Natural England Commissioned Report NECR052

The vegetation of the Severn/Avon Vale Floodplain Meadows

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

The National Vegetation Classification (NVC) identifies and describes different types of plant communities in Britain. It is a working tool that provides a framework to support land management, conservation and monitoring. Vegetation systems are complex and the classification cannot be comprehensive. However, as more data and information becomes available it can be refined and developed.

The grassland community known as MG4 grassland is found on seasonally flooded land that has traditionally been cut for hay. With improvements to grassland productivity and to river drainage this community is now very restricted.

Many of the Site of Special Scientific Interest (SSSI) grasslands within the Severn & Avon Vale have been notified for their species-rich MG4 communities. However, when assessed against the common standards monitoring devised by the Joint Nature Conservation Committee (JNCC) for this grassland type several of the sites consistently underperform.

The objectives of this study were:

- To assess and describe the floodplain vegetation on the Gloucester and Worcestershire SSSIs within the Severn/Avon Vale in terms of their NVC communities using existing quadrat data.
- To identify stands of vegetation that conform to MG4 as described in the published NVC (Rodwell 1992) or to other forms of MG4 vegetation recently described by the Floodplain Meadows Partnership and which are not described in the NVC.

The report identified four forms of MG4 as being present in the Severn/Avon Vale as well as a range of related floodplain vegetation types. Conservation objectives for SSSIs with notified MG4 interest in the Severn & Avon Vales will be revised to reflect these local varieties and the findings are being published in order to contribute to the ongoing re-assessment of the vegetation of floodplain grasslands including MG4 grassland.

The report identifies the need for further botanical survey work. The extent to which this can be undertaken will depend on organisational priorities and resource availability.

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Further information
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The vegetation of the Severn/Avon Vale Floodplain Meadows

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1. INTRODUCTION

1.1 Background

Following on from the NVC survey of Ashleworth Ham, a wider appraisal of the vegetation of the Severn and Avon Vales has been conducted.
The Severn and Avon Vale stretches across the counties of Gloucestershire, Worcestershire and Warwickshire consisting of around 45,000 ha of lowland wet grassland and floodplain meadows from Bristol to north of Worcester. It includes the Severn Avon Vales HLS Target Area (NE 2008), which is an extensive area that follows the River Severn from Worcester and the River Avon from Evesham to their confluence at Tewksbury (Wallace *et al.,* 2008). These floodplain grazing marshes and floodplain meadows are prone to occasional fluvial floods and provide important habitat for nationally important assemblages of breeding waders. The Vale also has a number of SSSIs that are important for their plant assemblages, especially along the Severn in Gloucestershire and Worcestershire where a number of meadows have survived under traditional land tenure, often referred to as Hams. These sites include alluvial grasslands still cut for hay in strips (Lammas), the most important of which is Upton Ham SSSI at Upton-on-Severn in Worcestershire.
The present study focuses on SSSIs within the Gloucestershire/Worcestershire part of the Severn-Avon Vale and involves an assessment of past vegetation surveys in the context of recent reappraisals of the MG4 community.

1.2 Objective of the study

The objective of the present study is to identify whether stands of MG4 do exist on the Gloucester and Worcestershire SSSIs within the Severn Vale and to place them within the wider context of the MG4 community in England. Rodwell *et al.* (2007) highlighted MG4 as one of the communities of the NVC that required a major revision, and variations in the floristic composition of the community have been identified relating primarily to variations in soil moisture (Gowing *et al.,* 2002). Research is on-going by the Floodplain Meadows Partnership at the Open University, who have amassed a database in excess of 15,000 releves of MG4 and allied vegetation. The final analysis of the data has not yet been completed, but preliminary interpretation of the MG4 community will be used to aid the assignment of the Severn Vale samples.

1.3 Data resource

A very considerable body of information has been made available for the study sites. Each item in the dossier has been examined and evaluated.
The information can be sorted into three categories.

(a) Species lists. Numerous plant lists have been compiled which cover five of the eight sites. Although these are of no value in the analysis of plant communities they serve to confirm the presence of *Sanguisorba officinalis*, *Alopecurus pratensis* and other species commonly associated with the MG4 community, at various times over the last 25 years, on these SSSIs.
(b) Monitoring. Relocatable quadrats have been established at both Combe Hill Canal (GWT) and Upton (Upper) Ham (Floodplain Meadows Partnership). Unfortunately, those at the former site which have been recorded annually since 2001 are located within vegetation which is not, and in all probability has never been, related to MG4.

