

# The History and Plant Ecology of Hinksey Meadow

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*I know what white, what purple fritillaries  
The grassy harvest of the river-fields,  
Above by Ensham, down by Sandford, yields  
And what sedged brooks are Thames's tributaries, ...*

Matthew Arnold (1866) *Thyrsis* (lines 107-110)

## Summary

The Oxfordshire Flora Group has counted fritillary plants (*Fritillaria meleagris*) on Hinksey Meadow (13 ha), owned and managed by the Oxford Preservation Trust, since 2003. A survey of the rest of the vegetation confirms that this is an historic flood meadow with 7 ha of a species-rich and diverse MG4a plant community. This makes an important contribution to the total area of this community in the UK. The baseline data in this paper will allow changes to the management or disturbance, such as the Oxford Flood Alleviation Scheme, to be closely monitored.

## Introduction

This paper describes the vegetation of Hinksey Meadow at North Hinksey (33 acres, 13 ha, SP 494058) which appears to have a particularly species rich, diverse and characteristic flood meadow flora. It is owned by the Oxford Preservation Trust (OPT), is open to the public, and used for botanical excursions (Figure 1). The meadow is a Thames Valley Environmental Record Centre (TVERC) Local Wildlife Site (Osney Mead, 40Y04), part of the Upper Thames Environmentally Sensitive Area, and gained a Country Land & Business Association Wildlife Sites award 2001. The Jubilee Scrape was inserted in 2002, following the meandering palaeochannel which marks the original boundary of Medieval Oxford's Franchises of Liberty (Local authority boundary until 1991); in early history it was part of the boundary between Mercia and Wessex, and later the boundary between Oxfordshire and Berkshire.



**Figure 1. ANHSO field trip in 2014. Photo by Margaret Abel.**



**Figure 2. 0.7 m depth of flood water on 29 November 2012. Photo by Tim King.**

Only about 2000 ha of characteristic semi-natural floodplain meadows (MG4) remain in Britain, but the Oxford Area has Pixey & Yarnton Meads (SSSI), Iffley Meadows (SSSI), New Marston Meadows (SSSI), Magdalen Meadows and Somerford Mead. On Hinksey Meadow the re-introduction of a rigorous management regime has allowed the regeneration of 7 ha of a particularly species-rich plant community variant (MG4a in the National Vegetational Classification) of which only 192 ha had previously been recorded in the UK (Wallace & Prosser 2017).

This meadow is between the Seacourt Stream and the Bulstake Stream. It flooded in summer 2007, 2009, late 2012 (Figure 2) and for two months in January-February 2014. Above Jurassic clay is about 1.6 m of Pleistocene gravel deposits, (Oxford Archaeology 2011) overtopped by 0.3-1.6 m of alluvial silt (Oxford Archaeology 2017). The water table is augmented by considerable lateral underground water movement; the Seacourt Stream drains the gravel aquifer along its full length with ground water flowing westwards (MacDonald et al. 2007, EA 2010). The Seacourt Stream used to be the main route of the Thames. Recent archaeological excavations for the Oxford Flood Alleviation Scheme (FAS) suggest that over the past 2,500 years the flood plain was served by numerous braided streams which continually altered course (Strafford, pers. comm. 2017).

Its management since 2013 has been traditional and ideal – a hay cut in July and aftermath grazing by cattle under Higher Level Scheme agreement. The limited population of Fritillaries (*Fritillaria meleagris*) has been assessed since 2003 (Table 1).

## History

Hinksey Meadow has probably been a hay meadow for much of the last thousand years, associated with Botley Mill, part of St Thomas' Parish in Oxford (Chance 1979). Its earliest mention is when, variously called King's Mead, Northleye, or Botley Mead, it was granted by Henry I to Abingdon Abbey between 1102 and 1110. Documents of 1162, 1249 (Chance 1979) and 1715, 1741 (Oxfordshire Local Studies Unit) suggest that it was hay meadow with aftermath grazing for a long time. It was taken over by Christ Church College, Oxford after the dissolution of the monasteries. Nutrient-rich hay meadows were valuable for both hay and grazing and their leases changed hands for considerable sums (Oxford Local Studies Unit).

The part of the meadow north-west of the Jubilee scrape was in Berkshire. Thus its historic management may have been different from the rest (North Hinksey Manorial descent). It is called 'Little Cindersea Meadow' on an 1842 map (1842 map). The rest was called 'Great Meadow'. This major part of the current Meadow was common in 1842 and 'therefore manorial land, passing to the Lords Harcourt in the 1770s (Munby pers. comm., after Hanson 1996). There is also an 1848 map. This is difficult to interpret but that is probably where the OPT name 'Hincksey Meadow' comes from.

