11%*	**33**	*64%*
Filipendula ulmaria			**2**	*9%*	**4**	*17%*	**1**	*4%*					**16**	*70%*
Galium palustre	**1**	*2%*	**1**	*2%*	**1**	*2%*	**1**	*2%*					**43**	*91%*
Galium saxatile	**1**	*2%*	**1**	*2%*	**1**	*2%*							**40**	*93%*
Galium verum	**1**	*2%*	**1**	*2%*	**1**	*2%*							**45**	*94%*
Hypochaeris radicata	**9**	*35%*	**7**	*27%*	**1**	*4%*			**1**	*4%*	**1**	*4%*	**7**	*27%*
Leontodon autumnalis	**4**	*24%*	**6**	*35%*							**1**	*6%*	**6**	*35%*
Leontodon hispidus	**3**	*27%*	**3**	*27%*							**1**	*9%*	**4**	*36%*
Leucanthemum vulgare	**11**	*22%*	**4**	*8%*	**3**	*6%*	**2**	*4%*	**2**	*4%*	**4**	*8%*	**25**	*49%*
Plantago lanceolata	**3**	*7%*	**3**	*7%*	**2**	*5%*	**1**	*2%*	**5**	*12%*	**9**	*21%*	**20**	*47%*
Potentilla reptans			**2**	*22%*	**1**	*11%*	**1**	*11%*			**1**	*11%*	**4**	*44%*
Primula veris	**1**	*17%*	**1**	*17%*									**4**	*67%*
Prunella vulgaris	**1**	*25%*									**1**	*25%*	**2**	*50%*
Ranunculus acris	**1**	*3%*	**5**	*17%*	**2**	*7%*	**7**	*24%*			**3**	*10%*	**11**	*38%*

Feeding location:	Flower/ seedhead		Leaf miner		Leaf		Stem		Stem base/ root crown		Root		General/ unspecified	
Ranunculus repens	**1**	*3%*	**5**	*16%*	**3**	*10%*	**5**	*16%*			**3**	*10%*	**14**	*45%*
Rhinanthus minor	**4**	*67%*											**2**	*33%*
Rumex acetosa	**2**	*4%*	**4**	*8%*	**5**	*10%*	**2**	*4%*	**3**	*6%*	**5**	*10%*	**31**	*60%*
Rumex acetosella	**2**	*3%*	**4**	*6%*	**5**	*8%*	**2**	*3%*	**5**	*8%*	**6**	*9%*	**40**	*63%*
Rumex crispus	**1**	*2%*	**5**	*10%*	**4**	*8%*	**3**	*6%*	**3**	*6%*	**3**	*6%*	**32**	*60%*
Rumex obtusifolius	**1**	*2%*	**4**	*8%*	**4**	*8%*	**3**	*6%*	**3**	*6%*	**3**	*6%*	**31**	*67%*
Sanguisorba minor			**2**	*25%*			**1**	*13%*	**1**	*13%*			**4**	*50%*
Senecio jacobaea	**12**	*25%*	**7**	*15%*	**2**	*4%*	**4**	*8%*	**2**	*4%*	**6**	*13%*	**15**	*61%*
Taraxacum officinale	**6**	*15%*	**9**	*23%*	**2**	*5%*			**1**	*3%*	**4**	*10%*	**18**	*45%*
Urtica dioica	**3**	*6%*	**3**	*6%*	**1**	*2%*	**4**	*8%*	**1**	*2%*	**2**	*4%*	**34**	*74%*
Veronica chamaedrys	**2**	*17%*	**2**	*17%*	**2**	*17%*							**6**	*50%*
TOTAL		***11%***		***8%***		***8%***		***4%***		***3%***		***7%***		***59%***

Leaf miners, free-living foliar feeders and stem feeders collectively comprised c. 20% of reported associations. Leaf mining associations were most abundant in the broad-leaved grasses (eg *Dactylis glomerata, Holcus lanatus*) and members of the Asteraceae, especially those with a large basal rosette (*Cirsium* spp. *Hypochaeris radicata, Taraxacum officinale*). Free-living foliar feeders were most frequent in the grasses and legumes, whilst high numbers of specialist stem feeding species were for *Dactylis glomerata, Achillea millefolium* and *Ranunculus* spp..

Root feeding species comprised an important component of the specialist fauna for many legume species (especially *Lotus* spp., *Medicago* spp. and *Vicia* spp.), and a number of rosette forming forbs with large rootstocks (eg *Cirsium vulgare, Plantago lanceolata, Senecio jacobaea*). A small number of insect species had feeding sites at the base of the stem or the top of the root stock. These were most frequent amongst rosette forming forbs (eg *Plantago lanceolata, Cirsium vulgare*), but also a significant component of the fauna of the tussock-forming grass *Dactylis glomerata*.

3.2.4 Conservation status of associated specialist insects

The conservation status of the insect species identified as having specific associations with the selected plant species was recorded for all groups except the aphids (Sternorrhyncha) and thrips (Thysanoptera), for which no conservation status has been published. The largest numbers of Red Data Book or Nationally Notable/Scarce species were found on the legume species (*Lotus corniculatus, L. pedunculatus, Trifolium pratense, T. repens*). A high percentage of the insects forming specialist associations with the forb *Plantago lanceolata* were also of RDB or Nationally Scarce status (Table 10). Rare and scarce species made a significant contribution to the total specialist fauna associated with *Anthoxanthum odoratum* (3 out of 10 associations), *Cerastium fontanum* (4/11), *Onobrychis viciifolia* (7/16) and *Prunella vulgaris* (2/4). Overall across the groups, grasses had generally lower numbers of nationally rare and scarce insect species associated with them, particularly compared to legumes.

3.2.5 Number of associations with widespread specialist species alone

Given the objectives of the review, the number of widespread insect species forming specialist associations with the selected plant species may provide a better quantification of the likely biodiversity gains from enhancing the botanical diversity of improved agricultural grasslands. Once a plant species has established in the sward, colonisation by its associated fauna may be a slow process. Firstly, the plant population may unsuitable as a habitat for

associaed insect species, either because the population size is too small or has not developed the age structure necessary to provide the microhabitats the insect requires (eg inflorescences or leaves, stems and roots of the right size (Mortimer and others 1998). Secondly, colonisation will be dispersal limited as a result of the paucity of sources of colonists in the surrounding landscape (Mortimer and others 2002). This latter factor is likely to be especially true for RDB and Nationally Scarce species.

When the numbers of associations with widespread (ie non-RDB/Nationally Scarce) species are considered, the identity of species with the most diverse associated insect fauna remains largely unchanged (Table 11, cf. Table 5).

Table 10 Number of Red Data Book and Nationally Notable/Scarce insect species showing specific associations with the 56 selected plant species (Nationally Notable/Scarce species are shown in parentheses).

	Coleopt.	Diptera.	Hemiptera		Hymen.	Lepidopt.	Total	Total	**Total**
			Auchen.	Heterop.	Aculeat.		RDB	Notable	
Grasses									
Agrostis capillaris						1	1		**1**
Agrostis stolonifera						1	1		**1**
Alopecurus pratensis									
Anthoxanthum odoratum		(1)	(1)			1	1	2	**3**
Cynosurus cristatus									
Dactylis glomerata		(1)	1			4	1	5	**6**
Festuca ovina		1	1 (1)			1 (6)	3	7	**10**
Festuca pratensis		1	1 (1)			(4)	2	5	**7**
Festuca rubra		1	1 (2)			(4)	2	6	**8**
Holcus lanatus									
Lolium perenne						(1)		1	**1**
Phleum pratense pratense						(1)		1	**1**
Poa pratensis			(1)			4 (3)	4	4	**8**
Poa trivialis			(1)			3 (2)	3	3	**6**
Legumes									
Lathyrus pratensis	1 (2)					3	4	2	**6**
Lotus corniculatus	6 (10)				1 (1)	9 (7)	16	18	**34**
Lotus pedunculatus	4 (7)				1	5 (2)	10	9	**19**
Medicago lupulina	2 (5)			1 (1)		1 (1)	4	7	**11**
Medicago sativa	2 (4)				1 (4)	1 (1)	4	9	**13**
Onobrychis viciifolia	1 (3)				3		4	3	**7**
Trifolium dubium	1 (10)	(1)				3 (1)	4	12	**16**
Trifolium pratense	2 (11)	1			1 (3)	3 (1)	7	15	**22**
Trifolium repens	1 (11)	1			(1)	3 (2)	5	14	**19**
Vicia cracca	1 (6)					1	2	6	**8**
Vicia sativa	1 (5)				1 (1)		2	6	**8**
Non leguminous forbs									
Achillea millefolium	1 (5)	2 (1)			1	1 (2)	5	8	**13**
Cardamine pratensis	(2)							2	**2**
Centaurea nigra	1 (4)	3 (2)			1 (2)	3 (2)	8	10	**18**
Cerastium fontanum				1		2 (1)	3	1	**4**
Cirsium arvense	2 (7)	1 (1)		1	1	2 (1)	7	9	**16**
Cirsium palustre	1 (7)	2 (1)		1		1 (1)	5	9	**14**
Cirsium vulgare	1 (7)	1 (1)		1	1	1 (2)	4	10	**14**
Filipendula ulmaria						1 (2)	1	2	**3**
Galium palustre	(1)					1 (3)	1	4	**5**
Galium saxatile	(1)			(1)		1 (2)	1	4	**5**
Galium verum	(1)			(1)		1 (2)	1	4	**5**
Hypochaeris radicata	(1)	(1)						2	**2**
Leontodon autumnalis	2	(1)					2	1	**3**
Leontodon hispidus	1	(1)			1		2	1	**3**
Leucanthemum vulgare	(5)	(2)		1		(2)	1	9	**10**
Plantago lanceolata	6 (11)					4 (1)	10	12	**22**

	Coleopt.	Diptera.	Hemiptera		Hymen.	Lepidopt.	Total	Total	**Total**
			Auchen.	Heterop.	Aculeat.		RDB	Notable	
Potentilla reptans	(1)			(1)	1		1	2	**3**
Primula veris									
Prunella vulgaris	(2)							2	**2**
Ranunculus acris	2 (2)				1		3	2	**5**
Ranunculus repens	2 (2)				2		4	2	**6**
Rhinanthus minor						(1)		1	**1**
Rumex acetosa	(6)		(1)			5 (2)	5	9	**12**
Rumex acetosella	(6)		(1)			5 (3)	5	10	**15**
Rumex crispus	(4)		(1)			4 (2)	4	7	**11**
Rumex obtusifolius	3		(1)			1 (4)	4	5	**9**
Sanguisorba minor									
Senecio jacobaea	1 (2)	2 (1)		(1)	(4)	1 (3)	5	10	**15**
Taraxacum officinale	(3)	1				4 (2)	4	6	**10**
Urtica dioica	1					1	2		**3**
Veronica chamaedrys	(3)						1	2	**3**

Table 11 Plant species from the three plant groups with the highest numbers of mono- or oligo-specific associations, excluding RDB and Nationally Scarce insect species (number of associations in parentheses).

Grasses	**Legumes**	**Other forbs**
Dactylis glomerata (99)	*Lotus corniculatus* (74)	*Cirsium arvense* (71)
Festuca ovina (88)	*Trifolium repens* (70)	*Cirsium vulgare* (62)
Festuca rubra (83)	*Trifolium pratense* (68)	*Achillea millefolium* (61)
Poa pratensis (67)	*Trifolium dubium* (54)	*Cirsium palustre* (56)
Holcus lanatus (59)	*Vicia cracca* (48)	*Rumex acetosella* (49)
Festuca pratensis (58)	*Vicia sativa* (42)	*Centaurea nigra* (45)
Poa trivialis (56)	*Lotus pedunculatus* (40)	*Urtica dioica* (45)
Agrostis capillaris (50)	*Lathyrus pratensis* (39)	*Leucanthemum vulgare* (43)
Agrostis stolonifera (42)	*Medicago sativa* (32)	*Galium verum* (43)

3.2.6 Polyphagous and polylectic associations

The review of insect:plant associations identified a total of 5,268 references to interactions between the 56 plant species and insect species in the 9 selected taxa. Approximately half (2,603) of these associations were classified as specific (that is monophagous/monolectic or oligophagous/oligolectic). The remaining 2,665 associations comprise records for polyphagous polylectic or other associations with well documented host plants (eg some predatory bugs, cleptoparasitic bees, etc.) Associations in this group result from records where the source material specifically identifies one of the selected plant species as a host, but where more than 4 other hosts are listed and these alternative hosts are from different plant families.

As a result of the criteria used in the search for associations, the database underestimates the total number of insect species utilising each of the selected plant species. For example, a record stating '*feeds on Taraxacum officinale and a range of herbaceous species*' would have been recorded in the database, whereas a record stating '*feeds on a range of herbaceous species*' would not. In addition, the standard reference sources used for each insect taxa vary in the level of precision adopted in listing host plants. Consequently, the figures for polyphagous and polylectic associations presented here (Table 12) are underestimates of the numbers of insect species utilising each plant species. In spite of these limitations, the figures presented for the number of specific associations (Tables 5-11), along with the restricted data for more general associations (Table 12) provide a guide to the likely benefits for insect diversity resulting from the presence or introduction of each plant species.

The summary of general associations listed in the database highlight the potential for benefits to insect diversity resulting from the introduction of legume and other forb species into species-poor, grass-dominated agriculturally-improved grasslands. In particular, a large number of general associations between the selected plant species and aculeate Hymenoptera and Lepidoptera were identified in the literature search, representing 35% and 36% of the listed general associations repectively. These associations included many with Red Data Book or Nationally Notable/Scarce insect species. The forbs *Taraxacum officinale, Plantago lanceolata* and *Rumex acetosa* had particularly high numbers of general associations with Lepidoptera of RDB or Nationally Scarce status, whilst *Lotus corniculatus, Cirsium arvense* and *Taraxacum officinale* had the highest numbers of general associations with aculeate Hymenoptera.

Table 12 Number of insect species showing polyphagous, polylectic or other general associations with the 56 selected plant species identified in the literature review for this study (number of RDB/Nationally Notable/Scarce species are shown in parentheses).

	Coleo	Dipter	Hemiptera			Hymenoptera		Lepid	Thysa	**Total**
			Auch	Heter	Stern	Acul	other			
Grasses										
Agrostis capillaris				1	2					**3**
Agrostis stolonifera				2	4					**6**
Alopecurus pratensis					2					**2**
Anthoxanthum odoratum					2			1		**3**
Cynosurus cristatus	1				4					**5**
Dactylis glomerata			3	2	13		1	9 (1)		**28**
Festuca ovina	2 (1)		1	1	6			7 (1)		**17**
Festuca pratensis	1		2	1	6			3 (1)		**13**
Festuca rubra	1		2	1	6			3 (1)		**13**
Holcus lanatus			1	5				1		**7**
Lolium perenne	1		1	4						**6**
Phleum pratense pratense				1	7					**8**
Poa pratensis	2 (1)		2		9			1		**14**
Poa trivialis	2 (1)		2		9			1		**14**
Legumes										
Lathyrus pratensis	1				7	12 (2)				**20**
Lotus corniculatus	7 (2)	1	3	3	3	56 (16)		18 (7)	2	**93**
Lotus pedunculatus	2 (1)		2	3	2	16 (1)		12 (5)		**37**
Medicago lupulina	1		4	2	6	8 (2)		1		**22**
Medicago sativa	1	1	3	2	8	20 (4)				**35**
Onobrychis viciifolia	2		1 (1)		2	21 (4)				**26**
Trifolium dubium	2	1	6 (2)	11 (3)	7	13 (3)		18 (6)		**58**
Trifolium pratense	2	2	5 (2)	11 (3)	14	39 (9)		20 (6)		**93**
Trifolium repens	3	3	5 (2)	11 (3)	10	45 (13)		19 (7)		**56**
Vicia cracca	1	2		8 (2)	5	18 (3)		1		**35**
Vicia sativa	1	2		8 (2)	7	9 (1)		1	1	**29**
Non legume Forbs										
Achillea millefolium	7 (3)	2	2 (1)	13	13	35 (12)		16 (4)		**88**
Cardamine pratensis			1					1 (1)		**2**
Centaurea nigra	4 (3)	1		7 (1)	7	41 (6)		7 (1)		**67**
Cerastium fontanum					6			2		**8**
Cirsium arvense	10 (3)	5	5	8 (1)	9	71 (16)		6		**114**
Cirsium palustre	9 (3)	2	4	6 (1)	7	37 (4)		4		**69**
Cirsium vulgare	9 (3)	4	3	6 (1)	7	54 (8)		5		**89**
Filipendula ulmaria	3		5	2	4	5 (1)	2	13 (2)		**34**
Galium palustre	1	1	2	10	9	3 (1)		24 (5)		**50**
Galium saxatile	1	1	2	10	9	3 (1)		24 (5)		**50**
Galium verum	1	1	2	10	10	3 (1)		24 (5)		**52**
Hypochaeris radicata					6	21 (5)		1		**28**
Leontodon autumnalis				1	2	27 (9)				**30**

	Coleo	Dipter	Hemiptera			Hymenoptera		Lepid	Thysa	**Total**
			Auch	Heter	Stern	Acul	other			
Leontodon hispidus			1	1	2	15 (5)				**19**
Leucanthemum vulgare	1 (1)		2	8 (2)	13	16 (5)		8 (2)		**48**
Plantago lanceolata	6 (3)		1		6	5 (1)	6	69 (10)		**93**
Potentilla reptans	2				3	27 (8)	1	6 (3)		**39**
Primula veris	1 (1)		1		5	1		6 (2)		**14**
Prunella vulgaris	3 (2)		1		4	10 (1)				**18**
Ranunculus acris	4	2	1	1	8	41 (8)	2	6 (2)		**65**
Ranunculus repens	5	1	3	1	10	35 (8)	3	6 (2)		**64**
Rhinanthus minor	2				1	6 (1)		1		**10**
Rumex acetosa	3		1 (1)	5	12		1	112 (9)		**134**
Rumex acetosella	4 (1)		2 (1)	5	12		2	109 (7)		**134**
Rumex crispus	3		1 (1)	5	14		1	109 (7)		**133**
Rumex obtusifolius	3		1 (1)	5	13		2	109 (7)		**133**
Sanguisorba minor	1		1		1	1		2		**6**
Senecio jacobaea	2 (2)	2	2	11	9	67 (14)	1	15 (1)	2	**111**
Taraxacum officinale	2		2 (1)	3	11	81 (15)		107(17)		**206**
Urtica dioica	3 (1)	2	12 (1)	20 (1)	9			29 (2)		**75**
Veronica chamaedrys	3 (3)	1			13	36 (10)	1	2 (1)		**56**

Given the general paucity of pollen and nectar sources in agriculturally improved grasslands, the provision of any species of forb from a range of families will benefit aculeates. To illustrate this, the host plants listed in the database for Red Data Book or Nationally Notable/Scarce species of polylectic bees (Apidae) are listed in Table 13. Within this group, the bumble bees (*Bombus* spp.) visit a wide range of plant species for pollen. However, the scarcer bumble bees tend to emerge later in the season, utilise more protein-rich pollens for feeding their brood and feed on a narrower range of species at any given time of the year. The numbers of bee species visiting particular plant species may reflect abundances of plants rather than preferences (see 4.3 below) but from the observations collated in Table 13, *Taraxacum officinale* has the highest number of bee species recorded as visiting, followed, in order, by *Lotus corniculatus*, *Potentilla reptans* and *Ranunculus acris*.

Table 13 Host plant associations of polylectic bees (Apidae) of Red Data Book or Nationally Scarce status in the UK identified in the database. Host plant abbreviations are the first 4 letters of genus and species, see Table 1 for full names.

Species	**Host plants listed in database**	**Conservation status**
Andrena labiata Fabricius	*Vero cham (+ Leon hisp, Tara offi, Hypo radi, Ranu acri, Leuc vulg, Ranu repe*	RDB3
Andrena nigriceps (Kirby)	*Cent nigr, Cirs palu, Cirs vulg, Fili ulma, Galium*	Nationally Scarce b
Andrena simillima Smith	*Cirs arve*	RDB3
Andrena varians (Kirby)	*Ranu acri, Tara offi*	Nationally Scarce b
Anthophora retusa (Linnaeus)	*Vici sati*	RDB3
Bombus cullumanus (Kirby)	*Trif repe, Cent nigr + Asteraceae, Lamiaceae*	RDB1+
Bombus distinguendus (Morawitz)	*Cent nigr, Cirsium, Trif repe*	RDB1
Bombus pomorum (Panzer)	*Cirsium, Leon autu, Lotu corn, Tara offi, Trif prat*	RDB1+
Bombus ruderatus (Fabricius)	*Cirs palu, Trif prat + Apiaceae, Boraginaceae, Fabaceae, Lamiaceae, Liliaceae, Oleaceae, Papaveraceae, Ranunculaceae, Rosaceae, Scrophulariaceae*	Nationally Scarce b
Ceratina cyanea (Kirby)	*Achi mill, Cent nigr, Cirs arve, Hypo radi, Leon hisp, Lotu corn, Medi sati, Pote rept, Prun vulg, Rhin mino, Sene jaco, Tara offi, Trif prat, Vero cham*	RDB3
Halictus confusus Smith	*Card prat, Leontodon, Pote rept, Sene jaco, Tara offi, Trif repe, Vero cham*	RDB3
Halictus eurygnathus Bluthgen	*Cent nigr*	RDB1+
Halictus maculatus Smith	*Achi mill, Cirs vulg, Leuc vulg, Ranu repe, Tara offi, Trif repe*	RDB1+
Hoplitis leucomelana (Kirby)	*Leon autu, Leon hisp , Lotu corn, Medicago, Onob vici, Trif prat, Trif repe + Lamiaceae*	RDB1+

Species	Host plants listed in database	Conservation status
Hylaeus cornutus Curtis	*Apiaceae (+ Achi mill, Brassicaceae, Euphorbiaceae, Apiaceae, Lamiaceae, Asteraceae)*	RDB3
Hylaeus gibbus Saunders	*Cirs arve, Achi mill, Pote rept, Leon autu + Apiaceae, Boraginaceae, Campanulaceae, Crassulaceae, Lamiaceae, Polygonaceae, Rosaceae*	RDB3
Lasioglossum angusticeps (Perkins)	*Lotu corn*	RDB3
Lasioglossum laticeps (Schenck)	*Cent nigr, Pote rept, Ranu acri, Sene jaco, Tara offi*	RDB2
Lasioglossum malachura (Kirby)	*Achi mill, Cirs arve, Cirs vulg, Hypo radi, Leon autu, Leuc vulg, Medi sati, Pote rept, Ranu acri, Ranu repe, Sene jaco, Tara offi, Trif repe*	Nationally Scarce a
Lasioglossum pauxillum (Kirby)	*Card prat, Cirs arve, Cirs vulg, Leon autu, Leon hisp, Leuc vulg, Lotu corn, Medi lupu, Pote rept, Ranu acri, Ranu repe, Tara offi*	Nationally Scarce a
Lasioglossum quadrinotatum (Kirby)	*Vero cham*	Nationally Scarce a
Lasioglossum sexnotatum (Kirby)	*Achi mill, Ranu acri, Sene jaco, Tara offi, Vero cham*	RDB1+
Megachile dorsalis Perez	*Cirs vulg, Lotu corn, Plan lanc, Pote rept, Sene jaco, Trif repe*	Nationally Scarce b
Megachile lapponica Thomson	*Chamerion angustifolium (+ Lath prat, Lotu corn, Trifolium, Vici crac)*	RDB1+
Osmia bicolor (Schrank)	*Lotu corn, Onob vici, Ranu acri, Ranu repe, Tara offi*	Nationally Scarce b
Osmia parietina Curtis	*Lotu corn, Trif prat, Vero cham*	RDB3

3.3 Quantifying strength of insect associations with host plants

The vast majority of records of plant:insect interactions identified in this review represent non-quantitative observations. While such records have provided the basis of the analysis presented so far, they have a number of failings, the most obvious of which is there is no direct measure of the strength of the relationship between individual species and host plants. While this is of limited importance for monophagous species, for insects with multiple hosts the identification of host plant preferences is invaluable in predicting the likely biodiversity gains from introducing particular plant species into agriculturally-improved grassland swards.

Assessing the extent of such associations is, however, problematic, not least because of the paucity of data sets available. It is also possible that considerable variation in the strength of associations with different host plants may exist between different sites, reflecting local environmental conditions as well as the availability of alternative host plants. A single study detailing the correlation between insect species and potential host plants based on a single site may therefore be unreliable. For this reason it would be preferential to assess the strength and direction of correlations between insect and host plant abundance based on multiple studies. While it is out of the scope of this review to assess such host plant associations for all oligophagous insects, (both in terms of the paucity of data sets and available time) an approach is presented here to illustrate a method for assessing the strength of these associations for one subset guild of the beetles.

A good example of such species where a number of potential host plants exist can be found in the Apionidae weevils, for example those feeding on clovers (*Trifolium* spp.). While some information is available on *Trifolium* spp. host plant preferences, this is largely anecdotal. For this reason we have focused on identifying specific *Trifolium* spp. host plant associations with the common weevil species *Protapion apricans* (Herbst), *P. assimile* (Kirby), *P. trifolii* (L.), *P. dichroum* (Bedel) and *Ischnopterapion virens* (Herbst). Only three species of *Trifolium* were considered as potential hosts, *T. repens* (white clover), *T. pratense* (red clover) and *T. dubium* (lesser trefoil). These species represent either common components of existing improved grasslands (*T. repens*) or have some potential to be introduced in to improved grasslands (*T. pratense* and *T. dubium*). While other species of *Trifolium* may be

potential hosts of these species of weevil, their occurrence in available data sets was too infrequent to make them useful in any quantitative analysis.

3.3.1 Study sites

In all cases study sites were considered suitable for inclusion in the analysis if adult beetles had been sampled using suction samplers (a quantitative sampling method suitable for grassland invertebrates (Southwood & Henderson 2000)) and sampling points were matched with data on the abundance (percentage cover) of plant species. Within individual sites the specific nature of the sampling regime for both the beetles and plants was not necessarily consistent in its duration and intensity. There was also variation in the types of grasslands, which included lowland improved grasslands (MG6 and MG7), chalk grasslands (CG3), lowland hay meadows (MG5) flood plain meadows (MG4) and grass field margins established on sandy soils (for NVC clasifications see Rodwell 1992). The ten sites included in the analysis were: Salisbury Plain, Salisbury (51:11:52N, 1:57:32W); North Meadow, Cricklade (51:38:17N, 1:51:23W); Somerford Mead, Oxford (51:46:28N, 1:18:19W); Rocks Farm, East Sussex (50:55:56N, 0:24:13E); Dancers End, Buckinghamshire (51:46:29N, 0:41:29W), Bickenhall Farm, Somerset (50:58:47N, 2:59:29W) South Hill Farm, Somerset (50:57:40N, 3:02:53W); Heywoods Farm, Devon (50:48:38N, 3:55:40W) North Wyke Farm, Devon (50:46:4N, 3:55:46W) and ADAS Gleadthorpe, Nottinghamshire (53:13:28N, 1:06:45W).

3.3.2 Statistical analysis

For each study site, the correlation between the abundance of each beetle species and that of potential *Trifolium* spp. host plants was calculated using Pearson's correlation coefficient (Krebs 1999). Within an individual site it was normal for only a subset of the weevil and *Trifolium* species to be present. All correlations were based on $\log_e (N+1)$ values of both individual beetle species abundances and the abundance (percentage cover) of the *Trifolium* spp. in the sward.

To assess the overall responses of each weevil species to the host plant, a statistical approach called meta-analysis was subsequently used. This approach is useful in ecological research as different studies often produce conflicting conclusions in terms of the direction of responses of individual species to environmental gradients, such as host plant abundance. Meta-analysis was used to provide a robust statistical approach to assess the overall population level direction of correlations between weevils and their host plants derived from these studies. The analysis is performed using summary statistics derived from each of these studies (the correlation coefficient, *r*, between beetle and host plant abundance) to determine the direction and strength of the population level response. This response was weighted in each case by the sample size of the individual studies involved.

Although population level responses can be derived using this method for the relationship between beetle and host plant abundance, it is possible that other unconsidered factors may result in a high degree of variation in the individual correlations seen between the individual studies. For example, differences in geographical region or grassland type may have a large effect on the direction of the correlations shown by individual species to host plants. Where this variation between the study sites is minimal the meta-analysis is said to be homogeneous. Where this is not the case, and secondary environmental factors characteristic of each study site result in a large degree of variation in the individual site beetle:host plant correlations,

then the population level response is said to be heterogeneous. Only where homogeneity in the population level response was found can a consistent response to the abundance of a particular host plant across all studies be assumed. Direct tests of homogeneity were therefore made in all cases. These meta-analyses were performed in Meta-Analysis Programs, Version 5.3 (Schwarzer 1989).

3.3.3 Results and discussion

Homogeneity in the population level response of the weevil species to the percentage cover of the *T. dubium* was found for all five weevil species considered (Table 14). For three of the five species this population level response showed a correlation coefficient between weevil abundance and *T. dubium* percentage cover that differed little from zero (r ranging between -0.02 and 0.05). The exceptions to this were for *P. apricans* and *P. trifolii*, both of which showed positive correlations with *T. dubium* percentage cover ($r>0.15$).

Population level responses of the weevils to the percentage cover of *T. pratense* and *T. repens* tended to be more heterogeneous. This suggested that there were additional factors characteristic of individual sites that were creating a large degree of variation in the correlation coefficients between weevil abundances and *T. pratense* and *T. repens* percentage cover. These additional site moderators may include aspects such as geographical location, the combinations of species present within individual sites (both beetles and host plant species) or the local soil and weather conditions. Only in the case of *P. apricans* on white clover and *P. dichroum* on red clover were homogenous population responses found. Identifying what the factors were that resulted in heterogeneity in the population level responses was not practical given the relatively small number of studies included in these analyses.

What this illustrative example demonstrates is that the characterisation of host preferences for oligophagous species may not be a simple procedure. Local site differences may result in unpredictable responses to changes in the abundance of potential host plants. The degree to which this heterogeneity in insect responses to host plant abundance occurs is unclear. It is possible that for the many other oligophagous insects not considered here there are more homogenous population level responses to the abundance of different potential host plants. It should also be noted that the meta-analyses performed for these five species of Apionidae were based on adult and not larval distributions. It is possible that the distribution of adults would not necessarily reflect that of the larvae.

Table 14 Results for the meta-analyses assessing the population level responses in terms of correlation coefficients (r) of five species of Apionidae with three potential host plants from the genus *Trifolium* spp.. For all cases the estimated population effect sizes (r) are given as weighted means with an R^2 value and the observed variance of the effect size expressed as a standard deviation (SD). In all correlations estimated population effect sizes reflect the direction and extent of correlations between the abundance of beetle species and each potential host plant, ranging from -1.0 to 1.0. Using χ^2 tests, the degree of homogeneity in the estimated population level response were assessed, where homogeneity is rejected if $p<0.05$. The number of studies used in each meta-analysis is given in the column N. The percentage of variance explained by the sampling error is given in parenthesis for the test of homogeneity.

Species		N	White clover (*T. repens* L.)	N	Red clover (*T .pratense* L.)	N	Lesser trefoil *(T.dubium* Sibth.*)*
Protapion apricans (Herbst)	Population level effect	2	r = 0.42 R^2 = 0.18 SD = 0.18	2	r = 0.64 R^2 = 0.41 SD = 0.23	2	r = 0.27 R^2 = 0.07 SD =0.07
	Homogeneity		χ^2_1 = 1.94 p = 0.16 (100.0 %)		χ^2_1 = 5.95 p = 0.01 (33.6 %)		χ^2_1= 0.19 p = 0.65 (100.0 %)
Protapion assimile (Kirby)	Population level effect	6	r = -0.06 R^2 = 0.01 SD = 0.23	6	r = 0.28, R^2 = 0.08 SD = 0.21	4	r = 0.05, R^2 = 0.01 SD = 0.08
	Homogeneity		χ^2_5=27.6 p < 0.001 (21.7 %)		χ^2_5= 28.1 p < 0.00 (21.2 %)		χ^2_4=2.23 p = 0.52 (100.0%)
Protapion trifolii (L.)	Population level effect	8	r = 0.09 R^2 = 0.01 SD = 0.20	6	r = 0.29 R^2 = 0.08 SD = 0.23	3	r = 0.15 R^2 = 0.02 SD = 0.11
	Homogeneity		χ^2_7 = 27.5 p < 0.001 (29.0 %)		χ^2_5=35.9 p < 0.001 (16.6 %)		χ^2_2=4.97 p = 0.08 (60.2 %)
Protapion dichroum (Bedel)	Population level effect	8	r = 0.36 R^2 = 0.13 SD = 0.29	6	r = 0.04 R^2 = 0.00 SD = 0.12	3	r = -0.02 R^2 = 0.00 SD = 0.16
	Homogeneity		χ^2_7=67.5 p < 0.001 (11.8 %)		χ^2_5=6.73 p = 0.24 (89.0 %)		χ^2_2=4.89 p = 0.08 (61.2 %)
Ischnopterapion virens (Herbst)	Population level effect	10	r = 0.31 R^2 = 0.09 SD = 0.27	8	r = 0.03 R^2 = 0.00 SD = 0.17	4	r = 0.01, R^2 = 0.00 SD = 0.08
	Homogeneity		χ^2_9=70.5 p < 0.001 (14.1 %)		χ^2_7=18.5 p = 0.01 (43.0 %)		χ^2_3=2.33 p = 0.50 (100.0 %)

3.4 Value for bird species

3.4.1 Value of selected plant species as direct food resources for birds

In most cases dietary information on the use of plant material by birds is only recorded by family or genus, primarily because of the difficulty of identification to species level from plant remains in bird droppings. The relative importance of the 56 plant species for 42 bird species was thus considered in terms of whether the family (Figure 1a-1c) or genus (Figure 2a-2c) was recorded as present or important in bird diets. Appendix 4 gives the bird species-specific information underlying the Figures and the families of all the plant species. Six families were recorded as present in the diet of 20 or more bird species; Poaceae (present in the diet of 34 species), Polygonaceae (29 species), Fabaceae (28), Asteraceae (26), Caryophyllaceae (23) and Ranunulaceae (20) (see Appendix 4 for details). Only four plant families were important in the diet of more than five bird species; Caryophyllaceae (important in the diet of 12 species) Poaceae (10 species), Polygonaceae (8), Brassicaceae (7). It is important to note, however, that data for 'presence' in the diet is almost certainly more reliable than that of 'importance' as the latter tends to be less systematically recorded and is derived from far fewer studies.

Results were generally similar when considering the sub-set of the 17 PSA or Farmland Bird Indicator species. In this case six plant families were present in the diet of 10 or more farmland birds; Asteraceae (present in the diet of 16 species), Poaceae and Fabaceae (14 species), Polygonaceae and Ranunulaceae (13) and Caryophyllaceae (11) and three were considered important in the diet of more than five species; Poaceae and Caryophyllaceae

(important in the diet of 7 species) and Brassicaceae (6). Focussing on the nine declining PSA species three families were present in the diet of eight bird species; Poaceae, Fabaceae and Polygonaceae and four were present in the diet of six bird species; Caryophyllaceae, Lamiaceae, Ranunulaceae and Urticaceae. Only four families were important in the diet of three or more species Poaceae (important in the diet of 6 species), Caryophyllaceae (4 species) Brassicaceae and Polygonaceae (3 species).

An important caveat should be made in relation to these results. In many diet studies plants are only mentioned by family or genus so the species within the family actually taken may not be the grassland species selected for this study. For example, many birds take Caryophyllaceae. The only member of this family/genus on the list of selected plant species is *Cerastium fontanum,* but it is more likely that many of the records of Caryophyllaceae in bird diets will have been *Stellaria* spp., which are the commonest members of the family mentioned when genus is given. Similarly, the family Lamiaceae, present in the diet of 12 bird species (Figure 1a) is a large one and the single species on the selected list, *Prunella vulgaris*, is rarely mentioned, if species is given in the diet, so it is likely to be rather unimportant

Considering the selected plants at the level of genus overcomes this problem for some but not all species (Fig 2a-2c). For all 42 bird species only five genera were present in the diet of more than 15 species (Table 15); *Rumex* spp. (21 species) *Trifolium* spp., *Vicia* spp., *Plantago* spp. (16 species) and *Ranunculus* spp. (15 species). Four other genera present in the diet of 10 or more species; *Poa* spp., and *Centaurea* spp. (13 species) and *Taraxacum* spp. and *Cerastium* spp. (10 species). Only three genera were classed as important in the diet of five or more bird species; *Poa* spp. (9 species) and *Senecio* spp. and *Trifolium* spp. (5 species).

Fig 1a

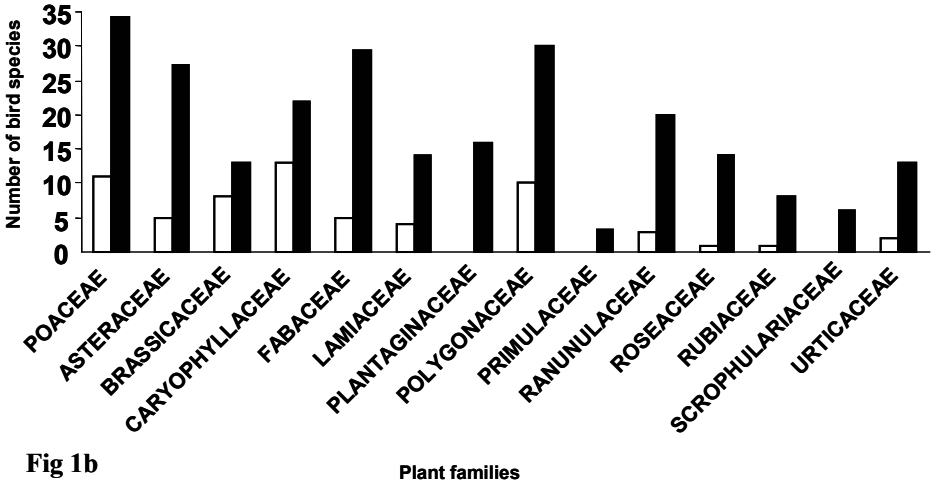

Fig 1b

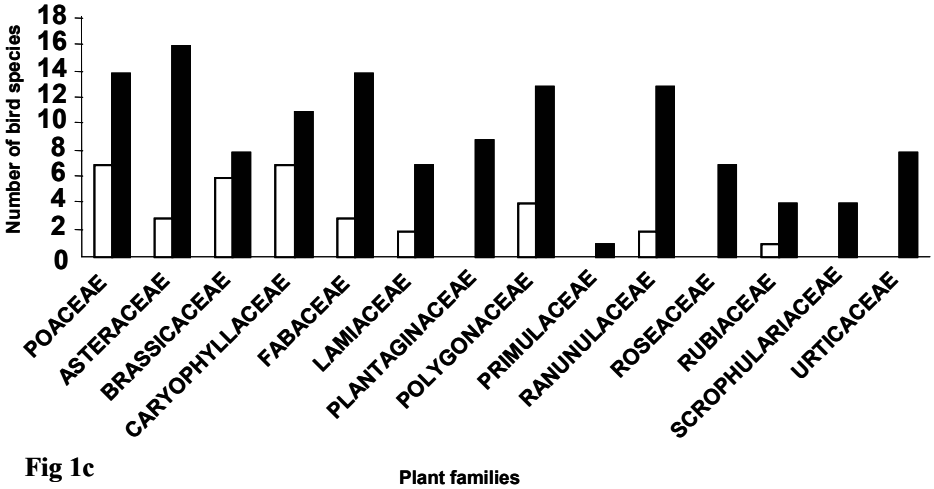

Fig 1c

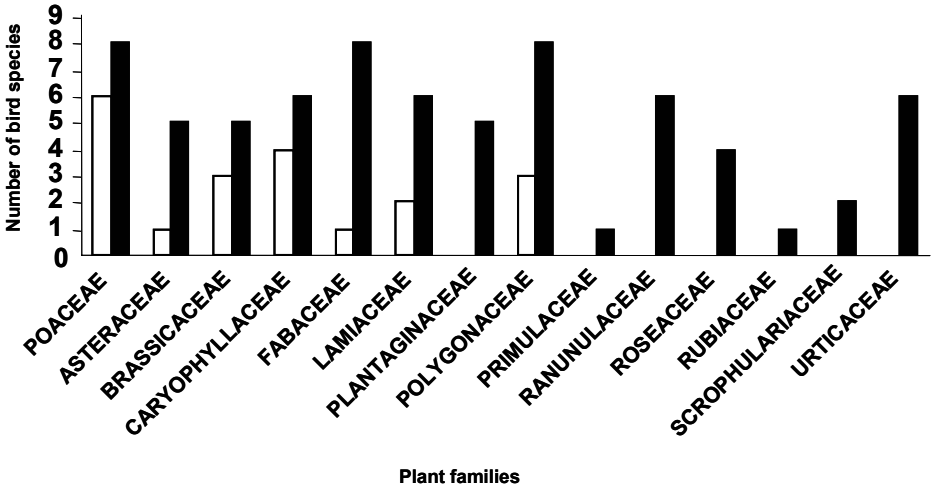

Figure 1 The number of bird species for which plant families (containing the 56 target species) have been recorded as present (filled bars) and important (open bars) in the diet of (a) all farmland bird species, n=42 (for definition see text) (b) PSA bird species n=17 and (c) declining PSA species n=9 (data are presented in Appendix 4).

Fig 2a

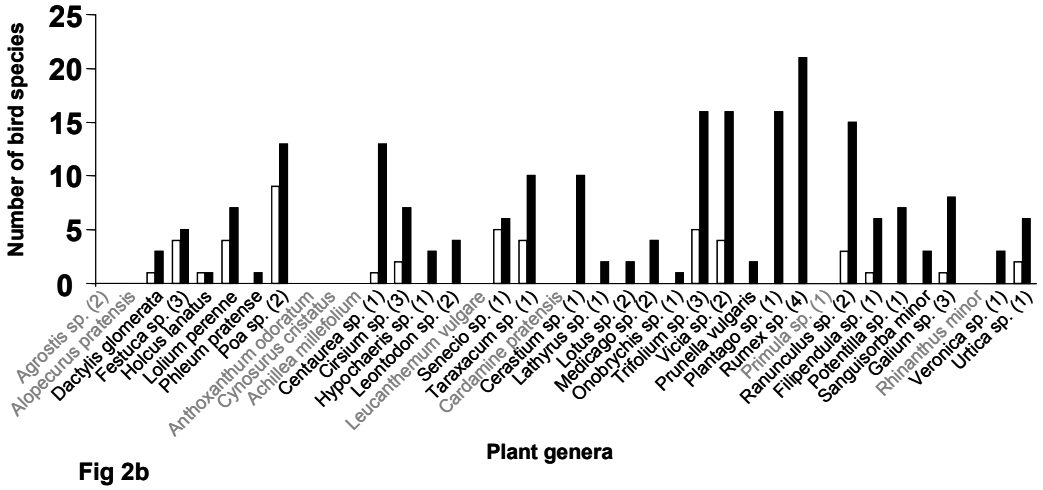

Fig 2b

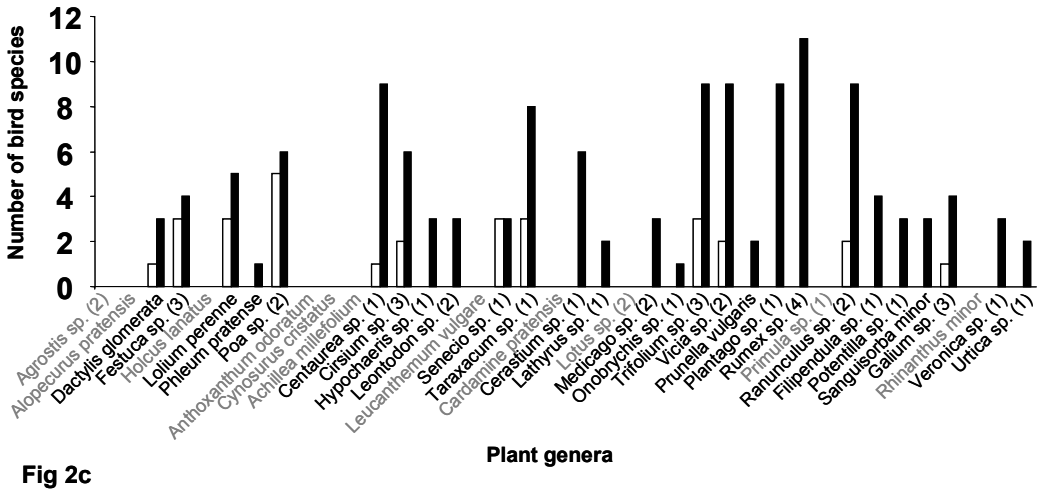

Fig 2c

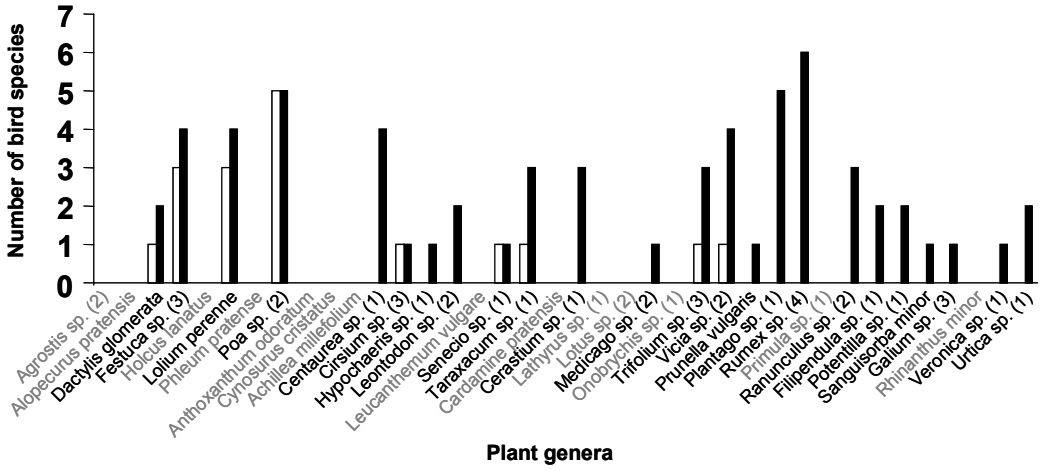

Figure 2 The number of bird species for which plant genera (containing the 56 target species) or species have been recorded as present (filled bars) and important (open bars) in the diet of (a) all farmland bird species, n=42 (for definition see text) (b) PSA bird species n=17 and (c) declining PSA species n=9. Genera /species in grey were not recorded in the diet of any of the birds considered. Numbers in parenthesis represent the number of selected plant species in each genus (data are presented in Appendix 4)**.**

Table 15 Plant genera ranked in order of importance as direct sources of food for farmland bird species and species included in the PSA target (for bird species included see **Table 2)**. Rank 1 = the plant genus that was present in the diet of the largest number of birds, n= number of bird species for which each genus was recorded in the diet.

	All bird species (42)		PSA species (17)		Declining PSA species (9)	
1	*Rumex*	21	*Rumex*	11	*Rumex*	6
2	*Trifolium*	16	*Centaurea*	9	*Poa*	5
3	*Vicia*	16	*Trifolium*	9	*Plantago*	5
4	*Plantago*	16	*Vicia*	9	*Festuca*	4
5	*Ranunculus*	15	*Plantago*	9	*Lolium*	4
6	*Poa*	13	*Ranunculus*	9	*Centaurea*	4
7	*Centaurea*	13	*Taraxacum*	8	*Vicia*	4
8	*Taraxacum*	10	*Cerastium*	6	*Taraxacum*	3
9	*Cerastium*	10	*Poa*	6	*Cerastium*	3
10	*Urtica*	8	*Cirsium*	6	*Trifolium*	3
11					*Ranunculus*	3

Table 16 The 11 plant genera recorded as present in the diet of more than 8 PSA species and/or important in the diet of more than 3 PSA species. The common names of the bird species relating to each plant genera are listed (see Appendix 4).

Plant genera	**Present**	**Important**
Festuca spp.		Turtle dove, yellowhammer, reed bunting
Lolium spp.		Tree sparrow, yellowhammer, reed bunting
Poa spp.		Grey partridge, tree sparrow, linnet, yellowhammer, reed bunting
Centaurea spp.	Grey partridge, stock dove, turtle dove, rook, jackdaw, linnet, greenfinch, goldfinch, yellowhammer	
Senecio spp.		Linnet, greenfinch, goldfinch
Taraxacum spp.		Linnet, greenfinch, goldfinch
Trifolium spp.	Grey partridge, stock dove, wood pigeon, rook, jackdaw, linnet, greenfinch, goldfinch, yellowhammer	Grey partridge, stock dove, wood pigeon
Vicia spp.	Grey partridge, stock dove, wood pigeon, turtle dove, rook, jackdaw, starling, greenfinch, yellowhammer	
Plantago spp.	Wood pigeon, rook, starling, tree sparrow, linnet, greenfinch, goldfinch, yellowhammer, reed bunting	
Rumex spp.	Grey partridge, lapwing, stock dove, skylark, jackdaw, linnet, greenfinch, goldfinch, yellowhammer, reed bunting, corn bunting	
Ranunculus spp.	Stock dove, wood pigeon, rook, starling, linnet, greenfinch, goldfinch, yellowhammer	

Similar genera emerge as being those most frequently present in the diet of PSA species. In this case, seven genera were present in the diet of more than eight species *Rumex* spp. (11 species), *Centaurea* spp., *Trifolium* spp., *Vicia* spp., *Plantago* spp. *Ranunculus* spp. (9 species) and *Taraxacum* spp. (8 species, see Table 16). However, more grass species were considered important in the diet of these PSA species, *Poa pratensis* (important for 5 species) and *Festuca* spp. and *Lolium* spp. (3 species) as well as the forbs *Senecio* spp., *Taraxacum* spp., and *Trifolium* spp. (3 species).

Once again, there are a number of important caveats associated with the plant genera results. First, plants are very rarely recorded in bird diets at species level. Where more than one possible plant species occurs in the list this number is shown in brackets at the end of the genus name (Figure 2a-2c). The literature may, however, refer to any of the species on the list and there are three instances where we feel this may be particularly misleading. The first is for *Poa* spp., there are two selected species of *Poa* (*P. pratensis* and *P. trivialis*) but when plant species is mentioned in the literature it is usually *Poa annua*. Similarly, *Senecio* spp. is another apparently important plant genus, but the selected *Senecio* is *S. jacobaea* (ragwort) whereas most, if not all, references to *Senecio* actually refer to S. *vulgaris* (groundsel). Finally, the species of *Urtica* on the list is *U. dioica* (common nettle) and when species is mentioned within this genus it is almost always *U. urens* (annual nettle).

The ranking of the plant genera/species in relation to presence in the diet are summarised in Table 15 for all species, all PSA species and declining (Red List) PSA species. Based on these data, *Rumex* spp. emerge as consistently of the highest value as a direct food source for birds. The selected species within this genus being two pernicious weeds *R. crispus* (curled dock) and *R. obtusifolius* (broad-leaved dock) and *R. acetosa* and *R. acetosella* (common and sheep's sorrel respectively). The other genera that emerge as important across all three groups of birds are non-legume forbs; *Centaurea* spp. (*C. nigra* common knapweed), *Plantago* spp. (*P. lanceolata* ribwort plantain), the legumes *Trifolium* spp. (selected species *T. dubium* lesser trefoil, *T. pratense* red clover, *T. repens* white clover) and *Vicia* spp. (*V. cracca* tufted vetch, *V. sativa* common vetch) and grasses *Poa* spp. (*P. pratensis* and *P trivialis* smooth and rough meadow-grass).

The primary sources of data (see Appendix 4) rarely distinguish between seeds or green material. Green material is only mentioned specifically in relation to clovers and legumes (Cramp, 1985, 1988, Cramp & Perrins 1994a, 1994b, Cramp & Simmons 1983). In addition, only a small number species will graze on green vegetation, species such as Woodpigeon and Skylark for example. Thus, the majority of occurrences of these target plants in the diet of farmland birds will be seeds.

3.4.2 Value of selected plant species as indirect food resources for birds

The indirect food resource value of these selected plant species for birds was considered using a slightly different approach than that adopted for the direct value. The number of insect species known to be important (from Wilson and others 1999) in the diet of farmland birds and having specialist associations with each of the 56 plant species was derived from data presented in previous sections (Figure 3). These data suggest that nine of the selected plant species have specific associations with 50 or more insect prey species, all of which have been recorded as important in the diet of farmland birds; *Dactylis glomerata* (cock's-foot) (69 species), *Lotus corniculatus* (common bird's-foot-trefoil) (67), *Festuca ovina* (sheep's fescue) (66), *Trifolium pratense* (red clover) and *T. repens* (white clover) (59), and, *Festuca rubra* (red fescue) (55), *Poa pratensis* (smooth meadow-grass) (53), and *Rumex acetosella* (sheep's sorrel) (50). To rank these plants in the same way as for their direct value we assigned a rank based on the maximum number of insects recorded on any one species within the genera. This resulted in the following species as being ranked as the top five for their indirect food resource value for birds *Dactylis glomerata*, *Lotus* spp., *Festuca* spp., *Trifolium* spp., and *Poa* spp. (Table 17).

The most important caveat to these results relates to the relationship between number of insect species with specialist associations with each of the plant species and the potential variability in the relative abundances of these species on their host plants, and thus their potential value as a prey item. Whilst prey diversity is likely to be important for farmland birds, abundance is almost certainly more important. Thus the use of diversity as an index of plant value may be misleading. This is illustrated by contrasting the ranking of insect associations in the table of polyphagous and general associations with the selected plants (Table 12) to gauge their possible importance for birds. In this table, the descending order of importance of the top ten genera based on the number of associated insects would be: *Taraxacum*, *Rumex*, *Cirsium*, *Senecio*, then equal *Plantago*, *Lotus, Trifolium*, followed by *Achillea*, *Urtica* and *Centaurea*.

Table 17 Plant genera ranked in order of importance as direct and indirect sources of food for farmland bird species (for bird species included see Table 2). Rank 1 (invertebrates) is the genus (ranked by the individual plant species within the genus) having the largest number of specific invertebrate associations among species. Rank 1 for plant food as for Table 14**.**

Rank	**Direct (seeds, leaves)**	**Indirect (specific invertebrates)**
1	*Rumex*	*Dactylis*
2	*Trifolium*	*Lotus*
3	*Vicia*	*Festuca*
4	*Plantago*	*Trifolium*
5	*Ranunculus*	*Poa*
6	*Poa*	*Rumex*
7	*Centaurea*	*Cirsium*
8	*Taraxacum*	*Achillea*
9	*Cerastium*	*Galium*
10	*Urtica*	*Vicia*

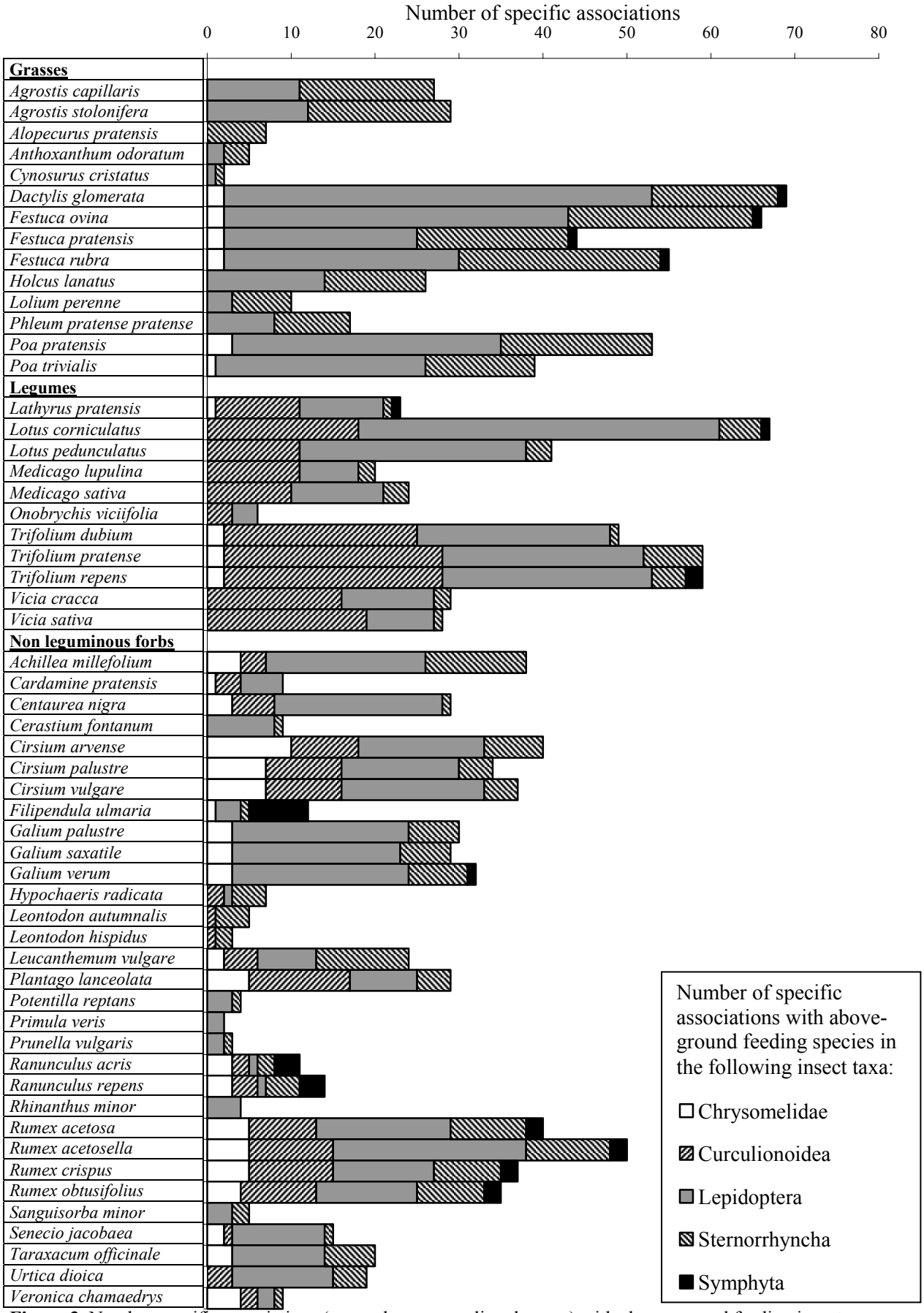

Figure 3 Number specific associations (monophagous or oligophagous) with above-ground feeding insect species in five taxa known to be important in the diet of farmland birds.