In 1990, 85 quadrats were recorded on one field in Chancely Meadows which confirmed the presence of the suite of MG4 species but these randomly placed quadrats were of 20 x 20cm and are not suitable for inclusion in the main analysis where species richness is likely to be an important consideration in the allocation of stands to sub-units of MG4 and related floodplain communities.

(c) NVC – style quadrats. Data have been accumulated for 681 quadrats from which NVC units might be deduced. These are a mixture of 1 x 1m and 2 x2m records and the quantitative elements are, variously, percentage cover, Domin values and, in a minority of cases, DAFOR listings. The protocol used to deal with these disparate values is described in the Section 2.3 of the Methods section. For those sites where the community composition appears complex and/or communities of conservation interest are clearly represented, the majority of the available quadrat records have been used in the main analysis. The exceptions being records of vegetation types outwith the normal spectrum of floodplain meadow communities (wet woodlands, dry banks, dry ruderal communities etc) which would form outliers distorting an analysis. For other sites, where a large number of quadrats have been recorded in apparently uniform vegetation, only a subset has been used which cover the survey area.

As a result of this culling of the available data, 361 quadrats were identified as being suitable for entry into an analysis of the characteristics of the Severn Vale vegetation. The distribution of the quadrats used, by site and by date of survey, is given in Table 1.

Table 1 Number of quadrats
(a) By site

Site ID		Site total
1	Ashleworth Ham	107
2	Chaceley Meadow	21
3	Upham Meadow	31
4	Upton (Upper) Ham	87
5	Rectory Farm meadows	40
6	Severn Ham	23
7	Hucclecote meadow	17
8	Coombe Hill canal	35

(b) By year

Year code	Year ID	Year total
187	1987	13
192	1992	16
194	1994	2
198	1998	44
199	1999	60
201	2001	4
202	2002	6
203	2003	30
204	2004	15
205	2005	20
206	2006	14
207	2007	41
208	2008	96

The detailed floristic characteristics of floodplain meadow communities can change quite dramatically in response to climatic changes; flood events, especially summer inundation, which can result in substantial shifts in the frequency of many species and may cause a significant reduction in species number per unit area in the following year. Some insight into such changes can be provided by the recording of permanent quadrats over a time series. Thus, in the present study, 30 precisely relocatable quadrats for Upton Ham have been included from recordings in both 1999 and 2008 by the same pair of surveyors.

2. METHODS

2.1 Quadrat identifiers

Each quadrat in the analysis has an eight digit number. The first digit refers to the site, from Ashelworth Ham (1) to Coombe Hill canal (8). The next three digits give the year of recording; from 1987 (187) to 2008 (208). The final triplet provides a unique quadrat number starting at 001 as the first quadrat entered for the first site in the first year of recording to 361, the last quadrat from site 8 recorded in the final year covered by the study (2008).

2.2 Non-species variables

For each releve entered the species information is preceded by a maximum of five variables each with a unique code. Hence:

- 68 = Site (1-8)
- 31 = Year of survey (192- 208)
- 26 = recorder (1-14)
- 8 = quadrat size ($8m^2$ or $2m^2$)
- 67 = unit

Code 67 is used where a site is subdivided into a number of fields or sub-compartments; for example, different fields at Ashleworth Ham or different compartments at Coombe Hill Canal and meadows.

2.3 Transformations

The data are entered with a cover value attached to each species code. In many cases the cover estimates were made at the time of recording. Where DOMIN values were used, these have been transformed into cover values using 'DOMIN 2.6' of the Currall conversion (Currall 1987). In some instances, species are accompanied by a DAFOR value, fortunately relatively few quadrats are in this form, they have been crudely transformed using cover values of R = 1%, O=4%, F=10%, A or D = 50 %. One set of five quadrats from the northern section of Severn Ham comprised only presence/absence data: the species from these releves were entered with a notional cover value of 5% to complete the data set.
Since the quadrat data were compiled from the records of 14 recorders (or pairs of recorders), it is inevitable that some degree of inconsistency in species identification has occurred. No attempt has been made to interpret the species record – all releves are entered unmodified from the original data sheets. In consequence, the synoptic table (Appendix 1) contains some anomalies. It appears that there has been some inconsistency in the accuracy of recording, particularly of *Agrostis, Bromus* and *Epilobium* species and the common bryophtes: it also seems probably that some species, most notably *Festuca pratensis,* have been under recorded.

