6. Cambridgeshire

6.1 Physical

Geology

The solid geology of Cambridgeshire is simple, with bands of progressively older rocks from the Chalk in the southeast, to Oolitic limestones in the north west. In between Jurassic and Cretaceous clays are dominant. A narrow band of Lower Greensand crosses the county but this is mostly obscured by drift. Much of the county is in fact covered by thick drift including boulder clay, alluvium, peat and limited amounts of glacial sands and gravels.

Soils

Boulder clay, alluvial and chalk and limestone soils occupy most of the county but soil associations dominated by brown sands do occur around Gamlingay on the Lower Greensand in the east, an extension of the Bedfordshire Greensand outcrop. The blown sands of Breckland also just penetrate the county in the east around Kennet and Chippenham to Newmarket Heath, where there are polygons and stripes (**Map 1d**).

6.2 Landscape history

19th Century

On the 1830's 1 inch OS map, Gamlingay Heath is marked as still unenclosed with the valley mires specifically shown. In the east, Kennet Heath still existed, although by then in a generally enclosed countryside.

Current landscapes and Natural Areas

The county is dominated by the West Anglian Plain (NA52) and the Fens (NA37) Natural Areas which are unlikely territory for acid grassland. To the south the East Anglian Chalk Natural Area (NA51) also has limited potential for acid grassland but small areas of Breckland (NA46) and the Bedfordshire Greensand Ridge (NA53) Natural Areas just enter the county and both contain areas of soil associations dominated by brown sands. However in the Cambridgeshire part of these two Natural Areas in there is very little semi-natural vegetation left.

6.3 Existing information

Flora

The coincidence maps of the lowland acid grassland species listed in **Table 1** (**Maps 2** to **4**) show high concentrations of these species on the acid soil areas on the eastern and western boundaries of the county. However, significant numbers of species have also been recorded from parts of the East Anglian Chalk (NA51). Post-1970 records indicate losses but there are still clusters of acid grassland species recorded.

Two fairly recent floras covering the historic county have been published; Perring *et al* (1964) and Crompton & Whitehouse (1983). The first is a traditional flora, lacking dot maps but with a useful account of the flora, while the latter is a more up-to-date check list. The county largely lacks any acid grassland but small areas near the county boundaries support, or have supported a rich flora. These include a small corner of Breckland in grid squares TL66, 67 and 67, the eastern end of the

Bedfordshire Greensand in TL25 and a small area of glacial gravels at Hildersham, the 'Furze Hills' in TL54.

Perring *et al* (1964) note that Breckland type vegetation only survived around the edges of sand pits around Chippenham and Kennett. Many typical Breckland species have been recorded including *Apera interrupta*, *Filago minima*, *Herniaria glabra*, *Medicago minima*, *Ornithopus perpusillus*, *Potentilla argentea* and *Silene conica* but several including *Crassula tillaea* and *Teesdalia nudicaulis* have not been seen for years (Crompton & Whitehouse, 1983). The Hildersham 'Furze Hills' are described as providing a famous, isolated, locality for Breckland species including *Dianthus deltoides*.

The Greensand area around the village of Gamlingay before the 1850's included well-developed heathland, with rich valley mires as well as drier habitats. In this century only small fragments of acid grassland survive but these are recorded as supporting *Trifolium subterraneum* as well as commoner acid grassland species. *Moenchia erecta* has been recorded in the past but not recently (Crompton & Whitehouse, 1983). The Soke of Peterborough has very few records for acid grassland species (Gent & Wilson, 1995).

The acid grassland species listed in **Table 1** that have been recorded from the county are listed in **Table 6**, from which the relevant data has been extracted below. The total number recorded is high (18 species) but there is also a high number of extinctions, with 5 species not recorded recently.

Habitat surveys

The Grassland Inventory records only two sites, Castor Hanglands (TF1101) and Furze Hill (TL5548), both SSSIs. The Heathland Inventory adds a tiny relic on the Greensand near Gamlingay. No other survey reports were obtained but the maps in the NVC Volume 3 show that at least one sample quadrat of Festuca-Agrostis-Rumex grassland Anthoxanthum-Lotus sub-community (U1d) was recorded from grid square TL56 (Rodwell, 1992).