3.4.3 Conclusions on diet value for birds

The nature of dietary studies for birds limits the robustness of the conclusions we can make about the potential value of the selected plant species as food sources in grassland. In general the direct value of these plants derives from their seeds and as many of these, eg Polygonaceae and Caryophyllaceae, are considered weed species within agricultural systems, there may be considerable resistance to management options in which these plants are able to set seed. Furthermore, to significantly increase the seed resources for birds these plants would need to be present in large numbers and/or over large areas. In terms of cost effectiveness, two approaches seem likely to provide more cost effective approach to enhancing seed food resources for birds. The first option is to plant fields, within-field plots or margins with arable crops or wild bird cover crops to create a very high density of seed throughout the winter. These have been shown to attract a wide range of passerine and game birds (Robinson and others 2001, Henderson and others 2004) and trials of sown margins (undersown cereal and wildbird cover crops) in grassland systems have been shown to attract good numbers of granivorous passerines (Defra project BD 1444). A second option is that of leaving final-cut grass silage in situ over winter as a seed resource (Buckingham et al 2004, Buckingham & Peach in prep). Trials have shown that fertile ryegrass (*Lolium* spp.) swards left to set seed attract high numbers of yellowhammers and reed buntings, but not finches. This method of providing seed in winter would be less costly as an agri-environmental option than wild bird cover crops (currently £510/ha compared to £250/ha paid to farmers trialling uncut silage) and as an option that would utilise fertile ryegrass swards would have wide applicability. However, the accumulation of senescent foliage on these ungrazed and uncut swards can result in significant loss in silage yield the following season and further research is ongoing to minimise sward damage and agricultural costs.

Promoting invertebrate prey in grassland depends on the balance between promoting abundance and accessibility of prey (Vickery and others 2001, Atkinson and others 2005). Tall swards can support abundant insect communities but these are often inaccessible to birds. Many studies have recommended that management should seek to deliver a mosaic of tall and short swards (eg Devereux and others 2004, Atkinson and others 2005, Buckingham and others 2006) but the scale at which this should be done remains unclear. Increasing the species complexity of swards through the addition of some of the plant species considered here will undoubtedly enhance food abundance for birds. However the relative benefits for birds of increasing the species diversity as opposed to the structural complexity remain unclear. The two are of course related, but structural complexity could be altered relatively simply, for example by modifying mowing or grazing regimes.

In summary, increasing sward species richness with plants was shown to be valuable as direct and indirect sources of food for birds will undoubtedly benefit farmland birds in grass systems. The direct benefits are likely to be relatively small compared, for example, with options such as wild bird cover crops or whole crop silage, as these options have been ‘tailor made’ for birds and provide much higher seed densities for birds. The indirect benefits, in terms of invertebrate prey availability, could be much greater because of the nature and range of grassland invertebrates the target plant species support but this will depend crucially on the spatial scale at which these plants are introduced, both in terms of area and distribution at the field and landscape scale.

3.5 Caveats to the invertebrate and bird results

We have adopted a relatively simple, but pragmatic, approach to rank the selected plant species in terms of their diet and microhabitat value for invertebrates and their direct (green material and seed) and indirect (associated insects) food value for birds. However, there are a number of important caveats to these results.

3.5.1 Poor data on microhabitat requirements and phenology of insect species

Data on over 2,600 associations between insect species and the selected plant species was collected for this study. However, the quantity and quality of data varied considerably between taxonomic groups. For some taxa, such as the Lepidoptera, it was easy to gather consistent information on feeding location and insect phenology. However, for several taxa (eg Sternorrhyncha) this data was absent or based on casual or unique observations. Information on the host plant preferences of different insect taxa also varies in quality, with little known about the preferences of many oligophagous and polyphagous species. In addition, the geographical distribution of the species in many taxa in the UK is poorly known and in the case of some groups (eg Heteroptera) changes in the accepted distributions of species are being observed at present, while long term changes in the distribution of most taxa are probable. In addition information on the conservation status for many taxa is either poor or, at present, undescribed. This is again a reflection of the poor distributional information avaliable for many species, eg the Cecidomyiidae.

Data on how each invertberate species utilised their host plant(s) was limited by the level of detail of the information available in the literature. For these practical reasons therefore it was necessary to assign invertebrates according to their functional usage of plant structure to a series of relatively broad catagories, the broadest of which being general shoot feeders. Whilst this may be a useful description, it masks that fact that many of the constituent species will have preferences for different microhabitats. Whilst systematically acquiring data on the ecology of insect species may be useful for species of conservation concern, it is clearly impractical for the large number of common or widespread insect species listed in this review.

3.5.2 Absence of data on population distribution and density

The review of insect requirements has focussed on the mono- and oligo-specific associations between insect and plant species. Whilst the data gathered allows comparison of the number of species of specialist insects associated with each plant species, it may not provide a good estimate of the likely gains in insect species richness if the plant species were to be introduced into a grassland sward. Firstly, it takes no account of the geographical distribution of the associated insect species. Colonisation of newly-established populations of plant species by their associated fauna is influenced by the local and regional species pool. Secondly, no information is available on the plant population characteristics necessary for a particular insect association to occur. The value of a particular plant population to an associated insect will depend on the size, age structure, architecture and spatial distribution of the host plant.

3.5.3 Taxonomic detail of bird diet

The level lack of taxonomic detail in many bird diet studies undoubtedly limits the robustness of the approach. Plants are rarely if ever recorded in the diet of birds at species level, most studies only recording to genus or family level. This makes it impossible to assess the particular value of the selected plant species, since many genera contain more than one species. As outlined above there are three genera for which this may be particularly important; *Poa, Senecio* and *Urtica*. In each of these cases the selected plant species are unlikely to be the ones taken by birds. *Senecio* spp., and *Urtica* spp. did not commonly feature as important in the review, but the apparent importance of *Poa* spp. should be interpreted with caution. Invertebrates are also rarely recorded in the diet of birds to species level and so the lack of taxonomic detail also limits the accuracy of the assessment of the value of plants in terms of the insects they support.

3.5.4 Differences in the relative value of bird diet items

The measures of food value used for birds could bias the results in several ways. In the case of plants , we have scored importance according to how frequently it appears in the diet of 42 bird species. Based on expert knowledge of the ecology of these birds, it is highly likely that the occurrence will frequently refer to seeds rather than green material. The method we have used to score value ignores differences between plants in terms of timing and level of seed production and seed weight. For example a single plant of *Plantago lanceolata* produces 1000-10000 seed per plant compared with 100-1000 per plant for *Ranunculus repens* and although these plants have seeds of similar weights (c. 2.0 mg) seeds of *Vicia sativa* and *V. cracca* are markedly bigger (mean weight 18 and 14 mg respectively) (Grime, Hodgson & Hunt 1988). We have not weighted scores in relation to these differences and so these biases are not accounted for in the results. Overall differences in seed size may result in over-estimation of the importance of small seeds and an under-estimation of the importance of larger ones.

In the case of insects eaten by birds, we have attributed the highest indirect food value to the species supporting the greatest number of specialist associations with insects. However, absolute abundance is almost certainly more important than diversity *per se* (eg Brickle and others 2000, Hart and others 2006) and the relationship between the two is complex such that abundance cannot be used as an index of diversity or vice versa. Two species of insect associated with the same plant species may occur at very different population densities, reflecting not only differences in the population ecology of the two species, but also the prevailing environmental conditions. Even if it were possible to score plants for abundance these data would still suffer the same bias as the seed data, namely that size of the insect prey (and so profitability) cannot be accounted for readily.

4 Agronomic potential of selected plant species

4.1 Agronomic value under ruminant livestock production

The results of the review of the agronomic properties of the selected plant species are shown in Appendix 5 and summarised in Tables 18 and 19. The implications of the findings are considered further below. The term 'agronomic value' is considered here in its widest sense. First, there are the conventional *measurable attributes of sward species* that relate to herbage mass and its basic feed value: production and utilization as harvested dry matter under cutting and/or grazing; responsiveness to fertilizers; seasonality of herbage accumulation; digestible organic matter content and crude protein content; and, in the case of legumes, the ability to supply nitrogen (N) to the sward through biological fixation. Secondly, there are additional *management characteristics of sward species*, such as the availability of seed at affordable prices; ease of sward and plant species establishment; ability of the species to maintain agriculturally-useful forage when required and be persistent and resilient to stresses due to environmental perturbation (drought, frost, inundation etc) or to management stress (periodic over- or under-grazing, poaching); and flexibility of use in terms of suitability for mowing and grazing, including grazing by different types of livestock and ease of ensilabilty.

These attributes and management characteristics have underpinned the requirements of the 'productionist' model of grassland use that developed in Britain in the post-Second World War period (ie maximizing herbage production and utilization in order to improve the reliability of food production, increase national self-sufficiency in agricultural commodities and to provide farmers with improved incomes). Since ryegrass (*Lolium* spp.) and, to a lesser extent, white clover (*Trifolium repens*) and a few other sown grasses (cock's-foot *Dactylis glomerata*, timothy *Phleum pratense*, meadow fescue *Festuca pratensis*, tall fescue *Festuca arundinacea*) provide a 'good fit' in terms of matching plant and sward characteristics to most farmers' (and advisers') perceived requirements, the potential agronomic value of most other grasses and almost all forb species (including many legumes) has largely been ignored.

For many farmers, particularly dairy producers and lowland beef and sheep producers selling into a commodity-based market (ie one without opportunity for higher prices associated with quality product differentiation) herbage mass and forage utilization are particularly important issues. Swards based on N-fertilized ryegrass are comparatively easy to manage under grazing by cattle and sheep, as well as for silage or hay, but are becoming increasingly expensive to maintain under current cost and price structures. There is some farmer interest (and this is probably increasing) in swards containing legumes, particularly white clover (*Trifolium repens)*, because of their superior feed value, their ability to maintain a high level of digestibility over a longer period than pure grass swards, and through the potential to support biological N fixation and thereby reduce or even eliminate the need for nitrogen fertilizer.

Legumes have a pivotal role in most organic livestock farms, and although clover-based swards are regarded as unreliable or risky by many livestock farmers inexperienced in their use, the present high price of fertilizer N is serving as an impetus to their wider adoption in mainstream farming. Red clover (*Trifolium pratense*) and lucerne (*Medicago sativa*) have more precise edaphic and management requirements than white clover, but have also proved their value as low input yet highly productive forage crops, particularly for silage. Where there is a requirement for short duration leys (2-3 harvest years) they outperform most N-

fertilized grass systems in terms of herbage mass, forage quality and animal response, and are superior in economic terms (Wilkins and Paul, 2002). There is a clearly defined role for these three legume species within mainstream dairy, beef and sheep production, as well as for organic and other low-input systems, at least on land that meets their growth requirements.

Other legumes, notably bird's-foot trefoil (*Lotus corniculatus* and its related species *L. pedunculatus*) have a niche rôle and increased potential, particularly in the context of fields with lower nutrient status, with increasingly recognized nutritional and/or advantages associated with condensed tannins (discussed below). Sainfoin (*Onobrychis vicifolia*) also has good agronomic characteristics, highly suited to organic and low input systems on free-draining alkaline soils, with very high nutritional values, drought resistance, and ideally suited to mowing with some rotational grazing. Thus, we have six legume species that can be regarded as having very good agronomic properties and potential for a wider use in grassland farming. The other legumes considered in this review (*Lathyrus pratensis, Medicago lupulina, Trifolium dubium, Vicia cracca* and *V. sativa*) are essentially non-crop species, for which there is little agronomic information, and while they may be expected to contribute to forage resources and N fixation on swards where they occur, their contributions will usually be minor, of interest more for their conservation value than their production.

In the context of this review we also considered the properties of sward species that might have a role in grassland over and beyond their interest to conservationists, including agricultural management consistent with the more sustainable and multi-functional model of agriculture envisaged in the latest CAP Reform measures (Defra/ HM Treasury, 2005). This includes the need for compliance with environmental regulations, and opportunities for additional payments from Environmental Stewardship and other management agreements that help deliver environmental benefits, improved animal health and welfare, and measures to improve the sustainability of rural economies.

Drivers for biodiversity protection within the farmed landscape have hitherto resulted from environmental policies (Habitats Directive 92/43/EEC, etc) which have often been at odds with agricultural policy drivers. CAP Reform, with its decoupling of payments from agricultural production, combined with a range of new measures introduced under the amended Rural Development Regulation (EC) No 1257/1999 - including incentive payments for improvements in the quality of agricultural products and assurance schemes, and financial support to help farmers meet statutory standards not yet included in national legislation - extends the scope for multiple objectives from agricultural land. In the context of farmed grassland, plant species whose agronomic attributes as sward constituents under relatively high nutrient input systems may have been considered undesirable to farmers, might now be re-evaluated for agronomic attributes other than just herbage productivity and digestibility. Examples include:

- Effects on soil structure associated with different rooting structure and development, eg species that develop deep roots, with associated implications for drainage and uptake of water and nutrients, and resilience to environmental stresses such as drought;
- Potential for complementarity in terms of niche exploitation, enabling greater resource use under low inputs than for botanically simple swards (Loreau and Hector, 2001);

- Different concentrations of macro- and micro-nutrients to those present in the herbage of the main sown grassland species;
- The presence of complex phytochemicals (eg alkaloids, glucosides, tannins) that may have either positive or negative impacts on animal health and nutrition;
- Variation between different sward components in the n-3/n-6 fatty-acid ratio, with consequent implications for food products and human nutrion.

4.1.1 Productivity and feed value

Several issues limit the ability to carry out *quantitative* comparisons of the characteristics of the various species under consideration. Although, with few exceptions, information on the grass and legume species is readily available, information on the productivity, feed value, animal health impacts and other variables describing agronomic value is absent from the literature for most of the selected non-leguminous forbs (see Appendix 5 and summaries in Tables 18 and 19). Secondly, the methods employed to quantify some of the important characteristics vary between studies. For example, data on productivity is derived from studies employing a range of techniques, from mesocosms to field studies, and from monocultures to mixtures, and different management strategies (cutting, grazing or simulated grazing).

Data on agricultural grass species and forage legumes is often quoted with reference to values for *Lolium perenne*, including those for species sown in monoculture, allowing comparison between species (Frame, 1989; 1991) or between ryegrass swards and multi-species permanent swards (Hopkins and others, 1990; Hopkins, 2000). In the case of swards where there is a dominant grass species present (eg *Festuca rubra, Holcus lanatus, Agrostis* spp.) information exists for permanent swards characterized by high proportions of each of these species. Many of the other grass species considered in this review (*Alopecurus pratensis, Cynosurus cristatus, Anthoxanthum odoratum, Poa trivialis*) are characteristic species of particular vegetation communities but individually they seldom dominate permanent swards or, if so, are seasonally dominant (eg *A. pratensis* on MG4 wet meadows).

A review of experiments on herbage production from permanent swards carried out for MAFF (Hopkins, 2000) summarized the productivity of different types of permanent swards and reported that, in most cases, their harvested forage production was comparable to that of sown perennial ryegrass, or even greater, but that responses to fertilizer N were lower than on ryegrass swards, and the digestible organic matter content was also generally lower than for ryegrass. Swards containing a high proportion of *F. rubra* tended to be less productive (relative to identically managed ryegrass) than most other permanent swards (*Agrostis, H. lanatus* etc) when similarly compared to ryegrass. Data on the period of peak growth rate is sparse in the UK literature, except for the common sown grasses, through there is more information from central and eastern Europe that may be relevant here. In general, most grass species have peak growth rates in the spring, exceptions being *Agrostis capillaris, A. stolonifera, Festuca rubra* and *Poa pratensis*.

Table 18 Productivity and phenological characteristics of the plant species (blank cells: no data).

Grasses	Life history[1]	Productivity[2]	Leaf phenology	Peak growth months	Flowering months
Agrostis capillaris	P	++	Evergreen	.....JJA....	.....JJA....
Agrostis stolonifera	P	++	Evergreen	.......ASO..	......JA....
Alopecurus pratensis	P	++	Evergreen	..MAM.....	...AMJ.....
Anthoxanthum odoratum	P	++	Evergreen	..MAM...SO..	...AMJ.....
Cynosurus cristatus	P	++	Evergreen	..MAMJJ.....	.....JJA....
Dactylis glomerata	P	+++	Evergreen	...AMJJA....	....MJJ.....
Festuca ovina	P	+	Evergreen	..MAM.....	....MJJ.....
Festuca pratensis	P	+++	Evergreen	..MAM.....	......J.....
Festuca rubra	P	++	Evergreen	.....JJA....	....MJJ.....
Holcus lanatus	P	+++	Partial evergreen	..MAMJJASO..	.....JJ.....
Lolium perenne	P	+++	Evergreen	..MAMJJASO..	....MJJA....
Phleum pratense pratense	P	++	Evergreen	..MAMJJA....	.....JJ.....
Poa pratensis	P	++	Evergreen	.....JJA....	....MJJ.....
Poa trivialis	P	+	Evergreen	..MAM.....	.....J.....
Legumes					
Lathyrus pratensis	P	+ ?	Seasonal (spr-aut)	..MAMJJA....	....MJJA....
Lotus corniculatus	P	+++	Seasonal (spr-aut)	..MAMJJA....	.....JJAS...
Lotus pedunculatus	P	+++	Seasonal (spr-aut)	..MAMJJA....	.....JJAS...
Medicago lupulina	A (or P)	+	Evergreen	..MAMJJA....	....MJJA....
Medicago sativa	P	+++	Evergreen		.......AS...
Onobrychis viciifolia	P	++	Evergreen	..MAMJJASO..	.....JJA....
Trifolium dubium	Aws	+	Seasonal (aut-sum)	..MAMJJ.....	....MJJASO..
Trifolium pratense	P	+++	Evergreen	....MJJA....	....MJJAS...
Trifolium repens	P	+++	Evergreen	....MJJA....	.....JJAS...
Vicia cracca	P	++ ?	Seasonal (spr-aut)		.....JJA....
Vicia sativa	Aw	++	Seasonal (aut-sum)	..MAMJJA....	....MJJAS...
Non leguminous forbs					
Achillea millefolium	P	+++	Evergreen	..MAM.....	.....JJA....
Cardamine pratensis	P	+ ?	Evergreen	..MAM.....	...AMJ.....
Centaurea nigra	P	++	Seasonal (spr-aut)	.....JJA....	.....JJAS...
Cerastium fontanum	P or (A)	+	Evergreen	..MAMJJASO..	...AMJJAS...
Cirsium arvense	P	+++ ?	Seasonal (spr-aut)	..MAMJJA....	......JAS...
Cirsium palustre	MP	+ ?	Evergreen	.....JJA....	......JAS...
Cirsium vulgare	MP	+++ ?	Evergreen	..MAMJJA....	......JAS...
Filipendula ulmaria	P	+	Seasonal (spr-aut)	.....JJA....	.....JJA....
Galium palustre	P	+	Partial evergreen	.....JJA....	.....JJ.....
Galium saxatile	P	+	Evergreen	.....JJA....	.....JJA....
Galium verum	P	+ ?	Evergreen	.....JJA....	......JA....
Hypochaeris radicata	P	+ ?	Partial evergreen	.....JJ.....	.....JJAS...
Leontodon autumnalis	P	+ ?	Evergreen	.....JJA....	.....JJASO..
Leontodon hispidus	P	+ ?	Seasonal (spr-aut)	..MAMJJA....	.....JJAS...
Leucanthemum vulgare	P	++	Evergreen	..MAMJJA....	.....JJA....
Plantago lanceolata	P	+++	Evergreen	..MAMJJ.....	...AMJJA....
Potentilla reptans	P	+ ?	Partial evergreen		.....JJAS...
Primula veris	P	+ ?	Evergreen	..MAMJJA....	...AM.....
Prunella vulgaris	P	+ ?	Evergreen	....MJJA....	.....JJAS...
Ranunculus acris	P	+ ?	Evergreen	..MAMJJA....	....MJJ.....
Ranunculus repens	P	++ ?	Evergreen	..MAM.....	....MJ.....
Rhinanthus minor	As	+	Seasonal (spr-aut)	..MAMJJA....	....MJJA....
Rumex acetosa	P	++ ?	Evergreen	..MAMJJA....	....MJ.....
Rumex acetosella	P	+ ?	Evergreen	..MAMJJA....	....MJJ.....
Rumex crispus	P (or A)	++	Evergreen	..MAMJJA....	....MJJAS...
Rumex obtusifolius	P	+++	Evergreen	..MAMJJA....	.....JJASO..
Sanguisorba minor	P	+	Evergreen	..MAMJJA....	.....JJ.....
Senecio jacobaea	MP	++ ?	Evergreen	..MAMJJA....	.....JJASO..
Taraxacum officinale	P	++	Evergreen	..MA.....	..MAMJJASO..
Urtica dioica	P	+++ ?	Partial evergreen	..MAMJJA....	.....JJ.....
Veronica chamaedrys	P	+ ?	Evergreen	..MA.....	...AMJJ.....

1. Life History: P perennial, MP monocarpic perennial, Aw winter annual, As spring annual.
2. Productivity uses subjective scale based on references in Appendix 5: + low, ++ medium, +++ high. ? denotes no information found in the literature and assessment based on size and established strategy (Grime and others 1988).

Table 19 Utilization characteristics and persistence of the plant species in grazing, hay and silage systems (blank cells: no data available).

Grasses	Feed value	Animal health issues	Grazing	Hay	Silage
Agrostis capillaris	+++		+++	++	++
Agrostis stolonifera	+++		+++	++	++
Alopecurus pratensis	+	some –ve effects	+	+	
Anthoxanthum odoratum	++	some –ve effects	+++	++	
Cynosurus cristatus	+++		+++	+	
Dactylis glomerata	+++		+++	+++	+
Festuca ovina	+		+++	+	
Festuca pratensis	+++		+++	+	
Festuca rubra	+		+++	++	
Holcus lanatus	+		+++	++	
Lolium perenne	+++		+++	++	+++
Phleum pratense pratense	+++		+++	+++	++
Poa pratensis	+++		+++	++	+
Poa trivialis	++		+++	++	
Legumes					
Lathyrus pratensis	+	? seeds poisonous*	0	++	
Lotus corniculatus	+++	-ve effects in quantity	++	++	++
Lotus pedunculatus	+++	-ve effects in quantity	++	++	
Medicago lupulina	+		+	+	
Medicago sativa	+++	-ve effects in quantity	0	++	++
Onobrychis viciifolia	+++		+	++	
Trifolium dubium	+		+	+	
Trifolium pratense	+++	-ve effects in quantity	++	++	+++
Trifolium repens	+++	-ve effects in quantity	++	+	+++
Vicia cracca		? seeds poisonous*	+	+	
Vicia sativa	+++	? seeds poisonous*	+	++	+
Non leguminous forbs					
Achillea millefolium	++	some –ve effects	++	+	+
Cardamine pratensis		poisonous for horses	++	++	
Centaurea nigra			++	++	
Cerastium fontanum			+	+	
Cirsium arvense	0	injurious	++ (avoided)	++	
Cirsium palustre			++ (avoided)	+	
Cirsium vulgare	0	injurious	++ (avoided)	++	
Filipendula ulmaria			+	+	
Galium palustre			+	0	
Galium saxatile			+	0	
Galium verum	++		++	+	
Hypochaeris radicata	++	poisonous for horses	++	+ (low contribution)	
Leontodon autumnalis			++	+ (low contribution)	
Leontodon hispidus		some –ve effects	++	+ (low contribution)	
Leucanthemum vulgare			+	++	
Plantago lanceolata	++		++	++	+
Potentilla reptans			+	+	
Primula veris			++ (avoided)	+ (low contribution)	
Prunella vulgaris			++ (avoided)	+ (low contribution)	
Ranunculus acris		poisonous	++ (avoided)	++	
Ranunculus repens		may be poisonous	++	+	
Rhinanthus minor		may be poisonous	0	++	
Rumex acetosa	+	poisonous in quantity	++	++	
Rumex acetosella		poisonous in quantity	+	0	
Rumex crispus	+	some –ve effects	++ (avoided)	++	
Rumex obtusifolius	+	some –ve effects	++ (avoided)	++	
Sanguisorba minor			++	+	
Senecio jacobaea	0	poisonous	++ (avoided)	++	
Taraxacum officinale	++	some –ve effects	++	+	+
Urtica dioica	+		++ (avoided)	++	
Veronica chamaedrys			+	+	

Scoring uses a subjective scale based on information presented in Appendix 5: 0 unsuitable, + low, ++ medium, +++ high.
* E. O'Beirne-Ranelagh, personal communication.

In the case of the selected non-leguminous forb species the information in the literature on productivity, feed value etc. is sparse (Isselstein, 1995). Productivity and phenology of the selected species is shown in Table 18. Most of the selected species are evergreen perennials, although their contribution to forage resources is usually seasonal. Productivity is generally low for the non-leguminous forbs, exceptions being the group of pernicious weeds (*Cirsium arvense, C. vulgare, Rumex crispus, R. obtusifolius, Senecio jacobaea*) and whose presence in a sward will frequently increase the actual harvestable herbage mass, though with the effect of reducing herbage quality, possibly substantially, and with potential harmful effects for livestock or forage utilization, ensilability etc (Mainz and others 1996). *Rumex obtusifolius* can increase total herbage mass while reducing grass herbage mass (Hopkins and Johnson, 2003). In addition, a small number of forbs (eg *Achillea millefolium, Plantago lanceolata*) have been shown to have productivity levels similar to those of *Lolium perenne* (Isselstein, 1993) and the introduction of a range of forbs to species-poor permanent grass was found to have no adverse effect of harvested production under hay cutting (Hopkins and others 1999). Subsequent work by Hofman and Isselstein (2005) found that introduction of forbs could partly increase forage quality with respect to its crude protein content.

The phenology of the forbs considered here varies between species, with both early (eg *Cardamine pratensis*) and late (eg *Leontodon autumnalis*) species represented in the list. It is clear that for the more productive species the period of peak growth is in the spring and early summer, with these species completing their annual flowering cycle during this period. Over 20% of the identified specific insect associations rely on the presence of stems, inflorescences and seed heads which are only present in the sward from mid-summer. There is therefore a major conflict between optimal agricultural production and provision of microhabitats for a significant component of the invertebrate fauna.

Most of the plant species considered in this review have the capacity to persist in grazed systems (Table 19). For some, whilst they may be tolerant of grazing, competitive exclusion limits their distribution to infertile sites. Other species can persist in grazed systems because they have physical or chemical properties which result in them being avoided by livestock, or hold their foliage too low, as defensive survival strategies to grazing (Herms and Mattson, 1992), and their herbage is therefore relatively inaccessible as feed for large herbivores.

Similarly, most species considered in this review are tolerant of cutting regimes, although several species will make only a small biomass contribution in mown forage as a result of their low stature. Conditions after the hay cut can strongly influence the persistence of such species. For example, *Leontodon hispidus* performs well after hay cutting in the absence of aftermath grazing. Data are available on the compatibility with silage systems of many of the grass species and several legumes. However, few of the non-leguminous forbs are likely to be compatible with such systems, and then only if inputs are low and cutting frequency low.

4.1.2 Impacts on soil structure

Many perennial forbs and some grasses have the capacity to develop rooting systems that enable them to exploit water and nutrients from lower soil horizons than is usual for the main grasses of agriculture. Many plant species that are deciduous, or that are vulnerable to herbivory, invest a higher proportion of their biomass in root development as a survival strategy (weeds such as *Rumex* and *Cirsium* are particularly successful for this reason). Kutschera and Lichtenegger (1992) present profile descriptions of all the main species of grasslands, although the rooting depths given by these authors are a guide to root potential

development rather that an absolute measure. It may be inferred that many species would have potential beneficial effects of root development on soil structure. This has been shown for white clover (Mytton and others 1993) but is essentially a topic that has received limited research. Improved root and soil structural development could in turn be beneficial for the resilience of grassland ecosystems in terms of water percolation and retention. The capacity for multi-species sowings to improve the availability of forage resources in dry seasons has been demonstrated in Australia and New Zealand (eg Daly and others 1996), lucerne being of notable value in this context. There is a research need for a better understanding of the role of multi-species swards to contribute to soil structure, particularly in the context of increased interest in multi-functionality in agricultural land management and in improving the resilence of swards to the effects of climate change.

4.1.3 Impacts on animal health and food quality

Information on the aspects of forage quality that might impact on animal health and indirectly upon the quality of meat and other livestock derived products is sparse. Notable examples that relate to animal nutrition are species such as *Lotus corniculatus* that contain condensed tannins. These help improve the rate of breakdown of protein through the rumen, leading to less N lost as urine, and also are associated with improved resistance to intestinal parasites and reduced incidence of bloat (Aerts and others 1999; Waghorn and others 2002).

The biochemical composition of forage species is emerging as a topical area of research interest whose outcomes have the potential to extend the socio-economic and ecological value of grassland species richness from a purely conservation interest to its links with food quality and animal health and welfare (Scollan and others 2005). There is evidence of higher omega-3 fatty acid content in meat from livestock that graze some types of semi-natural grassland when compared to lowland ryegrass-based swards. Valorisation of forage resources into food production has been a feature of niche-product cheese and quality meat systems in parts of mainland Europe (eg Alpine cheeses). The consequences of plant species in the animals' diets and its effects on taste, texture, appearance, shelf life, and human health are potentially considerable (Coulon and others 2004).

Food production in the UK has been largely aspatial and marketing boards served to create a level playing field for producers which usually eliminated local differences. Now we are seeing more regional brands linked to the environment in which they are farmed and the emergence of new producer-consumer relations. Understanding how plant species and vegetation communities contribute to product distinctiveness is a major research challenge now starting to be addressed (Buller, 2005). There is thus the potential that some types of existing botanically diverse or distinctive grasslands might become recognized as having greater agronomic value to producers through their presence of plants that improve product quality, and that this might further the justification for restoration and species reintroductions.

4.2 Grassland managed for equines

Horses account for a significant and increasing proportion (~ 1 m ha) of UK grassland, either as grazers or indirectly as consumers of hay or haylage. The estimated horse population is between 0.6 and 1.0 million. There is potential for grassland managed for horses to incorporate plant biodiversity and other wildlife objectives and, subject to further understanding, for plant species associated with species-rich grassland to contribute to the diet of horses.

The environmental impact of horses was identified as a key issue in a recent Defra-commissioned report on the horse industry (BHIC/ Defra, 2005). Standards of pasture management, the present inadequate knowledge about the quality of the land used for horse grazing, and further encouragement for the use of horses in conservation grazing projects which support wildlife and pasture biodiversity were considered. Equines, if well-managed, can be beneficial in supporting wildlife of meadows and pasture. Gibson (1997) concluded that horse grazing is a legitimate and valuable way of managing MG5 grasslands, but only if the intensity and pattern of grazing is carefully controlled. There were (in 2005) some 75 conservation schemes operating in England and Wales that used native pony breeds to help keep vegetation open by eating rough grasses.

The scientific literature of horse utilization and pasture ecology is relatively poorly developed in comparison with that for utilization under ruminants. However, there are a number of textbooks and handbooks aimed at students of equine studies and as practical instruction/ reference books for responsible horse owners, whose authors have combined their personal knowledge of horses with that of grassland (eg Cooper and others 1981; Pilliner, 1992; O'Beirne-Ranelagh, 2005). There is also increasing interest among horse keepers in using herbal medicines, and in providing horses with opportunities for self-medication, and several monographs deal with the nutritional and pharmacological properties of individual plant species (eg Allison, 1995; Ferguson, 2002).

In spite of this, many of the conclusions and recommendations in the literature relating to equine pasture management are based on observations, anecdotal evidence or from *a priori* assumptions, rather than on the outcomes scientific research. This is not to be over-critical; rather it reflects the paucity of funded research for a sector whose role in rural land management and the rural economy have been overlooked until recently. Nevertheless, within the horse-keeping community there is an acceptance that botanically diverse grassland may have a role in reducing dietary problems, and some support for the notion that 'medieval pasture' may provide the right balance of nutrition with minimum maintenance (Holter, 2003). There appears, therefore, to be scope for the sector to be responsive to information and opportunities that would lead to increased sward diversity on grounds of possible benefits for horses, as well as in contributing to wider conservation interests.

The paragraphs below consider the properties and attributes of the plant species selected for this review in terms of their possible contributions, either positive or adverse, in the context of grassland managed for equines.

Horses are non-ruminants and have different nutritional requirements from cattle or sheep. Compared with ruminants, equines need more chewing time while feeding. They also need less protein and less highly digestible forage but more fibre instead; ideally they need year-round access to pasture; and they are highly selective, leading to spatial heterogeneity with closely grazed 'lawns' and ungrazed 'latrines' which can become a problem in situations (very common) when horses are grazed on paddocks of insufficient area. Horses are prone to a number of diet-related illnesses such as laminitis, colic and developmental orthopaedic disease – conditions which appear to be associated with grazing on pastures and diets that are really more suited to productive ruminants rather than to horses.

Many existing horse pastures are based on, or at least contain, a high proportion of *Lolium perenne*. This may be as a result of agricultural improvement under previous ruminant-based

use, or because of cheapness and availability of ryegrass seed for reseeding. Pilliner (1992) suggests that *Lolium perenne* should be 50% of the seed mixture, together with *Festuca rubra, Cynosurus cristatus, Poa* and a small amount of *Trifolium repens*. A mixture with less *Lolium perenne* and other grasses (with no forbs or legumes) is offered as a 'permanent horse pasture mix that balances turf density with grazing' (Cotswold Seeds, 2006). However, O'Beirne-Ranelagh (2005) appears to argue against *Lolium perenne* and against fertilizing grass swards. For many horse grazers the open sward that is typical of most ryegrass cultivars does not provide good wear, particularly in young swards, and the relatively high digestibility and crude protein content of ryegrass forage, especially in spring and early summer, can result in diet-related problems for horses. Fine-leaved amenity cultivars of *L. perenne* are now advocated for their wear tolerance on 'the going' (Winter, 2004) or mixtures of *L. perenne*, with creeping red fescue (*F. rubra*) and *Poa pratensis* for gallops (Cotswold Seeds, 2006). Commercial seeds mixtures for pony paddocks frequently include a complex mix of grass species (*Festuca pratensis, F. arundinacea, F. rubra, F. ovina, Phleum pratense, Poa pratensis, P. trivialis, Dactylis glomerata,* and small amounts of *Cynosurus cristatus, Anthoxanthum odoratum, Alopecurus pratensis* together with herbs such as *Achillea millefolium* and *Plantago lanceolata*) (see Cotswold Seeds, 2006). Thus, virtually all the grass species considered in this review can be considered as having potential for inclusion in pastures for horse grazing. And while *Holcus lanatus* and *Agrostis stolonifera* would not normally be included (intentionally) in sowings, both are almost ubiquitous as volunteer species in established pasture.

There is a less clearly defined role for legumes in horse pasture but a recognition of their N-fixing role. White clover is generally not favoured (other than in small quantities) by horse keepers because of its high protein content and digestibility. But this argument may not fully recognize that its contribution in the sward is usually greatest at times of the year when other species may be low in digestibility (in mid-season), when the high feed value of the clover can be complemented by the high fibre value of other sward companion species. However, this may require a degree of management skill if the white clover component in the diet is not to exceed levels (as yet not understood) that may present risk. O'Beirne-Ranelagh (2005) suggests that *Trifolium dubium, Medicago lupulina* and *Lotus corniculatus* are more suitable legumes, and possibly small amounts of wild white clover (*Trifolium repens*), rather than modern cultivars. Red clover (*Trifolium pratense*) is alleged to be unpalatable for horses and its oestrogenic properties make it unsuitable for breeding stock (O'Beirne-Ranelagh, 2005), although Ferguson (2002) notes it has possible pharmacological and nutritional benefits. However, cultivars of red clover are unlikely to survive over the long-term in grazed pastures, in contrast to wild types which feature in permanent grasslands such as *Cynosurus cristatus-Centaurea nigra* grassland, MG5, (Rodwell 1992).

The presence of non-legume forbs (or 'herbs') in pastures appears to be generally favoured by horse grazers, and this would suggest that horse keepers might be more receptive than most livestock grazers to measures to increase plant species diversity. A number of forb species considered in this review have properties or characteristics that have led authors to advocate their presence in horse pastures. These include *Taraxacum officinale, Achillea millefolium, Filipendula ulmaria, Urtica dioica* (though presumably only in small amounts), *Plantago lanceolata,* and *Sanguisorba minor*. Amongst these, *Urtica dioica* will not be grazed when growing, but are palatable when cut and wilted (E. O'Beirne-Ranelagh, pers. comm.). High concentrations of minerals important for skeletal development (Ca, Mg) or other metabolic functions (Cu, Fe) are cited among the favoured attributes of these species, as

well as high concentrations of certain vitamins and other herbal properties that may have medicinal value (Ferguson, 2002).

Species-rich grasslands (eg MG5) are also considered as being suitable for making excellent hay for horses (O'Beirne-Ranelagh, 2005). Species that are poisonous to horses are mainly avoided in grazed swards, or are only toxic when ingested in quantity (eg *Ranunculus* spp.). However, ragwort (*Senecio jacobaea)* can be a particularly serious problem and has been the cause of numerous cases of fatal poisoning of horses. Its development is associated with germination (from wind-dispersed seeds) on bare ground niches typical of compacted and over-grazed areas. Once established, the plants are usually avoided by horses, although they may be taken when wilted, although there is growing evidence that horses will graze rosettes of ragwort (E. O'Beirne-Ranelagh, pers. comm.). There is a research challenge to better understand whether the sward structure associated with a more diverse species sward would limit the opportunities for ragwort to establish.

In the case of grassland that is managed primarily for hay or haylage for equines, some of the attributes of plant species referred to above may need to be reconsidered. Hay crops, particularly when cut and baled relatively late in the summer provide the maximum opportunities for both seed maturation and dispersal and for supporting invertebrates. Avoidance of mouldy hay is particularly important for horses, hence the need for fine weather and a relatively rapid haymaking period. Species that do not dry easily in the mown swath would be less desirable in this respect: eg *Rumex* spp. with thick petioles and waxy leaf epidermis, and species of *Cirsium* with a thorny and downy epidermis. However, most other species considered here are unlikely to present drying problems unless the sward is mown in wet weather or if the cutting height is set too close to the ground surface. A prolonged hay curing and turning results in significant leaf shatter and any feed value attributes (eg superior mineral concentrations or phytochemicals) in forb species are likely to be lost or reduced as a result. Realising the agronomic properties of species-rich hay is likely to depend therefore on attention to detail.

In addition to meadows mown to supply traditional hay for equines there is increasing popularity of haylage, which may be regarded as intermediate between hay and silage. It is cut at a later, more mature and lower digestibility stage than silage, wilted to ~ 50-65% DM, baled-wrapped and then undergoes a slow and restricted fermentation. It avoids the risks of dust and moulds associated with some hays and also offers transport and storage advantages. A number of contract growers and larger livery establishments are providing haylage, particularly catering for the more valuable end of the horse market. Compatiblity of haylage production with species-rich grassland is probably possible if haylage is cut late and some turning is undertaken (Crofts and Jefferson 1999). Species (grasses or forbs) that produce stalks that might puncture the bale wrap would not be compatible with haylage (*Rumex* spp. are the most obvious example).

Finally, an aspect of plant species diversity as it affects sward utilized by equines is that of the relationship between the sward composition and soil structure. For horses at pasture the advantages of a good springy sward surface, with a dense turf that is resilient to divoting and other grazing damage, are considerable. Horses can add to compaction, and poor soil structure, particularly through running and galloping especially in wet or frosty weather. Only a few of the plant species reviewed here are adapted to survive on compacted areas (eg *Taraxacum officinale).* Good soil structure, with good drainage and root penetration, is encouraged by a rich soil biology with earthworm activity that contributes to organic matter

formation in the surface horizon and helps bury stones which could otherwise be potentially injurious to horses. Species with strong deep roots have a potential role to contribute in this respect, and white clover has been shown to benefit soil structure and drainage (Mytton and others 1993). Further research is needed to evaluate the role of other species in this context.

5 Conclusions and research requirements

5.1 Value of different grassland plant species for wildlife

The issues surrounding the enhancement of the diversity of agriculturally-improved grasslands can best be summarised by considering the grasses, legumes, and other forbs separately. Reference is made to the characteristics of the plant species that have been identified in this review as having the highest wildlife value. The intention here is not to promote a uniformity of recommendations confined to a small suite of species. Rather, these species are used to illustrate particular qualities and specific management issues. Clearly, a wider range of species should be considered and species selection should reflect individual site characteristics and conservation objectives.

5.1.1 Grasses

Encouraging a diversity of grass species in the sward is likely to benefit a range of taxa. Many of the plant species identified as having high numbers of insect associations, such as *Dactylis glomerata*, are easily incorporated into production systems, being tolerant of both mowing and grazing. *Festuca rubra* and *Poa pratensis*, both having relatively high numbers of specific insect associations (Table 6), are particularly tolerant of trampling and make good selected species for grassland managed for horse grazing and exercise. Interestingly, the two species commonly used in grassland enhancement schemes (*Anthoxanthum odoratum* and *Cynosurus cristatus*) appear to have low wildlife value, expressed as the number of specific insect associations, and are rarely mentioned as host plants for species with more general preferences. However, these species are likely to contribute to the agronomic value of swards of declining fertility. *Lolium perenne* also had relatively low numbers of specific and general insect associations among the grasses (Tables 6 and 12). However, recent experiments have suggested that uncut *Lolium* may provide a useful winter seed source for birds (Buckingham et al 2004). In the assessment of bird diet (Table 15), *Festuca* spp. and *Lolium* feature relatively highly in the plant diet of declining PSA birds. *Poa* spp. are also in the list but records may refer to *Poa annua* rather than *Poa trivialis* or *P. pratensis.*

When the total numbers of mono- and oligo-specific insect associations are examined (Table 6), grasses had relatively high numbers of associations across the group compared to legumes and other forbs. However, numbers of nationally rare and scarce species and general insect associations (Tables 10 and 12) were generally lower than for the legumes or other forbs. These findings illustrate the important point that there is no single ideal set of grassland plants suitable for increasing biodiversity, as different combinations will have different benefits.

Most associated invertebrates on grasses were classified as general shoot feeders, although many of these are likely to have more particular niches in the sward. Few invertebrates are described as being associated exclusively with the flowers or seed head. However, most of the grasses have some insect species dependent on flower, seed head or stem (Table 9). There is, therefore, a conflict between allowing the structural development of such grasses through the season, and the optimum management for livestock production, which usually involves cutting or grazing before flowers and flower stems develop.

5.1.2 Legumes

The legume group has significant value both for insects and birds. Numbers of mono- and oligo-specific insect associations are high across the group (Table 6), as are numbers of general associations (Table 12) and nationally rare and scarce species (Tables 10 and 12). The value of flowers and seed heads for insects is also apparent (Table 9). *Lotus corniculatus* in particular stands out in all these tables, and it is also the legume with the highest number of links with rare bees (Table 13). *Trifolium pratense* and *T. repens* have considerable value, especially *T. pratense* in relation to general insect associations, including rare and scarce Hymenoptera (Table 12). *T. pratense* is noted for its value for long-tongued bumblebees, some species of which are now very scarce in the countyside (Edwards and Williams 2004). *Lotus corniculatus*, *Trifolium* spp., including *Trifolium dubium*, and *Vicia* spp., support high numbers of specialist associations with Coleoptera (Table 6), while there is a strong representation of specialist Lepidoptera species among the *Trifolium* and *Lotus* species. The foliage of *Trifolium* spp. and the seeds of *Vicia* spp are important in bird diets in general, though rather less important among specialist bird groups (Table 15).

The high productivity and feed value of legumes makes them a valuable component of forage systems, although there may be impacts on animal performance if they make up a high proportion of the diet. Ensilability in forage legumes can be difficult because of their low sugar contents and high buffering capacity but wilting and additive treatments improve performance (Appendix 5). However, given the importance of legume flower and seed heads for the associated insect fauna, light rotational grazing and/or hay production are likely to produce the most valuable outcomes for wildlife unless silage cutting regimes can be modified in some parts of the field. *Trifolium repens* is quite persistent in fertile grasslands but cultivar strains of *Lotus corniculatus* and *Trifolium pratense* may not persist for more than a few years. Wild strains are likely to be more persistent, and thus would be suitable where intermittent re-sowing is not a favoured option. *Vicia sativa* is highly acceptable to livestock, and tolerates moderate grazing (Appendix 5).

Whilst their value for insects appears to lower than that of the grassland legumes described above, *Medicago sativa* and *Onobrychis viciifolia* can contribute to productive forage systems where soil type and climate allow. These species can form a part of productive silage systems when grown with less competitive grasses such as *Dactylis glomerata*, *Festuca pratensis* and *Phleum pratense*.

5.1.3 Other forbs

The other forbs covered by this review represent a range of species of different growth form and ecological characteristics. A wide span of numbers of insect associations is also evident, for instance, the group contains the species with the highest and lowest numbers of general associations (Table 12), these species being *Taraxacum officinale* (206) and *Cardamine pratensis* (2). The group has a smaller proportion of representatives with high numbers of mono- and oligo-specific insect associations, compared to legumes and grasses (Table 6), but has stronger representation among specific rare and scarce insect species (Table 10) than grasses, and has representatives with high numbers of general insect associations, including rare and scarce species (Table 12).

Among the forbs, the group with the highest numbers of specific associations are robust members of the Asteraceae (*Cirsium* spp., and *Achillea millefolium*), which provide important

diet items and microhabitats for a range of Coleoptera, Diptera and Lepidoptera species (Table 6). *Centaurea nigra* has a wide variety of Diptera and Lepidoptera among specific associations (Table 6) and a relatively high number of nationally rare and scarce species which are specific to the plant (Table 10).

Plantago lanceolata has a relatively varied Coleoptera fauna and the highest number of mono- and oligo-specific nationally rare and scarce species (Table 10) among the group of forbs. *Taraxacum officinale* and *Rumex* spp. stand out among the 56 selected plants for the number of general associations, especially for Lepidotera (Table 12). *Rumex* spp. are consistently the most widely-utilised direct plant food for birds among all the plant genera in the study (Table 15), and is included in the diet of declining (Red List) seed-eating birds such as linnet, corn bunting and yellowhammer (Appendix 4). *Centaurea* sp. and *Plantago* sp. are also important in terms of numbers of birds which include these taxa in their diet.

As with the legumes, stems and reproductive structures form significant microhabitats for many of the invertebrates associated with these forb species, although a large number of associations also relate to basal rosette leaves, stem bases and root crowns. Among the birds, most will be eating plant seeds rather than green parts. The timing of management therefore needs to take account of the reproductive phenology of the plant species in order to maximise wildlife value.

5.2 Management options to promote value for wildlife

The review has highlighted a group of grassland species that have diet and microhabitat value for insects and / or birds and have useful agronomic characteristics in terms of productivity and feed value for livestock. This group includes grasses (*Dactylis glomerata, Festuca* spp.), and legumes (*Lotus corniculatus*, *Trifolium pratense, T. repens* and *Vicia sativa*). Some of these have been established successfully in experiments on the restoration of grassland diversity while others are agriculturally-sown species. *Lotus corniculatus* and *Festuca ovina* are probably the most difficult to establish in more fertile swards. Other forbs, such as *Achillea millefolium, Centaurea nigra,* and *Plantago lanceolata* are of high value for wildlife and are reasonably easy to establish but have lower values for livestock production. The *Cirsium* species have high value for wildlife but along with other pernicious grassland weeds are actual management problems rather than of being of benefit for livestock production. *Rumex acetosa* poses less of a weed problem than *R. crispus* and *R. obtusifolius,* if not present in quantity, and is able to grow in fertile grasslands.

The use of forbs and less-productive grasses may be particularly relevant in grasslands managed for equines, but the topic has not been much researched. As for grasslands used for livestock, it is clear from the review that the full microhabitat and diet values are only manifest if the plant species are allowed to develop stems, flower and set seed. Taller vegetation can be achieved by decreasing the frequency of mowing or grazing. However, leaving areas unmown or ungrazed has implications for the agronomic value of the sward for livestock, and these effects may persist after grazing or mowing is reinstated. In addition, the persistence of various species of wildlife value in the sward will itself be influenced by the mowing or grazing regime, with different species being affected positively or negatively.

Whilst areas of tall turf provide useful microhabitats for many invertebrates, small mammals and some bird species such as raptors, some groups of grassland fauna prefer short turf or bare ground microhabitats, whilst others require both tall and short vegetation in order to

successfully complete their lifecycles. In addition, the utilisation by birds of invertebrate and seed resources provided in areas of tall vegetation will be determined by the accessibility of prey items, determined in part by the characteristics of the mosaic of short and tall vegetation.

Research is needed to identify sustainable management regimes that maintain an appropriate balance between agricultural value and equine value and the provision of different microhabitats for grassland fauna, and to calculate the costs to the farmer of such management in terms of lost production or management complications for horse-owners. Three main research areas are apparent. Firstly, how to establish and maintain the persistence of populations of these species in swards that are currently species-poor, secondly, how to maximise the value of the species for the fauna that utilise them, thirdly, what are the most beneficial spatial configurations of such manipulations and finally, what are the agronomic / equine implications of such management.

5.2.1 Potential management options to enhance biodiversity value

The range of options for enhancing the diversity of agriculturally-improved grasslands ranges along a gradient from simple manipulations of grazing and cutting regimes and/or fertilizer inputs, through the sowing of plant species into the sward, to the conversion of areas of grassland through cultivation and sowing of seed mixtures. Such an approach has been used as a structure for a range of treatments on grass field margins in the PEBIL project (Defra project BD1444).

For pastures, manipulations might involve the mere cessation of fertilizer inputs. Preliminary results of the PEBIL project show strong effects of cessation of fertilizer on Coleoptera assemblages. Manipulations of grazing and mowing, for example with early season grazing and a late season cut would allow stem, flower and seed resources to develop in the canopy over the summer and would benefit a range of invertebrates and birds. Finally, fenced exclosures would allow the development of rank tussocky patches in field centres. For all of these options, the balance between the biodiversity gains achieved and the agronomic implications need to be assessed in relation to the spatial configuration (extent and density) of manipulated areas within fields. The interaction of these manipulations of grazing, mowing and input regimes with the successful establishment and persistence of additional introductions of forb species needs to be investigated through field experiments.

The botanical enhancement of fields cut for silage poses a more difficult challenge, with few forb species identified in this review as likely to persist in silage systems, although some of the legumes are exceptions. The timing of cutting, which is usually before flowering, is also an issue. However, the diet and microhabitat value of the sward could be enhanced through manipulation of the frequency of mowing in small areas within fields. This might involve the simple leaving of unmown strips at intervals across the field when the grass is cut for silage. Taking the second cut at right angles to the first cut and again including unmown strips will create a range of areas with different sward heights. Alternatively, leaving areas uncut when the last silage cut is taken will result in taller areas with grass stems, flowers and seedheads persisting into the late summer and autumn.

5.2.2 Issues of within-field scale, density and position

The location and spatial scale at which these beneficial plants are introduced to the sward will also have important implications for their exploitation by invertebrates and birds. For

example, whether these are introduced throughout the field or restricted to margins will influence the ability of some bird species, such as Skylark, that tend to avoid field boundaries, to exploit them. The spatial scale may also be important, scattered patches maybe more effectively utilised by breeding birds that tend to be territorial and central place foragers often favouring foraging areas close to nests in hedgerows (eg Morris 2001, Vickery and others 2002). In winter when birds are more mobile fewer, larger patches may be equally effective.

There is a need to understand the optimal spatial scale at which to deliver these food resources in winter and summer. In particular the optimum size, density and spatial positioning of food patches (eg in this case, patches of plants supporting high abundance and diversity of insects). It is likely that these optimal scales differ between summer (when birds are territorial and taking mainly invertebrate prey) and winter (when many birds flock and feed on seeds and/or green plant material).

5.3 Research on underlying ecological mechanisms

5.3.1 Enhancement of botanical diversity

There is a pressing requirement to investigate practical methods for increasing plant species richness on agriculturally-managed grassland. Whilst there has been considerable progress in this area, particularly in the introduction of plant species that have a wide ecological amplitude, there are many challenges that remain. Grasslands dominated by *Lolium perenne* (MG7) present a particular challenge as their soil nutrient status, botanical composition and sward structure are resilient to competition from most "non-weed" forbs and to many wild grass species. The same applies to some of the species-poor swards of the NVC communities MG1, MG6, MG9 and MG10 (*Arrhenatherum* grasslands, *Lolium-Cynosurus* grassland and damp *Holcus-Deschamsia cespitosa/Juncus effuses* grasslands). Whilst many such swards on intensively-managed livestock farms are unlikely to be able to support species-rich grassland at a field scale, there is scope for enabling sward diversity at a range of other scales, including field margins. The potential for restoration to wild grass assemblages as a first step before introduction of forb species is one approach that merits consideration for these communities. Species may also be identified that create conditions that promote the establishment of other plant species, for example through modification of soil microbial communities.

5.3.2 Promoting invertebrate diversity and abundance

The review has highlighted the paucity of information on the microhabitat requirements of many grassland invertebrates. However, comprehensive autecological studies of the numerous insect species identified as forming specialist associations with the plant species used in this study is not likely to be cost-effective. A more productive approach would be to focus research on the promotion of spatial and temporal heterogeneity in the botanical composition and canopy structure of grassland swards. Research on the impact of stock density and livestock type/breed on sward heterogeneity, and the responses of different guilds of insect is required. In addition, understanding the impacts of the timing of grazing early in the season and the spatio-temporal dynamics of nutrient returns to the sward on the competitive balance between grasses and forb species is likely to lead to improved management prescriptions.

5.3.3 Bird diets

The taxonomic level of detail in many dietary studies has limited the robustness of the approach adopted in the present study. However, intensive studies of diet composition of a suite of species are unlikely to be a very cost effective avenue of research. A much more valuable question is that of 'preferences', as stated in Wilson and others (1999). A great deal is known about what is present in the diet of many birds, but rarely are studies linked with those assessing prey abundance in the foraging site. For this reason we have almost no data on prey preferences. There is therefore a need for studies which quantify foraging preferences of grassland birds in terms of habitat or micro-habitat patch choice and invertebrate abundance and availability, and relate these to dietary composition.

