# Composition and characteristics of a transitional flora at Rough Hills grasslands, Bayfordbury

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## Introduction

As in neighbouring counties, semi-natural grasslands are a fast-disappearing habitat in Hertfordshire. According to the recent Hertfordshire's State of Nature report (HMWT, 2020), 'of the semi-natural habitats, the greatest combined percentage of extinctions and species that have decreased were associated with grasslands'. This decrease is driven by conversion to other land uses (including tree planting) as well as inadequate management (too intensive or lack of management) of the existing grasslands leading to species loss.

> Legend Bayfordbury Bor RHG Boundarie

> > Pinetum

Bayfordbury

**Mansion** 

Observatory

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Figure 1. Locations of Rough Hills grasslands within the

Hook's

Grove

Rough Hills grasslands are part of the Bayfordbury Estate, now part of the University of Hertfordshire. The estate was originally developed in 1757, and includes an ornamental lake. plantation woodland and a Pinetum (from 1767) (https://www.herts. ac.uk/bayfordbury/lifeand-medical-sciencesfield-centre). Currently, Bayfordbury contains five Local Wildlife Sites including two grassland sites (Rough Hills and a patch of grassland next to the glasshouses), two woodlands (Hook's Grove and Sailor's Grove) and the Lake. The Pinetum has a status of a Local Ecosite (pers. comm. Alex Waechter, Herts Environmental Records Centre data officer).

Rough Hills is identified as a Local Wildlife Site for its species-rich neutral grassland interest (information available from Herts Environmental Records Centre www.hercinfo.org.uk). Prior to the 1960s land use was mixed arable and pasture, and since the 1960s have

Igreen

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Bayfordbury campus.

a history of irregular cutting (leading the substantial scrub encroachment), abandoned mowing experiments and haphazard management with no records kept (Helm, 2013). Rough Hills are sited between Sailor's Grove and Pinetum both of which generate abundant tree seeds and so, without informed and regular management, Rough Hills would quickly turn into a woodland. In this article, we look specifically at the grasslands themselves, which are approximately 2 hectares in size and comprise three compartments linked by a path and separated by scrub/woodland

(Figure 1). The type of soil found at Bayfordbury is 'lime-rich loamy and clayey soils with impeded drainage' (http://www.landis. org.uk/soilscapes/). This soil has high fertility and potentially supports 'base-rich pastures and classic chalky boulder clay ancient woodlands' (Cranfield University, 2004). Rough Hills are usually classified as MG1 (mesotrophic grassland dominated by False Oatgrass Arrhenatherum elatius) for management purposes (Helm, 2013: Scholes, 2019) but the species composition has been in transition over recent years following the introduction of diverse mowing practices. In this article we analyse the botanical composition of Rough Hills as disclosed by

surveys between 2013 and 2020 using HMWT's site survey criteria and Common Standards Monitoring (CSM) Guidance for Lowland Grassland Habitats (2004) as sources of indicator species for different grassland types.

#### Plant species composition

Between 2013 and 2020, 122 species of flowering plants were recorded at Rough Hills (Table 1). According to Herts and Middlesex Wildlife Trust (HMWT) criteria, 28 of these species are positive grassland indicators, 19 are negative grassland indicators and 7 are Ancient Woodland Indicators. A further ten species can be classified as indicators based on Common Standards Monitoring (CSM) Guidance for Lowland Grassland Habitats (2004).

The most notable species is Adder's-tongue (Ophioglossum vulgatum, Figure 2) - a fern associated with unimproved grasslands and an indicator of calcareous/neutral grasslands, lost at many sites in Hertfordshire. Two orchids - Bee Orchid (Ophrys apifera, calcareous/neutral grassland indicator) and Common Spotted-orchid (Dactylorhiza fuchsii, calcareous grassland indicator) appear sporadically in Rough Hills Central and South. D. fuchsii was most abundant following clearance work near the Monument which caused severe compaction of vegetation in the previous year. Meadow Cranesbill (Geranium pratense, not listed as an indicator) and Marjoram (Origanum vulgare, calcareous grassland indicator) have been spreading steadily during the observation period.

