

# Changes in the flora of a Berkshire farm after a period of 24 years

G. S. Davy

## Summary

The flora of the estate and farmland at Jealott's Hill Research Centre in Berkshire was surveyed in 1978 and again in 2002 using 100 metre grid squares for recording purposes. In the intervening years there have been some considerable changes. The arable species have declined in number and in frequency. This is probably due to the use of selective herbicides, but the ending of field experiments on nitrogen fertilisers that had helped to maintain rich seed banks will have had an effect. There was no difference between the Ellenberg Indicator Values for nitrogen for those annual and biennial species that had declined or had increased. However, some of the perennial species that had declined, such as betony (*Stachys officinalis*) and burnet-saxifrage (*Pimpinella saxifraga*), have low Ellenberg Indicator Values for nitrogen and are ancient grassland species. The survival of perennial species from a set-aside experiment and the earlier scattering of wild flower seeds have added to the flora. There is no evidence that the use of selective herbicides has had any adverse effect on the perennial species along field borders. Disturbance to roadside grassland caused by the lining of the edges of the main roads with kerbstones, together with the remaking of the roadside ditches, has reduced the number of perennial species along the roads bordering the farm. A few species, such as plicate sweet-grass (*Glyceria notata*), have been lost or much reduced along the bridleways due to improvement of the surface for the benefit of walkers and riders. The increase of scrub has also had an effect in shading out species.

## Introduction

Changes in agricultural management over the last 50 years have resulted in increased productivity for both crops and grass. This has brought about a decline in farmland biodiversity. The intensification of agriculture is characterised by the increased use of pesticides and inorganic fertilisers, the growing of autumn sown cereals and increases in the area of oilseed rape. In a study quantifying changes in the abundance of food plants for butterfly larvae and farmland birds, it was found that any reduction in food plant frequency, including arable weeds, was significantly related to changes in bird species (Smart *et al.*, 2000).

A survey of the flora in Danish arable fields found that between the periods 1967-70 and 1987-89, the number of individuals of the 67 species studied had been reduced on average by about 60%. The frequency of some species declined markedly, while the dominating species were largely the same (Andreasen *et al.*, 1996). In 1997, 100 arable fields that had been first surveyed in the 1960s in Oxfordshire and Berkshire were resurveyed. The abundance of the less common species had declined markedly although they persisted in the seed bank (Sutcliffe and Kay, 2000).

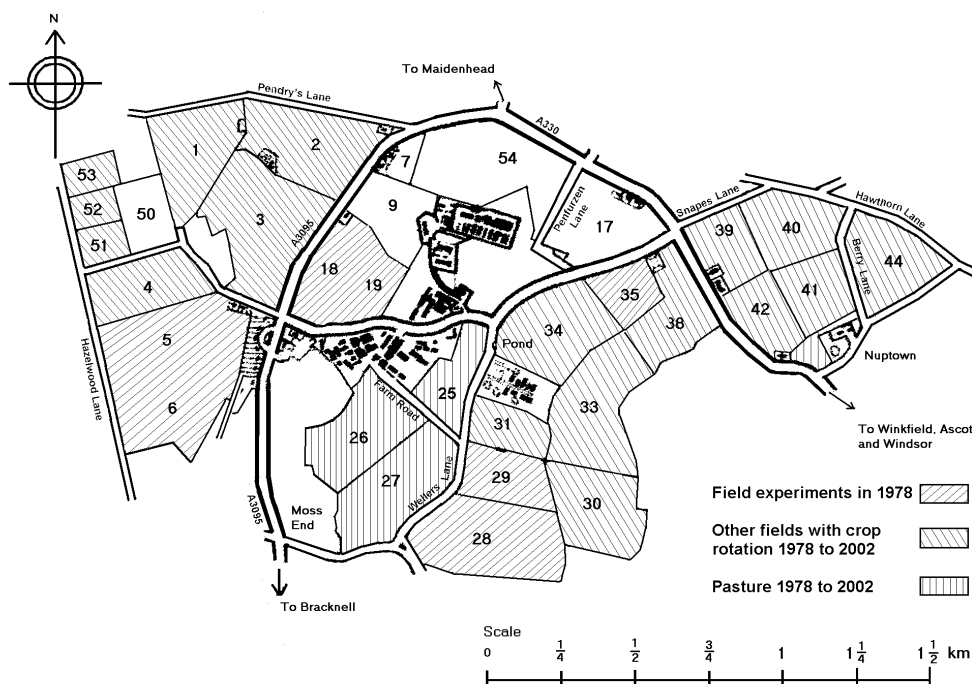
Two surveys in 1978 and 2002 of the flora of Jealott's Hill are reported here. The method chosen for both surveys was to use a 100 m x 100 m grid enabling the distribution of plants to be mapped (and giving a similar number of grid squares to an average county recorded using a 2 km x 2 km grid). In the intervening years the management objective of the farm had changed from field experiments on the use of nitrogen fertilisers to being a commercial farm. Also, considerable effort had been made to increase the biodiversity on the farm in consultation with the Farming and

Wildlife Advisory Group, including extensive planting of tree and bush species and some seed mix additions along the field margins.

## Study Area

In 1978, the Research Centre and farm occupied about 252 ha of which about 200 ha were farmed; of these about 28 ha were used for field experiments with nitrogen fertilisers for ICI's Agricultural Division and about 109 ha for farm projects, which evaluated new crop and livestock production techniques. Although the farm had been enlarged by 2002, the second survey was kept to the original area covered in 1978. Changes in some of the field boundaries and changes in crops meant that the grid squares covered in 2002 were not exactly the same. A map of the farm at Jealott's Hill as it was in 1978 is given in figure 1. The study area lies in the grid square SU 8570 of the Flora of Berkshire (Bowen, 1968).

**Figure 1. Jealott's Hill Research Centre 1978 showing field numbers**



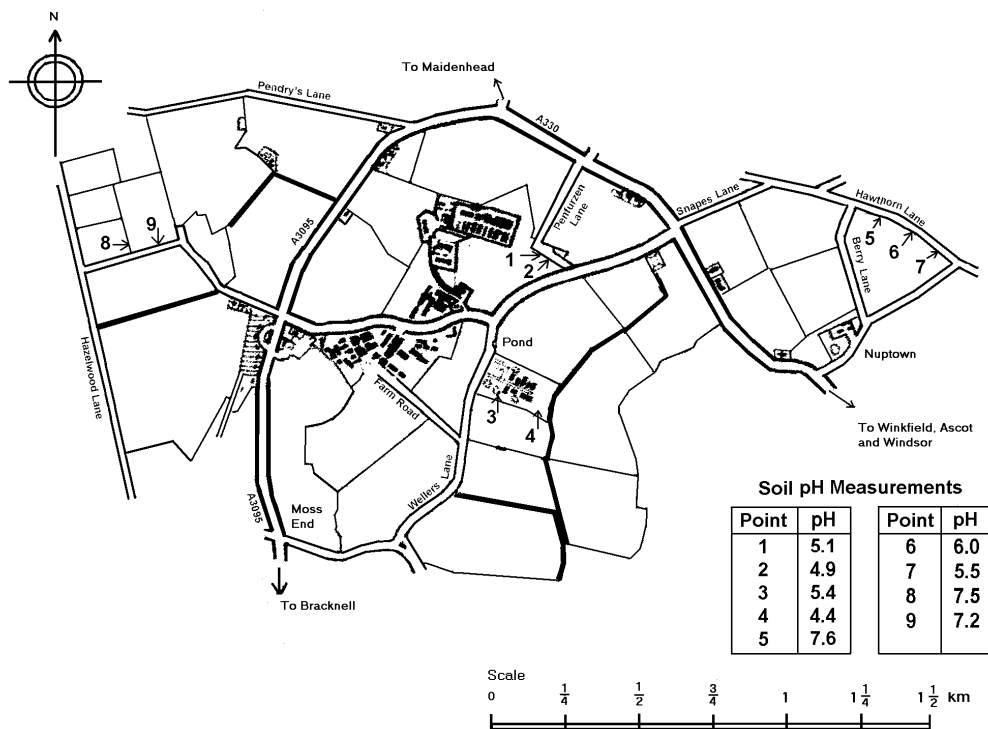
## Crop rotation and field experiments

In 1978, the crop rotation followed a five-year cycle with winter wheat, then winter wheat or field experiments, then spring barley, then two years with perennial ryegrass (*Lolium perenne*) ley. The fields that had experiments on nitrogen fertilisers in 1978 are shown in figure 1. The other fields in which crops were rotated from 1978 to 2002 are also shown in figure 1. Fields 17 and 54 were used for trials on plant protection products throughout the period and were not part of the crop rotation. Experiments on nitrogen fertilisers ceased after 1991 and Field 9 was added to those used for trials on plant protection products. Field 50 that had permanent grass in 1978 was added to the crop rotation. After 1991, the crop rotation involved two years with winter wheat followed by either a crop of oil seed rape or grass or maize. In 1978 and

2002 there were 22 fields involved in the crop rotation. In the Results and Discussion section, the term ‘arable fields’ is used. This refers only to those fields that had arable crops as part of the crop rotation and so excludes the fields that had rye-grass leys as well as the fields with fertiliser experiments or other trials.

A set-aside experiment in 1997-98 has had an influence on the flora. A number of species have survived from a seed mix that was applied along the field margins of six fields to a depth of 20 m in the autumn of 1996. The objective of the study was to identify ways of improving populations of skylarks and other open-field farmland birds by the optimisation of set-aside and its management (P. J. Edwards, pers. comm.). The species that were in the seed mix are indicated in the tables in the Appendix and the location of the field margins is shown in figure 2.