5.3.4 Seed provenance

The provenance of seed used to enhance the diversity of agriculturally-improved grassland may have an impact on the suitability of the resulting plants for use by their associated invertebrates. A recent review highlighted a potential risk from introgression from non-local genotypes (Walkerand others 2004), including several species identified as having high value for invertebrates in this review (*Plantago lanceolata, Rumex acetosa, Rumex acetosella*). The impact of the use of agricultural varieties of legume species on plant:insect interactions is also unclear.

5.4 Research requirements at the farm and landscape scale

The focus of this review has been on the diet and microhabitat value of particular grassland plant species. However, two problems have been highlighted. Firstly, many of the species of high value are unlikely to form sustainable populations in productive swards and may require sward disturbance in order to persist or protection from grazing in order to allow the desired canopy or reproductive structures to develop. Secondly, undesirable grassland weeds have been shown to have particularly high value to invertebrates and birds. There is therefore an argument for partitioning the farmed landscape into areas for wildlife and areas for forage production.

5.4.1 Uncropped areas

Boundary features (including buffer strips and field margins) and other semi-natural 'corridors' may facilitate the movement of highly mobile taxa (birds, butterflies, bees, grasshoppers) between forage/nesting/shelter resources and into the grasslands. There is also scope to increase invertebrate abundance and diversity, and food abundance and availability for birds, through field margin, hedgerow and hedge base management (eg Haysom and others 1999, Haysom and others 2004, Maudsley 2001, Maudsley and others 1997, 2000).

5.4.2 Issues of landscape scale, density and position

Issues of the optimum density, scale and landscape positioning of such features in order to maximise wildlife value need to be researched. Likewise, the extent to which food abundance could be increased for a suite of grassland species, for example through farm-scale rotational cutting, may also merit further investigation. Research is needed on the incorporation of sward management practices that are beneficial to wildlife into sustainable whole-farm production systems. The agronomic implications of allowing grasses and forbs to seed in order to provide microhabitat for invertebrates and seed resources for birds need to

be assessed. In addition, the impacts of diverse swards on livestock finishing and the need for the retention of areas of 'lay back' grassland of higher productivity need investigating.

5.4.3 Multiple benefits from novel grass/legume mixes

This review has confirmed the high value of legumes for invertebrates and birds. The wider use of grass/legume mixes as forage crops has the potential for multiple benefits, including not only biodiversity benefits (eg for pollinators), but also reduced fertilizer inputs and enhanced soil characteristics (Rochon and others 2004). Research is needed on the suitability of novel grass/legume mixes and their potential utility in the face of climate change. The introduction of legumes into established swards is likely to yield similar benefits. In this situation, research is needed on methods to promote the persistence of introduced legume species.

5.4.4 Surrounding land use

The impacts of surrounding land use for grassland biodiversity are poorly understood. It is widely accepted that the decline in the biodiversity of pastoral landscapes in parts of England is linked to the loss of mixed farming and the overwhelming dominance of species-poor grasslands. The use of whole crop cereal silage, especially when spring sown and followed by winter stubbles, or the sowing of pollen and nectar or wild bird seed mixes are more likely to increase populations of many invertebrate and bird species associated with farmland in these areas than manipulations of the botanical composition of grasslands, and may increase the diversity of adjacent grasslands.

5.5 Research on changing land use and its drivers

5.5.1 Monitoring and understanding changes

Grassland management is likely to face a diverse array of new socio-economic drivers in the next few years, resulting from changes in support payments and new agri-environment schemes. However, information on the contemporary botanical status of British grasslands in relation to their management is scarce, so the ability to detect these changes and understand the causes is limited. The Countryside Survey does not adequately captured information on field scale sward type in relation to farm management. The predecessors of the Institute for Grassland and Environmental Research (IGER) carried out national grassland surveys in 1939, 1947, 1959, in the 1970s, and repeat surveys of some areas of the 1970-72 survey were made in the mid-1980s (including farmer interviews). Original field-scale data from these surveys are still held at IGER and could be exploited to derive an up-to-date assessment.

There is a need to address the implications for grassland biodiversity that will stem from the introduction of the Single Payment Scheme and replacement of headage payments with area-based payments. Low availability of grazing livestock in response to these changes may well have a significant impact on lowland grasslands in the coming decade. Such changes may lead to natural restoration of plant species diversity, or provide opportunities for more interventionist restoration measures.

Similarly, there is a need to understand the impact of widely adopted measures for agriculturally-improved grasslands introduced in the Entry Level Environmental Stewardship Scheme, including input restrictions, buffer strips and abandoned field corners. In particular,

research is needed to identify the densities and landscape configurations of these options necessary to maximise biodiversity gains.

There is a need for a research focus that targets the value of grassland species on land no longer used for livestock production. In many urban fringe areas, agriculturally improved grassland is being used for livery stables and informal 'pony paddocks'. However, little is known about the potential wildlife value of horse grazing on species-poor swards. With the area under agriculture declining, and development pressure increasing in many urban fringe areas, identifying opportunities for biodiversity enhancement in non-agricultural grasslands is likely to become increasingly important. Such areas have are known to be of considerable value to invertebrates (Gibson 1998).

5.5.2 Nutritional quality and 'value added'

The loss of species-rich grassland has been brought about by a received wisdom that ryegrass and clover swards are most productive. There is now increasing interest in the secondary dietary attributes of pasture species in terms of their ability to contribute towards animal health and nutrition and to affect the properties of meat and dairy products that are based on utilization of grazed and conserved-mown forage (Coulon and Priolo 2002). Some livestock producers are already deriving marketing opportunities from "non-commodity" produce linked to the botanical composition of their grassland. Although there is some on-going research activity in this field (Whittington and others 2006), there is a need to further this in terms of which pasture species offer the potential to best contribute to food quality (taste, appearance, nutrition, shelf life, human health attributes such as fatty acid balance) and also in the wider agronomic sense (animal health, seasonal growth, suitability for grazing and hay/silage).

5.5.3 Climate change

There is a need to identify livestock production systems that can meet the demands imposed by changes in climate. The role of multi-species swards is one area where there is a research need, for example the mixtures of grass and *Medicago sativa* or *Onobrychis viciifolia*. Many forbs and some minor grasses can exploit lower soil horizons for water, or temporal niches, and thereby provide a degree of resilience to drought, or ability to recover from floods, saline inundations etc. This is a whole new area, with many possible opportunities for botanically diverse grasslands to be exploited in ways that may be commercially favourable to livestock farmers and, at the same time, help achieve biodiversity targets.

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Appendix 3. Mono- and oligo-specific associations between the selected plant species and insect species

Key

Specificity

M	Monophagous (or monolectic for Aculeata)
O	Oligophagous (or oligolectic for Aculeata)
	Numerical suffixes give the number of reported species associations if <5
	Subdivided into:
OG	Associated with species within a single Genus
OT	Associated with species within a single Tribe (Fabaceae and Asteraceae only)
OF	Associated with species within a single Family
O	Associated with fewer than five plant species in different taxonomic groups

Status

RDB1	Endangered
RDB2	Vulnerable
RDB3	Rare
RDB4	Out Of Danger
RDB5	Endemic
RDBK	Insufficiently known
N	Nationally Notable - Scarce
Na	Notable/Na (Nationally Notable A - Scarce A)
Nb	Notable/Nb (Nationally Notable B - Scarce B)

Phenology

O	Egg
L	Larva
LD	Larval diapause
P	Pupa
A	Adult (imago)

Agrostis capillaris

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Auchenorrhyncha)	Cercopidae	Neophilaenus campestris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cercopidae	Neophilaenus lineatus (L)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Balclutha punctata (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Diplocolenus abdominalis (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Doratura stylata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Jassargus flori (Fieber)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Jassus distinguendus (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydiopsis parvicauda (Ribaut)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Psammotettix confinis (Dahlbom)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Sardius argus (Marshall)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Streptanus sordidus (Zetterstedt)		OF3													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Delphacodes venosus (Germ)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella dubia (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Struebingianella dalei (Scott)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Xanthodelphax stramineus (Stal)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Stenodema calcaratum (Fallen)	Flower buds, Unripe grain	OF													
HEMIPTERA (Heteroptera)	Miridae	Stenodema laevigatum (L)	Flowering heads	OF						O	O	AO	A				
HEMIPTERA (Heteroptera)	Miridae	Trigonotylus ruficornis (Geoffroy)		OF							A	A	A	A	A		
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus inermis Green		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Heterococcus pulverarius (Newstead)		OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus perrisii (Signoret)	Base of leaf sheath	OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus thulensis Green	Stem, Leaf sheath	OF													
LEPIDOPTERA	Elachistidae	Cosmiotes stabilella (Stt.)	Leaves	OF	RDB 3		L	L	LPA	LPA	PA	AL	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	LP	PA	A		L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				LP	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Noctuidae	Mythimna loreyi (Duponchel)		OF									A	A	A		
LEPIDOPTERA	Nymphalidae	Lasiommata megera L.		OF		LD P	LD P	LD LP	LPA	AO	AOLP	LP	LPA	AOL	L	LD P	LD P
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Maniola jurtina (L)	Leaves	OF		L	L	L	L	L	PA	A	A	A	A		
LEPIDOPTERA	Satyridae	Maniola jurtina insularis (Thomson)		OF		L	L	L	L	L	LPA	LPAO	PAOL	PAOL	L	L	L
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Agrostis stolonifera

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Cerodontha atra (Meigen, 1830)	Leaf miner	OF						A	A?	A?	A				
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Phytomyza milii Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Streptanus sordidus (Zetterstedt)		OF3													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella dubia (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella forcipata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Xanthodelphax stramineus (Stal)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Trigonotylus ruficornis (Geoffroy)		OF							A	A	A	A	A		
HEMIPTERA (Sternorrhyncha)	Aphididae	Diuraphis agrostidis (Muddathir)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum agrostis Hille Ris Lambers		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus inermis Green		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus perrisii (Signoret)	Base of leaf sheath	OF													
LEPIDOPTERA	Elachistidae	Cosmiotes stabilella (Stt.)	Leaves	OF	RDB 3		L	L	LPA	LPA	PA	AL	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	LP	PA	A		L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				LP	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Noctuidae	Mythimna loreyi (Duponchel)		OF									A	A	A		
LEPIDOPTERA	Nymphalidae	Lasiommata megera L.		OF		LD P	LD P	LD LP	LPA	AO	AOLP	LP	LPA	AOL	L	LD P	LD P
LEPIDOPTERA	Satyridae	Aphantopus hyperantus (L)		OF		LD	LD	L	L	L	L	P	PAOL	AOL	L	LD	LD
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Maniola jurtina (L)	Leaves	OF		L	L	L	L	L	PA	A	A	A	A		
LEPIDOPTERA	Satyridae	Maniola jurtina insularis (Thomson)		OF		L	L	L	L	L	LPA	LPAO	PAOL	PAOL	L	L	L
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Alopecurus pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Cerodontha denticornis (Panzer)	Leaf miner	OF					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia merceri Barnes, 1930		M													
HEMIPTERA (Heteroptera)	Miridae	Leptopterna dolabrata (L)		OF							A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Stenodema calcaratum (Fallen)	Flower buds, Unripe grain	OF													
HEMIPTERA (Heteroptera)	Miridae	Stenodema laevigatum (L)	Flowering heads	OF						O	O	AO	A				
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis nigerrima (Hille Ris Lambers)	Leaf blades	OF2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Laingia psammae (Theobald)		OF													
THYSANOPTERA	Thripidae	Chirothrips hamatus Trybom		M						A	A	A					

Anthoxanthum odoratum

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
					Status	J	F	M	A	M	J	J	A	S	O	N	D
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Opomyzidae	Opomyza petrei Mesnil, 1934	Stem borer	OF													
DIPTERA	Opomyzidae	Opomyza punctata Haliday, 1833	Stem borer, shoot miners	OF	N												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Graphocraerus ventralis (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Ribautodelphax angulosus (Ribaut)		M	Nb												
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Momphidae	Cosmopterix orichalcea (Stt)		OF	RDB 3	LD	L	LD	LD	P	PA	O	L	L	L	LD	LD

Cynosurus cristatus

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
LEPIDOPTERA	Noctuidae	Luperina nickerlii knilli (Boursin)		OF		L	L	L	L	L	L	LP	PA	AOL	L	L	L

Dactylis glomerata

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Chaetocnema hortensis (Fourcroy, 1785)	Stem, Leaves	OF		A	A	A	AOL	L	L	LA	A	A	A	A	A
DIPTERA	Agromyzidae	Agromyza cinerascens Macquart	Leaf miner	M					A								
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Agromyza rondensis Strobl	Leaf miner	OF													
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Cerodontha incisa (Meigen, 1830)	Leaf miner	OF													
DIPTERA	Agromyzidae	Cerodontha pygmaea (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza flaveola (Fallen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia dactylidis (Loew, 1851)	Flower	M													
DIPTERA	Cecidomyiidae	Dasyneura dactylidis Metcalfe, 1933	Seed	M													
DIPTERA	Cecidomyiidae	Lasioptera graminicola (Kieff.)	Stem	OF													
DIPTERA	Cecidomyiidae	Mayetiola dactylidis Kieffer, 1896	Leaves	M													
DIPTERA	Cecidomyiidae	Sitodiplosis dactylidis Barnes, 1940	Flower	M													
DIPTERA	Chloropidae	Meromyza femorata Macquart, 1835	Stem borer	M													
DIPTERA	Chloropidae	Meromyza variegata Meigen, 1830	Stem	M													
DIPTERA	Chloropidae	Oscinella maura (Fallén, 1820)	Stem borer	M													
DIPTERA	Opomyzidae	Opomyza punctata Haliday, 1833	Stem borer, Shoot miner	OF	N												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Adarrus ocellaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Athysanus argentarius (Metcalf)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Cicadula persimilis (Edwards)		M													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Macrosteles sexnotatus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydia crocea (Herrich-Schaeffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Dicranotropis hamata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Eurybregma nigrolineata (Scott)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Stenocranus minutus (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Stiroma bicarinata (Herrich-Schaeffer)		OF	Nb												
HEMIPTERA (Heteroptera)	Miridae	Leptoptema dolabrata (L)		OF							A	A	A	A			
HEMIPTERA (Sternorrhyncha)	Aphididae	Hyalopteroides humulis (Walker)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Chaitophorus capreae (Mosley)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Laingia psammae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus dactylis Green	Leaf sheath	OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Tenthredopsis litterata (Geoffroy)		OF													
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista apicipunctella (Stainton)	Leaves	OF		LD	LD	LD	LD A	A	A	A	A	L	L	L	L LD
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista atricomella Stt.	Stem, Leaves	M				L	L	LA	A	A	A	A			
LEPIDOPTERA	Elachistidae	Elachista gangabella Zell.	Leaves	OF		LD	LD	LD	LD P	A	A		L	L	L	L	LD
LEPIDOPTERA	Elachistidae	Elachista luticomella (Zeller)		OF		L	L	L	L	L	A	A	A	L	L	L	L

Dactylis glomerata

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Elachistidae	Elachista megerlella (Hb.)	Leaves	OF		L	L	L	LA	LA	LA	LA	LA	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	LA	A	LA	A				
LEPIDOPTERA	Elachistidae	Elachista unifasciella (Haw.)	Leaves	OF2	N	L	L	L	LP	LPA	A				L	L	L
LEPIDOPTERA	Gelechiidae	Brachmia rufescens (Haw)		OF		L	L	L	L	L	PA	A	AL	L	L	L	L
LEPIDOPTERA	Glyphipterigidae	Glyphipterix simpliciella (Stephens)	Seed	OF		LD	LD	LD	P	PA	AO	L	L	LD	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Ochlodes faunus (Turati)		OF		LD	LD	LD	LD	LP	PAO	AOL	AOL	L LD	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Ochlodes venata (Bremer & Grey)		OF		LD	LD	LD	LD	L	LA	LA	LA	L	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Thymelicus lineola (Ochsenheimer)		OF		LDO	LDO	LDO	L	L	PA	A	AO	LD O	LD O	LD O	LD O
LEPIDOPTERA	Lasiocampidae	Euthrix potatoria (L)		OF		LD	LD	L	L	L	LP	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Noctuidae	Amphipoea fucosa (Freyer)	Root, Stem	OF					L	L	L	LA	A	A			
LEPIDOPTERA	Noctuidae	Amphipoea lucens (Freyer)	Root, Stem	OF		O	O	O	O	L	L	LP	PA	A	O	O	O
LEPIDOPTERA	Noctuidae	Apamea anceps (D. & S.)	Leaves, Flower, Seed	OF		L	L	L	L	P	A	AO	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea crenata (Hufn)	Leaves, Flower, Seed	OF		L	L	L	LP	PA	A	AO	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea epomidion (Haworth)		OF		L	L	L	P	PA	PA	AO	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea monoglypha (Hufn)	Upper Roots, Stem	OF		L	L	L	L	L	LA	A	LA	LA	LA	LA	L
LEPIDOPTERA	Noctuidae	Apamea sordens (Hufn)	Blades, Seed	OF		L	L	LP	P	A	A	O	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Calamia tridens (Hufn)		OF					L	L	L	A	A				
LEPIDOPTERA	Noctuidae	Calamia tridens occidentalis (Cockayne)		OF		O	O	O	L	L	LP	PA	A	O	O	O	O
LEPIDOPTERA	Noctuidae	Eremobia ochroleuca (D. & S.)	Flower, Seed	OF		O	O	O	O	L	L	LPA	AO	L	L	L	L
LEPIDOPTERA	Noctuidae	Mesoligia literosa (Haworth)	Root, Stem	OF		L	L	L	L	L	LP	PA	OA	OL	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna albipuncta (D&S)		OF							A	A	A	A	A		
LEPIDOPTERA	Noctuidae	Mythimna comma (Hubn)		OF		LD	LD	LD	LD P	P	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna favicolor (Barrett)		OF	Nb						A	A					
LEPIDOPTERA	Noctuidae	Mythimna impura (Hubn)		OF		L	L	L	L	L	A	LA	LA	L	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna loreyi (Duponchel)		OF									A	A	A		
LEPIDOPTERA	Noctuidae	Mythimna pallens (L)		OF		LD	LD	LD	L	LP	AOL	AOLP	AOLP	AOL	L	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna pudorina (D&S)		OF		LD	LD	LD	L	LP	A	AO	L	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna putrescens (Hb)		OF	Na	L	L	LD	LD	LDP	P	A	AO	L	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna turca (L)		OF	Nb	LD	LD	LD	L	LP	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna unipuncta (Haw)		OF									A	A	A		
LEPIDOPTERA	Noctuidae	Mythimna vitellina (Hubn)		OF						AOL	AOL	AOLP	AOLP	A	A	A	
LEPIDOPTERA	Noctuidae	Oligia latruncula (D&S)	Stem, Leaves	OF		L	L	L	L	LA	A	A	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Oligia strigilis (L)	Root Stock, Stem	OF		L	L	L	L	PA	PA	AO	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Oligia versicolor (Borkh.)	Rootstock, Stem	OF							A	A					
LEPIDOPTERA	Noctuidae	Omphaloscelis lunosa (Haworth)		OF		L	L	L	L	L	P	P	A	A	AOL	L	L
LEPIDOPTERA	Nymphalidae	Lasiommata megera L.		OF		LD P	LD P	LD LP	LPA	AO	AOLP	LP	LPA	AOL	L	LD P	LD P
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria mediopectinellus (Haworth)	Stem	OF		L	L	L	L	LP	P	PAO	AO	AOL	L	L	L
LEPIDOPTERA	Pyralidae	Ancylolomia tentaculella (Hubner)		OF								A					
LEPIDOPTERA	Satyridae	Aphantopus hyperantus (L)		OF		LD	LD	L	L	L	L	P	PAOL	AOL	L	LD	LD
LEPIDOPTERA	Satyridae	Melanargia galathea (L.)		OF		LD	L	L	L	L	LPA	PAO	AO LD	LD	LD	LD	LD
LEPIDOPTERA	Satyridae	Pararge aegeria (L.)	Leaves	OF		LD P	LD P	LD P	LA	AOLP	AOLP	AOLP	AOLP	AOLP	AOLP	LD P	LD P
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD
THYSANOPTERA	Thripidae	Aptinothrips rufus (Haliday)		OF		LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
THYSANOPTERA	Thripidae	Aptinothrips stylifer Trybom		OF		LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA	LA
THYSANOPTERA	Thripidae	Chirothrips manicatus Haliday	Flower	OF		A	A	LA	LA	LA	A	A	A	A	A	A	A
THYSANOPTERA	Thripidae	Limothrips cerealium Haliday	Leaves	OF													

Festuca ovina

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Chaetocnema hortensis (Fourcroy, 1785)□	Stem, Leaves	OF		A	A	A	AEL	L	L	LA	A	A	A	A	A
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Cerodontha pygmaea (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia festucae Jones, 1940		OG													
DIPTERA	Chloropidae	Crassivenula brachyptera		OF	RDB 3												
HEMIPTERA (Auchenorrhyncha)	Cercopidae	Neophilaenus exclamationis (Thunberg)		OF													
HEMIPTERA (Auchenorrhyncha)	Cercopidae	Neophilaenus lineatus (L)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arocephalus punctum (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Conosanus obsoletus (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Dikraneura variata (Hardy)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Doratura stylata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Ebarrius cognatus (Fieber)		OF	Nb												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupelix cuspidata (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Hardya melanopsis (Hardys)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocuellus collinus (Boheman)		OF	RDB K												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydiopsis attenuata (Germer)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Paluda adumbrata (Sahlberg)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Psammotettix nodosus (Ribaut)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Rhytistylus proceps (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Streptanus marginatus (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Delphacinus mesomelas (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Kosswigianella exigua (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Ribautodelphax pallens (Stal)		M													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Asphidaphis porosiphon (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptaphis poae (Hardy)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptaphis setiger (Hille Ris Lambers)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium tenerum (Hille Ris Lambers)		OF3													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides brevicornis (Laing)		OF2													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha maydis (Passerini)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Lecanopsis formicarum Newstead	Scales rootlet junctions, Base of leaf	OF		L	L	L	L	PA	AO	L	L	L	L	L	L
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus inermis Green		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus placidus Green		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus pseudinsignis Green		OF		O	O	O	A	A	AO	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Heterococcus pulverarius (Newstead)		OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Rhizoecus albidus Goux	Root	OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus obductus (Hartig)		OF													

Festuca ovina

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista apicipunctella (Stainton)	Leaves	OF		LD	LD	LD	LD A	A	A	A	A	L	L	L	L LD
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista bedellella (Sirc.)	Leaves	OF		L	L	L	L	A	LD A	LD A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista collitella (Dup.)	Leaves	OF	N	L	L	L	L	LPA	AL	LPA	A		L	L	L
LEPIDOPTERA	Elachistidae	Elachista dispunctella (Dup.)		OG		L	L	L	LPA	A	AL	LPA	A	AL	L	L	L
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	LA	A	LA	A				
LEPIDOPTERA	Elachistidae	Elachista triatomea (Haworth)	Leaves	OG					L	L	LPA	A					
LEPIDOPTERA	Elachistidae	Elachista triseriatella (Stainon)		OG	N	L	L	L	L	L	A	A		L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Glyphipterigidae	Glyphipterix simpliciella (Stephens)	Stem, Seed	OF		LD	LD	LD	P	PA	AO	L	L	LD	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Hesperia comma (L.)		OF	RDB 3	O	O	OL	L	L	L	PA	AO	AO	O	O	O
LEPIDOPTERA	Noctuidae	Apamea lateritia (Hufn)		OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Noctuidae	Luperina testacea (D. & S.)	Root, Stem bases	OF		L	L	L	L	L	L	P	PA	AOL	L	L	L
LEPIDOPTERA	Noctuidae	Mesoligia furuncula (D. & S.)		OF		LD	LD	LD	L	L	LP	PA	A	AO	LD	LD	LD
LEPIDOPTERA	Noctuidae	Mesoligia literosa (Haworth)	Root, Stem	OF		L	L	L	L	L	LP	PA	OA	OL	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Rivula sericealis (Scop.)		OF		LD	LD	LD	L	LP	PA	AOL	LPA	AOL	L	LD	LD
LEPIDOPTERA	Noctuidae	Tholera decimalis (Poda)		OF		O	O	L	L	L	L	LP	PA	A	O	O	O
LEPIDOPTERA	Nymphalidae	Hipparchia semele (L)		OF							P	A	A	A			
LEPIDOPTERA	Pyralidae	Agriphila inquinatella (D&S)		OF				L	L	LP	PA	A	A	AO			
LEPIDOPTERA	Pyralidae	Agriphila selasella (Hubner)		OF				L	L	L	P	A	A				
LEPIDOPTERA	Pyralidae	Agriphila straminella (D&S)	Stem	OF		L	L	L	L	L	LP	PA	A	L	L	L	L
LEPIDOPTERA	Pyralidae	Anerastia lotella (Hubner)	Leaves	OF		L	L	L	L	L	LP	PL		L	L	L	L
LEPIDOPTERA	Pyralidae	Crambus perlella (Scop)	Stem	OF		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Pyralidae	Pediasia contaminella (Hubner)		OF	Nb	L	L	L	L	L	LP	PA	A	L	L	L	L
LEPIDOPTERA	Pyralidae	Platytes cerussella (D&S)		OF					L	L	A	A					
LEPIDOPTERA	Pyralidae	Thisanotia chrysonuchella (Scopoli)		OF	N	L	L	L	L	LPA	A	L	L	L	L	L	L
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Coenonympha pamphilus pamphilus (L)		OF		L	L	L	LP	P	PAO	AOL	PAOL	AOL	OL	L	L
LEPIDOPTERA	Satyridae	Erebia aethiops (Esper)		OF		LD	LD	LD	L	L	L	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Satyridae	Erebia epiphron (Knoch)		OF													
LEPIDOPTERA	Satyridae	Maniola jurtina (L)		OF		L	L	L	L	L	PA	A	A	A	A		
LEPIDOPTERA	Satyridae	Melanargia galathea (L.)		OF		LD	L	L	L	L	LPA	PAO	AO LD	LD	LD	LD	LD
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD
LEPIDOPTERA	Tortricidae	Eana penziana bellana (Curt)		M		LD	LD	LD	L	L	LPA	AOL	L	LD	LD	LD	LD

Festuca pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Chaetocnema hortensis (Fourcroy, 1785)	Stem, Leaves	OF		A	A	A	AOL	L	L	LA	A	A	A	A	A
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Cerodontha denticornis (Panzer)	Leaf miner	OF					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Cerodontha pygmaea (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia festucae Jones, 1940		OG													
DIPTERA	Chloropidae	Crassivenula brachyptera		OF	RDB 3												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus striifrons (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Conosanus obsoletus (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Ebarrius cognatus (Fieber)		OF	Nb												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocuellus collinus (Boheman)		OF	RDB K												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydiopsis attenuata (Germer)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Psammotettix confinis (Dahlbom)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Asphidaphis porosiphon (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptaphis poae (Hardy)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis nigerrima (Hille Ris Lambers)	Leaf blades	OF2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides brevicornis (Laing)		OF2													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha kurdjumovi (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha maydis (Passerini)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus placidus Green		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus pseudinsignis Green		OF		O	O	O	A	A	AO	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Heterococcus pulverarius (Newstead)		OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Rhizoecus albidus Goux	Root	OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus obductus (Hartig)		OF													
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista apicipunctella (Stainton)	Leaves	OF		LD	LD	LD	LD A	A	A	A	A	L	L	L	L LD
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista dispunctella (Dup.)		OG		L	L	L	LPA	A	AL	LPA	A	AL	L	L	L
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Elachistidae	Elachista luticomella (Zeller)		OF		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	LA	A	LA	A				
LEPIDOPTERA	Elachistidae	Elachista triseriatella (Stainon)		OG	N	L	L	L	L	L	A	A		L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Glyphipterigidae	Glyphipterix simpliciella (Stephens)	Stem, Seed	OF		LD	LD	LD	P	PA	AO	L	L	LD	LD	LD	LD
LEPIDOPTERA	Noctuidae	Luperina testacea (D. & S.)	Root, Stem bases	OF		L	L	L	L	L	L	P	PA	AOL	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD

Festuca pratensis (Continued)

Festuca pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Noctuidae	Rivula sericealis (Scop.)		OF		LD	LD	LD	L	LP	PA	AOL	LPA	AOL	L	LD	LD
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria vacculella (Fischer von Roslerstamm)	Stem, Leaves	OF	Nb	O	O	O	OL	LP	P	A	AO	O	O	O	O
LEPIDOPTERA	Pyralidae	Crambus perlella (Scop)	Stem	OF		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Pyralidae	Platytes cerussella (D&S)		OF					L	L	A	A					
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Coenonympha pamphilus pamphilus (L)		OF		L	L	L	LP	P	PAO	AOL	PAOL	AOL	OL	L	L
LEPIDOPTERA	Satyridae	Erebia aethiops (Esper)		OF		LD	LD	LD	L	L	L	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Festuca rubra

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Chaetocnema hortensis (Fourcroy, 1785)□	Stem, Leaves	OF		A	A	A	AOL	L	L	LA	A	A	A	A	A
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Cerodontha pygmaea (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia festucae Jones, 1940		OG													
DIPTERA	Cecidomyiidae	Dasyneura festucae Barnes, 1939		M													
DIPTERA	Chloropidae	Crassivenula brachyptera		OF	RDB 3												
HEMIPTERA (Auchenorrhyncha)	Cercopidae	Neophilaenus lineatus (L)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arocephalus punctum (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Conosanus obsoletus (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Dikraneura variata (Hardy)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Diplocolenus abdominalis (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Doratura stylata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Ebarrius cognatus (Fieber)		OF	Nb												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupelix cuspidata (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Hardya melanopsis (Hardys)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Jassus distinguendus (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocuellus collinus (Boheman)		OF	RDB K												
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydiopsis attenuata (Germer)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Paluda adumbrata (Sahlberg)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Turrutus socialis (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus albomarginatus (Curtis)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Delphacinus mesomelas (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Dicranotropis divergens (Kirschbaum)		OF	Nb												
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Hyledelphax elegantulus (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Heteroptera)	Miridae	Leptopterna ferrugata (Fallen)		OF							A	A	A				
HEMIPTERA (Heteroptera)	Miridae	Stenodema laevigatum (L)	Flowering heads	OF						O	O	AO	A				
HEMIPTERA (Heteroptera)	Miridae	Trigonotylus ruficornis (Geoffroy)		OF							A	A	A	A	A		
HEMIPTERA (Sternorrhyncha)	Aphididae	Asphidaphis porosiphon (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptaphis poae (Hardy)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium tenerum (Hille Ris Lambers)		OF3													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides brevicornis (Laing)		OF2													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha littoralis (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha maydis (Passerini)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Lecanopsis formicarum Newstead	Scales rootlet junctions, Base of leaf	OF		L	L	L	L	PA	AO	L	L	L	L	L	L
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus placidus Green		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus pseudinsignis Green		OF		O	O	O	A	A	AO	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													

Festuca rubra

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Heterococcus pulverarius (Newstead)		OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Rhizoecus albidus Goux	Root	OG													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus perrisii (Signoret)	Base of leaf sheath	OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus thulensis Green	Stem, Leaf sheath	OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus obductus (Hartig)		OF													
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista apicipunctella (Stainton)	Leaves	OF		LD	LD	LD	LD A	A	A	A	A	L	L	L	L LD
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista dispunctella (Dup.)		OG		L	L	L	LPA	A	AL	LPA	A	AL	L	L	L
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	L A	A	LA	A				
LEPIDOPTERA	Elachistidae	Elachista triatomea (Haworth)	Leaves	OG					L	L	LPA	A					
LEPIDOPTERA	Elachistidae	Elachista triseriatella (Stainon)		OG	N	L	L	L	L	L	A	A		L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Glyphipterigidae	Glyphipterix simpliciella (Stephens)	Stem, Seed	OF		LD	LD	LD	P	PA	AO	L	L	LD	LD	LD	LD
LEPIDOPTERA	Noctuidae	Apamea oblonga (Haw)	Root, Stem bases	OF	Nb	L	L	L	L	L	LA	A	LA	L	L	L	L
LEPIDOPTERA	Noctuidae	Luperina nickerlii knilli (Boursin)	Stem	OF		L	L	L	L	L	L	LP	PA	AOL	L	L	L
LEPIDOPTERA	Noctuidae	Luperina nickerlii nickerlii (Freyer)	Root, Stem	OF		L	L	L	L	L	L	LP	PA	AOL	L	L	L
LEPIDOPTERA	Noctuidae	Luperina testacea (D. & S.)	Root, Stem bases	OF		L	L	L	L	L	L	P	PA	AOL	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Rivula sericealis (Scop.)		OF		LD	LD	LD	L	LP	PA	AOL	LPA	AOL	L	LD	LD
LEPIDOPTERA	Nymphalidae	Hipparchia semele (L)		OF							P	A	A	A			
LEPIDOPTERA	Pyralidae	Crambus perlella (Scop)	Stem	OF		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Pyralidae	Platytes cerussella (D&S)		OF					L	L	A	A					
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Coenonympha pamphilus pamphilus (L)		OF		L	L	L	LP	P	PAO	AOL	PAOL	AOL	OL	L	L
LEPIDOPTERA	Satyridae	Erebia aethiops (Esper)		OF		LD	LD	LD	L	L	L	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Satyridae	Melanargia galathea (L.)		OF		LD	L	L	L	L	LPA	PAO	AO LD	LD	LD	LD	LD
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Holcus lanatus

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Agromyza nigripes Meigen, 1830	Leaf miner	M													
DIPTERA	Agromyzidae	Cerodontha denticornis (Panzer)	Leaf miner	OF					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Liriomyza flaveola (Fallen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza phryne Hendel	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza milii Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Mayetiola holci Kieffer, 1896	Leaves	OG2													
DIPTERA	Chloropidae	Conioscinella frontella (Fallén, 1820)	Stem	OF													
DIPTERA	Chloropidae	Oscinella frit (Linnaeus, 1758)		OF													
DIPTERA	Opomyzidae	Geomyza balachowskyi Mesnil, 1934	Stem borer, shoots	OF													
DIPTERA	Opomyzidae	Geomyza combinata agg. sensu Collin (1945)	Stem borer	OF													
DIPTERA	Opomyzidae	Opomyza petrei Mesnil, 1934	Stem borer	OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Adarrus ocellaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Athysanus argentarius (Metcalf)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Diplocolenus abdominalis (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Elymana sulphurella (Zetterstedt)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Jassus distinguendus (Flor)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydia crocea (Herrich-Schaeffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Mocydiopsis parvicauda (Ribaut)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Recilia coronifera (Marshall)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Streptanus aemulans (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Dicranotropis hamata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Eurybregma nigrolineata (Scott)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Muellerianella fairmairei (Perris)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Heteroptera)	Miridae	Leptopterna dolabrata (L)		OF							A	A	A	A			
HEMIPTERA (Heteroptera)	Nabidae	Nabis flavomarginatus Scholtz		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptaphis poae (Hardy)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Diuraphis holci (Hille Ris Lambers)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum holci Hille Ris Lambers		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis holci (Hille Ris Lambers)		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha maydis (Passerini)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus pseudinsignis Green		OF		O	O	O	A	A	AO	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica setulosa (Passerini)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pseudococcidae	Trionymus perrisii (Signoret)	Base of leaf sheath	OF													
LEPIDOPTERA	Cicadellidae	Elachista gangabella Zell.	Leaves	OF		LD	LD	LD	LD P	A	A		L	L	L	L	LD
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA				
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista apicipunctella (Stainton)	Leaves	OF		LD	LD	LD	LD A	A	A	A	A	L	L	L	L LD
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	L A	L A	A				
LEPIDOPTERA	Hesperiidae	Thymelicus sylvestris (Poda)		OF		LD	LD	L	L	LP	PA	A	O	LD	LD	LD	LD
LEPIDOPTERA	Noctuidae	Omphaloscelis lunosa (Haworth)		OF		L	L	L	L	L	P	P	A	A	AOL	L	L
LEPIDOPTERA	Noctuidae	Plusia putnami (Grote)		OF		L	L	L	L	L		A	LA	L	L	L	L
LEPIDOPTERA	Noctuidae	Plusia putnami gracilis (Lempke)		OF		L	L	L	L	L	LP	A	A	O	L	L	L
LEPIDOPTERA	Nymphalidae	Lasiommata megera L.		OF		LD P	LD P	LD LP	LPA	AO	AOLP	LP	LPA	AOL	L	LD P	LD P
LEPIDOPTERA	Satyridae	Maniola jurtina (L)		OF		L	L	L	L	L	PA	A	A	A	A		
LEPIDOPTERA	Satyridae	Pararge aegeria (L.)	Leaves	OF		LD P	LD P	LD P	LA	AOLP	AOLP	AOLP	AOLP	AOLP	AOLP	LD P	LD P
THYSANOPTERA	Thripidae	Baliothrips dispar (Haliday)		OF		A	A	A	A	A	LA	LA	LA	LA	LA	LA	LA

Lolium perenne

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Melolontha melolontha (Linnaeus, 1758)	Root	OF													
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Cerodontha incisa (Meigen, 1830)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Agromyzidae	Pseudonapomyza atra	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia lolii Metcalfe, 1933		M													
DIPTERA	Chloropidae	Oscinella frit (Linnaeus, 1758)	Stem borer	OF													
DIPTERA	Opomyzidae	Geomyza balachowskyi Mesnil, 1934	Stem borer, shoots	OF													
DIPTERA	Opomyzidae	Geomyza tripunctata Fallén, 1823	Stem borer, shoot miner	OF													
DIPTERA	Opomyzidae	Opomyza florum (Fabricius, 1794)	Stem borer	OF		LD	LD	L	L	LP	A	A	A	A	AOL	L	LD
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus striifrons (Kirschbaum)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha maydis (Passerini)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria vacculella (Fischer von Roslerstamm)	Stem, Leaves	OF	Nb	O	O	O	OL	LP	P	A	AO	O	O	O	O
LEPIDOPTERA	Satyridae	Maniola jurtina (L)	Leaves	OF		L	L	L	L	L	PAO	AOP	AOP	AO	A		
LEPIDOPTERA	Satyridae	Maniola jurtina insularis (Thomson)		OF		L	L	L	L	L	LPA	LPAO	PAOL	PAOL	L	L	L

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia kanervoi Barnes, 1958		M													
DIPTERA	Cecidomyiidae	Winnertzia tridens Panelius, 1965		M													
DIPTERA	Scathophagidae	Nanna armillata (Zetterstedt, 1846)	Flower heads, inflorescences	OF													
DIPTERA	Scathophagidae	Nanna flavipes (Fallén, 1819)	Flower heads, inflorescences	OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Heteroptera)	Miridae	Capsus ater (L.)		OF													
HEMIPTERA (Heteroptera)	Miridae	Leptopterna dolabrata (L)		OF							A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Stenodema laevigatum (L)	Flowering heads	OF						O	O	AO	A				
HEMIPTERA (Heteroptera)	Miridae	Trigonotylus ruficornis (Geoffroy)		OF							A	A	A	A	A		
HEMIPTERA (Sternorrhyncha)	Aphididae	Diuraphis muehlei (Borner)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HYMENOPTERA (Symphyta)	Cephidae	Cephus cultratus (Eversmann)		OF						A	A	A					
HYMENOPTERA (Symphyta)	Cephidae	Cephus pygmeus (L)		OF													
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista bedellella (Sirc.)	Leaves	OF		L	L	L	L	A	LD A	LD A	A				
LEPIDOPTERA	Hesperiidae	Thymelicus lineola (Ochsenheimer)		OF		LD O	LD O	LD O	L	L	PA	A	AO	LD O	LD O	LD O	LD O
LEPIDOPTERA	Hesperiidae	Thymelicus sylvestris (Poda)		OF		LD	LD	L	L	LP	PA	A	O	LD	LD	LD	LD
LEPIDOPTERA	Noctuidae	Deltote deceptoria (Scop)		OF						A	LA	L	L				
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria vacculella (Fischer von Roslerstamm)	Stem, Leaves	OF	Nb	O	O	O	OL	LP	P	A	AO	O	O	O	O
LEPIDOPTERA	Satyridae	Melanargia galathea (L.)		OF		LD	L	L	L	L	LPA	PAO	AO LD	LD	LD	LD	LD

Poa pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Chaetocnema hortensis (Fourcroy, 1785)	Stem, Leaves	OF		A	A	A	AOL	L	L	LA	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Psylliodes cucullata (Illiger, 1807)	Root, Stem miner, Leaf miner	O													
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Agromyza rondensis Strobl	Leaf miner	OF													
DIPTERA	Agromyzidae	Cerodontha crassiseta (Strobl)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza flaveola (Fallen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza milii Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Agromyzidae	Pseudonapomyza atra	Leaf miner	OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Doratura stylata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Graphocraerus ventralis (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Jassargus flori (Fieber)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Muirodelphax aubei (Perris)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Xanthodelphax flaveolus(Flor)		M	Na												
HEMIPTERA (Heteroptera)	Miridae	Amblytylus nasutus (Kirschbaum)		OF													
HEMIPTERA (Heteroptera)	Miridae	Leptopterna ferrugata (Fallen)		OF							A	A	A				
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium frisicum (Hille Ris Lambers)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalomyzus poae (Gillette)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum maidis (Fitch)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Schizaphis graminum (Rondn.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Eriopeltis festucae (Boyer de Fonscolombe)		OF													
HEMIPTERA (Sternorrhyncha)	Coccidae	Lecanopsis formicarum Newstead	Scales rootlet junctions, Base of leaf	OF		L	L	L	L	PA	AO	L	L	L	L	L	L
HEMIPTERA (Sternorrhyncha)	Eriococcidae	Eriococcus glyceriae Green		OF		O	O		L	L		A	A		O	O	O
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Colopha compressa (Koch)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HYMENOPTERA (Symphyta)	Cephidae	Cephus nigrinus (Thomson)		OF						A	A	A					
HYMENOPTERA (Symphyta)	Tenthredinidae	Eutomostethus ephippium (Panz)		OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus obductus (Hartig)		OF													
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista collitella (Dup.)	Leaves	OF	N	L	L	L	L	LPA	AL	LPA	A	A	L	L	L
LEPIDOPTERA	Elachistidae	Elachista humilis (Zeller)	Leaves	OF						A	A	A					
LEPIDOPTERA	Elachistidae	Elachista luticomella (Zeller)		OF		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista pomerana (Frey)	Leaves	OF	RDB 2				LPA	PA	LPA	A	LPA	PA			
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	LA	A	LA	A				
LEPIDOPTERA	Gelechiidae	Brachmia rufescens (Haw)		OF		L	L	L	L	L	PA	A	AL	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea furva (D&S)	Root, Lower stem	OF		L	L	L	L	L	L	A	A	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea furva britannica (Cockayne)		OG		L	L	L	L	L	LP	A	AO	L	L	L	L

Poa pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Noctuidae	Deltote bankiana (Fabricius)		OF	RDB 3	P	P	P	P	P	PA	AO	L	L	P	P	P
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna vitellina (Hubn)		OF						AOL	AOL	AOLP	AOLP	A	A	A	
LEPIDOPTERA	Noctuidae	Pachetra sagittigera (Hufn)		OF	RDB 1	L	L	L	L		A	L	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Pachetra sagittigera britannica (Turner)		OF	RDB 1 +	L	L	L	LP	PA	AO	L	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Tholera decimalis (Poda)		OF		O	O	L	L	L	L	LP	PA	A	O	O	O
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria mediopectinellus (Haworth)	Stem	OF		L	L	L	L	LP	P	PAO	AO	AOL	L	L	L
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria vacculella (Fischer von Roslerstamm)	Stem, Leaves	OF	Nb	O	O	O	OL	LP	P	A	AO	O	O	O	O
LEPIDOPTERA	Pyralidae	Agriphila inquinatella (D&S)		OF				L	L	LP	PA	A	A	AO			
LEPIDOPTERA	Pyralidae	Agriphila tristella (D&S)		OF		L	L	L	L	L	LP	PA	A	AL	L	L	L
LEPIDOPTERA	Pyralidae	Crambus pascuella (L)		OF							A	A	A				
LEPIDOPTERA	Pyralidae	Thisanotia chrysonuchella (Scopoli)		OF	Notable	L	L	L	L	LPA	A	L	L	L	L	L	L
LEPIDOPTERA	Satyridae	Aphantopus hyperantus (L)		OF		LD	LD	L	L	L	L	P	PAOL	AOL	L	LD	LD
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Coenonympha pamphilus pamphilus (L)		OF		L	L	L	LP	P	PAO	AOL	PAOL	AOL	OL	L	L
LEPIDOPTERA	Satyridae	Maniola jurtina (L)	Leaves	OF		L	L	L	L	L	PAO	AOP	AOP	AO	A		
LEPIDOPTERA	Satyridae	Maniola jurtina insularis (Thomson)		OF		L	L	L	L	L	LPA	LPAO	PAOL	PAOL	L	L	L
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Poa trivialis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chaetocnema aridula (Gyllenhal, 1827)	Stem	OF		A	A	A	A	A	L	LA	A	A	A	A	A
DIPTERA	Agromyzidae	Agromyza nigrella Rondani	Leaf miner	OF									A	A	A		
DIPTERA	Agromyzidae	Agromyza rondensis Strobl	Leaf miner	OF													
DIPTERA	Agromyzidae	Cerodontha crassiseta (Strobl)	Leaf miner	OF													
DIPTERA	Agromyzidae	Cerodontha flavocingulata (Strobl)	Leaf miner	OF						A	A	A					
DIPTERA	Agromyzidae	Cerodontha fulvipes (Meigen)	Leaf miner	M								A					
DIPTERA	Agromyzidae	Liriomyza flaveola (Fallen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza milii Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Agromyzidae	Pseudonapomyza atra	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Sitodiplosis cambriensis Jones, 1940		M													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Arthaldeus pascuellus (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Deltocephalus pulicaris (Fallen)		OF													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Zyginidia scutellaris (Herrich-Schaffer)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus williamsi (China)		OF	Nb												
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella forcipata (Boheman)		OF													
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Javesella pellucida (Fabr)		OF													
HEMIPTERA (Heteroptera)	Miridae	Amblytylus nasutus (Kirschbaum)		OF													
HEMIPTERA (Heteroptera)	Miridae	Leptoptema ferrugata (Fallen)		OF							A	A	A				
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium festucae (Theobald)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium frisicum (Hille Ris Lambers)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalomyzus poae (Gillette)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphum insertum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Atheroides serrulatus (Haliday)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Aploneura lentisci (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Baizongia pistaciae (L)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Colopha compressa (Koch)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda formicaria (von Heyden)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Forda marginata (Koch)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HYMENOPTERA (Symphyta)	Tenthredinidae	Eutomostethus ephippium (Panz)		OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus obductus (Hartig)		OF													
LEPIDOPTERA	Elachistidae	Cosmiotes freyerella (Hubn)	Leaves	OF				L	LPA	PA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista albifrontella (Hubn)	Leaves	OF		L	L	L	L	L	A	A	A	L	L	L	L
LEPIDOPTERA	Elachistidae	Elachista argentella (Clerck)	Leaves	OF				L	P	PA	A	A	A				
LEPIDOPTERA	Elachistidae	Elachista canapennella (Hubn)		OF				L	LP	LPA	A	LP	PA	A			
LEPIDOPTERA	Elachistidae	Elachista monosemiella (Rossler)	Leaves	OF						A	LA	LA	A				
LEPIDOPTERA	Elachistidae	Elachista pomerana (Frey)		OF	RDB 2				LPA	PA	LPA	A	LPA	PA			
LEPIDOPTERA	Elachistidae	Elachista subnigrella Dougl.	Leaves	OF					L	LA	A	LA	A				
LEPIDOPTERA	Gelechiidae	Brachmia rufescens (Haw)		OF		L	L	L	L	L	PA	A	AL	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea furva (D&S)	Root, Lower stem	OF		L	L	L	L	L	L	A	A	L	L	L	L
LEPIDOPTERA	Noctuidae	Apamea furva britannica (Cockayne)		OG		L	L	L	L	L	LP	A	AO	L	L	L	L
LEPIDOPTERA	Noctuidae	Mythimna conigera (D&S)		OF		LD	LD	L	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Mythimna vitellina (Hubn)		OF						AOL	AOL	AOLP	AOLP	A	A	A	
LEPIDOPTERA	Noctuidae	Pachetra sagittigera (Hufn)		OF	RDB 1	L	L	L	L		A	L	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Pachetra sagittigera britannica (Turner)		OF	RDB 1 +	L	L	L	LP	PA	AO	L	L	L	L	L	L
LEPIDOPTERA	Noctuidae	Tholera decimalis (Poda)		OF		O	O	L	L	L	L	LP	PA	A	O	O	O
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria mediopectinellus (Haworth)	Stem	OF		L	L	L	L	LP	P	PAO	AO	AOL	L	L	L
LEPIDOPTERA	Ochsenheimeriidae	Ochsenheimeria vacculella (Fischer von Roslerstamm)	Stem, Leaves	OF	Nb	O	O	O	OL	LP	P	A	AO	O	O	O	O
LEPIDOPTERA	Pyralidae	Agriphila inquinatella (D&S)		OF				L	L	LP	PA	A	A	AO			
LEPIDOPTERA	Pyralidae	Agriphila tristella (D&S)		OF		L	L	L	L	L	LP	PA	A	AL	L	L	L
LEPIDOPTERA	Pyralidae	Crambus pascuella (L)		OF							A	A	A				
LEPIDOPTERA	Pyralidae	Thisanotia chrysonuchella (Scopoli)		OF	N	L	L	L	L	LPA	A	L	L	L	L	L	L
LEPIDOPTERA	Satyridae	Coenonympha pamphilus (L)		OF													
LEPIDOPTERA	Satyridae	Coenonympha pamphilus pamphilus (L)		OF		L	L	L	LP	P	PAO	AOL	LPAO	AOL	OL	L	L
LEPIDOPTERA	Satyridae	Maniola jurtina (L)	Leaves	OF		L	L	L	L	L	PAO	AOP	AOP	AO	A		
LEPIDOPTERA	Satyridae	Maniola jurtina insularis (Thomson)		OF		L	L	L	L	L	LPA	LPAO	LPAO	LPAO	L	L	L
LEPIDOPTERA	Satyridae	Pyronia tithonus (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	AOL	L	LD	LD

Lathyrus pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Cyanapion afer (Gyllenhal, 1833)	Vegetative buds	M					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Eutrichapion ervi (Kirby, 1808)	Bud, Fruit, seeds	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Eutrichapion viciae (Paykull, 1800)	Flowers; Anthers; Pistils	OT		AD	AD	A AD	A	LA	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Holotrichapion pisi (Fabricius, 1801)		OF		LD	LD	L	LA	A	A	A	A	LA	LA	LD	LD
COLEOPTERA	Apionidae	Oxystoma cerdo (Gerstaecker, 1854)	Seed, Seed pod, Fruit	OT	Nb	AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma craccae (Linnaeus, 1767)		OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma pomonae (Fabricius, 1798)	Seeds, Fruits, Seed pod	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma subulatum (Kirby, 1808)	Seeds, Fruits, Seed pod	OF		AD	AD	A AD	A	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Syapion ebeninum (Kirby, 1808)	Stem	OF		AD	AD	AD	A AD	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Bruchidae	Bruchidius cisti (Fabricius, 1775)	Seed pods	O						A (rarely)	A	A	A (rarely)	A (rarely)			
COLEOPTERA	Bruchidae	Bruchus atomarius (Linnaeus)	Seed pods	OF	Nb				A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Bruchidae	Bruchus loti Paykull, 1800	Seed pods	OF		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Bruchidae	Bruchus rufimanus Boheman	Seed pods	OT		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)
COLEOPTERA	Bruchidae	Bruchus rufipes Herbst	Seed pods	OT													
COLEOPTERA	Chrysomelidae	Derocrepis rufipes (Linnaeus, 1758)		OF				A	A	AO	AL	A	A	A			
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)	Leaves	OF						A							
COLEOPTERA	Curculionidae	Sitona ambiguus Gyllenhal, 1834	Root nodules	OF2													
COLEOPTERA	Curculionidae	Sitona gemellatus Gyllenhal, 1834	Root nodules	OF	RDB 1	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Sitona suturalis Stephens, 1831	Root nodules	OT		AD	AD	AO	AO	AOL	L	L	L	A	A AD	AD	AD
DIPTERA	Agromyzidae	Agromyza lathyri Hendel	Leaf miner	OT													
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza pisivora Hering	Leaf miner	OT													
DIPTERA	Cecidomyiidae	Asphondylia lathyri Rübsaamen, 1914		OG													
DIPTERA	Cecidomyiidae	Contarinia jaapi Rübsaamen, 1914		M													
DIPTERA	Cecidomyiidae	Contarinia lathyri Kieffer, 1909		M													
DIPTERA	Cecidomyiidae	Dasyneura lathyri (Kieffer, 1909)		M													
DIPTERA	Cecidomyiidae	Dasyneura lathyricola (Rübsaamen, 1890)		M													
DIPTERA	Cecidomyiidae	Dasyneura pratensis (Kieffer, 1909)		M													
DIPTERA	Cecidomyiidae	Jaapiella volvens Rübsaamen, 1917		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis pseudocomosa Stroyan	Shoot, Flower	M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Megourella purpurea (Hille Ris Lambers)		OF													
HYMENOPTERA (Symphyta)	Argidae	Aprosthema melanura (Klug)		OG2								A	A				
LEPIDOPTERA	Gracillariidae	Phyllonorycter nigrescentella (Logan)	Leaves	OF		P	P	P	PA	A		LP	LPA	AL	P	P	P
LEPIDOPTERA	Noctuidae	Lygephila craccae (D. & S.)		OT	RDB 3	O	O	O	O	L	L	P	A	O	O	O	O
LEPIDOPTERA	Pieridae	Leptidea sinapis (L.)		OF						A	LA	LA	LA	L			
LEPIDOPTERA	Pieridae	Leptidea sinapis sinapis (L.)		OF3		P	P	P	P	A	AOL	LPA	AOL	L	P	P	P
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Cydia lunulana (Hb)	Stem, Leaves, Pods	OT		LD	LD	LD	LD P	PA	AOL	L	L	LD	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia nigricana (Fabr.)	Pods	OT		LD	LD	LD	LD	PA	PA	AOL	L	LD	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	LOPA	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena viciae (D&S)		OF2	RDB 1 !	L	L	L	L	L	LPA	LOPA	L	L	L	L	
LEPIDOPTERA	Zygaenidae	Zygaena viciae argyllensis (Trem)		OF2	RDB 1	LD	LD	LD	L	L	LP	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena viciae ytenensis (Briggs)		OF2	Extinct	L	L	L	L	L	A	A	L	L	L	L	L
THYSANOPTERA	Thripidae	Kakothrips pisivorous (Westwood)	Flower	OF						LA	LA	LA	A				
THYSANOPTERA	Thripidae	Odontothrips phaleratus (Haliday)		OT						A	A	LA	LA	LA			

