Ecological Survey, Fir Farm, Lower Swell, Stow on the Wold, Gloucestershire

Grasslands

Philip Wilson

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Pennyhayes Farm, Shute, Axminster, Devon, EX13 7QP
Tel: 01297 552434/0780 3126929. Email: philipjohnwilson@aol.com

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Introduction

Fir Farm consists of 118 ha of arable land, 106 ha of grassland and 37 ha of woodland between Lower Swell and Upper Slaughter and to the west of Stow on the Wold in the Gloucestershire Cotswold Hills. It is divided into five blocks by four roads and the River Dikler. The geology is largely Jurassic limestones, but with a broad belt of mudstones on either side of the valley of the River Dikler

This is one of a series of species and habitat surveys of Fir Farm commissioned in 2018 to provide a baseline of data prior to the conversion of the farm to organic management. It is designed to assess the plant communities, using the National Vegetation Classification (Rodwell, 1992), to record species present in each field at Fir Farm currently managed as grassland, and to determine the importance of these species and communities in a national context with reference to Section 41 of the NERC Act (2006).

The methods used should, through a combination of listing species for whole fields, quadrat recording, photography and vegetation community mapping, provide a series of data that can be reviewed at regular intervals in the future to provide an indication of the effects of changes in management on the Fir Farm grasslands.

Methods

All fields are identified by a number (Appendix 4). Surveys were conducted between 21st May and 3rd July 2018.

Grasslands

All grassland fields were surveyed by walkover survey to identify areas of potential conservation value, in particular Priority Habitat grassland types (http://jncc.defra.gov.uk/page-5706). A full list of vascular plant and bryophyte species was collected from each field with abundances on the DAFOR scale (D=Dominant, A=Abundant, F=Frequent, O=Occasional, R=Rare, prefix L=locally) and a brief description was made. Features of interest in the field boundaries were also noted, but these were not surveyed systematically. All types of vegetation were assigned to an NVC community as described in British Plant Communities (Rodwell, 1992). Photographs were taken of the majority of fields.

A standard representative quadrat was recorded from the majority of fields. These quadrats measured 2m X 2m, all vascular plants and bryophytes were recorded with abundances on the Domin scale (Table 1).

Where a significant area of Priority Habitat was present, a full Phase 2 survey was carried out, although in practice this only occurred in a single field (Field 17). The areas of NVC communities were delineated and a set of five standard quadrats were recorded from each community. The sets of five quadrats from Field 17 was analysed using the Match programme (Malloch, 2000) to confirm the identity of the NVC community.

Table 1. DOMIN Cover-abundance Scale

% Cover	Score
91–100%	10
76–90%	9
51–75%	8
34–50%	7
26–33%	6
11–25%	5
5-10%	4
0-4% many individuals	3
0-4% several individuals	2
0-4% few individuals	1

Arable

Survey of the arable fields did not form a formal part of this work, however the opportunity was taken to examine field corners and margins where possible. A species list with abundances on the DAFOR scale was recorded.

Results

Grassland

Species recorded in each field are given in Appendix 1, with quadrat data in Appendix 3.

Section 41 Priority Habitat Grasslands

Priority Habitat grassland was recorded in four areas (Appendix 5). The main area was in Field 17, where there was 4.4ha of agriculturally unimproved, species-rich grassland (Priority Habitat Lowland Meadow). Approximately 60% of this was NVC community MG4 (*Alopecurus pratensis* meadow foxtail-*Sanguisorba officinalis* greater burnet grassland), with approximately 40% MG5b (*Centaurea nigra* black knapweed-*Cynosurus cristatus* crested dog's-tail grassland)(Rodwell, 1992). It is unlikely that this grassland has been ploughed for several centuries or has been intensively managed.

MG4 is the characteristic grassland community of seasonally-flooded river valleys in lowland southern England, and is particularly well-represented in the valleys of the Upper Thames system (Rothero et al, 2016). There are thought to be fewer than 1500ha of this grassland type remaining in Britain. Soils are typically alluvial, neutral to slightly calcareous and rich in mineral nutrients but low in available phosphate and nitrogen. The vegetation is usually managed by an annual hay-cut in July, with the aftermath grazed by stock until soils become too wet in the autumn. The stand here is slightly unusual, being on a gentle slope in a field modified in the past by ridge and furrow cultivation, more than 100m from the floodplain of the River Dikler. This grassland here is composed of a mixture of grasses and dicotyledonous species with no single dominant (Table 2). These species include the grasses common bent *Agrostis capillaris,* meadow foxtail *Alopecurus pratensis,* cocksfoot *Dactylis glomerata,* red fescue *Festuca rubra,* rough-stalked meadow-grass *Poa trivialis* and sweet vernal-grass *Anthoxanthum odoratum*, with the broad-leaved species greater burnet *Sanguisorba officinalis,* ribwort plantain *Plantago lanceolata,* meadow buttercup *Ranunculus acris,* pignut *Conopodium majus,* meadow vetchling *Lathyrus pratensis,* sorrel *Rumex acetosa* and dandelion *Taraxacum sp.* The dandelions are a very complicated group of microspecies, and MG4 grasslands are known to be particularly rich in these. Dandelions were not identified to species here.

Table 2. Constancy table for MG4 grasslands in Field 17. Constancy is the frequency with which a species is recorded in quadrats expressed on a five-point scale. Number of quadrats is 5.