**Figure 2. Location of set-aside field margins in 1997-98 and soil sampling for pH in 1978**



## Cultivation practices

For field experiments in 1978, the winter wheat and barley areas were sprayed with ‘Gramoxone’ (paraquat) in early September 1977, ploughed three days afterwards and sown in early October. For field experiments on spring wheat and barley, the areas were sprayed with ‘Gramoxone’ in late September and ploughed in early December. No further herbicide was applied in 1977 or 1978 (Guide to Field Experiments and Farm Projects, 1978). Areas between experimental plots were kept bare by mechanical means. A similar procedure for sowing crops was followed on the remainder of the farm. Herbicides other than paraquat were little used.

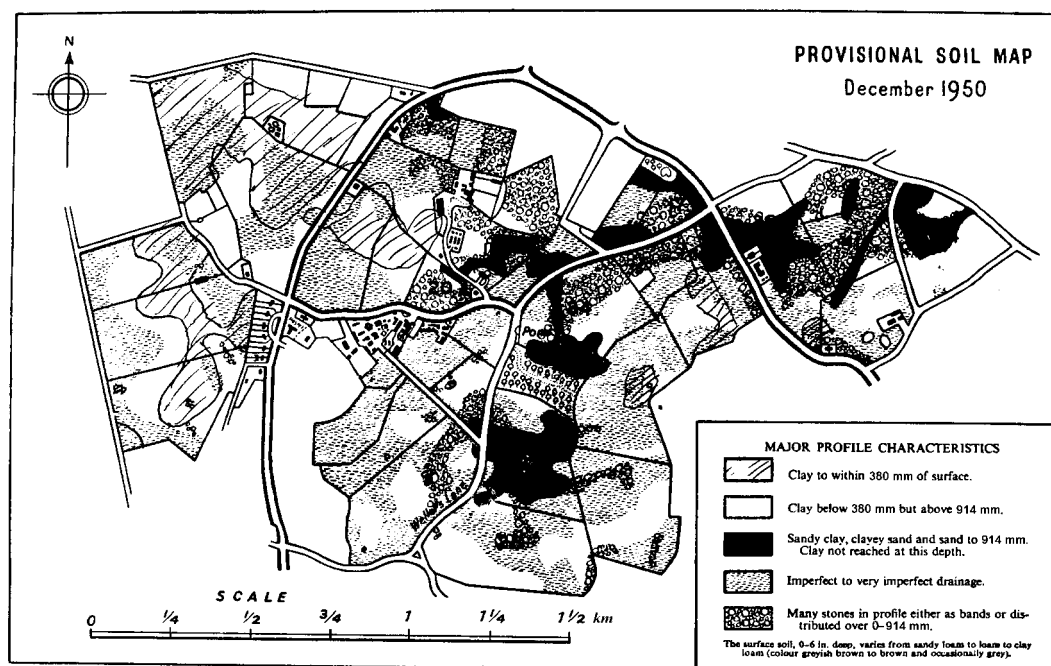
Field experiments with nitrogen fertilisers ceased around 1991. The current practice in fields devoted to trials on plant protection products is to use grass rather than bare

ground between experimental plots. These trial fields are not rotated round the farm. The current practice on the farm follows the principles of Integrated Farm Management. A crop rotation with two years of winter wheat followed by rape, grass or maize is used. Cultivation includes ploughing and minimum till depending on both the weed burden and weather conditions. The herbicides flufenacet and pendimethalin in admixture are among those used for wheat when necessary (M. Osman, pers. comm.).

## Soils

The topsoil, to a depth of 150 mm, ranges from a sandy loam to clay loam. London Clay is found from 220 mm to a metre or more below the surface. As a result the natural drainage is poor over the greater part of the farm. On the higher ground the London Clay is covered in places with sand and gravel deposits known as Plateau Gravel. With an average rainfall of about 650 mm, grass and arable crops can suffer in a summer drought; in contrast, during a wet spell, waterlogging can be a serious problem (Guide to Field Experiments and Farm Projects, 1978). A map of the soils, based on a provisional map dated 1950, is given in figure 3.

**Figure 3. Soil Map for Jealott's Hill Research Centre**



## Methods

One hundred metre grid squares were used for recording purposes. The farm together with the Research Centre occupied, in whole or in part, 299 x 100 m grid squares available for recording purposes. In 1978, 50 of these squares fell wholly within cereal crops or perennial rye-grass ley areas and were not surveyed. The grid squares were surveyed by walking round the edges of fields and along the verges of roads and lanes. In each grid square the location(s) in which a plant was seen were noted e.g. in which of several fields it occurred. This often gave rise to more than one observation

in a grid square; however, the records given in the Appendix refer only to the presence or absence of a plant in a grid square.

The survey in 1978 was begun in April and completed in October after harvest. In the spring, 226 grid squares were covered, taking 14 days spread over a period of five weeks. The survey was continued in the summer and autumn at a similar pace with the majority of the 249 squares having three visits. Soil samples were taken to a depth of 20 cm from nine locations along the lanes and from within a plantation and were analysed by ICI Agricultural Division's Agronomic Services for pH. The locations of the sampling points are shown in figure 2 along with the pH results.

The survey in 2002 was made between May and September. As May was found to be too late for detecting some hedge bottom plants, the survey was continued in March 2003 and ended in the following May.

Ellenberg's indicator values (Hill *et al*, 1999), which indicate the preference of a plant for environmental factors, are included in the table of herb species in the Appendix for moisture (F), for soil pH, i.e. acidity/alkalinity (R) and for nitrogen (N).

## **Results and discussion**

### **Changes in habitats**

The planting of trees and hedges has produced some significant changes in the habitats on the farm. New woodland strips and copses were found in 48 grid squares and new hedges in 27 grid squares resulting in the number of grid squares containing only fences falling from 120 to 50.

By 2002, the ditches along the A330 had been completely remade; sections had been buried in pipes; a pond beside Wellers Lane (see figure 1) had been deepened. Since 1978, blackthorn (*Prunus spinosa*) and/or suckers of English elm (*Ulmus procera*) have invaded the ditches along Hawthorn Lane and parts of Hazelwood Lane. Also by 2002, a new pond had been created to take drainage water from the central laboratory area. The banks of this were sown with a wild flower seed mixture.

In 1978, the bridleways were mainly grass covered and liable to become muddy in wet weather. However, by 2002, Hazelwood Lane had been covered with gravel with consequent loss of habitat. A similar treatment of Pendry's Lane had begun. In the years between the two surveys, the Research Centre site underwent considerable development with the building of new laboratory blocks and glasshouses and the construction of a ring road.

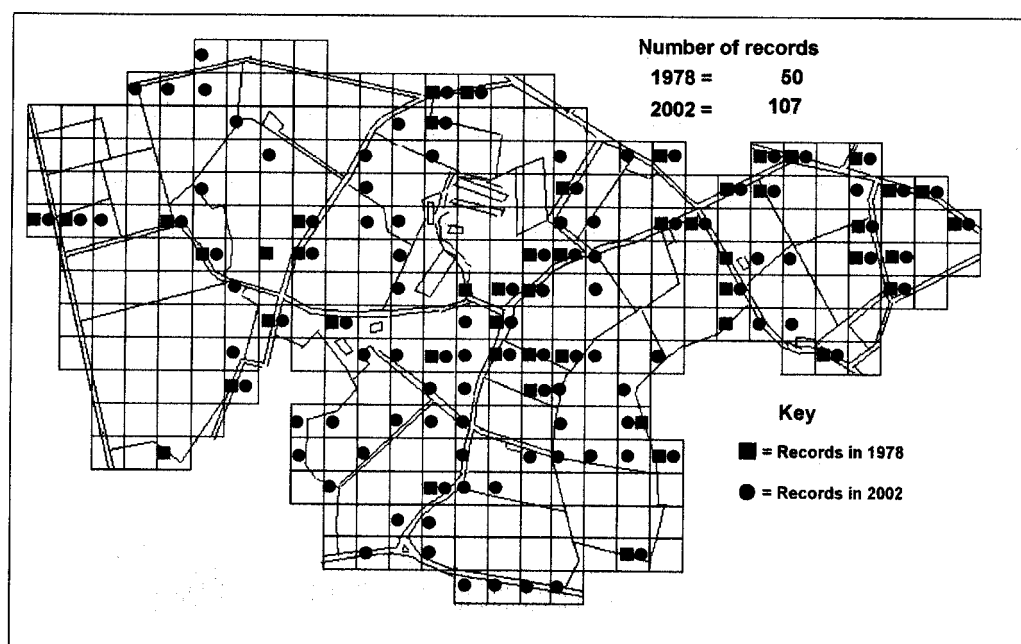
### **Plant species**

A total of 308 species were found in 2002 compared with 318 in 1978 (Appendix) with 369 overall. In 1978, 52 species were found that had not been recorded in the Flora of Berkshire (1968) for SU 8570; these are indicated in the Appendix. Owing to the extensive planting of trees and shrubs, the woody species are listed separately from the herb species in the Appendix.

## Woody species

The number of woody species increased from 42 to 54 with 17 species being introduced by planting. The number of records almost doubled from 882 to 1,720. The increase in records for field maple (*Acer campestre*), shown in figure 4, illustrates the extent of planting. Ash (*Fraxinus excelsior*), blackthorn, dog-rose (*Rosa canina*), hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*) and pedunculate oak (*Quercus robur*) show a similar increase. Elder (*Sambucus nigra*), alder (*Alnus glutinosa*), wild cherry (*Prunus avium*), silver birch (*Betula pendula*), wild privet (*Ligustrum vulgare*), hornbeam (*Carpinus betulus*), rowan (*Sorbus aucuparia*) and holly (*Ilex aquifolium*) have been planted on a slightly smaller scale. Five species from 1978 were not found in 2002. These included downy birch (*Betula pubescens*) lost from a plantation due to construction work and a mature pear tree (*Pyrus communis*) - cause of loss unknown. The records for English elm only refer to suckers, as by 1978, all mature trees had fallen victim to Dutch elm disease and had been removed.