After enclosure (1853) the flood meadows in the area were divided amongst private landowners. Willow Walk (area G in figure 4), along the SE boundary, was developed by the Harcourts around 1880 and was opened to the public in the 1920s as a route from North Hinksey to Osney Mead. The OPT purchased the meadow, which it calls Hinksey Meadow, in 1997 (from Brigadier Montague-Jones). It has more or less the same boundaries as in 1870 (Ordnance survey, 1<sup>st</sup> edition). In 2011 the Environment Agency installed six culverts each 1.4 m in diameter beneath Willow Walk to take flood water southwards. Despite its fluctuating fortunes, on the basis of this evidence it would be justified to refer to Hinksey Meadow as an ancient flood meadow or ancient hay meadow.

In view of its antiquity it seems likely that the importance of the vegetation on Hinksey Meadow has been underestimated. I surveyed it to establish which of the new four categories of MG4 classification it belongs to.

## Management Past and Present

After the annual hay cut the meadow was grazed by horses from the Old Manor House Riding School, North Hinksey, from the 1960s to about 2012. Until the meadow was purchased by OPT it was cut for hay and aftermath grazed by horses (Donnelly pers. comm. June 2016). After OPT purchased the meadow in 1997 horses grazed it at low density, all year round, except when it was flooded. In most years after the Jubilee Scrape was deepened in 2002, the north-west part of the meadow was fenced south of the scrape to prevent the incursion of horses. The vegetation to the north-west of the scrape became ranker and poorer in species.

The July hay cut was re-instituted around 2006. In autumn 2007 (the hay was left on the surface), the hay cut was late in 2010 and three months late in 2011. In 2012-13

the fence across the meadow was removed and the perimeter was fenced. In 2013 optimal management began; a hay cut in July or early August has been followed by aftermath grazing by 10-15 Aberdeen Angus cross cattle owned by Charles Gee of Medley Manor Farm, who also carries out the hay cut (Gee pers. comm. 2016). The cattle range over the whole Meadow area.

## **Methods**

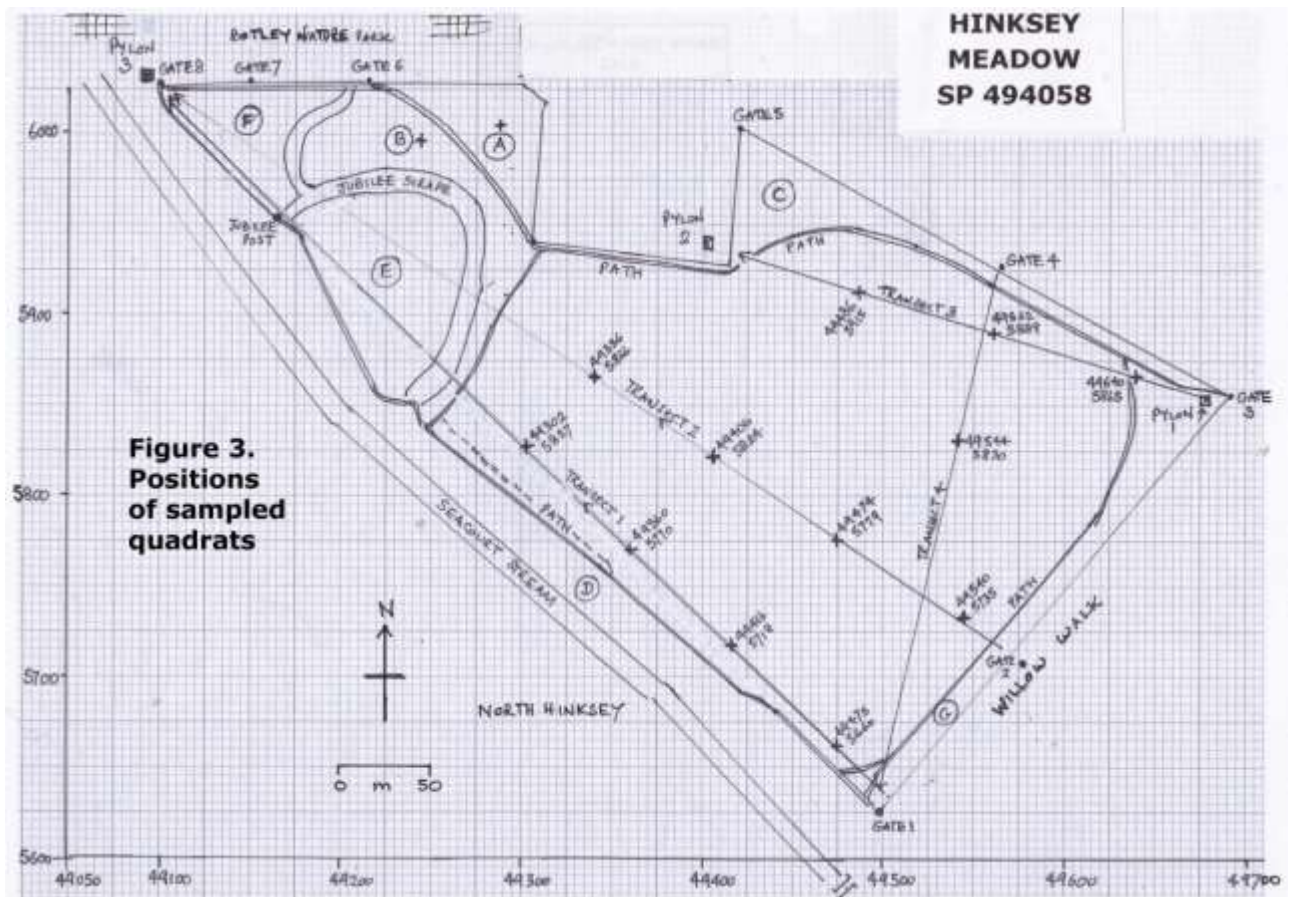
Three surveys were carried out: a count of the population of fritillary (*Fritillaria meleagris*) from 2003-2017; two quadrat surveys in 2016 of the 7 ha MG4 plant community. A map was produced of the main plant communities.