Other plants considered as calcareous grassland indicators by CSM (in part at least) are Grey Sedge



**Figure 2.** Adder's-tongue fern in Rough Hills North on 14 May 2019 (photo Alla Mashanova).

(Carex divulsa), Spike Sedge (Carex spicata), Wild Basil (Clinopodium vulgare), Hairy and Perforate St. John's-wort (Hypericum hirsutum, H. perforatum). Other calcareous/neutral indicators include Agrimony (Agrimonia eupatoria), Knapweed (Centaurea nigra agg.), Field Scabious (Knautia arvensis), Oxeye Daisy (Leucanthemum vulgare), Birds-foot-Trefoil (Lotus corniculatus), Bulbous Buttercup (Ranunculus bulbosus), Yellow Rattle (Rhinanthus minor), Red Clover (Trifolium pratense) and Germander Speedwell (Veronica chamaedrus). Glaucous Sedge (Carex flacca) is referred to as calcareous/neutral and wet, and Lesser Hawkbit (Leontodon saxatilis) as calcareous/neutral and acid grassland indicators. Hairy Violet (Viola hirta) is mentioned as calcareous/ acid indicator in CSM. CSM also mentions Dog's Mercury (Mercurialis perennis) and Wild Angelica (Angelica sylvestris) as calcareous in addition to ancient woodland indicator for Dog's Mercury and fen/ wet for Wild Angelica.

Neutral grassland indicators include Meadow Barley (Hordeum secalinum), Grass Vetchling (Lathyrus nissolia), Meadow Vetchling (Lathyrus pratensis), Meadow Buttercup (Ranunculus acris), Common Sorrel (Rumex acetosa) and Meadow Fescue (Schedonorus pratensis). Common Bent (Agrostis capillaris), Field Wood-rush (Luzula campestris) and Lesser Stitchwort (Stellaria graminea) indicate



**Figure 3.** An example of Rough Hills Central with a half cut and another half showing abundant Hoary Ragwort on 23 August 2019 (photo Alla Mashanova).



**Figure 4.** Knapweed with Hoary Ragwort in the background in Rough Hills South on 17 August 2016 (photo Alla Mashanova).

neutral/acid grasslands. Meadow Brome (*Bromus commutatus*) and Cuckoo-flower (*Cardamine pratensis*) indicate neutral/wet grasslands. Meadowsweet (*Filipendula ulmaria*) includes neutral as well as wet/fen in CSM but has only wet/fen in the HMWT criteria. Just two plants of Meadowsweet have been persistent in Rough Hills South along with a few tussocks of Hard Rush (*Juncus inflexus*).

In addition to Dog's Mercury, ancient woodland indicators include Wavy Bitter-cress (*Cardamine flexuosa*), Pendulous and Wood Sedges (*Carex pendula, C. sylvatica*), and three tree species encroaching as tree saplings – Field Maple (*Acer campestre*), Hornbeam (*Carpinus betulus*) and Holly (*Ilex aquifolium*). All the above species occur in the margins adjacent to tracts of scrub or woodland and have low abundance.

The most abundant negative indicators are the highly competitive False Oat-grass and Cocksfoot (*Dactylis glomerata*) as well as Yorkshire Fog (*Holcus lanatus*) and Rough Meadow-grass (*Poa trivialis*). These may be in part a legacy of the agricultural past of Rough Hills. During the survey period the abundance of these species has been decreasing in favour of Hedge Bedstraw (*Galium album*), buttercups, Knapweed and Hoary Ragwort (*Senecio erucifolius*), and the less aggressive grass species like Meadow Brome, Red Fescue (*Festuca rubra*) and Meadow Fescue. Creeping



Figure 5. Hedge Bedstraw in Rough Hills Central on 7 July 2017 (photo Alla Mashanova).

Thistle (Cirsium arvense) is the one abundant nongrass species that has been decreasing in response to the more frequent cutting regimes. Daisy (Bellis perennis), Soft Brome (Bromus hordeaceus), Perennial Rye-grass (Lolium perenne), Greater Plantain (Plantago major), Creeping Buttercup (Ranunculus repens) and White Clover (Trifolium repens) encroach from the paths which are kept cut during the season. Cleavers (Galium aparine) and Stinging Nettle (Urtica *dioica*) are mostly confined to the sites where grass cuttings are deposited which leads to soil enrichment. Common Mouse-ear (Cerastium fontanum), Spear Thistle (Cirsium vulgare), Timothy (Phleum pratense), Curled and Broad-leaved Docks (Rumex crispus, R. obtusifolius) and Common Ragwort (Senecio jacobaea) are also negative indicators but are sparse and infrequent. Negative indicator species appear to be associated with the management units that are mown less frequently and where tree saplings have not been removed.

Two abundant species with no indicator status are Hoary Ragwort and Hedge Bedstraw. Hoary Ragwort is a characteristic plant of rough grasslands on clay soils (James, 2009) and is abundant in Rough Hills in late summer (Figure 3) along with Knapweed (Figure 4). Hedge Bedstraw is a common plant of hedgerows and ungrazed grasslands which is widespread but showing some signs of decrease in Hertfordshire (James, 2009). In Rough Hills, Hedge Bedstraw has become abundant in mid-summer following re-introduction of regular mowing (Figure 5).