**Figure 4. Distribution map for field maple (*Acer campestre*)**



Most of the new species planted since 1978 are species that are rare in East Berkshire including spindle (*Euonymus europaeus*), wayfaring-tree (*Viburnum lantana*) and buckthorn (*Rhamnus cathartica*). Bay willow (*Salix pentandra*) was only known at one previous location in Berkshire (Bowen, 1968) so is rather special. Some alien species have also been planted such as Italian alder (*Alnus cordata*) to form hedges in the trial fields and silver maple (*Acer saccharinum*) for ornamentation.

## Perennial herbs

In the study area as a whole 29 species were lost since 1978. Although the loss of these species only accounts for 1.3% of the total records, they represent a loss of

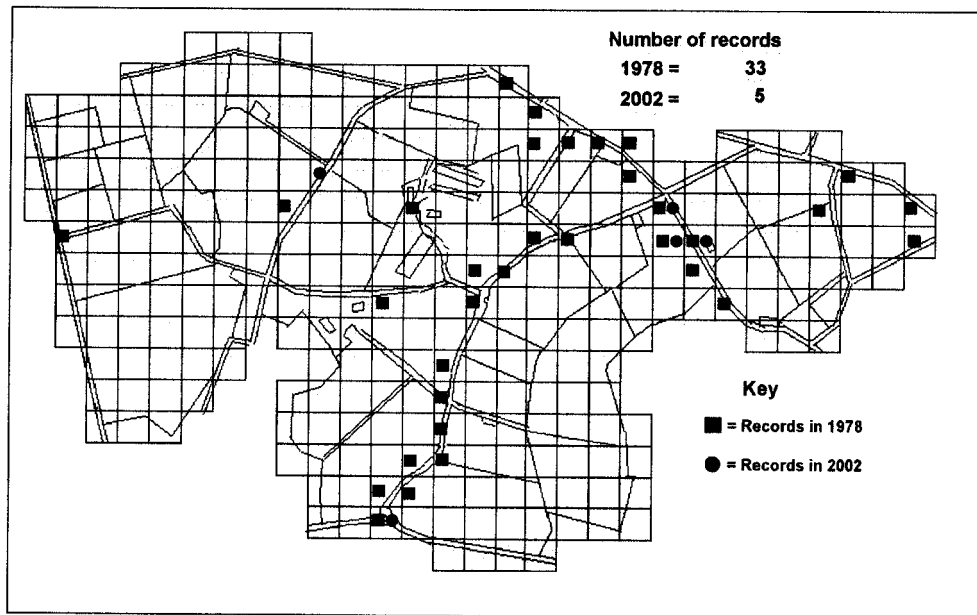
biodiversity, especially as some of the species e.g. betony (*Stachys officinalis*) and saw-wort (*Serratula tinctoria*) had a local rarity value.

To find factors that might have caused the loss of species, the preferences of the perennial species for different levels of soil acidity, nitrogen and moisture were examined using Ellenberg's Indicator Values for pH (R), nitrogen (N) and moisture (F). This revealed that there was a greater natural preference for acid soils or low pH among the species that have been lost or have declined. Out of 29 perennial species with an Ellenberg Indicator Value R of five or lower, seven have been lost and thirteen have declined. There was also a greater preference for low nitrogen levels than was shown by the species that had not declined.

The analysis of soil samples in 1978 showed that the undisturbed soil over the higher areas with Plateau Gravel was more acidic than the lower areas of the farm over London Clay. Samples taken from along Penfurzen Lane, where betony and slender St. John's-wort (*Hypericum pulchrum*) were growing, gave pH values of 5.1 and 4.9. Two samples from an old plantation had pH values of 5.4 and 4.4. Three samples from Hawthorn Lane, away from the Plateau Gravel, were more varied with pH values of 7.6 near saw-wort and 6.0 and 5.5 from amongst dog's mercury (*Mercurialis perennis*). Over the London Clay to the west of the farm the pH values obtained were 7.5 and 7.2.

Species with a preference for low nitrogen and for acid soils that have declined in the study area are sweet vernal-grass (*Anthoxanthum odoratum*), common mouse-ear (*Cerastium fontanum*), tufted hair-grass (*Deschampsia cespitosa*), creeping soft-grass (*Holcus mollis*), cat's-ear (*Hypochaeris radicata*), field wood-rush (*Luzula campestris*), common sorrel (*Rumex acetosa*), sheep's sorrel (*Rumex acetosella*), betony (*Stachys officinalis*) and lesser stitchwort (*Stellaria graminea*). These species occurred mainly along the verges of roads and lanes. Records for burnet-saxifrage (*Pimpinella saxifraga*), that has a preference for soils with low nitrogen, fell from 33 to only five. This plant (distribution shown in figure 5), which only occurred along lanes and roadsides, has been noted as decreasing elsewhere. It has a low colonising ability and can be considered an indicator of old grassland (Grime *et al*, 1988). Burnet-saxifrage, along with the species listed above, was undoubtedly affected by disturbance of the roadside verges caused when the edges of the main roads were lined with kerbstones. This has prevented some less vigorous species from re-establishing themselves. Spiked sedge (*Carex spicata*) and saw-wort which also have a preference only for soils with low nitrogen were lost from lanes but this was probably due to invasion by scrub; it is noted in the New Atlas of the British and Irish Flora (Preston *et al*, 2002) that saw-wort has declined due to loss of grassland in woods and wood margins. Oval sedge (*Carex ovalis*) was lost from a permanent pasture that has been improved.

Figure 5. Distribution map for burnet-saxifrage (*Pimpinella saxifraga*)



It is probable from the presence of betony and saw-wort and the frequency of burnet-saxifrage in 1978 that, up to that time, the verges of the roads and bridleways at Jealott's Hill had been neither seriously disturbed nor encroached upon by scrub.

Considering moisture loving plants, the following species were lost: water-plantain (*Alisma plantago-aquatica*), wild angelica (*Angelica sylvestris*), common duckweed (*Lemna minor*), gipsywort (*Lycopus europaeus*), tall mint (*Mentha x smithiana*), reed canary-grass (*Phalaris arundinacea*), bog pondweed (*Potamogeton polygonifolius*) and lesser spearwort (*Ranunculus flammula*). These losses were due to better drainage resulting from the improvement of the ditches along the main roads, to the drying up of other ditches and to the dredging of a pond. Plicate sweet-grass (*Glyceria notata*) was lost from a muddy bridleway due to the improvement of the surface for the benefit of walkers and riders. Clustered dock (*Rumex conglomeratus*) was lost from a permanent pasture that was brought into cultivation. Out of a total of 29 perennial species with an Ellenberg F indicator value of 8 and higher for moisture, the ten species listed above have been lost and a further nine have declined.

The principal exception to the decline of wetland species is the great willowherb (*Epilobium hirsutum*) that has extended its range beyond ditches into drier areas and the number of records for it has increased from 45 to 75. This plant has been noted to be increasing elsewhere and to be an effective colonist of artificial habitats and highly responsive to eutrophication (Grime *et al*, 1988).

The survival of perennial species from the set-aside experiment and established from earlier scattering of wild flower seeds have added to the flora. Species acquired in this way are: musk-mallow (*Malva moschata*), red campion (*Silene dioica*), tansy (*Tanacetum vulgare*), field scabious (*Knautia arvensis*), meadow crane's-bill



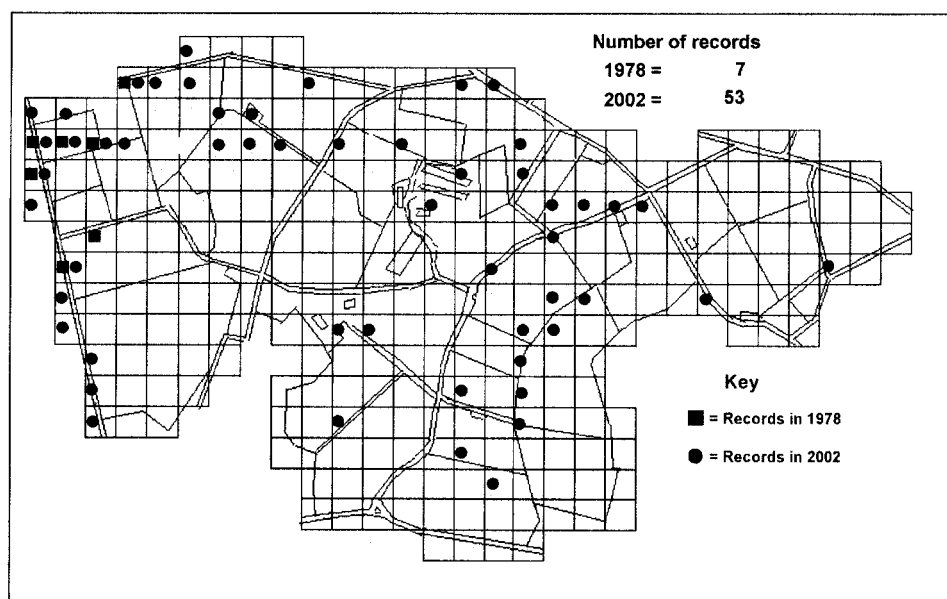
(*Geranium pratense*), nettle-leaved bellflower (*Campanula trachelium*) and lady's bedstraw (*Galium verum*). Increases in records for great mullein (*Verbascum thapsus*), ribwort plantain (*Plantago lanceolata*), oxeye daisy (*Leucanthemum vulgare*) and smaller cat's-tail (*Phleum bertolonii*) also appear to be from the same source. An increase in the amount of mown grass has allowed daisy (*Bellis perennis*) and selfheal (*Prunella vulgaris*) to increase, while lesser celandine (*Ranunculus ficaria*) and common ragwort (*Senecio jacobea*) have benefited from the fencing off of land for the planting of trees.