Summary of consultations with Local Team Conservation Officers

The area of acid grassland in the county is now very small, probably between 1 and 10ha. In the East Anglian Chalk Natural Area (NA51) there are small areas of parched acid grassland (U1), in mosaics with calcicolous grassland on patchy drift at Furze Hill and at Newmarket Heath. The latter is usually regarded as a calcareous site but actually has a chalky/acid vegetation mosaic. The former site is rabbit grazed and has a lichen-rich areas (U1a); the latter site is mown. In the Greensand Ridge area small areas of U1 survive around Gamlingay (TL25).

The acid grassland recorded at Castor Hanglands is a tiny 0.5ha relic of about 1,000ha of heathland ploughed up earlier this century. This heathland originally included wet heath, dry heath, bracken and *Deschampsia flexuosa* grassland (U2). It now consists of two Heather *Calluna* plants in an acid grassland with *Carex pilulifera*, *Potentilla erecta* and *Rumex acetosella*. This grassland could be NVC community Festuca-Agrostis-Rumex Galium-Potentilla sub-community (U1e).

The Breckland area in the east of the county now contains no undisturbed acid grassland, but secondary sites with characteristic acid grassland species occur in old gravel pits and include species such as *Apera interrupta*, *Vulpia ciliata* and *Herniaria glabra*. These are fragmentary and none are SSSIs. These sites could conceivably include the rare Erodium-Teesdalia sub-community U1c.

6.4 Summary of resource

Extent and composition

Only a tiny proportion of the once rich acid grasslands in the Bedfordshire Greensand Ridge and Breckland Natural Areas in Cambridgeshire now survive.

Gravel works are of some importance in retaining something of the flora and small patches also survive with calcareous grasslands on shallow drifts. Furze Hill is the most floristically significant of these areas. Only U1 grasslands appear to be present in the county, with the sub-communities U1a, U1b, U1d and U1e probably present.

Conservation value

The conservation value of the surviving acid grassland is limited by its small area, but it is clearly significant in a county context.

6.5 Future requirements for survey and conservation

Survey

Any survey of the Greensand Ridge in Bedfordshire should include the Gamlingay area. The Kennet area should probably be included by on-going Breckland surveys.

Conservation

The Greensand Ridge and Breckland areas have a high priority for restoration of grassland from arable and mineral workings.

6.6 References

CROMPTON, G. & WHITEHOUSE, H.L.K. 1983. *A checklist of the flora of Cambridgeshire.* Cambridge: University Printing Services.

GENT, G. & WILSON, R. 1995. *The flora of Northamptonshire and the Soke of Peterborough.* Rothwell: Kettering & District Natural History Society & Northamptonshire Flora Group.

PERRING, F.H., SELL, P.D. & WALTERS, S.M. 1964. *A flora of Cambridgeshire.* Cambridge: Cambridge University Press.

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

County: Cambridgeshire	
Natural Areas:	**All**
Grasses	
Apera interrupta	1
Vulpia ciliata	1
Other Vascular Plants	
Crassula tillaea	0
Filago minima	1
Herniaria glabra	1
Hypochaeris glabra	0
Medicago minima	1
Moenchia erecta	0
Ornithopus perpusillus	1
Potentilla argentea	1
Silene conica	1
Stellaria pallida	1
Teesdalia nudicaulis	0
Thymus serpyllum	0
Trifolium scabrum	1
Trifolium striatum	1
Trifolium subterraneum	1
Vicia lathyroides	1
Total no. of species extant	**13**
Total no. of species extinct	**5**
Total no. of species recorded	**18**

1 = Recent record
0 = Apparently extinct

Cambridgeshire acid grasslands surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1989-90	Calcareous/drift	No sites recorded in the acid soil areas	2	95.2	0.8			
Heathland Inventory		1983-95	Calcareous/drift, Enclosure relic	Tiny relics	4	878.0			0.3	
Estimates, ha		1996	Above	Donna Radley EN				<10		
Estimates, classes		1996						A		

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, ha																						
Estimates, class	A	A	?		A	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,
E = 1,000-5,000 ha
F = 5,000-10,000 ha
G = Greater than 10,000 ha
+ = Present but no area given
? = Possibly present

7. Cheshire

7.1 Physical

Geology

The Cheshire Plain lies predominantly on Keuper Marl but the landscape is dominated by boulder clay and associated sandy glacial deposits. In the far east of the county the Pennine fringes are formed of Coal Measures and Millstone Grit.

Soils

The Cheshire Plain has ground water gley soils dominating over wide areas but with locally brown earths and podzols becoming dominant (**Map 1e**).