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Eutrichapion ervi (Kirby, 1808)		OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Ischnopterapion loti (Kirby, 1808)	Seed-pod, Fruit, Seeds	OG		AD	AD	AD	A AD	A	AL	AL	AL	AL	AL	AD	AD
COLEOPTERA	Apionidae	Oxystoma subulatum (Kirby, 1808)		OF		AD	AD	A AD	A	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Syapion ebeninum (Kirby, 1808)		OF		AD	AD	AD	A AD	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Bruchidae	Bruchidius cisti (Fabricius, 1775)	Seed pods	O						A (rarely)	A	A	A (rarely)	A (rarely)			
COLEOPTERA	Bruchidae	Bruchus loti Paykull, 1800	Seed-pods	OF		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Curculionidae	Cleopmiarus plantarum (Germar, 1824)		O	RDB K												
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera nigrirostris (Fabricius, 1775)		OF				A	A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)	Leaves, Flowers	O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)		OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Hypera venusta (F., 1781)		OF					A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Pachytychius haematocephalus (Gyll.)	Seed, Seed-pod, Fruits	OG	RDB 1		A				A		A	A	A		
COLEOPTERA	Curculionidae	Sitona ambiguus Gyllenhal, 1834	Root nodules	OF2													
COLEOPTERA	Curculionidae	Sitona cinerascens (Fahraeus, 1840)		M	RDB K												
COLEOPTERA	Curculionidae	Sitona gemellatus Gyllenhal, 1834	Root nodules	OF	RDB 1	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	SItona ononidis Sharp, 1866	Root nodules	OF	Nb	AD	AD	AO	AO	L	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puberulus Reit.	Root nodules	OG	RDB K							A	A				
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Sitona waterhousei Walton, 1846	Root nodules	OF	Nb		A	A	A	A	A	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Trachyphloeus aristatus (Gyllenhal, 1827)	Root	O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Trachyphloeus asperatus Boheman, 1843	Root	O	Nb			A	A	A	A	A	A	A	A	A	
COLEOPTERA	Curculionidae	Trachyphloeus digitalis (Gyllenhal, 1827)	Root	O	Na					A		A	A				
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
COLEOPTERA	Curculionidae	Tychius flavicollis Stephens, 1831	Seed-pods	OG					A		A		A				
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
COLEOPTERA	Curculionidae	Tychius picirostris (Fabricius, 1787)	Seed-pods	OF					A	A	A	A	A		A		
COLEOPTERA	Curculionidae	Tychius polylineatus (Germar, 1824)		OF	RDB K												
COLEOPTERA	Curculionidae	Tychius pusillus Germar, 1842	Root	OF	Nb					A	A	A	L	A			
COLEOPTERA	Curculionidae	Tychius squamulatus Gyllenhal, 1836	Root	OT	Nb	A		A		A	A		A		A		
COLEOPTERA	Nitidulidae	Brachypterolus pulicarius (Linnaeus, 1758)	Pollen	M													
COLEOPTERA	Nitidulidae	Meligethes carinulatus Forster, 1849	Pollen	M				A	A	A	A	A	A	A	A		
COLEOPTERA	Nitidulidae	Meligethes erythropus (Marsham, 1802)	Pollen	M													
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Agromyzidae	Melanagromyza cunctans (Meigen)	Stem gall	M									A				
DIPTERA	Cecidomyiidae	Asphondylia melanopus Kieffer, 1890	Seed-pods	M													
DIPTERA	Cecidomyiidae	Contarinia barbichei (Kieffer)	Buds	M													
DIPTERA	Cecidomyiidae	Contarinia loti (De Geer, 1776)	Flower, Buds	OG													
DIPTERA	Cecidomyiidae	Dasyneura loti (Kieffer)	Flower, galls	M													
DIPTERA	Cecidomyiidae	Jaapiella loticola (Rübsaamen, 1889)		OG													
DIPTERA	Platystomatidae	Rivellia syngenesiae (Fabricius, 1781)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Acyrthosiphon loti (Theob.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis loti (Kalt)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis lotiradicis Stroyan	Root, Stem bases	M													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
HEMIPTERA (Sternorrhyncha)	Chaitophoridae	Sipha glyceriae (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HYMENOPTERA (Aculeata)	Apidae	Andrena fuscipes (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena wilkella (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Melitta tricincta Kirby	Flower	Monolectic	Nb	LD	LD	LD	LD	LD	LD	LP	PAOL	PAOL	LD	LD	LD
HYMENOPTERA (Symphyta)	Tenthredinidae	Tenthredo sulphuripes (Kreichbaumer)		M													
LEPIDOPTERA	Coleophoridae	Coleophora discordella Zell.	Leaves	OG		LD	LD	LD	L	L	P	A		L	L	LD	LD

Lotus corniculatus

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Gelechiidae	Syncopacma cinctella (Cl.)		OF	Nb					L	LPA	A					
LEPIDOPTERA	Gelechiidae	Syncopacma sangiella (Stt.)		M	N					L	LPA	A					
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Gelechiidae	Xystophora pulveratella (H.-S.)		OF	RDB 1					A	A		L	L			
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Erynnis tages L.		OF		LD	LD	LD	A	A	A	A	L	LD	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Erynnis tages tages (L.)		OF3		LD	LD	LD	LD P	PA	AO	L	L LD	LD	LD	LD	LD
LEPIDOPTERA	Lycaenidae	Everes argiades (Pallas)		OF		L	L	L	L		L			L	L	L	L
LEPIDOPTERA	Lycaenidae	Lysandra coridon (Poda)		OF		LDO	LDO	LDO	L	L	LP	PA	AO	AO	LDO	LDO	LDO
LEPIDOPTERA	Lycaenidae	Plebejus argus cretaceus Tutt		M		LDO	LDO	LDO	L	L	LP	PA	AO	AOLD	LDO	LDO	LDO
LEPIDOPTERA	Lyonetiidae	Leucoptera lotella (Stt.)	Leaves	OG		P	P	P	P	AO	LP	PAO	OLP	P	P	P	P
LEPIDOPTERA	Nepticulidae	Trifurcula cryptella (Stt.)		OG		P	P	P	P	A	AOL	L	LP	LP	P	P	P
LEPIDOPTERA	Nepticulidae	Trifurcula eurema (Tutt)		OG	Nb	P	P	P	P	PA	AOL	LP	A	OL	LP	P	P
LEPIDOPTERA	Nepticulidae	Trifurcula subnitidella (Dup.)	Stem	OG	Nb					A			A		L		
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	L A	L A	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct		LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Leptidea sinapis (L.)		OF						A	LA	LA	LA	L			
LEPIDOPTERA	Pieridae	Leptidea sinapis sinapis (L.)		OF3		P	P	P	P	A	AOL	LPA	AOL	L	P	P	P
LEPIDOPTERA	Pyralidae	Oncocera semirubella (Scopoli)		OF	Nb	LD	LD	LD	L	L	LP	PA	OL	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Pima boisduvaliella (Guenee)	Seed-pods	OF3	RDB 3	LD	LD	LD	LD	LD	PA	PAL	AL	L	L	LD	LD
LEPIDOPTERA	Scythrididae	Scythris picaepennis (Haw.)		O2						L	P	A					
LEPIDOPTERA	Scythrididae	Scythris siccella (Zell.)		O	RDB 1					L	P	A					
LEPIDOPTERA	Sesiidae	Bembecia scopigera (Scopoli)	Root	OF3		L	L	L	L	LP	PA	AO	AOL	L	L	L	L
LEPIDOPTERA	Tortricidae	Cydia compositella (Fabr.)	Stem, Leaves, Flower	OF		LD	LD	LD	LDP	PA	AOL	LP	PAOL	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Cydia succedana (D. & S.)	Pods	OF		LD	LD	LD	LDP	A	AOLP	PA	A	AOL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Lathronympha strigana (Fabr.)	Flower, Seed	O						LPA	PA	AOLP	PA	A			
LEPIDOPTERA	Tortricidae	Lobesia littoralis (Humph. & Westw.)	Stem, Flower, Seed	O2					L	LP	PA	AO	LP	PA	A		
LEPIDOPTERA	Tortricidae	Periclepsis cinctana (D. & S.)		OF	RDB 1	L	L	L	L	L	LP	A		L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena filipendulae (L)		OG2		L	L	L	L	L	ALP	PAO	ALOP	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena filipendulae stephensi Dupont		OG2		LD	LD	LD	L	L	LP	PAO	PAOL	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena loti (D&S)		M	RDB 3	LD	LD	LD	L	LP	PAO	AOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena loti scotica (Rowland-Brown)		M	RDB 3	L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena trifolii palustrella (Ver)		M		LD	LD	LD	LP	PAO	AOL	L	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena trifolli (Esper)		OG2		L	L	L	L	L A	L A	L	L	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena viciae (D&S)		OF2	RDB 1 !	L	L	L	L	L	LPA	LOPA	L	L	L	L	
LEPIDOPTERA	Zygaenidae	Zygaena viciae argyllensis (Trem)		OF2	RDB 1	LD	LD	LD	L	L	LP	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena viciae ytenensis (Briggs)		OF2	Extinct	L	L	L	L	L	A	A	L	L	L	L	L
THYSANOPTERA	Thripidae	Kakothrips pisivorous (Westwood)	Flower	OF						LA	LA	LA	A				
THYSANOPTERA	Thripidae	Odontothrips loti (Haliday)	Buds, Flower	OF					A	A	A	LA	LA	A	A		
THYSANOPTERA	Thripidae	Sericothrips abnormis (Karny)	Leaves, Flower	OF2		A		A	A	LA	LA	LA	LA	LA			
THYSANOPTERA	Thripidae	Thrips physapus Linnaeus		O						A	A	A	A	A			

Lotus uliginosus

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Ischnopterapion loti (Kirby, 1808)	Seed-pod, Fruit, Seeds	OG		AD	AD	AD	A AD	A	AL	AL	AL	AL	AL	AD	AD
COLEOPTERA	Apionidae	Oxystoma subulatum (Kirby, 1808)		OF		AD	AD	A AD	A	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Syapion ebeninum (Kirby, 1808)		OF		AD	AD	AD	A AD	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Bruchidae	Bruchidius cisti (Fabricius, 1775)	Seed-pods	O						A (rarely)	A	A	A (rarely)	A (rarely)			
COLEOPTERA	Bruchidae	Bruchus loti Paykull, 1800	Seed-pods	OF		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Curculionidae	Cleopmiarus plantarum (Germar, 1824)		O	RDB K												
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)	Leaves, Flowers	O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Hypera venusta (F., 1781)	Leaves	OF					A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Pachytychius haematocephalus (Gyll.)	Seed, Seed-pod, Fruits	OG	RDB 1		A				A		A	A	A		
COLEOPTERA	Curculionidae	Sitona gemellatus Gyllenhal, 1834	Root nodules	OF	RDB 1	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puberulus Reit.	Root nodules	OG	RDB K							A	A				
COLEOPTERA	Curculionidae	Sitona waterhousei Walton, 1846	Root nodules	OF	Nb		A	A	A	A	A	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Trachyphloeus aristatus (Gyllenhal, 1827)	Root	O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Trachyphloeus asperatus Boheman, 1843	Root	O	Nb			A	A	A	A	A	A	A	A	A	
COLEOPTERA	Curculionidae	Trachyphloeus digitalis (Gyllenhal, 1827)	Root	O	Na					A		A	A				
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
COLEOPTERA	Curculionidae	Tychius flavicollis Stephens, 1831	Seed-pods	OG					A		A		A				
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
DIPTERA	Cecidomyiidae	Contarinia loti (De Geer, 1776)	Flower, Buds	OG													
DIPTERA	Cecidomyiidae	Jaapiella loticola (Rübsaamen, 1889)		OG													
DIPTERA	Platystomatidae	Rivellia syngenesiae (Fabricius, 1781)		OF													
HEMIPTERA (Heteroptera)	Miridae	Adelphocoris ticinensis (Meyer-Dur)		OF2								A	A	A	A		
HEMIPTERA (Sternorrhyncha)	Aphididae	Acyrthosiphon loti (Theob.)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis loti (Kalt)		OF													
HEMIPTERA (Sternorrhyncha)	Callaphidiidae	Therioaphis trifolii (Monell)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora discordella Zell.	Leaves	OG		LD	LD	LD	L	L	P	A		L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Syncopacma cinctella (Cl.)		OF	Nb					L	LPA	A					
LEPIDOPTERA	Gelechiidae	Syncopacma larseniella (Gozm)		M						L	LPA	A					
LEPIDOPTERA	Gelechiidae	Xystophora pulveratella (H.-S.)		OF	RDB 1					A	A		L	L			
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Erynnis tages L.		OF		LD	LD	LD	A	A	A	A	L	LD	LD	LD	LD
LEPIDOPTERA	Hesperiidae	Erynnis tages tages (L.)		OF3		LD	LD	LD	LD P	PA	AO	L	L LD	LD	LD	LD	LD
LEPIDOPTERA	Lycaenidae	Everes argiades (Pallas)		OF		L	L	L	L		L			L	L	L	L
LEPIDOPTERA	Lycaenidae	Lysandra coridon (Poda)		OF		LD O	LD O	LD O	L	L	LP	PA	AO	AO	LD O	LD O	LD O
LEPIDOPTERA	Lyonetiidae	Leucoptera lotella (Stt.)	Leaves	OG		P	P	P	P	AO	LP	PAO	OLP	P	P	P	P
LEPIDOPTERA	Nepticulidae	Trifurcula cryptella (Stt.)		OG		P	P	P	P	A	AOL	L	LP	LP	P	P	P
LEPIDOPTERA	Nepticulidae	Trifurcula eurema (Tutt)		OG	Nb	P	P	P	P	PA	AOL	LP	A	OL	LP	P	P
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct		LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Leptidea sinapis (L.)		OF						A	LA	LA	LA	L			
LEPIDOPTERA	Scythrididae	Scythris siccella (Zell.)		O	RDB 1					L	P	A					
LEPIDOPTERA	Sesiidae	Bembecia scopigera (Scopoli)	Root	OF3		L	L	L	L	LP	PA	AO	AOL	L	L	L	L
LEPIDOPTERA	Tortricidae	Cydia succedana (D. & S.)	Pods	OF		LD	LD	LD	LD P	A	AOLP	PA	A	AOL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Periclepsis cinctana (D. & S.)		OF	RDB 1	L	L	L	L	L	LP	A		L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena filipendulae (L)		OG2		L	L	L	L	L	ALP	PAO	ALOP	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena filipendulae stephensi Dupont		OG2		LD	LD	LD	L	L	LP	PAO	PAOL	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena trifolii (Esper)		OG2		L	L	L	L	LA	LA	L	L	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena trifolii decreta (Verity)		M		L	L	L	L	L	L	A	A	L	L	L	L
LEPIDOPTERA	Zygaenidae	Zygaena viciae (D&S)		OF2	RDB 1 !	L	L	L	L	L	LPA	LOPA	L	L	L	L	
THYSANOPTERA	Thripidae	Odontothrips loti (Haliday)	Buds, Flower	OF					A	A	A	LA	LA	A	A		

Medicago lupulina

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Catapion seniculus (Kirby, 1808)		OT					A	A	AL	AL	AL	A	A		
COLEOPTERA	Apionidae	Holotrichapion pisi (Fabricius, 1801)	Flower bud	OF		LD	LD	L	LA	A	A	A	A	LA	LA	LD	LD
COLEOPTERA	Apionidae	Protapion filirostre (Kirby, 1808)	Stem, Buds	OT	Nb	AD	AD	AD A	A	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Stenopterapion tenue (Kirby, 1808)	Stem	OF		AD	AD	AL	L	L	A	A	A	A	AD	AD	AD
COLEOPTERA	Chrysomelidae	Derocrepis rufipes (Linnaeus, 1758)	Root	OF				A	A	AO	AL	A	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)		O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)	Leaves	OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera punctata (Fabricius, 1775)	Leaves	OT				A		AL	AL	A	A	A	A	LD	LD
COLEOPTERA	Curculionidae	Sitona gemellatus Gyllenhal, 1834	Root nodules	OF	RDB 1	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona waterhousei Walton, 1846	Root nodules	OF	Nb		A	A	A	A	A	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Tychius crassirostris Kirsch, 1871	Leaves	OT	RDB K					A	A	A	A				
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
DIPTERA	Agromyzidae	Agromyza frontella Rondani	Leaf miner	OG2													
DIPTERA	Agromyzidae	Agromyza nana Meigen	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Asphondylia lupulinae Kieffer, 1909		M													
DIPTERA	Cecidomyiidae	Dasyneura lupulinae (Kieffer, 1891)		M													
DIPTERA	Cecidomyiidae	Jaapiella jaapiana (Rübsaamen, 1914)		M													
HEMIPTERA (Heteroptera)	Berytinidae	Berytinus montivagus (Meyer)		OG													
HEMIPTERA (Heteroptera)	Coreidae	Bathysolen nubilis (Fallen)		M	N	A	A	A	A	A	A		A	A	A	A	A
HEMIPTERA (Heteroptera)	Coreidae	Coriomeris denticulatus (Scop.)		OF		A	A	A	A	A	AO		A	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Chlamydatus pullus (Reuter)		OF3													
HEMIPTERA (Heteroptera)	Miridae	Chlamydatus saltitans (Fallen)		OF2													
HEMIPTERA (Heteroptera)	Scutelleridae	Odontoscelis fuliginosa (L.)		M?	RDB 3												
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis coronillae arenaria Ferrari	Base	M													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Gelechiidae	Xystophora pulveratella (H.-S.)		OF	RDB 1					A	A		L	L			
LEPIDOPTERA	Gracillariidae	Phyllonorycter nigrescentella (Logan)	Leaves	OF		P	P	P	PA	A		LP	LPA	AL	P	P	P
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	LD	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias hyale (L.)		OF		LD	LD	LD L	LP	PA	AO	LPAO	LPA	AOL	L	LD	LD
LEPIDOPTERA	Pyralidae	Oncocera semirubella (Scopoli)		OF	Nb	LD	LD	LD	L	L	LP	PA	OL	L	L	LD	LD

Medicago sativa

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Catapion seniculus (Kirby, 1808)		OT					A	A	AL	AL	AL	A	A		
COLEOPTERA	Apionidae	Holotrichapion pisi (Fabricius, 1801)	Flower bud	OF		LD	LD	L	LA	A	A	A	A	LA	LA	LD	LD
COLEOPTERA	Apionidae	Protapion filirostre (Kirby, 1808)	Stem, Buds	OT	Nb	AD	AD	AD A	A	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Stenopterapion tenue (Kirby, 1808)	Stem	OF		AD	AD	AL	L	L	A	A	A	A	AD	AD	AD
COLEOPTERA	Chrysomelidae	Derocrepis rufipes (Linnaeus, 1758)	Root	OF				A	A	AO	AL	A	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)		O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)	Leaves	OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera punctata (Fabricius, 1775)	Leaves	OT				A		AL	AL	A	A	A	A	LD	LD
COLEOPTERA	Curculionidae	Sitona gemellatus Gyllenhal, 1834	Root nodules	OF	RDB 1	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Sitona hispidulus (Fabricius, 1777)	Root nodules	OT		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	A O	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Tychius crassirostris Kirsch, 1871	Leaves	OT	RDB K					A	A	A	A				
DIPTERA	Agromyzidae	Agromyza frontella Rondani	Leaf miner	OG2													
DIPTERA	Agromyzidae	Agromyza nana Meigen	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia medicaginis Kieffer, 1895	Flower	M													
DIPTERA	Cecidomyiidae	Dasyneura medicaginis (Bremi, 1847)		M													
DIPTERA	Micropezidae	Micropeza corrigiolata (Linnaeus, 1767)	Root nodules, Root nodules	OF						A	A	A	A	A			
HEMIPTERA (Heteroptera)	Alydidae	Alydus calcaratus (L.)		OF													
HEMIPTERA (Heteroptera)	Berytinidae	Berytinus montivagus (Meyer)		OG													
HEMIPTERA (Heteroptera)	Lygaeidae	Heterogaster urticae (Fabr.)		O3													
HEMIPTERA (Heteroptera)	Miridae	Chlamydatus pullus (Reuter)		OF3													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis ononidis (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
HYMENOPTERA (Aculeata)	Apidae	Dasypoda hirtipes (Fabricius)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Eucera longicornis (Linnaeus)	Flower	Oligolectic	Na	AD	AD	AD	AD	AOL	AOLP	AOLP	LPAD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Eucera nigrescens Perez	Flower	Oligolectic	RDB 1	AD	AD	AD	AD	AOL	AOLP	AOLP	LPAD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Melitta leporina (Panzer)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LPA	AO	OL	L	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Melitta tricincta Kirby	Flower	Monolectic	Nb	LD	LD	LD	LD	LD	LD	LP	PAOL	PAOL	LD	LD	LD
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Gelechiidae	Xystophora pulveratella (H.-S.)		OF	RDB 1					A	A		L	L			
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Gracillariidae	Phyllonorycter nigrescentella (Logan)	Leaves	OF		P	P	P	PA	A		LP	LPA	AL	P	P	P
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Noctuidae	Tathorhynchus exsiccata (Lederer)		OF													
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	LD	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Nymphalidae	Argynnis lathonia (L)		O						A	A	A	A	A	A		
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Colias hyale (L.)		OF		LD	LD	LD L	LP	PA	AO	LPAO	LPA	AOL	L	LD	LD
LEPIDOPTERA	Pyralidae	Oncocera semirubella (Scopoli)		OF	Nb	LD	LD	LD	L	L	LP	PA	OL	L	L	LD	LD

Onobrychis viciifolia

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Hemitrichapion reflexum (Gyllenhal, 1833)	Flowers, Flower galls	OG	Na			A	A	A	A	A	A	A	A	A	
COLEOPTERA	Apionidae	Stenopterapion intermedium (Eppelsheim, 1875)	Stem	OG	Na					A	A	A	A	A			
COLEOPTERA	Bruchidae	Bruchidius cisti (Fabricius, 1775)	Seed-pods	O						A (rare	A	A	A (rare	A (rarely)			
COLEOPTERA	Bruchidae	Bruchidius olivaceus (Germar, 1824)	Seed-pods	M	RDB 1	LD	LD				A	A	A	A		LD	LD
COLEOPTERA	Chrysomelidae	Derocrepis rufipes (Linnaeus, 1758)	Root	OF				A	A	AO	AL	A	A	A			
COLEOPTERA	Curculionidae	Hypera venusta (F., 1781)	Leaves	OF					A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
DIPTERA	Cecidomyiidae	Bremiola onobrychidis (Bremi, 1847)		OG													
DIPTERA	Cecidomyiidae	Contarinia onobrychidis Kieffer, 1895		M													
HYMENOPTERA (Aculeata)	Apidae	Andrena hattorfiana (Fabricius)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD P	PAOL	AOLP	AOLP	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena similis	Flower	Oligolectic	RDB 3	AD	AD	AD	AD	AOL	AOLP	AOLP	PA	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena wilkella (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Melitta dimidiata Morawitz	Flower	Monolectic	RDB 1	LD	LD	LD	LD	LD	LPA	AO	OL	L	LD	LD	LD
LEPIDOPTERA	Gelechiidae	Aproaerema anthyllidella (Hb.)	Pod	OF					L	LPA	A	LP	PA				
LEPIDOPTERA	Tortricidae	Cydia caecana (Schlag.)	Stem	M		LD	LD	LD	LD	LD PA	PA	AO	L	L	L	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Catapion curtisi (Stephens, 1831)		OG	Na			A	L	AL	AL	AL	A	A	A	A	
COLEOPTERA	Apionidae	Catapion pubescens (Kirby, 1811)	Stem, Stem galls	OG	Nb			AD A	AO	AL	AL	AL	A	A	A	AD	AD
COLEOPTERA	Apionidae	Catapion seniculus (Kirby, 1808)		OT					A	A	AL	AL	AL	A	A		
COLEOPTERA	Apionidae	Ischnopterapion virens (Herbst, 1797)	Stem	OG		AD	AD	AD A	LA	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Protapion assimile (Kirby, 1808)	Flowers	OG		AD	AD	AD A	AL	L	L	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion difforme (Germar, 1818)		O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Apionidae	Protapion dissimile (Germar, 1817)		OG		AD	AD	AD A	A	A	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion filirostre (Kirby, 1808)	Stem, Buds	OT	Nb	AD	AD	Ad A	A	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion nigritarse (Kirby, 1808)	Flowers	OG		AD	AD	AD A	A	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion schoenherri (Boheman, 1839)		OG	Na				A	A	A	A	A	A			
COLEOPTERA	Apionidae	Protapion trifolii (Linnaeus, 1768)	Flowers	OG		AD	AD	AD A	A	A	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion varipes (Germar, 1817)	Flower galls	OG	Nb			A	A	A	A	A	A	A			
COLEOPTERA	Bruchidae	Bruchidius varius (Olivier)	Seed-pods	OG					A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)		
COLEOPTERA	Chrysomelidae	Cassida nebulosa Linnaeus, 1757	Leaves	O					L	LA	A	A	A	A			
COLEOPTERA	Chrysomelidae	Longitarsus pellucidus (Foudras, 1860)		O					L (?)	L (?)	AL (?)	AL (?)	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera nigrirostris (Fabricius, 1775)		OF				A	A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)	Leaves, Flowers	O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)	Leaves	OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera punctata (Fabricius, 1775)	Leaves	OT		LD		A	L	AL	AL	A	A	A	A	LD	LD
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Sitona hispidulus (Fabricius, 1777)	Root nodules	OT		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona lepidus Gyllenhal, 1834	Root nodules	OG		L AD	L AD	LA	A	A	A	A	O	O LA	L	L AD	L AD
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona striatellus Gyllenhal, 1834	Root nodules	OF not Trif		AD	AD	AO	AO	L	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
COLEOPTERA	Curculionidae	Tychius picirostris (Fabricius, 1787)		OF					A	A	A	A	A		A		
COLEOPTERA	Curculionidae	Tychius polylineatus (Germar, 1824)		OF	RDB K												
COLEOPTERA	Curculionidae	Tychius pusillus Germar, 1842		OF	Nb					A	A	A	L	A			
COLEOPTERA	Scolytidae	Hylastinus obscurus (Marsham, 1802)		OF													
DIPTERA	Agromyzidae	Agromyza nana Meigen	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Campylomyza ormerodi (Kieffer, 1913)		OG													
DIPTERA	Cecidomyiidae	Dasyneura axillaris Kieffer, 1896		OG													
DIPTERA	Cecidomyiidae	Dasyneura gentneri Pritchard, 1953		OG													
DIPTERA	Cecidomyiidae	Dasyneura leguminicola (Lintner, 1879)		OG													
DIPTERA	Cecidomyiidae	Dasyneura trifolii (F. Löw, 1874)	Leaves, midrib	OG													
DIPTERA	Cecidomyiidae	Tricholaba trifolii Rübsaamen, 1917		OF													
DIPTERA	Lauxaniidae	Calliopum simillimum (Collin, 1933)	Leaf miner	OG	RDB 3						A	A	A	A	A		
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			
HEMIPTERA (Heteroptera)	Pentatomidae	Piezodorus lituratus (Fabr.)		OF		A	A	A	A	AO	AOL	A	A	A	A	A	A
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
LEPIDOPTERA	Coleophoridae	Coleophora frischella (L.)		O		LD	LD	LD	LD	AO	AOLP	A	A	AOL	L	LD	LD
LEPIDOPTERA	Gelechiidae	Aproaerema anthyllidella (Hb.)	Pod	OF					L	LPA	A	LP	PA				
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Geometridae	Ematurga atomaria (L.)		OF						A	LA	LA	LA	LP			
LEPIDOPTERA	Geometridae	Scopula rubiginata (Hufnagel)		O	RDB 3	LD	LD	LD	L	LP	PA	AOL	LPA	AL	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria (D&S)		OF		L	L	L	L	L	L		L	L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx chenopodiata (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Semiothisa clathrata (L.)		OF							L	L	L	L			
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Gracillariidae	Parectopa ononidis (Zell.)	Leaves	OF		LD	LD	L	LP	LPA	AO	LP	PAO	L	L	LD	LD

Trifolium dubium

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Gracillariidae	Phyllonorycter insignitella (Zeller)	Leaves	OF	RDB 3	P	P	P	P	PA	O	LP	PAO	OL	LP	P	P
LEPIDOPTERA	Lycaenidae	Lysandra coridon (Poda)		OF		LD O	LD O	LD O	L	L	LP	PA	AO	AO	LD O	LD O	LD O
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	LD	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Colias hyale (L.)		OF		LD	LD	LD L	LP	PA	AO	LPAO	LPA	AOL	L	LD	LD
LEPIDOPTERA	Pyralidae	Nyctegretis lineana (Scopoli)		O	RDB 3	L	L	L	L	L	P	PA	L	L	L	L	L
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Celypha cespitana (Hb.)		O		LD	LD	LD	L	LP	PA	A	AO	OL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia compositella (Fabr.)	Stem, Leaves, Flower	OF		LD	LD	LD	LD P	PA	AOL	LP	PAOL	L	L	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae latomarginata (Tutt)		OF		L	L	L	L	L	A	A	L	L	L	L	L

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Catapion curtisi (Stephens, 1831)		OG	Na			A	L	AL	AL	AL	A	A	A	A	
COLEOPTERA	Apionidae	Catapion pubescens (Kirby, 1811)	Stem, Stem galls	OG	Nb			AD A	AO	AL	AL	AL	A	A	A	AD	AD
COLEOPTERA	Apionidae	Catapion seniculus (Kirby, 1808)		OT					A	A	AL	AL	AL	A	A		
COLEOPTERA	Apionidae	Ischnopterapion virens (Herbst, 1797)	Stem	OG		AD	AD	AD A	LA	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Protapion apricans (Herbst, 1797)	Flowers, Florets	OF3		AD	AD	AD A	AL	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion assimile (Kirby, 1808)	Flowers	OG		AD	AD	AD A	AL	L	L	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion difforme (Germar, 1818)		O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Apionidae	Protapion dissimile (Germar, 1817)		OG		AD	AD	AD A	A	A	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion filirostre (Kirby, 1808)	Stem, Buds	OT	Nb	AD	AD	AD A	A	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion nigritarse (Kirby, 1808)	Flowers	OG		AD	AD	AD A	A	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion ryei (Blackburn, 1874)	Flowers	M	RDB 5												
COLEOPTERA	Apionidae	Protapion schoenherri (Boheman, 1839)		OG	Na				A	A	A	A	A	A			
COLEOPTERA	Apionidae	Protapion trifolii (Linnaeus, 1768)	Flowers	OG		AD	AD	AD A	A	A	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion varipes (Germar, 1817)	Flower galls	OG	Nb			A	A	A	A	A	A	A			
COLEOPTERA	Apionidae	Stenopterapion tenue (Kirby, 1808)	Stem	OF		AD	AD	AL	L	L	A	A	A	A	AD	AD	AD
COLEOPTERA	Bruchidae	Bruchidius varius (Olivier)	Seed-pods	OG					A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)		
COLEOPTERA	Chrysomelidae	Cassida nebulosa Linnaeus, 1757	Leaves	O					L	LA	A	A	A	A			
COLEOPTERA	Chrysomelidae	Longitarsus pellucidus (Foudras, 1860)		O					L (?)	L (?)	AL (?)	AL (?)	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera nigrirostris (Fabricius, 1775)		OF				A	A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)	Leaves, Flowers	O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)	Leaves	OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera punctata (Fabricius, 1775)	Leaves	OT		LD		A	L	AL	AL	A	A	A	A	LD	LD
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Sitona hispidulus (Fabricius, 1777)	Root nodules	OT		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona lepidus Gyllenhal, 1834	Root nodules	OG		L AD	L AD	LA	A	A	A	A	O	OLA	L	L AD	L AD
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona striatellus Gyllenhal, 1834	Root nodules	OF not Trif		AD	AD	AO	AO	L	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
COLEOPTERA	Curculionidae	Tychius lineatulus Stephens, 1831		OF	Na	A			A	A	A	A	A	A		A	
COLEOPTERA	Curculionidae	Tychius picirostris (Fabricius, 1787)		OF					A	A	A	A	A		A		
COLEOPTERA	Curculionidae	Tychius polylineatus (Germar, 1824)		OF	RDB K												
COLEOPTERA	Curculionidae	Tychius pusillus Germar, 1842		OF	Nb					A	A	A	L	A			
COLEOPTERA	Curculionidae	Tychius stephensi Gyllenhal, 1836	Flower	OF					A	A	A	A	A	A			
COLEOPTERA	Scolytidae	Hylastinus obscurus (Marsham, 1802)		OF													
DIPTERA	Agromyzidae	Agromyza nana Meigen	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Campylomyza ormerodi (Kieffer, 1913)		OG													
DIPTERA	Cecidomyiidae	Clinodiplosis leguminicola Milne 1960	Inflorescence, Flower heads	OG2						AL	AL	AL	AL	AL			
DIPTERA	Cecidomyiidae	Dasyneura axillaris Kieffer, 1896		OG													
DIPTERA	Cecidomyiidae	Dasyneura gentneri Pritchard, 1953		OG													
DIPTERA	Cecidomyiidae	Dasyneura leguminicola (Lintner, 1879)		OG													
DIPTERA	Cecidomyiidae	Dasyneura trifolii (F. Löw, 1874)	Leaves, midrib	OG													
DIPTERA	Cecidomyiidae	Giardomyia britanica Milne 1960	Flower heads, infloresences	OG2						L	AL	AL	AL				
DIPTERA	Cecidomyiidae	Tricholaba barnesi Milne, 1960	Flower heads, infloresences	OG2								AL	AL	AL			
DIPTERA	Cecidomyiidae	Tricholaba trifolii Rübsaamen, 1917		OF													
DIPTERA	Lauxaniidae	Calliopum simillimum (Collin, 1933)	Leaf miner	OG	RDB 3						A	A	A	A	A		
DIPTERA	Micropezidae	Micropeza corrigiolata (Linnaeus, 1767)	Root nodules	OF						A	A	A	A	A			
HEMIPTERA (Heteroptera)	Coreidae	Ceraleptus lividus Stein		OG		A	A	A	A	A	A		A	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			
HEMIPTERA (Heteroptera)	Pentatomidae	Piezodorus lituratus (Fabr.)		OF		A	A	A	A	AO	AOL	A	A	A	A	A	A
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis coronillae coronillae Ferrari	Base	OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Triphyllaphis luteola (Borner)		M													

Trifolium pratense (Continued)

Trifolium pratense

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis ononidis (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
HEMIPTERA (Sternorrhyncha)	Calliphididae	Therioaphis luteola (Borner)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Geoica utricularia (Passerini)		OF +													
HYMENOPTERA (Aculeata)	Apidae	Dasypoda hirtipes (Fabricius)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Eucera longicornis (Linnaeus)	Flower	Oligolectic	Na	AD	AD	AD	AD	AOL	AOLP	AOLP	LP AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Eucera nigrescens Perez	Flower	Oligolectic	RDB 1	AD	AD	AD	AD	AOL	AOLP	AOLP	LP AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Melitta leporina (Panzer)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LPA	AO	OL	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora deauratella Lien. & Zell.	Seed	M		LD	LD	LD	LD	LP	A	A	L	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora frischella (L.)		O		LD	LD	LD	LD	AO	AOLP	A	A	AOL	L	LD	LD
LEPIDOPTERA	Gelechiidae	Aproaerema anthyllidella (Hb.)	Pod	OF					L	LPA	A	LP	PA				
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Geometridae	Ematurga atomaria (L.)		OF						A	LA	LA	LA	LP			
LEPIDOPTERA	Geometridae	Scopula rubiginata (Hufnagel)		O	RDB 3	LD	LD	LD	L	LP	PA	AOL	LPA	AL	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria (D&S)		OF		L	L	L	L	L	L		L	L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx chenopodiata (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Semiothisa clathrata (L.)		OF							L	L	L	L			
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Gracillariidae	Parectopa ononidis (Zell.)	Leaves	OF		LD	LD	L	LP	LPA	AO	LP	PAO	L	L	LD	LD
LEPIDOPTERA	Gracillariidae	Phyllonorycter insignitella (Zeller)	Leaves	OF	RDB 3	P	P	P	P	PA	O	LP	PAO	OL	LP	P	P
LEPIDOPTERA	Lycaenidae	Lysandra coridon (Poda)		OF		LD O	LD O	LD O	L	L	LP	PA	AO	AO	LD O	LD O	LD O
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	LD	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Colias hyale (L.)		OF		LD	LD	LD L	LP	PA	AO	LPAO	LPA	AOL	L	LD	LD
LEPIDOPTERA	Pyralidae	Nyctegretis lineana (Scopoli)		O	RDB 3	L	L	L	L	L	P	PA	L	L	L	L	L
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Celypha cespitana (Hb.)		O		LD	LD	LD	L	LP	PA	A	AO	OL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia compositella (Fabr.)	Stem, Leaves, Flower	OF		LD	LD	LD	LD P	PA	AOL	LP	PAOL	L	L	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae latomarginata (Tutt)		OF		L	L	L	L	L	A	A	L	L	L	L	L

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Catapion curtisi (Stephens, 1831)		OG	Na			A	L	AL	AL	AL	A	A	A	A	
COLEOPTERA	Apionidae	Catapion pubescens (Kirby, 1811)	Stem, Stem galls	OG	Nb			AD A	AO	AL	AL	AL	A	A	A	AD	AD
COLEOPTERA	Apionidae	Catapion seniculus (Kirby, 1808)		OT					A	A	AL	AL	AL	A	A		
COLEOPTERA	Apionidae	Ischnopterapion virens (Herbst, 1797)	Stem	OG		AD	AD	AD A	LA	LA	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Protapion assimile (Kirby, 1808)	Flowers	OG		AD	AD	AD A	AL	L	L	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion dichroum (Bedel, 1886)	Flowers, Seed	OF		AD	AD	AD A	A	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion difforme (Germar, 1818)		O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Apionidae	Protapion dissimile (Germar, 1817)		OG		AD	AD	AD A	A	A	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion filirostre (Kirby, 1808)	Stem, Buds	OT	Nb	AD	AD	AD A	A	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion laevicolle (Kirby, 1811)	Gall, Seed	OG2	Na	AD	AD	AD	A	A	A	A	A	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion nigritarse (Kirby, 1808)	Flowers	OG		AD	AD	AD A	A	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Protapion schoenherri (Boheman, 1839)		OG	Na				A	A	A	A	A	A			
COLEOPTERA	Apionidae	Protapion trifolii (Linnaeus, 1768)	Flowers	OG		AD	AD	AD A	A	A	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Protapion varipes (Germar, 1817)	Flower galls	OG	Nb			A	A	A	A	A	A	A			
COLEOPTERA	Bruchidae	Bruchidius varius (Olivier)	Seed-pods	OG					A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)		
COLEOPTERA	Chrysomelidae	Cassida nebulosa Linnaeus, 1757	Leaves	O					L	LA	A	A	A	A			
COLEOPTERA	Chrysomelidae	Longitarsus pellucidus (Foudras, 1860)		O					L (?)	L (?)	AL (?)	AL (?)	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera meles (Fabricius, 1792)	Leaves	OF	Na												
COLEOPTERA	Curculionidae	Hypera nigrirostris (Fabricius, 1775)		OF				A	A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)	Leaves, Flowers	O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Hypera postica (Gyllenhal, 1813)	Leaves	OF						A	A		A		A	A	A
COLEOPTERA	Curculionidae	Hypera punctata (Fabricius, 1775)	Leaves	OT		LD		A	L	AL	AL	A	A	A	A	LD	LD
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Sitona hispidulus (Fabricius, 1777)	Root nodules	OT		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona lepidus Gyllenhal, 1834	Root nodules	OG		L AD	LAD	LA	A	A	A	A	O	OLA	L	L AD	L AD
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona striatellus Gyllenhal, 1834	Root nodules	OF not Trif		AD	AD	AO	AO	L	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Tychius junceus (Reich, 1797)		OF					A	A	A	L (?)	L (?)	A			A
COLEOPTERA	Curculionidae	Tychius picirostris (Fabricius, 1787)	Seed-pods	OF					A	A	A	A	A		A		
COLEOPTERA	Curculionidae	Tychius polylineatus (Germar, 1824)		OF	RDB K												
COLEOPTERA	Curculionidae	Tychius pusillus Germar, 1842		OF	Nb					A	A	A	L	A			
COLEOPTERA	Curculionidae	Tychius stephensi Gyllenhal, 1836	Flower	OF					A	A	A	A	A	A			
COLEOPTERA	Nitidulidae	Meligethes nigrescens Stephens, 1830	Pollen	M					A		A	A	A	A	A	A	A
COLEOPTERA	Scolytidae	Hylastinus obscurus (Marsham, 1802)		OF													
DIPTERA	Agromyzidae	Agromyza nana Meigen	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Brachyneura squamigera (Winnertz, 1853)	Inflorescence, Flower heads	M													
DIPTERA	Cecidomyiidae	Campylomyza ormerodi (Kieffer, 1913)		OG													
DIPTERA	Cecidomyiidae	Clinodiplosis leguminicola Milne 1960	Inflorescence, Flower heads	OG2						AL	AL	AL	AL	AL			
DIPTERA	Cecidomyiidae	Dasyneura axillaris Kieffer, 1896		OG													
DIPTERA	Cecidomyiidae	Dasyneura gentneri Pritchard, 1953		OG													
DIPTERA	Cecidomyiidae	Dasyneura leguminicola (Lintner, 1879)		OG													
DIPTERA	Cecidomyiidae	Dasyneura trifolii (F. Löw, 1874)	Leaves, midrib	OG													
DIPTERA	Cecidomyiidae	Giardomyia britanica Milne 1960	Flower heads, infloresences	OG2						L	AL	AL	AL				
DIPTERA	Cecidomyiidae	Isodiplosis deutera Milne, 1960	Flower heads, infloresences	M								AL	AL				
DIPTERA	Cecidomyiidae	Tricholaba barnesi Milne, 1960	Flower heads, infloresences	OG2								AL	AL	AL			
DIPTERA	Cecidomyiidae	Tricholaba trifolii Rübsaamen, 1917		OF													
DIPTERA	Lauxaniidae	Calliopum simillimum (Collin, 1933)	Leaf miner	OG	RDB 3						A	A	A	A	A		
HEMIPTERA (Heteroptera)	Berytinidae	Berytinus minor (H-S.)		OF													
HEMIPTERA (Heteroptera)	Miridae	Chlamydatus pullus (Reuter)		OF3													
HEMIPTERA (Heteroptera)	Miridae	Chlamydatus saltitans (Fallen)		OF2													
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			

Trifolium repens

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Heteroptera)	Pentatomidae	Piezodorus lituratus (Fabr.)		OF		A	A	A	A	AO	AOL	A	A	A	A	A	A
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis coronillae coronillae Ferrari	Base	OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Subacyrthosiphon crytobium (Hille Ris Lambers)		OF													
HEMIPTERA (Sternorrhyncha)	Callaphididae	Therioaphis trifolii (Monell)		OF													
HEMIPTERA (Sternorrhyncha)	Cicadellidae	Sipha glyceriae (Kaltenbach)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena labialis (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Melitta leporina (Panzer)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LPA	AO	OL	L	L	LD	LD
HYMENOPTERA (Symphyta)	Tenthredinidae	Tenthredo arcuata (Forster)		M													
HYMENOPTERA (Symphyta)	Tenthredinidae	Tenthredo perkinsi (Morice)		M													
LEPIDOPTERA	Coleophoridae	Coleophora frischella (L.)		O		LD	LD	LD	LD	AO	AOLP	A	A	AOL	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora mayrella (Hb.)	Seed	M		LD	LD	LD	LD	LP	AO	AO	LA	L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Aproaerema anthyllidella (Hb.)	Pod	OF					L	LPA	A	LP	PA				
LEPIDOPTERA	Gelechiidae	Syncopacma taeniolella (Zell.)		OF						L	LP	A					
LEPIDOPTERA	Geometridae	Ematurga atomaria (L.)		OF						A	LA	LA	LA	LP			
LEPIDOPTERA	Geometridae	Scopula rubiginata (Hufnagel)		O	RDB 3	LD	LD	LD	L	LP	PA	AOL	LPA	AL	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria (D&S)		OF		L	L	L	L	L	L		L	L	L	L	L
LEPIDOPTERA	Geometridae	Scotopteryx bipunctaria cretata (Prout)		OF	Nb	LD	LD	LD	L	L	LP	A	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scotopteryx chenopodiata (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Semiothisa clathrata (L.)		OF							L	L	L	L			
LEPIDOPTERA	Geometridae	Semiothisa clathrata clathrata (L.)		OF		P	P	P	P	A	AO	LPA	A	AO	L	P	P
LEPIDOPTERA	Gracillariidae	Parectopa ononidis (Zell.)	Leaves	OF		LD	LD	L	LP	LPA	AO	LP	PAO	L	L	LD	LD
LEPIDOPTERA	Gracillariidae	Phyllonorycter insignitella (Zeller)	Leaves	OF	RDB 3	P	P	P	P	PA	O	LP	PAO	OL	LP	P	P
LEPIDOPTERA	Lycaenidae	Lysandra coridon (Poda)		OF		LD O	LD O	LD O	L	L	LP	PA	AO	AO	LD O	LD O	LD O
LEPIDOPTERA	Noctuidae	Callistege mi (Clerck)		OF						A	LA	LA	L	L			
LEPIDOPTERA	Noctuidae	Euclidia glyphica (L.)		OF		P	P	P	P	A	A	OL	L	P	P	P	P
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	LD	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Colias croceus (Geoffroy)		OF						AO	AOL	LP	AOL	LPA	LPAO	L	
LEPIDOPTERA	Pieridae	Colias hyale (L.)		OF		LD	LD	LD L	LP	PA	AO	LPAO	LPA	AOL	L	LD	LD
LEPIDOPTERA	Pyralidae	Nyctegretis lineana (Scopoli)		O	RDB 3	L	L	L	L	L	P	PA	L	L	L	L	L
LEPIDOPTERA	Pyralidae	Oncocera semirubella (Scopoli)		OF	Nb	LD	LD	LD	L	L	LP	PA	OL	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Celypha cespitana (Hb.)		O		LD	LD	LD	L	LP	PA	A	AO	OL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia compositella (Fabr.)	Stem, Leaves, Flower	OF		LD	LD	LD	LD P	PA	AOL	LP	PAOL	L	L	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae latomarginata (Tutt)		OF		L	L	L	L	L	A	A	L	L	L	L	L
THYSANOPTERA	Thripidae	Sericothrips abnormis (Kamy)		OF2													

Vicia cracca

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Cyanapion gyllenhali (Kirby, 1808)	Stem, Stem gall	OG	Nb	AD	AD	AD	A AD	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Apionidae	Cynapion spencii (Kirby, 1808)		OG		AD	AD	AD	A AD	A	LA	LA	A	A	A	AD	AD
COLEOPTERA	Apionidae	Eutrichapion ervi (Kirby, 1808)	Bud	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Eutrichapion punctigerum (Paykull, 1792)	Seed-pods	OG					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Eutrichapion viciae (Paykull, 1800)	Flowers, Anthers, Pistils	OT		AD	AD	A AD	A	LA	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Eutrichapion vorax (Herbst, 1797)	Flowers	OT					A	A	A	A	A	A	A		
COLEOPTERA	Apionidae	Holotrichapion aethiops (Herbst, 1797)	Stem, Stem galls	OG					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Holotrichapion pisi (Fabricius, 1801)		OF		LD	LD	L	LA	A	A	A	A	LA	LA	LD	LD
COLEOPTERA	Apionidae	Oxystoma cerdo (Gerstaecker, 1854)	Seed, Seed-pods, Fruits	OT	Nb	AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma craccae (Linnaeus, 1767)	Seeds, Fruits, Seed-pods	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma pomonae (Fabricius, 1798)	Seed-pods	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Bruchidae	Bruchus atomarius (Linnaeus)	Seed-pods	OF	Nb				A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Bruchidae	Bruchus loti Paykull, 1800	Seed-pods	OF		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Bruchidae	Bruchus rufimanus Boheman	Seed-pods	OT		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)
COLEOPTERA	Bruchidae	Bruchus rufipes Herbst	Seed-pods	OT													
COLEOPTERA	Chrysomelidae	Derocrepis rufipes (Linnaeus, 1758)	Root	OF				A	A	AO	AL	A	A	A			
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Hypera venusta (F., 1781)	Leaves	OF					A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona ononidis Sharp, 1866	Root nodules	OF	Nb	AD	AD	AO	AO	L	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Sitona suturalis Stephens, 1831	Root nodules	OT		AD	AD	AO	AO	AOL	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Tychius quinquepunctatus (Linnaeus, 1758)		OT	RDB 2					A	A						
COLEOPTERA	Curculionidae	Tychius stephensi Gyllenhal, 1836		OF					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Agromyza bicophaga Hering	Leaf miner	M													
DIPTERA	Agromyzidae	Agromyza erythrocephala Hendel	Stem gall	OG								A					
DIPTERA	Agromyzidae	Agromyza marionae Griffiths	Stem	M													
DIPTERA	Agromyzidae	Agromyza vicifoliae Hering	Leaf miner	OG							A						
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia craccae Kieffer, 1897		OG													
DIPTERA	Cecidomyiidae	Dasyneura spadicea Rübsaamen, 1917		M													
DIPTERA	Cecidomyiidae	Dasyneura viciae (Kieffer, 1888)		OG													
DIPTERA	Cecidomyiidae	Tricholaba trifolii Rübsaamen, 1917		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis craccae (L)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Submegoura heikinheimoi (Borner)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena wilkella (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
LEPIDOPTERA	Geometridae	Ematurga atomaria (L.)		OF						A	LA	LA	LA	LP			
LEPIDOPTERA	Geometridae	Scotopteryx chenopodiata (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	L	LD	LD	LD
LEPIDOPTERA	Noctuidae	Lygephila craccae (D. & S.)		OT	RDB 3	O	O	O	O	L	L	P	A	O	O	O	O
LEPIDOPTERA	Noctuidae	Lygephila pastinum (Treit.)		OF		LD	LD	LD	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	L	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Pieridae	Leptidea sinapis (L.)		OF						A	LA	LA	LA	L			
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Cydia lunulana (Hb)	Stem Leaves Pods	OT		LD	LD	LD	LD P	PA	AOL	L	L	LD	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia nigricana (Fabr.)	Pods	OT		LD	LD	LD	LD	PA	PA	AOL	L	LD	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia orobana (Treit.)	Leaves	OT		LD	LD	LD	LD P	P	P	A	AOL	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae latomarginata (Tutt)		OF		L	L	L	L	L	A	A	L	L	L	L	L
THYSANOPTERA	Thripidae	Kakothrips pisivorous (Westwood)	Flower	OF						LA	LA	LA	A				
THYSANOPTERA	Thripidae	Odontothrips biuncus John		OG							A	LA	LA	LA	A	A	
THYSANOPTERA	Thripidae	Odontothrips phaleratus (Haliday)		OT						A	A	LA	LA	LA			
THYSANOPTERA	Thripidae	Sericothrips gracilicornis Williams		M						A	LA	LA	LA	LA			

Vicia sativa

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	J	F	M	A	M	J	J	A	S	O	N	D
COLEOPTERA	Apionidae	Protapion dichroum (Bedel, 1886)	Flowers	OF													
COLEOPTERA	Apionidae	Holotrichapion pisi (Fabricius, 1801)		OF		LD	LD	L	LA	A	A	A	A	LA	LA	LD	LD
COLEOPTERA	Bruchidae	Bruchus atomarius (Linnaeus)	Seed-pods	OF	Nb				A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Bruchidae	Bruchus loti Paykull, 1800	Seed-pods	OF		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	
COLEOPTERA	Curculionidae	Hypera suspiciosa (Herbst, 1795)		OF						A							
COLEOPTERA	Curculionidae	Hypera fuscocinerea (Marsham, 1802)	Leaves	OF	Nb				A	A	A	A					
COLEOPTERA	Curculionidae	Hypera venusta (F., 1781)	Leaves	OF					A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Sitona lineatus (Linnaeus, 1758)	Root nodules	OF		AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona macularius (Marsham, 1802)	Root nodules	OF	Nb	AD	AD	AO	L	L	L	A	A	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Sitona puncticollis Stephens, 1831		OF				A	A	A	L (?)	L (?)	A	A	A		
COLEOPTERA	Curculionidae	Sitona humeralis Stephens, 1831	Root nodules	OF		OA	OA	OA	L	L	L	A	A	OA	OA	OA	OA
COLEOPTERA	Curculionidae	Sitona sulcifrons (Thunberg, 1798)	Root nodules	OF					A	A		A		A	A	A	A
COLEOPTERA	Curculionidae	Tychius stephensi Gyllenhal, 1836		OF					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Protapion apricans (Herbst, 1797)	Flowers	OF3		AD	AD	AD A	AL	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Eutrichapion punctigerum (Paykull, 1792)	Seed-pods	OG					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Cyanapion gyllenhali (Kirby, 1808)	Stem, Stem gall	OG	Nb	AD	AD	AD	A AD	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Apionidae	Holotrichapion aethiops (Herbst, 1797)	Stem, Stem galls	OG					A	A	A	A	A	A			
COLEOPTERA	Apionidae	Cynapion spencii (Kirby, 1808)		OG		AD	AD	AD	A AD	A	LA	LA	A	A	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma craccae (Linnaeus, 1767)	Seeds, Fruits, Seed-pod	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Oxystoma cerdo (Gerstaecker, 1854)	Seed, Seed-pod, Fruits	OT	Nb	AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Apionidae	Eutrichapion ervi (Kirby, 1808)	Bud	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Eutrichapion viciae (Paykull, 1800)	Flowers, Anthers, Pistils	OT		AD	AD	A AD	A	LA	LA	LA	LA	LA	A	LD	LD
COLEOPTERA	Apionidae	Eutrichapion vorax (Herbst, 1797)	Flowers	OT					A	A	A	A	A	A	A		
COLEOPTERA	Apionidae	Oxystoma pomonae (Fabricius, 1798)	Seed-pod	OT		AD	AD	AD	A AD	A	LA	LA	LA	LA	A	AD	AD
COLEOPTERA	Bruchidae	Bruchus rufimanus Boheman	Seed-pods	OT		A (rarely)	A (rarely)	A (rarely)	A (rarely)	A	A	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)	A (rarely)
COLEOPTERA	Bruchidae	Bruchus rufipes Herbst	Seed-pods	OT													
COLEOPTERA	Curculionidae	Sitona suturalis Stephens, 1831	Root nodules	OT		AD	AD	AO	AO	AOL	L	L	L	A	A AD	AD	AD
COLEOPTERA	Curculionidae	Tychius quinquepunctatus (Linnaeus, 1758)		OT	RDB 2					A	A						
DIPTERA	Agromyzidae	Liriomyza congesta (Becker)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Tricholaba trifolii Rübsaamen, 1917		OF													
DIPTERA	Agromyzidae	Agromyza vicifoliae Hering	Leaf miner	OG							A						
DIPTERA	Agromyzidae	Agromyza erythrocephala Hendel	Stem gall	OG								A					
DIPTERA	Cecidomyiidae	Contarinia craccae Kieffer, 1897		OG													
DIPTERA	Cecidomyiidae	Dasyneura viciae (Kieffer, 1888)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis craccae (L.)		OF													
HYMENOPTERA (Aculeata)	Apidae	Eucera longicornis (Linnaeus)	Flower	Oligolectic	Na	AD	AD	AD	AD	AOL	AOLP	AOLP	LP AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Eucera nigrescens Perez	Flower	Oligolectic	RDB 1	AD	AD	AD	AD	AOL	AOLP	AOLP	LP AD	AD	AD	AD	AD
LEPIDOPTERA	Geometridae	Ematurga atomaria (L.)		OF						A	LA	LA	LA	LP			
LEPIDOPTERA	Geometridae	Scotopteryx chenopodiata (L.)		OF		LD	LD	LD	L	L	LP	PA	AO	L	LD	LD	LD
LEPIDOPTERA	Noctuidae	Lygephila pastinum (Treit.)		OF		LD	LD	LD	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Nolidae	Nola aerugula (Hb.)		OF	Believed extinct	L	LD	LD	L	L	L	LPA	A	AOL	L	LD	LD
LEPIDOPTERA	Tortricidae	Ancylis badiana (D. & S.)		OF		LD	LD	LD	LD PA	A	AOL	LPA	AO	L	L	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae (Schev.)		OF		LD	LD	LD	L	L	LPA	PAOL	L	L	LD	LD	LD
LEPIDOPTERA	Zygaenidae	Zygaena lonicerae latomarginata (Tutt)		OF		L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Tortricidae	Cydia nigricana (Fabr.)	Pods	OT		LD	LD	LD	LD	PA	PA	AOL	L	LD	LD	LD	LD
LEPIDOPTERA	Tortricidae	Cydia lunulana (Hb)	Stem, Leaves, Pods	OT		LD	LD	LD	LD P	PA	AOL	L	L	LD	LD	LD	LD
THYSANOPTERA	Thripidae	Kakothrips pisivorous (Westwood)	Flower	OF						LA	LA	LA	A				
THYSANOPTERA	Thripidae	Odontothrips biuncus John		OG							A	LA	LA	LA	A	A	
THYSANOPTERA	Thripidae	Frankliniella intonsa (Trybom)		OG2													
THYSANOPTERA	Thripidae	Odontothrips phaleratus (Haliday)		OT						A	A	LA	LA	LA			

