

## 13. Essex

### 13.1 Physical

#### Geology

The solid geology of Essex is buried by drift over about half of the county. Chalk outcrops in the far north west, whilst ridges of Tertiary sand and clay outcrop in the south and east. The north western half of the county is dominated by boulder clay, but gravels of various sorts also occur here, and gravels are extensive in the south and east.

#### Soils

Dry acid soils are not recorded as abundant within Essex according to the soil association map (Map 1b).

### 13.2 Landscape history

#### 19th Century

In the early 19th century unenclosed heathlands were scattered through the east of the county, especially on the Tertiary ridges. In the south there were several large pasture woodlands including Epping Forest.

#### Current landscapes and Natural Areas

English Nature divides the county between the East Anglian Plain (NA50) to the north and the London Basin (NA66) to the south. The London Basin includes the surviving Epping Forest and small relics of the eastern heaths, and also includes the areas of lighter soils around Colchester, which have a few relics of former heaths. The coastal edge is within the Greater Thames Estuary Natural Area (NA67).

### 13.3 Existing information

#### Flora

The coincidence maps of the lowland acid grassland species listed in Table 1 (Maps 2 to 4) show that there were concentrations of these species between Colchester and Chelmsford but that these have suffered considerable decline. In contrast, Epping Forest appears to have always been species-poor.

There are two modern floras covering all or parts of the county (Jermyn, 1974 and Tarpey & Heath, 1990). These record a total of 17 acid grassland species of which 6 appear to be extinct (Table 6 and extract below). In the species accounts, gravel pits are often mentioned, and indicate that these may be a significant reservoir of habitat for species with better dispersal capabilities. Sites frequently mentioned include the Roman River area (TM0715), Tiptree Heath (TL8814) Fingringhoe (TM0715) and Danbury Common (TL7804). The possible native, *Filago gallica*, was last recorded in a gravel pit in the Colchester area and was reintroduced by Plantlife and EN in 1995. The nationally scarce *Scilla autumnalis* has been recorded from parched acid grassland on gravel terraces near the Thames.

#### Fauna

No published data were consulted but the English Nature Local Team reported that a recent addition of the 'Essex Naturalist' has an extensive review of the Aculeate Hymenoptera which are often an

important element of dry grassland fauna. This review and contract work by Colin Plant for English Nature shows that the Thames Terrace Gravels are very important for invertebrates.

### **Habitat surveys**

The Grassland and Heathland Inventories note only small relic areas of acid grasslands and heath. The Heathland Inventory notes the presence of tiny amounts of lichen heath which may represent stands of U1a. The maps in the NVC, Volume 3, show that U1b, U1d and U1e were sampled from the county in the Chelmsford-Colchester area (Rodwell, 1992).

In his detailed description of the remarkable pasture woodland established on the boulder clay of Hatfield Forest, Rackham (1989) describes the survival of a small area of parched acid grassland (U1) in old gravel workings, including *Moenchia erecta* in one of its few surviving sites in East Anglia. The description also includes the local moss *Rhodobryum roseum* (Rackham, 1989).

The shingle survey (Sneddon & Randall, 1994) also suggests the presence of small areas of grassland close to or synonymous with U1 in shingle sites on stable parts of shingle structures.

### **Summary of consultations with Local Team Conservation Officers**

The extent of acid grassland was estimated as covering between 100-500ha, possibly more. This is mostly parched acid grassland (U1) with some Deschampsia flexuosa grassland (U2). These grasslands are found in the east and south, on periglacial ridges and glacial out-wash, and occur from Epping Forest to Dunbury, Triptree, Colchester and Basildon to Rochford and the Dengie Hills. Most are relics of heathland. Very small areas occur within grazing marshes on sand ridges and ant hills. They can be important invertebrate sites where there are bare ground and vegetation mosaics. As with heaths, areas of acid grassland are often unmanaged.

## **13.4 Summary of resource**

### **Extent and composition**

Given the degree of habitat loss in Essex, EPR doubts that there is much more than 500ha of lowland acid grassland in Essex. Surviving areas appear to be a typical eastern mixture of parched acid grassland (U1b, U1d & U1e) with some Deschampsia flexuosa grassland (U2) in relic habitats. The richest acid grassland is confined to the area between Chelmsford and Colchester. It is thought that 'rather different grasslands survive on the Thames Terraces but there is little information about them.

### **Conservation value**

The remaining areas of lowland acid grassland in Essex are still of considerable nature conservation value, both at a county level, and in the context of south east England.

## **13.5 Future requirements for survey and conservation**

### **Survey**

The English Nature Local Team regards the London Basin as a relatively high priority for survey, with the other areas of lower priority. In a national context, the area between Chelmsford to Colchester and the Thames Terraces probably have the highest priority for survey.

## Conservation

The lowland acid grassland of Essex suffers from considerable problems of neglect and habitat degradation. The heaths and acid grassland relics of the Chelmsford to Colchester area have the greatest priority for restoration and the creation of new habitat. The heathland in this area has probably always been richer in dry grassland species than elsewhere in the county, although the heathlands to the south may be wetter and have with a different range of species. This is likely to be the case in Epping Forest.

