



Important Arable Plant Areas In Bedfordshire's Chalk Arc

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Field gromwell *Lithospermum arvense*
Photo by Tico Bassie



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Summary

Many arable plants once common and considered as weeds are now exceedingly rare. This has prompted the inclusion of several species on the Biodiversity Action Plan Priority List, and the formulation of an Arable Field Margins Habitat Action Plan.

This report outlines the results of a survey of selected known arable plant areas, previously mapped at 1km square scale, by the Wildlife Trust for Bedfordshire with the aim of identifying, mapping species locations and characterising Nationally Important Arable Plant Areas within the Chalk Arc.

Six sites identified in a preliminary study were surveyed between July and September 2007. Sites were assessed using the Plantlife Criteria to determine whether they could be deemed of County, National or European Importance by virtue of their arable plants species assemblage.

Important arable plant species were found at all of the survey sites that had not previously been recorded, which resulted in each site's score increasing. In total 32 important arable plant species have been recorded, with between 12 and 18 species at each site.

The surveys confirmed that the six 1km squares remain as being of National Importance for arable plants. During the survey the entire Galley and Warden Hills area was surveyed as one unit, and the cumulative score of 73 signifies it is of European Importance.

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1 Introduction

Many arable plants once common and considered as weeds are now exceedingly rare. This has prompted the inclusion of several species on the Biodiversity Action Plan Priority List, and the formulation of an Arable Field Margins Habitat Action Plan.

Many of these species now rely on the longevity of their seeds within the seed bank, enabling them to germinate in years when conditions are suitable. These plants in turn attract a range of animals including butterflies, beetles, mammals and birds (Bedfordshire and Luton Wildlife Working Group 2001).

Bedfordshire is ranked within the 15 richest vice-counties for arable plants in Britain with an accumulative species score of 307 (Still & Byfield 2007). This report outlines the results of a survey by the Wildlife Trust for Bedfordshire of nationally important Arable Plant Areas (IAPA) within the Chalk Arc.

The project aims were to identify, map and characterise sites within the Chalk Arc, of county, national and/or European importance for arable plant conservation, using the Plantlife International methodology for identifying outstanding assemblages of arable plants.

Plantlife International defines an Important Plant Area as *a natural or semi-natural site exhibiting exceptional botanical richness and/or supporting an outstanding assemblage of rare, threatened and/or endemic plant species and/or vegetation of high botanic value* (Byfield & Wilson 2005).

Arable plants are considered to include only *non-casual, arable populations of naturally occurring species* (Byfield & Wilson 2005).

2 Methodology

2.1 Identification of Sites

A preliminary study by the Biodiversity Recording and Monitoring Centre (BRMC) (BedsLife 2007) used the scoring system designed by Plantlife International and the arable plant records held for the county to calculate a score for each 1km grid square in Bedfordshire.

This preliminary study identified six key 1km squares within the Chalk Arc, which were classified as being of National Importance. These sites were visited between July and September 2007 to determine the presence and distribution of important arable plant species.

The six survey sites are listed below, with the site score resulting from the preliminary study shown in brackets:

- South of Wingfield TL0025 (50)
- South of Chalton TL0325 (38)
- Barton Hills TL0829 (37)
- Warden Hill South TL0925 (41)
- Galley Hill North TL0927 (63)
- East of Barton TL0930 (39)

2.2 Site Survey and Scoring

Arable plant species are predominantly restricted to field margins, which escape the most intensive management. Survey effort was therefore concentrated along field edges and the immediate cropped edge. Whilst the intention of the study was to record important arable plants, other vascular plant species were also noted to build up a more complete picture of species diversity and composition.

Where a highly scoring important arable plant species was recorded, a ten-figure grid reference was taken using a Garmin GPS.

The scoring system designed by Plantlife International (Table 1) was used to calculate a total score for each site based on its arable plant composition. Each species is assigned a score between one and nine, which relates to its current occurrence, recent decline and current species threat.

Table 1 Scoring categories for arable plant species (Byfield & Wilson 2005)

Score	Status
9	Threatened-critically endangered (CR)
8	Threatened-endangered (EN/E)
7	Threatened-vulnerable (VU/V)
6	Near threatened (NT)
5	Additional Nationally Scarce: 16 to 50 10-km squares; or 51 to 100 10-km squares, change index less than -1.0
4	Additional Nationally Scarce: 51 to 100 10-km squares, change index greater than -1.0
3	Species of local concern: 101 to 500 10-km squares
2	Species of local concern: 501 to 1000 10-km squares
1	Species of local concern: 1001 to 1500 10-km squares, change index less than 0.0 (i.e. negative)

Three broad geological substrate categories are used along with the total score to determine the importance level of a site, as Local, National or European Importance (Table 2).

Table 2 Threshold scores for calculating importance of an arable plant site (Byfield & Wilson 2005)

	Chalk and limestone-derived soils (excluding clays)	Clays	Sands and freely draining acidic soils
European Importance	90+	70+	70+
National Importance	45-89	30-69	35-69
County Importance	30-44	20-29	20-34

The six survey sites lie on a mixture of freely draining lime-rich loamy soils and shallow lime-rich soils over chalk or limestone. As such they are not all subject to the same scoring system; those lying on freely draining lime-rich loamy soils are scored according to the *sands and freely draining acidic soils* thresholds, whilst those lying on shallow lime-rich soils over chalk or limestone are scored according to the *chalk and limestone-derived soils (excluding clays)* thresholds.

In calculating site scores, both the species recorded during the survey and the species records held by the BRMC were used to produce a cumulative score. This reflects the fact that arable plants can remain dormant for long periods in the seed-bank and will not necessarily be found on an annual basis, and therefore aims to build a more complete picture of the importance of each site for arable plants.

3 Results

At all six of the survey sites, important arable plant species were found that had not previously been recorded. This resulted in each site's score increasing, by up to 20 in the case of Site 6: east of Barton.