### ***Fritillaria meleagris***

The flowers, and non-flowering plants, were mapped and carefully counted each year in April or early May at peak flowering time from 2003 onwards.

### **Quadrat surveys**

Sampling of the main MG4 area on 6-8 June 2016 followed the protocol suggested by Emma Rothero and the Floodplain Meadow Partnership (FMP) Technical Handbook (2016). Twelve sampling points were mapped on paper along transects (Figure 3) between prominent fixed objects (e.g. pylons) 40 or 80 m apart so that the survey could easily be repeated. The points were located on the ground by GPS; they were not subjectively chosen. A one square metre quadrat was sampled with the post in the NW corner and its NW and SE edges parallel to Willow Walk (area G in figure 4). The percent covers of all species rooted in the quadrat were estimated by the same (experienced) observer on a percentage scale. Then the area was extended to 2 x 2 m, the rest of the quadrat was surveyed and the cover-abundance of all the species was recorded on the Domin scale to allow comparison with the original NVC data (Rodwell 1982).



**Figure 3. Positions of sampled quadrats.**

### Plant communities

Four other sites were Domin-sampled on 13 June by 2 x 2 m quadrats selected subjectively to represent typical stands. The central area, coloured red in figure 4, is pure MG4. Until the whole field was surveyed the large extent of Sites A & B (Figure 4) was not apparent. Superficially, both also seemed homogeneous MG4. Site G, 30 m wide along the Willow Walk boundary, is species-poor and weedier. Site D, the nutrient-rich grassland area between the path and the trees lining the Seacourt Stream, was sampled because it seemed the most suitable Channel sacrifice.

Species names follow Stace (2010). Identification was comparatively easy because many of the grasses were flowering. Several quadrats were re-visited on 13 June to investigate minor discrepancies. It was sometimes difficult to estimate percentage grass covers in vegetation 60 cm high with many vertical stems. I made no attempt to distinguish between *Taraxacum* microspecies (Dudman and Richards 1997).

## Results

### *Fritillaria meleagris*

Despite occasional planting, and its striking abundance at a few sites (e.g. North Meadow Cricklade, Ducklington, Iffley Fields, Magdalen Meadows) it has declined through picking, drainage, ploughing and artificial fertilization (Oswald 1992). Before 1930 it was recorded in 116 10 km squares in 27 counties, but by 1970 in 15 squares in nine (old) counties (Perring and Farrell 1977).

The numbers of *Fritillaria meleagris*, Oxfordshire's county flower, are stable or increasing on Hinksey Meadow (Table 1).

GRID REFERENCE	2003	2007	2008	2010	2011	2012	2013	2014	2015	2016	2017
SP49480 05771			21	35 (19V)	33 (6V)	51 (9V)	60 (3V)	60 (8V)	68 (6V)	45 (3V)	51 (1V)
SP49473 05793					17 (0V)	33 (30V)	43 (0V)	37 (2V)	30 (1V)	45 (2V)	48
SP49493 05790		49	40	83 (50V)	84 (0V)	105 (70V)	148 (10V)	137 (2V)	109 (2V)	78 (3V)	136 (3V)
SP49612 05867		15	13	12 (12V)	19 (0V)	20 (4V)	19 (2V)	23 (4V)	23 (7V)	23 (3V)	28
SP49486 05819				3 (3V)		7 (2V)	9 (0V)	13 (1V)	17	11 (4V)	24
SP49533 05938				2 (0V)		7 (7V)	8 (0V)	8 (0V)	7	5	10
SP49475 05784						15 (0V)	1 (0V)		20	17	23 (2V)
SP49470 05810						4 (0V)	2 (0V)			2	
SP49277 05823						2 (0V)	3 (0V)		4	0	
SP49379 05819						1 (0V)	1 (0V)			0	
SP49544 05874											1
<b>Total flowering</b>	<b>58</b>	<b>64</b>	<b>74</b>	<b>135</b>	<b>153</b>	<b>245</b>	<b>294</b>	<b>278</b>	<b>278</b>	<b>226</b>	<b>321</b>
<b>Total vegetative</b>		<b>156</b>	<b>88</b>	<b>84</b>	<b>6</b>	<b>122</b>	<b>15</b>	<b>17</b>	<b>16</b>	<b>15</b>	<b>6</b>

**Table 1. The numbers of flowering and non-flowering (V) *Fritillaria meleagris* at peak flowering time (April/early May) in Hinksey Meadow from 2003 – 2017.**

The median time from seed germination to flowering in *Fritillaria* is about five years.