## 13.6 References

- JERMYN, S.T. 1974. *Flora of Essex*. Colchester: Essex Naturalists' Trust.
- RACKHAM, O. 1989. *The last forest: the history of Hatfield Forest*. London: J.M. Dent and Sons.
- SNEDDON P. & RANDALL, R.E. 1994. *Coastal vegetated shingle structures of Great Britain: Appendix 3. Shingle sites in England*. Peterborough: Joint Nature Conservation Committee.
- TARPEY, T. & HEATH, J. 1990. *Wild flowers of north east Essex*. Colchester: Colchester Natural History Society.

Extract from Table 6 for Essex: occurrence of plant species generally faithful to lowland acid grassland

County: Essex	
Natural Areas:	All
<b>Grasses</b>	
<i>Apera interrupta</i>	0
<b>Other Vascular Plants</b>	
<i>Chamaemelum nobile</i>	0
<i>Filago minima</i>	1
<i>Hypochaeris glabra</i>	0
<i>Medicago minima</i>	0
<i>Moenchia erecta</i>	1
<i>Ornithopus perpusillus</i>	1
<i>Potentilla argentea</i>	1
<i>Stellaria pallida</i>	1
<i>Teesdalia nudicaulis</i>	0
<i>Trifolium glomeratum</i>	1
<i>Trifolium ornithopodioides</i>	1
<i>Trifolium scabrum</i>	0
<i>Trifolium striatum</i>	1
<i>Trifolium subterraneum</i>	1
<i>Trifolium suffocatum</i>	1
<i>Vicia lathyroides</i>	1
<b>Total no. of species extant</b>	<b>11</b>
<b>Total no. of species extinct</b>	<b>6</b>
<b>Total no. of species recorded</b>	<b>17</b>

1 = Recent record

0 = Apparently extinct

## Essex acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1985-90	Common, Field, Pasture woodland	Only small amounts noted	8	1539.6	3.5	3.5		
Heathland Inventory		1984-95	Common, Waste	Epping Forest and small patches beyond	20	2628.0			33.9	0.2
Estimates, classes		1996	Plus Parkland	Stephen Ayliffe, English Nature				C		

Survey Name	U1	U1a	U1b	U1c	U1d	U1e	U1f	U2	U2a	U2b	U3	U4	U4a	U4b	U4c	U4d	U4e	U5	U6	SD10	SD11	U20r	
Grassland Inv.																							
Heathland Inv.																							
Estimates, class	C	?	+		+	+		A															

## Key

### Column headings

GR = Grid reference if relevant

No Sites = Number of sites

Site Area = Area of sites

GR Area = Area of grassland

A G Area = Area of acid grassland

H Area = Area of dry heath

LHA = Area of lichen heath

NI = No information

NA = Natural Area

U1-U20r = NVC communities/sub-communities

### Area estimates

A = Less than 50 ha

B = 50-100 ha

C = 100-500 ha

D = 500-1,000 ha,

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## 14. Gloucestershire

### 14.1 Physical

#### Geology

East of the River Severn, Gloucestershire is composed of Jurassic deposits with Oolitic Limestone forming the dramatic scarp of the Cotswolds. To the west, New Red Sandstone, Old Red Sandstone and Carboniferous rocks occur.

#### Soils

The largest block of acid soils recorded are brown podzolic soil associations in the Forest of Dean. Elsewhere there are small areas of brown sands north of Newent (**Map 1b**).

### 14.2 Landscape history

#### 19th Century

In the 1830's the 'rolling enclosure' of the Forest of Dean had not been completed and areas of open heathland and pasture woodland still survived. However, at this point in time, the Forest of Dean was already more enclosed than the New Forest in the 1870's, when the practice of enclosure was finally halted in the New Forest. Since then, virtually all of the Forest of Dean has been included within timber enclosures.

#### Current landscapes and Natural Areas

Gloucestershire is divided into three Natural Areas: the limestone-dominated Cotswolds (NA55), the low lying plain of the Severn and Avon Vales (NA56) and the varied undulating landscape of the Dean Plateau and Wye Valley (NA61). Only the latter contains any potential for the widespread occurrence of acid grasslands.

### 14.3 Existing information

#### Flora

The coincidence maps of the lowland acid grassland species listed in **Table 1 (Maps 2 to 4)** show that there was a moderate concentration of these species in the Forest of Dean but that they have declined considerably. A total of 10 species are recorded, of which 4 appear to be extinct (**Table 6** and extract below).

#### Habitat surveys

The Grassland Inventory reflects the efforts of the Forest of Dean grassland survey (Regini 1995; Doe 1996) but also records the presence of a few acid grasslands beyond NA61, eg Brockeridge Common (SO83) in the Severn Valley (NA56) and Cleeve Common on the highest part of the Cotswolds (NA55). The Heathland Inventory reflects the completeness of enclosure in the Forest of Dean, recording only tiny fragments of heathland.

### *Forest of Dean grassland survey (Regini 1995 & Doe 1996)*

The detailed Phase 2 survey of the Dean Plateau and Wye Valley Natural Area (NA61) (Regini 1995 & Doe 1996) records an area of acid grassland of approximate equal size (just over 100ha) to that of herb-rich neutral grassland (MG5). Both parched acid grassland (U1) and moist acid grassland (U4) were recorded but the former was more frequent. The acid grasslands are concentrated on the areas where podzols and brown sands are recorded as dominant on the soil map (Map 1b).