Agrostis capillaris	Common bent	5
Alopecurus pratensis	Meadow foxtail	5
Dactylis glomerata	Cocksfoot	5
Festuca rubra	Red fescue	5
Holcus lanatus	Yorkshire fog	5
Plantago lanceolate	Ribwort plantain	5
Ranunculus acris	Meadow buttercup	5
Sanguisorba officinalis	Greater burnet	5
Taraxacum sp	Dandelion	5
Anthoxanthum odoratum	Sweet vernal-grass	4
Conopodium majus	Pignut	4

Lathyrus pratensis	Meadow vetchling	4
Poa trivialis	Rough meadow-grass	4
Rumex acetosa`	Sorrel	4
Cerastium fontanum	Mouse-eared chickweed	3
Lotus corniculatus	Bird's-foot trefoil	3
Luzula campestris	Field wood-rush	3
Veronica chamaedrys	Germander speedwell	3
Centaurea nigra	Black knapweed	2
Cynosurus cristatus	Crested dog's-tail	2
Filipendula ulmaria	Meadowsweet	2
Galium verum	Lady's bedstraw	2
Hypochaeris radicata	Common catsear	2
Potentilla reptans	Creeping cinquefoil	2
Ranunculus repens	Creeping buttercup	2
Trifolium pratense	Red fescue	2
Trifolium repens	White clover	2
Alchemilla filicaulis	Lady's mantle	1
Carex hirta	Hairy sedge	1
FestuloliumXloliaceum	RyegrassXfescue hybrid	1
Filipendula vulgaris	Dropwort	1
Leontodon autumnalis	Autumn hawkbit	1
Ranunculus bulbosus	Bulbous buttercup	1
Ranunculus ficaria	Lesser celandine	1
Sanguisorba minor	Salad burnet	1
Trifolium dubium	Lesser trefoil	1

MG5b is typical of deep soils over well-drained and relatively calcareous substrata. In field 17 it was recorded mainly at the eastern end and on the ridge tops and sides, where it formed a mosaic with the MG4 in the furrows. This stand included a number of species typically restricted to chalk and limestone grasslands such as upright brome *Bromus erectus,* salad burnet *Sanguisorba minor*, meadow oat-grass *Avenula pratensis* and dropwort *Filipendula vulgaris*. This grassland here is composed of a mixture of grasses and dicotyledonous species with no single dominant (Table 3). The most abundant grasses were common bent *Agrostis capillaris, s*weet vernal-grass *Anthoxanthum odoratum, c*ocksfoot *Dactylis glomerata,* yorkshire fog *Holcus lanatus,* upright brome *Bromus erectus* and red fescue *Festuca rubra,* with the broad-leaved species black knapweed *Centaurea nigra,* pignut *Conopodium majus*, lady's bedstraw *Galium verum*, meadow vetchling *Lathyrus pratensis,*bird's-foot trefoil *Lotus corniculatus*, field wood-rush *Luzula campestris*, ribwort plantain *Plantago lanceolata,* bulbous buttercup *Ranunculus bulbosus*, salad burnet *Sanguisorba minor*, dandelion *Taraxacum sp,* germander speedwell *Veronica chamaedrys* and rough hawkbit *Leontodon hispidus*.

Table 3. Constancy table for MG5b grasslands in Field 17. Constancy is the frequency with which a species is recorded in quadrats expressed on a five-point scale. Number of quadrats is 5.

Agrostis capillaris	Common bent	5
Anthoxanthum odoratum	Sweet vernal-grass	5
Centaurea nigra	Black knapweed	5
Conopodium majus	Pignut	5
Dactylis glomerata	Cocksfoot	5
Galium verum	Lady's bedstraw	5
Holcus lanatus	Yorkshire fog	5
Lathyrus pratensis	Meadow vetchling	5
Lotus corniculatus	Bird's-foot trefoil	5
Luzula campestris	Field wood-rush	5
Plantago lanceolate	Ribwort plantain	5
Ranunculus bulbosus	Bulbous buttercup	5
Sanguisorba minor	Salad burnet	5
Bromus erectus	Upright brome	5
Festuca rubra	Red fescue	4
Taraxacum sp	Dandelion	4
Veronica chamaedrys	Germander speedwell	4
Leontodon hispidus	Rough hawkbit	4
Cerastium fontanum	Mouse-eared chickweed	3
Primula veris	Cowslip	3
Ajuga reptans	Bugle	3
Alopecurus pratensis	Meadow foxtail	2
Carex hirta	Hairy sedge	2
Ranunculus acris	Meadow buttercup	2
Trifolium pratense	Red fescue	2
Trifolium repens	White clover	2
Cynosurus cristatus	Crested dog's-tail	1
FestuloliumXloliaceum	RyegrassXfescue hybrid	1
Filipendula vulgaris	Dropwort	1
Lolium perenne	Perennial rye-grass	1
Poa trivialis	Rough meadow-grass	1
Potentilla reptans	Creeping cinquefoil	1
Ranunculus ficaria	Lesser celandine	1
Rumex acetosa`	Sorrel	1
Rhinanthus minor	Yellow rattle	1
Avenula pratense	Meadow oat-gass	1
Carex caryophyllea	Spring sedge	1
Vicia cracca	Tufted vetch	1
Carex flacca	Carnation sedge	1
Briza media	Quaking grass	1

The grassland in Field 17 was considered of exceptional quality in a national context. A condition assessment carried out according to FEP guidelines (Natural England 2010), fulfilled all attribute targets (Table 4). This grassland may also pass a condition assessment for SSSIs (Robertson & Jefferson, 2000).

Table 4. Condition Assessment of grassland in Field 17.

Attribute	Target	Observation
Cover of undesirable species	<5%	0
Cover of bare ground	<10%	0
Cover of scrub	<5%	0
Cover of coarse grass species	<20%	5%
Cover of wildflower species (excluding undesirable species)	>20%	30
Indicators of waterlogging	<30%	0
Frequency of indicator species	Two frequent, two occasional	Seven frequent, three occasional, five rare
Pass/fail		Pass

Small areas of species-rich grassland were recorded in a further three areas. It is likely that these are relics of formerly more widespread vegetation. In fields 7, 8, 9 and 14, small areas of grassland related to MG8 (*Caltha palustris* marsh marigold-*Cynosurus cristatus* crested dog's-tail grassland) were present in the floodplain of the River Dikler. In field 7, this grassland was largely restricted to the mown riverside path outside the field itself, while in fields 9 and 14 there were narrow zones along the western field boundaries. A lightly larger are was present in the east of Field 8. These patches have several wet grassland species including hard rush *Juncus inflexus,* soft rush *Juncus effusus,* jointed rush *Juncus articulatus,* brown sedge *Carex disticha*, carnation sedge *Carex panicea,* glaucous sedge *Carex flacca,* common spike-rush *Eleocharis palustris,* ragged robin *Lychnis flos-cuculi,* gipsywort *Lycopus europaeus,* greater bird's-foot trefoil *Lotus pedunculatus*, wild angelica *Angelica sylvestris*, water mint *Mentha aquatica* lady's smock *Cardamine pratensis,* meadowsweet *Filipendula ulmaria,* and the moss *Calliergonella cuspidatum.* These small areas could act as valuable nuclei for the restoration of species-rich grasslands in the floodplain.