The number of records for perennial species along the field borders in fields in which crop rotation has been carried out continuously since 1978 rose from 1,014 to 1,275 with 14 new species recorded and nine species lost. The figure for 2002 was adjusted by deducting 60 records. These records came from nine species that were introduced by the set-aside experiment. There are good indications therefore, that normal farming practice has not had an adverse effect on the perennial species.

### **Annual and biennial species**

Between 1978 and 2002, the overall number of records for annual species fell by 39%. The drop in the number of records for some species was considerable. The records for common chickweed (*Stellaria media*), knotgrass (*Polygonum aviculare*), shepherd's-purse (*Capsella bursa-pastoris*) and groundsel (*Senecio vulgaris*) each fell by over 100. This represents a drop of from 57 to 67% of the number of records for each species since 1978. Twenty-four annual species were not refound; almost half of these had only one record and so were particularly vulnerable considering the scale of the decline of the more abundant species. The number of records for biennial species increased by 18% despite the loss of three species. The increase is due mainly to the spread of spear thistle (*Cirsium vulgare*) and stone parsley (*Sison amomum*). It is remarked in the New Atlas of the British and Irish Flora that spear thistle is probably increasing in man-made habitats. The Atlas notes that there has been no appreciable change in the 10 km distribution of stone parsley since 1962. In contrast bristly oxtongue (*Picris echioides*), an annual or biennial species, has increased from seven records to 53 and has spread from the western side of the farm right across to the east (figure 6). It is noted in the New Atlas of the British Flora that it has consolidated itself within its range south of a line from the Severn to the Humber.

Figure 6. Distribution map for bristly Oxtongue (*Picris echioides*)



Out of a total of 126 annual and biennial species from the two surveys, 29 were recorded only along roads, on ditch banks, in waste ground or in lawns and flowerbeds and were not found in any of the arable fields in either survey. In 1978, the three most numerous of these were wild teasel (*Dipsacus fullonum*) with 18 records in both surveys, red bartsia (*Odontites vernus*) with 15 records falling down to one along lanes and three-nerved sandwort (*Moehringia trinervia*) with records falling from 14 to three along lanes, in hedgerows and in a plantation.

Five of the arable species present in the farm fields in 1978 had not been recorded previously in the Flora of Berkshire for grid square SU 8570. These were: small toadflax (*Chaenorhinum minus*), prickly poppy (*Papaver argemone*), corn buttercup (*Ranunculus arvensis*), field woundwort (*Stachys arvensis*) and bugloss (*Anchusa arvensis*). They were not found however in 2002. Another arable plant that was lost was field madder (*Sherardia arvensis*); this was recorded as being rare in SU 8570. It is noted in the New Atlas of the British and Irish Flora that the above species have been much reduced probably by the intensification of agriculture. Treacle-mustard (*Erysimum cheiranthoides*), dwarf spurge (*Euphorbia exigua*), field penny-cress (*Thlaspi arvense*) and small nettle (*Urtica urens*) were recorded as being common in SU 8570; these were not found in 2002.

Two annual species survived from the set-aside seed mix that was applied in 1997. These were cornflower (*Centaurea cyanus*) that was present in two fields and gave six records and corn marigold (*Chrysanthemum segetum*) that was present in five fields and had ten records.

Soil type has not had any influence on the frequency of arable species in the fields at Jealott's Hill. Although in 2002, a significantly greater number of species was

recorded in fields with clay up to 380 mm compared with other situations, the result was entirely due to two fields that each had an area of previously bare ground rich in species. Examination of the Ellenberg Indicator Value N for the annual and biennial species showed no difference between those that had declined and those that had not.

In 1978, Field 44, in which a perennial rye-grass ley failed to establish, had 49 species and contributed to the overall richness of the arable flora. The arable species in Field 44 included: corn buttercup, common poppy (*Papaver rhoeas*), prickly poppy and round-leaved fluellen (*Kickxia spuria*), which are rare or uncommon at Jealott's Hill. The mean number of records per grid square in Field 44 was 17.5 compared with 11.1 in the fields with fertiliser experiments and 7.6 in the arable fields. In 2002, the figures for the mean number of records per grid square were 8.6 in the trial fields and 7.7 for the arable fields.

The richness of the arable flora in the fields with experiments is most likely to be due to the amount of bare ground maintained to separate the individual experimental plots. The decline in the number and frequency of annual species at Jealott's Hill is probably due to the introduction of the use of selective herbicides. However, the ending of field experiments on nitrogen fertilisers will also have contributed.

It is surprising in view of the decline in records for individual arable species that the mean numbers of records per grid square in the arable fields were similar in the two surveys (7.6 and 7.7). However, the frequency of most of the individual species was quite different. The top 15 most frequent species in each year in the arable fields are listed in Table 1 to show the changes between 1978 and 2002. The frequency figures are the number of records expressed as a percentage of the number of grid squares in the arable fields (100 in 1978 and 137 in 2002).

**Table 1. Top 15 most frequent species in the arable fields at Jealott's Hill in descending order of frequency**

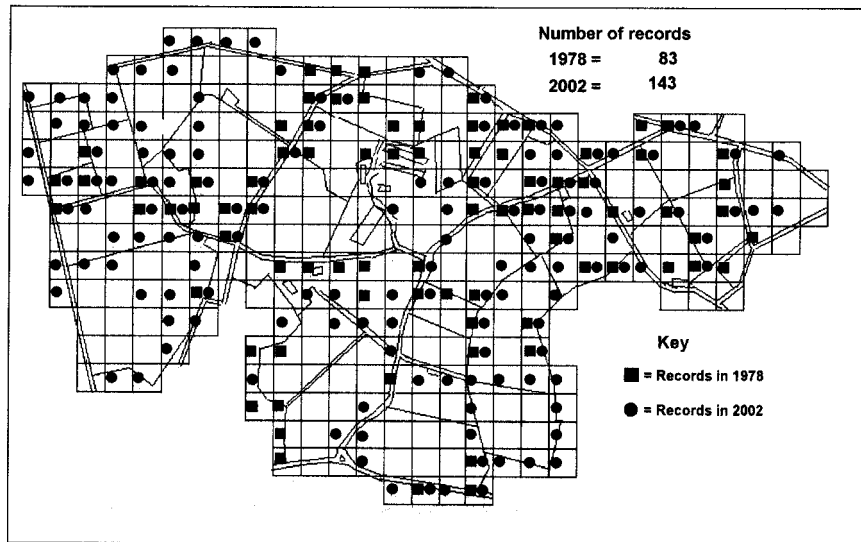
1978	Records as a percentage of the number of grid squares	2002	Records as a percentage of the number of grid squares
Common Chickweed	47	Soft-brome	53
Fat-hen	45	Cut-leaved Crane's-bill	52
Scented Mayweed	43	Barren Brome	42
Scentless Mayweed	42	Scentless Mayweed	39
<i>Knotgrass</i>	39	Spear Thistle	37
Groundsel	37	Common Field-speedwell	32
Common Field-speedwell	35	Cleavers	30
Black-grass	34	Scented Mayweed	27
Cut-leaved Crane's-bill	33	Annual Meadow-grass	26
Shepherd's Purse	32	Nipplewort	26
Red Dead-nettle	29	Stone Parsley	26
Annual Meadow-grass	29	Scarlet Pimpernel	24
Prickly Sow-thistle	28	Common Chickweed	18
Cleavers	23	Groundsel	18
Sticky Mouse-ear	19	Prickly Sow-thistle	17

The decline of arable weeds at Jealott's Hill is in line with the observations made in other surveys. In Table 1, common chickweed, fat-hen (*Chenopodium album*), knotgrass, groundsel (*Senecio vulgaris*), shepherd's-purse and red dead-nettle (*Lamium purpureum*) were noted also to have declined in surveys in Denmark between the periods 1967-70 and 1987-89 (Andreasen *et al.* 1996). These species, with the exception of fat-hen, were also found to have declined in other UK surveys between 1978 and 1990 (Bunce *et al.*, 1999) although cleavers had increased. A number of arable species have increased at Jealott's Hill. An increase in the frequency of barren brome (*Anisantha sterilis*), cleavers (*Galium aparine*), cut-leaved crane's-bill (*Geranium dissectum*) and spear thistle was also noted in surveys of arable fields in Oxfordshire (Sutcliffe and Kay, 2000). Although eight species are common to both lists, only scentless mayweed (*Tripleurospermum inodorum*) and annual meadow-grass (*Poa annua*) were present at a similar frequency in both surveys. Cut-leaved crane's-bill is noted in the New Atlas of the British and Irish Flora to thrive in disturbed nutrient enriched habitats and this makes it likely that it will become more abundant in many areas.

The annual grasses, barren brome, mapped in figure 7, and soft-brome (*Bromus hordeaceus*) were abundant at Jealott's Hill in 2002. Both species were present in fields where they had been absent in 1978. When mature, they formed a sufficiently dense sward in some fields with winter wheat that it was difficult to walk round the edge of the crop.

The grasses did not invade the crop but were growing on an area of the headland that had been ploughed at some time but not cultivated. This spread is associated with increases in winter wheat cropping and has probably taken place gradually over the 24 years between the two surveys. The increase in the incidence of barren brome has been noted in the literature e.g. by Cussans, 1976, Froud-Williams and Chancellor, 1982 and Grime *et al.*, 1988.