The two most frequently recorded sub-communities of parched acid grassland were the heathy Galium-Potentilla sub-community (U1e) and the more base rich Anthoxanthum-Lotus sub-community (U1d). Rarely recorded sub-communities included the Typical sub-community (U1b), the Hypochaeris sub-community (U1f) and fragmentary stands, possibly Erodium-Teesdalia sub-community (U1c), on coal waste tips. Selected data from the survey of May Hill SSSI are presented in Volume I, Appendix 1, as an illustration of U1e grassland in enclosed pasture.

The sub-communities of moist acid grassland (U4) recorded include Typical sub-community U4a, Holcus-Trifolium sub-community (U4b) Lathyrus-Stachys sub-community (U4c), presumably as a transition to MG5c, and the Luzula-Rhynchospora sub-community (U4d). Most were found in fields but relics of the open Forest vegetation and vegetation on coal mine waste were also seen. Interestingly, transitions from acid grasslands to calcicolous grassland (Festuca-Pilosella-Thymus grassland, CG7) are recorded on Carboniferous Limestone.

### *Fungi in the Patches (Rotheroe, 1995)*

In an article on unimproved grassland fungi (Rotheroe, 1995), mention is made of 'The Patches', a 3.7ha area of ancient grassland in the Forest of Dean which is one of the richest grasslands for fungi so far recorded. This area was surveyed by Regini (1995) (Moseley Green) and was found to be predominantly a mixture of moist acid grassland (U4) and *Nardus* grassland (U5).

### **Summary of consultations with Local Team Conservation Officers**

The acid grasslands of the Forest of Dean are well described by Regini (1995) and Doe (1996). They are concentrated on the central Forest of Dean and are found in mosaic with other grasslands, especially calcicolous grassland and mires, with distinctive stands developed in industrial waste sites. The sites are mostly small and the individual quality is not high, but they represent relics of habitats which were once widespread in the Forest. There is a need to restore the diversity of the habitat mosaic in the Forest of Dean. To the east of the county, acid grassland is very rare and occurs in a few sites where the communities present remain undefined. The area present totals less than 10ha in all.

## **14.4 Summary of resource**

### **Extent and composition**

The acid grasslands of the Forest of Dean are an integral part of the unimproved grasslands there, and mostly survive in small fields and relic commons. They probably represent a typical western mixture of parched acid grasslands (U1d & U1e) on shallow soils with moist acid grassland (U4) present on less droughty soils.

### **Conservation value**

The acid grasslands are best assessed as part of an unimproved grassland complex. Considered alone, though interesting, they are not floristically outstanding, with the exception of their important fungi flora.

## 14.5 Future requirements for survey and conservation

### Survey

The completion of the Forest of Dean survey has left no priorities for survey, but the value of acid grasslands for fungi needs further investigation.

### Conservation

Restoring the habitat diversity in the Forest of Dean is a priority consideration and can be achieved with the restoration of heath, mire and pasture woodland as well as acid grassland. The New Forest is a directly relevant model given its similar history, legal status and ownership.

## 14.6 References

- REGINI, K. 1995. *Forest of Dean grassland survey 1994*. Stonehouse: Gloucestershire Wildlife Management Ltd.
- DOE, J. 1996. *Forest of Dean grassland survey 1995*. Stonehouse: Gloucestershire Wildlife Management Ltd.
- ROTHEROE, M. 1995. Saving an historic lawn: conservation progress report. *Mycologist*, 9: 106-109.

Extract from Table 6 for Gloucestershire: occurrence of plant species generally faithful to lowland acid grassland

County: Gloucestershire	
Natural Area:	61
<i>Chamaemelum nobile</i>	0
<i>Filago minima</i>	1
<i>Moenchia erecta</i>	1
<i>Ornithopus perpusillus</i>	1
<i>Potentilla argentea</i>	1
<i>Trifolium ornithopodioides</i>	0
<i>Trifolium scabrum</i>	0
<i>Trifolium striatum</i>	1
<i>Trifolium subterraneum</i>	1
<i>Viola lactea</i>	0
Total no. of species extant	6
Total no. of species extinct	4
Total no. of species recorded	10

61 = Dean Plateau and Wye Valley

1 = Recent record

0 = Apparently extinct

## Gloucestershire acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1988-95	Field, Enc. relic, Waste, Common	Mainly in NA 61 (see below)	35	688.0	521.6	39.1		
Heathland Inventory		1983-89	Enclosure relic & Common	Fragments in NA61 & Cleeve Common NA55	3	484.0			4.4	
Forest of Dean Ph2		1994-5	Field, Enc. relic, Waste, Common	Detailed Phase 2 (Regini, 1995 & Doe, 1996)	37			113.1		
Estimates, classes		1996		Mike Wilkinson, English Nature				C		

Survey Name	U1	U1a	U1b	U1c	U1d	U1e	U1f	U2	U2a	U2b	U3	U4	U4a	U4b	U4c	U4d	U4e	U5	U6	SD10	SD11	U20r	
Grassland Inv.																							
Heathland Inv.																							
Forest of Dean Ph2	73.3		+	+	+	+	+					39.0	+	+	+	+		1.5					
Estimates, class	B		A	?	A	A	A					A	A	A	A	A		A					

## Key

### Column headings

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No Sites = Number of sites

Site Area = Area of sites

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LHA = Area of lichen heath

NI = No information

NA = Natural Area

U1-U20r = NVC communities/sub-communities

### Area estimates

A = Less than 50 ha

B = 50-100 ha

C = 100-500 ha

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## 15. Greater London

### 15.1 Physical

#### Geology

Virtually all of the London area is underlain by Tertiary sands and clays but drift and alluvium often mask these deposits, especially on river terraces. In the south an outcrop of Chalk occurs where the North Downs dip slope rises above the London Basin.