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Cassida denticollis Suff.	Leaves	OF	RDB 1												
COLEOPTERA	Chrysomelidae	Cassida prasina Illiger, 1796	Leaves	OF	Nb	A	A			LA	LA	LA	LA	A	A		
COLEOPTERA	Chrysomelidae	Cassida sanguinosa Suffrian, 1844	Leaves	OF													
COLEOPTERA	Chrysomelidae	Hypocassida subferruginea (Schr.)		O	Extinct												
COLEOPTERA	Chrysomelidae	Longitarsus succineus (Foudras, 1860)		OF					L (?)	L (?)	LA (?)	LA (?)	A				
COLEOPTERA	Curculionidae	Eusomus ovulum Germar, 1824		OG	Extinct												
COLEOPTERA	Curculionidae	Microplontus triangulum (Boheman, 1845)	Stem	OT	Nb					A	A	A	A	A			
COLEOPTERA	Curculionidae	Pseudostyphlus pillumus	Capitula, Seed pods	OT	Na						A	A					
COLEOPTERA	Curculionidae	Trichosirocalus barnevillei (Grenier, 1866)		OF	Nb			A		A	A	A	A	A			
COLEOPTERA	Phalacridae	Olibrus millefolii (Paykull, 1800)	Flower	OG	Nb												
DIPTERA	Agromyzidae	Liriomyza flavopicta Hendel	Stem miner	M													
DIPTERA	Agromyzidae	Liriomyza hampsteadensis Spencer		M	Rare												
DIPTERA	Agromyzidae	Liriomyza millefolii Hering	Leaf miner	M													
DIPTERA	Agromyzidae	Liriomyza ptarmicae	Leaf miner	OG2													
DIPTERA	Agromyzidae	Melanagromyza dettmeri Hering	Stem borer	OF													
DIPTERA	Agromyzidae	Melanagromyza oligophaga	Stem	OF3													
DIPTERA	Agromyzidae	Phytomyza matricariae Hendel	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza pullula Zetterstedt, 1848	Leaf miner	M													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza tanaceti Hendel, 1923	Leaf miner	OF2													
DIPTERA	Cecidomyiidae	Clinorrhyncha leucanthemi Kieff.	Flower	OT													
DIPTERA	Cecidomyiidae	Dasyneura francoisi (Kieffer)		M													
DIPTERA	Cecidomyiidae	Macrolabis achilleae Rübsaamen, 1893		M													
DIPTERA	Cecidomyiidae	Rhopalomyia millefolii (Loew, 1850)		OG2													
DIPTERA	Cecidomyiidae	Rhopalomyia ptarmicae (Vallot, 1849)		OG													
DIPTERA	Tephritidae	Dithryca guttularis (Meigen, 1826)	Stem, Gall stem	OG2								AOL	AOL				
DIPTERA	Tephritidae	Oxyna flavipennis (Loew, 1844)	Root, Gall root	OG	Nb							AOL	AOL				
DIPTERA	Tephritidae	Oxyna parietina (Linnaeus)	Stem	OT					AOL	AOL	AOL						
DIPTERA	Tephritidae	Trupanea amoena (Frauenfeld)	Capitula	OF	RDB 2												
DIPTERA	Tephritidae	Trypeta zoe Meigen	Leaves	OF		LD	LD	LD	LPA	AOLP	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora solstitialis (Linnaeus, 1758)	Capitula	OF	RDB 3	LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupteryx tenella (Fallen)		M													
HEMIPTERA (Heteroptera)	Cimicidae	Orius niger (Wolff)		OF													
HEMIPTERA (Heteroptera)	Miridae	Megalocoleus molliculus (Fallen)		O		O	O	O	O	O	OL	LA	A	A	O	O	O
HEMIPTERA (Heteroptera)	Miridae	Megalocoleus pilosus (Schrank)		OT													
HEMIPTERA (Heteroptera)	Miridae	Orthocephalus coriaceus (Fabr.)		O							A	A	A				
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Craspedolepta nervosa (Forster)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis vandergooti (Borner)	Root, Stolon, Petioles	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Coloradoa achilleae (Hille Ris Lambers)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella absinthii (L)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella millefolii (DeGeer)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella sejuncta (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella usquertensis (Hille Ris Lambers)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopeurum fuscoviride (Stroyan)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Microsiphum millefolii (Wahlgren)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Pleotrichophorus duponti (Hille Ris Lambers)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Toxopterina vandergooti (Borner)		OT													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon achilleae (Koch)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena nitidiuscula Schenck	Flower	Oligolectic		LD	LD	LD	LD	LD P	AO	AOLP	AOLP	AOLP	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
LEPIDOPTERA	Bucculatricidae	Bucculatrix capreella (Krogerus)	Leaves	M		A	A	A	A	AO	L	LPA	A	A	A	A	A
LEPIDOPTERA	Bucculatricidae	Bucculatrix cristatella (Zell)	Leaves	M					L	LP	PAO	LP	PA				
LEPIDOPTERA	Cochylidae	Aethes margaritana (Haw.)	Flower, Seed	OT	N	LD	LD	LD	LD	P	P	AO	AO	L	L	LD	LD
LEPIDOPTERA	Cochylidae	Aethes smeathmanniana (Fabr.)	Flower, Seed	OF		LD	LD	LD	LD	LD PA	A	A	A	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora argentula (Steph.)	Withering flowers	O3		LD	LD	LD	LD	LD	LP	A	A	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora gardesanella Toll	Leaves	OT		LD	LD	LD	L	L	LPA	A	A	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora trochilella (Dup.)		OT		LD	LD	LD	LD	L	LP	PA	A	OL		LD	LD

Achillea millefolium (Continued)

Achillea millefolium

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	J	F	M	A	M	J	J	A	S	O	N	D
LEPIDOPTERA	Geometridae	Eupithecia icterata (de Villers)		OT								A	LA	L	L		
LEPIDOPTERA	Geometridae	Eupithecia icterata subfulvata (Haw.)	Leaves, Flower	OG2		P	P	P	P	P	P	A	AO	L	L	P	P
LEPIDOPTERA	Geometridae	Eupithecia millefoliata Rossler	Seed, Seed heads	M	Nb	P	P	P	P	P	A	A	OL	L	L	P	P
LEPIDOPTERA	Oecophoridae	Depressaria olerella Zell.		M	RDB 3	A	A	A	A		L	LP	PA	A	A	A	A
LEPIDOPTERA	Oecophoridae	Depressaria silesiaca (Hein)		OT		A	A	A	A			LP	PA	A	A	A	A
LEPIDOPTERA	Pterophoridae	Platyptilia pallidactyla (Haw)	Root, Stem, Shoot	OG		LD	LD	LD	L	L	LPA	AO	AO	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Phycitodes maritima (Tengstrom)	Flower	OF2		LD	LD	LD	LD P	PA	LP	PA	L	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Dichrorampha gueneeana (Obraztsov)		OT		L	L	L	L	LP	PA	A	A	L	L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha montanana (Duponchel)		OT		L	L	L	LP	P	A	A	A		L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha petiverella (L.)	Root, Rootstock	OT		L	L	L	L	P	A	A	AO	L	L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha plumbagana (Treit.)	Rootstock, Stem	M		L	L	L	L	P	PA	A		L	L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha plumbana (Scop.)	Root, Rootstock	OT		L	L	L	LP	PA	A		L	L	L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha sequana (Hubn)		OT		L	L	L	L	P	PA		L	L	L	L	L
LEPIDOPTERA	Tortricidae	Thiodia citrana (Hb.)	Flower	OT		LD	LD	LD	LD	LD	P	A	AOL	L	LD	LD	LD
THYSANOPTERA	Phlaeothripidae	Haplothrips propinquus Bagnall	Flower	M		L		L		A	A	LA	LA	LA			
THYSANOPTERA	Phlaeothripidae	Haplothrips setiger Priesner		OF													
THYSANOPTERA	Thripidae	Thrips pillichi Priesner	Flower	OF						A	A	A	A	A			

Cardamine pratensis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Phyllotreta atra (F., 1775)	Root	OF		LD	LD	L	L	L	LA	A	A	A	LD	LD	LD
COLEOPTERA	Chrysomelidae	Phyllotreta nemorum (Linnaeus, 1758)	Leaf miner	OF		AD	AD	A	AL	AL	A	A	A	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Phyllotreta nigripes (F., 1775)	Root	OF		A	A	A	L(?)	L(?)	L(?)	L(?)		A	A		A
COLEOPTERA	Curculionidae	Ceutorhynchus cochleariae (Gyllenhal, 1813)	Seed, Fruit	OF			A		A	A	A	A	A			A	
COLEOPTERA	Curculionidae	Ceutorhynchus pectoralis Weise, 1895	Stem, Petiole	OF	Na		A		A			A	A		A	A	
COLEOPTERA	Curculionidae	Ceutorhynchus pervicax Weise, 1883		OF3	Na			A	A	A							
DIPTERA	Cecidomyiidae	Dasyneura cardaminicola Rübsaamen, 1915		OG													
HYMENOPTERA (Aculeata)	Apidae	Andrena nitida (Muller)	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
LEPIDOPTERA	Incurvariidae	Adela rufimitrella (Scop)	Leaves	OF2						A	A	L	L	L	L		
LEPIDOPTERA	Pieridae	Anthocharis cardamines (L)	Leaves, Flower, Flower buds, Seed pods	OF					A	A	A						
LEPIDOPTERA	Pieridae	Anthocharis cardamines britannica (Ver)	Seed pods	OF		P	P	P	PA	AOL	AOL	LP	P	P	P	P	P
LEPIDOPTERA	Pieridae	Pieris napi (L)		OF					A	LA	LA	LA	LA	LA			
LEPIDOPTERA	Pieridae	Pieris napi sabellicae (Steph)		OF		P	P	P	PAOL	AOLP	AOLP	AOLP	AOLP	AOLP	AOLP	P	P

Centaurea nigra

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Ceratapion armatum (Gerstaecker, 1854)		OG	RDB K	AD	AD	AD A	A	A	A	A	A	A	A	AD	AD
COLEOPTERA	Apionidae	Ceratapion onopordi (Kirby, 1808)	Root, Stem	OT		AD	AD	AD A	A	L	L	LA	LA	LA	A	AD	AD
COLEOPTERA	Chrysomelidae	Cassida rubiginosa Mueller, 1776	Leaves	OT		AD	AD	AD	A	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Sphaeroderma rubidum (Graells, 1858)		OT							L (?)	L (?)	LA (?)	A			
COLEOPTERA	Chrysomelidae	Sphaeroderma testaceum (F., 1775)		OT						L (?)	LA (?)	LA (?)	LA (?)	A	A		
COLEOPTERA	Curculionidae	Larinus planus (Fabr.)	Flower	OT	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Rhinocyllus conicus (Froel.)		OST	Na				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Rhynchaenus pratensis (Germ.)	Leaves, Leaf miner	M	Nb					A	A	A	A	A			
COLEOPTERA	Nitidulidae	Meligethes subrugosus (Gyllenhal, 1808)	Pollen	O3	N						A	A		A	A		
DIPTERA	Agromyzidae	Liriomyza centaureae Hering	Leaf miner	M								A					
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Melanagromyza dettmeri Hering	Stem borer	OF													
DIPTERA	Agromyzidae	Melanagromyza oligophaga	Stem	OF3													
DIPTERA	Agromyzidae	Napomyza hirticornis Hendel	Stem borer	O2													
DIPTERA	Agromyzidae	Phytomyza autumnalis Griffiths	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza spinaciae Hendel, 1928	Leaf miner	OT3													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Clinodiplosis cilicrus (Kieffer, 1889)		OG													
DIPTERA	Cecidomyiidae	Dasyneura miki (Kieffer, 1891)		OG													
DIPTERA	Cecidomyiidae	Loewiola centaureae (F. Löw, 1875)		OG													
DIPTERA	Tephritidae	Acanthiophilus helianthi (Rossi, 1794)	Capitula, inflorescence	OF	Nb							AOL	AOL				
DIPTERA	Tephritidae	Acinia corniculata (Zetterstedt, 1819)	Capitula, inflorescence	OF	RDB 1												
DIPTERA	Tephritidae	Chaetorellia jaceae (Robineau-Desvoidy, 183	Capitula, Inflorescence	OG		LD	LD	LD	LD	LP	AOL	AOLP	AOL	L	LD	LD	LD
DIPTERA	Tephritidae	Chaetostomella cylindrica (Robineau-Desvoid	Capitula, Inflorescence	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Paroxyna misella (Loew)	Stem, Capitula	OF2		AD	AD	AD	AD	AD	AOL	AOLP	PAOL	AOLP	AOLP	AD	AD
DIPTERA	Tephritidae	Trupanea amoena (Frauenfeld)	Capitula	OF	RDB 2												
DIPTERA	Tephritidae	Urophora cuspidata (Meigen)	Capitula	OG	N	LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora jaceana (Hering, 1935)	Flower, Galls	OG		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora quadrifasciata (Meigen, 1826)	Capitula, Flower	OF		LD	LD	LD	LD	LPA	AOL	AOLP	AOL	L	LD	LD	LD
DIPTERA	Tephritidae	Urophora solstitialis (Linnaeus, 1758)	Capitula	OF	RDB 3	LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
HEMIPTERA (Heteroptera)	Lygaeidae	Peritrechus sylvestris Fabr.		M													
HEMIPTERA (Heteroptera)	Miridae	Oncotylus viridiflavus (Goeze)		OG		O	O	O	O	O	L	LA	AO	O	O	O	O
HEMIPTERA (Heteroptera)	Nabidae	Nabis flavomarginatus Scholtz		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon jaceae (L)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama radicis (Kalt.)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Trama centaureae (Borner)	Root	OF													
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Melitta leporina (Panzer)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LPA	AO	OL	L	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Melitta tricincta Kirby	Flower	Monolectic	Nb	LD	LD	LD	LD	LD	LD	LP	PAOL	PAOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Osmia leaiana (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	A	AO	AOLP	AOLP	LP	P AD	AD	AD
LEPIDOPTERA	Coleophoridae	Coleophora conspicuella Zell.	Leaves	M	N	LD	LD	LD	L	L	LP	PA	L	L	LD	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora frischella (L.)		O		LD	LD	LD	LD	AO	AOLP	A	A	AOL	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora paripennella Zell.	Leaves	OT		LD	LD	LD	L	L	LPA	LPA	LA	L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Metzneria metzneriella (Stt.)	Seed	OT2		LD	LD	LD	LD	P	A	A	A		L	L	LD
LEPIDOPTERA	Gelechiidae	Metzneria neuropterella (Zeller)	Seed	OT	RDB I	LD	LD	LD	LD	LD	P	A	A		L	L	LD
LEPIDOPTERA	Gelechiidae	Ptocheuusa paupella (Zell.)		OF		P	P	P	P	P	A	L	PA	AL	L	P	P
LEPIDOPTERA	Gelechiidae	Scrobipalpa acuminatella (Sirc.)		OT		P	P	P	P	PA	A	LP	PA	L	P	P	P
LEPIDOPTERA	Gelechiidae	Scrobipalpa pauperella (Hein.)		OT	RDB K						A	A					
LEPIDOPTERA	Oecophoridae	Agonopterix arenella (D. & S.)		OT		A	A	A	A	A	L	L	LPA	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix carduella (Hb.)		OT						L	L	LPA	A				
LEPIDOPTERA	Oecophoridae	Agonopterix kaekeritziana (L.)		OG						L	LP	PA	A				
LEPIDOPTERA	Oecophoridae	Agonopterix pallorella (Zeller)		OT	N	A	A	A	A	L	LP	LP	LPA	A	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix subpropinquella (Stt.)		OT		A	A	A	A		L	LP	PA	A	A	A	A
LEPIDOPTERA	Pyralidae	Microstega hyalinalis (Hubner)	Leaves	O2		LD	LD	LD	L	L	PA	AO	OL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Aethes smeathmanniana (Fabr.)	Flower, Seed	OF		LD	LD	LD	LD	LD PA	A	A	A	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Agapeta zoegana (L.)	Root	O2		LD	LD	LD	LD P	PA	AO	AO	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Conchylimorpha straminea (Haw.)	Stem, Flower	M		LD	LD	LD	L	LPA	A	AOLP	LPA	AOL	L	LD	LD
LEPIDOPTERA	Tortricidae	Endothenia oblongana (Haw.)	Root	M		L	L	L	L	LPA	PA	A	O	L	L	L	L
LEPIDOPTERA	Tortricidae	Epiblema cirsiana (Zell.)	Root, Stem	OT2		LD	LD	LD	LD P	PA	A		L	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Eucosma cana (Haw.)	Flower	OT		L	L	L	L	LP	PA	PA	AOL	L	LD	L	L
LEPIDOPTERA	Tortricidae	Eucosma hohenwartiana (D. & S.)	Flower	OT		LD	LD	LD	LD	LP	PA	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Pelochrista caecimaculana (Haw.)	Root	OT		L	L	L	L	L	P	A		L	L	L	L
LEPIDOPTERA	Zygaenidae	Adscita globulariae (Hb.)		OG2	RDB 3	LD	LD	L	L	LP	PAO	AOL	L	LD	LD	LD	LD

Cerastium fontanum

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Heteroptera)	Berytinidae	Berytinus crassipes (H.-S.)		OG													
HEMIPTERA (Heteroptera)	Lygaeidae	Pionosomus varius (Wolff)		O	RDB 3												
HEMIPTERA (Sternorrhyncha)	Aphididae	Brachycolus cerastii (Kaltenburg)		OF													
LEPIDOPTERA	Coleophoridae	Coleophora striatipennella (Tengstrom)	Seed	OF3		LD	LD	LD	LD	LD	LPA	A	AL	L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Caryocolum alsinella semidecandrella (Threl)	Flower, Seed	OG2						LP	P	A	A	A			
LEPIDOPTERA	Gelechiidae	Caryocolum marmoreum (Haw)		M				L	L	P	A	A	A				
LEPIDOPTERA	Gelechiidae	Caryocolum proximum (Haw)	Flower, Seed	OF	RDB K				L	LP	PA	A					
LEPIDOPTERA	Gelechiidae	Eulamprotes wilkella (L.)		O	Nb					LP	PA	LP	PA				
LEPIDOPTERA	Geometridae	Eupithecia pygmaeata (Hb)	Flower, Seed heads	OF		P	P	P	P	A	AOL	L	P	P	P	P	P
LEPIDOPTERA	Noctuidae	Panemeria tenebrata (Scop.)	Flower, Seed capsules	OF		P	P	P	P	PA	LA	LP	P	P	P	P	P
LEPIDOPTERA	Scythrididae	Scythris siccella (Zell.)		O	RDB 1					L	P	A					

Cirsium arvense

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Assiorestia impressa	Root	O	Na					A	A	A	A	A			
COLEOPTERA	Mordellidae	Mordellistena acuticollis Schil.		M	RDB K							A					
COLEOPTERA	Chrysomelidae	Assiorestia impressa	Root	O	Na					A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Oulema lichenis (Voet, 1806)		O		A			A	A	A	A	A	A		A	
COLEOPTERA	Chrysomelidae	Oulema melanopa (Linnaeus, 1758)		O			A	A	A			A	A	A	A		A
COLEOPTERA	Chrysomelidae	Psylliodes picina (Marsham, 1802)		O		A				L(?)	L(?)	L(?)	AL (?)	A		A	A
COLEOPTERA	Curculionidae	Phyllobius roboretanus Gredler, 1882	Root	O						A	A	A					
COLEOPTERA	Nitidulidae	Meligethes ruficornis (Marsham, 1802)	Pollen	O					A	A	A					A	
COLEOPTERA	Chrysomelidae	Cassida denticollis Suff.	Leaves	OF	RDB 1												
COLEOPTERA	Chrysomelidae	Cassida sanguinosa Suffrian, 1844	Leaves	OF													
COLEOPTERA	Apionidae	Ceratapion carduorum (Kirby, 1808)	Root, Leaves	OST							A	A	A	A			
COLEOPTERA	Apionidae	Ceratapion lacertense (Tottenham, 1941)	Root, Stem, Leaves	OST							A	A	A	A			
COLEOPTERA	Chrysomelidae	Lema cyanella (Linnaeus, 1758)		OST													
COLEOPTERA	Chrysomelidae	Psylliodes chalcomera (Illiger, 1807)	Root	OST	Nb			A	A	LA	LA	A	A	A			
COLEOPTERA	Curculionidae	Hadroplontus litura (Fabricius, 1775)		OST							A	A	A	A			
COLEOPTERA	Curculionidae	Hadroplontus trimaculatus (Fabricius, 1775)		OST	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Lixus elongatus (Goeze, 1777)		OST	Extinct	AD	AD	AD	AL	AL	AL	AL	AL	AL	AD	AD	AD
COLEOPTERA	Curculionidae	Rhinocyllus conicus (Froel.)	Flower	OST	Na				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Trichosirocalus horridus (Panzer, 1801)		OST	Na			A		A	A	A	A	A			
COLEOPTERA	Mycteridae	Mycterus curculioides (Fabr.)		OST	Extinct												
COLEOPTERA	Apionidae	Ceratapion onopordi (Kirby, 1808)	Stem	OT		AD	AD	AD A	A	L	L	LA	LA	LA	A	AD	AD
COLEOPTERA	Chrysomelidae	Cassida rubiginosa Mueller, 1776	Leaves	OT		AD	AD	AD	A	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Sphaeroderma rubidum (Graells, 1858)		OT							L (?)	L (?)	AL (?)	A			
COLEOPTERA	Chrysomelidae	Sphaeroderma testaceum (F., 1775)		OT						L (?)	AL (?)	AL (?)	AL (?)	A	A		
COLEOPTERA	Curculionidae	Cleonis pigra (Scopoli, 1763)	Stem	OT	Nb	A			A	A	A	A	A	A			A
COLEOPTERA	Curculionidae	Larinus planus (Fabr.)	Flower	OT	Nb				A	A	A	A	A	A			
DIPTERA	Agromyzidae	Phytomyza continua Hendel, 1920	Leaf miner	M													
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza tanaceti de Meijere	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Jaapiella compositarum (Kieffer, 1888)		OF													
DIPTERA	Tephritidae	Acanthiophilus helianthi (Rossi, 1794)	Capitula	OF	Nb							AOL	AOL				
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Tephritis cometa (Loew, 1840)	Capitula, Flower	OF		AD	AD	AD	AD	AD	AD	AD	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Trypeta zoe Meigen	Leaf miner	OF		LD	LD	LD	LPA	AOLP	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora quadrifasciata (Meigen, 1826)	Capitula	OF													
DIPTERA	Tephritidae	Urophora solstitialis (Linnaeus, 1758)	Capitula	OF	RDB 3	LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Cecidomyiidae	Dasyneura spp.	Leaf miner	OF2													
DIPTERA	Agromyzidae	Liriomyza soror Hendel	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza cirsii Hendel	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Jaapiella cirsiicola Rübsaamen, 1915		OG													
DIPTERA	Tephritidae	Tephritis conura (Loew, 1844)	Capitula	OG		AD	AD	AD	AD	AD	AD	AD	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Terellia ruficauda (Fabricius, 1794)	Capitula	OG		LD	LD	LD	LP	AOL	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora cardui (Linnaeus, 1758)	Stem, Gall	OG		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Terellia serratulae (Linnaeus, 1758)	Capitula, Inflorescence, Flower	OST		LD	LD	LD	LD	LPA	AOLP	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora stylata (Fabricius, 1775)	Capitula, Flower, Gall	OST		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Agromyzidae	Phytomyza autumnalis Griffiths	Leaf miner	OT													
DIPTERA	Tephritidae	Cerajocera tussilaginis (Fabricius)	Stem, Capitula	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Chaetostomella cylindrica (Robineau-Desvoidy, 1830)	Flower	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Xyphosia miliaria (Schrank, 1781)	Capitula	OT		LD	LD	LD	LPA	AOL	AOLP	AOLP	AOL	AOL	LD	LD	LD
DIPTERA	Agromyzidae	Phytomyza spinaciae Hendel, 1928	Leaf miner	OT3													
HEMIPTERA (Heteroptera)	Coreidae	Arenocoris falleni (Schilling)		O													
HEMIPTERA (Heteroptera)	Tingidae	Tingis ampliata (H.-S.)		O		A	A	A	A	AO	AO	AOL	LA	LA	A	A	A
HEMIPTERA (Heteroptera)	Cimicidae	Orius niger (Wolff)		OF													
HEMIPTERA (Heteroptera)	Miridae	Psallus lepidus Fieb.		OG													
HEMIPTERA (Heteroptera)	Tingidae	Tingis angustata (H.-S.)		OST	RDB 3					A	A			A			
HEMIPTERA (Heteroptera)	Tingidae	Tingis cardui (L.)		OST		A	A	A	A	AO	AOL	OLA	LA	LA	A	A	A

Cirsium arvense

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus horni gynoxantha (Hille Ris Lambers)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis lappae cirsii (Borner)	Root, Stem	M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus carduinus (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus elaeagni (Del Guercio)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus similis (van der Goot)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis lappae (Koch)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Sitobion fragariae (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon cirsii (L)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama radicis (Kalt.)	Root	OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena fuscipes (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena rosae Panzer	Flower	Oligolectic		LD	LD	LD	LD	LDP	AO	AOL	AOL	DL	D	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
LEPIDOPTERA	Tortricidae	Lobesia abscisana (Doubl.)		M						PA	OL	PA	AOL	L			
LEPIDOPTERA	Tortricidae	Aethes cnicana (Westw.)	Stem, Seed	OG		LD	LD	LD	LD	P	PAO	AO	O	L	L	LD	LD
LEPIDOPTERA	Noctuidae	Eublemma ostrina (Hubn)	Shoots, Flower, Seed heads	OST													
LEPIDOPTERA	Oecophoridae	Agonopterix propinquella (Treit.)		OST		A	A	A	A	A	A	AL	LP	PA	A	A	A
LEPIDOPTERA	Pyralidae	Myelois cribrella (Hubner)	Stem, Flower, Seed	OST		LD	LD	LD	LD	L	P	PA	AL	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Phlyctaenia perlucidalis (Hb)		OST		LD	LD	LD	LD	P	PA	A	L	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Agapeta hamana (L.)	Root	OST		LD	LD	LD	LD	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora paripennella Zell.	Leaves	OT		LD	LD	LD	L	L	LPA	LPA	L A	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora peribenanderi (toll)		OT	N	LD	LD	LD	L	LP	PA	A	O	L	LD	LD	LD
LEPIDOPTERA	Gelechiidae	Scrobipalpa acuminatella (Sirc.)		OT		P	P	P	P	PA	A	LP	PA	L	P	P	P
LEPIDOPTERA	Gelechiidae	Scrobipalpa pauperella (Hein.)		OT	RDB K						A	A					
LEPIDOPTERA	Noctuidae	Lygephila craccae (D. & S.)		OT	RDB 3	O	O	O	O	L	L	P	A	O	O	O	O
LEPIDOPTERA	Oecophoridae	Agonopterix arenella (D. & S.)		OT		A	A	A	A	A	L	L	LPA	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix carduella (Hb.)		OT						L	L	LPA	A				
LEPIDOPTERA	Oecophoridae	Agonopterix subpropinquella (Stt.)		OT		A	A	A	A		L	LP	PA	A	A	A	A
LEPIDOPTERA	Tortricidae	Eucosma hohenwartiana (D. & S.)	Flower	OT		LD	LD	LD	LD	LP	PA	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Pelochrista caecimaculana (Haw.)	Root	OT		L	L	L	L	L	P	A		L	L	L	L
THYSANOPTERA	Phlaeothripidae	Haplothrips distinguendus (Uzel)	Flower	O							A	LA	LA				

Cirsium palustre

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Ceratapion carduorum (Kirby, 1808)	Root, Leaves	OST							A	A	A	A			
COLEOPTERA	Apionidae	Ceratapion lacertense (Tottenham, 1941)	Root, Stem, Leaves	OST							A	A	A	A			
COLEOPTERA	Apionidae	Ceratapion onopordi (Kirby, 1808)	Stem	OT		AD	AD	AD A	A	L	L	LA	LA	LA	A	AD	AD
COLEOPTERA	Chrysomelidae	Assiorestia impressa	Root	O	Na					A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Cassida denticollis Suff.	Leaves	OF	RDB 1												
COLEOPTERA	Chrysomelidae	Cassida rubiginosa Mueller, 1776	Leaves	OT		AD	AD	AD	A	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Cassida sanguinosa Suffrian, 1844	Leaves	OF													
COLEOPTERA	Chrysomelidae	Lema cyanella (Linnaeus, 1758)		OST													
COLEOPTERA	Chrysomelidae	Psylliodes chalcomera (Illiger, 1807)	Root	OST	Nb			A	A	LA	LA	A	A	A			
COLEOPTERA	Chrysomelidae	Psylliodes picina (Marsham, 1802)		O		A				L(?)	L(?)	L(?)	AL (?)	A		A	A
COLEOPTERA	Chrysomelidae	Sphaeroderma rubidum (Graells, 1858)		OT							L (?)	L (?)	AL (?)	A			
COLEOPTERA	Chrysomelidae	Sphaeroderma testaceum (F., 1775)		OT						L (?)	AL (?)	AL (?)	AL (?)	A	A		
COLEOPTERA	Curculionidae	Cleonis pigra (Scopoli, 1763)	Stem	OT	Nb	A			A	A	A	A	A	A			A
COLEOPTERA	Curculionidae	Hadroplontus litura (Fabricius, 1775)		OST							A	A	A	A			
COLEOPTERA	Curculionidae	Hadroplontus trimaculatus (Fabricius, 1775)		OST	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Larinus planus (Fabr.)	Flower	OT	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Lixus elongatus (Goeze, 1777)		OST	Extinct	AD	AD	AD	AL	AL	AL	AL	AL	AL	AD	AD	AD
COLEOPTERA	Curculionidae	Rhinocyllus conicus (Froel.)	Flower	OST	Na				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Trichosirocalus horridus (Panzer, 1801)		OST	Na			A		A	A	A	A	A			
COLEOPTERA	Mycteridae	Mycterus curculioides (Fabr.)		OST	Extinct												
COLEOPTERA	Nitidulidae	Meligethes ruficornis (Marsham, 1802)	Pollen	O					A	A	A					A	
DIPTERA	Agromyzidae	Liriomyza soror Hendel	Leaf miner	OG													
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza albiceps Meigen, 1830	Leaf miner	O2													
DIPTERA	Agromyzidae	Phytomyza autumnalis Griffiths	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza cirsii Hendel	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Jaapiella cirsiicola Rübsaamen, 1915		OG													
DIPTERA	Cecidomyiidae	Jaapiella compositarum (Kieffer, 1888)		OF													
DIPTERA	Tephritidae	Acanthiophilus helianthi (Rossi, 1794)	Capitula	OF	Nb							AOL	AOL				
DIPTERA	Tephritidae	Chaetostomella cylindrica (Robineau-Desvoidy, 1830)	Flower	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Tephritis conura (Loew, 1844)	Capitula	OG		AD	AD	AD	AD	AD	AD	AD	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Terellia ruficauda (Fabricius, 1794)	Capitula	OG		LD	LD	LD	LP	AOL	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Terellia serratulae (Linnaeus, 1758)	Capitula, Inflorescence, Flower	OST		LD	LD	LD	LD	LPA	AOLP	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Terellia winthemi (Meigen)	Capitula	OST	RDB 3	LD	LD	LD	LP	AOL	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora cardui (Linnaeus, 1758)	Stem, Gall	OG		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora stylata (Fabricius, 1775)	Capitula, Flower, Gall	OST		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Vidalia spinifrons (Schroeder)	Leaves	OF	RDB 3	LD	LD	LD	LPA	AOL	L	L	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Xyphosia miliaria (Schrank, 1781)	Capitula	OT		LD	LD	LD	LPA	AOL	AOLP	AOLP	AOL	AOL	LD	LD	LD
HEMIPTERA (Heteroptera)	Cimicidae	Orius niger (Wolff)		OF													
HEMIPTERA (Heteroptera)	Coreidae	Arenocoris falleni (Schilling)		O													
HEMIPTERA (Heteroptera)	Miridae	Psallus lepidus Fieb.		OG													
HEMIPTERA (Heteroptera)	Rhopalidae	Aeschyntelus maculatus (Fieber)		O2													
HEMIPTERA (Heteroptera)	Tingidae	Tingis ampliata (H.-S.)		O		A	A	A	A	AO	AO	AOL	LA	LA	A	A	A
HEMIPTERA (Heteroptera)	Tingidae	Tingis angustata (H.-S.)		OST	RDB 3					A	A			A			
HEMIPTERA (Heteroptera)	Tingidae	Tingis cardui (L.)		OST		A	A	A	A	AO	AOL	OLA	LA	LA	A	A	A
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus carduinus (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus elaeagni (Del Guercio)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus similis (van der Goot)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis lappae (Koch)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon cirsii (L.)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama radicis (Kalt.)	Root	OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena fuscipes (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora paripennella Zell.	Leaves	OT		LD	LD	LD	L	L	LPA	LPA	LA	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora peribenanderi (toll)		OT	N	LD	LD	LD	L	LP	PA	A	O	L	LD	LD	LD
LEPIDOPTERA	Gelechiidae	Scrobipalpa acuminatella (Sirc.)		OT		P	P	P	P	PA	A	LP	PA	L	P	P	P
LEPIDOPTERA	Gelechiidae	Scrobipalpa pauperella (Hein.)		OT	RDB K						A	A					

Cirsium palustre (Continued)

Cirsium palustre

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Noctuidae	Eublemma ostrina (Hubn)	Shoots, Flower, Seed heads	OST													
LEPIDOPTERA	Oecophoridae	Agonopterix arenella (D. & S.)		OT		A	A	A	A	A	L	L	LPA	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix carduella (Hb.)		OT						L	L	LPA	A				
LEPIDOPTERA	Oecophoridae	Agonopterix propinquella (Treit.)		OST		A	A	A	A	A	A	AL	LP	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix subpropinquella (Stt.)		OT		A	A	A	A		L	LP	PA	A	A	A	A
LEPIDOPTERA	Pyralidae	Myelois cribrella (Hubner)	Stem, Flower, Seed	OST		LD	LD	LD	LD	L	P	PA	AL	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Phlyctaenia perlucidalis (Hb)		OST		LD	LD	LD	LD	P	PA	A	L	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Aethes cnicana (Westw.)	Stem, Seed	OG		LD	LD	LD	LD	P	PAO	AO	O	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Agapeta hamana (L.)	Root	OST		LD	LD	LD	LD	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Tortricidae	Epiblema cirsiana (Zell.)	Root, Stem	OT2		LD	LD	LD	LD P	PA	A		L	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Eucosma hohenwartiana (D. & S.)	Flower	OT		LD	LD	LD	LD	LP	PA	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Pelochrista caecimaculana (Haw.)	Root	OT		L	L	L	L	L	P	A		L	L	L	L
THYSANOPTERA	Phlaeothripidae	Haplothrips distinguendus (Uzel)	Flower	O							A	LA	LA				

Cirsium vulgare

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Ceratapion carduorum (Kirby, 1808)	Root, Leaves	OST							A	A	A	A			
COLEOPTERA	Apionidae	Ceratapion lacertense (Tottenham, 1941)	Root, Stem, Leaves	OST							A	A	A	A			
COLEOPTERA	Apionidae	Ceratapion onopordi (Kirby, 1808)	Stem	OT		AD	AD	AD A	A	L	L	LA	LA	LA	A	AD	AD
COLEOPTERA	Chrysomelidae	Assiorestia impressa	Root	O	Na					A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Cassida denticollis Suff.	Leaves	OF	RDB 1												
COLEOPTERA	Chrysomelidae	Cassida rubiginosa Mueller, 1776	Leaves	OT		AD	AD	AD	A	LA	LA	LA	A	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Cassida sanguinosa Suffrian, 1844	Leaves	OF													
COLEOPTERA	Chrysomelidae	Lema cyanella (Linnaeus, 1758)		OST													
COLEOPTERA	Chrysomelidae	Psylliodes chalcomera (Illiger, 1807)	Root	OST	Nb			A	A	LA	LA	A	A	A			
COLEOPTERA	Chrysomelidae	Psylliodes picina (Marsham, 1802)		O		A				L(?)	L(?)	L(?)	AL (?)	A		A	A
COLEOPTERA	Chrysomelidae	Sphaeroderma rubidum (Graells, 1858)		OT							L (?)	L (?)	AL (?)	A			
COLEOPTERA	Chrysomelidae	Sphaeroderma testaceum (F., 1775)		OT						L (?)	AL (?)	AL (?)	AL (?)	A	A		
COLEOPTERA	Curculionidae	Cleonis pigra (Scopoli, 1763)	Stem	OT	Nb	A			A	A	A	A	A	A			A
COLEOPTERA	Curculionidae	Hadroplontus litura (Fabricius, 1775)		OST							A	A	A	A			
COLEOPTERA	Curculionidae	Hadroplontus trimaculatus (Fabricius, 1775)		OST	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Larinus planus (Fabr.)	Flower	OT	Nb				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Lixus elongatus (Goeze, 1777)		OST	Extinct	AD	AD	AD	AL	AL	AL	AL	AL	AL	AD	AD	AD
COLEOPTERA	Curculionidae	Rhinocyllus conicus (Froel.)	Flower	OST	Na				A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Trichosirocalus horridus (Panzer, 1801)		OST	Na			A		A	A	A	A	A			
COLEOPTERA	Mycteridae	Mycterus curculioides (Fabr.)		OST	Extinct												
COLEOPTERA	Nitidulidae	Meligethes ruficornis (Marsham, 1802)	Pollen	O					A	A	A					A	
DIPTERA	Agromyzidae	Liriomyza soror Hendel	Leaf miner	OG		LD	LD	LD	LD	LPA	AOL	AOLP	AOL	L	LD	LD	LD
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza autumnalis Griffiths	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza cirsii Hendel	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Jaapiella cirsiicola Rübsaamen, 1915		OG													
DIPTERA	Cecidomyiidae	Jaapiella compositarum (Kieffer, 1888)		OF													
DIPTERA	Tephritidae	Acanthiophilus helianthi (Rossi, 1794)	Capitula	OF	Nb							AOL	AOL				
DIPTERA	Tephritidae	Cerajocera tussilaginis (Fabricius)	Stem, Capitula	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Chaetorellia jaceae (Robineau-Desvoidy, 1830)	Flower	OG		LD	LD	LD	LD	LP	AOL	AOLP	AOL	L	LD	LD	LD
DIPTERA	Tephritidae	Chaetostomella cylindrica (Robineau-Desvoidy, 1830)	Flower	OT		LD	LD	LD	P	AOL	AOL	AOL	LD	LD	LD	LD	LD
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Tephritis cometa (Loew, 1840)	Capitula, Flower	OF		AD	AD	AD	AD	AD	AD	AD	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Tephritis conura (Loew, 1844)	Capitula	OG		AD	AD	AD	AD	AD	AD	AD	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Terellia ruficauda (Fabricius, 1794)	Capitula	OG		LD	LD	LD	LP	AOL	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Terellia serratulae (Linnaeus, 1758)	Capitula,Inflorescence, Flower	OST		LD	LD	LD	LD	LPA	AOLP	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora cardui (Linnaeus, 1758)	Stem, Gall	OG		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora quadrifasciata (Meigen, 1826)	Capitula	OF													
DIPTERA	Tephritidae	Urophora solstitialis (Linnaeus, 1758)	Capitula	OF	RDB 3	LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora stylata (Fabricius, 1775)	Capitula, Flower, Gall	OST		LD	LD	LD	LD	LPA	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Xyphosia miliaria (Schrank, 1781)	Capitula	OT		LD	LD	LD	LPA	AOL	AOLP	AOLP	AOL	AOL	LD	LD	LD
HEMIPTERA (Heteroptera)	Cimicidae	Orius niger (Wolff)		OF													
HEMIPTERA (Heteroptera)	Coreidae	Arenocoris falleni (Schilling)		O													
HEMIPTERA (Heteroptera)	Miridae	Psallus lepidus Fieb.		OG													
HEMIPTERA (Heteroptera)	Tingidae	Tingis ampliata (H.-S.)		O		A	A	A	A	AO	AO	AOL	LA	LA	A	A	A
HEMIPTERA (Heteroptera)	Tingidae	Tingis angustata (H.-S.)		OST	RDB 3					A	A			A			
HEMIPTERA (Heteroptera)	Tingidae	Tingis cardui (L.)		OST		A	A	A	A	AO	AOL	OLA	LA	LA	A	A	A
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus carduinus (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus elaeagni (Del Guercio)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Capitophorus similis (van der Goot)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis lappae (Koch)	Root	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon cirsii (L)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama radicis (Kalt.)	Root	OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena fuscipes (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Osmia leaiana (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	A	AO	AOLP	AOLP	LP	P AD	AD	AD
LEPIDOPTERA	Coleophoridae	Coleophora paripennella Zell.	Leaves	OT		LD	LD	LD	L	L	LPA	LPA	LA	L	L	LD	LD

Cirsium vulgare

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LEPIDOPTERA	Coleophoridae	Coleophora peribenanderi (toll)		OT	N	LD	LD	LD	L	LP	PA	A	O	L	LD	LD	LD
LEPIDOPTERA	Gelechiidae	Scrobipalpa acuminatella (Sirc.)		OT		P	P	P	P	PA	A	LP	PA	L	P	P	P
LEPIDOPTERA	Gelechiidae	Scrobipalpa pauperella (Hein.)		OT	RDB K						A	A					
LEPIDOPTERA	Noctuidae	Eublemma ostrina (Hubn)	Shoots, Flower, Seed heads	OST													
LEPIDOPTERA	Oecophoridae	Agonopterix arenella (D. & S.)		OT		A	A	A	A	A	L	L	LPA	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix carduella (Hb.)		OT						L	L	LPA	A				
LEPIDOPTERA	Oecophoridae	Agonopterix propinquella (Treit.)		OST		A	A	A	A	A	A	AL	LP	PA	A	A	A
LEPIDOPTERA	Oecophoridae	Agonopterix subpropinquella (Stt.)		OT		A	A	A	A		L	LP	PA	A	A	A	A
LEPIDOPTERA	Pyralidae	Homoeosoma nebulella (D.&S.)	Flower, Seed	OF2	Nb	LD	LD	LD	LD	LD	PA	PA	AOL	OL	LD	LD	LD
LEPIDOPTERA	Pyralidae	Myelois cribrella (Hubner)	Stem, Flower, Seed	OST		LD	LD	LD	LD	L	P	PA	AL	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Phlyctaenia perlucidalis (Hb)		OST		LD	LD	LD	LD	P	PA	A	L	L	LD	LD	LD
LEPIDOPTERA	Pyralidae	Phycitodes binaevella (Hubner)	Flower, Seed heads	M		LD	LD	LD	LD	LD	P	PA	AL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Aethes cnicana (Westw.)	Stem, Seed	OG		LD	LD	LD	LD	P	PAO	AO	O	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Agapeta hamana (L.)	Root	OST		LD	LD	LD	LD	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Tortricidae	Epiblema scutulana (D. & S.)	Root, Stem	OST		LD	LD	LD	LP	PA	A		L	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Eucosma cana (Haw.)	Flower	OT		L	L	L	L	LP	PA	PA	AOL	L	LD	L	L
LEPIDOPTERA	Tortricidae	Eucosma hohenwartiana (D. & S.)	Flower	OT		LD	LD	LD	LD	LP	PA	PA	AOL	L	LD	LD	LD
LEPIDOPTERA	Tortricidae	Pelochrista caecimaculana (Haw.)	Root	OT		L	L	L	L	L	P	A		L	L	L	L
THYSANOPTERA	Phlaeothripidae	Haplothrips distinguendus (Uzel)	Flower	O							A	LA	LA				

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Galerucella lineola (F., 1781)	Leaves	O						OL	LA						
COLEOPTERA	Kateretidae	Kateretes bipustulatus (Paykull, 1798)		O													
DIPTERA	Agromyzidae	Agromyza spiraeae Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Agromyza sulfuriceps Strobl	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Dasyneura harrisoni (Bagnall, 1922)		M													
DIPTERA	Cecidomyiidae	Dasyneura pustulans (Rübsaamen, 1889)		M													
DIPTERA	Cecidomyiidae	Dasyneura spiraeae (Loiselle, 1912)		M													
DIPTERA	Cecidomyiidae	Dasyneura ulmaria (Bremi, 1847)	Leaves	OG													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupteryx signatipennis (Boheman)		M													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Macrosteles septemnotatus (Fallen)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis ulmariae Schrank	Terminal leaves	OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena denticulata (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	LPAO	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena tarsata Nylander	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
HYMENOPTERA (Symphyta)	Argidae	Arge ciliaris (L)		M						A	A	A	A				
HYMENOPTERA (Symphyta)	Cephidae	Hartigia xanthostoma (Eversmann)	Stem	M						A	A	A	A				
HYMENOPTERA (Symphyta)	Tenthredinidae	Allantus calceatus (Klug)		OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Caliroa alector (Benson)		M?													
HYMENOPTERA (Symphyta)	Tenthredinidae	Caliroa baltica (Conde)		M													
HYMENOPTERA (Symphyta)	Tenthredinidae	Caliroa pumila (Konow)		M?													
HYMENOPTERA (Symphyta)	Tenthredinidae	Monophadnoides geniculata (Hartig)		OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Monophadnoides tenuicornis (Klug)		OF													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachyprotasis antennata (Lepeletier)		O													
LEPIDOPTERA	Geometridae	Scopula immutata (L)		O2	RDB 1 +	LD	LD	LD	L	LP	PA	A	AO	L	L	LD	LD
LEPIDOPTERA	Nepticulidae	Stigmella ulmariae(Wocke)	Leaves	M	Nb	P	P	P	P	PAO	OL	LP	PAO	OL	LP	P	P
LEPIDOPTERA	Tortricidae	Acleris shepherdana (Steph)		M	Nb					L	LP	P	A	A			

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chrysolina violacea (Mueller, 1776)	Leaves	O	Nb				A	A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Sermylassa halensis (Linnaeus, 1767)		OG						L (?)	L (?)	AL (?)	A	A	A		
COLEOPTERA	Chrysomelidae	Timarcha tenebricosa (F., 1775)		OG					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Liriomyza morio (Brischke)	Leaf miner	OG													
DIPTERA	Agromyzidae	Paraphytomyza orphana (Hendel)	Stem miner	OG2									A				
DIPTERA	Cecidomyiidae	Dasyneura galiicola (F. Löw, 1880)		OG													
DIPTERA	Cecidomyiidae	Dasyneura hygrophila (Mik, 1883)		M													
DIPTERA	Cecidomyiidae	Geocrypta galii (Loew, 1850)		OG													
HEMIPTERA (Heteroptera)	Cydnidae	Legnotus limbosus (Geoffroy)		OG		A	A	A	A	A	A	A		A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Charogochilus gyllenhali (Fallen)		O		A	A	A	A	AO	AOL	LA	LA	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Dichrooscytus rufipennis (Fallen)		OG		O	O	O	O	OL	A	A	A				
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Orthocephalus coriaceus (Fabr)		O		O	O	O	O	O	OL	L	L				
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigrita (Fallen)		OG													
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigritus (Fallen)		OG		O	O	O	O	OL	A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Polymerus palustris (Reuter)		OG		O	O	O	O	OL	LA	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis pyri (Boyer de Fonscolombe)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Galiobium langei (Borner)		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Linosiphon galiophagum (Wimshurst)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Staegeriella necopinata (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii typica (Forster)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii velutina (Forster)		OG													
LEPIDOPTERA	Geometridae	Catarhoe cuculata (Hufn.)	Flower	OG		P	P	P	P	P	PA	AOL	L	LP	P	P	P
LEPIDOPTERA	Geometridae	Catarhoe rubidata (D. & S.)		OG	Nb	P	P	P	P	P	PA	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia multistrigaria (Haw.)		OG		P	P	A	AO	L	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia olivata (D. & S.)		OG		LD	LD	LD	L	L	P	A	A	L	L	LD	LD
LEPIDOPTERA	Geometridae	Colostygia pectinataria (Knoch)		OG		LD	LD	LD	LP	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Cosmorhoe ocellata (L.)		OG	RDB 3	LD	LD	LD	P	PA	A	AOL	PA	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Costaconvexa polygrammata (Borkh.)		OG	Believed extinct				A	L	AL	L	AL				
LEPIDOPTERA	Geometridae	Epirrhoe alternata alternata (Mull.)		OG		P	P	P	P	A	AO	LP	LPA	AOL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe galiata (D. & S.)		OG		P	P	P	P	PA	A	AOL	LPA	OL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe tristata (L)		OG		P	P	P	P	PA	A	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Eulithis pyraliata (D. & S.)		OG		O	O	O	OL	LP	PA	A	A	O	O	O	O
LEPIDOPTERA	Geometridae	Lampropteryx otregiata (Metc.)		OG	Nb	P	P	P	P	PA	AOL	L	PA	AOL	L	P	P
LEPIDOPTERA	Geometridae	Lampropteryx suffumata (D. & S.)		OG		P	P	P	A	AOL	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Nebula salicata (Hubn)		OG		LD	LD	LD	P	P		L	L	LD	LD	LD	LD
LEPIDOPTERA	Geometridae	Nebula salicata latentaria (Curt.)		OG		LD	LD	LD	P	PA	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Orthonama vittata (Borkh.)		OG		L	L	L	LP	PA	AO	L	PA	AO	L	L	L
LEPIDOPTERA	Geometridae	Phibalapteryx virgata (Hufn.)		OG	Nb	P	P	P	P	PA	AO	LD	AO	L	P	P	P
LEPIDOPTERA	Geometridae	Xanthorhoe munitata (Hubn)		M													
LEPIDOPTERA	Sphingidae	Deilephila porcellus (L.)	Leaves, Flower	O		P	P	P	P	A	AO	L	L	P	P	P	P
LEPIDOPTERA	Sphingidae	Hyles gallii (Rott.)		O		P	P	P	P	A	A	A	L	L	P	P	P
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
LEPIDOPTERA	Sphingidae	Macroglossum stellatarum (L.)		OF		A	A	A	A	A	A	AOL	ALP	A	A	A	A
THYSANOPTERA	Thripidae	Anaphothrips validus Karny		M	Rare					A	A	AL	A				
THYSANOPTERA	Thripidae	Platythrips tunicatus (Haliday)		OG		A	A	A	A	A	LA	LA	LA	LA	A	A	A
THYSANOPTERA	Thripidae	Tmetothrips subapterus (Haliday)		O2								LA	LA	A			

Galium saxatile

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chrysolina violacea (Mueller, 1776)	Leaves	O	Nb				A	A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Sermylassa halensis (Linnaeus, 1767)		OG						L (?)	L (?)	AL (?)	A	A	A		
COLEOPTERA	Chrysomelidae	Timarcha tenebricosa (F., 1775)		OG					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Liriomyza morio (Brischke)	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Dasyneura galiicola (F. Löw, 1880)		OG													
DIPTERA	Cecidomyiidae	Geocrypta galii (Loew, 1850)		OG													
HEMIPTERA (Heteroptera)	Cydnidae	Legnotus limbosus (Geoffroy)		OG		A	A	A	A	A	A	A		A	A	A	A
HEMIPTERA (Heteroptera)	Cydnidae	Legnotus picipes (Fallen)		OG2	N	A	A	A	A	A	A		A	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Charogochilus gyllenhali (Fallen)		O		A	A	A	A	AO	AOL	LA	LA	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Dichrooscytus rufipennis (Fallen)		OG		O	O	O	O	OL	A	A	A				
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Orthocephalus coriaceus (Fabr)		O		O	O	O	O	O	OL	L	L				
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigrita (Fallen)		OG													
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigritus (Fallen)		OG		O	O	O	O	OL	A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Polymerus palustris (Reuter)		OG		O	O	O	O	OL	LA	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis pyri (Boyer de Fonscolombe)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Galiobium langei (Borner)		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Linosiphon galiophagum (Wimshurst)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Staegeriella necopinata (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii typica (Forster)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii velutina (Forster)		OG													
LEPIDOPTERA	Geometridae	Catarhoe cuculata (Hufn.)	Flower	OG		P	P	P	P	P	PA	AOL	L	LP	P	P	P
LEPIDOPTERA	Geometridae	Catarhoe rubidata (D. & S.)		OG	Nb	P	P	P	P	P	PA	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia multistrigaria (Haw.)		OG		P	P	A	AO	L	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia olivata (D. & S.)		OG		LD	LD	LD	L	L	P	A	A	L	L	LD	LD
LEPIDOPTERA	Geometridae	Colostygia pectinataria (Knoch)		OG		LD	LD	LD	LP	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Cosmorhoe ocellata (L.)		OG	RDB 3	LD	LD	LD	P	PA	A	AOL	PA	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Costaconvexa polygrammata (Borkh.)		OG	Believed extinct				A	L	AL	L	AL				
LEPIDOPTERA	Geometridae	Epirrhoe alternata alternata (Mull.)		OG		P	P	P	P	A	AO	LP	LPA	AOL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe galiata (D. & S.)		OG		P	P	P	P	PA	A	AOL	LPA	OL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe tristata (L)		OG		P	P	P	P	PA	A	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Eulithis pyraliata (D. & S.)		OG		O	O	O	OL	LP	PA	A	A	O	O	O	O
LEPIDOPTERA	Geometridae	Lampropteryx suffumata (D. & S.)		OG		P	P	P	A	AOL	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Nebula salicata (Hubn)		OG		LD	LD	LD	P	P		L	L	LD	LD	LD	LD
LEPIDOPTERA	Geometridae	Nebula salicata latentaria (Curt.)		OG		LD	LD	LD	P	PA	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Orthonama vittata (Borkh.)		OG		L	L	L	LP	PA	AO	L	PA	AO	L	L	L
LEPIDOPTERA	Geometridae	Phibalapteryx virgata (Hufn.)		OG	Nb	P	P	P	P	PA	AO	LD	AO	L	P	P	P
LEPIDOPTERA	Geometridae	Xanthorhoe munitata (Hubn)		M													
LEPIDOPTERA	Sphingidae	Deilephila porcellus (L.)	Leaves, Flower	O		P	P	P	P	A	AO	L	L	P	P	P	P
LEPIDOPTERA	Sphingidae	Hyles gallii (Rott.)		O		P	P	P	P	A	A	A	L	L	P	P	P
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
LEPIDOPTERA	Sphingidae	Macroglossum stellatarum (L.)		OF		A	A	A	A	A	A	AOL	ALP	A	A	A	A
THYSANOPTERA	Thripidae	Platythrips tunicatus (Haliday)		OG		A	A	A	A	A	LA	LA	LA	LA	A	A	A