(For its life cycle see

<http://www.floodplainmeadows.org.uk/sites/www.floodplainmeadows.org.uk/files/Final%20Frit%20Leaflet%20Feb%202017.pdf> )

Hinksey Meadow was flooded in 2007, 2009, 2012 and 2014; it is tempting to speculate that the increases in numbers in 2010, 2012 and 2017 were related to previous flooding events.

### Plant communities

The vegetation results are in the appendix, in Table 2 (per cent cover) and Table 3 (Domin). Table 4 shows those extra plant species recorded on the whole site over the years.

Species constancy for the 14 Domin quadrats clearly place them within the MG4 (*Alopecurus-Sanguisorba*) community in the National Vegetation Classification (Rodwell 1992). Areas A, B and C on the Map (Figure 4) are also MG4. The SW

margin along the Seacourt Stream trees (Area D) is *Urtica-Epilobium* OV26 and MG1b *Arrhenatherum-Urtica*. Between these trees and the path and around the edge (F) is MG5 *Cynosurus-Centaurea* grazed old meadow. Area E, between the Jubilee scrape and the trees, is the wettest community (MG8 *Cynosurus-Caltha* water meadow).

Most of the area, in red on the map, clearly falls within the MG4a (*Dactylis*) sub-community. This is the most species-rich of the four MG4 sub-communities recognised by the Floodplain Meadows Partnership on the basis of their sampling of 2508 quadrats from 48 sites (Rothero et al. (FMP) 2016, Chapter 8; Wallace and Prosser 2017). Their MG4a quadrats average 25.3 species per square metre. The samples from this survey averaged 25.6 species a square metre. The site has all the differential species only found in this this sub-community, Goat's-beard (*Tragopogon pratensis*), Autumn Hawkbit (*Leontodon autumnalis*), Fairy Flax (*Linum catharticum*), Cowslip (*Primula veris*), Black medick (*Medicago lupulina*). At this time of year many early or small species (Fritillary, White Clover (*Trifolium repens*), Cowslip (*Primula veris*), Adder's-tongue (*Ophioglossum vulgatum*), Black Medick, Fairy Flax) are unlikely to be found in small quadrats amongst tall vegetation. I was lucky to find one plant of Fairy Flax and one of Marsh Horsetail (*Equisetum palustre*). There is plenty of Lady's Bedstraw (*Galium verum*) although little was recorded in the current quantitative survey.

By counting squares, the area of MG4a is conservatively estimated at 7.0 ha.