#### Soils

In the south of London several of the larger open spaces are dominated by podzolic soils (**Map 1b**).

### 15.2 Landscape history

#### 19th Century

In the early 19th century there were still sizeable heathlands south of the River Thames.

#### Current landscapes and Natural Areas

Most of London is within the London Basin Natural Area (NA66). Although the Area is now occupied by one of the world's largest conurbations, former heathland and parklands have survived as public open spaces as a result of their status as commons or Royal Parks. On the urban fringes, golf courses provide other areas where relic semi-natural vegetation survives.

### 15.3 Existing information

#### Flora

The coincidence maps of the lowland acid grassland species listed in **Table 1 (Maps 2 to 4)** show that there were high concentrations of characteristic lowland acid grassland species south of the Thames, but unsurprisingly, that there have been massive declines. The nationally scarce *Scilla autumnalis* occurred in parched acid grasslands on gravel terraces along the Thames and is still found in Hampton Court Park.

#### Habitat surveys

The Grassland Inventory picks out the very large Richmond Park and the smaller Bushy Park as containing areas of acid grassland, with the rest occurring as smaller fragments.

Williams (1993) carried out a Phase 2 survey of 11 sites but did not survey the 847ha Richmond Park. He found 180ha of acid grassland with parched acid grassland dominant. The main sub-community was the Typical sub-community (U1b) but the Anthoxanthum-Lotus (U1d) and the Galium-Potentilla (U1e) sub-communities occurred in significant quantities. Only a very little Deschampsia flexuosa grassland (U2) was recorded. This was said to be the upland Vaccinium sub-community (U2b) but this unlikely. More likely is a transition to woodland (W16) or Bracken (U20b). Little indication of the floristic diversity of the sites was given. Old gravel workings at the Chase Nature Reserve included 22ha of U1 but this was species poor.

## Summary of consultations with Local Team Conservation Officers

It is considered that there are between 500-1,000 hectares of acid grassland in London with most in Richmond Park. Dr Francis Rose thought that Addington Hills still had a rich acid grassland flora, and this view should be balanced against the views of Williams (1993), that Addington was not a high quality site. He also described Keston Common (TQ4264) as containing rich, rabbit grazed, and trampled acid grassland with *Potentilla argentea*, *Trifolium arvense*, *Trifolium glomeratum* and *Trifolium striatum*. Again, this was not mentioned by Williams. Acid grassland often occurs in association with veteran trees, an important feature of the London Basin, in sites such as Richmond Park.

### 15.4 Summary of resource

#### Extent and composition

In spite of the massive urban expansion that has occurred in Greater London, significant areas of parched acid grassland with a typical mixture of U1b with U1d and U1e, still remain. However, available data indicates that this grassland is now rather species poor.

#### Conservation value

The most significant grasslands are probably those in Richmond Park, as part of a well-preserved, ancient, deer park. The grasslands themselves are probably of little more than London significance.

### 15.5 Future requirements for survey and conservation

#### Survey

It would be useful if the areas not surveyed by Williams (1993) were covered, but this is not considered a high priority.

#### Conservation

There are presumably opportunities for extending acid grassland habitats in areas of scrub and heaths, and old gravel workings. However, the likely problems of grazing this grassland makes this a low national priority.

### 15.6 References

WILLIAMS, P.R. 1993. *Phase 2 survey of acid grassland and heathland in Greater London 1993*. Wye: English Nature.

## Greater London acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1986-93	Park, Enc relic, Common, Waste drift/calc	Mainly in old parks and heathland relics	15	2672.2	199.8	182.0		
Heathland Inventory		1984-93	Park, Enc relic, Common	Mainly in old parks and heathland relics	19	2350.0			123.9	
Williams (1993)		1993	Enc relic, Common	Excludes Richmond Park & Wimbledon Com.	11	1443		180.0	23	
Estimate, classes		1996		Neil Sanderson, EPR				D		

Survey Name	U1	U1a	U1b	U1c	U1d	U1e	U1f	U2	U2a	U2b	U3	U4	U4a	U4b	U4c	U4d	U4e	U5	U6	SD10	SD11	U20r	
Grassland Inv.																							
Heathland Inv.																							
Williams (1993)	179.0		93.0		41.0	45.0		1.0		1.0													
Estimates, class	D		+		+	+		A		?													

## Key

### Column headings

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NA = Natural Area

U1-U20r = NVC communities/sub-communities

### Area estimates

A = Less than 50 ha

B = 50-100 ha

C = 100-500 ha

D = 500-1,000 ha,

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## 16. Greater Manchester

### 16.1 Physical

#### Geology

Manchester is located on Coal Measures to the north and east, and New Red Sandstone to the south and west. The Millstone Grit uplands are included in the extreme east of the area. Much of this part is covered with glacial drift.

#### Soils

Upland soils occur in the extreme east, whilst in the lowlands, sizeable patches of brown sands exist (Map 1e).

### 16.2 Landscape history

#### 19th Century

In the early 19th century the landscape included sizeable raised mires and small areas of heathlands.

#### Current landscapes and Natural Areas

The area is part of English Nature's Urban Mersey Basin Natural Area (NA26), which is now occupied by a major urban conurbation. The Southern Pennines Natural Area (NA14) fringes the northern part of the county.