7.2 Landscape history

19th Century

The 1 inch OS maps of the 1830's show a scatter of heaths in a largely enclosed landscape.

Current landscapes and Natural Areas

Most of Cheshire is in the Mosses and Meres Natural Area (NA27), a heavily cultivated area with only limited patches of surviving acid grassland. The eastern fringes of the county include several more upland Natural Areas.

7.3 Existing information

Flora

The coincidence maps of the lowland acid grassland species listed in **Table 1** (**Maps 2** to **4**) show a rather limited acid grassland flora throughout Cheshire. Only five species appear to have been recorded from Cheshire in the Mosses and Meres Natural Area (NA27). The relevant data extracted from **Table 6** is given below.

Habitat surveys

The Grassland Inventory records quite a number of unimproved grasslands scattered across the Cheshire Plain and the Pennine fringes. All were in fields and many were in valleys. The Heathland Inventory similarly records a scatter of enclosure relics across the centre and east of the county. The maps in the NVC Volume 3 show that at least one sample quadrat of Festuca-Agrostis-Galium grassland Holcus-Trifolium sub-community (U4d) was recorded from the Cheshire Plain (Rodwell, 1992). Two Phase 2 survey reports have been produced covering the south west of the county.

Cheshire unimproved grassland and hay meadow search 1992-93 (Drage, 1992 & 1993)

This survey recorded several areas of acid grassland associated with neutral grassland and rush pasture, but is rather unclear on the types of acid grassland present. One unidentified stand (Old Castle Pastures, SU469447) appears to be an interesting example of Festuca-Agrostis-Rumex grassland Anthoxanthum-Lotus sub-community (U1d) but U1 is not mentioned in the report. Other stands are described as U4 grassland and appear to be less floristically interesting.

Summary of consultations with Local Team Conservation Officers

The Cheshire Plain has very little unimproved grassland, with intensive dairy production the dominant land use. To the east, acid grassland does occur in the Pennine fringes but is very upland in character and is not considered here.

Most lowland grassland occurs in the south west, often in valley sites where improvement is not easy. Neutral grassland (MG5) dominates but there is some acid grassland. The largest area is Tatton Park (SJ78), a deer park with rather semi-improved acid grassland. There is probably about 50-100ha of acid grassland in the county with U4 probably more frequent than U1. Sandstone ridges support relic heathland and here Deschampsia flexuosa grassland (U2) may occur.

7.4 Summary of resource

Extent and composition

The limited area of lowland acid grassland that occurs is mainly associated with patches of dry sandy soils within unimproved grasslands, and is associated with neutral grassland and fen meadows communities. Some parched acid grassland (U1) occurs but is not particularly floristically rich; U4 and U2 appear more typical of the acid grasslands of the county.

Conservation value

The main interest of acid grasslands in this county appears to be in their association with neutral grasslands rather than any intrinsic importance. The Wych Valley is the most impressive area of this type (Drage, 1992).

7.5 Future requirements for survey and conservation

Survey

There are no priorities for acid grassland surveys but Drage's work in the south west of the county could be followed up with floristic assessments.

Conservation

Stands of acid grassland associated with neutral grassland would appear to be the main priority for conservation.

7.6 References

DRAGE, J. 1992. *South-west Cheshire unimproved grassland and hay meadow search.* Shrewsbury: English Nature.

DRAGE, J. 1993. *West Cheshire unimproved grassland and hay meadow search.* Shrewsbury: English Nature.

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

County: Cheshire	
Natural Areas:	**27 (part)**
Filago minima	1
Hypochaeris glabra	0
Ornithopus perpusillus	1
Potentilla argentea	1
Trifolium striatum	1
Total no. of species extant	4
Total no. of species extinct	1
Total no. of species recorded	5

27 = Mosses and Meres

1 = Recent record
0 = Apparently extinct

Cheshire acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1985-94	Fields, some in valleys	Most in NA27 but also NA28 & NA29	33	360.4	37.9	2.2		
Heathland Inventory		1984-94	Enclosure relics	Scattered across the county, except in the west	44	1550.0			54.9	
Drage (1992 & 93)		1992-93	Fields	Acid grassland recorded but identity not clear	34			c10		
Estimate, classes		1996		Chris Walker, English Nature				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.																						
Drage (92/93)	+				+							+										
Estimate, class	A				A			A				B										

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,
E = 1,000-5,000 ha
F = 5,000-10,000 ha
G = Greater than 10,000 ha
+ = Present but no area given
? = Possibly present

8. Cornwall

8.1 Physical

Geology

The most distinctive features of Cornwall are the granite intrusions that underlie the higher ground and the Lizard, which has an unusual ultra-basic intrusion. Extensive mineralisation is associated with the granite intrusions. The Culm Measure shales extend into the north east of the county whilst the rest of the county is dominated by Lower Devonian sediments.