2.4 Data analysis

The quadrat data were all entered into the VESPAN suite of programs (Malloch 1999). An open matrix array of species by quadrat was then produced (severnvale_speciesdata.xls).
Nomenclature used for vascular plants in the synoptic table follows Tutin *et al* (1964) in order to retain consistency with the published NVC tables.

The data were then read into the JUICE software package (Tichy 2002, Tichy and Holt 2006) for TWINSPAN analysis. The new version of JUICE includes an amended version of the original TWINSPAN program of Hill 1979, which is considered to be more stable.
Since the quadrat size and unit of cover estimation were not consistent across the data set all cover values were converted to '1' prior to running TWINSPAN, which was thus run on a simple presence/absence data array. Parameters for the run were set to a minimum group size for division of 5 and a maximum number of 8 divisions.

2.5 Ellenberg scores

As an aid to the interpretation of the environmental conditions across the sites, Ellenberg scores have been used (Ellenberg 1988). Each species is assigned a series of scores indicating its nutrient (N-scores) and moisture requirements (F-scores). Ellenberg N-scores range from 1 (extremely infertile soils) to 9 (extremely rich areas, e.g. cattle resting areas) and soil moisture tolerance (F-scores) range from 1 (extreme dryness) to 12 (permanently submerged plants). A mean score was calculated for each of the quadrats that were entered into the TWINSPAN analysis. Some species are generalists and thus do not have scores, so the mean quadrat score is achieved by summing the available scores for each species within a quadrat and dividing by the number of species/score couplets. Graphs are presented of the range of N and F scores for the different vegetation units recognised.

2.6 Comparison with other sites

Two contrasting sites supporting MG4, and allied vegetation communities, have been used for comparison against the Severn and Avon vale sites. The Derwent Ings, in Yorkshire, where 18 Ings were subject to NVC in 2001-2002 and the Oxford Meads, where NVC survey and monitoring quadrats were recorded in 2008.
For both of these sites, Ellenberg N and F scores were calculated for all the communities present and those for the MG4 and allied vegetation are compared with those for the Severn and Avon Vale.

3 RESULTS

3.1 The main analysis

The initial classification of the entire data set resulted in a synoptic table of 43 columns which, following amalgamations and the isolation of unique releves gave 28 distinct vegetation units some of which clearly represented intergrades between established NVC communities.
The endgroups were partitioned as follows (Table 2). The floristics of all units having 10 or more releves are presented in a compound synoptic table as Appendix 1.

Table 2 Allocation of quadrats to different vegetation types

Unit	Number of releves	Unit	Number of releves
MG1 e	1	MG7D	27
MG4 T	18	MG4/7D intergrade	18
MG4Sanguisorba	64	MG9	3
MG4 Carex	5	MG11	3
MG4 D	11	MG10 a	3
MG5	8	MG13	24
MG6 a	29	OV24	1
MG6 b	9	OV28	12
MG4/6b intergrade	11	OV29	11
MG7 B	6	OV30	7
MG7 C	22	M27	3
MG4 / 7C intergrade	29	S28	8
MG8	4	Agrostis-Carex grassland	4
MG4/8 intergrade	16	Carex acuta/acutiformis stands	2
		Total	361

A second TWINSPAN was run on the MG4 stands alone, eliminating all transitional stands with MG4 affinities and all other vegetation types. In addition, two outlying groups were also omitted:

- four of the releves from Ashleworth and one from Upton Ham were identified as the *Carex acuta/acutiformis* form of MG4 previously recognised from samples in the Derwent and Trent catchments; and
- at the other, drier, extreme end of the analysis, a species-rich group of releves from Hucclecote meadows represented the proposed *Dactylis-Primula veris* subcommunity of MG4 which grades into MG5 and is well represented at North Meadow (Cricklade), Clattinger Farm and, most notably at Yarnton Mead on the Thames near Oxford.