### 16.3 Existing information

#### Flora

The coincidence maps of the lowland acid grassland species listed in Table 1 (Map 2 to 4) show that few of these species have been recorded in the county.

#### Habitat surveys

The Grassland Inventory indicates that acid grassland has been recorded quite frequently across the urban area, in both urban fringe sites and in the upland fringe. The Grassland Inventory records a total of 68 sites covering 475ha from which acid grassland has been recorded but gives no indication of how much of this is actually acid grassland. The Heathland Inventory records small areas of relic heathland, mainly to the north east.

During EPR work in Greater Manchester (Colebourn, 1994b) *Deschampsia flexuosa* (U2) and *Nardus* (U5) grasslands were observed in the drier parts of remaining unimproved grasslands, and parched acid grasslands (U1e & U1f) seen on disturbed areas or very steep and dry sites.

#### Summary of consultations with Local Team Conservation Officers

The Local Team confirmed that Greater Manchester has between 10 to 100ha of acid grassland. The bulk is in the uplands bordering the Urban Mersey Basin Natural Area and acid grassland is restricted in the lowlands, where it occurs with heathland. Small patches of acid grassland also occur on boiler-ash waste areas in Nob End SSSI.

## **16.4 Summary of resource**

### **Extent and composition**

There appears to be between 10 to 100ha of acid grassland in the Greater Manchester area, but much may be upland or upland fringe. From what observations have been made, a combination of U2 and U5, with U1 in disturbed areas, appears to dominate in the lowlands but U4 can be expected to occur.

### **Conservation value**

Acid grasslands in Greater Manchester are likely only to be of value in a county context.

## **16.5 Future requirements for survey and conservation**

### **Survey**

No national priorities, though the acid grassland fringes of the Southern Pennines Natural Area (NA14), which borders the county, have been identified as a local priority for survey (Colin Newlands, pers. comm).

### **Conservation**

No national priorities.

## **16.6 References**

COLEBOURN, P.H. 1994b. Thameside UDP Public Inquiry Feb-March 1994. Proof of Evidence on Ecology by P.H. Colebourn, MA, MSc, MRTPI, MIEEM. Winchester: Ecological Planning and Research.

## Greater Manchester acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1988-91	Field, Waste, Enclosure relic	Includes urban fringe and upland edge sites	68	475.1	27.0	NI		
Heathland Inventory		1980-92	Field, Mire	Mainly in north and east	41	964			50.1	
Estimates, classes		1996		N. Sanderson, EPR				B		

Survey Name	U1	U1a	U1b	U1c	U1d	U1e	U1f	U2	U2a	U2b	U3	U4	U4a	U4b	U4c	U4d	U4e	U5	U6	SD10	SD11	U20r	
Grassland Inv.																							
Heathland Inv.																							
Estimates, class	A					A	A	A				A?						A					

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## 17. Hampshire

### 17.1 Physical

#### Geology

Three areas of sands and clays predominate, separated by the Chalk hills of central Hampshire. In the south, the Hampshire Basin contains Tertiary sands and clays, with the London Clay much less predominant than in the Thames Basin as a whole. The Hampshire part of the Thames Basin however, includes only limited amounts of London Clay, and a great deal of Bagshot and Bracklesham Beds. In both areas, gravel terraces (Plateau Gravels) are important features. In the south there are sand dune systems on the south coast of Hayling Island and very sandy areas with ancient sand dunes and inland blow outs on the lower terraces of the River Avon, west of the New Forest at Bistern Warren. The western Weald forms the third area, and is very different, with the sand-dominated Lower Cretaceous Lower Greensand being particularly well exposed.

#### Soils

In the New Forest and south east Hampshire, podzol-dominated soil associations are largely restricted to Plateau Gravels, with surface-water gleys dominating elsewhere. In the Thames Basin, areas dominated by podzols are confined to ridge tops to the west but are more widespread in the north east. The Lower Greensand of the western Weald supports podzol-dominated soils under heathland and former heathland areas, with brown earths dominant under enclosed land (**Map 1b**).

### 17.2 Landscape history

#### 19th Century

The landscape depicted on the 1 inch OS maps of the 1810's is, with a few exceptions, little changed from the medieval period. The New Forest stood out, even then, as an immense area of open heathland and pasture woodland, but it still had many attached commons which are now enclosed. To the east the rest of the Hampshire Basin had large areas of heathland and pasture woodland, now almost entirely lost. In the north there were scattered, medium-sized, commons to the west and extensive coalescing heaths in the north east. Finally the western Weald was dominated by large blocks of almost treeless heathland on the Lower Greensand.

#### Current landscapes and Natural Areas

English Nature divides the Hampshire Basin into the New Forest Natural Area (NA77) with its extensive surviving heathland and pasture woodlands and the South Coast Plain and Hampshire Lowlands (NA75), where most of the heathlands have been enclosed and destroyed but coastal habitats with heath and acid grassland still survive.

The whole of the Thames Basin is included in the London Basin Natural Area (NA66). However, the heathland areas of north east Hampshire and its neighbouring counties, where heathland was the dominant historic land use, are very different to the rest of the Thames Basin, where heathland was always a subsidiary land use. The Lower Greensand heathlands are included within the Wealden Greensand Natural Area (NA70).