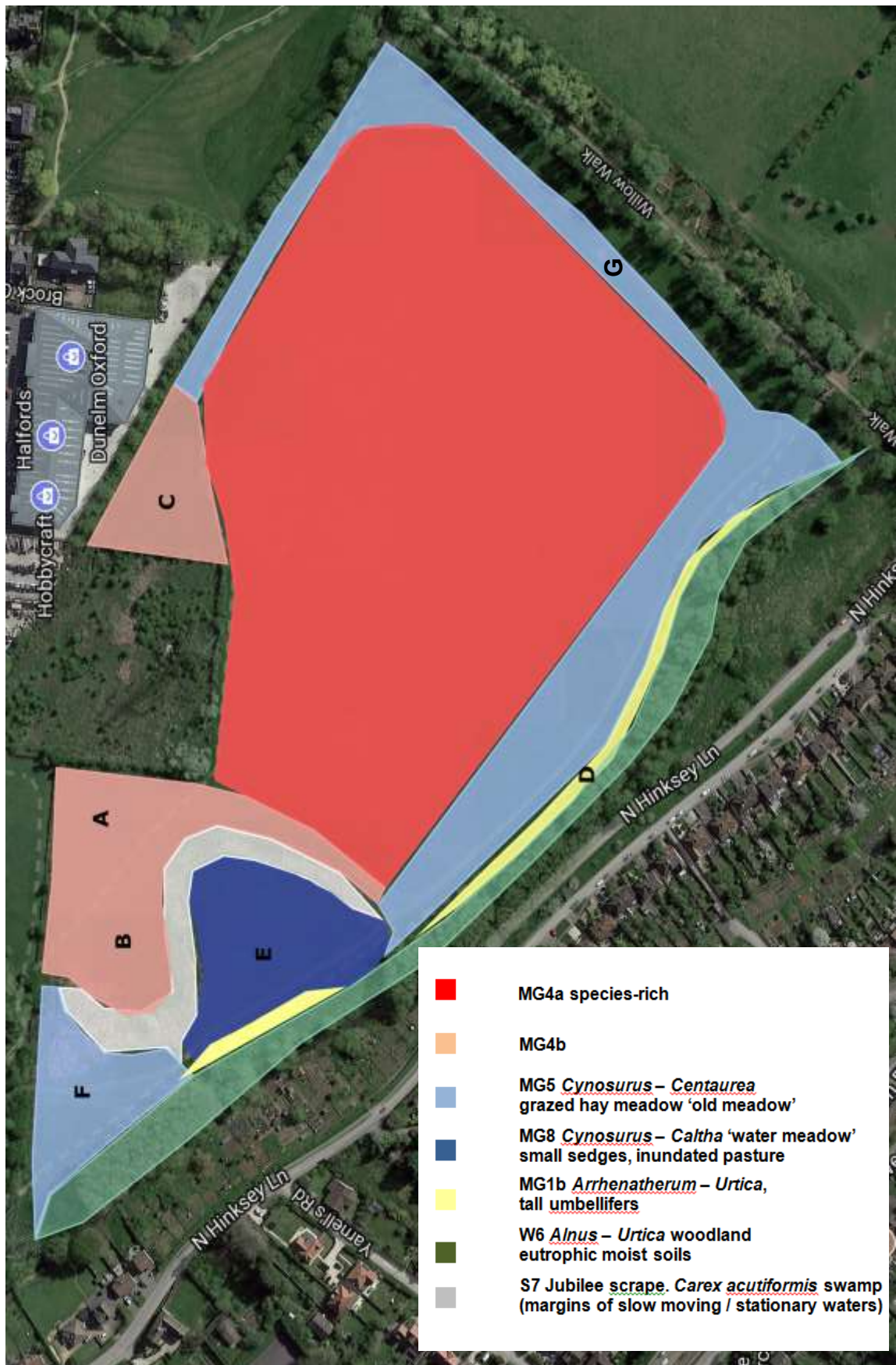


Figure 4. Map of Hinksey Meadow showing the major plant communities June 2016.



MG4a, in red, is the Cock's Foot (*Dactylis glomerata*) sub-community (26 species/m<sup>2</sup>), whereas MG4b (A, B, C) is the less species-rich typical sub-community (22 species/m<sup>2</sup>).

## Discussion

The history of the management of the meadow shows clearly that the establishment and maintenance of the most diverse flora on flood meadows requires a precise set of conditions. Cattle grazing was selected as a component of the optimal management by OPT after Alison McDonald's long-term experiment at Somerford Mead had suggested that cattle grazing after the hay cut produces vegetation richer in species than sheep grazing or no grazing at all (McDonald 2012).

Since 2013, as recorded in our annual fritillary surveys, the vegetation to the north-west and north-east of the scrape has become shorter, richer in species, and richer in forbs (plants other than grasses, sedges and rushes).

Whereas just over 2000 ha of the whole MG4 community (MG4a, MG4b, MG4c, MG4d) remain in the UK, *there are only 192 ha of MG4a* (Wallace and Prosser 2017). This site contains 7 ha of strikingly species rich old grassland. It is therefore on a par with parts of North Meadow (Cricklade), Clattinger Farm (Wiltshire), Yarnton Mead and the newly acquired 'Blackthorn Bridge' Meadow at Meadow Farm near Bicester (FMP 2014). Such precious plant communities, dramatically floral in midsummer and a magnet for pollinating insects, have declined by at least 97% since the Second World War (Biodiversity 1995). Their creation and maintenance needs a long history, a precise flooding regime, a regular hay cut, followed by aftermath grazing. Ideally, Hinksey Meadow should continue to contribute to this important plant community within the UK.

The current plan for the Oxford Flood Alleviation Scheme (2018) is to excavate a wider channel for the Seacourt Steam, parallel to the meadow, from north to south, and taking in its western margin. This will avoid much of the current MG4a area. Nevertheless, the effects on the hydrology of the area, the fritillary population and the species composition of the species-rich MG4a community are unpredictable. Management may become more difficult. The data in this paper will allow changes in the flora of the meadow to be monitored.

## Acknowledgements

I am grateful to Dr Camilla Lambrick for her site records, to Drs Judy Webb and Alison McDonald for useful discussions, and to all three, together with Janet Keene of the Oxford Urban Wildlife Group, for help with the Fritillary census. Julian Munby has thoroughly researched the history of the meadows to the west of Oxford. He provided the 1842 and 1848 maps and much extra information. Thanks to Debbie Dance and Rachel Sanderson (OPT) for their encouragement and Dr Oliver King for drawing Figure 4.

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## Appendix

The grid references in tables 1 and 2 for the quadrat numbers 1 to 12 are given in table 5 and can be matched with their positions in figure 3. The grid references for A and B, quadrats in the areas marked A and B in figure 3, are also given.