The 79 MG4 releves remaining separated into two groups, which displayed a high degree of site specificity though both contain sub-divisions representing a typical form of MG4 and an impoverished version which has been identified across a range of English sites and is most commonly encountered where typical stands of MG4 have been subject to summer flooding – the effects of such inundation of warm soil may persist for a number of years.

Table 3 presents a pair of constancy tables for these two endgroups.
Since releves in both endgroups are predominantly from 1 x 1m quadrats, the species number per sample is relevant: the values for the two groups are 14.4 and 16.3 respectively.

Table 3 Constancy tables for the two most widespread expressions of MG4 found on the SevernVale sites

Code	Species	Endgroup 1	Endgroup 2	Code	Species	Endgroup 1	Endgroup 2
1190	*Sanguisorba officinalis*	V	V	477	*Deschampsia cespitosa*	.	I
158	*Alopecurus pratensis*	V	V	572	*Festuca arundinacea*	.	I
1139	*Rumex acetosa*	V	V	575	*Festuca pratensis*	.	I
460	*Cynosurus cristatus*	IV	IV	661	*Heracleum sphondylium*	.	I
583	*Filipendula ulmaria*	IV	III	733	*Juncus inflexus*	.	I
758	*Lathyrus pratensis*	IV	III	973	*Plantago lanceolata*	.	I
122	*Agrostis stolonifera*	IV	IV	1059	*Prunella vulgaris*	.	I
171	*Anthoxanthum odoratum*	III	IV	1086	*Ranunculus bulbosus*	.	I
				1250	*Silaum silaus*	.	I
1095	*Ranunculus repens*	IV	II	1305	*Succisa pratensis*	.	I
118	*Elymus repens*	IV	.	1323	*Thalictrum flavum*	.	I
685	*Hordeum secalinum*	III	.				
960	*Phleum pratense*	III	I	295	*Cardamine pratensis*	III	III
609	*Galium palustre*	II	.	1350	*Trifolium repens*	II	II
1143	*Rumex crispus*	II	.	1411	*Vicia cracca*	II	II
258	*Bromus hordeaceus*	I	.	988	*Poa pratensis*	II	I
302	*Carex acutiformis*	I	.	613	*Galium verum*	II	I
415	*Cirsium arvense*	I	.	576	*Festuca rubra*	I	II
				2982	*Taraxacum officinale*	I	II
796	*Lolium perenne*	III	V	768	*Leontodon autumnalis*	I	II
990	*Poa trivialis*	III	V	371	*Centaurea nigra*	I	II
1081	*Ranunculus acris*	II	V	800	*Lotus corniculatus*	I	I
680	*Holcus lanatus*	II	IV	197	*Arrhenatherum elatius*	I	I
1349	*Trifolium pratense*	I	III	1445	*Calliergon cuspidatum*	I	I
1343	*Trifolium dubium*	.	III	722	*Juncus articulatus*	I	I
384	*Cerastium fontanum*	.	II	324	*Carex hirta*	I	I
123	*Agrostis capillaris*	.	I	706	*Hypochoeris radicata*	I	I
230	*Bellis perennis*	.	I				
465	*Dactylis glomerata*	.	I		Number of samples	24	55

Group 1 consists predominantly of samples from Ashelworth Ham whilst Group 2 includes 36 of the 37 MG4 samples from Upton Ham. The former group is notable for the high frequencies of *Elytrigia repens, Hordeum secalinum, Phleum pratense* and *Ranunculus repens* whilst group 2 features more *Lolium perenne, Poa trivialis, Holcus lanatus* and *Ranunculus acris*, generally less flood tolerant species.
The status of *Trifolium pratense* across the two groups is of particular interest. The red clover, together with *Festuca rubra, Plantago lanceolata, Rhinanthus minor* and *Leontodon autumnalis*, appear to provide an indication of the quality of the MG4 community. In Typical stands of this floodplain meadow vegetation they are normally present at high frequencies (though populations of *Rhinanthus* may fluctuate greatly from year to year on an individual

site). In examples of the proposed *Sanguisorba* subcommunity of MG4, these species are either lacking or present at very depressed frequencies.