Soils

The granite outcrops support complexes of upland soils with ironpan stagnopodzols and humic brown podzolic soils. In the highly oceanic conditions found in Cornwall, these occur at much lower levels than are typical of such soils in less oceanic areas. Beyond these areas brown earths dominate, but with brown podzolic soils and brown rankers on valley sides (**Map 1a**).

8.2 Landscape history

19th Century

In the early 19th century large areas of the central 'spine' of Cornwall were still common land under heathland. Since then, beyond West Penwith, The Lizard and Bodmin Moor, where extensive areas of heathland or moorland still survive, most of this common land has been enclosed and improved.

Current landscapes and Natural Areas

Bodmin Moor (NA94), the highest granite outcrop, generally regarded as an upland area, West Penwith (NA96) and the unique Lizard (NA97), are recognised as individual Natural Areas in Cornwall by English Nature. Elsewhere the north east corner is included within the Culm Measures Natural Area (NA93) and the rest included within Cornish Killas and Granite Natural Area (NA95). The latter Area and West Penwith have distinctive landscapes on the granite outcrops. The Culm Measures Natural Area and the Cornish Killas and Granite Nature Area are dominated by improved grassland and suffered a high loss of unimproved grasslands and mires to agricultural improvement this century.

8.3 Existing information

Flora

The coincidence maps of lowland acid grassland species listed in **Table 1** (**Maps 2** to **4**) show a very high concentration of species along the south coast. This flora has declined but significant concentrations still exist. The flora is mostly composed of southern oceanic species and is similar to that of the south Devon coast. On the Lizard, acid grassland forms part of the complex of unique habitats that harbour many rare species, including clovers. The relevant data extracted from **Table 6** is given below.

An interesting RDB species is Toadflax-leaved St John's-wort *Hypericum linariifolium* which occurs at two sites in Cornwall. This plant is found on shallow rocky soils on south facing slopes, mainly on rock outcrops. These are mostly set in Ulex galllii-Agrostis curtisii heaths (H4) but the actual rock outcrops appear to carry U1 type vegetation (McDonnell, 1995)

West Cornwall also had a concentration of ephemeral pond species which appear to have suffered a decline in recent decades (**Maps 5** to **7**).

Habitat surveys

The Grassland Inventory shows that most acid grassland have been recorded during the surveying of wet *Molinia* grassland. The Heathland Inventory is probably more useful for indicating potential dry acid grassland locations by showing the distribution of heathland and heathland relics which are still frequent on the higher ground and on the coast.

Lock (1990) in an assessment of the plant communities on the mid-Cornwall moors, which lie largely between St Austell and Bodmin, reported that less than 25 ha of dry acid grassland occurred. It generally was found as very small patches on drier hummocks amongst wetland plant communities and on freely draining soils on the margins of the moors. Maps in the NVC Volume 3, show that U1e, U1f, U4a, U4b and U4e were sampled from the county (Rodwell, 1992).

Summary of consultations with Local Team Conservation Officers

Most of the acid grassland in Cornwall is found within Bodmin Moor where heavy grazing of heathland has extended its area to some extent. Bodmin Moor is regarded as being of upland character, falling into the social/land use definition of being within a Less Favoured Area and has significant areas above an elevation of 250m.

Beyond Bodmin it is difficult to estimate the area of acid grassland due to the lack of data. The extent of heathland enclosure and near universal improvement within enclosed fields, even within areas of small scale field patterns, means that it is unlikely to be a large area. A conservative estimate is between 100-500ha.

Moist acid grassland (Festuca-Agrostis-Galium grassland, U4) and *Agrostis curtisii* grass heath (U3) are widespread, whilst parched acid grassland is much more scarce, although species-rich stands exist on coastal cliffs. Most inland acid grassland is likely to be associated with heathland habitats.