**Table 2. The percentage cover data from 1 m<sup>2</sup> quadrats on Hinksey Meadow, SP495057, in 2016 (positions shown in Figure 3).**

Quadrat number		1	2	3	4	5	6	7	8	9	10	11	12
Date	Date in June 2016	6	6	7	7	7	7	7	7	8	8	8	8
English Name	Scientific Name												
Creeping Bent	<i>Agrostis stolonifera</i>	10	3		2	4	5		2	1	1	2	
Meadow Foxtail	<i>Alopecurus pratensis</i>		2	2		3	1	2	2	1			
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>		2	3	3			3				1	4
False Oat-grass	<i>Arrhenatherum elatius</i>			1							1		
Quaking Grass	<i>Briza media</i>												2
Common Meadow Brome	<i>Bromus commutatus</i>	10	5	10	3	1	10	7	6			2	
Soft Brome	<i>Bromus hordeaceus</i>	5	20			1			2	2		1	
Glaucous Sedge	<i>Carex flacca</i>						3	1				2	
Hairy Sedge	<i>Carex hirta</i>			1	4							1	
Common Knapweed	<i>Centaurea nigra</i>	1	3		2	2	6	7	2			10	
Common Mouse-ear	<i>Cerastium fontanum</i>			1	1								
Smooth Hawk's-beard	<i>Crepis capillaris</i>	1	3	30				12		1		2	
Cock's-foot	<i>Dactylis glomerata</i>	3	4	2	5	3		7	10	10	2	3	5
Common Couch	<i>Elytrigia repens</i>	7											
Marsh Horsetail	<i>Equisetum palustre</i>								1				
Red Fescue	<i>Festuca rubra</i>	25	5	3	5	6	5	2	3	2	15	7	12
Meadowsweet	<i>Filipendula ulmaria</i>	8	6	7	5	12		3	10				
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	4	2	1	2	3	1	1	1	5	4	3	2
Bristly Oxtongue	<i>Helminthotheca echioides</i>	1											
Hogweed	<i>Heracleum sphondylium</i>		1							1			
Yorkshire Fog	<i>Holcus lanatus</i>	2	3	1	10			6	8	3	5	2	2
Meadow Barley	<i>Hordeum secalinum</i>	2	1			1	6	1	1	1	5	3	4
Meadow Vetchling	<i>Lathyrus pratensis</i>	4	2	1	5	3	2	6	4		4		3
Rough Hawkbit	<i>Leontodon hispidus</i>		10									3	4
Autumn Hawkbit	<i>Leontodon saxatilis</i>				1			1					
Oxeye Daisy	<i>Leucanthemum</i>	1										4	1

	<i>vulgare</i>												
Fairy Flax	<i>Linum catharticum</i>												1
Perennial Rye-grass	<i>Lolium perenne</i>	10	10	2	10	1	6	20	6	30	4	6	10
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>	4	3	7	4	1		5	6		6	4	8
Field Woodrush	<i>Luzula campestris</i>											1	
Creeping Jenny	<i>Lysimachia nummularia</i>				1		1						
Hemlock Water-dropwort	<i>Oenanthe crocata</i>						3						
Timothy	<i>Phleum pratense</i>	5	3	2	5	6	3	6	10	3			3
Burnet Saxifrage	<i>Pimpinella saxifraga</i>									2			
Ribwort Plantain	<i>Plantago lanceolata</i>	1	4	2	10	1	3	10	3	20	10	6	6
Flattened Meadow-grass	<i>Poa compressa</i>		1					1					
Smooth Meadow-grass	<i>Poa pratensis</i>	15	8	6	4		4		2	20	10	10	10
Rough Meadow-grass	<i>Poa trivialis</i>	3	1	4		50	30	10	25	30	10	1	
Cinquefoil	<i>Potentilla reptans</i>										6	2	
Selfheal	<i>Prunella vulgaris</i>		1										
Meadow Buttercup	<i>Ranunculus acris</i>	6	7	6	8	10	7	8	5	6	6	8	5
Creeping Buttercup	<i>Ranunculus repens</i>	2	3			10	13	2			1		
Yellow-rattle	<i>Rhinanthus minor</i>												1
Great Burnet	<i>Sanguisorba officinalis</i>		3	20	4	1					13	10	30
Tall Fescue	<i>Schedonorus arundinaceus</i>			2	2	5	6		6				1
Meadow Fescue	<i>Schedonorus pratensis</i>	20		12	5	1	3	2	3	2	1	3	2
Pepper Saxifrage	<i>Silaum silaus</i>	4	3	2		2	2	2	4		3	10	10
Dandelion	<i>Taraxacum</i> spp.	12	3	2	17	3	2	3	12	7	3	9	5
Goat's-beard	<i>Tragopogon pratensis</i>		1	2	1					1	1	1	
Red Clover	<i>Trifolium pratense</i>	5	15	3	6	4	6	8	8	8	9	18	4
Tufted Vetch	<i>Vicia cracca</i>												1
<b>TOTAL % COVER</b>		<b>171</b>	<b>138</b>	<b>135</b>	<b>125</b>	<b>134</b>	<b>128</b>	<b>136</b>	<b>144</b>	<b>154</b>	<b>121</b>	<b>135</b>	<b>135</b>
<b>NUMBER OF SPECIES</b>		<b>27</b>	<b>31</b>	<b>27</b>	<b>26</b>	<b>24</b>	<b>23</b>	<b>26</b>	<b>26</b>	<b>20</b>	<b>23</b>	<b>29</b>	<b>24</b>

**Table 3. The Domin scores from 4 m2 quadrats located on Hinksey Meadow, SP495057, at the same positions.**

The Domin scale is as follows: 1- 3 one to a few plants, with less than 4% cover; 4 4-10% cover; 5 11-25%; 6 26-33%; 7 34-50%; 8 51-75%; 9 76-90%; 10 91-100% cover.