Figure 7. Distribution map for barren brome (*Anisantha sterilis*)



## Conclusions

Extensive planting of tree and bush species has been carried out to increase suitable habitats for wildlife. There is no evidence that the use of selective herbicides has had any adverse effect on the perennial species along field borders. Lining of the edges of the main roads with kerbstones together with the remaking of the roadside ditches has reduced the number of perennial species along the roads bordering the farm. Some of the species that had declined are old grassland species with low Ellenberg Indicator Values for nitrogen. A few species have been lost or much reduced along the bridleways due to improvement of the surface for the benefit of walkers and riders. The growth of scrub has also had an effect in shading out species. The survival of perennial species from the set-aside experiment and the earlier scattering of wild flower seeds have added to the flora. The arable species have declined in number and in frequency. This is probably due to the use of selective herbicides, but the ending of field experiments on nitrogen fertilisers that had helped to maintain rich seedbanks will have had an effect. There is no difference between the Ellenberg Indicator Values for nitrogen for the arable and biennial species that have declined and for those that have increased.

## Acknowledgements

The author wishes to thank the past and present management at Jealott's Hill for permission to carry out the two surveys and particularly to Mark Osman for his interest and support for the second survey. The author also wishes to thank Stephen Hills for protecting five Bee Orchid plants from being mown so that they could flower and be identified.

The author particularly wishes to thank Camilla Lambrick for advice and encouragement during the preparation of this paper.

## References

- Andreasen, C., Stryhn, H. and Streibig, J. C. 1996. Decline of the flora in Danish arable fields. *Journal of Applied Ecology*, 33: 619-626.
- Bowen, H. J. M. 1968. *The Flora of Berkshire*. The Holywell Press, Oxford.
- Bunce, R. G. H., Smart, S.M., van de Poll, H.M., Watkins, J.W. and Scott, W.A. 1999. Measuring change in British vegetation. *ECOFACT Volume 2*. DETR.
- Cussans, G.W. 1976. The influence of changing husbandry on weeds and weed control in arable crops. *Proceedings British Crop Protection Conference – Weeds*. 1001-1009.
- Froud-Williams, R.J. and Chancellor, R.J. 1982. A survey of grass weeds in cereals in central southern England. *Weed Research*, 22: 163-171.
- Grime, J.P., Hodgson, J.G. and Hunt, R. 1988. *Comparative Plant Ecology. A functional approach to common British species*. Unwin Hyman, London.
- Guide to Field Experiments and Farm Projects 1978. Private publication by Jealott's Hill Research Centre.
- Hill, M.O., Mountford, J.O., Roy, D.B. and Bunce, R.G.H. 1999. Ellenberg's indicator values for British plants. *ECOFACT Volume 2 Technical Annex*. DETR.
- Home-Grown Cereals Authority (HGCA) 2003. [www.hgca.com](http://www.hgca.com).
- Preston, C.D., Pearman, D.A. and Dines, T. D. 2002. *New Atlas of the British and Irish Flora*. Oxford University Press.
- Smart, S.M., Firbank, L.G., Bunce, R.G.H. and Watkins, J.W. 2000. Quantifying changes in abundance of food plants for butterfly larvae and farmland birds. *Journal of Applied Ecology*, 37: 398-414.
- Sutcliffe, O.L. and Kay, Q.O.N. 2000. Changes in the arable flora of central southern England since the 1960s. *Biological Conservation*, 93: 1-8.

**Dr Geoffrey S. Davy, MRSC**  
**56 Howe Drive, Beaconsfield, Buckinghamshire, HP9 2BD**  
**geoffdavy@aol.com**

## Appendix

**Table 2. Records for tree and shrub species in 1978 and 2002**

# Introduced or increased by planting. Δ Not recorded in the Flora of Berkshire for SU8570.

Botanical Name	Common Name	Number of Records in 1978	Status in 1978	Number of Records in 2002
<i>Rubus fruticosus</i>	Bramble	151		168
<i>Crataegus monogyna</i> #	Hawthorn	112		171
<i>Quercus robur</i>	Pedunculate Oak	97		142
<i>Ulmus procera</i>	English Elm	86		66
<i>Prunus spinosa</i> #	Blackthorn	80		124
<i>Rosa canina</i> #	Dog-rose	52		97
<i>Acer campestre</i> #	Field Maple	50		107
<i>Fraxinus excelsior</i> #	Ash	50		100
<i>Sambucus nigra</i> #	Elder	42		78
<i>Salix cinerea</i>	Grey Willow	22		22
<i>Aesculus hippocastanum</i> #	Horse-chestnut	15	Planted	19
<i>Corylus avellana</i> #	Hazel	15		68
<i>Cornus sanguinea</i> #	Dogwood	13		25
<i>Rosa arvensis</i>	Field-rose	11		10
<i>Acer pseudoplatanus</i> #	Sycamore	7	Planted	12
<i>Betula pendula</i> #	Silver Birch	7	Planted	36
<i>Carpinus betulus</i> #	Hornbeam	7	Planted	32
<i>Salix fragilis</i> #	Crack-willow	7		15
<i>Ilex aquifolium</i> #	Holly	6	Planted	29
<i>Salix caprea</i> #	Goat Willow	6		17
<i>Tilia x vulgaris</i> #	Lime	6	Planted	26
<i>Ulex europaeus</i> #	Gorse	5		18
<i>Acer platanoides</i> #□Δ	Norway Maple	4	Planted	13
<i>Fagus sylvatica</i>	Beech	4	Planted	3
<i>Betula pubescens</i>	Downy Birch	3	Planted. Lost due to development.	0
<i>Sorbus torminalis</i> Δ	Wild Service-tree	3		6
<i>Populus x canescens</i> Δ	Grey Poplar	2	Planted	3
<i>Quercus ilex</i> Δ	Evergreen Oak	2	Planted	2
<i>Taxus baccata</i> #	Yew	2	Planted	10
<i>Tilia cordata</i> Δ	Small-leaved Lime	2	Planted	2
<i>Ulmus glabra</i>	Wych Elm	2		4
<i>Alnus glutinosa</i> #	Alder	1		36
<i>Ligustrum vulgare</i> #	Wild Privet	1		28
<i>Mahonia aquifolium</i>	Oregon-grape	1		0
<i>Populus alba</i> #	White Poplar	1	Planted	4
<i>Populus tremula</i> #	Aspen	1		9
<i>Prunus avium</i> #	Wild Cherry	1		33
<i>Prunus domestica</i> #	Wild Plum	1		11
<i>Pyrus communis</i> Δ	Pear	1	Planted	0
<i>Ribes rubrum</i>	Red Currant	1	In plantation	0
<i>Rubus idaeus</i>	Raspberry	1	Garden escape?	0
<i>Sorbus aucuparia</i> #	Rowan	1	Planted	23
<i>Acer saccharinum</i> #	Silver Maple	0		5

Botanical Name	Common Name	Number of Records in 1978	Status in 1978	Number of Records in 2002
<i>Aesculus carnea</i> #	Red Horse-chestnut	0		4
<i>Alnus cordata</i> #	Italian Alder	0		5
<i>Alnus incana</i> #	Grey Alder	0		14
<i>Buddleja davidii</i>	Butterfly Bush	0		1
<i>Euonymus europaeus</i> #	Spindle	0		15
<i>Malus domestica</i> #	Apple	0		18
<i>Malus sylvestris</i>	Crab Apple	0	Planted?	3
<i>Populus x canadensis</i> #	Hybrid Black-poplar	0		13
<i>Quercus cerris</i> #	Turkey Oak	0		1
<i>Rhamnus cathartica</i> #	Buckthorn	0		6
<i>Salix alba</i> #	White Willow	0		7
<i>Salix pentandra</i> #	Bay Willow	0		3
<i>Salix viminalis</i> #	Osier	0		11
<i>Ulex minor</i> #	Dwarf Gorse	0	Found in 1988.	2
<i>Viburnum lantana</i> #	Wayfaring-tree	0		13
<b><i>Viburnum opulus</i> #</b>	Guelder-rose	0		30



**Table 3. Herb Species**

# Present in set-aside seed mix sown in 1997 \*Present in seed mix sown prior to 1997  
 Δ Not recorded in the Flora of Berkshire for SU8570