The six 1km grid squares all remain as being of National Importance. During the study it was decided to survey the entire Galley and Warden Hills area (of which Site 4 and 5 are part). When this entire unit is taken as a site as opposed to the 1km grid squares used in this methodology, the cumulative score of 73 identifies Galley and Warden Hills as being of European Importance for arable plants (Site 5: Galley Hill North on its own is only under the threshold by one point).

In total over all six sites 32 important arable plant species have been recorded, with 26 of these found during the 2007 surveys.

The most significant species recorded are:
 *not recorded during the 2007 surveys

Threatened-critically endangered	Red Hemp-nettle <i>Galeopsis angustifolia</i>
Threatened-endangered	Ground Pine <i>Ajuga chamaepitys</i> Corn Chamomile <i>Anthemis arvensis</i> * Cornflower <i>Centaurea cyanus</i> * Field Gromwell <i>Lithospermum arvense</i> Narrow-fruited Cornsalad <i>Valerianella dentata</i> Broad-fruited Cornsalad <i>Valerianella rimosa</i>
Threatened-vulnerable	Rye Brome <i>Bromus secalinus</i> * Few-flowered Fumitory <i>Fumaria vaillantii</i> Prickly Poppy <i>Papaver argemone</i>
Near threatened	Great Pignut <i>Bunium bulbocastanum</i> Dwarf Spurge <i>Euphorbia exigua</i>

3.1 Site 1: South of Wingfield TL0025 (preliminary score 50)

Date of survey: 24 July 2007
 Surveyors: Laura Downton, Laurie Jackson

The site consisted of several wheat fields yet to be harvested, with well-used public footpaths and bridleways running along many of the field margins. Grasses dominated many of the margins however four Important Arable Plants were recorded (Table 3).

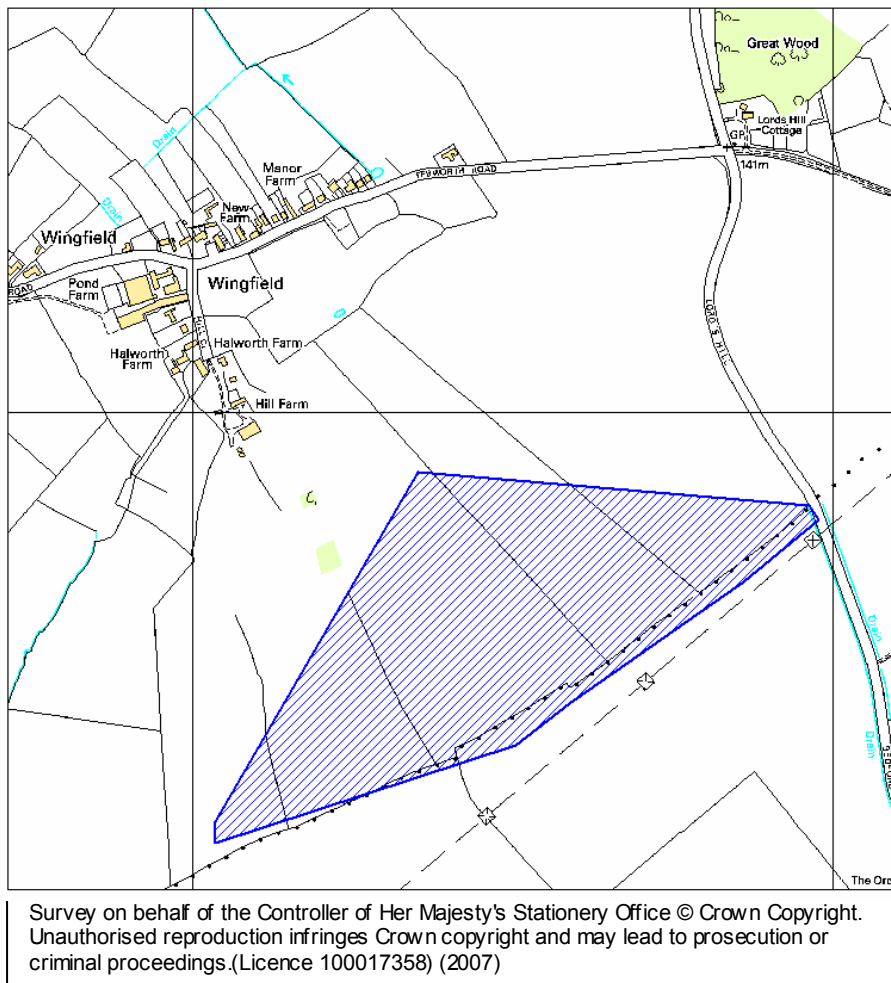
Table 3 Important Arable Plants recorded at Site 1. Species recorded during the 2007 survey are highlighted

Common Name	Latin Name	Score
Black Grass	<i>Alopercurus myosuroides</i>	2
Corn Chamomile	<i>Anthemis arvensis</i>	8
Rye Brome	<i>Bromus secalinus</i>	7
Cornflower	<i>Centaurea cyanus</i>	8
Small Toadflax	<i>Chaenorhinum minus</i>	1
Dwarf Spurge	<i>Euphorbia exigua</i>	6
Broad-leaved Spurge	<i>Euphorbia platyphyllos</i>	3
Sharp-leaved Fluellen	<i>Kickxia elatine</i>	2
Round-leaved Fluellen	<i>Kickxia spuria</i>	3
Babington's Poppy	<i>Papaver dubium lecoqii</i>	2
Narrow-fruited Cornsalad	<i>Valerianella dentata</i>	8
Grey Field-speedwell	<i>Veronica polita</i>	2
Total Score		52

A complete species list can be found in Appendix 1.

The most significant species found was Dwarf Spurge, which is classified as *near threatened*. This was concentrated in three main areas, in reasonable numbers. There were smaller patches of Broad-leaved Spurge *Euphorbia platyphyllos* and Round-leaved Fluellen *Kickxia spuria*, the latter of which extended further into the crop, taking advantage of islands.