The final column (Con.= Constancy) gives details from the table for MG4 in Rodwell (1992). Roman numerals refer to the frequency with which the species was recorded in the NVC samples (V constant, 81-100% of samples, IV frequent, 61-80%, III occasional, 41-60%); D, R and P refer to whether the species were differential for the (sub-) community where:

D= MG4a Diff

R= Rodwell C

P =MG4a Pref.

Quadrat number		1	2	3	4	5	6	7	8	9	10	11	12	A	B	Con.
Creeping Bent	<i>Agrostis stolonifera</i>	4	3		2	4	4		2	3	2	2		2		
Meadow Foxtail	<i>Alopecurus pratensis</i>		4	3		5	4	4	4	4				1		
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>		4	3	4			4		1		3	3	3		
False Oat-grass	<i>Arrhenatherum elatius</i>									3	2					
Quaking Grass	<i>Briza media</i>												2			III R
Common Meadow Brome	<i>Bromus commutatus</i>	4	3	4	4	3	5	4	4	2		3	3	1		III
Soft Brome	<i>Bromus hordeaceus</i>	4	4			3				2	3	3	3	2	3	
Glaucous Sedge	<i>Carex flacca</i>						2	2								2
Hairy Sedge	<i>Carex hirta</i>	1		3	4				4						4	V
Common Knapweed	<i>Centaurea nigra</i>	2	4	4	4	3	4	4	3			5	3			
Common Mouse-ear	<i>Cerastium fontanum</i>			2	2										3	3
Smooth Hawk's-beard	<i>Crepis capillaris</i>	2	3	5				4		1		2				
Cock's-foot	<i>Dactylis glomerata</i>	3	4	3	4	3		5	5	4	4	3	4	2		P
Common Couch	<i>Elytrigia repens</i>	3													4	V P
Marsh Horsetail	<i>Equisetum palustre</i>								1							
Red Fescue	<i>Festuca rubra</i>	5	3		3	4	4	3	3	3	5	4	5	4	2	IV
Meadowsweet	<i>Filipendula ulmaria</i>	4	4	4	4	5	1	4	5	3		3	5		4	IV
Lady's Bedstraw	<i>Galium verum</i>							3							3	R
Cut-leaved Crane's-bill	<i>Geranium dissectum</i>	4	3	3	3	4	3	2	4	4	4	3	3	3		
Bristly Oxtongue	<i>Helminthotheca echioides</i>	1													4	V
Hogweed	<i>Heracleum sphondylium</i>		1							1						5
Yorkshire Fog	<i>Holcus lanatus</i>	4	4	4	5			4	4	2	5	4	4	4	3	V P

Meadow Barley	<i>Hordeum secalinum</i>	1	2			2	2	2	2	2	4	4	3	4		
Meadow Vetchling	<i>Lathyrus pratensis</i>	4	3	3	4	4	4	4	3	3	4	2	4			
Rough Hawkbit	<i>Leontodon hispidus</i>		4									4	4	4		
Autumn Hawkbit	<i>Leontodon saxatilis</i>			1	1			1							V	
Oxeye Daisy	<i>Leucanthemum vulgare</i>	1										3	1	3	3	V R
Fairy Flax	<i>Linum catharticum</i>											1				D
Perennial Rye-grass	<i>Lolium perenne</i>	4	5	4	4	4	4	4	4	5	5	4	4	3	5	V R
Common Bird's-foot-trefoil	<i>Lotus corniculatus</i>	3	3	4	4	2	1	4	4		4	4	4	4		P
Field Woodrush	<i>Luzula campestris</i>									2	2	2				
Creeping Jenny	<i>Lysimachia nummularia</i>				1			1								
Hemlock Water-dropwort	<i>Oenanthe crocata</i>							4								D
Timothy	<i>Phleum pratense</i>	3	3	2	3	4	4	4	4	3					5	V R
Burnet Saxifrage	<i>Pimpinella saxifraga</i>										2					
Ribwort Plantain	<i>Plantago lanceolata</i>	1	3	3	5	4	4	4	3	5	5	4	4	7		
Flattened Meadow-grass	<i>Poa compressa</i>		1				1								4	V
Smooth Meadow-grass	<i>Poa pratensis</i>	4	5	5	4		2		3	5	5	5	5	3	4	V R
Rough Meadow-grass	<i>Poa trivialis</i>	3	4	3	4	6	6	5	5	6	6	4	3	1	2	IV
Cinquefoil	<i>Potentilla reptans</i>										4	2				
Selfheal	<i>Prunella vulgaris</i>		2												1	
Meadow Buttercup	<i>Ranunculus acris</i>	4	4	4	4	5	5	5	5	4	4	5	5	4	5	V R
Creeping Buttercup	<i>Ranunculus repens</i>	4	2			4	5	3	3		1					
Yellow-rattle	<i>Rhinanthus minor</i>													1		
Common Sorrel	<i>Rumex acetosa</i>		3	3	3	1	1	3	3		1		3	3	5	V R
Great Burnet	<i>Sanguisorba officinalis</i>		3	5	5	1					6	5	6	6		
Tall Fescue	<i>Schedonorus arundinaceus</i>			3	4	3	3		4						1	
Meadow Fescue	<i>Schedonorus pratensis</i>	5		5	4	2	2	2	3	2	2	2	5	4	4	V
Pepper Saxifrage	<i>Silaum silaus</i>	3	4	3		3	3	2	4		3	4	5	3	3	
Dandelion	<i>Taraxacum spp.</i>	5	3	3	5	3	4	4	5	4	4	4	4	3	3	V R
Goat's-beard	<i>Tragopogon pratensis</i>		2	3	2				2	1	3	3	3		5	IV R
Red Clover	<i>Trifolium pratense</i>	4	5	5	4	4	4	4	4	4	4	4	4	3		V
Tufted Vetch	<i>Vicia cracca</i>												1		3	V R