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Chrysolina violacea (Mueller, 1776)	Leaves	O	Nb				A	A	A	A	A	A			
COLEOPTERA	Chrysomelidae	Sermylassa halensis (Linnaeus, 1767)		OG						L (?)	L (?)	AL (?)	A	A	A		
COLEOPTERA	Chrysomelidae	Timarcha tenebricosa (F., 1775)		OG					A	A	A	A	A	A			
DIPTERA	Agromyzidae	Liriomyza morio (Brischke)	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Dasyneura galiicola (F. Löw, 1880)		OG													
DIPTERA	Cecidomyiidae	Geocrypta galii (Loew, 1850)		OG													
HEMIPTERA (Heteroptera)	Cydnidae	Legnotus limbosus (Geoffroy)		OG		A	A	A	A	A	A	A		A	A	A	A
HEMIPTERA (Heteroptera)	Cydnidae	Legnotus picipes (Fallen)		OG2	N	A	A	A	A	A	A		A	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Charogochilus gyllenhali (Fallen)		O		A	A	A	A	AO	AOL	LA	LA	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Dichrooscytus rufipennis (Fallen)		OG		O	O	O	O	OL	A	A	A				
HEMIPTERA (Heteroptera)	Miridae	Halticus luteicollis (Panzer)		O		O	O	O	O		A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Halticus macrocephalus Fieber		M							L	A	A				
HEMIPTERA (Heteroptera)	Miridae	Orthocephalus coriaceus (Fabr)		O		O	O	O	O	O	OL	L	L				
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigrita (Fallen)		OG													
HEMIPTERA (Heteroptera)	Miridae	Polymerus nigritus (Fallen)		OG		O	O	O	O	OL	A	A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Polymerus palustris (Reuter)		OG		O	O	O	O	OL	LA	A	A	A	O	O	O
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis pyri (Boyer de Fonscolombe)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Galiobium langei (Borner)		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Hydaphias hofmanni (Borner)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Linosiphon galiophagum (Wimshurst)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Staegeriella necopinata (Borner)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii typica (Forster)		OG													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza galii velutina (Forster)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Aglaostigma fulvipes (Scopoli)		OG2													
LEPIDOPTERA	Geometridae	Catarhoe cuculata (Hufn.)	Flower	OG		P	P	P	P	P	PA	AOL	L	LP	P	P	P
LEPIDOPTERA	Geometridae	Catarhoe rubidata (D. & S.)		OG	Nb	P	P	P	P	P	PA	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia multistrigaria (Haw.)		OG		P	P	A	AO	L	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Colostygia olivata (D. & S.)		OG		LD	LD	LD	L	L	P	A	A	L	L	LD	LD
LEPIDOPTERA	Geometridae	Colostygia pectinataria (Knoch)		OG		LD	LD	LD	LP	PA	AO	AO	AOL	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Cosmorhoe ocellata (L.)		OG	RDB 3	LD	LD	LD	P	PA	A	AOL	PA	AOL	L	LD	LD
LEPIDOPTERA	Geometridae	Costaconvexa polygrammata (Borkh.)		OG	Believed extinct				A	L	AL	L	AL				
LEPIDOPTERA	Geometridae	Epirrhoe alternata alternata (Mull.)		OG		P	P	P	P	A	AO	LP	LPA	AOL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe galiata (D. & S.)		OG		P	P	P	P	PA	A	AOL	LPA	OL	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe rivata (Hb.)		OG		P	P	P	P	P	PA	A	AOL	L	P	P	P
LEPIDOPTERA	Geometridae	Epirrhoe tristata (L)		OG		P	P	P	P	PA	A	AOL	L	P	P	P	P
LEPIDOPTERA	Geometridae	Eulithis pyraliata (D. & S.)		OG		O	O	O	OL	LP	PA	A	A	O	O	O	O
LEPIDOPTERA	Geometridae	Lampropteryx suffumata (D. & S.)		OG		P	P	P	A	AOL	L	P	P	P	P	P	P
LEPIDOPTERA	Geometridae	Nebula salicata (Hubn)		OG		LD	LD	LD	P	P		L	L	LD	LD	LD	LD
LEPIDOPTERA	Geometridae	Nebula salicata latentaria (Curt.)		OG		LD	LD	LD	P	PA	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Orthonama vittata (Borkh.)		OG		L	L	L	LP	PA	AO	L	PA	AO	L	L	L
LEPIDOPTERA	Geometridae	Phibalapteryx virgata (Hufn.)		OG	Nb	P	P	P	P	PA	AO	LD	AO	L	P	P	P
LEPIDOPTERA	Geometridae	Xanthorhoe munitata (Hubn)		M													
LEPIDOPTERA	Sphingidae	Deilephila porcellus (L.)	Leaves, Flower	O		P	P	P	P	A	AO	L	L	P	P	P	P
LEPIDOPTERA	Sphingidae	Hyles gallii (Rott.)		O		P	P	P	P	A	A	A	L	L	P	P	P
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
LEPIDOPTERA	Sphingidae	Macroglossum stellatarum (L.)		OF		A	A	A	A	A	A	AOL	ALP	A	A	A	A
THYSANOPTERA	Thripidae	Belothrips acuminatus Haliday		M						A	A	LA	L	L	L		
THYSANOPTERA	Thripidae	Platythrips tunicatus (Haliday)		OG		A	A	A	A	A	LA	LA	LA	LA	A	A	A

Hypochaeris radicata

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Curculionidae	Glocianus marginatus (Paykull, 1792)		M						A		A	A	A			A
COLEOPTERA	Curculionidae	Orthochaetes setiger (Beck, 1817)		O	Nb		A	A	A	A	L (?)	L (?)	A		A	A	
COLEOPTERA	Phalacridae	Olibrus affinis (Sturm, 1807)	Flower	OT													
DIPTERA	Agromyzidae	Ophiomyia beckeri (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia cunctata (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia heringi Stáry, 1930	Leaf miner	M													
DIPTERA	Agromyzidae	Ophiomyia pulicaria (Meigen)	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza cecidonomia britannica Griffiths	Leaf miner	M													
DIPTERA	Agromyzidae	Phytomyza nigra Meigen, 1830	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia hypochoeridis (Rübsaamen, 1891)	Flower	M													
DIPTERA	Cecidomyiidae	Cystiphora spp.	Leaves, Gall	M													
DIPTERA	Cecidomyiidae	Jaapiella compositarum (Kieffer, 1888)		OF													
DIPTERA	Chloropidae	Heterostylodes pratensis (Meigen, 1826)	Flower	M													
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula, Flower	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Paroxyna producta (Loew, 1844)	Capitula, Flower	OT	N												
DIPTERA	Tephritidae	Tephritis formosa (Loew, 1844)	Capitula	OT													
DIPTERA	Tephritidae	Tephritis vespertina (Loew, 1844)	Capitula, Inflorescence, Flower	OT		AD	AD	AD	AD	AD	AOL	PAOL	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Trypeta immaculata Macquart	Leaf miner	OT		PD	PD	PD	PD	AOL	AOL	L	L	PD	PD	PD	PD
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis hypochoeridis (Borner)	Root collar, Lower stem	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aulacorthum palustre (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon hypochoeridis (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Neotrama caudata (Del Guercio)	Root	OT													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta sonchi (Forster)		OF													
HYMENOPTERA (Aculeata)	Apidae	Osmia leaiana (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	A	AO	AOLP	AOLP	LP	PAD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Panurgus banksianus (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	PAO	AO	LD	LD	LD	LD	LD
LEPIDOPTERA	Oecophoridae	Depressaria badiella (Hb.)		OT						L	LP	LPA	PA	A	A		
THYSANOPTERA	Thripidae	Thrips physapus Linnaeus	Flower	O						A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips validus Uzel	Flower	OG													

Leontodon autumnalis

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Curculionidae	Glocianus moelleri (Thomson, C.G., 1868)		OT	RDB K				A	A	A	A	A	A			
COLEOPTERA	Phalacridae	Olibrus flavicornis (Sturm, 1807)	Flower	M	RDB K						A	A					
DIPTERA	Agromyzidae	Chromatomyia farfarella	Leaf miner	M													
DIPTERA	Agromyzidae	Liriomyza taraxaci Hering	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia beckeri (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia pinguis (Fallen)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia pulicaria (Meigen)	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza farfarella Hendel	Leaf miner	OT													
DIPTERA	Cecidomyiidae	Cystiphora leontodontis (Bremi, 1847)		OG													
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Paroxyna producta (Loew, 1844)	Capitula	OT	N												
DIPTERA	Tephritidae	Tephritis leontodontis (De Geer)	Capitula, Inflorescence	OG		AD	AD	AD	AD	AD	AD	AOL	AOL	LPA	AD	AD	AD
HEMIPTERA (Sternorrhyncha)	Aphididae	Aulacorthum palustre (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon hypochoeridis (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Neotrama caudata (Del Guercio)	Root	OT													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta flavipennis (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta sonchi (Forster)		OF													
HYMENOPTERA (Aculeata)	Apidae	Hoplosmia spinulosa (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	PAO	AO	AOL	AOL	LD	LD	LD

Leontodon hispidus

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Curculionidae	Glocianus moelleri (Thomson, C.G., 1868)		OT	RDB K				A	A	A	A	A	A			
DIPTERA	Agromyzidae	Ophiomyia beckeri (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia pinguis (Fallen)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia pulicaria (Meigen)	Leaf miner	OT													
DIPTERA	Cecidomyiidae	Cystiphora leontodontis (Bremi, 1847)		OG													
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Paroxyna producta (Loew, 1844)	Capitula	OT	N												
DIPTERA	Tephritidae	Tephritis leontodontis (De Geer)	Capitula, Inflorescence	OG		AD	AD	AD	AD	AD	AD	AOL	AOL	LPA	AD	AD	AD
HEMIPTERA (Sternorrhyncha)	Aphididae	Aulacorthum palustre (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Neotrama caudata (Del Guercio)	Root	OT													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta flavipennis (Forster)		OF													
HYMENOPTERA (Aculeata)	Apidae	Hoplosmia spinulosa (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	PAO	AO	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Diplapion confluens (Kirby, 1808)	Root collars, Stem	OT		AD	AD	AD A	A	L	L	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Diplapion stolidum (Germar, 1817)	Root, Root-stock, Stem	OT	Nb	AD	AD	AD A	A	L	L	AL	AL	A	AD	AD	AD
COLEOPTERA	Chrysomelidae	Cryptocephalus bilineatus (L.)	Leaves	O2	Nb						A	A					
COLEOPTERA	Chrysomelidae	Longitarsus succineus (Foudras, 1860)		OF					L (?)	L (?)	AL (?)	AL (?)	A				
COLEOPTERA	Chrysomelidae	Mantura chrysanthemi (Koch, 1803)		O3	Na					A	AL	APL	APL	AP	A		
COLEOPTERA	Curculionidae	Microplontus campestris (Gyllenhal, 1837)	Flower	M	Nb				A	A	A	A	A				
COLEOPTERA	Curculionidae	Microplontus triangulum (Boheman, 1845)		OT	Nb					A	A	A	A	A			
DIPTERA	Agromyzidae	Liriomyza tanaceti de Meijere	Leaf miner	OF													
DIPTERA	Agromyzidae	Melanagromyza eupatorii Spencer	Stem borer	OF													
DIPTERA	Agromyzidae	Phytomyza leucanthemi Hering	Leaf miner	M													
DIPTERA	Agromyzidae	Phytomyza matricariae Hendel	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Clinorrhyncha leucanthemi Kieff.	Flower	OT													
DIPTERA	Cecidomyiidae	Clinorrhyncha millefolii Rubsaamen		M													
DIPTERA	Cecidomyiidae	Contarinia chrysanthemi Kieff.	Flower	M													
DIPTERA	Cecidomyiidae	Dasyneura chrysanthemi Heath, 1962		OG													
DIPTERA	Cecidomyiidae	Dasyneura spp.	Flower	OF2													
DIPTERA	Cecidomyiidae	Diarthronomyia chrysanthemi Ahlberg	Stem galls, Leaf galls	M													
DIPTERA	Cecidomyiidae	Rhopalomyia hypogaea F.L.W.	Flower	M													
DIPTERA	Psilidae	Psila bicolor Meigen, 1826		M													
DIPTERA	Psilidae	Psila limbatella (Zetterstedt)		OG													
DIPTERA	Tephritidae	Acanthiophilus helianthi (Rossi, 1794)	Capitula	OF	Nb							AOL	AOL				
DIPTERA	Tephritidae	Dioxyna bidentis (Robineau-Desvoidy)	Capitula	OF2	N	AD	AD	AD	AD	AD	AD	AD	AOL	AOLP	AD	AD	AD
DIPTERA	Tephritidae	Oxyna nebulosa (Wiedemann)	Root	OF													
DIPTERA	Tephritidae	Tephritis neesii (Meigen, 1830)	Capitula, Inflorescence	OG		AD	AD	AD	AD	AD	AOL	AOL	AOL	LPA	AD	AD	AD
DIPTERA	Tephritidae	Trypeta zoe Meigen	Leaves	OF		LD	LD	LD	LPA	AOLP	AOL	AOL	L	LD	LD	LD	LD
DIPTERA	Tephritidae	Urophora quadrifasciata (Meigen, 1826)	Capitula	OF		LD	LD	LD	LD	LPA	AOL	AOLP	AOL	L	LD	LD	LD
HEMIPTERA (Heteroptera)	Lygaeidae	Trapazonotus ullrichi (Fieber)		M	RDB 3						A						
HEMIPTERA (Heteroptera)	Tingidae	Catoplatus fabricii (Stal)		M													
HEMIPTERA (Heteroptera)	Tingidae	Derephysia foliacea (Fallen)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Hyperomyzus lactucae (L)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella oblonga (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella sanborni (Gillette)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella tanacetaria (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Macrosiphoniella trimaculata H.R.L.		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Pleotrichophorus glandulosus (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Toxopterina vandergooti (Borner)		OT													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon tanaceti (L)		OF													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta flavipennis (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Psyllidae	Craspedolepta sonchi (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza abdominalis (Flor)		O													
HYMENOPTERA (Aculeata)	Apidae	Colletes daviesanus Smith	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	AOL	AOL	AOL	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Colletes similis Schenck	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	AOL	AOL	AOL	L	LD	LD
LEPIDOPTERA	Bucculatricidae	Bucculatrix nigricomella ()		M		L	L	L	L	PA	AO	L	PA				
LEPIDOPTERA	Coleophoridae	Coleophora gardesanella Toll	Leaves	OT		LD	LD	LD	L	L	LP	A	A	L	L	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora trochilella (Dup.)		OT		LD	LD	LD	LD	L	LP	PA	A	OL		LD	LD
LEPIDOPTERA	Pterophoridae	Leioptilus lienigianus (Zell.)		OT						L	LP	PA					
LEPIDOPTERA	Pyralidae	Homoeosoma nebulella (D.&S.)	Flower, Seed	OF2	Nb	LD	LD	LD	LD	LD	PA	PA	AOL	OL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Aethes margaritana (Haw.)	Flower, Seed	OT	N	LD	LD	LD	LD	P	P	AO	AO	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Dichrorampha aeratana (Pierce & Metcalfe)	Root	M		L	L	L	LP	PA	A	A			L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha alpinana (Treitschke)	Root	M		L	L	L	L	L	LPA	PA	AO	L	L	L	L
LEPIDOPTERA	Tortricidae	Dichrorampha consortana (Stephens)	Stem	M					L	LP	PA	A					
LEPIDOPTERA	Tortricidae	Dichrorampha plumbana (Scop.)	Root, Rootstock	OT		L	L	L	LP	PA	A		L	L	L	L	L

Plantago lanceolata

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Apteropeda splendida Allard, 1859	Leaf miner	O	RDB 1					A	A	A	A				
COLEOPTERA	Chrysomelidae	Chrysolina crassicornis (Helliesin, 1911)		O	RDB 2	A			LA	LA	LA	A		A	A	A	A
COLEOPTERA	Chrysomelidae	Chrysolina haemoptera (Linnaeus, 1758)		O	Nb						L	LA	LA	A			
COLEOPTERA	Chrysomelidae	Longitarsus aeruginosus (Foudras, 1860)	Root	O3	RDB 1					AOL	AL	AL	A	A	A		
COLEOPTERA	Chrysomelidae	Longitarsus kutscherae (Rye, 1872)	Root	O				AO	AOL	A		A	A	A			
COLEOPTERA	Chrysomelidae	Longitarsus pratensis (Panzer, 1794)	Leaves	O				A	A	A	AOL	AL	A	A			
COLEOPTERA	Chrysomelidae	Longitarsus reichei (Allard, 1860)	Root	OG					L (?)	L (?)	AL (?)	AL (?)	A	A	A		
COLEOPTERA	Chrysomelidae	Mniophila muscorum (Koch, 1803)	Leaf miner	O	Nb			A	A	A	AL (?)	L	AL	AP	AP	A	A
COLEOPTERA	Curculionidae	Alophus triguttatus (Fabricius, 1775)		O	Nb			A	A	A		A		A		A	
COLEOPTERA	Curculionidae	Cathormiocerus britannicus Blair	Root	O2	RDB 1			A	A	A	A			A	A	A	A
COLEOPTERA	Curculionidae	Cathormiocerus maritimus Rye.		OG	RDB 3			A	A	A	A			A	A	A	
COLEOPTERA	Curculionidae	Cathormiocerus socius Boh.		OG	RDB 2			A	A	A	A	A	A	A			
COLEOPTERA	Curculionidae	Hypera plantaginis (Degeer, 1775)		O		A	A	A	A	A	A		A	A	A		
COLEOPTERA	Curculionidae	Mecinus circulatus (Marsham, 1802)	Root collars, Stem	OG2	Nb	A			A	A	A		A	A			
COLEOPTERA	Curculionidae	Mecinus collaris Germar, 1821		OG	Nb			A	A		A	A	A	A			
COLEOPTERA	Curculionidae	Mecinus labilis (Herbst, 1795)	Root collars, Stem	OG						A	A						
COLEOPTERA	Curculionidae	Mecinus pascuorum (Gyllenhal, 1813)	Seed-pods, fruits	OG2				A	A	LA	LA	L	A	A			
COLEOPTERA	Curculionidae	Mecinus pyraster (Herbst, 1795)	Root, Stem, Flower galls?	OG					A	A	A	A	A	A	A		
COLEOPTERA	Curculionidae	Trachyphloeus alternans Gyllenhal, 1834	Root	O	Nb					A	A	A	A	A	A		
COLEOPTERA	Curculionidae	Trachyphloeus aristatus (Gyllenhal, 1827)	Root	O	Nb	A	A	A	A	A	A	A	A	A	A	A	A
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
COLEOPTERA	Curculionidae	Trachyphloeus spinimanus Germar, 1824	Root	M	Nb			A	A	A	A	A	A	A	A		
COLEOPTERA	Curculionidae	Trichosirocalus dawsoni (Brisout, Ch., 1869)		OG	Nb					L (?)	L (?)	L (?)	A	A			
COLEOPTERA	Curculionidae	Trichosirocalus rufulus (Dufour, 1851)		OG	Na			A		A	A	A	A	A	A		
COLEOPTERA	Curculionidae	Trichosirocalus troglodytes (Fabricius, 1787)	Stem	OG		A		AL (?)	L(?)	A (?)	A (?)	A	A	A			
DIPTERA	Agromyzidae	Phytomyza plantaginis Robineau-Desvoidy	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Jaapiella schmidti (Rübsaamen, 1912)		M													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Utecha trivia (Germar)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis plantaginis (Goeze)	Root collar, Basal rosette	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Brachycaudus lucifugus (Muller)	Root, Lower stem, Leaves	M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis aucupariae (Buckton)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis plantaginea (Passerini)		O													
HYMENOPTERA (Symphyta)	Tenthredinidae	Tenthredo obsoleta (Klug)		M													
LEPIDOPTERA	Coleophoridae	Coleophora argentula (Steph.)	Withering flowers	O3		LD	LD	LD	LD	LD	LP	A	A	L	L	LD	LD
LEPIDOPTERA	Geometridae	Idaea sylvestraria (Hubner)		O	Nb	L	L	L	L	LP	PA	A	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Gracillariidae	Aspilapteryx tringipennella (Zell.)	Leaves	M		LD	LD	L	LP	PAO	OL	LP	PA	O	L	LD	LD
LEPIDOPTERA	Nymphalidae	Melitaea cinxia (L.)		OG	RDB 3	LD	LD	LD	L	LP	AOL	AOL	L	LD	LD	LD	LD
LEPIDOPTERA	Pyralidae	Homoeosoma sinuella (Fabricius)	Root	OG		L LD	L LD	LD	LD P	P	PA	PA	AL	L	L	L LD	L LD
LEPIDOPTERA	Pyralidae	Pyrausta cespitalis (D.&S.)		OG					P	A	AOL	PA	AL	L			
LEPIDOPTERA	Scythrididae	Scythris siccella (Zell.)		O	RDB 1					L	P	A					
LEPIDOPTERA	Tortricidae	Falseuncaria degreyana (McLach.)	Flower, Seed	O2	RDB 2	LD	LD	LD	LD	LD PA	AOL	PA	AOL	L	LD	LD	LD
THYSANOPTERA	Thripidae	Thrips nigropilosus Uzel		O		A	A	A	A	A	A	A	A	A			

Potentilla reptans

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Attelabidae	Neccoenorrhinus germanicus (Herbst, 1797)	Stem	OF													
COLEOPTERA	Chrysomelidae	Batophila aerata (Marsham, 1802)	Root	OF	Nb	L	L	L	LA	AO	L	L	L	L	L	L	L
DIPTERA	Agromyzidae	Agromyza spiraeae Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Agromyza sulfuriceps Strobl	Leaf miner	OF													
HEMIPTERA (Heteroptera)	Pentatomidae	Sciocoris cursitans (Fabr.)		O	N	A	A	A	A	AO	AO		A	A	A	A	A
HEMIPTERA (Sternorrhyncha)	Aphididae	Amphophora rubi (Kaltenbach)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena tarsata Nylander	Flower	Oligolectic		LD	LD	LD	LD	LD	LD	LPA	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma campanularum (Kirby)	Flower	Oligolectic		PD	PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Heriades truncorum (Linnaeus)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
LEPIDOPTERA	Geometridae	Aspitates gilvaria gilvaria (D. & S.)		O		L	L	L	L	L	LP	A	AO	L	L	L	L
LEPIDOPTERA	Hesperiidae	Pyrgus malvae (L.)		OF		P	P	P	P	A	A	OL	L	LP	P	P	P
LEPIDOPTERA	Nepticulidae	Stigmella aeneofasciella (H.-S.)	Leaves	OF		P	P	P	P	PAO	OL	LP	PAO	OL	L	P	P

Primula veris

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Phytomyza primulae Robineau-Desvoidy	Leaf miner	OG													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Thecabius auriculae (Murray)		OG													
LEPIDOPTERA	Nemeobiidae	Hamearis lucina (L.)		OG2		P	P	P	P	A	AOL	L	LP	P	P	P	P
LEPIDOPTERA	Tortricidae	Falseuncaria ruficiliana (Haworth)	Seed	O3		LD	LD	LD	LDP	PAOL	AOLP	PAOL	AOL	LD	LD	LD	LD

Prunella vulgaris

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Squamapion cineraceum (Wencker, 1864)	Root stocks?	M	Na				A	A	A	A	A	A	A		
COLEOPTERA	Nitidulidae	Meligethes umbrosus Sturm, 1845	Pollen	OG	N				A	A	A		A		A		
DIPTERA	Cecidomyiidae	Macrolabis brunellae Tavares, 1907		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis brunellae (Schouteden)	Stem, Flowering bracts	M													
HYMENOPTERA (Aculeata)	Apidae	Anthophora furcata (Panzer)	Flower	Oligolectic		LD	LD	LD	LD	LPAO	AOLP	AOLP	AOLP	AOL	LD	LD	LD
LEPIDOPTERA	Coleophoridae	Coleophora albitarsella Zell.		OF		LD	LD	L	L	LP	PA	A	LA		LD	LD	LD
LEPIDOPTERA	Nepticulidae	Fedalmia headleyella (Stt.)	Stem, Leaves, Petiole	M		P	P	P	PA	PA	A	AOL	AOL	AOL	LP	P	P

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Cryptocephalus aureolus Suffrian, 1847	Leaves	O	Nb					A	A	A					
COLEOPTERA	Chrysomelidae	Hydrothassa hannoveriana (F., 1775)		OF	RDB 3				A	A	A	A					
COLEOPTERA	Chrysomelidae	Hydrothassa marginella (Linnaeus, 1758)		OG													
COLEOPTERA	Curculionidae	Bagous tempestivus (Herbst, 1795)	Stem	OG				A	A	A							
COLEOPTERA	Curculionidae	Leiosoma deflexum (Panz.)	Root, Rhizome	OF				A	A	A	A	L (?)	L (?)	A	A		
COLEOPTERA	Curculionidae	Leiosoma oblongulum Boh.		OF	Nb			A	A	A	A						
COLEOPTERA	Curculionidae	Leiosoma troglodytes		OG	RDB 2				A								
COLEOPTERA	Nitidulidae	Meligethes viridescens (F., 1787)	Pollen	O						A	A	A	A	A	A	A	
DIPTERA	Agromyzidae	Napomyza evanescens	Stem	M													
DIPTERA	Agromyzidae	Napomyza nigritula	Stem	OG2													
DIPTERA	Agromyzidae	Ophiomyia ranunculicaulis Hering	Stem miner	M							A						
DIPTERA	Agromyzidae	Phytomyza albipennis Fallen	Stem borer	OG						A							
DIPTERA	Agromyzidae	Phytomyza cineracea Hendel	Stem borer	OG													
DIPTERA	Agromyzidae	Phytomyza evanescens Hendel	Stem borer	OG													
DIPTERA	Agromyzidae	Phytomyza fallaciosa Brischke	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza notata Meigen	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza ranunculi (Schrank)	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza ranunculivora Hering	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza rydeni Hering	Leaf miner	M								A					
DIPTERA	Cecidomyiidae	Dasyneura ranunculi (Bremi, 1847)		OG													
DIPTERA	Cecidomyiidae	Dasyneura traili (Kieffer, 1909)		OG													
DIPTERA	Cecidomyiidae	Geodiplosis ranunculi Kieffer, 1909		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis ranunculi (Kaltenbach)		O													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama ranunculi (Del Guercio)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Thecabius affinis (Kalt.)	Root, Runner	O													
HYMENOPTERA (Aculeata)	Apidae	Andrena labialis (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena nitida (Muller)	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma campanularum (Kirby)	Flower	Oligolectic		PD	PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma florisomne (Linnaeus)	Flower	Oligolectic		PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Hoplosmia spinulosa (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	PAO	AO	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Osmia leaiana (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	A	AO	AOLP	AOLP	LP	PAD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Osmia xanthomelana (Kirby)	Flower	Oligolectic	RDB 1	AD	AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD
HYMENOPTERA (Symphyta)	Tenthredinidae	Athalia bicolor (Lepeletier)		OG?													
HYMENOPTERA (Symphyta)	Tenthredinidae	Monophadnus pallescens (Gmelin)		OG2													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pseudodineura fuscula (Klug)	Leaves	OG													
LEPIDOPTERA	Geometridae	Horisme vitalbata (D. & S.)		OF								L	L	L			

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Cryptocephalus aureolus Suffrian, 1847	Leaves	O	Nb					A	A	A					
COLEOPTERA	Chrysomelidae	Hydrothassa hannoveriana (F., 1775)		OF	RDB 3				A	A	A	A					
COLEOPTERA	Chrysomelidae	Hydrothassa marginella (Linnaeus, 1758)		OG													
COLEOPTERA	Curculionidae	Bagous tempestivus (Herbst, 1795)	Stem	OG				A	A	A							
COLEOPTERA	Curculionidae	Barynotus obscurus (F., 1775)		M						A							
COLEOPTERA	Curculionidae	Leiosoma deflexum (Panz.)	Root, Rhizome	OF				A	A	A	A	L (?)	L (?)	A	A		
COLEOPTERA	Curculionidae	Leiosoma oblongulum Boh.		OF	Nb			A	A	A	A						
COLEOPTERA	Curculionidae	Leiosoma troglodytes		OG	RDB 2				A								
COLEOPTERA	Nitidulidae	Meligethes viridescens (F., 1787)	Pollen	O						A	A	A	A	A	A	A	
DIPTERA	Agromyzidae	Napomyza nigritula	Stem	OG2													
DIPTERA	Agromyzidae	Phytomyza albipennis Fallen	Stem borer	OG						A							
DIPTERA	Agromyzidae	Phytomyza cineracea Hendel	Stem borer	OG													
DIPTERA	Agromyzidae	Phytomyza evanescens Hendel	Stem borer	OG													
DIPTERA	Agromyzidae	Phytomyza fallaciosa Brischke	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza notata Meigen	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza ranunculi (Schrank)	Leaf miner	OG													
DIPTERA	Agromyzidae	Phytomyza ranunculi var. flava Fallen	Leaf miner	M													
DIPTERA	Agromyzidae	Phytomyza ranunculivora Hering	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Dasyneura ranunculi (Bremi, 1847)		OG													
DIPTERA	Cecidomyiidae	Dasyneura traili (Kieffer, 1909)		OG													
DIPTERA	Cecidomyiidae	Geodiplosis ranunculi Kieffer, 1909		OG2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis crataegi (Kaltenbach)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis ranunculi (Kaltenbach)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Tubaphis ranunculina (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama ranunculi (Del Guercio)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Thecabius affinis (Kalt.)	Root, Runner	O													
HYMENOPTERA (Aculeata)	Apidae	Andrena labialis (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma campanularum (Kirby)	Flower	Oligolectic		PD	PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma florisomne (Linnaeus)	Flower	Oligolectic		PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Hoplosmia spinulosa (Kirby)	Flower	Oligolectic		LD	LD	LD	LD	LD	PAO	AO	AOL	AOL	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Macropis europaea (Warncke)	Flower	Oligolectic	RDB 3	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Osmia leaiana (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	A	AO	AOLP	AOLP	LP	PAD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Osmia xanthomelana (Kirby)	Flower	Oligolectic	RDB 1	AD	AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD
HYMENOPTERA (Symphyta)	Tenthredinidae	Athalia bicolor (Lepeletier)		OG?													
HYMENOPTERA (Symphyta)	Tenthredinidae	Monophadnus pallescens (Gmelin)		OG2													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pseudodineura fuscula (Klug)	Leaves	OG													
LEPIDOPTERA	Geometridae	Horisme vitalbata (D. & S.)		OF								L	L	L			
THYSANOPTERA	Thripidae	Thrips discolor Haliday	Leaves	M		A	A	A	A	A	A	A	LA	LA	A	A	A

Rhinanthus minor

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
DIPTERA	Agromyzidae	Phytomyza varipes Macquart	Seed heads	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Hyperomyzus rhinanthi (Schouteden)		O													
LEPIDOPTERA	Geometridae	Eupithecia plumbeolata (Haworth)		OF2	Nb					A	A	L	L				
LEPIDOPTERA	Geometridae	Perizoma albulata (D. & S.)	Ripening seeds	M		P	P	P	P	P	L	L	L	P	P	P	P
LEPIDOPTERA	Geometridae	Perizoma albulata albulata (D. & S.)	Seed	M		P	P	P	P	PA	A	AOL	L	P	P	P	P
LEPIDOPTERA	Pyralidae	Opsibotys fuscalis (D.&S.)	Flower, Seed	O		LD	LD	LD	LD	P	A	L	L	LD	LD	LD	LD

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Apion cruentatum Walton, 1844	Root, Stem	OG		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion frumentarium (Linnaeus, 1758)	Root, Rootstock, Stem	OG		AD	AD	AD A	AO	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion affine (Kirby)	Flower galls	OG2		AD	AD	AD A	AL	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion curtirostre (Germar, 1817)	Stem	OG		AD	AD	AL	L	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion marchicum (Herbst, 1797)	Roots, Rootstock, Galls, Root collar	OG2		AD	AD	AD A	AL	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Perapion violaceum (Kirby, 1808)	Stem	OG		AD	AD	AD A	AD A	L	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Galerucella lineola (F., 1781)	Leaves	O						O L	LA						
COLEOPTERA	Chrysomelidae	Gastrophysa viridula (Degeer, 1775)	Leaves	OG						A	AL	L	AL				
COLEOPTERA	Chrysomelidae	Mantura chrysanthemi (Koch, 1803)	Leaf miner	O3	Na				A	A	AL	APL	APL	AP	A		
COLEOPTERA	Chrysomelidae	Mantura obtusata (Gyllenhal, 1813)	Leaf miner	OG	Nb	A	A	A	A	A	LA	LPA	LPA	P A			
COLEOPTERA	Chrysomelidae	Mantura rustica (Linnaeus, 1767)	Leaf miner	OG	Nb	A	A	A	A	A	AL	LPA	LPA	AP	A	A	A
COLEOPTERA	Curculionidae	Hypera rumicis (Linnaeus, 1758)	Leaves	OF						AL (?)	AP	APL (?)	APL (?)	A	A		
COLEOPTERA	Curculionidae	Neophytobius quadrinodosus (Gyllenhal, 1813)		OF	Na	A	A	AL (?)	L (?)	AL (?)	A	A	AL (?)	L (?)		A	A
COLEOPTERA	Curculionidae	Rhinoncus castor (F., 1792)	Root	OG													
COLEOPTERA	Curculionidae	Rhinoncus pericarpius (Linnaeus, 1758)	Root, Stem	OF				A		A	A	A		A	A		A
COLEOPTERA	Curculionidae	Trachyphloeus asperatus Boheman, 1843	Root	O	Nb			A	A	A	A	A	A	A	A	A	
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
DIPTERA	Anthomyidae	Pegomya haemorrhoa (Zetterstedt)	Leaf miner	OG						L	L	L		L			
DIPTERA	Cecidomyiidae	Contarinia acetosellae (Rübsaamen, 1891)		OG2													
DIPTERA	Cecidomyiidae	Contarinia rumicis (Loew, 1850)		OG													
DIPTERA	Cecidomyiidae	Jaapiella rubicundula (Rübsaamen, 1891)		OG													
DIPTERA	Scathophagidae	Norellisoma spinimanum (Fallén, 1819)		OG							A	A	A				
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus williamsi (China)		OF	Nb												
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara exilis (Weber & Mohr)		OG													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni var rumicicola (Loginova)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae (L)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae L. (R. acel form)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis rumicis (L)	Stem, Leaf rolls, Flower	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis plantaginea (Passerini)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphoninus staphyleae (Koch)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Thuleaphis sedi (Jacob)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Ametastegia tener (Fallen)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus rumicis (Linne)		OG													
LEPIDOPTERA	Geometridae	Idaea degeneraria (Hubner)		O	RDB 3	LD	LD	L	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Idaea humiliata (Hufn.)		O	Extinct	L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Rhodometra sacraria (L)		OF						A	A	L	L A	L			
LEPIDOPTERA	Geometridae	Scopula floslactata (Haworth)		O													
LEPIDOPTERA	Geometridae	Scopula floslactata floslactata (Haworth)		O		LD	LD	LD	LP	PA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Timandra griseata (Petersen)		OG		L	L	L	L	A	A	A	A	L A	L	L	L
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas eleus (Fabr)		OG2		LD	LD	LD L	LP	PAO	LP	PAO	AOL	LP	AOL	LD	LD
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas L.	Leaves	OG						A	A	A	A	A	A		
LEPIDOPTERA	Nepticulidae	Enteucha acetosaa (Stt.)		OG2	N	P	P	P	PA	AOL	LP	PAO	OL	L	LP	LP	P
LEPIDOPTERA	Nepticulidae	Johanssonia acetosae (Stainton)	Leaves	OG2						L	L	L	L	L	L		
LEPIDOPTERA	Noctuidae	Mythimna comma (Hubn)		OF		LD	LD	LD	LD P	P	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Scythrididae	Scythris potentillella (Zell)		OG2	RDB 2				L	L	PA	A					
LEPIDOPTERA	Sesiidae	Bembecia chrysidiformis (Esper)	Root, Crowns	OG	RDB 1	L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
LEPIDOPTERA	Zygaenidae	Adscita statices (L.)		OG2		L	L	L	L	PA	PAO	AOL	L	L	L	L	L

Rumex acetosella

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Apion cruentatum Walton, 1844	Root, Stem	OG		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion frumentarium (Linnaeus, 1758)	Root, Rootstock, Stem	OG		AD	AD	AD A	AO	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion haematodes Kirby, 1808	Root, Rootstock, Leaves	M?		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion rubens Stephens, 1839	Stem, Petiole gall, Midrib gall	M?		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion affine (Kirby)	Flower galls	OG2		AD	AD	AD A	AL	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion curtirostre (Germar, 1817)	Stem	OG		AD	AD	AL	L	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion marchicum (Herbst, 1797)	Roots, Rootstock, Galls, Root collar	OG2		AD	AD	AD A	AL	AL	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Apionidae	Perapion violaceum (Kirby, 1808)	Stem	OG		AD	AD	AD A	AD A	L	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Galerucella lineola (F., 1781)	Leaves	O						OL	LA						
COLEOPTERA	Chrysomelidae	Gastrophysa viridula (Degeer, 1775)	Leaves	OG						A	AL	L	AL				
COLEOPTERA	Chrysomelidae	Mantura chrysanthemi (Koch, 1803)	Leaf miner	O3	Na				A	A	AL	APL	APL	AP	A		
COLEOPTERA	Chrysomelidae	Mantura obtusata (Gyllenhal, 1813)	Leaf miner	OG	Nb	A	A	A	A	A	LA	LPA	LPA	PA			
COLEOPTERA	Chrysomelidae	Mantura rustica (Linnaeus, 1767)	Leaf miner	OG	Nb	A	A	A	A	A	AL	LPA	LPA	AP	A	A	A
COLEOPTERA	Curculionidae	Coniocleonus hollbergi (Fåhraeus, 1842)		O	Extinct												
COLEOPTERA	Curculionidae	Hypera rumicis (Linnaeus, 1758)	Leaves	OF						AL (?)	AP	APL (?)	APL (?)	A	A		
COLEOPTERA	Curculionidae	Neophytobius quadrinodosus (Gyllenhal, 1813)		OF	Na	A	A	AL (?)	L (?)	AL (?)	A	A	AL (?)	L (?)		A	A
COLEOPTERA	Curculionidae	Rhinoncus castor (F., 1792)	Root	OG													
COLEOPTERA	Curculionidae	Rhinoncus pericarpius (Linnaeus, 1758)	Root, Stem	OF				A		A	A	A		A	A		A
COLEOPTERA	Curculionidae	Trachyphloeus asperatus Boheman, 1843	Root	O	Nb			A	A	A	A	A	A	A	A	A	
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
DIPTERA	Anthomyidae	Pegomya haemorrhoa (Zetterstedt)	Leaf miner	OG						L	L	L		L			
DIPTERA	Cecidomyiidae	Contarinia rumicis (Loew, 1850)		OG													
DIPTERA	Cecidomyiidae	Jaapiella rubicundula (Rübsaamen, 1891)		OG													
DIPTERA	Scathophagidae	Norellisoma spinimanum (Fallén, 1819)		OG							A	A	A				
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus williamsi (China)		OF	Nb												
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara exilis (Weber & Mohr)		OG													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni var rumicicola (Loginova)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae (L)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae L. (R. asca form)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis etiolata (Stroyan)	Root	M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis rumicis (L)	Stem, Leaf rolls, Flower	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis plantaginea (Passerini)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis radicola (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphoninus staphyleae (Koch)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Thuleaphis rumexicolens (Patch)		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Thuleaphis sedi (Jacob)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Ametastegia tener (Fallen)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus rumicis (Linne)		OG													
LEPIDOPTERA	Gelechiidae	Aroga velocella (Zell.)		M		L	L	L	LP	PA	L	P	A	L	L	L	L
LEPIDOPTERA	Gelechiidae	Monochroa palustrella (Dougl)		M	Nb	LD	LD	LD	LD P	P	PA	A		L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Monochroa tenebrella (Hb.)		M		LD	LD	LD	LD P	P	PA	A		L	L	LD	LD
LEPIDOPTERA	Gelechiidae	Neofriseria peliella (Treit)		M						L	P	A					
LEPIDOPTERA	Gelechiidae	Neofriseria singula (Stdgr)		M						L	P	A					
LEPIDOPTERA	Gelechiidae	Teleiopsis diffinis (Haw)	Root, Stem	M		L	L	L	L	PA		L	L	PAL	AL	L	L
LEPIDOPTERA	Geometridae	Idaea degeneraria (Hubner)		O	RDB 3	LD	LD	L	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Idaea humiliata (Hufn.)		O	Extinct	L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Rhodometra sacraria (L)		OF						A	A	L	LA	L			
LEPIDOPTERA	Geometridae	Scopula floslactata (Haworth)		O													
LEPIDOPTERA	Geometridae	Scopula floslactata floslactata (Haworth)		O		LD	LD	LD	LP	PA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Timandra griseata (Petersen)		OG		L	L	L	L	A	A	A	A	LA	L	L	L
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas eleus (Fabr)		OG2		LD	LD	LD A	LP	PAO	LP	PAO	AOL	LP	AOL	LD	LD
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas L.	Leaves	OG						A	A	A	A	A	A		
LEPIDOPTERA	Nepticulidae	Enteucha acetosaa (Stt.)		OG2	N	P	P	P	PA	AOL	LP	PAO	OL	L	LP	LP	P
LEPIDOPTERA	Nepticulidae	Johanssonia acetosae (Stainton)	Leaves	OG2						L	L	L	L	L	L		
LEPIDOPTERA	Noctuidae	Mythimna comma (Hubn)		OF		LD	LD	LD	LD P	P	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Opostegidae	Opostega salaciella (Treitschke)		M							A	A					
LEPIDOPTERA	Scythrididae	Scythris potentillella (Zell)		OG2	RDB 2				L	L	PA	A					
LEPIDOPTERA	Sesiidae	Bembecia chrysidiformis (Esper)	Root, Crowns	OG	RDB 1	L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
LEPIDOPTERA	Zygaenidae	Adscita statices (L.)		OG2		L	L	L	L	PA	PAO	AOL	L	L	L	L	L

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Apion cruentatum Walton, 1844	Root, Stem	OG		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion frumentarium (Linnaeus, 1758)	Root, Rootstock, Stem	OG		AD	AD	AD A	AO	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion curtirostre (Germar, 1817)	Stem	OG		AD	AD	AL	L	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion hydrolapathi (Marsham, 1802)	Stem	OG		AD	AD	AD A	AD A	L	L	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion violaceum (Kirby, 1808)	Stem	OG		AD	AD	AD A	AD A	L	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Galerucella lineola (F., 1781)	Leaves	O						OL	LA						
COLEOPTERA	Chrysomelidae	Gastrophysa polygoni (Linnaeus, 1758)		OF				A		A	A	A	A				
COLEOPTERA	Chrysomelidae	Gastrophysa viridula (Degeer, 1775)	Leaves	OG						A	AL	L	AL				
COLEOPTERA	Chrysomelidae	Mantura obtusata (Gyllenhal, 1813)	Leaf miner	OG	Nb	A	A	A	A	A	LA	LPA	LPA	PA			
COLEOPTERA	Chrysomelidae	Mantura rustica (Linnaeus, 1767)	Leaf miner	OG	Nb	A	A	A	A	A	AL	LPA	LPA	AP	A	A	A
COLEOPTERA	Curculionidae	Hypera rumicis (Linnaeus, 1758)	Leaves	OF						AL (?)	AP	APL (?)	APL (?)	A	A		
COLEOPTERA	Curculionidae	Neophytobius quadrinodosus (Gyllenhal, 1813)		OF	Na	A	A	AL (?)	L (?)	AL (?)	A	A	AL (?)	L (?)		A	A
COLEOPTERA	Curculionidae	Pelenomus quadrituberculatus (F., 1787)		OF		A		A	A	A		A	A	A		A	A
COLEOPTERA	Curculionidae	Rhinoncus castor (F., 1792)	Root	OG													
COLEOPTERA	Curculionidae	Rhinoncus pericarpius (Linnaeus, 1758)	Root. Stem	OF				A		A	A	A		A	A		A
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
DIPTERA	Anthomyidae	Pegomya bicolor (Hoffmannsegg)	Leaf miner	OG2													
DIPTERA	Anthomyidae	Pegomya haemorrhoa (Zetterstedt)	Leaf miner	OG						L	L	L		L			
DIPTERA	Anthomyidae	Pegomya nigritarsis (Zetterstedt, [1838])	Leaf miner	OG2													
DIPTERA	Cecidomyiidae	Contarinia rumicis (Loew, 1850)		OG													
DIPTERA	Cecidomyiidae	Jaapiella rubicundula (Rübsaamen, 1891)		OG													
DIPTERA	Scathophagidae	Norellisoma spinimanum (Fallén, 1819)		OG							A	A	A				
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus williamsi (China)		OF	Nb												
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara exilis (Weber & Mohr)		OG													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni var rumicicola (Loginova)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae (L)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis rumicis (L)	Stem, Leaf rolls, Flower	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis plantaginea (Passerini)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis radicola (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphoninus staphyleae (Koch)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Thuleaphis sedi (Jacob)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Ametastegia tener (Fallen)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus rumicis (Linne)		OG													
LEPIDOPTERA	Gelechiidae	Scrobipalpa clintoni (Pov)		M	Nb	P	P	P	P	PA	A	L	P	P	P	P	P
LEPIDOPTERA	Geometridae	Idaea degeneraria (Hubner)		O	RDB 3	LD	LD	L	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Idaea humiliata (Hufn.)		O	Extinct	L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Rhodometra sacraria (L)		OF						A	A	L	LA	L			
LEPIDOPTERA	Geometridae	Scopula floslactata (Haworth)		O													
LEPIDOPTERA	Geometridae	Scopula floslactata floslactata (Haworth)		O		LD	LD	LD	LP	PA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Timandra griseata (Petersen)		OG		L	L	L	L	A	A	A	A	LA	L	L	L
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas L.	Leaves	OG						A	A	A	A	A	A		
LEPIDOPTERA	Noctuidae	Mythimna comma (Hubn)		OF		LD	LD	LD	LD P	P	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Sesiidae	Bembecia chrysidiformis (Esper)	Root, Crowns	OG	RDB 1	L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
THYSANOPTERA	Thripidae	Thrips flavus Schrank		O3					A	A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips major Uzel		OG2													
THYSANOPTERA	Thripidae	Thrips tabaci Lindeman		O3													

Rumex obtusifolius

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Apion cruentatum Walton, 1844	Root, Stem	OG		AD	AD	AD A	AL	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Apion frumentarium (Linnaeus, 1758)	Root, Rootstock, Stem	OG		AD	AD	AD A	AO	L	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion curtirostre (Germar, 1817)	Stem	OG		AD	AD	AL	L	AL	AL	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion hydrolapathi (Marsham, 1802)	Stem	OG		AD	AD	AD A	AD A	L	L	AL	AL	AL	A	AD	AD
COLEOPTERA	Apionidae	Perapion violaceum (Kirby, 1808)	Stem	OG		AD	AD	AD A	AD A	L	AL	AL	AL	A	A	AD	AD
COLEOPTERA	Chrysomelidae	Galerucella lineola (F., 1781)	Leaves	O						OL	LA						
COLEOPTERA	Chrysomelidae	Gastrophysa polygoni (Linnaeus, 1758)		OF				A		A	A	A	A				
COLEOPTERA	Chrysomelidae	Gastrophysa viridula (Degeer, 1775)	Leaves	OG						A	AL	L	AL				
COLEOPTERA	Chrysomelidae	Mantura rustica (Linnaeus, 1767)	Leaf miner	OG	Nb	A	A	A	A	A	AL	LPA	LPA	AP	A	A	A
COLEOPTERA	Curculionidae	Hypera rumicis (Linnaeus, 1758)	Leaves	OF						AL (?)	A P	APL (?)	APL (?)	A	A		
COLEOPTERA	Curculionidae	Neophytobius quadrinodosus (Gyllenhal, 1813)		OF	Na	A	A	AL (?)	L (?)	AL (?)	A	A	AL (?)	L (?)		A	A
COLEOPTERA	Curculionidae	Rhinoncus castor (F., 1792)	Root	OG													
COLEOPTERA	Curculionidae	Rhinoncus pericarpius (Linnaeus, 1758)	Root, Stem	OF				A		A	A	A		A	A		A
COLEOPTERA	Curculionidae	Trachyphloeus laticollis Boheman, 1843	Root	O	Na			A	A		A		A	A	A		
DIPTERA	Anthomyidae	Pegomya bicolor (Hoffmannsegg)	Leaf miner	OG2													
DIPTERA	Anthomyidae	Pegomya haemorrhoa (Zetterstedt)	Leaf miner	OG						L	L	L		L			
DIPTERA	Anthomyidae	Pegomya nigritarsis (Zetterstedt, [1838])	Leaf miner	OG2													
DIPTERA	Cecidomyiidae	Contarinia rumicis (Loew, 1850)		OG													
DIPTERA	Cecidomyiidae	Jaapiella rubicundula (Rübsaamen, 1891)		OG													
DIPTERA	Scathophagidae	Norellisoma spinimanum (Fallén, 1819)		OG							A	A	A				
HEMIPTERA (Auchenorrhyncha)	Delphacidae	Criomorphus williamsi (China)		OF	Nb												
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara exilis (Weber & Mohr)		OG													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni (Forster)		OF													
HEMIPTERA (Sternorrhyncha)	Aphalaridae	Aphalara polygoni var rumicicola (Loginova)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis acetosae (L)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis rumicis (L)	Stem, Leaf rolls, Flower	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis plantaginea (Passerini)		O													
HEMIPTERA (Sternorrhyncha)	Aphididae	Dysaphis radicola (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Rhopalosiphoninus staphyleae (Koch)		OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Thuleaphis sedi (Jacob)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Ametastegia tener (Fallen)		OG													
HYMENOPTERA (Symphyta)	Tenthredinidae	Pachynematus rumicis (Linne)		OG													
LEPIDOPTERA	Geometridae	Idaea degeneraria (Hubner)		O	RDB 3	LD	LD	L	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Idaea humiliata (Hufn.)		O	Extinct	L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Rhodometra sacraria (L)		OF						A	A	L	LA	L			
LEPIDOPTERA	Geometridae	Scopula floslactata (Haworth)		O													
LEPIDOPTERA	Geometridae	Scopula floslactata floslactata (Haworth)		O		LD	LD	LD	LP	PA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Geometridae	Selidosema brunnearia scandinaviaria Stdgr		O	Na	L	L	L	L	L	LP	PA	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Siona lineata (Scopoli)		O	RDB 1 !	LD	LD	LD	L	LPA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Timandra griseata (Petersen)		OG		L	L	L	L	A	A	A	A	LA	L	L	L
LEPIDOPTERA	Lycaenidae	Lycaena dispar rutilus Werneburg		M							P	A	A				
LEPIDOPTERA	Lycaenidae	Lycaena phlaeas L.	Leaves	OG						A	A	A	A	A	A		
LEPIDOPTERA	Noctuidae	Mythimna comma (Hubn)		OF		LD	LD	LD	LD P	P	A	AO	L	L	LD	LD	LD
LEPIDOPTERA	Sesiidae	Bembecia chrysidiformis (Esper)	Root, Crowns	OG	RDB 1	L	L	L	L	L	A	A	L	L	L	L	L
LEPIDOPTERA	Sphingidae	Hyles lineata (Fabr.)		O		P	P	P	P	A	AOL	L	PA	AOL	LP	P	P
THYSANOPTERA	Thripidae	Thrips flavus Schrank		O3					A	A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips major Uzel		OG2													
THYSANOPTERA	Thripidae	Thrips tabaci Lindeman		O3													

Sanguisorba minor

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Attelabidae	Neccoenorrhinus germanicus (Herbst, 1797)	Stem	OF													
DIPTERA	Agromyzidae	Agromyza spiraeae Kaltenbach	Leaf miner	OF													
DIPTERA	Agromyzidae	Agromyza sulfuriceps Strobl	Leaf miner	OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis sanguisorbae Schr.	Base	OG													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cerosipha poterii (Borner)		M													
LEPIDOPTERA	Nepticulidae	Stigmella poterii (Stt.)		OF		P	P	P	PA	AO	L	LP	PAO	OL	LP	P	P
LEPIDOPTERA	Nepticulidae	Stigmella poterii serella (Stt.)		OF3		P	P	P	P	P	PAO	OLPA	PAO	OL	LP	P	P
LEPIDOPTERA	Nepticulidae	Stigmella poterii tengstoemi (Nolck)		OF3		P	P	P	P	P	PA	AO	L	P	P	P	P

Senecio jacobaea

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Longitarsus dorsalis (F., 1781)	Root	OG	Na			A	AL	AL	AL	L	L	A	A	A	A
COLEOPTERA	Chrysomelidae	Longitarsus flavicornis (Stephens, 1831)	Root	OG		OL	OL	L	L	A	AL	AL	AOL	OL	OL	OL	OL
COLEOPTERA	Chrysomelidae	Longitarsus ganglbaueri Heikertinger, 1911	Root	OG	Na				A	A	A	A	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Longitarsus gracilis Kutsch.		OG				A		L (?)	L (?)	L (?)	AL (?)	A		A	
COLEOPTERA	Chrysomelidae	Longitarsus jacobaeae (Waterhouse, 1858)	Root	OG		OL	OL	L	L	A	AL	AL	AOL	OL	OL	OL	OL
COLEOPTERA	Chrysomelidae	Longitarsus succineus (Foudras, 1860)		OF					L (?)	L (?)	AL (?)	AL (?)	A				
COLEOPTERA	Chrysomelidae	Longitarsus suturellus (Duftschmid, 1825)	Root	OG					A	AO	AL	A L	A	A	A	A	
COLEOPTERA	Curculionidae	Orthochaetes setiger (Beck, 1817)		O	Nb		A	A	A	A	L (?)	L (?)	A		A	A	
DIPTERA	Agromyzidae	Liriomyza erucifolii de Meijere	Leaf miner	OG2									A				
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Melanagromyza dettmeri Hering	Stem borer	OF													
DIPTERA	Agromyzidae	Melanagromyza eupatorii Spencer	Stem borer	OF													
DIPTERA	Agromyzidae	Melanagromyza oligophaga	Stem	OF3													
DIPTERA	Agromyzidae	Napomyza lateralis (Fallen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Ophiomyia senecionina Hering	Stem miner	OG2													
DIPTERA	Agromyzidae	Phytomyza alpina Groschke	Leaf miner	M													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Anthomyidae	Pegomya depressiventris (Zetterstedt, 1845)	Leaf miner	OF													
DIPTERA	Cecidomyiidae	Contarinia aequalis Kieffer, 1898		OG													
DIPTERA	Cecidomyiidae	Contarinia jacobaeae (Loew, 1850)	Shoot	OG													
DIPTERA	Tephritidae	Acidia cognata (Wieidemann)	Leaves	OF		PD	PD	PD	PD	PAO	AOL	LP	PD	PD	PD	PD	PD
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF													
DIPTERA	Tephritidae	Icterica westermanni (Meigen)	Capitula	OG	N	LD	LD	LD	LD	LD	LP	PAOL	AOL	L	LD	LD	LD
DIPTERA	Tephritidae	Noeeta pupillata (Robineau-Desvoidy)	Capitula	OF2		PD	PD	PD	AOL	AOLP	AOLP	AOLP	AOLP	AOLP	PD	PD	PD
DIPTERA	Tephritidae	Paroxyna lhommei Hering, 1936	Capitula?	OF	RDB 1							A					
DIPTERA	Tephritidae	Sphenella marginata (Fallén, 1814)	Capitula, gall, Inflorescence	OG								PAOL	AOL	AOL			
DIPTERA	Tephritidae	Tephritis praecox (Loew)	Capitula	OF	RDB 1												
DIPTERA	Tephritidae	Trupanea stellata (Fuessly, 1775)	Capitula	OF									AOL	AOL			
DIPTERA	Tephritidae	Trypeta artemisiae (Fabriciua)	Leaves	OF		PD	PD	PD	PD	P	AOL	AOL	L	PD	PD	PD	PD
DIPTERA	Tephritidae	Trypeta zoe Meigen	Leaves, Leaf miner	OF		LD	LD	LD	LPA	AOLP	AOL	AOL	L	LD	LD	LD	LD
HEMIPTERA (Heteroptera)	Tingidae	Oncochila simplex (H.-S.)		M	N												
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis jacobaeae (Schrank)	Base of plant, Stem base, Flower	OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena nitidiuscula Schenck	Flower	Oligolectic		LD	LD	LD	LD	LD P	AO	AOLP	AOLP	AOLP	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena tridentata (Kirby)	Flower	Oligolectic	RDB 1	LD	LD	LD	LD	LD	LD	LPA	AOL	L	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Colletes daviesanus Smith	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	AOL	AOL	AOL	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Colletes fodiens (Geoffroy in Fourcroy)	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	AOL	AOL	AOL	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Colletes halophilus Verhoeff	Flower	Oligolectic	Na	LD	LD	LD	LD	LD	LD	LDP	AOL	AOL	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Colletes similis Schenck	Flower	Oligolectic		LD	LD	LD	LD	LD	LPA	AOL	AOL	AOL	L	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Dasypoda hirtipes (Fabricius)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LP	AO	AOL	LD	LD	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Melitta leporina (Panzer)	Flower	Oligolectic	Nb	LD	LD	LD	LD	LD	LPA	AO	OL	L	L	LD	LD
LEPIDOPTERA	Geometridae	Eupithecia virgaureata Doubl.	Flower	OF2		P	P	P	P	A	AO	P	AO	L	L	P	P
LEPIDOPTERA	Pterophoridae	Leioptilus chrysocomae (Rag)		OF		LD	LD	LD	LD	P	P	A	O	L	L	LD	LD
LEPIDOPTERA	Pterophoridae	Leioptilus osteodactylus (Zell)		OF		LD	LD	LD	LD	P	P	A	O	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Homoeosoma nebulella (D.&S.)	Flower, Seed	OF2	Nb	LD	LD	LD	LD	LD	PA	PA	AOL	OL	LD	LD	LD
LEPIDOPTERA	Pyralidae	Homoeosoma nimbella (Dup.)	Flower	OF	RDB K	LD	LD	LD	LD	P	A	A	AO	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Perinephela lancealis (D.&S.)	Leaves, Flower, Seed	O		LD	LD	LD	LD	LD P	PA	A	AL	L	LD	LD	LD
LEPIDOPTERA	Pyralidae	Phycitodes maritima (Tengstrom)	Flower	OF2		LD	LD	LD	LD P	PA	LP	PA	L	L	L	LD	LD
LEPIDOPTERA	Pyralidae	Udea uliginosalis (Stephens)		OG	Nb						LP	PA	A				
LEPIDOPTERA	Tortricidae	Cochylis atricapitana (Steph.)	Root, Stem, Flower	M		LD	LD	LD	LD P	A	AO	OLPA	AO	OL	LD	LD	LD
LEPIDOPTERA	Tortricidae	Commophila aeneana (Hb.)	Root	M	N	LD	LD	LD	LD	PA	AO	AO	O	L	L	LD	LD
LEPIDOPTERA	Tortricidae	Epiblema costipunctana (Haw.)	Root, Stem	M		LD	LD	LD	LD P	A	AOL	LPA	A	L	L	L	LD
LEPIDOPTERA	Tortricidae	Eucosma campoliliana (D. & S.)	Stem, Seed	M		LD	LD	LD	LD	LP	PA	A	AOL	L	LD	LD	LD
THYSANOPTERA	Phlaeothripidae	Haplothrips senecionis Bagnall		OG2						LA	LA	LA	LA	LA	LA		
THYSANOPTERA	Phlaeothripidae	Haplothrips setiger Priesner		OF													
THYSANOPTERA	Thripidae	Thrips flavus Schrank		O3					A	A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips pillichi Priesner	Flower	OF						A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips tabaci Lindeman		O3													