## 17.3 Existing information

### Flora

The coincidence maps of the lowland acid grassland species listed in Table 1 (Maps 2 to 4) show that there were high concentrations of characteristic lowland acid grassland species in the New Forest, the south east coast, the western Weald and the north east of the county. All these areas are still of interest, with the lowest rate of decline present in the New Forest area. Lists of the species in each area are given in the extract of Table 6 below. The New Forest also contains a major concentration of ephemeral pond species characteristic of acid grassland sites (Maps 5 to 7), whilst the western Weald holds a concentration of species typical of disturbed acid soils (Maps 8 to 10).

The recent Flora of Hampshire (Brewis et al, 1996) allows a detailed analysis of the acid grassland flora of the county. A total of 23 acid grassland species have been recorded, all of which remain extant - a unique feature in England. The highest total is recorded from the New Forest area (including the New Forest proper and the Avon sand terraces, but excluding the coast) with 21 extant species recorded.

The dry acid grassland species are mainly confined to the plateau gravels across the New Forest and to sands in the west of the Forest, with rich outliers on the Avon terraces. The species present include all the remaining colonies of Wild Gladiolus, *Gladiolus illyricus*, a major proportion of the British population of *Chamaemelum nobile* (Winship, 1993), *Carex montana* and *Viola lactea*. A rich clover flora is widespread, along with species such as *Sagina subulata* and *Moenchia erecta*.

More localised to the west on sands, and the Avon sand terraces, are species such as *Carex arenaria*, *Crassula tillaea*, *Hypochaeris glabra*, *Teesdalia nudicaulis* and *Vicia lathyroides*. As well as the 21 characteristic species, 33 of the locally characteristic species are present (Table 2) giving an overall total of 53 species on the provisional acid grassland indicator list (Table 8). This is likely to be the highest total from any single tract of semi-natural vegetation, perhaps because elsewhere heathlands have suffered greater fragmentation.

A distinctive feature of the New Forest acid grasslands is the scattered occurrence of calcicole species including frequent *Cirsium acaule* and *Carlina vulgaris* and, less often, species such as *Brachypodium pinnatum* and *Scabiosa columbaria*. These occur, along with species such as *Botrychium lunaria* and *Gentianella campestris*, in acid grasslands created by war time or post-war disturbance of heathland through either air field construction or temporary arable cultivation.

Other features include abundant *Agrostis curtisii* in grassland and heathland, and herb-rich Bracken. Species present in the latter include a mixture of pasture species such as *Succisa pratensis*, *Stachys officinalis* and *Serratula tinctoria*, and woodland species such as *Anemone nemorosa*, *Hyacinthoides non-scripta* and *Convallaria majalis* as well as the spectacular *Gladiolus illyricus*.

The next richest area is the coastal grasslands in the south east, where acid grassland occurs in shingle and sand dune systems. A total of 21 species have been recorded but 3 are apparently extinct. Species here include *Sagina subulata* at Hayling Island, one of the few remaining sites for this species outside the New Forest, and *Silene nutans* on Browndown shingle beach. *Agrostis curtisii* still occurs in some relic inland heaths.

The western Weald is also notable, with 18 species recorded, one of which is apparently extinct. Here the Woolmer area is picked out as being especially rich. Species such as *Carex arenaria*, *Hypochaeris glabra*, *Teesdalia nudicaulis* and *Vicia lathyroides* are much more prominent than in the New Forest. *Herniaria glabra* has been found since the Hampshire Flora was published (F. Rose, pers com.).



Conversely, species such as *Chamaemelum nobile* and *Moenchia erecta* are rare. *Agrostis curtisii* is exceptionally rare.

The heaths of north east Hampshire are less spectacular. Fourteen species have been recorded of which two are apparently extinct and many of the surviving species are in a perilous situation. *Agrostis curtisii* occurs locally.

Finally, data for the Hampshire Chalk indicates the presence of limited areas of acid soils from which a total of seven species have been recorded, of which two are apparently extinct.

## Fauna

The New Forest has one of the most important invertebrate faunas in Britain, although little data exists on the relative role of acid grassland and associated herb rich Bracken stands as invertebrate habitat. Most probably the value of acid grassland is high, as virtually all the long-lasting, bare, sandy ground is associated with acid grassland. The Grayling Butterfly (*Hipparchia semele*) is especially strongly associated with *Agrostis curtisii* grasslands and heaths (U3 and H3).

In the New Forest, the acid grassland bird fauna includes Woodlark, which nests semi-colonially on short heath and in large areas of acid grassland, associated with past disturbance. In the grasslands it often nests in the shelter of Bracken litter. Five to ten pairs of Ring Plovers also nest on acid grasslands, which are associated with disused war time air fields, in the north of the New Forest.

The Forest grasslands support one of the largest surviving Wheatear populations in the lowlands, and a small Whinchat population still breeds in the north west of the New Forest, in areas of mixed Bracken, acid grassland, Gorse and heath. Stonechat use Gorse in both acid grassland and heath, but Dartford Warblers tend to be much more strictly confined to the latter habitat (Clark & Eyre, 1993 & Gibbons *et al* 1993).

Nightjars may use open Bracken litter in grassland on the edge of pasture woodlands. Finally Stone Curlew has been recorded in the area, but is unlikely to breed due to high levels of disturbance by the visiting public. It is thought that the nesting success of ground nesting birds is being affected by predation and disturbance by domestic dogs.