**Table 4. Species not found in the 2016 quadrats (Tables 2 & 3), but recorded in 2006-2014 during Fritillary counts.**

<b>Scientific name</b>	<b>English Name</b>
<i>Ajuga reptans</i>	Bugle
<i>Alliaria petiolata</i>	Jack by the Hedge
<i>Anisantha sterilis</i>	Barren Brome
<i>Anthriscus sylvestris</i>	Cow Parsley
<i>Avenula pratense</i>	Meadow Oat-grass
<i>Avenula pubescens</i>	Downy Oat-grass
<i>Bromus racemosus</i>	Smooth Brome
<i>Cardamine pratensis</i>	Cuckooflower
<i>Carex acuta</i>	Slender Tufted-sedge
<i>Carex acutiformis</i>	Lesser Pond-sedge
<i>Carex riparia.</i>	Greater Pond-sedge
<i>Carex x subgracilis</i>	
<i>Cirsium arvense</i>	Creeping Thistle
<i>Convolvulus arvensis</i>	Lesser Bindweed
<i>Cynosurus cristatus</i>	Crested Dog's-tail
<i>Deschampsia caespitosa</i>	Tufted Hair-grass
<i>Dipsacus sylvestris</i>	Wild Teasel
<i>Epilobium hirsutum</i>	Great Willowherb
<i>Ficaria verna</i>	Lesser Celandine
<i>Galium aparine</i>	Cleavers
<i>Galium verum</i>	Lady's Bedstraw
<i>Glechoma hederacea</i>	Ground Ivy
<i>Humulus lupulus</i>	Hop
<i>Lotus pedunculatus</i>	Bird's-foot Trefoil
<i>Malus sylvestris</i>	Crab Apple
<i>Medicago lupulina</i>	Black Medick
<i>Myosotis arvensis</i>	Field Forget-me-not
<i>Myosotis scorpioides</i>	Water Forget-me-not
<i>Narcissus pseudonarcissus</i>	Daffodil
<i>Ophioglossum vulgatum</i>	Adder's-tongue
<i>Persicaria amphibia</i>	Amphibious Bistort
<i>Persicaria hydropiper</i>	Water-pepper
<i>Phalaris arundinacea</i>	Reed Canary-grass
<i>Phleum pratense</i>	Timothy
<i>Phragmites australis</i>	Common Reed
<i>Plantago major</i>	Greater Plantain
<i>Populus x canadensis</i>	Canadian Black Poplar
<i>Populus alba</i>	White Poplar
<i>Potentilla reptans</i>	Cinquefoil
<i>Primula vulgaris</i>	Primrose
<i>Prunus spinosa</i>	Blackthorn
<i>Ranunculus bulbosus</i>	Bulbous Buttercup
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex crispus</i>	Curled Dock
<i>Rumex obtusifolius</i>	Broad-leaved Dock
<i>Senecio erucifolius</i>	Hoary Ragwort
<i>Sonchus asper</i>	Prickly Sowthistle
<i>Symphytum officinale</i>	Common Comfrey



<i>Thalictrum flavum</i>	Common Meadow-rue
<i>Trifolium campestre</i>	Hop Trefoil
<i>Trifolium dubium</i>	Lesser Trefoil
<i>Trifolium repens</i>	White Clover
<i>Trisetum flavescens.</i>	Yellow Oat-grass
<i>Urtica dioica</i>	Common Nettle
<i>Veronica beccabunga</i>	Brooklime

**Table 5. The grid references in tables 1 and 2 for the quadrat numbers. These can be matched with their positions in figure 3.**

1	SP49475 05660
2	SP49416 05715
3	SP49360 05770
4	SP49302 05827
5	SP49540 05735
6	SP49474 05779
7	SP49406 05824
8	SP49336 05866
9	SP49640 05865
10	SP49562 05889
11	SP49486 05915
12	SP49544 05830
A	SP49287 06005
B	SP49219 05996