Field 25 is a narrow strip of grassland including two small ponds, outside the farmed area and probably used as part of a garden. Although ungrazed and dominated by tall grasses, it is nevertheless moderately species-rich and good habitat for insects and other species. Several species typical of long established wet grasslands are present including ragged robin *Lychnis flos-cuculi,* wild angelica *Angelica sylvestris*, water mint *Mentha aquatica* and meadowsweet *Filipendula ulmaria.*

Other grasslands

The major grassland community at Fir Farm is MG7 (*Lolium perenne* leys and related grasslands). These are species-poor, agriculturally improved grasslands, typically where these have been ploughed and reseeded as short or medium leys. High levels of nitrogen and phosphate are usually applied to enable high-yielding grass varieties to thrive. They are often part of an arable rotation, and are either grazed or cut for silage. In general the high levels of residual phosphate in the soil make these grasslands poorer candidates for restoration to species-rich swards. The dominant species are grasses, most importantly perennial rye-grass *Lolium perenne,* but also rough-stalked meadow-grass *Poa trivialis* and in some stands creeping bent *Agrostis stolonifera,* yorkshire fog *Holcus lanatus,* timothy *Phleum pratense* and meadow foxtail *Alopecurus pratensis*. The only

frequent dicotyledonous species are dandelion *Taraxacum sp.* and white clover *Trifolium repens,* with creeping buttercup where soils are wetter (Table 5).

Table 5. Constancy table for MG7 grasslands. Constancy is the frequency with which a species is recorded in quadrats expressed on a five-point scale. Number of quadrats is 18.

Lolium perenne	Perennial rye-grass	5
Trifolium repens	White clover	5
Taraxacum sp	Dandelion	4
Poa trivialis	Rough meadow-grass	4
Agrostis stolonifera	Creeping bent	3
Ranunculus repens	Creeping buttercup	3
Alopecurus pratensis	Meadow foxtail	3
Rumex obtusifolius	Broad-leaved dock	3
Holcus lanatus	Yorkshire fog	3
Plantago major	Greater plantain	2
Phleum pratense	Timothy	2
Poa annua	Annual meadow-grass	2
Lolium multiflorum	Italian rye-grass	2
Dactylis glomerata	Cocksfoot	1
Rumex crispus	Curled dock	1
Cerastium fontanum	Mouse-eared chickweed	1
Ranunculus bulbosus	Bulbous buttercup	1
Alopecurus geniculatus	Marsh foxtail	1
Lolium multiflorum	Italian rye-grass	1
Cirsium arvense	Creeping thistle	1
Bromus hederaceus	Soft-grass	1
Plantago lanceolate	Ribwort plantain	1
Bellis perennis	Daisy	1
Brachythecium rutabulum	Moss	1
Cardamine pratensis	Cuckoo-flower	1
Cirsium vulgare	Spear thistle	1
Crepis vesicaria	Rough hawksbeard	1
Elymus repens	Couch	1
Geranium molle	Dove's-foot cranesbill	1
Veronica serpyllifolia	Thyme-leaved speedwell	1
Agrostis capillaris	Common bent	1
Kindbergia praelongum	Moss	1
Ranunculus acris	Meadow buttercup	1
Cerastium glomeratum	Clustered mouse-ear	1
Festuca pratensis	Meadow fescue	1

The farm has a substantial area of relatively unintensively managed permanent pasture (Appendix 6). While the grassland is only of moderate species-richness, the composition is different to the more improved swards, and is largely referable to NVC community MG6b (*Lolium perenne* perennial rye-grass-*Cynosurus cristatus* crested dog's-tail grassland, *Anthoxanthum odoratum* sweet vernal-grass sub-community). In the east of the farm this grassland is largely associated to the well-drained

soils on the tops and sides of the ridges of former ridge and furrow cultivation. This is characteristic grassland of long leys or permanent pasture on well-drained circum-neutral soils which have received a moderate application of fertiliser, often in the form of farmyard manure. Phosphate levels are often low, and these grasslands can be good candidates for restoration to more species-rich swards. As for MG7 grasslands, perennial rye-grass is the most frequent species, but with a lower cover and rough-stalked meadow-grass *Poa trivialis* is also constant. The associated grasses are more varied, with frequent common bent *Agrostis capillaris,*sweet vernal-grass *Anthoxanthum odoratum*, yorkshire fog *Holcus lanatus* and crested dog's tail *Cynosurus cristatus* and in some stands cocksfoot *Dactylis glomerata*, red fescue *Festuca rubra,* creeping bent *Agrostis stolonifera* and meadow foxtail *Alopecurus pratensis*. Dicotyledonous species are more varied than in MG7 with locally frequent bulbous buttercup R*anunculus bulbosus,* meadow buttercup *Ranunculus acris,* white clover *Trifolium repens* and mouse-eared chickweed *Cerastium fontanum* (Table 6).

Table 6. Constancy table for MG6b grasslands. Constancy is the frequency with which a species is recorded in quadrats expressed on a five-point scale. Number of quadrats is nine.