Figure 1 Important Arable Plant Area at Site 1



In total 12 important arable plant species have been recorded at Site 1: South of Wingfield, two of which are classified as *endangered*.

Using the Plantlife International scoring system, this site has a total score of 52 and is classified as being of National Importance.

3.2 Site 2: South of Chalton TL0325 (preliminary score 38)

Date of survey: 12 September 2007

Surveyor: Laurie Jackson

The site consisted of harvested cereal fields, with many of the edges botanically quite sparse. A smaller field adjacent to Sundon Road was dominated by tall ruderals indicating it had not been cultivated that year. A footpath and byway open to all traffic run through the site, with both appearing to be well used.

In total 12 important arable plant species have been recorded at Site 2: South of Chalton, one of which is classified as endangered.

Using the Plantlife International scoring system, this site has a total score of 39 and is classified as being of National Importance.

3.3 Site 3: Barton Hills TL0829 (preliminary score 37)

Date of survey: 7 August 2007

Surveyors: Graham Bellamy, Chris Boon, Laurie Jackson

The site consisted of a mixture of set-aside, corn and ploughed fields. It appeared that some of the field edges had been sprayed, presumably for grass.

Table 5 Important Arable Plants recorded at Site 3. Species recorded during the 2007 survey are highlighted

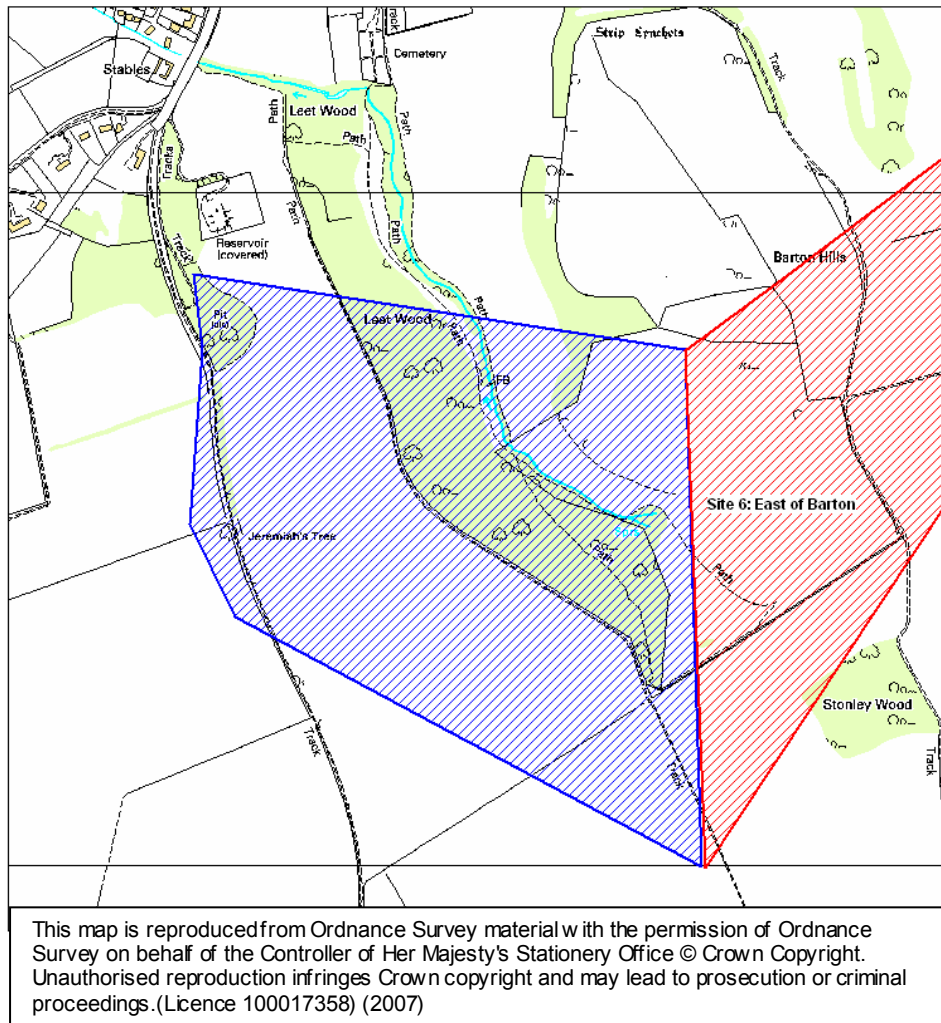
Common Name	Latin Name	Score
Black Grass	<i>Alopercurus myosuroides</i>	2
Small Toadflax	<i>Chaenorhinum minus</i>	1
Dwarf Spurge	<i>Euphorbia exigua</i>	6
Small-flowered Crane's-bill	<i>Geranium pusillum</i>	2
Sharp-leaved Fluellen	<i>Kickxia elatine</i>	2
Round-leaved Fluellen	<i>Kickxia spuria</i>	3
Henbit Dead-nettle	<i>Lamium amplexicaule</i>	1
Venus's-looking-glass	<i>Legousia hybrida</i>	3
Cornfield Knotgrass	<i>Polygonum rurivagum</i>	3
Field Madder	<i>Sherardia arevensis</i>	1
White Mustard	<i>Sinapis alba</i>	2
Knotted Hedge-parsley	<i>Torilis nodosa</i>	3
Narrow-fruited Cornsalad	<i>Valerianella dentata</i>	8
Broad-fruited Cornsalad	<i>Valerianella rimosa</i>	8
	Total Score	45

A complete species list can be found in Appendix 3.

There were three areas within the site found to be particularly rich in arable plants, with some species occurring in high numbers.

The most significant species found were Narrow-fruited Cornsalad *Valerianella dentata* and Broad-fruited Cornsalad *Valerianella rimosa*, both of which are classified as *endangered*. Good-sized populations were found of both species, concentrated particularly in the area around Jeremiah's Tree.