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Curculionidae	Alophus triguttatus (Fabricius, 1775)		O	Nb			A	A	A		A		A		A	
COLEOPTERA	Curculionidae	Glocanus pilosellus (Gyllenhal, 1837)	Capitula	OG	RDB 2	A			A	A				A			
COLEOPTERA	Curculionidae	Glocianus punctiger (Gyllenhal, 1837)	Flower, Capitula	OG	Nb				L	LA	LA	A	A	A	A		
DIPTERA	Agromyzidae	Liriomyza strigata (Meigen)	Leaf miner	OF													
DIPTERA	Agromyzidae	Liriomyza taraxaci Hering	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia beckeri (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia cunctata (Hendel)	Leaf miner	OT													
DIPTERA	Agromyzidae	Ophiomyia pulicaria (Meigen)	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza farfarella Hendel	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza marginella Fallen	Leaf miner	OT													
DIPTERA	Agromyzidae	Phytomyza syngenesiae (Hardy)	Leaf miner	OF													
DIPTERA	Agromyzidae	Phytomyza taraxacocecis Hering	Leaf miner	M						A							
DIPTERA	Cecidomyiidae	Cystiphora taraxaci (Kieffer, 1888)	Leaves	OG													
DIPTERA	Tephritidae	Ensina sonchi (Linnaeus, 1767)	Capitula	OF							AOL	AOL	AOL	AOL			
DIPTERA	Tephritidae	Paroxyna producta (Loew, 1844)	Capitula	OT	N												
DIPTERA	Tephritidae	Trypeta immaculata Macquart	Leaves	OT		PD	PD	PD	PD	AOL	AOL	L	L	PD	PD	PD	PD
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis taraxacicola (Borner)	Root collar	M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Aulacorthum palustre (Hille Ris Lambers)		OT													
HEMIPTERA (Sternorrhyncha)	Aphididae	Uroleucon taraxaci (Kaltenbach)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Neotrama caudata (Del Guercio)	Root	OT													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Protrama radicis (Kalt.)		OF													
HEMIPTERA (Sternorrhyncha)	Lachnidae	Trama rara (Mordvilko)		OF													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Paracletus cimiciformis (von Heyden)	Root	OF +													
HEMIPTERA (Sternorrhyncha)	Pemphigidae	Pemphigus borealis (Tullgren)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena lapponica Zetterstedt	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena nitida (Muller)	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena rosae Panzer	Flower	Oligolectic		LD	LD	LD	LD	LDP	AO	AOL	AOL	DL	D	LD	LD
HYMENOPTERA (Aculeata)	Apidae	Andrena ruficrus Nylander	Flower	Oligolectic		AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena wilkella (Kirby)	Flower	Oligolectic		AD	AD	AD	AD	AO	AOLP	PA	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma campanularum (Kirby)	Flower	Oligolectic		PD	PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD
HYMENOPTERA (Aculeata)	Apidae	Chelostoma florisomne (Linnaeus)	Flower	Oligolectic		PD	PD	PD	PD	AOL	AOLP	PD	PD	PD	PD	PD	PD
LEPIDOPTERA	Geometridae	Idaea degeneraria (Hubner)		O	RDB 3	LD	LD	L	L	LP	PA	AO	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Idaea fuscovenosa (Goeze)		M		L	L	L	L	LP	PA	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Idaea humiliata (Hufn.)		O	Extinct	L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Idaea straminata (Borkh)		O		L	L	L	L	L	P	AO	L	L	L	L	L
LEPIDOPTERA	Geometridae	Idaea sylvestraria (Hubner)		O	Nb	L	L	L	L	LP	PA	A	AO	L	L	L	L
LEPIDOPTERA	Geometridae	Scopula emutaria (Hubner)		O	Nb	LD	LD	LD	L	LP	PA	A	L	L	L	LD	LD
LEPIDOPTERA	Geometridae	Scopula floslactata (Haworth)		O													
LEPIDOPTERA	Geometridae	Scopula floslactata floslactata (Haworth)		O		LD	LD	LD	LP	PA	AO	L	L	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula immorata (L.)		O	RDB 1 +	L	L	L	L	LP	PA	A	L	L	L	L	L
LEPIDOPTERA	Geometridae	Scopula nigropunctata (Hufnagel)		O2	RDB 2	LD	LD	LD	L	L	P	A	AL	L	LD	LD	LD
LEPIDOPTERA	Geometridae	Scopula rubiginata (Hufnagel)		O	RDB 3	LD	LD	LD	L	LP	PA	AOL	LPA	AL	LD	LD	LD
LEPIDOPTERA	Oecophoridae	Depressaria badiella (Hb.)		OT						L	LP	LPA	PA	A	A		
LEPIDOPTERA	Tortricidae	Celypha rosaceana (Schlag)	Root	OT						L	LPA	A	A				
LEPIDOPTERA	Tortricidae	Celypha striana (D. & S.)	Root	OG		L	L	L	L	LP	PA	AO	AO	AOL	L	L	L
THYSANOPTERA	Thripidae	Thrips hukkineni Priesner	Flower	OF					A	A	A	A	A	A			
THYSANOPTERA	Thripidae	Thrips physapus Linnaeus	Flower	O						A	A	A	A	A			

Urtica dioica

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Apionidae	Taeniapion urticarium (Herbst, 1784)	Stem	OG							L	L	L	AL	AL		
COLEOPTERA	Chrysomelidae	Psylliodes attenuata (Koch, 1803)	Root	O3	RDB 1	A	A	A	A	LA	L	LA	LA	A	A	A	A
COLEOPTERA	Curculionidae	Nedyus quadrimaculatus (Linnaeus, 1758)	Stem	OG			A	A	A	A	A	A	A	A	A	A	
COLEOPTERA	Curculionidae	Parethelcus pollinarius (Forster, 1771)	Root	M		A		A	A	A	A	A		A	A	A	
COLEOPTERA	Curculionidae	Phyllobius pomaceus Gyllenhal, 1834	Root, Leaves?	OG						A	A						
COLEOPTERA	Kateretidae	Brachypterus glaber (Stephens, 1835)	Flower, Pollen	OG						A	A	A	A	A			
COLEOPTERA	Kateretidae	Brachypterus urticae (F., 1792)	Flower, Pollen	OG					A	A	A	A	A	A	A		
DIPTERA	Agromyzidae	Agromyza anthracina Meigen, 1830	Leaf miner	OG2							L	AL	A	L	L		
DIPTERA	Agromyzidae	Agromyza pseudoreptans Nowakowski, 1967	Leaf miner	M							L	L		L	L		
DIPTERA	Agromyzidae	Agromyza reptans Fallén, 1823	Leaf miner	OG2							L	L		L	L		
DIPTERA	Agromyzidae	Melanagromyza aenea	Stem borer	M													
DIPTERA	Agromyzidae	Phytomyza flavicornis Fallén, 1823	Stem	OG2													
DIPTERA	Cecidomyiidae	Dasyneura dioicae Rübsaamen, 1895		M													
DIPTERA	Cecidomyiidae	Dasyneura urticae (Perris, 1840)		OG2							L	L	L	L			
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupteryx cyclops (Matsumura)		M													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupteryx urticae (Fabr)		OF3													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Macropsis scutellata (Boheman)		OG2													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Macrosteles variatus (Fallen)		OG2													
HEMIPTERA (Heteroptera)	Coreidae	Arenocoris falleni (Schilling)		O													
HEMIPTERA (Heteroptera)	Lygaeidae	Heterogaster urticae (Fabr.)		O3													
HEMIPTERA (Heteroptera)	Miridae	Calcoris major (Schilling)		OG2							A	A					
HEMIPTERA (Heteroptera)	Miridae	Calocoris alpestris (Meyer-Dur)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Calocoris stysi		OG2													
HEMIPTERA (Heteroptera)	Miridae	Charogochilus gyllenhali (Fallen)		O		A	A	A	A	AO	AOL	LA	LA	A	A	A	A
HEMIPTERA (Heteroptera)	Miridae	Heterotoma meriopterum (Scop.)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Heterotoma planicornis (Palles)		OG2													
HEMIPTERA (Heteroptera)	Miridae	Liocoris tripustulatus (Fabr)	Stem, Flower, Bud, Fruit	OG2													
HEMIPTERA (Heteroptera)	Miridae	Orthonotus rufifrons (Fallen)	Flower buds, Unripe fruit	OG2								A	A	A			
HEMIPTERA (Heteroptera)	Miridae	Orthotylus ochrotrichus Fieb.		O													
HEMIPTERA (Heteroptera)	Miridae	Plagionathus arbustorum (Fabr)		OG								A	A	A			
HEMIPTERA (Sternorrhyncha)	Aphididae	Aphis urticata Gmelin		M													
HEMIPTERA (Sternorrhyncha)	Aphididae	Metopolophium dirhodum (Walker)		OF													
HEMIPTERA (Sternorrhyncha)	Aphididae	Microlophium carnosum (Buckton)		M													
HEMIPTERA (Sternorrhyncha)	Triozidae	Trioza urticae (L)		OG													
LEPIDOPTERA	Choreutidae	Anthophila fabriciana (L)		OF		L	L	L	L	LPA	PAOL	LPA	PAOL	AOL	AOL	AOL	L
LEPIDOPTERA	Incurvariidae	Adela reaumurella (L)	Leaves	OG		L	L	L		A	A			L	L	L	L
LEPIDOPTERA	Noctuidae	Abrostola trigemina (Werneburg)		O2		P	P	P	P	P	A	AO	LA	LA	P	P	P
LEPIDOPTERA	Noctuidae	Abrostola triplasia (L)		O2		P	P	P	P	PA	A	AOL	L	L	P	P	P
LEPIDOPTERA	Noctuidae	Hypena obesalis (Treitschke)		M						A	LA	L					
LEPIDOPTERA	Noctuidae	Hypena obsitalis (Hubn)		OF2	RDB 3					L	L	LA	LA	LA	A		
LEPIDOPTERA	Noctuidae	Hypena proboscidalis (L)		M		L	L	L	L	LP	PA	AOL	AOL	LP	AOL	L	L
LEPIDOPTERA	Nymphalidae	Aglais urticae (L)		OG2		A	A	A	AO	AOL	LP	LPA	LPA	A	A	A	A
LEPIDOPTERA	Nymphalidae	Araschnia levana (L)		OG2	Extinct						L	L	L	L			
LEPIDOPTERA	Nymphalidae	Inachis io (L)		O2		A	A	A	AO	AL	AL	LPA	PA	A	A	A	A
LEPIDOPTERA	Nymphalidae	Polygonia c-album (L)		O					O	LO	L	AOL	AOL	A			
LEPIDOPTERA	Nymphalidae	Vanessa atalanta L.		OF3		A	A	A	A	AO	AOL	AOLP	AOLP	AOLP	A		
LEPIDOPTERA	Pyralidae	Pleuroptya ruralis (Scop)		M		L	L	L	L	L	LP	A	A	AL	L	L	L
THYSANOPTERA	Thripidae	Thrips urticae Fabricius		OG2	Rare					LA	A	A	A	LA	A		

Veronica chamaedrys

ORDER	FAMILY	SPECIES	PLANT PARTS	SPECIFICITY	STATUS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
COLEOPTERA	Chrysomelidae	Apteropeda splendida Allard, 1859	Leaf miner	O	RDB 1					A	A	A	A				
COLEOPTERA	Chrysomelidae	Phaedon armoraciae (Linnaeus, 1758)	Leaves	O			A			A	A		A	A			A
COLEOPTERA	Chrysomelidae	Phaedon cochleariae (F., 1792)	Leaves	O		A		L (?)	AL (?)	L (?)	AL (?)	A	A	A	A	A	A
COLEOPTERA	Chrysomelidae	Prasocuris junci (Brahm)		OG													
COLEOPTERA	Curculionidae	Gymnetron melanarium (Germar, 1821)		OG3	Nb			A		A	A	A	A				
COLEOPTERA	Curculionidae	Gymnetron villosulum Gyllenhal, 1838	Flower	OG	Nb												
DIPTERA	Agromyzidae	Phytomyza crassiseta Zetterstedt	Leaf miner	OG													
DIPTERA	Cecidomyiidae	Dasyneura similis (F. Löw, 1888)		OG													
HEMIPTERA (Auchenorrhyncha)	Cicadellidae	Eupteryx origani (Zachvatkin)		O2													
HEMIPTERA (Sternorrhyncha)	Aphididae	Cryptomyzus galeopsidis (Kaltenbach)		OF													
HYMENOPTERA (Aculeata)	Apidae	Andrena lapponica Zetterstedt	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
HYMENOPTERA (Aculeata)	Apidae	Andrena nitida (Muller)	Flower	Oligolectic		AD	AD	AD	AOL	AOLP	AOLP	AD	AD	AD	AD	AD	AD
LEPIDOPTERA	Incurvariidae	Adela fibulella (D. & S.)	Leaves, Seeds, Seed capsules	OG		L	L	L	L	LPA	AO	L	L	L	L	L	L
LEPIDOPTERA	Pterophoridae	Stenoptilia pterodactyla (L.)	Stem, Flower	M		LD	LD	LD	L	LP	PA	PA	AOL	L	LD	LD	LD

Appendix 4 The occurrence of different plant species in the diet of 42 farmland birds

(data underlying Figure 1 and 2). Codes represent : P= present, I=important (based on criteria in Wilson and others 1999). For some species where season or value as chick food were specifically mentioned and these are indicated by W=winter, S=summer, C=chick. The majority of data are taken from Wilson and others 1999, Buxton and others 1998, Holland and others 2006.

	Red-legged Partridge	Grey Partridge	Pheasant	Quail	Stone Curlew	Lapwing	Golden Plover	Snipe	Curlew	Black-headed Gull	Stock Dove	Wood Pigeon	Collared Dove	Turtle Dove	Woodlark	Skylark	Tree Pipit	Meadow Pipit	Whitethroat	Song Thrush	Mistle Thrush
POACEAE	IWP	IWC	IP	P			P	P	P		CP	SP	P	SCP		P	P	P			P
Agrostis spp.			P		P	P	P														
Agrostis capillaris																					
A. stolonifera																					
Alopecurus pratensis																					
Dactylis glomerata																					
Festuca spp.		C												I							
Festuca ovina																					
F. pratensis																					
F. rubra																					
Holcus lanatus																					
Lolium perenne		S		P																	
Phleum pratense																					
Poa spp.	IP	ISCP	I	P														P			
Poa pratensis																					
P. trivialis																					
Anthoxanthum odoratum																					
Cynosurus cristatus																					
ASTERACEAE	W	W	P								CP	SP		SP	P	P			P		
Achillea millefolium																					
Centaurea spp.	P	P	P								P			P							
Centaurea nigra																					
Cirsium spp.																			P		
Cirsium arvense																					
C. palustre																					
C. vulgare																					
Hypochaeris spp.																					
Hypochaeris radicata																					
Leontodon spp.	P	P	P																		
Leontodon autumnalis																					
L. hispidus																					
Leucanthemum vulgare																					
Senecio spp.																					
Senecio jacobaea																					
Taraxacum spp.											P	P									
Taraxacum officinale																					
BRASSICACEAE											IWC	I		ISCP		P		P			
Cardamine pratensis																					
CARYOPHYLLACEAE	IW	ISWC	I	P	P	P				P	ISC	IP		SCP	P						
Cerastium spp.				P								P									
Cerastium fontanum																					

FABACEAE	IW	ISW	I	P							ISCP	WP		SP	P	P				P	
Lathyrus spp.											P	P									
Lathyrus pratensis																					
Lotus spp.																					
Lotus corniculatus																					
L. pedunculatus																					
Medicago spp.											P	P		P							
Medicago lupulina																					
M. sativa																					
Onobrychis spp.																					
Onobrychis vicifolia																					
Trifolium spp.	I	ISP	IP							P	ISCP	ISWP								P	
Trifolium dubium																					
T. pratense																					
T. repens																					
Vicia spp.	IP	I	I	P				P			IP	P		P							
Vicia cracca																					
Vicia sativa																					

Appendix 4 (continued)

	Red-legged Partridge	Grey Partridge	Pheasant	Quail	Stone Curlew	Lapwing	Golden Plover	Snipe	Curlew	Black-headed Gull	Stock Dove	Wood Pigeon	Collared Dove	Turtle Dove	Woodlark	Skylark	Tree Pipit	Meadow Pipit	Whitethroat	Song Thrush	Mistle Thrush
LAMIACEAE	IW	ISW	I													IWP	P				
Prunella vulgaris																					
PLANTAGINACEAE				P								P									
Plantago spp.				P								P									
Plantago lanceolata																					
POLYGONACEAE	IW	ISW	IP	P						P	SW	C		PSC	P	IWP		P			
Rumex spp.		C	P	P	P	P	P	P			P					P		P			
Rumex acetosa																					
R. acetosella																					
R. crispus								P													
R. obtusifolius																					
PRIMULACEAE														P							
Primula spp.																					
Primula veris																					
RANUNULACEAE		C				P					C	P		CP		P					
Ranunculus spp.	P							P			ICP	IP		P							
Ranunculus acris																					
R. repens																					
ROSEACEAE	W																	P			
Filipendula spp.																					
Filipendula ulmaira																					
Potentilla spp.	P	P	P									P									
Potentilla reptans																					
Sanguisorba minor																					
RUBIACEAE											P		P								
Galium spp.											IP		P								
Galium palustre																					
G. saxatile																					
G. verum																					
SCROPHULARIACEAE												P		P		P		P			
Rhinanthus minor																					
Veronica spp.											P	P				P					
Veronica chamaedrys																					
URTICACEAE												P		C		P					
Urtica dioica																P					

Appendix 4 (continued)

	Fieldfare	Blue Tit	Great Tit	Magpie	Crow	Rook	Jackdaw	Dunnock	Starling	House Sparrow	Tree Sparrow	Chaffinch	Brambling	Linnet	Greenfinch	Goldfinch	Bullfinch	Yellowhammer	Cirl Bunting	Reed Bunting	Corn Bunting
POACEAE	P		P	P			P	P		SWP	SWP	SWP	P	CP	P	SP	P	P	WCP	SWP	WP
Agrostis spp.																P				P	
Agrostis capillaris																					
A. stolonifera																					
Alopecurus pratensis																					
Dactylis glomerata											I			C		SP					
Festuca spp.																		IP	I	IP	
Festuca ovina																					
F. pratensis																					
F. rubra																					
Holcus lanatus								IP													
Lolium perenne							P				I							IP	IP	IP	
Phleum pratense																P					
Poa spp.								P		I	ISW			IC		P		IP	IWCP	IP	
Poa pratensis																					
P. trivialis																					
Anthoxanthum odoratum																					
Cynosurus cristatus																					
ASTERACEAE			P		P	P	P	P	P	WP	SWP	ISWP		ISWC	IWCP	SWP	P	P	P	W	W
Achillea millefolium																					
Centaurea spp.		P			P	P	P							P	P	ISP		P			
Centaurea nigra																					
Cirsium spp.						P	P	P						ICP	P	ISP					
Cirsium arvense																					
C. palustre																					
C. vulgare																					
Hypochaeris spp.														CP	P	P					
Hypochaeris radicata																					
Leontodon spp.														P		SP					
Leontodon autumnalis																					
L. hispidus																					
Leucanthemum vulgare																					
Senecio spp.												I		ICP	IW	ISWP	IP		W		
Senecio jacobaea																P					
Taraxacum spp.						P			P	P				ICP	ICP	ISP	P	P			
Taraxacum officinale																	I				
BRASSICACEAE								P		WP	SW	ISW		ISWC	ISWC		I			IW	
Cardamine pratensis																					
CARYOPHYLLACEAE								IP		ISWP	IP	ISWP		ISCP	ICP	SP	IP	P	PW	IP	
Cerastium spp.								P				SP		SP	P	P	P	P		P	
Cerastium fontanum																					

FABACEAE			P	P	P	P	P	P	P	P	W	P	P	P	P	P	P	P		W	
Lathyrus spp.																					
Lathyrus pratensis																					
Lotus spp.								P					P								
Lotus corniculatus																					
L. pedunculatus																					
Medicago spp.				P																	
Medicago lupulina																					
M. sativa																					
Onobrychis spp.							P														
Onobrychis vicifolia																					
Trifolium spp.					P	P	P	P				P		P	P	P		P			
Trifolium dubium																					
T. pratense																					
T. repens																					
Vicia spp.				P	P	P	P	P	P						P			P			
Vicia cracca																					
Vicia sativa																					

Appendix 4 (continued)

	Fieldfare	Blue Tit	Great Tit	Magpie	Crow	Rook	Jackdaw	Dunnock	Starling	House Sparrow	Tree Sparrow	Chaffinch	Brambling	Linnet	Greenfinch	Goldfinch	Bullfinch	Yellowhammer	Cirl Bunting	Reed Bunting	Corn Bunting
LAMIACEAE								P		P	P	SWP		P	P		P	P		S	
Prunella vulgaris														P	P						
PLANTAGINACEAE				P		P		P	P	P	P	P	P	P	P	P	P	P		P	
Plantago spp.				P		P		P	P	P	P	P	P	P	P	P	P	P		P	
Plantago lanceolata																					
POLYGONACEAE			P		P		P	IP		ISW	SW	ISWP	P	ISWC	ISWC	SWP	IP	PP	PW	SWP	PWP
Rumex spp.							P	P				P	P	CP	P	SWP	P	P		P	P
Rumex acetosa																					
R. acetosella																					
R. crispa																					
R. obtusifolius																					
PRIMULACEAE			P					P													
Primula spp.																					
Primula veris																					
RANUNULACEAE						P	P	P		P	P	P	P	SCP	P	SP	P			P	
Ranunculus spp.						P	P			P		P	P	SCP	P	P	IP			P	
Ranunculus acris																					
R. repens																					
ROSEACEAE			P								W	WP	P	SWC	WP	WP	IP			P	
Filipendula spp.												P		WP	P	WP	P			P	
Filipendula ulmaira																	I				
Potentilla spp.												P	P	P							
Potentilla reptans																					
Sanguisorba minor														P	P	P					
RUBIACEAE					P		P			P	P	P			P						
Galium spp.					P		P			P	P	P			P						
Galium palustre																					
G. saxatile																					
G. verum																					
SCROPHULARIACEAE								P													
Rhinanthus minor																					
Veronica spp.																					
Veronica chamaedrys																					
URTICACEAE								P		P	P	P		P		P	P	P	WCP	P	
Urtica dioica								I		P				P			I		WCP		

Appendix 5 Summary of agronomic and ecological information for the plant species

Information is drawn from the sources listed under 'Species profile' unless alternative reference given (BFBI denotes Biological Flora of the British Isles series in the *Journal of Ecology*; BCW denotes Biology of Canadian Weeds series in *Canadian Journal of Botany*).
Information is given in cases where the comments are supported by research findings. 'No information' is used for cases where no auditable information on the aspect was found for that species in the literature search; 'no reliable information' is used where only anecdotal comments were found in the literature.
The methods employed to quantify some of the important agronomic characteristics vary considerably between studies. Data on agricultural grass species and forage legumes is often quoted with reference to values for *Lolium perenne* (see Section 5.1 for further details).

Grass	***Agrostis capillaris***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Small perennial, with short rhizomes, often stoloniferous.
Environmental factors	Mesotrophic to oligotrophic soils with low or high pH, soils with low P status. Tolerant of both hot and cold conditions.
Regeneration/ persistence	Persistent seed bank. Slow to establish (Charles and others 1979). Able to resist invasion and inhibits growth of other species, eg *Trifolium*.
Competitive ability	Can become dominant on poor or dry soils with extensive grazing. Reduced via competitive exclusion under high fertiliser input situations.
Productivity	Average to low. In low input systems can he higher yielding than *Lolium perenne*, especially in hills and uplands and if infrequently cut. Low rate of development of new leaves. Production reported to increase over time (Charles and others 1979).
Seasonality	Evergreen. Peak growth in summer, and complements early-growing grasses in a mixed species permanent pasture. Its herbage production is lower at other times of year. Flowers June to August.
Utilization/feed value	Widely accepted as a grazed forage by domestic and wild animals. Good live weight gain in upland habitats compared to *Molinia caerulea* and *Nardus stricta* (Common and others 1991).Can tolerate frequent cutting. Allocates proportionally more resource to regrowth than *L. perenne* or *Poa trivialis*. Less ensilable than *L. perenne.* Favoured by horses (O'Beirne-Ranelagh 2005).
Digestibility	Low, especially when infrequently cut.
Other feed values	Good mineral content values for N, P, K and Mg (but not Ca) (Frame 1991).
Animal health	Little or no reliable information available
Grass	***Agrostis stolonifera***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Small, tufted stoloniferous perennial. Shallow root system.
Environmental factors	Prefers cool and wet soil conditions. Intolerant of drought conditions. Tolerates acidic soil except of very low pH. Subspecies *maritima* salt tolerant.
Regeneration/ persistence	Persistent seed bank. Good persistence, and increases in abundance from time of establishment in sown pastures.
Competitive ability	Poor competitor but can become dominant, excluding other species if conditions ideal.
Productivity	In wet soil conditions can out-produce *L. perenne*. Produces less biomass in freer drained and fertile (high N) systems, but can equal that of *L. perenne* in drained low N systems. Maintains productivity in fluctuating soil moisture conditions.
Seasonality	Evergreen. Peak in growth in late summer / autumn. Flowers July to August.
Utilization	Intake of young leaves high. Productive under frequent cutting and mixed cutting-grazing regime. Relatively unwettable leaf laminae so little reduction of intake under wet conditions (Tallowin and others 1991). Favoured by horses.
Digestibility	Lower annual organic matter digestibility than *L. perenne*, but only slightly so (approximately 3%) (Sheldrick and others 1990, Bruinenberg and others 2002). Digestibility declines rapidly at beginning of spring, but rate of decline after then is slower than for *L. perenne* (Haggar 1976).
Other feed values	Comparable P, K, Ca and Mg content to *L. perenne*.
Animal health	Little or no reliable information available

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	***Alopecurus pratensis***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Tufted rhizomatous perennial.
Environmental factors	Intolerant of low pH soil conditions. Excluded from dry soils, and rarely in soils waterlogged during summer. Good growth on rich to very rich soils. Very tolerant of low temperatures and shade.
Regeneration/persistence	No persistent seed bank. Regenerates via seeding into gaps in autumn. Intolerant of heavy trampling. Tolerates moderate grazing and cutting.
Competitive ability	Can exclude other species if not checked by early season grazing as later in season stemy growth is avoided compared to other pasture species.
Productivity	Very good yield in frequently cut systems, less so if cutting infrequent.
Seasonality	Evergreen. Peak growth in spring. Flowers very early in spring, from April to June. On-set of senescence early in year.
Utilization/feed value	Poor intake if animals have choice of other species, even as hay. Poor liveweight gain. Often avoided by horses (O'Beirne-Ranelagh 2005).
Digestibility	Low if cut late in season, but higher than other grasses if cut at same growth stage. Faster rate of decline in digestibility than other grasses.
Other feed values	Good N, P, Ca, Mg content
Animal health	Possibly contains adverse chemicals which retard liveweight gain after switching from *Alopecurus pratensis* feed to other species (Rode & Pringle 1986). However, does not contain alkaloid, cyanogenic, glycoside or nitro-toxin compounds.

Grass	***Anthoxanthum odoratum***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Caespitose perennial, with relatively short lifespan. Limited tillering so tufts not dense.
Environmental factors	Optimum habitat dry soil, but also found in wetter conditions. Found on nutrient poor soils with low P. Will tolerate full range of soil pH but 4.5-6 is optimal. Resistant to drought and extremes of temperature. Tolerates wetness.
Regeneration/persistence	Will disappear from the sward, if cutting regime and fertilization are high. Regeneration is mostly by seed, which persists in the seed bank.
Competitive ability	Poor competitor, often forms a component of species-rich grassland. Incompatible with competitive forage species.
Productivity	When cut infrequently, can achieve high yields, comparable to *Lolium*, and can out-yield it at low N fertilization. But on a 6 cuts per year regime, it is one of the lower yielding grasses.
Seasonality	Evergreen. Earliest flowering common grass (April to June). Has a second flush of growth in autumn and has some growth during winter.
Utilization/feed value	Eaten readily by cattle. Suitable for hay production.
Digestibility	Moderately high digestibility. Average organic matter digestibility is 75.8%, slightly lower than *Lolium*.
Other feed values	No reliable information.
Animal health	Contains an alkaloid, coumarin, which is toxic at high levels, but no cases of livestock poisoning have been recorded.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	*Cynosurus cristatus*
Species profiles	BFBI: Lodge (1959), Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Caespitose perennial, with erect stems. Limited tillering so tufts not dense.
Environmental factors	Optimum habitat normally drained soils. Tolerant of a wide range of soil fertility, apart from the very richest and poorest. Found at soil pHs above 4 and generally 5-7.5. Moderately resistant to drought and cold, although may not tolerate extreme frosts.
Regeneration/persistence	Germination rate is high but establishment is slow. Will persist under moderately intensive grazing, but will disappear with high nutrient/high stocking regimes. Will not persist in regularly cut grassland. Individual plants are short-lived. Mortality is high if defoliated heavily in first year. Regenerates mainly by seed
Competitive ability	Poor competitor
Productivity	Moderate yield, lower than *Lolium* at high fertilizer rates, but comparable yields at low to moderate fertilizer rates.
Seasonality	Evergreen. Flowers mainly in June, but through to August. Summer leaves short-lived.
Utilization/feed value	Readily accepted by livestock and horses at leafy stage. Sheep will graze it down very tightly. Seed culms are hardened to resist grazing and these often need removal by topping.
Digestibility	Digestibility good, though lower than *Lolium*.
Other feed values	Nutritive value good at leafy stage. Richer in N than *Lolium* at same fertilization level, and similar P, K, Ca and Mg levels.
Animal health	No information.

Grass	*Dactylis glomerata*
Species profiles	BFBI: Beddows (1959), Grime, Hodgson & Hunt (1996), Peeters (2004).
Growth form and habit	Erect tufted perennial.
Environmental factors	Suited to dry to moderately dry soils, of moderate to high fertility. Grows in soils from pH 5.5 – 8 (Spurway 1941). Tolerates both hot, cold and drought conditions.
Regeneration/persistence	Low ability to regenerate by vegetative spread via tussocks, but good sexual regeneration. Relatively poor seed bank, more so if seeds buried. Intolerant of heavy trampling (Beddows 1959).
Competitive ability	Can become dominant in cut systems, though less tolerant of heavy grazing. May be sensitive to trampling (Beddows 1955). Less compatible with *Trifolium repens* than *L. perenne* and can reduce *T. repens* abundance. Less competitive in first year after sowing. Becomes dominant within a sward if grazed in spring and summer, though disappears if grazed in autumn, winter and early spring before active growth initiation (Davies 1938).
Productivity	Very high production, though high inputs for intensive systems required though less than *L. perenne* here for same dry matter production. Stays productive in low input systems.
Seasonality	Evergreen. Production good throughout growing season, with peak shoot production in late spring and summer. Flowers May to July.
Utilization/feed value	Accepted well while at leafy stage, but avoided if allowed to age. Conversion to hay results in lower P, Ca and K concentrations, but higher neutral detergent fibre and NO_3-N. Crude protein content higher in fresh grass. Live weight gains similar to *L. perenne*, and potentially higher in droughted conditions.
Digestibility	Ranges from 4 to 7% lower organic matter digestibility (OMD) than *L. perenne*, with the same rate or slightly greater rate of decline over time from April to mid-June. Cell wall digestibility similar to *L. perenne*. Poor in soluble carbohydrates while high in cellulose and lignin compared with *L. perenne*.
Other feed values	N content similar to other productive grasses. High Na but low Ca and Fe contents. High fructan content.
Animal health	No information.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	***Festuca ovina***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Small tufted perennial.
Environmental factors	More abundant on oligotophic soils or at higher altitudes. Very tolerant to low temperatures and drought. Not tolerant of wet soils and shade.
Regeneration/persistence	Very persistent unless soil moisture very low. Seed set is high and can re-establish successfully. Seemingly low ability to regenerate vegetatively. No persistent seed bank.
Competitive ability	Low competitive ability, though able to persist if conditions correct, ie water and nutrient resources scarce due to slow turnover of tissues.
Productivity	Generally very low, though can be productive relative to other species in dry high altitude areas.
Seasonality	Evergreen. Peak in production early in year. Flowers May to July.
Utilization/feed value	Very tolerant of heavy grazing. Not useful in cutting regimes due to low stature and production. Grazed more readily by sheep than cattle, though avoided in comparison to other pasture species. Tolerant of moderate trampling. Intolerant to burning. Very low animal production, though allows sheep production in otherwise unfavourable conditions on hills.
Digestibility	Very low in comparison to productive species (Davies & Riley 1992).
Other feed values	Little or no reliable information available
Animal health	No information.

Grass	***Festuca pratensis***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004),
Growth form and habit	Tufted erect perennial.
Environmental factors	Tolerant of wet winter soils, and somewhat tolerant of summer drought. Absent only from very nutrient poor and pH <5 soils. Resistant to hot and cold conditions and temporary droughted soils.
Regeneration/persistence	No persistent seed bank. Requires some disturbance to allow seeds to regenerate population lost in previous year. Poor persistence due to relatively short lifespan. Intolerant of heavy grazing, though poor persistence in exclusively cut regimes.
Competitive ability	Moderately competitive, more so in soils of fluctuating seasonal moisture content. Very compatible with other sown species, especially useful in mixtures. Can be out competed by *L. perenne* in two-species mixture.
Productivity	Very productive.
Seasonality	Evergreen. Peak in growth early in season. Flowers mainly in June.
Utilization/feed value	Grows well with a range of legumes, especially *Onobrychis viciifolia*. Well accepted. Good liveweight gain.
Digestibility	High digestibility, with decline through year similar to *Lolium perenne*. Soluble carbohydrate slightly lower than *L. perenne*, but greater than *Dactylis glomerata* and *Phleum pratense*.
Other feed values	Little or no reliable information available
Animal health	No information.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	*Festuca rubra*
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Small tufted perennial with long creeping rhizomes.
Environmental factors	Tolerant of very wide range of soil moisture contents with good drought resistance and also very cold tolerant. Subspecies *litoralis* is salt tolerant.
Regeneration/persistence	Very good tolerance to all but very frequent cutting or grazing. Very tolerant of trampling which explains its suitability as a sown grass in amenity situations, including some horse grazed areas. Very persistent. No persistent seed bank.
Competitive ability	Excluded in very high input systems. Moderately competitive, especially with *L. perenne* except under high N conditions or very frequent cuttings (5-6 per year).Abundance greater in extensive systems than high input intensive systems. Rapid rates of leaf growth in spring compared to *Agrostis capillaris* provide means of niche differentiation in intermediate productivity pastures (Grime and others 1985).
Productivity	High under most conditions, more so than most species including *Lolium perenne* unless heavily fertilized.
Seasonality	Evergreen. Peak production in summer. Flowers May to July.
Utilization/feed value	Poorly accepted by cattle, better acceptability with sheep. Variable liveweight gain, but good relative to other species in higher altitude systems. Native variety (ssp. *rubra*) is one of the most palatable grasses to horses (O'Beirne-Ranelagh 2005).
Digestibility	Low, especially compared to other productive grasses. Faster rate of decline in digestibility compared to *L. perenne* and other productive grasses (Haggar 1976)
Other feed values	High N values than *L. perenne* at same N application rate, but lower mineral contents.
Animal health	No information.

Grass	*Holcus lanatus*
Species profiles	BFBI: Beddows (1961), Watt (1978), Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Medium sized tufted hairy perennial.
Environmental factors	Wide pH, moisture, nutrient tolerance, most abundant with cool, moist acid soils. May produced relatively more biomass under elevated CO_2 levels than other grasses (Jongen & Jones 1998). Somewhat intolerant of harsh winter frosts and summer drought (Beddows 1961).
Regeneration/persistence	Persistent seed bank. Declines with heavy grazing, though can tolerate cutting and is intolerant of trampling (Beddows 1961).
Competitive ability	Competitive and widespread in temperate areas.
Productivity	Production greatest on high fertility soils. Higher production than *Lolium perenne* in most N regimes unless frequently cut. Lower productivity in high N systems. Requires moderate to high fertilization to produce maximum yield, but produces good yield in low fertility systems.
Seasonality	Evergreen in mild winters, grows year round if temperature above 5.5 °C (Beddows 1961). Peak in growth earlier in year than *L. perenne*. Flowers June to July.
Utilization/feed value	At leafy stage of growth, well accepted by cattle and sheep, less accepted if allowed to grow older and when stem somewhat lignified. Live weight gain as good as *L. perenne* if frequently cut, less so if infrequently cut. Can tolerate relatively long periods (>14 days) of low water availability in terms of seedling establishment (Hofmann & Isselstein 2004). Relatively unwettable leaf laminae, so little reduction of intake under wet conditions (Tallowin and others 1991).
Digestibility	Similar digestibility to *L. perenne* if harvested at same stage of growth. May be less digestible if infrequently cut.
Other feed values	N, P, K and Mg higher than in *L. perenne* (Harvey and others 1984).
Animal health	Levels of condensed tannins (0.18% of dry matter) below the moderate levels (2-4% of dry matter) found to have beneficial effect on protein outflow of sheep rumen and hence live weight gain (Aerts and others 1999).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	***Lolium perenne***
Species profiles	BFBI: Beddows (1967), Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972), Peeters (2004).
Growth form and habit	Tufted perennial with erect shoots.
Environmental factors	Optimum pH range 5-8, absent from highly acidic soils. Extremes of soil moisture content unfavourable. Intolerant to very cold temperatures – sensitive to frost. Sensitive to diseases such as rust. Production is reduced in drought.
Regeneration/persistence	Tolerates heavy grazing, but decreases in exclusive cutting regimes. Resistant to trampling; stems and leaves have good tensile strength (Sun & Liddle 1993).If establishment is poor initially it will be replaced by other grasses. Seeds are not highly persistent in the seed bank and vegetative spread is slow. Frequent resowing is often required if the management has resulted in its decline and replacement by less desirable species.
Competitive ability	Will dominate in a high N input system, but is less abundant at low fertility. Slower leaf appearance rate compared with eg *Agrostis* spp., *Holcus lanatus* and *Phleum pratense*, therefore tillering capacity not so high under all levels of nitrogen input.
Productivity	High levels of production, particularly in high N input systems.
Seasonality	Evergreen. Long growing season (March- September in lowland areas). Early flowering, May onwards for early varieties. Two growth peaks – early and late summer.
Utilization/feed value	High animal performance on pure swards. Palatability high when young, and retains palatability late into season unlike some other more palatable grasses (eg *Cynosurus cristatus, Dactylis glomerata*). Wilts slowly which can present some management problems when used for hay production. Highly wettable leaf laminae which can reduce intake under wet conditions (Tallowin and others 1991).
Digestibility	High digestibility, remaining so throughout season.
Other feed values	High in soluble carbohydrates and proteins. Good mineral content (Frame 1991) with high Na. Highly productive varieties are low in trace elements (O'Beirne-Ranelagh 2005).
Animal health	No toxicity in ryegrass itself, although the presence of endophytic fungi can produce ryegrass staggers (Mortimer and others 1984). Perennial ryegrass staggers occurs in sheep, cattle, horses and deer. Alkaloids produced by the endophytes found in perennial ryegrass act as neurotoxins, specifically the tremorgen Lolitrem-B. The vasoconstrictor alkaloid ergovaline is also present in the *Lolium perenne* endophytes affecting circulation. The ergovaline toxin is associated with increased body temperature, alteration in the production of prolactin and digestion. Lambs grazed on *L. perenne* have beneficial lower ω-6:ω-3 fatty acid ratio and greater oxidative stability than stock grazed on pure *Medicago sativa* or *Trifolium pratense*, but a lower live weight gain and hence longer time to slaughter (Fraser and others 2004). Tetraploid and hybrid varieties are high in soluble carbohydrates and may lead to laminitis in horses (O'Beirne-Ranelagh 2005).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	***Phleum pratense pratense***
Species profiles	Spedding & Diekmahns (1972), Grime, Hodgson & Hunt (1996), Peeters (2004).
Growth form and habit	Tall tufted erect perennial with shallow rooting system.
Environmental factors	Prefers moist soil conditions, of relatively high fertility and of both acidic and basic soils. Very tolerant of cold conditions.
Regeneration/persistence	Intolerant of trampling. Can be reduced if allowed to be overgrazed in mixed species system. Persistent seed bank.
Competitive ability	Highly competitive, especially if infrequently defoliated. Less competitive against other grasses and dicots in year of sowing. Compatible with other productive grasses and *Trifolium* species.
Productivity	High yield in all but initial sowing year. Can be higher yielding than *Lolium perenne* in a range of cutting regimes. Moderate production in low input systems, higher yield if fertilized.
Seasonality	Evergreen. Growing season April- August. Flowers June to July. Growth maximum in spring, with second peak in July.
Utilization/feed value	Good species for use in silage and hay making, especially if harvested at optimal time. Well accepted by grazers with a higher acceptability than *L. perenne* in leafy stage of growth which extends later into season due to later heading time. Can be overgrazed in a mixed sward and reduce in abundance. Crude protein, total digestible nutrient concentration and K greater in fresh grass than hay, with neutral detergent fibre and Ca greater in hay (Singer 2002). Good live weight gain when fed hay cut at a suitable age.
Digestibility	Digestibility starts to decline prior to ear emergence. Rate of decline is less than for *L. perenne*, *Dactylis glomerata* and *Festuca pratensis*. Lignin content higher than for *L. perenne* (due to height of stems requiring support).
Other feed values	Mineral contents similar to other productive grasses except for low Na content.
Animal health	No information.

Grass	***Poa pratensis***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Medium sized rhizomatous perennial with deep rooting system.
Environmental factors	Optimum growth on moderately dry soils but exists on wet to very dry soils. Able to produce deep rhizomes and acquire moisture from depth within soil. Abundant on soils of moderate to high fertility, but exists also on low fertility soils. Salt tolerant. Very resistant to hot, cold and dry conditions.
Regeneration/persistence	Highly persistent in grazed systems and frequent cutting. May need to be cut higher than normal for productive grasses to maintain population persistence. Tolerant to trampling. A popular choice on horse paddocks and other areas subject to wear and impact. Possibly has a persistent seed bank.
Competitive ability	Very competitive more than two years after sowing and can produce monospecific stands via rhizomatous spread. Compatible with *Trifolium repens* even in dense swards (Frame 1990).
Productivity	Very slow growing after sowing, but increases yield with time (possibly as late as into third or fourth year). Good winter biomass production. Good productivity compared to *Lolium perenne* on dry soils.
Seasonality	Evergreeen. Later peak in biomass production than *L. perenne*, with lower biomass accumulation by mid-summer. Flowers May to July.
Utilization/feed value	Well accepted by grazing animals. Live weight gain good, especially in mixtures with more digestible species.
Digestibility	Lower digestibility than *L. perenne* (Bruinenberg and others 2002). Faster rate of decline in digestibility than *L. perenne*, especially after mid-spring. One of the fastest declines in productive grasses.
Other feed values	N content is higher than *L. perenne* at same N application rate. Mineral content similar to productive grasses but slightly lower than *L. perenne*.
Animal health	No information.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Grass	***Poa trivialis***
Species profiles	Grime, Hodgson & Hunt (1996), Peeters (2004)
Growth form and habit	Tall tufted stoloniferous fast growing perennial. May be annual in some disturbed situations. Shallow root system.
Environmental factors	Shows optimum growth on moderately wet soils, and less abundant on dryer soils. Highest growth and abundance on fertile soils.
Regeneration/persistence	Poor persistence. Sensitive to drought conditions. Maintains abundance if fertility remains relatively high. Short lived individuals, but seed production high. Able to fill gaps in vegetation via seed production. Persistent seed bank (Thompson & Grime 1979; Roberts 1986).
Competitive ability	Competitive, and has high ability to fill gaps in vegetation from seed production. Compatible with other productive grasses and *Trifolium repens* and *T. pratense*.
Productivity	Low to moderate production (Haggar 1976; Frame 1989, 1991). Production by individuals only maintained for 2 years.
Seasonality	Evergreen. Most growth produced in spring. Summer and autumn re-growths low particularly on drought-prone sites. Flowers June.
Utilization/feed value	Well accepted when grazed before heading occurs. Hay well accepted.
Digestibility	Lower in summer and autumn but higher in spring than *Lolium perenne*. Rate of decline is faster than for *L. perenne*.
Other feed values	N content higher than *L. perenne* later in year due to slow growth. Lower P, K, Ca and Mg mineral content than *L. perenne* (Frame 1989).
Animal health	Little or no reliable information available

Legume	***Lathyrus pratensis***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial climbing forb. Ascends through the sward, supported by tendrils. Reproduction mainly vegetative due to low seed set.
Environmental factors	Optimum pH between 5 and 7. Occurs in undisturbed grassland habitats.
Regeneration/persistence	Intolerant to heavy grazing, due to ascending growth form.
Competitive ability	Restricted to sites where competitive species are repressed by grazing or cutting.
Productivity	Little or no reliable information available.
Seasonality	Shoots appear in spring. Flowers May to August and dies back in autumn.
Utilization/feed value	Little or no reliable information available
Digestibility	Has low cell wall degradability compared to *Lolium* (Bruinenberg and others 2004).
Other feed values	Little or no reliable information available.
Animal health	*Lathyrus* species are known to contain toxic amino acids (Lathyrogens) but these have not been specifically identified in *L. pratensis* (Cooper & Johnson 1998). The leaves contain tannins, which prevent bloat in livestock (Bate-Smith 1973). Seeds can be poisonous to horses (O'Beirne-Ranelagh 2005).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	***Lotus corniculatus* and *pedunculatus***
Species profiles	BFBI: Jones & Turkington (1986), BCW: Turkington & Franko (1980), Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972), Barnes and others (1995), Frame (2005)
Growth form and habit	*L. corniculatus* grows up to 20cm in height, with flowers over-topping foliage. *L. pedunculatus* is a more robust plant growing to 60cm.
Environmental factors	*L. corniculatus* is widespread on drier infertile grassy areas. *L. pedunculatus* is primarily found on wet grasslands and mires. Both are better adapted to less fertile situations than *Trifolium repens*. Can grow on soils of low pH and depleted P status (Sheldrick & Martyn 1992). Both species are common at pHs between 5 and 6, but *L corniculatus* is also found in more alkaline conditions up to pH 8. Can tolerate poor drainage and some shade. *Lotus* is susceptible to crown and root rot, particularly in areas of high temperatures and humidity.
Regeneration/persistence	*L. corniculatus* regenerates mainly from seed, whereas *L. pedunculatus* also spreads by stolons. Establishment may be difficult due to slow seedling growth and low vigour. Persistance can be poor beyond a few years of planting. Lifespan of individual plants 2-4 years. If allowed to set seed this may not be a problem. Problems of seed loss due to pod shattering have been reported. Optimal persistance achieved by adoption of light rotational grazing. Both species have a persistent seed bank.
Competitive ability	*Lotus* is not very competitive in a mixed swards, but can establish well when less competitive companion species are used (eg *Phleum* and *Festuca pratensis*)
Productivity	Relatively high yielding under low input conditions. Usually grown in combination with grasses. Grass/*Lotus* mixture compares favourably with grass/*Trifolium repens* mixtures. *L. pedunculatus* can be higher yielding than *L. corniculatus* in some situations. Annual yield recorded as 13.1t/ha in grass mixture and 10.8t/ha grown alone on fertile soils. Yield can be increased by application of P and K on infertile soils.
Seasonality	Both species produce new shoots in spring and flower from June to September. Most shoots die back in autumn.
Utilization/feed value	Due to its N fixing properties *Lotus* can be used as a green manure. Silage intake by sheep was higher for Lotus silage than any other legume. Experiments have shown that *Lotus* is grazed preferentially over *Lolium* and chosen equally to *Trifolium pratense*. It is suggested that animals have a preference for 67-75% *Lotus* in their diet. Ensilability in forage legumes can be difficult because of their low sugar contents and high buffering capacity; wilting to ca. 40 g/kg DM assists fermentation and quality is improved with addition of formic acid or an inoculant.
Digestibility	*Lotus pedunculatus* has lower digestibility than *L. corniculatus*. Digestibility of *L. corniculatus* declined as it matured, but the rate of decline was much less than that which occurs for (*Lolium perenne*)/white clover pasture.
Other feed values	Can be fed as pasture, hay or silage and has high nutritive value. Nutritive value is better than or equal to *Medicago sativa*. Has good levels of Ca and Na, but low P (Barber 1985).The presence of condensed tannins (CT) in both species has important nutritional implications. Unlike *M. sativa* and *Trifolium* species (which do not contain CT), Lotus does not cause bloat. CT precipitates soluble proteins, which prevent bloat and also allow a higher rate of protein utilization in the rumen. McNabb and others 1997). Wool production, ewe fecundity, and subsequent survival of lambs increased under a diet of *L. corniculatus* during the mating season. It is suggested that this may be due to the increased protein utilization of CT (Ramírez-Restrepo and others 2005, Min and others 2003). Forages with high CT are also associated with greater rates of N retention and leaner carcasses. CT inhibits the growth of rumen bacteria (Min and others 2005).The essential acid content of Lotus is optimal for the production of high quality animal products. Condensed tannin levels are higher in *L. pedunculatus* than *L. corniculatus*.
Animal health	*Lotus* contains a cyanogenic glycoside (lotusin). Poisoning has been reported, with milk from the poisoned cattle having a bitter taste and yellow colouration (Cooper & Johnson 1998). *L. corniculatus* is said to have an anthelminthic effect on sheep (Marley and others 2004) but evidence is inconclusive (Athanasiadou and others 2005).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	*Medicago lupulina*
Species profiles	BCW: Turkington & Cavers (1979), Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972)
Growth form and habit	Annual/short lived perennial with branched basal shoots. In short grazed turf, fruits are borne close to the ground. . Deep tap roots.
Environmental factors	Occurs commonly on open grasslands on calcareous soils. Less susceptible to root rot than *T. pratense*. Most frequent in soils of pH 7 or more.
Regeneration/persistence	Establishes on poor, shallow soils where other legumes will not grow. Reproduction is by seed only. Consequently, needs to be able to seed occasionally if it is to persist in grassland. Persistent seed bank.
Competitive ability	Little or no reliable information available.
Productivity	Of no yield value in permanent pastures.
Seasonality	Wintergreen. New shoots and seedlings produced mainly in spring. Flowers May to August.
Utilization/feed value	Can be grazed by sheep early in the year but is not acceptable for cattle. Weak stems preclude planting it alone. Can be sown with a cereal crop to provide green manure (Barney 1987, Stopes et al). Was found to be the most suitable crop for inter-cropping with maize (Alford 2003). Can withstand frequent cutting.
Digestibility	No data.
Other feed values	Has a higher sodium content than other legumes**.**
Animal health	Little or no reliable information available.

Legume	*Medicago sativa*
Species profiles	Frame (2005)
Growth form and habit	Erect or ascending perennial. Buds formed in crown of stem and leaf axils producing new stems. Deep rooted, especially in deep well aerated soils.
Environmental factors	Maintains positive water relations due to deep roots, while prolonged waterlogged soils causes damage to roots.
Regeneration/persistence	Abundance can be reduced if defoliation frequency is too great. Establishment reduced if weeds allowed to compete at early stage of growth. Can naturally decline after 4-6 years of growth. Persistent seed bank.
Competitive ability	Suffers with competitive grasses, but grown in a mixed sward with *Dactylis glomerata*, *Festuca pratensis*, *F. arundinaceae* and *Phleum pratense* in Europe. Poor competitor with weeds at early stage of growth, but competitive ability improves when older.
Productivity	Very productive if grown on deep, well-aerated, fertile soils of circum-neutral pH.
Seasonality	Evergreen. Flowers August to September.
Utilization/feed value	Highly suitable for use as hay or silage, providing sufficient period of time is left between cuts for N stored in roots to be translocated into new shoot material. Can adapt to dry and cold conditions, though number of possible cuts less compared to ideal conditions. If cut too late in season to allow overwinter storage compounds to be produced, new shoot growth in spring is reduced. High amounts of fertilization may be required if productivity is to be maintained, especially for K.
Digestibility	Highly digestible but reduces with maturity and increase in stem:leaf ratio.
Other feed values	Rich in crude protein, vitamins and minerals.
Animal health	Can cause bloat if material ingested is very fresh and young. Contains oestrogens which reduce conception rates in cattle and sheep if consumed prior to fertilization.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	***Onobrychis viciifolia***
Species profiles	Frame (2005)
Growth form and habit	Tall erect or sub-erect perennial with shoots arising from basal buds on a branched root stock. Branches develop from axillary buds on defoliated stems. Deep tap root with some branches and a fine lateral root network near surface of soil.
Environmental factors	Grows best on deep well aerated soils of pH 6 and above.
Regeneration/persistence	Able to persist for many years. Establishment best if direct sown rather than undersown with other crop species, and seeds drilled to 20-30 cm depth into soil.
Competitive ability	Can prevent weed establishment better if grown with non-aggressive grasses, eg *Festuca pratensis* and *Phleum pratense*.
Productivity	Good, but can vary due to growing conditions.
Seasonality	Spring to autumn growth, with a single peak in growth.
Utilization/feed value	Establishes well due to vigorous seedling growth. Adapted to warm temperate climate. Best suited to cutting rather than grazing due to erect habit. If cut too late in season to allow overwinter storage compounds to be produced, new shoot growth in spring is reduced. Drought tolerant but intolerant of waterlogged soils over prolonged periods.
Digestibility	Good digestibility, but reduces with maturity and increase in stem: leaf ratio.
Other feed values	Higher content of protein and minerals than grasses, though Ca and Na lower than other legumes.
Animal health	Contains condensed tannins – hence no problem with bloat. Also increases protein protection in rumen and increases amino acid supply to small intestine for absorption by animal.