Lolium perenne	Perennial rye-grass	5
Holcus lanatus	Yorkshire fog	5
Poa trivialis	Rough meadow-grass	5
Taraxacum sp	Dandelion	3
Agrostis capillaris	Common bent	4
Cynosurus cristatus	Crested dog's-tail	4
Anthoxanthum odoratum	Sweet vernal-grass	4
Ranunculus bulbosus	Bulbous buttercup	3
Trifolium repens	White clover	3
Ranunculus acris	Meadow buttercup	3
Dactylis glomerata	Cocksfoot	3
Festuca rubra	Red fescue	3
Cerastium fontanum	Mouse-eared chickweed	3
Agrostis stolonifera	Creeping bent	3
Alopecurus pratensis	Meadow foxtail	2
Cerastium glomeratum	Clustered mouse-ear	2
Trifolium pratense	Red clover	2
Cirsium arvense	Creeping thistle	2
Bellis perennis	Daisy	2
Veronica serpyllifolia	Thyme-leaved speedwell	2
Calliergonella cuspidatum	Moss	1
Plantago lanceolate	Ribwort plantain	1
Bromus hederaceus	Soft-grass	1
Festuca pratensis	Meadow fescue	1
Lolium multiflorum	Italian rye-grass	1
Veronica chamaedrys	Germander speedwell	1
Carex hirta	Hairy sedge	1
Hypochaeris radicata	Common catsear	1
Poa annua	Annual meadow-grass	1
Potentilla anserina	Silverweed	1
Ranunculus repens	Creeping buttercup	1

Arable

Species recorded in the arable fields are given in Appendix 2.

A rapid survey of the arable fields was carried out on 2nd and 3rd July 2018. This survey concentrated on the corners and margins of the cultivated fields as these are known to be the areas where the remnants of the arable flora are most likely to be found. Many of the field margins are currently managed as strips of perennial vegetation as nectar sources for pollinating insects or as cover and food resources for wild birds.

The principal crops in 2018 were winter wheat, winter oil-seed rape and perennial mixes for short-term leys. These last are probably intended to remain for more than a year and to be rotated around the arable part of the farm. The seed mixture appears to include perennial rye-grass *Lolium perenne,* white clover *Trifolium repens,* chicory *Chichorium intybus*, bird's-foot trefoil *Lotus corniculatus*, ribwort plantain *Plantago lanceolata,* yarrow *Achillea millefolium*, black knapweed *Centaurea nigra*, sainfoin *Onobrychis viciifolia* and salad burnet *Sanguisorba minor*.

The majority of fields had a relatively species-poor flora as might be expected under a conventional management regime (Appendix). Some fields however had some more uncommon species.

The northern (south-facing) margin of Field 44 to the south-west of Hill Barn is of exceptional importance in a national context. It contains populations of shepherd's needle *Scandix pecten-veneris* and broad-fruited cornsalad *Valerianella rimosa,* both of which are included on Section 41 of the Natural Environment and Rural communities Act (2006). Other species of importance in this field margin are narrow-fruited cornsalad *Valerianella dentata* and Babington's poppy *Papaver dubium ssp lecoquii*. If this field is evaluated on the Plantlife IAPA system (Byfield & Wilson, 2005), it scores 35 which means that it is of county importance. The north-western corner of the farm at Hill Barn as a whole scored 47. With more favourable management it is likely that this score will increase considerably.

Evaluation

Of the 106ha of grassland at Fir Farm in 2018, approximately 6ha (c6%) is priority habitat grassland, this being concentrated in a single field (Field 17) in the south of the farm which had 4.4ha of species-rich MG4 and MG5b in favourable condition. It should be noted that Field 17 is not included in Natural England's inventory of priority habitat grasslands (https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england).

The Priority Habitat Inventory does however suggest that Fields 1, 2, 3, 4, 5, 6, 7, 8, 14, 15, 47, 48 and a small area of tree planting to the south of Field 47 have stands of good quality semi-improved grassland. There was little evidence of this, although of these fields, 7, 8 and 14 have small stands of Priority Habitat grassland, and there is a further small area in Field 25.

The farm contains approximately 21.5ha of semi-improved grassland, and a further 9 ha of grassland which is likely to be restorable to species-rich grassland. The remaining 70ha is species-poor agriculturally-improved pasture which appears to be of lower potential for restoration.

There is thought to be less than 1500ha of MG4 grassland, between 5000 and 10000ha of MG5 grassland and a total of approximately 15000ha of species-rich lowland meadow remaining in the UK (Maddock, 2011). Field 17 at Firs farm represents approximately 0.2% of the national resource of MG4 and approximately 0.03% of the remaining Lowland Meadow Priority Habitat, and is therefore of great importance nationally.

The presence of 30ha of grassland potentially restorable to species-rich Lowland Meadow could represent a significant contribution to national targets for habitat restoration.

In 2018, one margin of Field 44 had an arable flora of national importance with populations of two Section 41 species, one of which, broad-fruited cornsalad *Valerianella rimosa* has fewer than 20 known localities in Britain. Three other fields included relatively uncommon arable plant species.

Recommendations

Grassland

Field 17. Species-rich grassland in this field is an exceptional stand of Priority Habitat Lowland Meadow. Current management by annual hay-cut seems suitable for maintaining favourable condition, but it is possible that this could be improved by stock-fencing and grazing the aftermath until October with cattle. This is the typical management for many stands of MG4 and MG5b grassland in southern England.

Restoration of species-rich grassland. Several of the grassland fields at Fir Farm are good candidates for the restoration of species-rich grassland. Priorities for restoration are those fields which retain relics of species-rich grassland (Fields 7, 8, 9, 14, 18) and those where the species present suggest that soil chemistry would enable restoration without recourse to expensive nutrient stripping work (Fields 10, 12, 13, 15, 23, 24, 32)(Appendix 7). For the successful restoration of species-rich grassland it is important for levels of available phosphate in the soil to be low (Index 0-1, <16mg/l)(Natural England, 2010), and a programme of soil sampling should be carried out before attempting any restoration work (Tytherleigh, 2008).