3.2 Status of MG4 at individual sites

Ashleworth Ham

For a detailed review of the vegetation of this site, see Wallace *et al* 2008. The status of MG4 on Ashleworth has been the subject of local debate with the view being expressed that stands on this site do not measure up to the 'floweriness' of MG4. A small area of reasonable quality MG4, referable to the Typical unit, is present but is outwith the current SSSI boundary. Apart from fragments of the *Carex acuta/acutiformis* variant, the bulk of the MG4 present is of the *Sanguisorba* type. Considerable areas of MG4/MG7C and MG4/MG7D intergrades are also present and probably reflect a formerly more extensive zone of the *Alopecurus-Sanguisorba* community, which may prove a good candidate for restoration.

Chaceley Meadow

A varied site. Small areas of MG4 Typical are present as are some of the *Sanguisorba* type. Other areas have a damper flora and these are provisionally viewed as part of the transition from MG4 to the *Calthion* vegetation of MG8. The MG7C floodplain meadow community is also well presented.

Upham meadow and Summer Leasow

A site which has clearly been subject to a degree of agricultural improvement. The damp neutral grassland here is dominated by MG6a though both MG7C and MG7D are also represented together with small patches of the MG13 inundation community.
A stand of the *Sanguisorba* version of MG4 was recorded in 1987, but more recent records suggest that this area is now an intergrade between MG4 and MG7C. *Sanguisorba officinalis* appears to be very scarce on the site, but both sections of the floodplain meadow have potential and a restoration program could well result in an expansion of the MG4 community from its surviving toe-holds.

Upton Ham

Upton Ham provides a representative example of changes in the quality of the MG4 community. Earlier surveys demonstrate that a very considerable area of the community was present and in good condition. By 1998 areas of the more impoverished bulky *Carex* variant were present and intergrades between MG4 and MG8 and between MG4 and MG7C were mapped, findings confirmed the following year: the more northerly and westerly sections of the Ham still supported MG4 of very reasonable quality. A survey, by the same recorders, in 2008 showed a marked reduction in the number of species per quadrat and a widespread shift from MG4 Typical to MG4 *Sanguisorba* type. This change, which has also been shown on sites as geographically diverse as East Cottingwith Ing on the Derwent, Mill Crook Meadow in Northamptonshire and North Meadow Cricklade in Wiltshire, almost certainly reflects the impact of summer flooding in 2007 and 2008. It is hoped that continued monitoring, hopefully coinciding with a run of dry summers, will establish the time span for a recovery in quality of the community.

Rectory Farm meadows

Though small, this site displays a fine sequence of floodplain meadow communities ranging from MG6 to MG8 across the hydrological gradient present. Surveys conducted in both 1998 and 2006 provide evidence for the presence of both good quality MG4 Typical and the MG4/8 intergrade. Results from the most recent survey, in 2007, suggest the now familiar

pattern of a shift from MG4 Typical to the impoverished *Sanguisorba* form with some of the wetter areas displaying very high levels of *Agrostis stolonifera, Hordeum secalinum* and *Ranunculus repens* suggesting a deterioration of the *Calthion* zone to the OV28 community. It is not however clear whether these results reflect the summer flooding or less than complete recording of the vegetation – both may be factors in the apparent decline in quality across the site. In fairness to the recorders, the site was reported to be densely thatched at the time of the 2007 survey.

Severn Ham

Apart from *Oenanthe silaifolia,* the only non-grass species mentioned in the SSSI notification are *Cardamine pratensis* and *Ranunculus acris*. A survey in 2003 produced one record for *Sanguisorba officinalis* and the species was also recorded in 1972 though not in 1984, 1987 or 1993. Severn Ham is thus the one site of the eight included in the study where conclusive evidence for the past or present occurrence of the MG4 community is lacking. Prior to agricultural improvement the community was almost certainly present. A range of neutral grassland communities are present which underline the agricultural management that has taken place. The main Twinspan analysis indicates that the bulk of the site supports the MG7D unit with small lenses of MG6a, MG7C and MG13. A greater level of improvement is suggested over some parts of the Ham by the identification of releves closest to the *Lolium-Trifolium* leys of MG7B.