Figure 3 Important Arable Plant Area at Site 3



In total 14 important arable plant species have been recorded at Site 3: Barton Hills, two of which are classified as *endangered*.

Using the Plantlife International scoring system, this site has a total score of 45 and is classified as being of National Importance.

3.4 Site 4 and Site 5: Galley and Warden Hills TL0825, TL0925, TL0926, TL0927

Date of survey: 27 July 2007

Surveyors: Graham Bellamy, Laurie Jackson

The preliminary study identified Galley and Warden Hills as an Important Arable Plant Area, ranging between County and National Importance.

The scope of this study was to survey Warden Hill South TL0925 and Galley Hill North TL0927, both of which were classified as being of National Importance. On site it was decided to survey the entire Galley and Warden Hills area, as this was feasible both in terms of future management and survey route.

The site consisted of a mixture of oats, corn and borage fields, as well as rank grassland, and unimproved calcareous and neutral grassland at Galley and Warden Hills Site of Special Scientific Interest (SSSI).

Table 6 Important Arable Plants recorded at Galley and Warden Hills. Species recorded during the 2007 survey are highlighted

Common Name	Latin Name	Score
Black Grass ¹²³⁴	<i>Alopecurus myosuroides</i>	2
Great Pignut ²⁴	<i>Bunium bulbocastanum</i>	6
Small Toadflax ²³⁴	<i>Chaenorhinum minus</i>	1
Dwarf Spurge ¹²³⁴	<i>Euphorbia exigua</i>	8
Dense-flowered Fumitory ⁴	<i>Fumaria densiflora</i>	3
Few-flowered Fumitory ³⁴	<i>Fumaria vaillantii</i>	7
Red Hemp-nettle ⁴	<i>Galeopsis angustifolia</i>	9
Henbit Dead-nettle ⁴	<i>Lamium amplexicaule</i>	1
Venus's-looking-glass ¹²³⁴	<i>Legousia hybrida</i>	3
Field Gromwell ²⁴	<i>Lithospermum arvense</i>	8
Dwarf Mallow ²	<i>Malva neglecta</i>	2
Prickly Poppy ²³⁴	<i>Papaver argemone</i>	7
Babington's Poppy ³	<i>Papaver dubium lecoqii</i>	2
Field Madder ²⁴	<i>Sherardia arvensis</i>	1
White Mustard ¹²³⁴	<i>Sinapsis alba</i>	2
Narrow-fruited Cornsalad ²⁴	<i>Valerianella dentata</i>	8
Green Field-speedwell ¹²³⁴	<i>Veronica agrestis</i>	1
Grey Field-speedwell ²⁴	<i>Veronica polita</i>	2
	TL0825 Score	14
	TL0925 Score	51
	TL0926 Score	33
	TL0927 Score	69
	Total Score	73

The site at which the species were found is indicated as follows:

¹ TL0825, ² TL0925, ³ TL0926, ⁴ TL0927.

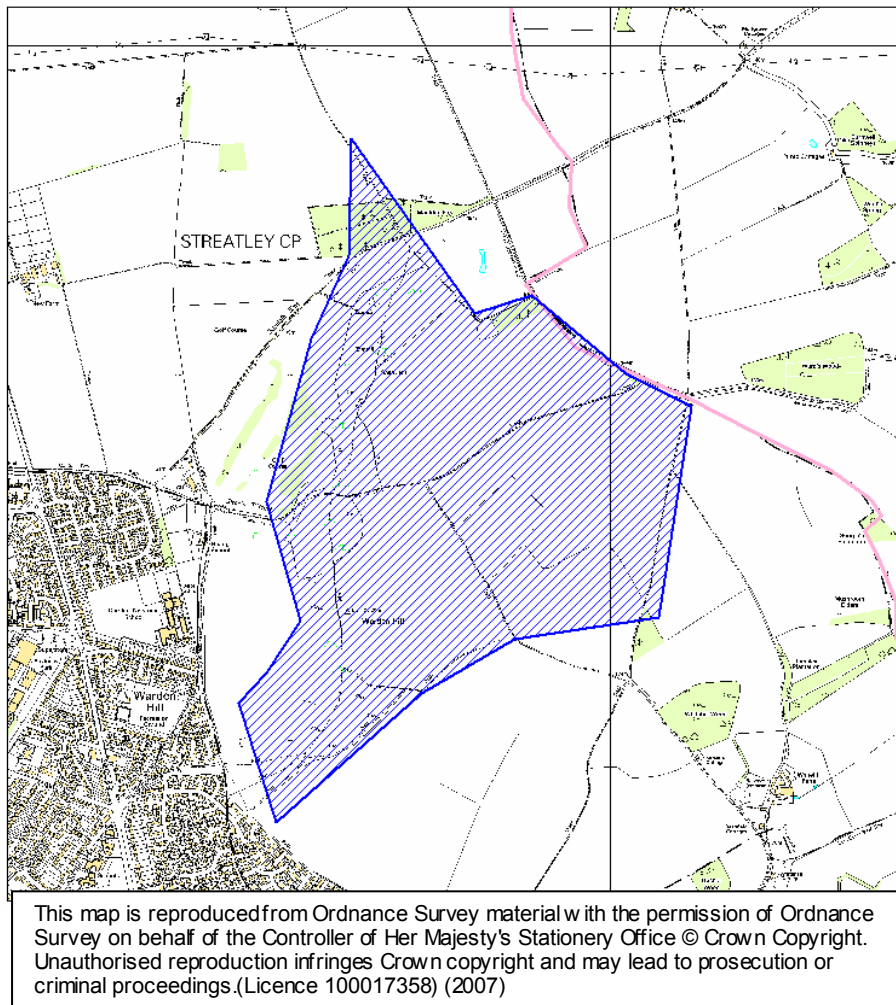
A complete species list can be found in Appendix 4.

Important arable plants were found in almost every field margin, with particularly rich aggregations in three areas, two of which bordered the SSSI.