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Achillea millefolium</i> #	Yarrow	5	6	4	Perennial	70	86
<i>Aegopodium podagraria</i>	Ground-elder	5	6	7	Perennial	6	12
<i>Aethusa cynapium</i>	Fool's Parsley	4	7	6	Annual	29	9
<i>Agrimonia eupatoria</i>	Agrimony	4	7	4	Perennial	18	16
<i>Agrostis capillaris</i> #	Common Bent	5	4	4	Perennial	39	32
<i>Agrostis gigantea</i>	Black Bent	6	6	7	Perennial	21	20
<i>Agrostis stolonifera</i>	Creeping Bent	6	7	6	Perennial	79	119
<i>Ajuga reptans</i>	Bugle	7	5	5	Perennial	2	0
<i>Alisma plantago-aquatica</i>	Water-plantain	10	7	7	Perennial	4	0
<i>Alliaria petiolata</i> #	Garlic Mustard	6	7	8	Biennial	73	68
<i>Allium vineale</i>	Wild Onion	5	8	6	Perennial	0	1
<i>Alopecurus geniculatus</i>	Marsh Foxtail	7	6	6	Perennial	16	4
<i>Alopecurus myosuroides</i> # Δ	Black-grass	5	7	6	Annual	93	27
<i>Alopecurus pratensis</i>	Meadow Foxtail	5	6	7	Perennial	133	82
<i>Anagallis arvensis</i> #	Scarlet Pimpernel	4	6	5	Annual or perennial	90	45
<i>Anchusa arvensis</i> Δ	Bugloss	4	6	5	Annual or biennial	1	0
<i>Angelica sylvestris</i>	Wild Angelica	8	6	5	Perennial	1	0
<i>Anisantha sterilis</i>	Barren Brome	5	8	7	Annual	83	143
<i>Anthemis arvensis</i> # Δ	Corn Chamomile	4	7	6	Annual	1	0
<i>Anthemis cotula</i>	Stinking Chamomile	5	6	6	Annual	2	2
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	6	4	3	Perennial	6	1
<i>Anthriscus sylvestris</i>	Cow Parsley	5	7	7	Perennial	146	176
<i>Antirrhinum majus</i>	Snapdragon	3	7	5	Perennial	0	1
<i>Aphanes arvensis</i>	Parsley-piert	4	6	4	Annual	25	1
<i>Aquilegia vulgaris</i> Δ	Columbine	4	6	5	Perennial	1	0
<i>Arabidopsis thaliana</i> Δ	Thale Cress	3	6	2	Annual	21	6
<i>Arctium minus</i>	Lesser Burdock	4	7	5	Perennial	24	30
<i>Armoracia rusticana</i>	Horse-radish	5	7	7	Perennial	9	8
<i>Arrhenatherum elatius</i>	False Oat-grass	5	7	7	Perennial	166	203
<i>Artemisia vulgaris</i>	Mugwort	4	8	7	Perennial	25	44
<i>Arum maculatum</i>	Lords-and-Ladies	5	7	7	Perennial	126	140
<i>Asparagus officinalis</i> Δ	Garden Asparagus	5	6	5	Perennial	1	0
<i>Atriplex patula</i>	Common Orache	5	7	7	Annual	40	23
<i>Atriplex prostrata</i>	Spear-leaved Orache	7	7	7	Annual	41	21
<i>Avena fatua</i>	Wild-oat	4	7	7	Annual	0	14
<i>Ballota nigra</i>	Black Horehound	4	8	6	Perennial	2	3
<i>Barbarea vulgaris</i>	Winter-cress	6	7	8	Biennial or perennial	49	42
<i>Bellis perennis</i>	Daisy	5	6	4	Perennial	35	58
<i>Bidens tripartita</i>	Trifid Bur-marigold	8	7	7	Annual	1	0
<i>Brachypodium sylvaticum</i>	False Brome	5	6	5	Perennial	23	19
<i>Bromopsis ramosa</i>	Hairy-brome	5	7	7	Perennial	21	10
<i>Bromus hordeaceus</i>	Soft-brome	4	7	4	Annual to perennial	82	152
<i>Bryonia dioica</i>	White Bryony	5	7	7	Perennial	27	9

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Calamagrostis epigejos</i>	Wood Small-reed	7	7	6	Perennial	1	0
<i>Callitriche stagnalis</i> Δ	Common Water-starwort	10	6	6	Annual to perennial	7	5
<i>Calystegia sepium</i> #	Hedge Bindweed	8	7	7	Perennial	37	57
<i>Calystegia silvatica</i>	Large Bindweed	5	7	6	Perennial	0	2
<i>Campanula trachelium</i>	Nettle-leaved Bellflower	5	7	6	Introduced	0	1
<i>Capsella bursa-pastoris</i> #	Shepherd's-purse	5	7	7	Annual	159	52
<i>Cardamine flexuosa</i>	Wavy Bitter-cress	7	6	6	Biennial to	6	2
<i>Cardamine hirsuta</i>	Hairy Bitter-cress	5	6	6	Annual	41	52
<i>Cardamine pratensis</i>	Cuckooflower	8	5	4	Perennial	4	1
<i>Carex divulsa</i> Δ	Grey Sedge	7	7	6	Perennial	4	4
<i>Carex hirta</i>	Hairy Sedge	7	7	6	Perennial	12	10
<i>Carex otrubae</i>	False Fox-sedge	8	7	7	Perennial	8	3
<i>Carex ovalis</i>	Oval sedge	7	5	4	Perennial	2	0
<i>Carex remota</i>	Remote Sedge	8	6	6	Perennial	6	1
<i>Carex spicata</i>	Spiked Sedge	6	6	4	Perennial	2	0
<i>Centaurea cyanus</i> #	Cornflower	5	6	5	Annual	1	5
<i>Centaurea nigra</i> #	Common Knapweed	5	6	5	Perennial	50	53
<i>Cerastium fontanum</i> #	Common Mouse-ear	5	5	4	Perennial	48	33
<i>Cerastium glomeratum</i>	Sticky Mouse-ear	5	6	5	Annual	101	29
<i>Chaenorhinum minus</i> # Δ	Small Toadflax	4	7	4	Annual	1	0
<i>Chaerophyllum temulum</i>	Rough Chervil	5	7	7	Biennial	3	2
<i>Chamerion angustifolium</i>	Rosebay Willowherb	5	6	5	Perennial	14	5
<i>Chenopodium polyspermum</i>	Many-seeded Goosefoot	6	7	8	Annual	65	12
<i>Chenopodium album</i> #	Fat-hen	5	7	7	Annual	148	69
<i>Chenopodium ficifolium</i>	Fig-leaved Goosefoot	6	6	7	Annual	0	3
<i>Chenopodium hybridum</i>	Maple-leaved Goosefoot	4	7	7	Annual	0	2
<i>Chenopodium rubrum</i> Δ	Red Goosefoot	7	7	8	Annual	9	1
<i>Chrysanthemum segetum</i> #	Corn Marigold	5	6	5	Annual	1	10
<i>Circaea lutetiana</i>	Enchanter's-nightshade	6	7	6	Perennial	2	0
<i>Cirsium arvense</i> #	Creeping Thistle	6	7	6	Perennial	178	209
<i>Cirsium vulgare</i> #	Spear Thistle	5	6	6	Biennial	80	123
<i>Claytonia perfoliata</i> Δ	Springbeauty	6	5	5	Annual	1	0
<i>Cochlearia danica</i>	Danish Scurvygrass	6	7	5	Annual to biennial	0	1
<i>Convolvulus arvensis</i> #	Field Bindweed	4	8	6	Perennial	129	141
<i>Conyza canadensis</i> #	Canadian Fleabane	4	7	6	Annual	0	1
<i>Coronopus didymus</i> Δ	Lesser Swine-cress	5	6	7	Annual or biennial	1	2
<i>Coronopus squamatus</i>	Swine-cress	5	7	7	Annual or biennial	49	27
<i>Crepis biennis</i> Δ	Rough Hawk's-beard	5	7	6	Biennial	3	0
<i>Crepis capillaris</i>	Smooth Hawk's-beard	4	7	4	Annual	39	28
<i>Crepis vesicaria</i> Δ	Beaked Hawk's-beard	5	7	7	Biennial	17	15
<i>Cymbalaria muralis</i>	Ivy-leaved Toadflax	5	7	6	Perennial	0	1
<i>Cynosurus cristatus</i> #	Crested Dog's-tail	5	6	4	Perennial	11	12
<i>Dactylis glomerata</i> #	Cock's-foot	5	7	6	Perennial	198	176
<i>Daucus carota</i> #	Wild Carrot	5	7	8	Perennial	19	22
<i>Deschampsia cespitosa</i>	Tufted hair-grass	6	5	4	Perennial	17	11
<i>Dipsacus fullonum</i> #	Wild Teasel	7	7	7	Biennial	18	18
<i>Dryopteris dilatata</i>	Broad Buckler-fern	6	4	5	Perennial	0	2
<i>Dryopteris filix-mas</i>	Male-fern	6	5	5	Perennial	19	14
<i>Echium vulgare</i> #	Viper's-bugloss	4	7	4	Biennial	0	5