Hucclecote Meadow

Records from 1987 indicate that this site was partitioned into areas of MG4 and MG5. A very competent NVC survey of the pair of meadows by Nicholas Pearson Associates in 2004 re-inforced this interpretation. The present study confirms that the vegetation at Hucclecote represents an example of MG4 near the driest end of its hydrological envelope. Detailed analysis suggests that the area of MG5 is smaller and that of MG4 *Dactylis-Primula veris* unit is greater than that suggested by the earlier surveyors. A re-examination of the site is indicated as it appears to represent an important western outlier of the form of the community found in the Thames catchment and is quite different to expressions of MG4 from the other Severn/Avon floodplain meadows SSSIs with the possible exception of one parcel in the Coombe Hill Canal meadows.

Coombe Hill Canal and meadows

A species list compiled by the BSBI recorder for the county in 1982 for the meadow at Brawn Farm implies the presence of a substantial stand of MG4. The list includes *Galium verum, Leontodon saxatilis, Oenanthe pimpinelloides, Tragopogon pratensis* and *Trisetum flavescens*. A collection of species which suggest a relatively dry form of the community. Unfortunately no other records or quadrat information has come to light for this meadow, which clearly invites further study.

The main block of parcels within the SSSI support much more flood tolerant vegetation: the present analysis indicates considerable areas of the inundation communities MG13 and OV29. Post flooding data for parcel 11 of the north meadows in 2008 has evidence for small fragments of impoverished MG4 which may have been more extensive before the recent summer floods. Stands regarded as transitional between MG4 and MG7 also occur here but are likewise very limited in extent. To the west, a further stand of MG4 was recorded on one of the Apperly Hall meadows (parcel 15) in 1987.

3.3 Ellenberg scores

In the graphs of mean Ellenberg N and F (for vegetation units having more than two releves) the communities have been ordered along a broadly hydrological gradient (Figures 3.1 a and b).

Vegetation units considered to be of higher conservation status (MG5, MG4D, MG4T and MG8) tend to have low moisture and fertility scores whilst their species poor and sedge dominated counterparts tend to have higher scores.

The range of Ellenberg scores for the NVC units recognised illustrate a clear tendency of increasing fertility with increasing moisture tolerance; the exceptions being the MG8 units which have low fertility but higher moisture tolerance than the MG4 units. This pattern has been observed at other floodplain meadow sites and reflects, to some extent, the higher sedimentation in areas prone to more prolonged flooding.

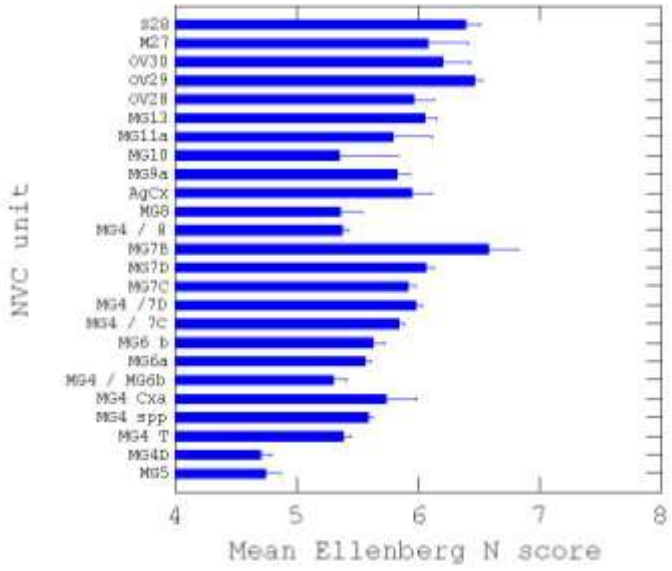
When the mean scores for the Severn and Avon sites are compared with those from the Derwent Ings (Prosser and Wallace 2004, Wallace and Prosser 2004) and the Oxford meads (Wallace *et al* 2008) it is immediately clear that the Severn and Avon sites support vegetation tolerant of more fertile soils. The differences in moisture tolerance values are much less (Figure 3.2).

This strongly suggests that the high representation of the *Sanguisorba* expression of the MG4 community in the Severn Avon data set reflects a higher than average level of soil fertility. Although this could be due to prolonged inundation in the past, the Ellenberg F scores do not support this.