Little information on the conservation value of acid grassland is available and there is concern that the role of acid grassland within the overall heathland ecosystem has not been adequately assessed.

Most of the plants which are regarded as being of interest on heathlands actually grow in wet and dry grasslands, examples being Heath Lobelia *Lobelia urens* in *Molinia* grassland, *Euphrasia vigursii* in Agrostis curtisii grassland (U3) and the nearly endemic Bladderseed *Physospermum cornubiense* which has a major stronghold on sloping acid grasslands associated with Bracken. In the lowlands the latter species occurs mainly on hedge banks but may once have occurred in lowland acid grasslands before enclosure. It was felt that acid grasslands would also have an important role in the ecology of heathland vertebrates and invertebrates but information is lacking.

One feature on which there is very little information are the steep grassy valley sides which frequently occur in Cornwall. These appear semi-improved with *Festuca-Agrostis* swards, often with Bracken. The conservation value of these in the wider countryside is unclear. Their topography means they are likely to have escaped ploughing or intensive grassland management.

The widespread mineral waste sites and derelict land, such as china clay tips and old railway lines, represent a second incompletely understood conservation resource in Cornwall. Acid grassland may be present in these habitats, which provide suitable conditions for species such as *Filago minima*. Such sites may have a lower plant interest and may have evolutionary and biodiversity value as they can

contain examples of micro-evolution of plant species towards the development of heavy metal tolerance.

Bodmin Moor has problems with inappropriate grazing; the commons are frequently used as winter feed lots, which results in overgrazing. In the lowlands, however, undergrazing or lack of grazing is the more typical problem.

Simon Leach of English Nature is currently surveying the RDB plant *Lotus angustissimus* and has become aware of a species-rich type of the little known NVC community Festuca-Agrostis-Rumex grassland Hypochaeris sub-community (U1f), which occurs in small areas of thin droughty soil on coastal cliff tops. Associated with the *Lotus angustissimus* are species such as *Lotus subbiflorus*, *Trifolium glomeratum*, *Trifolium ornithopodioides*, *Trifolium scabrum*, *Moenchia erecta*, *Erodium maritimum* and *Erodium moschatum*. Quadrat data show there to be little *Festuca rubra* and no *Festuca ovina* and much *Vulpia bromoides*. A constancy table for U1f, based on quadrat data from the survey, is presented in Volume I, Appendix 1, to illustrate the richness of this cliff top acid grassland. The community is best developed from Start Point in Devon to Looe in Cornwall on the south coast, with pockets on the Lizard and Land's End. It is less well-developed on the north coast where south-facing slopes are rare. The coastal habitat where this community occurs is much degraded by the lack of grazing and spread of Gorse, and many stands are reduced to narrow bands along paths.

The Lizard coastal grasslands are unique in Britain and of exceptional importance but for the most part are true maritime grasslands (MC5) and outside the scope of this report.

8.4 Summary of resource

Extent and composition

Lowland acid grassland in Cornwall is a significant component of acid heathland and cliff top habitats. In the case of the latter it has recently been shown to be floristically species-rich with an important flora of southern oceanic affinities. The inland stands are an integral part of heathland ecosystems.

Conservation value

The small patches of coastal acid grassland (U1f) are, along with those in Devon, are amongst the most floristically important acid grasslands in the country. Otherwise acid grasslands in the county are best regarded as an integral and important part of heathland ecosystems. The Agrostis curtisii grasslands (U3) have an intrinsic rarity value in an international context.

8.5 Future requirements for survey and conservation

Survey

The remaining cliff top acid grassland resource requires assessment but otherwise Cornwall's requirements are more for ecological studies of the role of grasslands in heathland biodiversity.

Conservation

The main requirements are for the restoration of sustainable extensive pastoralism to the remaining relics of heathland and cliff top habitats and, where possible, their extension. The more upland stands of U3 are over-grazed, a more structured grassland would probably be of more value.

8.6 References

LOCK, L. 1990. *Analysis of the remaining resource of the mid-Cornwall moors.* Taunton: Nature Conservancy Council, South-West Region.

McDONNELL, E.J. 1995. 'Back from the brink project'. *The status of Toadflax-leaved St John's-wort* (Hypericum linariifolium Vahl) *in Britain 1994.* London: Plantlife Project Report No. 40.