Two patches of the *critically endangered* species Red Hemp-nettle *Galeopsis angustifolia* were found on a bank in Galley Hill North. More than 20 individuals were counted, along with several Field Gromwell *Lithospermum arvense* plants, Dwarf Spurge, Few-flowered Fumitory *Fumaria vaillantii* and abundant Narrow-fruited Cornsalad. All of these species are classified as either *endangered* or *vulnerable*, making this bank significant in terms of important arable plants.

The site also supports a good population of Great Pignut *Bunium bulbocastanum*, a *near threatened* species, considered by Wilson & King (2003) as being Nationally Rare, having as it does a distribution limited to central England.

Figure 4 Important Arable Plant Area at Galley and Warden Hills



In total 18 important arable plant species have been recorded at Galley and Warden Hills, six of which are *vulnerable*, *endangered* or *critically endangered*.

Using the Plantlife International scoring system, Galley and Warden Hills has a total score of 73 and is classified as being of European Importance.

3.5 Site 6: East of Barton TL0930

Date of survey: 23 July 2007

Surveyors: Graham Bellamy, Laura Downton, Laurie Jackson

Date of survey: 7 August 2007

Surveyor: Graham Bellamy, Chris Boon

The survey carried out at Site 6 also included parts of TL0929, to encompass complete boundaries of survey units.

The site consisted of arable land, as well as the unimproved chalk grassland Barton Hills National Nature Reserve (NNR) and Barton Gravel Pits County Wildlife Site (CWS), a former gravel pit managed specifically to maintain arable weed populations.

Table 7 Important Arable Plants recorded at Site 6. Species recorded during the 2007 survey are highlighted

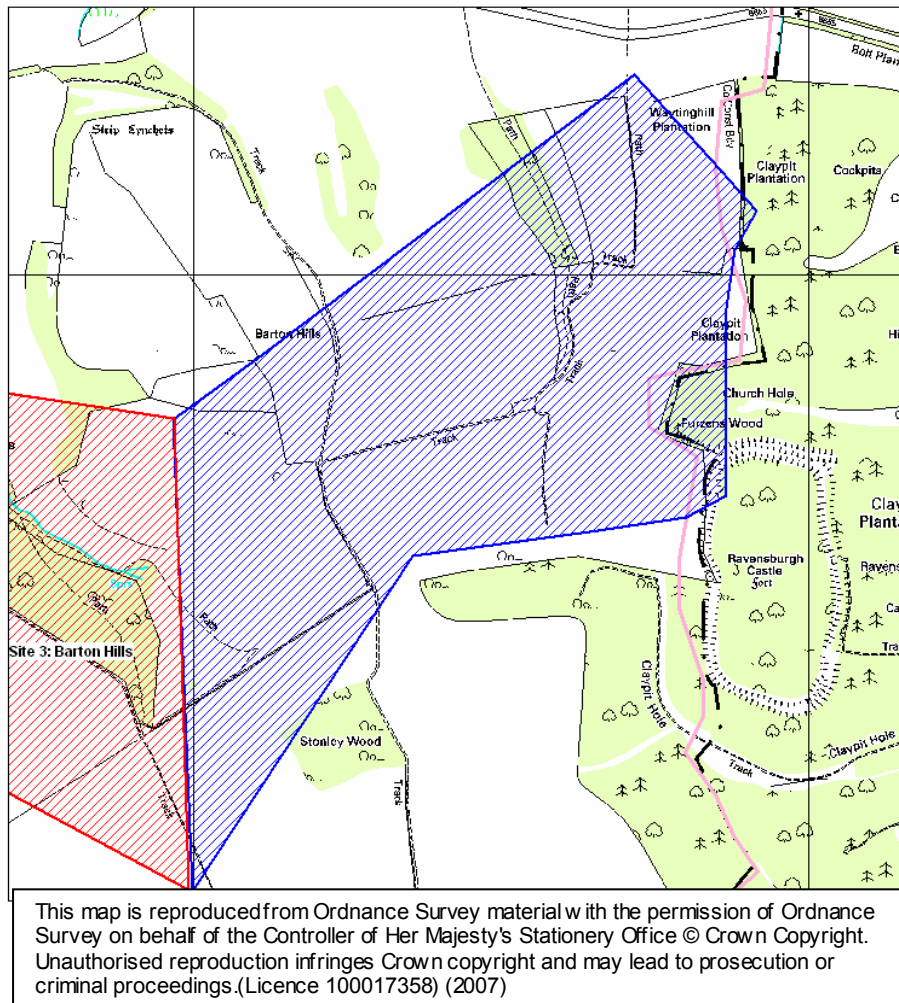
Common Name	Latin Name	Score
Ground-pine	<i>Ajuga chamaepitys</i>	8
Black Grass	<i>Alopercurus myosuroides</i>	2
Great Pignut	<i>Bunium bulbocastanum</i>	6
Small Toadflax	<i>Chaenorhinum minus</i>	1
Common Stork's-bill	<i>Erodium cicutarium</i>	1
Dwarf Spurge	<i>Euphorbia exigua</i>	6
Few-flowered Fumitory	<i>Fumaria vaillantii</i>	7
Long-stalked Crane's-bill	<i>Geranium columbinum</i>	2
Small-flowered Crane's-bill	<i>Geranium pusillum</i>	2
Round-leaved Fluellen	<i>Kickxia spuria</i>	3
Henbit Dead-nettle	<i>Lamium amplexicaule</i>	1
Venus's-looking-glass	<i>Legousia hybrida</i>	3
Rough Poppy	<i>Papaver hybridum</i>	3
Field Madder	<i>Sherardia arevensis</i>	1
White Mustard	<i>Sinapsis alba</i>	2
Knotted Hedge-parsley	<i>Torilis nodosa</i>	3
Narrow-fruited Cornsalad	<i>Valerianella dentata</i>	8
	Total Score	59

A complete species list can be found in Appendix 5.