Beyond the New Forest, Wheatear, Whinchat, Ring Plover and Stone Curlew are absent from heathland. The other species all occur in heathlands but are less likely to use acid grassland and open Bracken due to its poor condition, but Woodlark uses mown acid grassland in Woolmer and north east Hampshire. In contrast, the use of open Bracken litter in the New Forest, by species such as Woodlark, appears to be associated with winter grazing of the Bracken/grass mixtures, producing a more attractive habitat by trampling down of the litter.

## Habitat surveys

The Grassland Inventory gives an unbalanced picture of the distribution of acid grassland because of the lack of information for most heathland and coastal sites. Most of the sites recorded are predominantly neutral grassland or fen meadow, with small patches of acid grasslands on banks or anthills. Some sites included do not actually have any dry acid grassland; acid MG5c or acid fen meadow (M23a, M24c or M25b) all appear to have been described as acid grassland. The Inventory does not, as yet, include mires but M22, M23a, M24c and M25b probably form over 50% of the enclosed unimproved grassland in Hampshire when taken together.

The only sites with extensive acid grasslands recorded in the Inventory are commons and former warrens along the eastern edge of the Avon flood plain and the New Forest. Some have been surveyed

to a Phase 2 level but no report is available. An example, surveyed by the contractor, is described in Volume I, Appendix 1. They differ from the parched acid grasslands of the New Forest in the dominance of U1b and the abundance of *Carex arenaria* in this community. One site, a former daffodil field that has reverted to grassland, supports a small fragment of the rare U1c with *Crassula tillaea*.

### *New Forest grasslands (Westerhoff, 1992)*

The vegetation of the common grazings of the New Forest has been mapped at 1: 10,000 scale using a customised classification (Westerhoff 1992). Its treatment of grasslands is based on a classification of landscape and management, due to the lack of suitable grassland classification at the time of survey. An attempt was made to correlate this with the NVC after the survey.

The 19773.8ha of rough grazing in the New Forest was found to contain 3299.36ha of grassland including mixtures with Bracken, along with 1823.84ha of Bracken (both may include species-rich Bracken stands) and Bracken/Gorse mixtures; 5848ha of dry and humid heath, including mixtures with Gorse; 2662ha of wet heath; 1492.32ha of mire and 4545.2ha of pasture woodland.

The grassland landscape/landuse units used by Westerhoff (1992) are estimated very roughly from personal experience (NA. Sanderson, EPR) to consist of the following communities:

- All combinations with acid grassland = 25% U3, 25% U1, 25% Wet Lawn (*Junco-Molinion* only) and 25% U20.
- Reseeded grassland and partly improved grassland = 90% U1d and 10% MG6b.
- Lawn = 60% wet lawn (*Junco-Molinion* only), 20% U1 and 20% MG6b.

The New Forest grasslands can be divided into the following broad NVC based categories which have been proposed to replace the original sub-divisions in any re-mapping of the Forest (Westerhoff 1992). Examples from categories covering dry acid grassland, as well as an example of species-rich Bracken, are given in Volume I, Appendix 1. Selected quadrat data and community lists are presented there, together with brief site descriptions.

- Heathy acid grassland

This extends to about 1100ha and is mostly composed of *Agrostis curtisii* grassland (U3), representing the bulk of the *Nardo-Galium* swards in the New Forest. This grassland type develops mainly on old acid brown earths, as opposed to the podzols found under heath, but is rarely found on soils disturbed this century. No U2 grassland exists.

- Parched acid grassland

The U1 grasslands of the New Forest. These are mainly found on fairly recently disturbed soils and cover about 1000ha. Of the sub-communities, U1f is most frequently found, except in the extensive 'brecks' created by war time and post-war disturbance and cultivation of heath. On these soils a rich vegetation has developed containing a mixture of both U1f and U1d species. For convenience these are described as U1d. U1d occupies about 600ha and U1f less than 400ha. Small areas of U1b, and U1e occur on localised areas of freely draining sands. Very locally, small strips and patches of U4 grasslands develop in the transition zone between wet lawn and parched acid grassland and in shaded glades in the pasture woodlands.

- Lawn

Lawn has been redefined to cover only the *Junco-Molinion* wet acid grasslands, including undescribed *Agrostis canina-Carex panicea* flood pasture related to M24c and M16b, as well as more typical patches of M23a, M25b, M24c and short M16b.

- Green

This covers the grassland on enriched soils which contain *Cynosurus*. It appears to be a distinctive variant of MG6b, with frequent *Chamaemelum nobile* (Sanderson & Colebourn, 1992), and often forms mosaics with U1f.

### **Heathlands**

A detailed inventory is being compiled by Paul Edgar of the Hampshire Heathland Project from unpublished surveys. This will cover acid grassland but was not available at in time to incorporate into this report. It is hoped that the information can be used to update the Heathland Inventory for the County. Two Phase 2 surveys covering part of the Lower Greensand heathlands have been published and these are discussed first.