Grasslands require constant management to keep scrub under control. Most problems are caused by Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*) with a contribution from Ash (*Fraxinus excelsior*) and Turkey and Pedunculate Oaks (*Quercus cerris, Q. robur*) and occasionally Horse Chestnut (*Aesculus hippocastanum*) and Elms (*Ulmus* sp.). In addition to tree saplings, Dewberry (*Rubus caesius* agg.) in Rough Hills South spreads rapidly between the cuts forming a mat.

### Conclusion

Based on species composition, Rough Hills grasslands can be summarised as neutral but with considerable calcareous elements. Two species (Common Spottedorchid and Marjoram) are classified as pure calcareous grassland indicators in the HMWT list (with an extra 5 species included in CSM). Six species are neutral indicators, and 13 species are both calcareous/neutral indicators.

We hypothesise that although the underlying soil is lime-rich and potentially can support base-rich communities, the long history of agricultural use up to the 1960s suppressed the calcareous species in favour of ones (including rank grasses) that can thrive under agricultural practices. Management between the 1960s and 2013 was patchy and at the beginning of the survey period only a few calcareous indicators were observed. Following regular mowing since 2013, the flora has been in active transition and calcareous species have increased in number and abundance, greatly enriching the flora and its value to other trophic groups.

## References

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**Table 1.** Species recorded at Rough Hills between 2013 and 2020 and their indicator status based on HMWT criteriaand adjusted with CSM guidance for lowland grassland habitats.

Latin name	English name	indicators, original	indicators, adjusted with CSM
Acer campestre	Field Maple	*	*
Achillea millefolium	Yarrow		
Aesculus hippocastanum	Horse-chestnut		
Agrimonia eupatoria	Agrimony	c/n	c/n
Agrostis capillaris	Common Bent	a/n	a/n
Agrostis stolonifera	Creeping Bent		
Alopecurus pratensis	Meadow Foxtail		
Angelica sylvestris	Wild Angelica	f/w	c/f/w
Anisantha sterilis	Barren Brome		
Arrhenatherum elatius	False Oat-grass	- a/c/n/w	- a/c/n/w
Arum maculatum	Lords-and-Ladies		
Bellis perennis	Daisy	- a/c	- a/c
Brachypodium sylvaticum	False Brome		
Bromus commutatus	Meadow Brome	n/w	n/w
Bromus hordeaceus	Soft Brome	- n	- n
Cardamine flexuosa	Wavy Bitter-cress	*	*
Cardamine hirsuta	Hairy Bitter-cress		
Cardamine pratensis	Cuckooflower	n/w	n/w
Carex divulsa	Grey Sedge		с

Latin name	English name	indicators, original	indicators, adjusted with CSM
Carex flacca	Glaucous Sedge	c/n/w	c/n/w
Carex pendula	Pendulous Sedge	*	*
Carex spicata	Spiked Sedge		с
Carex sylvatica	Wood Sedge	*	*
Carpinus betulus	Hornbeam	*	*
Centaurea nigra agg.	Knapweed	c/n	c/n/w
Cerastium fontanum	Common Mouse-ear	- a	- a
Cerastium glomeratum	Sticky Mouse-ear		
Cirsium arvense	Creeping Thistle	- a/c/n/w	- a/c/n/w
Cirsium vulgare	Spear Thistle	- a/c/n/w	- a/c/n/w
Clinopodium vulgare	Wild Basil		c
Convolvulus arvensis	Field Bindweed		
Cornus sanguinea	Dogwood		
Crataegus monogyna	Hawthorn		
Crepis capillaris	Smooth Hawk's-beard		
Dactylis glomerata	Cocksfoot	- a/c/n/w	- a/c/n/w
Dactulorhiza fuchsii	Common Spotted-orchid	c	a/c/n/w
Dipsacus fullonum	Wild Teasel		
Epilobium hirsutum	Great Willowherb		
Epilobium parviflorum	Hoary Willowherb		
Epilobium tetraaonum	Square-stalked Willowherb		
Festuca rubra aaa.	Red Fescue		
Filipendula ulmaria	Meadowsweet	f/w	n/f/w
Fraxinus excelsior	Ash	-1	
Galium aparine	Cleavers	- c/n	- c/n
Galium album	Hedge Bedstraw	0/ 11	0,
Geranium dissectum	Cut-leaved Craneshill		
Geranium pratense	Meadow Cranesbill		
Geum urbanum	Wood Avens		
Glechoma hederacea	Ground Ivy		
Heracleum sphondulium	Hogweed		
Holcus lanatus	Yorkshire Fog	- a/c/n/w	- a/c/n/w
Holcus lanatus x H. mollis	Yorkshire Fog $\times$ Creeping		
	Soft-grass		
Hordeum secalinum	Meadow Barley	n	n
Hypericum hirsutum	Hairy St John's-wort		с
Hypericum perforatum	Perforate St John's-wort		с
Ilex aquifolium	Holly	*	*
Juncus inflexus	Hard Rush		- n/w
Knautia arvensis	Field Scabious	c/n	c/n
Lathyrus nissolia	Grass Vetchling	n	n
Lathyrus pratensis	Meadow Vetchling	n	n
Leontodon saxatilis	Lesser Hawkbit	c/a/n	c/a/n
Leucanthemum vulaare	Oxeve Daisy	c/n	c/n
Lolium perenne	Perennial Rye-grass	- a/c/n/w	- a/c/n/w
Lotus corniculatus	Common Bird's-foot-trefoil	c/n	a/c/n
Luzula campestris	Field Wood-rush	a/n	a/n
Malva moschata	Musk Mallow	,	, 
Medicago lupuling	Black Medick		
Mercurialis perennis	Dog's Mercury	*	*/c
Muosotis arvensis	Field Forget-me-not		1-
Odontites vernus	Red Bartsia		