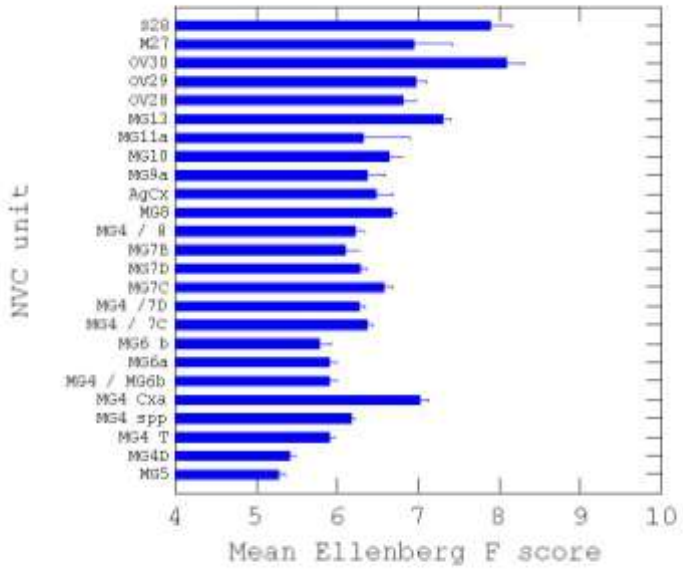
The late cutting of some of the meadows that is currently practiced might be contributing to species poverty of the stands. It has become clear since the summer flood of 2007 that the failure to cut for hay can result in a major reduction in species richness and it is suspected that late cutting may also have a similar impact on the species complement.

Figure 3.1 Ellenberg scores for vegetation units recognised on the Severn/Avon Vales

(a) Ellenberg N scores



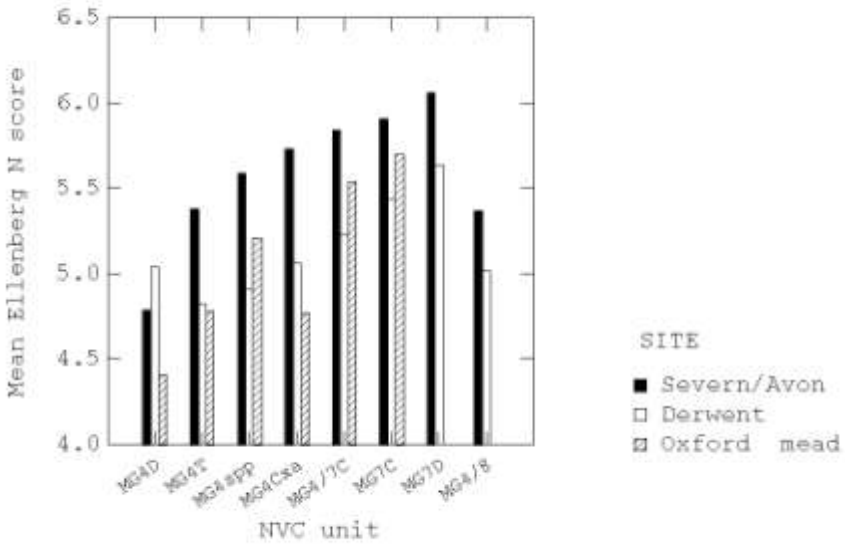
(b) Ellenberg F scores



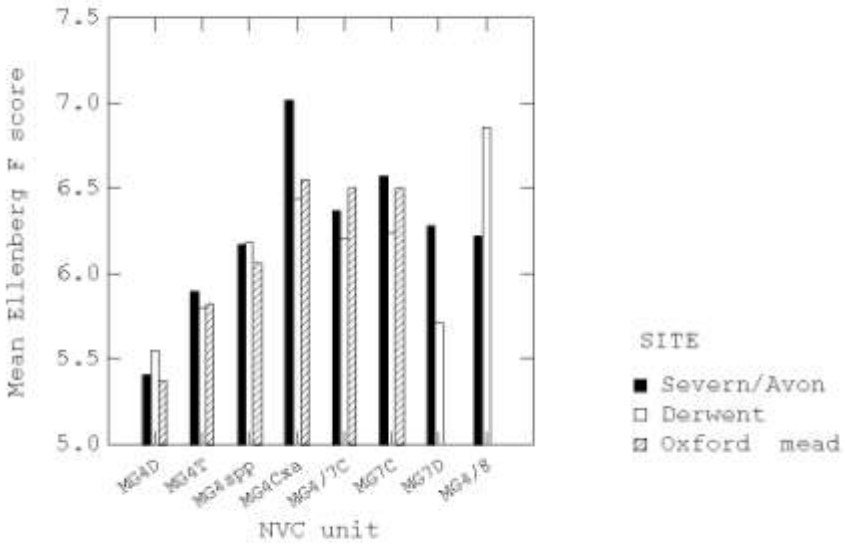
Values are means with ± one standard error of the mean.