#### **Woolmer Forest (Sanderson & Colebourn, 1993 & Sanderson & Stanbury, 1996)**

Both of these surveys were carried out to assess the impact of road proposals on heathland. The heathlands on the Folkstone Sand of the Lower Greensand around Woolmer Forest and Bordon were surveyed. The heath itself is unusual. Over much of the area H2a dominates but locally H1b becomes prominent. Acid grassland is restricted to parched acid grassland (U1); *Deschampsia flexuosa* grass heath (U2) is absent, possibly due to high levels of rabbit grazing. The most widespread acid grassland is the Typical sub-community (U1b), with *Carex arenaria* locally abundant, as at Shortheath Common (SU7736). Other species of interest include *Chamaemelum nobile* and *Trifolium ornithopodioides*. These grasslands have mainly developed on areas of past disturbance, but which now carry fairly closed, rabbit grazed, swards. At Shortheath, grazing by tethered horses supplements the rabbit grazing.

Additional communities are confined to the corridor of the old military railway (SU7931 to 7832) where repeated heavy disturbance has produced a mix of communities more typical of East Anglia. Areas which have not been recently disturbed support lichen-rich acid grassland (U1a), with 1.6ha recorded. This grassland has a high diversity of lichens, with a mean of 19 species per stand and 10.2 per quadrat. This contrasts with figures of 1.9 species per stand and 1.6 per quadrat in the Suffolk Breckland (Smith & James 1995 and Smith, 1996). Species of interest include *Cladonia foliacea*.

Repeatedly disturbed sites supported 0.6ha of the rare Erodium-Teesdalia sub-community (U1c). Species of interest recorded from this species-rich community include *Hypochaeris glabra* and *Vulpia ciliata ambigua*. A little U1d was noted and some little rank *Carex arenaria* vegetation (SD10) has developed where rabbit grazing is low. A patch of Carex arenaria-Cornicularia community (SD11) has developed on disturbed sand. Selected data from the disturbed heathland edge is presented in Volume I, Appendix 1, to illustrate the characteristics of this type of acid grassland.

The grasslands near Woolmer Pond are very species rich; 135 species were recorded from U1 stands of which of 11 were lowland acid grassland species (Table 1) and a further 16 are in the list of locally characteristic species (Table 2) giving a total of 28 on the provisional lowland acid grassland indicator list (Table 8).

Observations beyond the military railway corridor (Sanderson & Colebourn, 1996, Sanderson & Stanbury, 1996 and personal observations by N.A. Sanderson, EPR) suggest that U1c will readily form in disturbed, slightly nutrient-enriched, soils, eg road verges and formerly improved fields. However, if such grassland is not continually grazed by rabbits, it will be lost to ranker vegetation. A source pool for re-colonisation may be important as stands distant from existing stands, ie at least 400m away, were found to lack the more local species. Disturbed, unenriched soils under heath are more likely to favour re-colonisation straight back to heath without any acid grassland stage.

### *Other heathland areas*

Beyond these areas the most significant areas of acid grassland among heathland are found in north east Hampshire and the fringe of the New Forest. In the former a large area of U1d type grassland has developed at Blackbush (SU 8059), in heathland disturbed by war time air-field development, while small areas of U1, U2 and U3 occur in other heaths in the area. The New Forest fringe has sizeable areas developing on old gravel workings to the in the Fawley area (SU4501), and smaller areas of U1 and U3 elsewhere. In all there is certainly over 100ha of acid grassland beyond the New Forest and Woolmer Heaths but much less than 500ha.

### *Coastal grazing marshes (Norton, 1996, Sanderson, 1995, 1996a & 1996b)*

Several surveys of coastal grazing marshes along the Solent coast have recorded small areas of parched acid grassland. These are found on old shingle banks within enclosed marshes, the edge of river terraces and on the banks of old salt pans.

In the Keyhaven to Lymington Marshes (SZ3191) (Sanderson, 1996a), 5.5ha of U1f was recorded on banks and on an old shingle structure. On the latter, the U1f graded into Festuca-Armeria Maritime community (MC8) near the sea. The flora was rich with *Trifolium ornithopodioides*, *Vicia lathyroides*, *Sedum anglicum* and *Cladonia foliacea*, and has a total of 12 species on the provisional acid grassland indicator list (Table 8).

At the Lower Test Marshes (SZ3613) (Sanderson, 1996b), a small area (0.5ha) of U1f, rich in clovers, was recorded on the edge of a river terrace above the marshes. The flora included *Trifolium glomeratum* among 8 species on the provisional acid grassland indicator list (Table 8), of which 4 are acid grassland species listed in Table 1.

At Titchfield Haven a mixture of U1f and U1d was found in an old sand pit in a terrace edge above the marsh and on stabilised shingle grassland (Norton, 1996). These areas are spectacularly rich with the nationally rare *Lotus angustissimus* as well as *Trifolium scabrum*, *Trifolium striatum*, *Trifolium suffocatum*, *Trifolium ornithopodioides*, *Trifolium subterraneum* and *Moenchia erecta*. A total of 15 species are present on the provisional acid grassland indicator list, of which eight are species generally faithful to acid grassland (Table 1).

Other than these areas there is a tiny patch of U1 recorded at Farlington Marshes (Sanderson, 1995a), and the rich shingle structure at Browndown supports a mixture of U1f and heath (Sneddon & Randall, 1994). Extensive U1f, MC8 and probably U1a occurs at Gravelly Marsh, Beaulieu (Hampshire Flora Group field meeting). Other species-rich coastal sites lacking NVC surveys exist in the south east of the county (Brewis *et al* 1996), including large areas of U1 (probably over 50ha), some of which is U1a, on the south of Hayling Island, on the inland side of dune/shingle complexes. Here the U1 grades into MC8 and MC5 on shingle and to SD11 on dunes.