Important arable plants were well dispersed in field margins although there were two areas where the richest concentrations were found; the eastern unit of Barton Hills NNR, and the northern section of Barton Gravel Pit CWS.

The *endangered* species Ground Pine was recorded in Barton Gravel Pit CWS, however only one plant was found. Narrow-fruited Cornsalad was also found at Barton Gravel Pit CWS in reasonable numbers, with larger numbers at Barton Hills NNR. Few-flowered Fumitory was found predominantly at the NNR.

Figure 5 Important Arable Plant Area at Site 6



In total 17 important arable plant species have been recorded at Site 6: East of Barton, two of which are classified as *endangered*.

Using the Plantlife International scoring system this site has a total score of 59 and is classified as being of National Importance.

4 Discussion

At all six of the survey sites, important arable plant species were found that had not previously been recorded, which resulted in each site's score increasing by between one and 20 points. Over the six sites, 32 important arable plant species have been recorded, with between 12 and 18 species at each site.

The six 1km grid squares all remain as being of National Importance with scores of between 39 and 69. During the survey the entire Galley and Warden Hills area was surveyed as one unit, and the cumulative score for this site of 73 signifies it is of European Importance.

Most arable plants are annuals, which have adapted life cycles synchronised with the traditional arable farm calendar (Wilson & King 2003). Changes to farming practices

over recent decades have seen numbers plummet, and many species are now uncommon and threatened.

The majority of arable plants have long-lived seed banks allowing populations to remain dormant. This means that all the species present in an area will not necessarily be found every year, rather when conditions are suitable for germination and seeding. This absence may not be significant in population terms, although it remains important that seed stocks are replenished to ensure the population at a site is retained.

The surveys carried out for this study found a couple of the sites were not as rich as indicated by previous records. At Site 1 for example, only a third of the total recorded species were found during 2007, however a new species was added to the list for the site. As indicated above however not all species will be found in any one-year, but they will still be present in the seed bank.

There is a possibility that failure to find certain species is an indication that the site is in unfavourable management or that the population has become extinct in that location. It could also indicate that the crop sown that year did not favour germination of a particular species. If this is the case species should still be able to survive at a site, as farming is often carried out on rotation rather than growing the same crop every year.

In order to get a complete picture of the arable plant complement of a site it is prudent to conduct surveys over several years, which would also enable monitoring of the population and distribution of endangered species such as Red Hemp-nettle and Narrow-fruited Cornsalad. Determining the cultivation history of a site; the ploughing and sowing regimes, herbicides used and crop grown; would also help determine the status and likely threats to any arable plant populations present. This would also enable targeted farm management advice to be provided to landowners.

Some arable plants can also germinate over the summer period and so could have been missed due to the timing of the visits. Other species may have been particularly inconspicuous or difficult to identify at the time they were seen. The Narrow-fruited and Broad-fruited Cornsalad for example are best identified by their seed, and at the time of the surveys the majority of plants were still in flower and only a small number of seed heads could be found for identification.

Fumitories *Fumaria* spp. were extremely difficult to identify with certainty and it is recommended that for some species samples are taken in the future and sent to the national recorder for verification.

Arable plants are largely confined to small areas, predominantly field margins, which can make populations vulnerable. It is therefore important in evaluating Important Arable Plant areas that the size and extent of populations of significant species is recorded. For instance only one Ground Pine individual was present at Barton Gravel Pit CWS and the species had not been seen for several years before 2007. This could indicate that the seed bank is close to exhaustion and urgent intervention may be needed on that site.

Other significant species such as the Red Hemp-nettle were in good numbers and for some such as Narrow-fruited Cornsalad in vast numbers. Sites with these healthy populations are very valuable for biodiversity, and must be retained.

5 References

BedsLife (2007) *Important Arable Plant Areas in Bedfordshire: Preliminary Study*.

Byfield, A.J., & Wilson, P.J. (2005) *Important Arable Plant Areas: Identifying priority sites for arable plant conservation in the United Kingdom*. Plantlife International, Salisbury

Still, K., & Byfield, A.J. (2007) *New Priorities for Arable Plant Conservation*. Plantlife International, Salisbury.

Wilson, P. & King, M. (2003) *Arable Plants – A Field Guide*. WildGuides Ltd., Hampshire.

6 Appendices

Appendix 1: Complete Species List Recorded at Site 1

Important arable plants are highlighted

Common Name	Latin Name
Yarrow	<i>Achillea millefolium</i>
Fool's Parsley	<i>Aethusa cynapium</i>
Black Grass	<i>Alopecurus myosuroides</i>
Scarlet Pimpernel	<i>Anagallis arvensis</i>
Borage	<i>Borago officinalis</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Black Knapweed	<i>Centaurea nigra</i>
Common Mouse-ear	<i>Cerastium holosteoides</i>
Wild Basil	<i>Clinopodium vulgare</i>
American Willowherb	<i>Epilobium ciliatum</i>
Dwarf Spurge	<i>Euphorbia exigua</i>
Broad-leaved Spurge	<i>Euphorbia platyphyllos</i>
Dove's-foot Crane's-bill	<i>Geranium molle</i>
Hedgerow Crane's-bill	<i>Geranium pyrenaicum</i>
Hogweed	<i>Heracleum sphondylium</i>
Round-leaved Fluellen	<i>Kickxia spuria</i>
Common Mallow	<i>Malva sylvestris</i>
Pineappleweed	<i>Matricaria matricarioides</i>
Red Bartsia	<i>Odontites verna</i>
Common Poppy	<i>Papaver rhoeas</i>
Redshank	<i>Persicaria maculosa</i>
Knotgrass	<i>Polygonum aviculare</i>
Selfheal	<i>Prunella vulgaris</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Groundsel	<i>Senecio vulgaris</i>
White Champion	<i>Silene alba</i>
Bittersweet	<i>Solanum dulcamara</i>
Goat's-beard	<i>Tragopogon pratensis agg.</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>
Common Field-speedwell	<i>Veronica persica</i>

Dwarf Spurge: TL0031925894, TL0061325581, TL0068625639.