Figure 3.2 Comparison of Ellenberg N and F scores with the vegetation communities of the Derwent Ings and Oxford Meads

(a) Ellenberg N



(b) Ellenberg F scores



4 DISCUSSION

The *Alopecurus- Sanguisorba* grasslands, originally classed as *Cynosurion* meadows, are now regarded as part of the *Alopecurion* alliance (Schaminee *et al* 1996). The *Fritillario-Alopecuretum pratensis*, the closest Dutch equivalent to MG4, is divided into three sub associations (subcommunities) which occupy differing parts of the hydrological envelope for the community. The community as published in the NVC is presented as a single unit but subsequent work (Gowing *et al* 2002) resulted in the identification of two sub-divisions, with a species poor variant (now referable to the *Sanguisorba* variant) being separated from the more typical stands. Additional studies, especially on the Derwent and Thames catchments, have established that there may be as many as six recognisable types within the community though the hierarchical status of these noda has yet to be established through work currently being undertaken within the Floodplain Meadows Partnership. This work aims to address the pressing need for a revision of the mesotrophic grasslands within floodplain meadows and grazing marsh identified by Rodwell *el al.* (2007).

From the available evidence, it seems that four forms of MG4 are present within the Severn and Avon study sites. Small areas of the driest type, the Typical form and the bulky *Carex* variant are present, but are dwarfed by the much greater hectarage of the *Sanguisorba* variant. MG4 is an extremely dynamic community and the present balance between the Typical and *Sanguisorba* forms is likely to be in part a reflection of recent summer flooding. Some early records from the Severn Avon Vale sites, for example those of Alison MacDonald in 1987, suggest a richer species complement than found in recent years: the higher levels of fertility on sites in this catchment demonstrated by the mean community Ellenberg N scores (Figure 3.2) may be a relatively recent feature of the system resulting from greater use of fertilisers and could be having a negative effect on species diversity in these grasslands.

Studies on many sites in 2008, including North Meadow Cricklade, the Oxford meads and sites near Milton Keynes, have all shown a depression in species richness following the summer flood of 2007 (see the Floodplain Meadows Newletter No 2, www.floodplainmeadows.org). On sites, such as Mottey Meadows in Staffordshire, where no summer flooding has occurred, this lowering of community quality has not been observed. The declines in species richness following flooding can be partly attributed to the flood itself, but more significant is the effect of failure to remove the standing hay crop. It seems probable that the retention of nutrients and the thatching of dead material suppresses the growth of many species in the following year. The practice of late summer cutting has also been highlighted in other studies as a possible cause of reduced species richness and a management programme that allows for occasional (i.e. every 3 years) early cutting and removal of the hay cut should be considered on sites where the MG4 unit is restricted to the *Sanguisorba* or large *Carex*-dominated variants.

5 COMMENTS AND RECOMMENDATIONS

5.1 Limitations of the study

Since few of the sites for which data were provided had detailed NVC maps, it is not possible to comment on the extent of the different vegetation units that have been recognised during this study: the interpretation of existing maps would be a major undertaking.
The variability of quadrat size and units of estimation of relative abundance of species have precluded the entry of any of the Severn Vale quadrat data into the Floodplain Meadows database. As a consequence the placing of the stands within the broader context of the MG4 unit has been limited to comparisons of floristic tables.

5.2 Recommendations

Some sites have been identified as supporting high quality MG4 vegetation and would merit more detailed mapping and quadrat survey; Hucclecote Meadow and the meadow at Brawn Farm adjacent to the Coombe Hill Canal SSSI are examples.
Some sites might be considered for MG4 restoration or rehabilitation projects. In particular Upham Meadow and Summer Leasow, and Ashleworth Ham.

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