Field 17 would be an ideal source of plant material for the restoration of grassland elsewhere on the farm. The presence of species-rich stands of two contrasting grassland types would ensure a good diversity of propagules for the restoration of both dry and seasonally wet grasslands, and the use of material collected from the farm would both reduce costs and would ensure the retention of any local genetic variation in the species used.

While several methods have been used for the restoration of species-rich grassland in lowland England, including planting plug-grown seedlings and broadcasting harvested seed, re-creation using on-site harvested green hay would probably be the most appropriate means here (Stevenson et al, 2008; Rothero et al, 2016). It requires little effort beyond that used in normal farm operations, no additional equipment is used beyond that used for making silage and muck-spreading, and livestock would be available for post-harvest treatment.

Arable. The management of arable field margins by cultivation for endangered arable plants has been supported by agri-environment schemes throughout Europe since the early 1990s. A brief survey of field margins in 2018 indicated that Fir Farm is of considerable value for arable plants, including two NERC Act Section 41 species, shepherd's needle *Scandix pecten-veneris* and broad-fruited corn-salad *Valerianella rimosa*. It is likely that further survey will reveal other species. The most interesting field margin in 2018 was the northern margin of Field 44, but others may reveal themselves to be equally good, as cropping and other management changes in the future.

Management of field margins for the arable flora should concentrate on the outermost part of the field, as research has shown that this is where the majority of seeds of rare plants occur (Wilson & Aebischer, 1994). This field margin strip should be adjacent to the established perennial sward of the hedge bottom with no intervening strip of sown grassland or similar perennial vegetation. This strip should be cultivated at the same time as the rest of the field, but not sown with a crop or treated with any fertiliser or herbicide (spot applications may be permitted for specific weed

problems). Such cultivated strips are known to be of benefit to pollinating insects as well as other farmland wildlife.

A range of other field margin options are available within the current Countryside Stewardship Scheme (https://www.gov.uk/countryside-stewardship-grants) for fields not managed for rare arable plants.

Field descriptions

Grassland

1. Pig Paddock.

Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant white clover *Trifolium repens* and dandelion *Taraxacum sp*. Thistles *Cirsium arvense* and *Cirsium vulgare* are locally frequent.

Boundaries: walls to the east and west, fence to the south.

2. Spring Pump.

Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant white clover *Trifolium repens* and frequent creeping buttercup *Ranunculus repens,* dandelion *Taraxacum sp*. and broad-leaved dock *Rumex obtusifolius*.

Boundaries: fences on all sides.

There is a small area of young woodland between Fields 1 and 2 , consisting of crack willow *Salix fragilis,* sallow *Salix cinerea*, elm *Ulmus minor* and bramble *Rubus sp*, with planted ash *Fraxinus excelsior* to the east.

3. Stable Close.

Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant white clover *Trifolium repens* and creeping buttercup *Ranunculus repens.*

Boundaries: The field is divided into two parts by a fenced strip (Field 4, below). The western boundary is a fence. The southern boundary is a wall with standard trees of hawthorn *Crataegus monogyna*, field maple *Acer campestre*, ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus*. To the east is a double-fenced stream with hawthorn *Crataegus monogyna*, field maple *Acer campestre*, ash *Fraxinus excelsior,* Crack willow *Salix fragilis* and sycamore *Acer pseudoplatanus* and bramble *Rubus sp*, elder *Sambucus nigra*, aspen *Populus tremula*, dogwood *Cornus sanguinea* and stinging nettle *Urtica dioica*. The northern boundary is a fenced ditch and track with large ash *Fraxinus excelsior* and aspen *Populus tremula*, hawthorn *Crataegus monogyna*, sycamore *Acer pseudoplatanus,* bramble *Rubus sp* and dense stinging nettle *Urtica dioica* and greater willow-herb *Epilobium hirsutum*.

4. Stable Close.

The fenced strip bisecting the field has semi-improved grassland (NVC community MG13) along a small stream with some planted shrubs. The grassland is tall and ungrazed, with abundant rough-stalked meadow-grass *Poa trivialis*, creeping bent *Agrostis stolonifera*, marsh foxtail *Alopecurus geniculatus,* yorkshire fog *Holcus lanatus*, creeping buttercup *Ranunculus repens* and stinging nettle *Urtica dioica.*

5.

Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant white clover *Trifolium repens,* rough-stalked meadow-grass *Poa trivialis* and locally meadow foxtail *Alopecurus pratensis*.

Boundaries: The northern boundary is a wall with some large ash *Fraxinus excelsior*, hawthorn *Crataegus monogyna* and a single yew *Taxus baccata.* To the east is a strip of fenced woodland with crack willow *Salix fragilis,* ash *Fraxinus excelsior*, hawthorn *Crataegus monogyna*, sycamore *Acer pseudoplatanus,* aspen *Populus tremula,* bramble *Rubus fruticosus,* stinging nettle *Urtica dioica,* cleavers *Galium aparine,* hedge garlic *Alliaria petiolata* and greater willow-herb *Epilobium hirsutum*.

6. Pub and Village Fields.

Field formerly divided into two, with a ditch still discernible between the parts. The northern part is also crossed by a raised track running from east to west. Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant dandelion *Taraxacum sp ,* cocksfoot *Dactylis glomerata* and rough-stalked meadow-grass *Poa trivialis*.