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Elytrigia repens</i>	Common Couch	5	7	7	Perennial	201	173
<i>Epilobium ciliatum</i> Δ	American Willowherb	6	6	6	Perennial	68	36
<i>Epilobium hirsutum</i>	Great Willowherb	8	7	7	Perennial	45	75
<i>Epilobium montanum</i> #	Broad-leaved Willowherb	6	6	6	Perennial	1	2
<i>Equisetum arvense</i>	Field Horsetail	6	6	6	Perennial	9	11
<i>Erodium cicutarium</i> #	Common Stork's-bill	4	6	4	Annual	5	1
<i>Erysimum cheiranthoides</i>	Treacle Mustard	5	7	7	Annual	11	0
<i>Euphorbia amygdaloides</i>	Wood Spurge	5	6	6	Perennial	2	3
<i>Euphorbia exigua</i>	Dwarf Spurge	4	7	5	Annual	2	0
<i>Euphorbia helioscopia</i> #	Sun Spurge	5	6	6	Annual	14	2
<i>Euphorbia peplus</i>	Petty Spurge	4	7	6	Annual	2	2
<i>Fallopia convolvulus</i> #	Black-bindweed	4	7	5	Annual	69	14
<i>Festuca arundinacea</i>	Tall Fescue	6	7	6	Perennial	21	8
<i>Festuca gigantea</i>	Giant Fescue	6	7	7	Perennial	6	3
<i>Festuca pratensis</i>	Meadow Fescue	6	6	6	Perennial	4	0
<i>Festuca rubra</i> #	Red Fescue	5	6	5	Perennial	48	23
<i>Filipendula ulmaria</i>	Meadowsweet	8	6	5	Perennial	1	1
<i>Fumaria officinalis</i> #	Common Fumitory	5	7	6	Annual	8	4
<i>Galanthus nivalis</i>	Snowdrop	6	7	7	Perennial	0	1
<i>Galeopsis tetrahit</i> #	Common Hemp-nettle	5	6	6	Annual	3	2
<i>Galinsoga parviflora</i> Δ	Gallant-soldier	4	6	7	Annual	1	0
<i>Galium aparine</i> #	Cleavers	6	7	8	Annual	182	183
<i>Galium mollugo</i> *	Hedge Bedstraw	4	7	4	Perennial	0	5
<i>Galium palustre</i>	Common Marsh-bedstraw	9	5	4	Perennial	5	3
<i>Galium verum</i>	Lady's Bedstraw	4	6	2	Perennial	5	11
<i>Geranium dissectum</i> #	Cut-leaved Crane's-bill	5	7	6	Annual	114	149
<i>Geranium molle</i> #	Dove's-foot Crane's-bill	5	6	5	Annual	10	0
<i>Geranium pratense</i> *	Meadow Crane's-bill	6	7	7	Perennial	0	2
<i>Geranium robertianum</i>	Herb-Robert	6	6	6	Annual or biennial	25	25
<i>Geum urbanum</i>	Wood Avens	6	7	7	Perennial	29	40
<i>Glechoma hederacea</i> #	Ground-ivy	6	7	7	Perennial	86	68
<i>Glyceria fluitans</i>	Floating Sweet-grass	10	6	6	Perennial	7	1
<i>Glyceria notata</i> Δ	Plicate Sweet-grass	10	6	7	Perennial	2	0
<i>Gnaphalium uliginosum</i>	Marsh Cudweed	6	6	5	Annual	35	4
<i>Hedera helix</i>	Ivy	5	7	6	Perennial	93	84
<i>Heracleum sphondylium</i>	Hogweed	5	7	7	Perennial	137	140
<i>Holcus lanatus</i> #	Yorkshire-fog	6	6	5	Perennial	168	174
<i>Holcus mollis</i>	Creeping Soft-grass	6	3	3	Perennial	26	9
<i>Hordeum murinum</i>	Wall Barley	4	7	6	Annual	43	41
<i>Humulus lupulus</i>	Hop	7	7	8	Perennial	2	2
<i>Hyacinthoides non-scripta</i>	Bluebell	5	5	6	Perennial	37	45
<i>Hypericum hirsutum</i>	Hairy St. John's-wort	5	7	5	Perennial	1	5
<i>Hypericum humifusum</i>	Trailing St. John's-wort	6	4	3	Perennial	0	1
<i>Hypericum perforatum</i>	Perforate St John's-wort	4	7	5	Perennial	18	20
<i>Hypericum pulchrum</i> Δ	Slender St. John's-wort	5	4	3	Perennial	1	1
<i>Hypericum tetrapterum</i>	Square-stalked St. John's-wort	8	6	4	Perennial	4	3
<i>Hypochaeris radicata</i>	Cat's-ear	4	5	3	Perennial	41	20
<i>Juncus bufonius</i>	Toad Rush	7	6	5	Annual	17	9
<i>Juncus conglomeratus</i>	Compact Rush	7	4	3	Perennial	2	1

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Juncus effusus</i>	Soft Rush	7	4	4	Perennial	28	23
<i>Juncus inflexus</i>	Hard Rush	7	7	5	Perennial	2	2
<i>Kickxia elatine</i>	Sharp-leaved Fluellen	4	6	5	Annual	36	9
<i>Kickxia spuria</i>	Round-leaved Fluellen	5	7	5	Annual	16	3
<i>Knautia arvensis</i> *	Field Scabious	3	8	4	Perennial	0	4
<i>Lactuca serriola</i> # Δ	Prickly lettuce	5	7	6	Annual or biennial	12	45
<i>Lactuca virosa</i>	Great Lettuce	4	7	7	Annual or biennial	0	5
<i>Lamium album</i> #	White Dead-nettle	5	7	8	Perennial	127	87
<i>Lamium amplexicaule</i> Δ	Henbit Dead-nettle	4	7	6	Annual	20	1
<i>Lamium hybridum</i> Δ	Cut-leaved Dead-nettle	5	7	6	Annual	31	2
<i>Lamium purpureum</i> #	Red Dead-nettle	5	7	7	Annual	149	75
<i>Lapsana communis</i> #	Nippelwort	4	7	7	Annual to perennial	61	90
<i>Lathyrus nissolia</i> Δ	Grass Vetchling	6	7	6	Annual	6	0
<i>Lathyrus pratensis</i> #	Meadow Vetchling	6	6	5	Perennial	46	43
<i>Lemna minor</i>	Common Duckweed	11	7	6	Perennial	2	0
<i>Leontodon autumnalis</i> #	Autumnal Hawkbit	6	6	4	Perennial	48	47
<i>Leontodon saxatilis</i>	Lesser Hawkbit	5	6	3	Perennial	3	4
<i>Lepidium campestre</i> Δ	Field Pepperwort	4	7	6	Annual or biennial	4	0
<i>Lepidium draba</i> Δ	Hoary Cress	4	8	6	Perennial	1	0
<i>Lepidium ruderales</i>	Narrow-leaved Pepperwort	4	7	7	Annual or biennial	0	4
<i>Leucanthemum vulgare</i> #	Oxeye Daisy	4	7	4	Perennial	10	44
<i>Linum bienne</i> Δ	Pale Flax	4	7	5	Biennial or	1	0
<i>Listera ovata</i> Δ	Common Twayblade	5	7	5	Perennial	1	0
<i>Lolium multiflorum</i>	Italian Rye-grass	5	7	7	Annual, biennial	91	12
<i>Lolium perenne</i>	Perennial Rye-grass	5	6	6	Perennial	229	207
<i>Lonicera periclymenum</i>	Honeysuckle	6	5	5	Perennial	26	24
<i>Lotus corniculatus</i> #	Bird's-foot-trefoil	4	6	2	Perennial	5	12
<i>Lotus pedunculatus</i> #	Greater Bird's-foot-trefoil	8	6	4	Perennial	10	8
<i>Luzula campestris</i>	Field Wood-rush	4	5	2	Perennial	4	0
<i>Lycopus europaeus</i>	Gipsywort	8	7	6	Perennial	4	0
<i>Lysimachia nummularia</i>	Creeping-Jenny	7	5	5	Perennial	4	0
<i>Malva moschata</i> #	Musk-mallow	3	7	4	Perennial	0	26
<i>Malva neglecta</i> #	Dwarf Mallow	4	8	7	Annual	1	0
<i>Malva sylvestris</i>	Common Mallow	5	6	6	Perennial	22	19
<i>Matricaria discoidea</i>	Pineapple-weed	5	7	7	Annual	63	13
<i>Matricaria recucita</i> # Δ	Scented Mayweed	5	7	7	Annual	152	77
<i>Medicago arabica</i>	Spotted Medick	5	6	5	Annual	0	2
<i>Medicago lupulina</i>	Black Medick	4	8	4	Annual	21	33
<i>Medicago sativa</i>	Lucerne	4	6	5	Perennial	2	1
<i>Melilotus altissimus</i> Δ	Tall Melilot	6	7	7	Biennial	1	0
<i>Mentha arvensis</i>	Corn Mint	7	7	6	Perennial	2	0
<i>Mentha x smithiana</i> Δ	Tall Mint				Perennial	1	0
<i>Mercurialis perennis</i>	Dog's Mercury	6	7	7	Perennial	1	1
<i>Moehringia trinervia</i>	Three-veined Sandwort	5	7	6	Annual	14	3
<i>Muscari armeniacum</i>	Garden Grape-hyacinth				Perennial	0	2
<i>Myosotis arvensis</i> #	Field Forget-me-not	5	6	6	Biennial	29	31
<i>Narcissus sp</i>	Daffodil				Perennial	0	26
<i>Odontites vernus</i>	Red Bartsia	5	6	5	Annual	15	1
<i>Oenanthe crocata</i>	Hemlock Water-dropwort	8	6	7	Perennial	16	19