Appendix 2: Complete Species List Recorded at Site 2

Important arable plants are highlighted

Common Name	Latin Name
Fool's Parsley	<i>Aethusa cynapium</i>
Black Grass	<i>Alopecurus myosuroides</i>
Scarlet Pimpernel	<i>Anagallis arvensis</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Black Knapweed	<i>Centaurea nigra</i>
Cock's-foot	<i>Dactylis glomerata</i>
Common Couch	<i>Elytrigia repens</i>
American Willowherb	<i>Epilobium ciliatum</i>
Dwarf Spurge	<i>Euphorbia exigua</i>
Petty Spurge	<i>Euphorbia peplus</i>
Black-bindweed	<i>Fallopia convolvulus</i>
Dove's-foot Crane's-bill	<i>Geranium molle</i>
Hedgerow Crane's-bill	<i>Geranium pyrenaicum</i>
Hogweed	<i>Heracleum sphondylium</i>
Round-leaved Fluellen	<i>Kickxia spuria</i>
Field Scabious	<i>Knautia arvensis</i>
Common Mallow	<i>Malva sylvestris</i>
Red Bartsia	<i>Odontites verna</i>
Common Poppy	<i>Papaver rhoeas</i>
Timothy	<i>Phleum pratense</i>
Knotgrass	<i>Polygonum aviculare</i>
White Champion	<i>Silene alba</i>
White Mustard	<i>Sinapis alba</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>
Green Field-speedwell	<i>Veronica agrestis</i>
Wall Speedwell	<i>Veronica arvensis</i>
Common Field-speedwell	<i>Veronica persica</i>
Field Pansy	<i>Viola arvensis</i>

Dwarf Spurge: TL0304025746, TL0318225597, TL0307025928, TL0310125966.

Appendix 3: Complete Species List Recorded at Site 3

Important arable plants are highlighted

Common Name	Latin Name
Fool's Parsley	<i>Aethusa cynapium</i>
Black Grass	<i>Alopercurus myosuroides</i>
Scarlet Pimpernel	<i>Anagallis arvensis</i>
Parsley-piert	<i>Aphanes arvensis</i>
Thyme-leaved Sandwort	<i>Arenaria serpyllifolia</i>
False Oat-grass	<i>Arrhenatherum elatius</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Common Mouse-ear	<i>Cerastium fontanum ssp. vulgare</i>
Small Toadflax	<i>Chaenorhinum minus</i>
Hoary Willowherb	<i>Epilobium parviflorum</i>
Dwarf Spurge	<i>Euphorbia exigua</i>
Sun Spurge	<i>Euphorbia helioscopia</i>
Eyebright	<i>Euphrasia nemorosa</i>
Black-bindweed	<i>Fallopia convolvulus</i>
Cleavers	<i>Galium aparine</i>
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>
Small-flowered Crane's-bill	<i>Geranium pusillum</i>
Herb-Robert	<i>Geranium robertianum</i>
Prickly Lettuce	<i>Lactuca serriola</i>
Henbit Dead-nettle	<i>Lamium amplexicaule</i>
Nipplewort	<i>Lapsana communis</i>
Venus's-looking-glass	<i>Legousia hybrida</i>
Common Toadflax	<i>Linaria vulgaris</i>
Black Medick	<i>Medicago lupulina</i>
Field Forget-me-not	<i>Myosotis arvensis</i>
Red Bartsia	<i>Odontites verna</i>
Common Poppy	<i>Papaver rhoeas</i>
Knotgrass	<i>Polygonum aviculare</i>
Cornfield Knotgrass	<i>Polygonum rurivagum</i>
Field Madder	<i>Sherardia arvensis</i>
White Mustard	<i>Sinapis alba</i>
Perennial Sowthistle	<i>Sonchus arvensis</i>
Common Chickweed	<i>Stellaria media</i>
Upright Hedge-parsley	<i>Torilis japonica</i>
Hop Trefoil	<i>Trifolium campestre</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>
Narrow-fruited Cornsalad	<i>Valerianella dentata</i>
Broad-fruited Cornsalad	<i>Valerianella ramosa</i>
Wall Speedwell	<i>Veronica arvensis</i>
Common Field-speedwell	<i>Veronica persica</i>
Field Pansy	<i>Viola arvensis</i>

Broad-fruited Cornsalad: TL08262966, TL08302948, TL08312948, TL0834729347, TL0835529333

Dwarf Spurge: TL08232981

Appendix 4: Complete Species List Recorded at Galley and Warden Hills
 Important arable plants are highlighted

Common Name	Latin Name
Fool's Parsley	<i>Aethusa cynapium</i>
Black Grass	<i>Alopercurus myosuroides</i>
Parsley-piert	<i>Aphanes arvensis</i>
Thyme-leaved Sandwort	<i>Arenaria serpyllifolia</i>
Common Orache	<i>Atriplex patula</i>
Wild-oat	<i>Avena fatua</i>
Borage	<i>Borago officinalis</i>
Fern-grass	<i>Catapodium rigidum</i>
Small Toadflax	<i>Chaenorhinum minus</i>
Fat-hen	<i>Chenopodium album</i>
Dwarf Spurge	<i>Euphorbia exigua</i>
Sun Spurge	<i>Euphorbia helioscopia</i>
Black-bindweed	<i>Fallopia convolvulus</i>
Common Fumitory	<i>Fumaria officinalis</i>
Few-flowered Fumitory	<i>Fumaria vaillantii</i>
Red Hemp-nettle	<i>Galeopsis angustifolia</i>
Common Hemp-nettle	<i>Galeopsis tetrahit</i>
Dove's-foot Crane's-bill	<i>Geranium molle</i>
Herb-Robert	<i>Geranium robertianum</i>
Red Dead-nettle	<i>Lamium purpureum</i>
Nipplewort	<i>Lapsana communis</i>
Venus's-looking-glass	<i>Legousia hybrida</i>
Field Gromwell	<i>Lithospermum arvense</i>
Prickly Poppy	<i>Papaver argemone</i>
Long-headed Poppy	<i>Papaver dubium</i>
Babington's Poppy	<i>Papaver dubium lecoqii</i>
Common Poppy	<i>Papaver rhoeas</i>
Opium Poppy	<i>Papaver somniferum</i>
Groundsel	<i>Senecio vulgaris</i>
Field Madder	<i>Sherardia arvensis</i>
White Mustard	<i>Sinapsis alba</i>
Hedge Mustard	<i>Sisymbrium officinale</i>
Smooth Sowthistle	<i>Sonchus oleraceus</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>
Narrow-fruited Cornsalad	<i>Valerianella dentata</i>
Green Field-speedwell	<i>Veronica agrestis</i>
Common Field-speedwell	<i>Veronica persica</i>
Field Pansy	<i>Viola arvensis</i>