Boundaries: The western boundary is a wall, the central section of which has shrubs of field maple *Acer campestre*, hawthorn *Crataegus monogyna*, hazel *Corylus avellana* and blackthorn *Prunus spinose*. The northern wall has small standard trees of ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus* and silver birch *Betula pendula*. The stream along the eastern side is hedged with hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior*, spindle *Euonymus europaeus* and bramble *Rubus sp.*

7. Far meadow.

Situated in the floodplain of the River Dikler, this field has peaty soil and there are the vestiges of drainage ditches in the south. Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, but differing from drier fields to the west in the abundance of marsh foxtail *Alopecurus geniculatus,* creeping buttercup *ranunculus repens* and *Agrostis stolonifera*. Rough-stalked meadow-grass *Poa trivialis* and white clover *Trifolium repens* are also abundant. The pond in the south-western corner is surrounded by ash *Fraxinus excelsior*, sallow *Salix cinerea,* hawthorn *Crataegus monogyna*, elder *Sambucus nigra* and crack willow *Salix fragilis*, with stinging nettle *Urtica dioica,* cleavers *Galium aparine,* common reed *Phragmites australis, r*ough-stalked meadow-grass *Poa trivialis,* fools' water-cress *Apium nodiflorum,* greater willow-herb *Epilobium hirsutum* and creeping buttercup *Ranunculus repens*.

Boundaries: The fenced strip along the eastern side between the main field and the river is more species-rich with plants typical of wet areas including meadowsweet *Filipendula ulmaria,* yellow flag *Iris pseudacorus*, greater pond sedge *Carex riparia*, water mint *Mentha aquatica*, crested hair-grass *Deschampsia cespitosa,* wild angelica *Angelica sylvestris* and hard rush *Juncus inflexus*. There are large trees of alder *Alnus glutinosa,* ash *Fraxinus excelsior* and white willow *Salix alba* by the river itself. The hedged and fenced ditch has field maple *Acer campestre*, sallow *Salix cinerea* and yew *Taxus baccata* and a single crab apple *Malus sylvestris*.

8.

Formerly divided into two fields, the boundary being marked by a large ash *Fraxinus excelsior*, two large oak *Quercus robur* and a hawthorn *Crataegus monogyna* and a ditch. Species-poor agriculturally-improved grassland. NVC community MG7. Dominated by perennial rye-grass *Lolium perenne*, with abundant meadow buttercup *Ranunculus acris,* dandelion *Taraxacum sp,* creeping bent *Agrostis stolonifera* and yorkshire fog *Holcus lanatus*. The field slopes down to the valley bottom, and the grassland in the floodplain at the eastern end is more species-rich, approaching NVC community MG8, with additional species including meadow fescue *Festuca pratensis,* lady's smock *Cardamine pratensis,* common spike-rush *Eleocharis palustris* and glaucous sedge *Carex flacca*. The fenced strip along the river has additional species including hard rush *Juncus inflexus,* water forget-me-not *Myosotis scorpioides*, brown sedge *Carex disticha,* meadowsweet *Filipendula ulmaria* and greater bird's-foot trefoil *Lotus pedunculatus*.

9. Bottom Southill.

A large field sloping gently down to the valley in the west. The majority of the field is a re-seeded grass ley NVC community MG7. This is dominated by perennial rye-grass *Lolium perenne*, with dandelion *Taraxacum sp,* creeping buttercup R*anunculus repens* and rough-stalked meadow-grass *Poa trivialis*. There is a strip of approximately 2m width along the lower, western edge of the field with a more species-rich grassland resembling NVC community MG8, with a range of species including soft rush *Juncus effusus,* hard rush *Juncus inflexus,* lesser pond-sedge *Carex acutiformis*, carnation sedge *Carex panicea*, ragged robin *Lychnis flos-cuculi*, meadowsweet *Filipendula ulmaria* and common reed *Phragmites australis*.

Boundaries: All boundaries are fenced. The eastern and northern boundaries also have hedges of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior*, blackthorn *Prubus 16entate* and bramble *Rubus sp.*

10. Southill

This field still retains traces of ridge and furrow cultivation. Most of the grassland is species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne*. The easternmost ridge has slightly richer grassland NVC community MG6 with additional species including crested dog's-tail *Cynosurus cristatus*, sweet vernal-grass *Anthoxanthum odoratum* and common bent *Agrostis capillaris*.

Boundaries: The northern boundary is a stockproof hedge of hawthorn *Crataegus monogyna*, field maple *Acer campestre*, bramble *Rubus sp* with ash *Fraxinus excelsior* standards, the eastern boundary is a hedge of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior,* blackthorn *Prunus 16entate,* bramble *Rubus sp* and common dog rose *Rosa canina*. The western boundary is a gappy, fenced hedge of hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior* and field maple *Acer campestre*.

11. Southill Boggy Piece

The majority of the field is a re-seeded grass ley NVC community MG7. This is dominated by perennial rye-grass *Lolium perenne* with abundant creeping buttercup *Ranunculus repens*. The field

is situated on a north-facing slope, and in mid-slope there is a flush-line with hard rush *Juncus inflexus,* soft rush *Juncus effusus* and hairy sedge *Carex hirta*.

Boundaries: All boundaries are hedged, with a ditch along the northern margin.

12. Coombes

This field is divided into two sections by a fence running from east to west. Both sections retain traces of ridge and furrow cultivation orientated from east to west in the northern part and from north-east to south-west in the south. The western part of the field has is species-poor agriculturally-improved grassland, NVC community MG7 dominated by perennial rye-grass *Lolium perenne*. The eastern part is slightly richer with NVC community MG6b including common bent *Agrostis capillaris,* crested dog's-tail *Cynosurus cristatus*, sweet vernal-grass *Anthoxanthum odoratum,* cocksfoot *Dactylis glomerata* and bulbous buttercup *Ranunculus bulbosus*. Two species typical of calcareous grasslands upright brome *Bromuserectus* and Downy oat-grass *Avenula pubescens* were present but rare.

13. Cow Ground

This field is divided into two sections by a fence running from east to west. Both sections retain traces of ridge and furrow cultivation orientated from east to west in the northern part and from north to south in the south. The western part of the field has is species-poor agriculturally-improved grassland, NVC community MG7 dominated by perennial rye-grass *Lolium perenne*. In the east, the ridges have a more species-rich MG6b grassland dominated by red fescue *Festuca rubra*, including common bent *Agrostis capillaris,* crested dog's-tail *Cynosurus cristatus* and sweet vernal-grass *Anthoxanthum odoratum*.