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Ophrys apifera</i>	Bee Orchid	4	8	3	Introduced in soil?	0	2
<i>Papaver argemone</i> Δ	Prickly Poppy	4	6	5	Annual	1	0
<i>Papaver dubium</i> #	Long-headed Poppy	5	6	5	Annual	1	1
<i>Papaver rhoeas</i> #	Common Poppy	5	7	6	Annual	11	8
<i>Persicaria amphibia</i>	Amphibious Bistort	10	6	6	Perennial	6	7
<i>Persicaria hydropiper</i> #	Water-pepper	7	6	6	Annual	10	6
<i>Persicaria lapathifolia</i> #	Pale Persicaria	6	7	7	Annual	22	10
<i>Persicaria maculosa</i> #	Redshank	6	6	7	Annual	97	45
<i>Phalaris arundinacea</i> #	Reed Canary-grass	8	7	7	Perennial	1	0
<i>Phleum bertolonii</i> # Δ	Smaller Cat's-tail	4	7	4	Perennial	27	41
<i>Phleum pratense</i> #	Timothy	5	7	6	Perennial	49	32
<i>Phragmites australis</i>	Common Reed	10	7	6	Perennial	0	1
<i>Picris echioides</i>	Bristly Oxtongue	5	7	6	Annual or biennial	7	53
<i>Pimpinella saxifraga</i>	Burnet-saxifrage	4	7	3	Perennial	33	5
<i>Plantago lanceolata</i> #	Ribwort Plantain	5	6	4	Perennial	56	95
<i>Plantago major</i> #	Greater Plantain	5	7	6	Perennial	151	161
<i>Poa annua</i> #	Annual Meadow-grass	5	6	7	Annual to perennial	243	185
<i>Poa nemoralis</i>	Wood Meadow-grass	5	6	5	Perennial	9	1
<i>Poa pratensis</i> #	Smooth Meadow-grass	5	6	5	Perennial	62	55
<i>Poa trivialis</i> #	Rough Meadow-grass	6	6	6	Perennial	214	197
<i>Polygonum arenastrum</i>	Equal-leaved Knotgrass	5	7	6	Annual	20	7
<i>Polygonum aviculare</i> #	Knotgrass	5	6	7	Annual	183	67
<i>Polystichum setiferum</i> Δ	Soft Shield-fern	5	5	6	Perennial	2	2
<i>Potentilla anserina</i>	Silverweed	7	7	6	Perennial	10	1
<i>Potentilla reptans</i> #	Creeping Cinquefoil	5	7	5	Perennial	59	52
<i>Potentilla sterilis</i>	Barren Strawberry	5	5	5	Perennial	5	0
<i>Potamogeton polygonifolius</i> Δ	Bog Pondweed	10	4	2	Perennial	1	0
<i>Primula veris</i> #	Cowslip	4	7	3	Perennial	1	3
<i>Primula vulgaris</i>	Primrose	5	6	4	Perennial	18	16
<i>Prunella vulgaris</i> #	Selfheal	5	6	4	Perennial	19	59
<i>Pulicaria dysenterica</i>	Common Fleabane	7	7	4	Perennial	31	28
<i>Ranunculus acris</i> #	Meadow Buttercup	6	6	4	Perennial	46	40
<i>Ranunculus arvensis</i> Δ	Corn Buttercup	5	7	6	Annual	10	0
<i>Ranunculus auricomus</i>	Goldilocks Buttercup	7	6	5	Perennial	8	7
<i>Ranunculus bulbosus</i>	Bulbous Buttercup	4	7	4	Perennial	11	0
<i>Ranunculus ficaria</i>	Lesser Celandine	6	6	6	Perennial	17	24
<i>Ranunculus flammula</i>	Lesser Spearwort	9	5	3	Perennial	1	0
<i>Ranunculus peltatus</i> Δ	Pond Water-crowfoot	11	5	6	Annual to perennial	2	0
<i>Ranunculus repens</i> #	Creeping Buttercup	7	6	7	Perennial	183	163
<i>Ranunculus sceleratus</i>	Celery-leaved Buttercup	8	8	8	Annual	4	2
<i>Raphanus raphanistrum</i>	Wild Radish	5	6	6	Annual to biennial	8	2
<i>Reseda luteola</i>	Weld	4	8	6	Biennial	1	1
<i>Rorippa nasturtium-aquaticum</i>	Water-cress	10	7	7	Perennial	9	4
<i>Rumex acetosa</i> #	Common Sorrel	5	5	4	Perennial	51	34
<i>Rumex acetosella</i> #	Sheep's Sorrel	5	4	3	Perennial	11	1
<i>Rumex conglomeratus</i>	Clustered Dock	8	7	7	Perennial	3	0
<i>Rumex crispus</i> #	Curled Dock	6	7	6	Perennial	141	90
<i>Rumex obtusifolius</i> #	Broad-leaved Dock	5	7	9	Perennial	127	118
<i>Rumex sanguineus</i>	Wood Dock	7	7	7	Perennial	65	85

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Sagina procumbens</i>	Procumbent Pearlwort	6	6	5	Perennial	8	0
<i>Scleranthus annuus</i> Δ	Annual Knawel	4	4	4	Annual	1	0
<i>Scrophularia auriculata</i>	Water Figwort	8	7	7	Perennial	0	1
<i>Scrophularia nodosa</i>	Common Figwort	6	7	6	Perennial	24	16
<i>Senecio erucifolius</i>	Rough Ragwort	5	7	5	Perennial	26	29
<i>Senecio jacobea</i>	Common Ragwort	4	6	4	Perennial	12	47
<i>Senecio squalidus</i>	Oxford Ragwort	4	7	7	Biennial or	12	3
<i>Senecio vulgaris</i> #	Groundsel	5	7	7	Annual	181	77
<i>Serratula tinctoria</i>	Saw-wort	6	6	2	Perennial	2	0
<i>Sherardia arvensis</i>	Field Madder	4	6	4	Annual	2	0
<i>Silene dioica</i> #	Red Campion	6	6	7	Perennial	0	13
<i>Silene latifolia</i> #	White Campion	4	7	6	Short-lived	7	6
<i>Sinapis arvensis</i> #	Charlock	5	7	7	Annual	75	24
<i>Sison amomum</i>	Stone Parsley	4	7	5	Biennial	46	90
<i>Sisymbrium officinale</i> #	Hedge Mustard	4	7	7	Annual	47	51
<i>Smyrnium olusatrum</i> Δ	Alexanders	5	7	7	Perennial	2	2
<i>Solanum dulcamara</i>	Bittersweet	8	7	7	Perennial	73	45
<i>Solanum nigrum</i>	Black Nightshade	5	7	8	Annual	81	21
<i>Sonchus arvensis</i>	Perennial Sow-thistle	6	7	6	Perennial	14	12
<i>Sonchus asper</i> #	Prickly Sow-thistle	5	7	6	Annual	170	85
<i>Sonchus oleraceus</i> #	Smooth Sow-thistle	5	7	7	Annual	95	53
<i>Spergula arvensis</i>	Corn Spurrey	4	5	5	Annual	18	2
<i>Stachys arvensis</i> Δ	Field Woundwort	5	5	5	Annual	5	0
<i>Stachys officinalis</i>	Betony	5	5	3	Perennial	2	0
<i>Stachys palustris</i>	Marsh Woundwort	8	7	7	Perennial	5	5
<i>Stachys sylvatica</i>	Hedge Woundwort	6	7	8	Perennial	98	78
<i>Stellaria graminea</i> #	Lesser Stitchwort	6	5	4	Perennial	36	20
<i>Stellaria holostea</i> #	Greater Stitchwort	5	6	6	Perennial	66	61
<i>Stellaria media</i> #	Common Chickweed	5	6	7	Annual	218	78
<i>Symphytum x uplandicum</i>	Russian Comfrey	5	7	7	Perennial	1	2
<i>Tamus communis</i>	Black Bryony	5	7	6	Perennial	39	35
<i>Tanacetum parthenium</i>	Feverfew	4	7	6	Perennial	1	2
<i>Tanacetum vulgare</i> #	Tansy	6	7	7	Perennial	0	6
<i>Taraxacum officinale</i> #	Dandelion	5	7	6	Perennial	164	159
<i>Thlaspi arvense</i>	Field Penny-cress	4	7	6	Annual	10	0
<i>Torilis japonica</i>	Upright Hedge-parsley	5	7	7	Annual	26	19
<i>Tragopogon pratensis</i>	Goat's-beard	4	7	5	Annual to perennial	0	5
<i>Trifolium dubium</i> #	Lesser Trefoil	4	6	5	Annual	53	44
<i>Trifolium hybridum</i>	Alsike Clover	5	7	6	Perennial	9	1
<i>Trifolium micranthum</i> Δ	Slender Trefoil	5	5	5	Annual	3	0
<i>Trifolium pratense</i> #	Red Clover	5	7	5	Perennial	60	30
<i>Trifolium repens</i> #	White Clover	5	6	6	Perennial	134	143
<i>Trifolium subterraneum</i> Δ	Subterranean Clover	3	4	2	Annual	1	0
<i>Tripleurospermum inodorum</i> #	Scentless Mayweed	5	6	6	Annual	194	111
<i>Trisetum flavescens</i>	Yellow oat-grass	4	7	4	Perennial	2	0
<i>Tussilago farfara</i>	Colt's-foot	6	6	6	Perennial	5	2
<i>Typha latifolia</i> *	Bulrush	10	7	7	Perennial	0	3
<i>Urtica dioica</i>	Common Nettle	6	6	8	Perennial	199	203
<i>Urtica urens</i>	Small Nettle	5	6	8	Annual	3	0

Botanical Name	Common Name	Ellenberg's Indicator Values			Notes	Number of Records	
		F	R	N		1978	2002
<i>Verbascum thapsus</i> #	Great Mullein	4	7	5	Perennial	1	5
<i>Veronica agrestis</i>	Green Field-speedwell	6	6	7	Annual	0	7
<i>Veronica arvensis</i>	Wall Speedwell	4	6	5	Annual	24	2
<i>Veronica beccabunga</i>	Brooklime	10	6	6	Perennial	4	1
<i>Veronica chamaedrys</i>	Germander Speedwell	5	6	5	Perennial	36	31
<i>Veronica hederifolia</i> #	Ivy-leaved Speedwell	5	7	6	Annual	31	18
<i>Veronica persica</i> #	Common Field-speedwell	5	7	7	Annual	136	86
<i>Veronica polita</i> Δ	Grey Field-speedwell	4	7	5	Annual	5	0
<i>Veronica serpyllifolia</i>	Thyme-leaved Speedwell	5	6	5	Perennial	2	2
<i>Vicia cracca</i>	Tufted Vetch	6	7	5	Perennial	15	10
<i>Vicia faba</i>	Broad Bean	4	7	7	Annual	0	3
<i>Vicia hirsuta</i>	Hairy Tare	5	6	6	Annual	6	8
<i>Vicia sativa</i>	Common Vetch	4	7	4	Annual	39	56
<i>Vicia sepium</i> #	Bush Vetch	5	6	6	Perennial	30	33
<i>Vicia tetrasperma</i>	Smooth Tare	5	7	6	Annual	10	13
<i>Vinca major</i> Δ	Greater Periwinkle	6	7	6	Perennial	1	2
<i>Viola arvensis</i> #	Field Pansy	4	6	6	Annual	18	17
<i>Viola odorata</i> Δ	Sweet Violet	5	7	7	Perennial	3	1
<i>Viola riviniana</i>	Common Dog-violet	5	5	4	Perennial	4	3
<i>Viola tricolor</i>	Wild Pansy	4	6	4	Annual to perennial	0	2
<i>Vulpia bromoides</i>	Squirreltail Fescue	4	5	3	Annual	1	0