Babington's Poppy: TL0943126524

Dwarf Spurge: TL0940526515, TL0943026532, TL0999226905, TL0998626908, TL0977327101, TL0975927100, TL0927026953

Few-flowered Fumitory: TL0998326910, TL0974027080, TL0934227019, TL0927026953

Field Gromwell: TL0967727047, TL0959927066, TL0913925610, TL0920425678, TL0957025939, TL0961125958

Long-headed Poppy: TL0961027013, TL0959927066

Narrow-fruited Cornsalad: TL0963627027, TL0960927013, TL0959927066, TL0924826933

Prickly Poppy: TL0943026532, TL0911225602
Red Hemp-nettle: TL0960827011, TL0959927066
Thyme-leaved Sandwort: TL0985426756
Venus's-looking-glass: TL0952026305

Appendix 5: Complete Species List Recorded at Site 6

Important arable plants are highlighted

Common Name	Latin Name
Fool's Parsley	<i>Aethusa cynapium</i>
Ground-pine	<i>Ajuga chamaepitys</i>
Black Grass	<i>Alopercurus myosuroides</i>
Scarlet Pimpernel	<i>Anagallis arvensis</i>
Parsley-piert	<i>Aphanes arvensis</i>
Thyme-leaved Sandwort	<i>Arenaria serpyllifolia</i>
Great Pignut	<i>Bunium bulbocastanum</i>
Shepherd's-purse	<i>Capsella bursa-pastoris</i>
Wetted Thistle	<i>Carduus crispus</i>
Small Toadflax	<i>Chaenorhinum minus</i>
Fat-hen	<i>Chenopodium album</i>
Creeping Thistle	<i>Cirsium arvense</i>
Basil Thyme	<i>Clinopodium acinos</i> ¹
Viper's-bugloss	<i>Echium vulgare</i>
American Willowherb	<i>Epilobium ciliatum</i>
Hoary Willowherb	<i>Epilobium parviflorum</i>
Common Stork's-bill	<i>Erodium cicutarium</i>
Dwarf Spurge	<i>Euphorbia exigua</i> ²
Black-bindweed	<i>Fallopia convolvulus</i>
Few-flowered Fumitory	<i>Fumaria vaillantii</i>
Cleavers	<i>Galium aparine</i>
Long-stalked Crane's-bill	<i>Geranium columbinum</i>
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>
Dove's-foot Crane's-bill	<i>Geranium molle</i>
Small-flowered Crane's-bill	<i>Geranium pusillum</i>
Round-leaved Fluellen	<i>Kickxia spuria</i> ²
Henbit Dead-nettle	<i>Lamium amplexicaule</i>
Venus's-looking-glass	<i>Legousia hybrida</i> ²
Common Mallow	<i>Malva sylvestris</i>
Pineappleweed	<i>Matricaria discoidea</i>
Black Medick	<i>Medicago lupulina</i>
Ribbed Melilot	<i>Melilotus officinalis</i>
Field Forget-me-not	<i>Myosotis arvensis</i>
Common Restharrow	<i>Ononis repens</i>
Common Poppy	<i>Papaver rhoeas</i>
Bristly Oxtongue	<i>Picris echioides</i>
Ribwort Plantain	<i>Plantago lanceolata</i>
Knotgrass	<i>Polygonum aviculare</i>
Creeping Buttercup	<i>Ranunculus repens</i>
Weld	<i>Resedaceae luteola</i>
Common Ragwort	<i>Senecio jacobaea</i>
Groundsel	<i>Senecio vulgaris</i>
Field Madder	<i>Sherardia arvensis</i>
White Champion	<i>Silene alba</i>
Bladder Champion	<i>Silene vulgaris</i>
White Mustard	<i>Sinapis alba</i>
Perennial Sowthistle	<i>Sonchus arvensis</i>
Knotted Hedge-parsley	<i>Torilis nodosa</i>
Scentless Mayweed	<i>Tripleurospermum inodorum</i>

Colt's-foot	<i>Tussilago farfara</i>
Narrow-fruited Cornsalad	<i>Valerianella dentata</i> ²
Dark Mullein	<i>Verbascum nigrum</i>
Wall Speedwell	<i>Veronica arvensis</i>
Common Field-speedwell	<i>Veronica persica</i>
Grey Field-speedwell	<i>Veronica polita</i>
Field Pansy	<i>Viola arvensis</i>

¹ Species recorded only on 7 August 2007

² Species recorded at TL0929 and TL0930

Basil Thyme: TL09893012

Dark Mullein: TL0982830049

Few-flowered Fumitory: TL0979729630

Ground-pine: TL09873004

Long-stalked Crane's-bill: TL0985430075

Narrow-fruited Cornsalad: TL0984130090, TL0986230095, TL0966929613,
TL09682961, TL09863009

Venus's-looking-glass: TL0965029603, TL09822965