Boundaries: The northern hedge is composed of hawthorn *Crataegus monogyna*, blackthorn *Prunus spinosa,* elder *Sambucus nigra,* bramble *Rubus sp* and common dog rose *Rosa canina* with ash *Fraxinus excelsior* standards. The western hedge has hawthorn *Crataegus monogyna*, ash *Fraxinus excelsior,* hazel *Corylus avellana*, bramble *Rubus sp* and elm *Ulmus minor*.

14. Cow Hovel

Traces of ridge and furrow cultivation are still discernible. The majority of the grassland is species-poor agriculturally-improved grassland, NVC community MG7 dominated by perennial rye-grass *Lolium perenne*. The western part nearer the river has wetter, peaty soils with more species-rich grassland including meadowsweet *Filipendula ulmaria* and glaucous sedge *Carex flacca*.

15.

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne*,

16. Cat Bridge

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with abundant Italian rye-grass *Lolium multiflorum,* marsh foxtail *Alopecurus*

geniculatus and dandelion T*araxacum sp* and frequent meadow foxtail *Alopecurus pratensis,* creeping buttercup *Ranunculus repens* and daisy *Bellis perennis*.

17.

Situated on a gentle east-facing slope and bisected by a raised track and with a ridge and furrow profile. Grassland in this field is of exceptional quality and is mostly very species-rich. It is possible that the lower-lying parts of the field are wet in the winter, and this may explain the distribution of grassland types.

Much of the western part of the field and the furrows further east have NVC community MG4. This grassland is most frequently found in the seasonally inundated floodplains of rivers in central southern England, and is particularly characteristic of the valley of the upper Thames tributaries where it is usually cut for a hay crop. This grassland is dominated by a mixture of grasses including meadow foxtail *Alopecurus pratensis,* sweet vernal-grass *Anthoxanthum odoratum, Dactylis glomerata, Festuca rubra* and *Agrostis capillaris* with broad-leaved species including greater burnet *Sanguisorba officinalis,* meadow buttercup *Ranunculus acris,* meadow vetchling *Lathyrus pratensis,* ribwort plantain *Plantago 18entate18te* and dandelion *Taraxacum spp* (several rare micro-species of *Taraxacum* are known from this grassland type in Oxfordshire).

Drier parts of the field in the east and on the ridges have species-rich MG5b grassland. This is a grassland typical of relatively deep, well-drained, calcareous soils. Here, this community includes some species equally typical of calcareous communities. Grasses and broad-leaved species are similarly abundant in the sward. Principal species are upright brome *Bromus erectus,* sweet vernal-grass *Anthoxanthum odoratum,* cocksfoot *Dactylis glomerata,*red fescue *Festuca rubra*, common bent *Agrostis capillaris*, yorkshire fog *Holcus lanatus,* field wood-rush *Luzula campestris,* meadow vetchling *Lathyrus pratensis,* ribwort plantain *Plantago lanceolate,* bird's-foot trefoil *Lotus corniculatus,* salad burnet *Sanguisorba minor,* black knapweed *Centaurea nigra,* pignut *Conopodium majus*, bulbous buttercup *Ranunculus bulbosus,* yellow rattle *Rhinanthus minor* and lady's bedstraw *Galium verum*.

These two grassland communities grade into each other, and locally form a fine-grained mosaic. In the extreme west and south-west, the grassland is less species-rich.

Boundaries: The north and south of the field are bordered by woodland. The western roadside hedge is thick and tall, composed mainly of hawthorn *Crataegus monogyna* and blackthorn *Prunus 18entate,* and with a large gap in the centre where the hedge bank appeared to be being reconstructed. The eastern hedge is gappy but fenced, consisting largely of hawthorn *Crataegus monogyna*, hazel *Corylus avellana* and field maple *Acer campestre* with standard ash *Fraxinus excelsior*.

18. Drive

Grassland in this field is not particularly species-rich, but is slightly better than that in most other fields. NVC community MG6b. Dominated by perennial rye-grass *Lolium perenne* with meadow foxtail *Alopecurus pratensis*, white clover *Trifolium repens*, meadow buttercup *Ranunculus acris*, yorkshire fog *Holcus lanatus*, sweet vernal-grass *Anthoxanthum odoratum* and commn bent *Agrostis capillaris*. A small part of the field is divided from the rest by the drive to Firs Farm. To the south of

this, several species typical of longer established grasslands were present at low frequencies, including black knapweed *Centaurea nigra,* bird's-foot trefoil *Lotus corniculatus,* cowslip *Primula veris*, ox-eye daisy *Leucanthemum vulgare* and glaucous sedge *Carex flacca*.

19. Turnips

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with rough-stalked meadow grass *Poa trivialis* and white clover *Trifolium repens*.

20. Stumpy

Although agriculturally improved and generally species-poor, grassland in this field is slightly more species-rich than in many other fields on the farm. NVC community MG6b, dominated by perennial rye-grass *Lolium perenne* with rough-stalked meadow grass *Poa trivialis*, white clover *Trifolium repens,* soft grass *Bromus hordaceus,* ribwort plantain *Plantago lanceolate*, bulbous buttercup *Ranunculus bulbosus,* red clover *Trifolium pratense,* cocksfoot *Dactylis glomerata* and yorkshire fog *Holcus lanatus*.

Boundaries: The eastern boundary is a relatively new hawthorn *Crataegus monogyna* hedge, the northern boundary a tall hawthorn *Crataegus monogyna* and ash *Fraxinus excelsior* hedge, and the western boundary a stone wall and fence.

21. Pigs

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with cocksfoot *Dactylis glomerata,* rough-stalked meadow grass *Poa trivialis,* dandelion *Taraxacum sp,* timothy *Phleum pratense* and white clover *Trifolium repens*.

22. Wynyards

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with*,* dandelion *Taraxacum sp,* timothy *Phleum pratense* and white clover *Trifolium repens*.