Legume	***Trifolium dubium***
Species profiles	Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972), Frame (2005).
Growth form and habit	Prostrate to sub-erect deep rooting creeping annual.
Environmental factors	Found on dry open habitats and grassland with pH above 5. Frost tolerant compared to other *Trifolium* species.
Regeneration/persistence	Autumn-germinating annual. Low persistence in the absence of sward disturbance. Persistent seed bank.
Competitive ability	Not competitive in well fertilized swards.
Productivity	Grows rapidly from seed, but very low yielding in agronomic terms (1t/ha when cut before seeding).
Seasonality	Autumn germinating, dying back after flowering in the following summer. Flowers from May to October, although the season will be shortened in drought conditions. Contributes to sward biomass in spring and early summer.
Utilization/feed value	Can adopt a low growth form allowing it to survive grazing, but not widely found on pastures.
Digestibility	Little or no reliable information available but similarities with other temperate legumes may be expected.
Other feed values	Little or no reliable information available similarities with other temperate legumes may be expected.
Animal health	Little or no reliable information available.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	***Trifolium pratense***
Species profiles	Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972), Barnes and others (1995), Frame (2005)
Growth form and habit	Perennial with erect habit, with numerous leafy branches forming a crown. Taproot system with many secondary branches. After second year, taproot disintegrates and surviving plants rely on secondary roots.
Environmental factors	Can survive in a wide range of soil conditions but optimum pH 5-6 on well drained soils. Deep rooting so can survive drought conditions. Does not respond to the addition of N fertilizer, but can be limited by low P and K levels.
Regeneration/persistence	Life span of cultivated varieties about 3 years, although wild types may live longer. Persistence is variable when planted as a forage. Yield decreases after second year. Prone to crown rot caused by fungus root rot; Red Clover Necrotic Mosaic Virus (RCNMV) and can be infected by stem eelworm (Ylimäki 1966). A 4-5 year break from its use is advocated when disease has been detected. Persistent seed bank.
Competitive ability	High seedling growth rate and plasticity under competition and drought conditions, (Hofmann & Isselstein 2004). Interspecific competition affects the nutritional value of *T. pratense* and grass when grown together - crude protein increases and water-soluble carbohydrates decrease in grasses grown with *T. pratense* (Opitz von Boberfeld & Biskupek 1995). Compatible with non-competitive species.
Productivity	Equal annual yield to *Lolium* in the first year of sowing (up to 16t/ha DM). Similar yield to *Medicago sativa*.
Seasonality	Wintergreen. Starts growing in late spring and flowers May to September. Flowering shoots die back in autumn. Main growth period about 3 weeks later than *L. perenne*, but reaches optimum digestibility at the same time.
Utilization/feed value	Used for pasture, hay, silage and soil improvement. Also undersown in an arable crop. It is the optimum species for use as green manure, accumulating high N and dry matter after a year of cutting and mulching (Stopes and others 1996). Hay making can lead to large losses of leafy material. Erect growth and good response to infrequent defoliation make it a suitable crop for silage. Silage yield without N fertilizer is comparable to *L. perenne* or meadow fescue receiving moderate-high N fertilizer inputs (ie 200 kg N/ha or equivalent from other sources) but would be lower than from grass fertilized to maximum production (Wilkins and Paul 2002). Also, higher intake and lamb performance makes it a valuable feed source (Fitzgerald 1982). Ensiling is more difficult than grass due to low concentrations of soluble carbohydrates, low dry matter and high buffering capacity (Pahlow and others 2002). This can be counteracted by good wilting of cut crop and use of additives (Frame 2000). Hard grazing in winter may encourage growth, but spring grazing may reduce yield and plant survival. Generally suited to an infrequent defoliation regime, two or three cuts per year. Probably not palatable to horses (O'Beirne –Ranelagh 2005).
Digestibility	Dry matter digestibility of approximately 75% in spring. Stays digestible longer in the season than *M. sativa*. Intake by livestock is high, compared with grasses, due to higher rate of digestion.
Other feed values	Similar chemical content to other legume species, but generally has high Mg content. All major mineral components of nutritional importance are higher than in grasses. Protein content high but not as high as other forage legumes, but protein degradation in rumen lower leading to higher utilization.
Animal health	Can cause bloat if present at more than 50% in the sward. Contains phyto-oestrogens which depress ewe reproductive performance (Newton and Betts 1974). Considered to have medicinal properties. Flowers have been used as a tonic and the entire plant is a sedative (de Baïracli Levy 1984). Pigs fed clover rich silage had lower ω-6:ω-3 fatty acid ratio in meat than pigs fed conventional silage Lundström & Jonsäll (2002).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	*Trifolium repens*
Species profiles	BFBI: Burdon (1983), BCW: Turkington & Burdon (1983), Grime, Hodgson & Hunt (1996), Spedding & Diekmahns (1972), Barnes and others (1995), Frame (2005)
Growth form and habit	Creeping, stoloniferous perennial. Young plants have taproot which dies back as plant spreads and adventitious roots are developed at stolon nodes.
Environmental factors	Very widespread, occurring on all soil types. Optimum pH range 5-7. Application of N strongly reduces cover, although can confer some benefit when sparingly applied at establishment stage. In mixed swards it is more sensitive to reduced P and K supply than grasses. Susceptible to stem eelworm and root rot. Total yield significantly increased by elevated CO_2 levels (Schenk and others 1997). Not drought-tolerant.
Regeneration/persistence	Successful seed establishment is dependent on P availability at the soil-root interface. Regeneration/persistence is fairly good. Persistent seed bank.
Competitive ability	Usually grown with companion grasses, *Festuca pratensis* most compatible and it also grows well with *Lolium* (Fisher and others 1996)
Productivity	Potential annual yield from a mixed sward of 20t/ha (Frame & Newbould 1984) but is more typically about 10t/ha dry matter, comparable to grass under 200kg N/ha.
Seasonality	Wintergreen. Growth starts late spring, and remains leafy throughout season. Slow spring growth means early season grazing demands may not be met. Flowers June to September.
Utilization/feed value	Usually grown with grasses as mixed pasture. Also undersown with cereal crops. Has value as both pasture and silage crop as livestock intake is high (Osbourn 1982).Can fix N at rates of up to 280kg/ha in lowlands (Hopkins 1998). Voluntary intake by sheep is considerably higher than for *Lolium*. Milk yield and liveweight gain is better than *Lolium* because particle breakdown and passage of feed through the rumen is faster. It also requires less biting and chewing time than grass-only swards do. Long intervals between defoliations increase total herbage production in mixed swards. Tolerates moderately heavy grazing in a mixed sward. Also suitable as a silage crop, especially grown in mixture with grasses. Ensilability improved with wilting to high DM content and use of additives.
Digestibility	High digestibility – up to 80% dry matter. Produces young, highly digestible material throughout the growing season, unlike some other legumes which can develop a high proportion of stem.
Other feed values	Lower cellulose and lignin and higher available carbohydrate, N, P, Na, Mo and S than other forage legume species. High water content. Contains half the fibre and 50% more protein than *Lolium*. As intake of *T. repens* by grazing cows increases so does yield, protein and fat content of milk. It also has higher casein and greater coagulum strength which make it more suitable for cheese-making (Thompson 1984)
Animal health	If fed to lactating ewes, lactation and lamb growth can be increased. But contains phyto-oestrogens which can depress ewe reproductive performance (Newton & Betts 1974). Some strains contain cyanogenetic glycosides which cause cyanide poisoning (Forsyth 1954). Plants in drought conditions have much lower levels of these compounds (Foulds & Grime 1972), and they have been selectively bred out of cultivated varieties. Excessive intake may result in bloat. Other potential problems are photosensitivity and mycotoxicoses (Cooper & Johnson 1998).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Legume	***Vicia cracca***
Species profiles	Grime, Hodgson & Hunt (1996), Aarsen and others (1986)
Growth form and habit	Shortly rhizomatous perennial. Shoots scrambling, supports itself on surrounding vegetation with tendrils. May form small patches when sprawling across grassland.
Environmental factors	Generally found on dry soils but also occurs in wetter places. Does not occur on soils below pH 4.5
Regeneration/persistence	No persistent seed bank.
Competitive ability	Dependent on tall vegetation for support.
Productivity	No reliable information found.
Seasonality	Shoots appear in spring. Flowers June to August, shoots die back in autumn.
Utilization/feed value	Rarely found in pasture, as erect growth form makes it intolerant to grazing, but occurs in meadows
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	Vetch seed can be poisonous if forming over 10% of the diet for several weeks. Poisoning in horses is very rare and generally non-lethal (O'Beirne –Ranelagh 2005).

Legume	***Vicia sativa***
Species profiles	Aarsen and others (1986)
Growth form and habit	Sprawling annual forb, can grow upright when supporting vegetation present.
Environmental factors	Found on well, drained moderately fertile soils pH 6-8. Responds to P fertilization. Intolerant of waterlogging.
Regeneration/persistence	Strong seedling vigour, but intolerant to drought during early establishment. Persistent seed bank.
Competitive ability	No reliable information found
Productivity	Moderate yield. Can be as high as 7.8t/ha dry matter (data from Northern Spain).
Seasonality	Autumn germinating annual. Main growth period spring to summer. Flowers May to September.
Utilization/feed value	Highly acceptable to livestock as grazed or stored forage. Tolerates moderate grazing down to about 4 cm, which preserves axillary buds for regrowth. Can be grown as a monoculture for hay or silage. Ideally grown with cereals for mixed hay/silage which avoids lodging. Can be used a green manure.
Digestibility	No reliable information found
Other feed values	Valuable source of protein and minerals.
Animal health	Vetch seed can be poisonous if forming over 10% of the diet for several weeks. Poisoning in horses is very rare and generally non-lethal (O'Beirne –Ranelagh 2005).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Achillea millefolium***
Species profiles	BFBI: Warwick & Black (1982), Grime, Hodgson & Hunt (1996)
Growth form and habit	Semi-rosette forming perennial with far-creeping rhizomes. Deep rooting system common.
Environmental factors	Found in a range of soil types, including low nutrient status soil. Tolerant to droughted soil conditions.
Regeneration/persistence	Poor seed bank persistence, though may be better than thought (Warwick & Black 1982). Tolerates grazing by forming a low growth form rather than a tall form when in taller vegetation. Tolerates low soil moisture via deep rooting system. Can spread easily vegetatively via rhizomes, with small fractions produced via soil disturbance producing new daughter plants. Grazing in summer reduces seed production, while defoliation via clipping increased relative leaf growth rate (Hicks & Turkington 2000). Germinates in both spring and summer and can fill gaps. Establishment better if seeds not buried (Chapman & Younger 1994).
Competitive ability	Poor competitor in tall vegetation where is become excluded. Grows well in disturbed conditions where other dominant plants are detrimentally affected.
Productivity	Greater yield in monoculture than *Lolium perenne* (Isselstein 1993).
Seasonality	Wintergreen. Peak in growth early in growing season. Flowers June to August.
Utilization/feed value	Well accepted by sheep, cattle and horses (Foster 1988). Possibly taints milk via chemical producing a bitter taste. Ensilability of biomass moderately good in comparison to *L. perenne* and *Trifolium repens* (Isselstein 1993). Not good in hay as it does not dry easily (O'Beirne-Ranelagh 2005).
Digestibility	Digestibility reduced from May to June with greater amounts of water soluble carbohydrate, crude protein and crude fat and less acid detergent fibre in spring (Isselstein 1993). Has less in vitro energy and water soluble carbohydrate but greater crude protein in spring than *L. perenne* (Isselstein 1993), whereas Am has relatively more crude protein and acid detergent fibre with less crude fat, in vitro energy and water soluble carbohydrate in summer (Isselstein 1993). Has good and persistent digestibility (Barber 1985).
Other feed values	Has higher P, K, Ca and Mg content than grasses but lower crude protein (Trzasko 1994). Good source of P and Cu (Barber 1985).
Animal health	Contains sesquiterpene lactones, a potential allergen causing adverse skin reactions (Tampion 1977). Has medicinal properties, and has been used as a home remedy for coughs, sealing wounds and cleaning the blood. Contains high amounts of unsaturated amides which may be insecticidal.

Other forb	***Cardamine pratensis***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Semi-rosette perennial with short rhizomes and shallow rooting system, overwintering as a short rosette.
Environmental factors	Found on moderately nutrient rich soil in wet grasslands and mires.
Regeneration/persistence	Spreads vegetatively in wet sites, with lower seed set where grazed. New plants arise from leaflets in contact with the soil. In drier sites sexual reproduction more effective than vegetative spread. Seed bank persistent. Mowing of wet meadows increases abundance (Jensen & Meyer 2001).
Competitive ability	Infrequent in tall vegetation and can be found in the sub-canopy of moderately dense vegetation. Can fill gaps in vegetation via spread of new plants formed from leaves and shoot pieces detached from parent plant.
Productivity	Little or no reliable information available but unlikely to contribute significant herbage even in situations where it is abundant
Seasonality	Wintergreen. Early flowering (April to June), with spring peak in biomass.
Utilization/feed value	Little or no reliable information available.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Potential use in treating convulsions, blood disorders and skin diseases (de Baïracli Levy 1984). Contains chemicals poisonous to horses (Briemle & Ruck 2003).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Centaurea nigra***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall semi-rosette forming perennial.
Environmental factors	Found in moderately to infertile grasslands. Greater seed yield in infrequently mown or burnt than in grazed situations. Greater seedling emergence in situations free of leaf litter (Bosy & Reader 1995).Elevated atmospheric CO_2 has a large positive effect on biomass
Regeneration/persistence	Good seed production which may be retained on the plant for several months and so drop seed over a long time period. Germination mainly in spring though also in autumn. No persistent seed bank. Can reproduce from daughter rosettes separating from rootstock in grazed conditions.
Competitive ability	Little or no reliable information available
Productivity	Increases yield and cover over time from year of sowing (Fisher and others 1996).
Seasonality	Shoots appear in spring. Summer peak in biomass. Flowers June to September. Stems die back after flowering.
Utilization/feed value	Accepted by sheep, and to lesser extent by cattle, with wiry stems generally avoided (Marsden-Jones & Turrill 1954). Avoided by horses, though they may take flower heads in autumn and winter (O'Beirne-Ranelagh 2005).
Digestibility	Little or no reliable information available
Other feed values	Little or no reliable information available
Animal health	Contains serotonin conjugates which have an anti-microbial properties against fifteen pathogenic bacteria (Kumarasamy and others 2003).

Other forb	***Cerastium fontanum***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Small winter-green polycarpic perennial with decumbent stems or ascending if flowering. Can act as a winter annual if growing with low soil moisture content. Roots shallow. Can spread vegetatively due to shoots producing roots on contact with ground.
Environmental factors	Most common in moderately fertile but undisturbed habitats, though can be common in low fertility sites.
Regeneration/persistence	Can be very persistent in closely mown vegetation. Sensitive to trampling, though capable of filling gaps created by poaching (Pakeman 2004). Persistent seed bank formed.
Competitive ability	Poor competitor with taller species, and only remains part of vegetation if not over shadowed and thereby excluded.
Productivity	Low due to subordinate nature within vegetation.
Seasonality	Wintergreen. Difficult to determine due to ability to germinate from spring to autumn and complete life-cycle from emergence to flowering and seed set in nine weeks under ideal growing conditions. Flowers April to September.
Utilization/feed value	Accepted by cattle. Shade tolerant. Can increase in abundance after hay cut.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No reliable information found.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Cirsium arvense***
Species profiles	Moore (1975), Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial geophyte with deep far reaching lateral roots and numerous adventitious shoots. Leaves protected by spiny outgrowths.
Environmental factors	Common on fertile and disturbed ground.
Regeneration/persistence	Very persistent due to ability to produce new plants from small root fragments, with roots reaching several metres into the soil. Seed set can be poor if isolated from other plants. Though being self-fertile, seed production low if not outcrossed. Dispersal distance can be low due to pappus being easily detached. Persistent seed bank formed. Establishment not limited by seed availability (Edwards and others 2005). Cutting increases shoot growth rate and biomass in year of cut, but subsequent cutting reduces biomass in second year (Kluth and others 2003). Application of rust bio-control agent *Puccinia punctiformis* reduces number and fertility of flower heads (Kluth and others 2003).
Competitive ability	Locally competitive. Abundance not affected by diversity of plant assemblage within sward (Bezemer and others 2004). Has allelopathic properties and reduces establishment of other plant species which can exist for nine weeks in soil (Kazinczi and others 2001).
Productivity	Little or no reliable information available but can be highly productive in terms of herbage mass on a dry matter per unit area basis, particularly when weed infested areas are left ungrazed or unmown.
Seasonality	New biomass produced in spring and summer, flowering from July to September with seeds shed over a long time period due to seeds being retained on dead shoots into the winter.
Utilization/feed value	Spiny leaves avoided by grazers. More acceptable to livestock (cattle and goats) when the leaves are young but avoided by sheep and horses. Horses will eat growing flower buds and wilted foliage (O'Beirne-Ranelagh 2005). Rich in minerals.
Digestibility	Little or no reliable information available but spiny and waxy epidermal structures and high lignin content in stems would be expected to result in thistles having significantly lower digestibility values than most pasture species.
Other feed values	Contains high amounts of K (Lehoczky and others 2003). High protein (up to 30%) and Cu (up to 30mg/Kg). Ca content very high (Barber 1985).
Animal health	Potential for injury to face and mouth of grazing animals, leading to opportunities for infection.

Other forb	***Cirsium palustre***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall monocarpic perennial. Stock carrying inflorescence produced when mature, potentially large basal rosette when immature. Leaves spiny. Shallow rooting system.
Environmental factors	Found in moist grasslands and mire of mildly acidic and fertile soils. Tolerates wet and waterlogged soil conditions.
Regeneration/persistence	Requires short grassland or open vegetation for seedling establishment. Seed bank persistent.
Competitive ability	Grows well in disturbed environments.
Productivity	Little or no reliable information available but unlikely to contribute significantly
Seasonality	Wintergreen. Potentially develops as basal rosette over a number of years before producing a flowering stock in summer. Flowers from July to September.
Utilization/feed value	Little grazed by stock.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Little or no reliable information available.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Cirsium vulgare***
Species profiles	BFBI: Klinkhamer & de Jong (1993), Grime, Hodgson & Hunt (1996)
Growth form and habit	Large monocarpic perennial with spiny and hairy leaves and deep tap root. Can live for many years before flowering if productivity low or plant defoliated.
Environmental factors	Intolerant of waterlogged soils.
Regeneration/persistence	Propagates exclusively by sexual reproduction, with seeds possibly needing disturbance to become established. Does not form a persistent seed bank. Seedling establishment increased with greater seed availability (Edwards and others 2005).
Competitive ability	Poor competitor, with reductions in grass abundance greatly increasing productivity.
Productivity	Little or no reliable information available but as for *C. arvense* can be highly productive in terms of herbage mass on a dry matter per unit area basis, particularly when weed infested areas are left ungrazed or unmown. Its contribution to total sward biomass is seldom as great as that of *C. arvense.*
Seasonality	Wintergreen. New biomass produced in spring and summer. Flowering from July to September, with a great number of seeds produced per flowering spike (up to 8000).
Utilization/feed value	Avoided by grazing animals due to spiny leaves, though young leaves are grazed in early spring (Klinkhamer & de Jong 1993). Horses will eat growing flower buds and wilted foliage (O'Beirne-Ranelagh 2005). Rich in minerals.
Digestibility	Little or no reliable information available but spiny and waxy epidermal structures and high lignin content in stems would be expected to result in thistles having significantly lower digestibility values than most pasture species.
Other feed values	High protein (up to 30%), Cu (up to 30mg/Kg). Ca content very high (Barber 1985).
Animal health	Potential for injury to face and mouth of grazing animals, leading to opportunities for infection.

Other forb	***Filipendula ulmaria***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall rhizomatous perennial, with erect stems growing from basal leaf rosette. Grows relatively slowly for a tall, dominant species, but individual leaves persist throughout the growing season.
Environmental factors	Associated with wet soils, but absent from sites that remain waterlogged all year. Comparatively drought resistant for a wetland plant. Frequent on soils of pH 4.5 and above, of moderate fertility.
Regeneration/persistence	Regenerates both by vegetative spread and by seed. Forms large persistent seed bank.
Competitive ability	Forms dense stands which dominate at relatively low shoot densities.
Productivity	Biomass production is relatively low compared to other tall herbaceous species.
Seasonality	Leaves develop from over-wintering buds in spring. Flowers June to August. Leaves produced until September, but die back by November.
Utilization/feed value	Avoided by horses Horses will eat growing flower buds and wilted foliage (O'Beirne-Ranelagh 2005). Rich in minerals.No other reliable information found.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No information found.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Galium palustre***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall, scrambling perennial.
Environmental factors	Exclusively found in wetland. Most commonly found on fertile soils of pH range 5-7.
Regeneration/persistence	Survival in the sward may depend on ability to laterally spread into small gaps in the vegetation. Detached cuttings root freely. Forms persistent seed bank.
Competitive ability	Confined to areas where dominant species are restricted.
Productivity	Makes up a very small proportion of the total biomass of the sward in which it is present.
Seasonality	Partially evergreen, overwinters as small shoots. Flowers June to July.
Utilization/feed value	No reliable information found.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No reliable information found.

Other forb	***Galium saxatile***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Small polycarpic weakly ascending winter-green perennial with slender tap root and rooted stolons.
Environmental factors	Limited to infertile acidic soils.
Regeneration/persistence	Intolerant of drought conditions. Persistent seed bank may develop, though regeneration by seed is infrequent. Intolerant of disturbance.
Competitive ability	Grows well with *Festuca ovina* in infertile hill pastures grazed by sheep.
Productivity	Slow growing, with low productivity due to size.
Seasonality	Wintergreen. Flowers June to August.
Utilization/feed value	Shade tolerant and grows under grass and heath, though intolerant of cover with litter layer.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No reliable information found.

Other forb	***Galium verum***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Small perennial with slender creeping stock. Deep rooting system.
Environmental factors	Grows predominantly in surface leached calcareous soils over limestone, though recoded in soils of pH 4 - 8.
Regeneration/persistence	Poor ability to regenerate into gaps. No persistent seedbank.
Competitive ability	Can become less abundant if vegetation left ungrazed or undisturbed via competition from taller species.
Productivity	Little or no reliable information available but unlikely to contribute significantly
Seasonality	Wintergreen. Mid-summer peak in biomass. Flowers July to August.
Utilization/feed value	Grows well on dry sandy soil due to deep root system. Preferentially grazed by goats in Italy during summer.
Digestibility	Has good digestibility compared to four other species (grasses, herbs shrubs) from Mediterranean alpine pasture (Marinas and others 2003).
Other feed values	High N content with slow decline through summer with average neutral detergent fibre and acid detergent lignin content compared to four Mediterranean alpine pasture species (Marinas and others 2003).
Animal health	Contains average amounts of antioxidant compounds (eg 2,2-diphenyl-1-picrylhydrazyl (DPPH) with radical scavenging activities) of seven medicinal plants in Turkey (Mavi and others 2004). Said to possess useful digestive properties for horses (O'Beirne-Ranelagh 2005).

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Hypochaeris radicata***
Species profiles	BFBI: Turkington & Aarrsen (1983), BCW: Aarrsen (1981), Grime Hodgson & Hunt (1996)
Growth form and habit	Rosette forming perennial with erect and stout stock. Deep rooting system.
Environmental factors	Occurs on dry, infertile soils.
Regeneration/persistence	Very persistent and can flower and set seed two months after establishment in favourable conditions. Able to resist grazing via leaf habit being closely adpressed to ground. Tolerates mowing due to leaf habit and flowering stem being able to spring back without being damaged by cutting blades. In heavily grazed and mown areas can spread more by vegetative reproduction than sexual, though seed production can be very high if only lightly grazed or cut. Tolerates droughted soil conditions via deep roots. No persistent seed bank.
Competitive ability	Highly competitive and does not show usual increase in productivity when growing free of competition from grasses (Ho 1964). Said to be allelopathic and also autotoxic with reductions in shoot growth rate of companion grasses (Newman & Rovira 1975).
Productivity	Little or no reliable information available.
Seasonality	Overwinters as a small rosette. Peak growth rate in early summer. Flowers mainly in summer, though extends to autumn. Germinates throughout year, but mainly in spring and autumn.
Utilization/feed value	Grows on a range of soil types, both acidic and basic. Highly palatable, and preferentially selected by sheep over grasses in New Zealand pastures (Struik1967).
Digestibility	Little or no reliable information available.
Other feed values	Higher values of mineral nutrients than grasses, especially for Ca and Cu while also high in protein and low in fibre (Coop and others 1953).
Animal health	Associated with outbreaks of the nerve degeneration condition stringhalt in horses where *Hypochaeris radicata* is abundant (O'Beirne-Ranelagh 2005).

Other forb	***Leontodon autumnalis***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Low growing perennial with a branching root stock and lanceolate pinnatifid leaves. May ascend when growing in taller vegetation to produce relatively undissected leaves. Over winters as a small rosette of pinnatifid leaves.
Environmental factors	Found in soils of pH > 5. Most common on soils of moderate fertility and moisture content.
Regeneration/persistence	Able to fill disturbance formed gaps in vegetation. Relatively incapable of reproducing vegetatively, relying on sexual reproduction. Persistent seed bank formed, with seeds germinating in warm conditions relatively free of litter. Seeds germinate mainly in spring, though can occur in autumn. Droughted conditions reduce seed production and establishment. Seed production reduced if grazed during summer. Sown seeds may establish better if pasture is cut on a weekly basis compared to longer cutting periods (Hofmann & Isselstein 2004a).
Competitive ability	Grows well with grasses if vegetation not allowed to become too tall. When sown into an existing *L. perenne* sward, relative growth rate and biomass accumulation of La seedlings is significantly reduced by the density of the sward but not by sward height (Hofmann & Isselstein 2004b).
Productivity	Little or no reliable information available.
Seasonality	Wintergreen. Peak in shoot biomass in summer, with seed production delayed until late summer and autumn. Flowers June to October.
Utilization/feed value	Leaves well accepted by grazing animals, and remain close to ground when grazed. Tolerates grazing, cutting and trampling.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Little or no reliable information available.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Leontodon hispidus***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Slow growing rosette forming perennial with branched root stocks.
Environmental factors	Grows in open and unproductive habitats, especially on dry, calcareous soils.
Regeneration/persistence	Can be reduced in taller vegetation via shading. Good seed production late in season, and able to fill gaps. Very capable of filling gaps in vegetation after disturbance, with over 40% occurrence in disturbed gaps (Burke & Grime 1996). Summer grazing can reduce seed set, and slow establishment within the sward. No persistent seed bank.
Competitive ability	Where summer grazing, especially aftermath grazing is removed, can dominate low productivity sites (Kirkham and others 1996).
Productivity	Little or no reliable information available.
Seasonality	Overwinters below ground. Peak in new growth in spring, with flowering from late summer to late autumn. Peak in biomass in summer and able to maintain positive water relations at this time via deep roots.
Utilization/feed value	Accepted by sheep and able to respond to close grazing due to budding from root stock.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Contains hypocretenolides (a small group of sesquiterpene lactones with an unusual ring structure found as constituents of a small number of species) which are capable of producing an anti-inflammatory activity response (Zidorn and others 1999). Also contains a range of secondary chemical compounds which may have a negative effect on animal performance. An index of negative potential action (IANP) of phenols in *Leontodon hispidus* was established, but it was found that the digestibility was high despite a high IANP (Mika and others 1998).

Other forb	***Leucanthemum vulgare***
Species profiles	BFBI: Howarth & Williams (1968), Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall perennial with somewhat woody stems. Rooting system shallow and mostly adventitious.
Environmental factors	Most abundant if soil fertility is not high and disturbance regime is moderate, such as cutting and light grazing. Leaves can become succulent if drought conditions prevail or in soils of low N status. Succulence also found in maritime individuals.
Regeneration/persistence	Abundance can be reduced if grazed throughout the year in pastures, with lower seed set in such situations. Capable of spring or autumn germination and forms a persistent seed bank. Capable of filling gaps in disturbed vegetation if seed set is high, eg if ungrazed. Seed production can be reduced if cut at certain times of year due to disruption of flowering though cuts for hay at more appropriate times can aid seed dispersal (Coulson and others 2001). Tolerant of trampling and drought, with seedling establishment high even in relatively dry soils (Oomes & Elberse 1976).
Competitive ability	Can alter susceptibility to invasion of vegetation by other broadleaved herbs, eg invasion by *Taraxacum officinale* reduced when *Leucanthemum vulgare* present (van Ruijnen and others 2003).
Productivity	Maintains a good level of production when sown with a mixture of grasses (Fisher and others 1996).
Seasonality	Over-winters as a basal rosette of leaves. Peak in growth in spring to produce high amounts of biomass relatively quickly. Flowers June to August, with seed set in autumn.
Utilization/feed value	Said to taint butter (Forsyth 1954). Can reduce number of invading species into a sward (van Ruijnen and others 2003).
Digestibility	Little or no reliable information available.
Other feed values	May increases mineral nutrient content of vegetation compared to grass only situations (Fisher and others 1996).
Animal health	Little or no reliable information available.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Plantago lanceolata***
Species profiles	BFBI: Sagar & Harper (1964), BCW: Cavers and others (1980), Grime, Hodgson & Hunt (1996), Stewart (1996)
Growth form and habit	Perennial rosette. Can form prostrate rosettes of broader leaves in closely grazed swards and upright lanceolate leaves in longer swards. Has both shallow and deeper roots which allow it to withstand drought.
Environmental factors	Most commonly found on soils of pH 5-8. Drought resistant and heat tolerant. Can tolerate low nutrient environment and is found on soils with low P or K levels. Ammonium fertilizers reduce cover of *P. lanceolata*, but not affected by nitrate application.
Regeneration/persistence	Forms persistent seed bank. Seed establishes in pastures in summer and autumn when sward has open micro-habitats. Survival depends on these areas remaining open while seedlings establish. Heavy grazing therefore encourages establishment. Emergence is rapid when planted but establishment can be limited by competition. Most successful when slow establishing grasses are planted as companions. Individual plants can live for more than 12 years. Survives better on fields with longer grazing/cutting intervals.
Competitive ability	When fertility is low, *Plantago* will compete well with grasses. It can develop more deep roots, allowing it to compete more effectively for nutrients. When fertility is high, competition for light becomes more important and grasses are at a competitive advantage.
Productivity	Can be as productive as grass and clover, and has been quoted as yielding up to 20 t/ha annually. Can be highly productive when first sown, but yield reduces dramatically over the years.
Seasonality	Overwinters as a rosette. Maximum leaf growth in spring and early summer. Flowers throughout the growing season, from April to August.
Utilization/feed value	Eaten very readily by sheep, who will chisel rosettes right down to the ground. Very palatable to cattle, but less so to horses (O'Beirne-Ranelagh 2005). Prostrate habit on grazed pastures makes it less accessible for cattle but they will preferentially graze it when long enough. Spikes are less acceptable but livestock eat them. Liveweight gain trials show results fom a pure stand of *Plantago* was equal to that from a pure *Lolium* sward. Liveweight gains were improved when *Plantago* was introduced into a mixed pasture. Moderately tolerant of trampling, but not to the extent of *Lolium*. Presence of antibiotic substances retards fermentation and lowers the energy value of *Plantago* silage. (Isselstein 1993). Makes good hay but drys slowly.
Digestibility	Similar physical breakdown characteristics to *Lolium*. Requires greater chewing and rumination than *Lolium*. Digesitibility is similar or lower than Trifolium and *Lolium. Plantago* has high digestiblility in spite of having high index of negative potential action of phenols (IANP) (Mika and others 1998). Digestibility decreases rapidly with increasing maturity (Barber 1985).
Other feed values	Good source of Ca, Cl, P, K, Na, Mg Zn, Cu, Co. Equal or higher than a *Lolium-Trifolium* sward. Animals grazing *Plantago* retained 4 times as much Ca as they did on a *Lolium* sward. Mg and Na retention was also higher. Mn levels are poor.
Animal health	Contains aucobin which has a number of medicinal properties, including microbial, laxative and liver protecting. Leaves contain 0.8% mucilage which is used in commercial preparations to control diarrhoea in calves. May have mild anthelminthic effect.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	*Potentilla reptans*
Species profiles	No information.
Growth form and habit	Sprawling perennial, with long rooting flowering stems.
Environmental factors	Found in disturbed grasslands on dry soils
Regeneration/persistence	Reproduces from runners. Forms persistent seed bank.
Competitive ability	No information.
Productivity	No information.
Seasonality	Partially evergreen. Flowers June to September.
Utilization/feed value	No information.
Digestibility	No information.
Other feed values	No information.
Animal health	No information.

Other forb	*Primula veris*
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Polycarpic rosette forming perennial with short rhizome.
Environmental factors	Mainly on moist calcareous soils, occasionally on non-calcareous strata.
Regeneration/persistence	Long-lived. Intolerant of shade. Population growth rate reduced if grazed in spring or no management applied (Brys and others 2004). Regenerates from seed and through daughter rosettes. Little evidence of a persistent seed bank.
Competitive ability	Common in species rich but short vegetation. Can form abundant populations in situations where seed availability is high and soils disturbed to create a seed bed. Mid-summer and autumn mowing increase abundance, with greater effect of later mowing due to size of plants at time of germination being lower in autumn (Brys and others 2004).
Productivity	No reliable information found**.**
Seasonality	New leaves formed in late winter and spring, with peak biomass in summer. Flowers in April and May, with seed shed from summer to autumn.
Utilization/feed value	Little grazed by stock, possibly due to leaves being adpressed to ground.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No reliable information found.

Other forb	*Prunella vulgaris*
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Low growing, stoloniferous, shallow rooted perennial.
Environmental factors	Grows in soils of pH 5 or more. Shade tolerant. Effective in exploiting N supply, growth will slow or stop when N is limited (Neitzke 1999). Produces more stolons in response to favourable conditions, allowing it to concentrate resources in favourable areas (Macek & Leps 2003).
Regeneration/persistence	Persists well on heavily grazed pastures where its growth form allows it to withstand grazing and trampling. In favourable conditions, produces more, short, stolons, allowing it to form a patch. Forms persistent seed bank.
Competitive ability	Is overgrown by larger herbs, so most common on short turf.
Productivity	Little or no reliable information available.
Seasonality	Overwinters as rosettes. New shoots emerge in late spring and flowering occurs from june to September. Has a marked summer peak in biomass.
Utilization/feed value	Leaves are not attractive to grazers.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	High content of phenolic acids, tannins and tri-terpenes which may confer a range of health benefits (antioxidative, antimicrobial and antiviral) (Psotová and others 2003) Antioxidative effects due to concentration of Rosmarinic acid – 6.1% in Prunella spikes (Lamaison and others 1991).Has been used as wound healer.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Ranunculus acris***
Species profiles	BFBI: Harper (1957), Grime, Hodgson & Hunt (1996)
Growth form and habit	Upright perennial, much branched and sometimes spreading, but does not root at nodes as *R. repens* does.
Environmental factors	Found on soils ranging from pH 5.5 to 7 on less waterlogged soils than *R. repens*.
Regeneration/persistence	Frequency increases on overgrazed pastures. Survives well on meadows frequently cropped for hay, as it can grow tall and compete with grasses. It is in flower when hay is cut suggesting that it is not dependent on seed set to persist in meadows. Reproduces from daugther rosettes. Little evidence of persistent seed bank.
Competitive ability	Found in association with a higher level of grass species than R. *bulbosus*. Competes with grass and clover in New Zealand, where it is estimated that it has reduced milk revenue significantly (Bourdot and others 2003).
Productivity	Little or no reliable information available.
Seasonality	Wintergreen, with little growth in winter. Flowers May-July.
Utilization/feed value	Common in haymeadows and horse pastures. The acrid taste makes it unattractive to grazing livestock. Can lead to reduced pasture utilization as animals will avoid it and the surrounding vegetation.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Contains protoanemonin which has been known to cause poisoning in animals. Compound is neutralised on storage (Cooper & Johnson 1998, Forsyth 1954). Acute *Ranunculus* poisoning has been recorded in horses (Griess & Rech 1997).

Other forb	***Ranunculus repens***
Species profiles	BFBI: Harper (1957), BCW: Lovett-Doust and others (1990), Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial, erect plant with creeping stolons.
Environmental factors	Found on soils ranging from pH 5 to 8. Particularly prevalent on fertile poorly drained soils.
Regeneration/persistence	Seed production is relatively low, but they persist in the soil.
Competitive ability	Grows in exclusive patches or interspersed in the sward. Can withstand competition from tall grass species in hay meadows. May deplete minerals, particularly K at the expense of other species. It is suggested that the roots secrete a toxin which caused N deficiency in neighbouring plants.
Productivity	Little or no reliable information available but can frequently be very abundant and contribute a significant proportion of the sward
Seasonality	Some growth in winter, but main growth starts in spring. Rapid growth after germination in spring. Flowers May to June. Additional ramets produced from stolon nodes in early summer, these become separated from main plant, in autumn and overwinter as independent rosettes.
Utilization/feed value	Stock will eat *R. repens*, more readily than other *Ranunculus* species. Relatively low levels of the acrid-tasting ranunculin are present in this species (Cooper & Johnson 1998).
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available.
Animal health	Contains protoanemonin which can cause poisoning in animals at high levels. Levels in *R. repens* are very low and no poisonings have been reported. Compound is neutralised on storage (Forsyth 1954). The same chemical can be used as an external poultice for boils and sores. Contains low levels of cardiac glycosides which can cause diarrhoea and stomach pains in cattle.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	*Rhinanthus minor*
Species profiles	BFBI: Westbury (2004), Grime, Hodgson & Hunt (1996),
Growth form and habit	Summer annual hemiparasite with shallow roots. Most common in hay meadows.
Environmental factors	Two forms exist, var. *stenophyllus* on moist soils with a northern bias and flowers from July – August and var. *minor* on dry soils in the south which flowers from May - July.
Regeneration/persistence	Low if overgrazed in summer before seed can be shed. Intolerant of shade and drought. No persistent seed bank produced. Seed requires vernalisation.
Competitive ability	No reliable information found.
Productivity	Generally low, but appears to depend upon type of host, eg greater if able to parasitize *Trifolium repens*.
Seasonality	Germinates in spring and flowers from May to August, with seed set from mid-summer onwards and quickly released.
Utilization/feed value	Can reduce vigour of grasses and thereby enable smaller forb species to proliferate.
Digestibility	No reliable information found.
Other feed values	Higher mineral content than parasitized grasses.
Animal health	Potentially toxic to grazing animals due to glycoside content, but only if sufficiently large amounts are ingested (Cooper & Johnson 1998).

Other forb	*Rumex acetosa*
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial with basal leaf rosette and erect sparsely branched stem. Thick rootstock.
Environmental factors	Found in slightly acidic soils in the pH range 5-7. Has tolerance to high Al levels in the soil (Tolra and others 2005).
Regeneration/persistence	Sets seed abundantly but they do not persist in the soil. Daughter rosettes also produced from rootstock.
Competitive ability	Spreads rapidly when grasses are removed but not when all other forb species are removed. Grasses may have a limiting effect on *Rumex* populations (Putwain & Harper 1970).
Productivity	Little or no reliable information available but can sometimes contribute a significant proportion of the sward's dry matter production.
Seasonality	Wintergreen. Flowers May to June.
Utilization/feed value	Can become a bulky component of haymeadow sward when flowering but responds well to grazing, forming compact low-growing rosettes.
Digestibility	Digestible when young but decreases rapidly with maturity (Barber 1985).
Other feed values	Good protein content when young. Useful source of P and trace elements (Barber 1985).
Animal health	Leaves contain oxalates which can be toxic to livestock if eaten in quantity. Lactating lambs more commonly affected than cows, but can cause acute calcium deficiency or 'milk fever' in both (Cooper & Johnson 1998, Forsyth 1954). . Also has medicinal properties. Has been used in the treatment of fevers and skin ulcers (de Baïracli Levy 1984). Anthraquinones in plant can be laxative (Chiej 1984).

Other forb	*Rumex acetosella*
Species profiles	Grime, Hodgson & Hunt (1996)
Environmental factors	Most abundant on infertile, peaty soils of pH range 3.5-5.5.
Growth form and habit	Patch-forming perennial with erect stems. Deep rooting.
Regeneration/persistence	Deep roots allow persistence on dry sandy soils. Spreads vegetatively and can regenerate from root fragments. Also forms a persistent seed bank.
Competitive ability	Low growth form mean it is easily dominated by large, fast-growing species.
Productivity	No reliable information found.
Seasonality	Flowers May to July, shoots die back in autumn, overwinters as small rosette.
Utilization/feed value	No reliable information found.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	Contains oxalates which are poisonous to stock.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Rumex crispus* and *R. obtusifolius***
Species profiles	BFBI: Cavers & Harper (1964), Grime, Hodgson & Hunt (1996)
Growth form and habit	*R. crispus* is a polycarpic perennial, though may behave as annual or biennial. *R. obtusifolius* is also a polycarpic perennial and generally more long lived. Tall erect shoots and stout roots often with a relatively deep tap root. Can produce seeds in first year of growth.
Environmental factors	Establishes better in non-waterlogged soils. Prefer fertile soils, may be limited by low soil K status (Humphreys and others 1999).
Regeneration/persistence	Very persistent seed bank. Unaffected by severe drought or frost. Less frequent defoliation, eg that which includes rest periods when grazing stock are removed or from shutting up for hay or silage, favours the development of more persistent plants. Repeated cutting offers a measure of control though plants tend to persist through this. Mature plants tend to break up around the crown of the tap root producing daughter tap-rooted plants.
Competitive ability	Establishes well in disturbed soils. Competitive in high nutrient status soils, especially for *R. obtusifolius*. Regrowth of *R. obtusifolius* is high even with intense competition from grasses, and is not significantly adversely affected by mowing frequency (Niggli and others 1993). *R. obtusifolius* reduced grass and clover dry matter production in a sown sward more than did *R. crispus* (Hongo 1989).
Productivity	High dry matter production, especially in high N and K situations with a long growing season (March – November). In experimental situations *R. obtusifolius* has contributed 38-50% of the total herbage DM harvested in high fertilizer N mown swards that produce a total herbage DM of 10-16 t/ha/year (Hopkins & Johnson, 2003).
Seasonality	Both species over-winter as small rosette with new growth in spring. Flowers from May to October, with seeds produced into winter.
Utilization/feed value	Generally both these species are avoided by grazers, but leaves that have been well chopped in silage are less likely to be avoided. Shading and competition for water and space, and possible allelopathic effects may reduce grass growth in vicinity of dock plants. However, their presence may reduce soil compaction via action of deep root stocks and root channel development.
Digestibility	Comparable to *Lolium perenne* at first cut early season growth stage, but reduces with subsequent cuts as lignification occurs (Hopkins & Johnson 2003).
Other feed values	Condensed tannins that may reduce the risk of bloat in legume-rich diets (Waghorn & Jones, 1989).
Animal health	Can have detrimental effects on animal, eg acute poisoning due to oxalate in *R. crispus* (Panciera and others 1990). Levels of condensed tannins may alleviate bloat caused by legumes in sheep (Waghorn & Jones 1989).

Other forb	***Sanguisorba minor***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial, with basal leaf rosette and erect stem. Deep tap root.
Environmental factors	Optimum soil pH range is 5-8 but can be found at pHs down to 4 on surface-leached limestone soil. Found on both dry and moist infertile soils.
Regeneration/persistence	Potentially long-lived. Survives tight grazing by sheep and rabbits. Not persistent in tall swards. Seed set low, maybe only 4 seeds per capitulum. Not known whether it forms persistent seed bank.
Competitive ability	Poor competitor due to low lateral vegetative spread.
Productivity	No reliable information found.
Seasonality	Increases biomass slowly from spring through to summer. Flowers June to July, large summer leaves die back in autumn but it remains wintergreen.
Utilization/feed value	Subspecies *muricata* (Gremli) Briq. formerly grown as a fodder plant and now naturalised.
Digestibility	No reliable information found.
Other feed values	Ca and Mg levels in leaves are high.
Animal health	No reliable information found.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Senecio jacobaea***
Species profiles	BFBI: Harper & Wood (1957), BCW: Bain. (1991), Grime, Hodgson & Hunt (1996)
Growth form and habit	Erect stem growing from rosette, biennial to perennial. Fairly deep roots.
Environmental factors	Most frequent on dry soils of pH 7 and above, but will also grow on more acidic soils.
Regeneration/persistence	Produces abundant seeds but they do not form a persistent seed bank. Can regenerate from root fragments.
Competitive ability	Colonises open habitats and gaps in grassland. Wind blown seed disperses over considerable distances aided by local turbulence, eg along highways.
Productivity	Little or no reliable information available but can be significant in extreme situations.
Seasonality	Seeds germinate in autumn and the following year is spent developing rosette and root system. Flowering occurs in second year, between June and October.
Utilization/feed value	Avoided by cattle and horses, but sheep will graze it, apparently with little ill effect. Becomes acceptable when dry which can lead to poisoning when present in hay or if cut/ pulled and left where animals have access to it.
Digestibility	Little or no reliable information available.
Other feed values	Little or no reliable information available but animal health risks override other feed-value considerations.
Animal health	Contains pyrrolizidine alkaloids which are highly toxic to livestock (Cooper & Johnson 1998). Can be used externally to treat skin disorders (de Baïracli Levy 1984).

Other forb	***Taraxacum officinale***
Species profiles	BFBI: Stewart-Wade and others (2002), Grime, Hodgson & Hunt (1996)
Growth form and habit	Rosette-forming perennial with strong tap root.
Environmental factors	Found mostly on basic soils, but can tolerate pH levels down to 4.5.
Regeneration/persistence	Effective colonising species due to early growth and flowering and abundant seed production. Seeds germinate rapidly over a range of temperatures. Seed bank is not persistent but plants can reproduce vegetatively from root fragments (Falkowski and others 1989).
Competitive ability	Has high requirement for K so may compete for this in the sward. Restriction of K may control its abundance (Tilman and others 1999).
Productivity	Little or no reliable information available but can contribute significantly especially in late spring
Seasonality	Wintergreen. Starts growing early in spring, allowing good establishment before grasses have started to grow. Flowers March to October.
Utilization/feed value	In pastures, stock will preferentially graze *Taraxacum* and it can rapidly recover from defoliation and trampling. Useful component of early silage cuts. When cut in May, *Taraxacum* had a higher dry matter yield than *Lolium*, but at a later cut (June) it was overtaken. Ensilability is acceptable, with moderate water soluble carbohydrate/ buffering capacity ratio. In same experiment, it had lower net energy value than *Lolium* (Isselstein 1993).
Digestibility	*Taraxacum* does not have a detrimental effect on forage digestibility when grown with *Medicago sativa* (Marten and others 1987). Holds its digestibility well throughout the season (Barber 1985). Has high digestibility despite having a high IANP value (index of negative action of phenols) (Mika and others 1998).
Other feed values	Micromineral concentration generally higher in *Taraxacum* than *Medicago sativa* (Marten and others 1987). Same experiment showed P and K levels to be higher, and Ca and Mg at similar levels to *M. sativa*. Protein content falls with increasing maturity
Animal health	*Taraxacum* is said to have medicinal properties. It has been used as a conditioner for racehorses, and for curing complaints and convulsions in young animals (de Baïracli Levy 1984). Has a diuretic effect which could be an issue for housed animals. This property may be lost on ensiling. Causes diarrhoea and a drop in animal performance when proportions of over 30% are grazed in the sward.

Appendix 5 (contd.) Summary of agronomic and ecological information by plant species.

Other forb	***Urtica dioica***
Species profiles	BFBI: Greig-Smith (1948), BCW: Bassett and others (1977), Grime, Hodgson & Hunt (1996)
Growth form and habit	Tall rhizomatous perennial forming dense canopy in summer.
Environmental factors	Very abundant over pH range 5-8. Can withstand drought but flowering is inhibited (Boot and others 1986).
Regeneration/persistence	Produces large, persistent seed bank.
Competitive ability	Highly competitive on nutrient rich soils.
Productivity	Little or no reliable information available but its presence in localised situations (patches on high fertility and disturbed sites) would suggest that it herbage mass per unit area can be very high.
Seasonality	Produces young shoots in autumn which overwinter. Flowers May to July and pollen is allergenic. Leaves are relatively short lived.
Utilization/feed value	Growth is reduced by repeated cutting. Avoided by cattle, presumable because of stinging hairs. Wilted foliage eaten by horses, and semi-feral ponies will dig up the roots in winter (O'Beirne-Ranelagh 2005).
Digestibility	Crude fibre has been reported as 13.7% (Barber 1985)
Other feed values	Leaves contain very high levels of N, Ca, Mg, P, Cu and Fe, protein (up to 28%) and fibre. Extremely high calcium content (up to 4.3%) (Barber 1985). As a dry feed additive, it improved the utilization of nutrients and benefited the growth of heifers (Gupta and others 2005).
Animal health	Dried as forage, it is said to have excellent health giving properties, due to its high mineral and protein content. It has been used as an anti-wormer, to increase milk yield and for adding condition to horses (de Baïracli Levy 1984). Not poisonous, but animals have occasionally had extreme reactions to stinging (Cooper and Johnson 1998). Potential as herbal substitute for antibiotic fodder for pigs (Urbanczyk and others 2002). Has powerful antioxidant properties (Gulcin and others 2004, Mavi 2004)

Other forb	***Veronica chamaedrys***
Species profiles	Grime, Hodgson & Hunt (1996)
Growth form and habit	Perennial with shoots prostrate at base with ascending tips. Shallow-rooted.
Environmental factors	Generally found on soils with pH of more than 6. Absent from sites with soils below pH 4.5. More frequent on infertile soils.
Regeneration/persistence	Colonises by means of stolons, and can also vegetatively spread by means of detached plant fragments. May form a persistent seed bank.
Competitive ability	No reliable information found.
Productivity	No reliable information found.
Seasonality	Wintergreen. New shoots emerge in early spring. Flowers April to July
Utilization/feed value	No reliable information found.
Digestibility	No reliable information found.
Other feed values	No reliable information found.
Animal health	No reliable information found.

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Research information note

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Review of the diet and micro-habitat values for wildlife and the agronomic potential of selected grassland plant species

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Keywords: grassland, diversity, insect, microhabitat, bird, diet

Introduction

Grasslands cover 5.6 million ha of agricultural land in the UK. The intensification of management practices over the last 50 years has increased productivity, but has had significant impacts of grassland biodiversity. Much work has focussed on the restoration of the remaining species-rich areas of grassland. However, in order to meet the requirements of wide-ranging farmland species, consideration needs to be given to methods of enhancing the diversity of species-poor grasslands dominated by ryegrass.

The aim of the project was to review two important aspects of any attempts to increase wildlife on improved, relatively fertile grasslands. These issues are firstly, the value to invertebrates, birds and other vertebrates of particular grassland plants that could be introduced into such swards or maintained in them, and secondly the agronomic potential of such species, so that the fit of these swards into viable farming or equine business can begin to be assessed.

What was done

A list of grassland plant species considered to be of potential wildlife value and able to establish and persist in fertile grasslands was identified, comprising 14 grasses, 11 legumes and 25 other forb species. In addition, 6 grassland weeds were included in the review.

Information was collected on the associations between the selected plant species and insects, including herbivores and pollinators. Data was also gathered on the value of the plant species to bird diets, both directly through the provision of foliage and seeds, and indirectly through the supply of invertebrate food.

Information was also gathered from agronomic literature on the feed value of the plant species, any impacts on animal health and their productivity in grazed and mown grassland management systems. In addition, data on the success of establishment of the species in grassland restoration experiments was collected.

Results and conclusions

Plant species supporting specialist associations with greater than 70 insect species were found among the grass species, the legumes and the other forb species. Most insects forming associations were classified as general shoot feeders, feeding on a range of above-ground plant parts. However, significant numbers of species dependent on the presence of stems or flowers and seed heads were found for the legumes (Fabaceae) and composite forbs (Asteraceae). *Cirsium* species, including pernicious grassland weed species included in the study supported some of the highest numbers of associated invertebrates.

The review of the importance of the plant species for provision of direct (seeds, foliage) diet items for birds showed that large-seeded forb species, ie vetches (*Vicia* spp.) and smaller-seeded species particularly docks (*Rumex* spp.), plantain (*Plantago* spp.) and buttercups (*Ranunculus* spp.) and the foliage of clover (*Trifolium* spp.) were important diet items for farmland bird species. The plant species with the highest number of specialist insect associations (*Dactylis glomerata, Festuca ovina* and *Lotus corninculatus*) provided one possible measure of the diversity of insect taxa important in bird diets, although different plant species had higher numbers of general insect associations (*Taraxacum officinale* and *Rumex* spp.).

The review has highlighted a group of grassland species that have diet and microhabitat value for insects and birds and have useful agronomic characteristics in terms of productivity and feed value. This group includes grasses (*Dactylis glomerata* and *Festuca* spp.), and legumes (*Lotus corniculatus, Trifolium pratense*, *T. repens* and *Vicia sativa*). Some of these have been established successfully in experiments on the restoration of grassland diversity while others are agriculturally-sown species. *Lotus corniculatus* and *Festuca ovina* are

probably the most difficult to establish in more fertile swards. Other forbs, such as *Achillea millefolium*, *Centaurea nigra*, and *Plantago lanceolata* are of high value for wildlife and are reasonably easy to establish but have lower values for livestock production. The *Cirsium* species have high value for wildlife but along with other pernicious grassland weeds are actual management problems rather than of being of benefit for livestock production. *Rumex acetosa* poses less of a weed problem than *R. crispus* and *R. obtusifolius*, if not present in quantity, and is able to grow in fertile grasslands.

For a significant element of the diet and microhabitat value of the identified grasses, legumes and other forbs to be realised, it is necessary to allow them to develop stems, flowers and seed heads. Thus, rotational grazing and/or infrequent mowing are the optimum management regimes. However, allowing the development of structural heterogeneity in the sward canopy can compromise the agronomic value of the sward. Research is needed on the relative balance between potential biodiversity gains and agronomic implications of relaxing grazing, mowing and fertilizer inputs in areas of improved grassland.

Given the management constraints on the provision of beneficial diet items and microhabitats, along with the high biodiversity value of some of the grassland weed species included in the study, it may be more beneficial to focus management aimed at promoting biodiversity on portions of fields, including field margins, for grasslands used for agricultural production. Research is needed to identify the optimal size, density and landscape positioning of such features.

The study identified a large number of insect species for which only limited information on microhabitat requirements is available. Whilst systematically acquiring data on the ecology of insect species may be useful for species of conservation concern, it is clearly impractical for the large number of common or widespread insect species listed in this review.

Research might be better focussed on providing management tools that promote spatial and temporal heterogeneity in grassland swards. Such tools might include modified mowing regimes, use of mixed stocking or particular livestock types (including horses), and the use of farm yard manure. Such heterogeneity is likely to lead to diversity in botanical composition, canopy structure and spatial patterning within fields, thus providing a range of microhabitats for associated species of grassland fauna.

The review pointed to major gaps in the understanding of the value of grassland plant species beyond conventional livestock production, in particular their potential role in improving the sustainability of pastoral systems and value for enhancing the suitability of species-poor grassland for horse grazing. If the area devoted to livestock grazing declines, identifying opportunities for biodiversity enhancement in non-agricultural grasslands is likely to become increasingly important. There is now increasing interest in the secondary dietary attributes of pasture species in terms of their ability to contribute towards animal health and nutrition and to affect the qualities of meat and dairy products from livestock for human nutrition.

There is also a need to identify livestock production systems that can meet the demands imposed by changes in climate. The role of multi-species swards is one promising area. Many forbs and some grasses can utilise lower soil horizons for water, or exploit temporal niches for regeneration, and thereby provide a degree of resilience to drought, or ability to recover from floods, compared to the predominant grassland species which are currently grown. This review has confirmed the high value of legumes for invertebrates and birds. The wider use of grass/legume mixes as forage crops has the potential for multiple benefits, including not only biodiversity benefits but also reduced fertilizer inputs and enhanced soil characteristics. Research is needed on the suitability of novel grass/legume mixes and their potential utility in the face of climate change. The introduction of legumes into established swards is likely to yield similar benefits. In this situation, research is needed on methods to promote the persistence of introduced legume species.

English Nature's viewpoint

The review is a vital first stage in understanding how the biodiversity of species-poor grassland can be enhanced. The review reveals some potentially useful plant species that have both biodiversity and agronomic value. English Nature needs to work with farmers, horse owners, policy makers and researchers to come up with practical grassland management prescriptions that achieve these multiple benefits.

Further information

For the full report or other publications on this subject, please contact the Enquiry Service on 01733 455100/101/102 or email enquiries@english-nature.org.uk

For further information about the work of English Nature, please visit our website at: www.english-nature.org.uk

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Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888