Latin name	English name	indicators, original	indicators, adjusted with CSM
Ophioglossum vulgatum	Adder's-tongue Fern	c/n	c/n
Ophrys apifera	Bee Orchid	c/n	a/c/n/w
Origanum vulgare	Wild Marjoram	с	с
Phleum bertolonii	Smaller Catstail		
Phleum pratense	Timothy	- a/n/w	- a/n/w
Picris hieracioides	Oxtongue Hawkweed		
Plantago lanceolata	Ribwort Plantain		
Plantago major	Greater Plantain	- a/c/n	- a/c/n
Poa angustifolia	Narrow-leaved Meadow-grass		
Poa annua	Annual Meadow-grass		
Poa pratensis	Smooth Meadow-grass		
Poa trivialis	Rough Meadow-grass	- W	- W
Potentilla reptans	Creeping Cinquefoil		
Prunella vulgaris	Selfheal		
Prunus spinosa	Blackthorn		
Quercus cerris	Turkey Oak		
Quercus robur	Pedunculate Oak		
Ranunculus acris	Meadow Buttercup	n	n
Ranunculus bulbosus	Bulbous Buttercup	c/n	c/n
Ranunculus ficaria subsp. verna	Lesser Celandine		
Ranunculus repens	Creeping Buttercup	- W	- W
Rhinanthus minor	Yellow Rattle	c/n	c/n
Rosa canina agg.	Dog-rose	,	c
Rubus caesius	Dewberry		
Rubus fruticosus agg.	Bramble		
Rumex acetosa	Common Sorrel	n	n
Rumex crispus	Curled Dock	- c/n/w	- c/n/w
Rumex obtusifolius	Broad-leaved Dock	- c/n/w	- c/n/w
Rumex sanguineus	Wood Dock		
Schedonorus pratensis	Meadow Fescue	n	n
Senecio erucifolius	Hoary Ragwort		
Senecio jacobaea	Common Ragwort	- a/c/n	- a/c/n
Senecio vulgaris	Groundsel		
Silene vulgaris	Bladder Campion		
Sonchus asper	Prickly Sowthistle		-с
Sonchus oleraceus	Smooth Sowthistle		-c
Stellaria graminea	Lesser Stichwort	a/n	a/n
Stellaria holostea	Greater Stichwort	,	,
Taraxacum officinale aga.	Dandelion		
Torilis japonica	Upright Hedge-parsley		
Traaopoaon pratensis	Goat's-beard		
Trifolium pratense var. pratense	Red Clover	c/n	c/n
Trifolium repens	White Clover	-a/c/n/w	- a/c/n/w
Ulmus sp.	Elm		
Urtica dioica	Stinging Nettle	- a/c/n/w	- a/c/n/w
Veronica chamaedrus	Germander Speedwell	c/n	c/n
Veronica filiformis	Slender Speedwell		,
Veronica serpullifolia	Thyme-leaved Speedwell		
Vicia hirsuta	Hairy Tare		
Vicia sativa aaa.	Common Vetch		
Vicia tetrasperma	Smooth Tare		
Viola hirta	Hairy Violet		a/c