23. Kirkham

Permanent pasture. More diverse and species-rich than most fields, the richest area on the steeper slopes in the east. The NVC community is MG6b. The less-rich areas are dominated by perennial rye-grass *Lolium perenne* and yorkshire fog *Holcus lanatus*. Richer parts have abundant common bent *Agrostis capillaris,* sweet vernal-grass *Anthoxanthum odoratum,* perennial rye-grass *Lolium perenne,* yorkshire fog *Holcus lanatus,* rough-stalked meadow grass *Poa trivialis,* meadow buttercup *Ranunculus acris* and dandelion *Taraxacum sp*. Bulbous buttercup *Ranunculus bulbosus*, crested dog's-tail *Cynosurus cristatus* and red clover *Trifolium pratense* are also frequent. Damp areas have abundant creeping bent *Agrostis stolonifera*. The boundary between this field and House Front has two crab apple M*alus sylvestris* trees at the northern end.

24. House Front

Moderately species-rich grassland, NVC community MG6b. perennial rye-grass *Lolium perenne* with rough-stalked meadow grass *Poa trivialis*, meadow buttercup *Ranunculus acris,* dandelion *Taraxacum sp,* daisy *Bellis perennis*, yorkshire fog *Holcus lanatus,* creeping bent *Agrostis stolonifera* and sweet vernal-grass *Anthoxanthum odoratum*. Ragged robin *Lychnis flos-cuculi* a species typical of long-established grasslands, was recorded.

25.

This is an ungrazed strip of grassland with two small ponds at the western end, and is probably used for recreation. The NVC community is MG1c, but with affinities with MG8. Grasses including rough-stalked meadow grass *Poa trivialis*, meadow foxtail *Alopecurus pratensis* and yorkshire fog *Holcus lanatus* are dominant with false oat-grass *Arrhenatherum elatius* locally . Species characteristic of wet grasslands include meadowsweet *Filipendula ulmaria,* water mint *Mentha aquatica*, ragged robin *Lychnis flos-cuculi* and wild angelica *Angelica sylvestris*.

26. Lime Kiln Southill (south)

Recent tree-planting in agriculturally-improved pasture, possibly former arable land. Dominant species are creeping bent *Agrostis stolonifera*, perennial rye-grass *Lolium perenne*, rough-stalked meadow grass *Poa trivialis,* timothy *Phleum pratense* and couch *Elymus repens*.

27. Lime Kiln Southill

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne,* creeping bent *Agrostis stolonifera* and timothy *Phleum pratense*.

28. Ridge and Furrow Southill

Ploughed for “wild-bird cover”. The north-eastern corner has been fenced and a pond dug.

29.

Divided into two parts by a fence. The north-western part of the field has been planted with trees. Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne,* timothy *Phleum pratense,* white clover *Trifolium repens,* yorkshire fog *Holcus lanatus,* rough-stalked meadow grass *Poa trivialis,*Italian rye-grass *Lolium multiflorum,* and creeping bent *Agrostis stolonifera* in wetter areas. The tree-planted area has NVC community MG1b, dominated by false oat-grass *Arrhenatherum elatius,* with field bindweed *Convrolvulus arvensis,* stinging nettle *Urtica dioica,* cow parsley *Anthriscus sylvestris,* broad-leaved dock *Rumex obtusifolius,* cleavers *Galium aparine,* yorkshire fog *Holcus lanatus,* rough-stalked meadow grass *Poa trivialis* and creeping thistle *Cirsium arvense*.

32 Skinner’s Hill

This is a steep, north-facing slope overlooking the B4068 road west of Lower Swell. The grassland on the slope is NVC community MG6c, moderately species-rich, but lacking any of the species typical of long-established calcareous grasslands. Perennial rye-grass *Lolium perenne* is dominant with

yorkshire fog *Holcus lanatus,* creeping bent *Agrostis stolonifera,* red fescue *Festuca rubra* and smaller cat's-tail *Phleum bertolonii*. This grades into poorer MG7 on the gentler, uppermost slopes.

35.

Recently re-seeded grassland dominated by perennial rye-grass *Lolium perenne* with white clover *Trifolium repens,* ribwort plantain *Plantago lanceolate,* chicory *Cichorium intybus* and bird's-foot trefoil *Lotus corniculatus*, all of which are likely to have been included in the seed mixture. A number of other species were recorded which were probably in the seed mix.

46.

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with dandelion *Taraxacum sp* and white clover *Trifolium repens*.

47.

Field divided into three sections by electric fencing. Most of the grassland is species-poor and agriculturally improved dominated by perennial rye-grass *Lolium perenne* and white clover *Trifolium repens*. Damper areas have abundant creeping bent *Agrostis stolonifera* and marsh foxtail *Alopecurus geniculatus*.

48

Species-poor agriculturally-improved grassland. NVC community MG7 dominated by perennial rye-grass *Lolium perenne* with creeping buttercup *Ranunculus repens* and white clover *Trifolium repens*.

NVC Communities recorded

MG1c False oat-grass *Arrhenatherum elatius* grassland , meadowsweet *Filipendula ulmaria* sub-community

MG4 Meadow foxtail *Alopercurus pratensis*-greater burnet *Sanguisorba officinalis* grassland

MG5b Black knapweed *Centaurea nigra*-crested dog's-tail *Cynosurus cristatus* grassland, lady's bedstraw *Galium verum* sub-community.

MG6b Perennial rye-grass *Lolium perenne*- crested dog's-tail *Cynosurus cristatus* grassland, sweet vernal-grass *Anthoxanthum odoratum* sub-community

MG6c Perennial rye-grass *Lolium perenne*- crested dog's-tail *Cynosurus cristatus* grassland, yellow oat-grass *Trisetum flavescens* sub-community

MG7 Perennial rye-grass *Lolium perenne* leys and related grasslands

MG8 Crested dog's-tail *Cynosurus cristatus*-marsh marigold *Caltha palustris* grassland

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