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

County: Cornwall			
Natural Areas:	**95 + 96**	**97**	**113**
Chamaemelum nobile	1	1	1
Crassula tillaea	1		
Erodium maritimum	1	1	1
Filago minima	1		
Hypochaeris glabra	0		
Lotus angustissimus	1	0	
Lotus subbiflorus	1	1	1
Moenchia erecta	1	1	
Ornithopus perpusillus	1	1	1
Sagina subulata	1	1	
Stellaria pallida	1	0	1
Teesdalia nudicaulis	1		
Trifolium glomeratum	1	1	1
Trifolium ornithopodioides	1	1	1
Trifolium scabrum	1	1	1
Trifolium striatum	1	1	1
Trifolium subterraneum	1	1	1
Trifolium suffocatum	1	1	1
Viola lactea	1	1	
Total no. of species extant	**18**	**13**	**11**
Total no. of species extinct	**1**	**2**	**0**
Total no. of species recorded	**19**	**15**	**11**

95 + 96 = Cornish Killas and Granite + West Penwith
97 = The Lizard
113 = Isles of Scilly

1 = Recent record
0 = Apparently extinct

Cornwall acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1986-92	Heath, Enc. relic, Field	Mostly recorded during acid fen meadow surveys	6	331.2	7.3	NI		
Heathland Inventory		1980-85	Heath, Enc. relic, Coastal cliff	Widespread on higher ground and coast	222	17345.0			1900.0	NI
Estimate, classes		1996		Jon Stewart, 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.																						
Estimate, class	A					+	A				C	C	+	+			+					

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
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Area estimates
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F = 5,000-10,000 ha
G = Greater than 10,000 ha
+ = Present but no area given
? = Possibly present

9. Cumbria

9.1 Physical

Geology

The Lake District is composed of lavas, tuffs, shales and slates of Silurian and Ordovician age which form the most mountainous area in England. It is surrounded by Carboniferous sediments including limestone and Triassic Sandstone. The latter underlies the coastal plain and the Eden Valley. The limestones and grits of the Pennines are extensively overlain by blanket bog.

Soils

The high ground in the county has upland soil complexes. In the Lake District, shallow rankers and brown podzols dominate but the less steeply sloping massifs to the east have humic surface-water gleys and blanket bog. In the lowlands there is a prominent area of browns sand and podzols north and east of Penrith, but there are few other areas elsewhere (**Map 1f**).

9.2 Landscape history

19th Century

The 1 inch OS maps of Cumbria were surveyed late and are difficult to read. As far as can be seen, the area of unenclosed land in the lowlands was limited.

Current landscapes and Natural Areas

The Cumbrian Fells and Dales Natural Area (NA10) is the central feature of the county, encompassing both the deeply dissected mountains and valleys of the Lake District and the limestone fringes. A large proportion of this Natural Area is upland or montane in character but lowland conditions exist in the dale bottoms and the fringes of the area. The Area passes into the low lying Natural Areas of the Eden Valley (NA9), West Cumbria Coastal Plain (NA11) and Solway Basin (NA3) which are on softer sediments, mainly sandstones, which in turn, are covered by glacial drift. These areas are fairly intensively farmed, with coastal habitats and mires the most notable semi-natural habitats.

9.3 Existing information

Flora

The coincidence maps of lowland acid grassland species listed in **Table 1** (**Maps 2** to **4**) show a rather limited lowland acid grassland flora in the Lake District. This is mostly characterised by *Teesdalia* , with localised concentrations recorded on the coast and north of Penrith. The coastal concentrations are typical of the increasing restriction of lowland acid grassland species to sand dunes and shingle in the north. The Penrith concentration includes an old record of *Herniaria glabra* and appears to be associated with heaths on brown sands. The post-1970 records suggest a serious decline. The relevant data extracted from **Table 6** is listed below.

Habitat surveys

The Grassland Inventory includes a large number of surveyed grassland sites, virtually all in the Cumbrian Fells and Dales Natural Area (NA10) where many are likely to be upland in character.

The Heathland Inventory indicates some heathland north of Penrith, including Wan Fell (NY5236), where a concentration of lowland acid grassland plant species has been recorded.

Sand dune vegetation surveys (Radley, 1994) indicate the occurrence of areas of parched acid grassland (U1) on the inland side of dune systems on stable leached acid sand, with 29.5ha recorded. *Juncus squarrosus* communities (U6) are also recorded but these are transitional to wet heath. The shingle survey (Sneddon & Randall, 1994) also suggests the presence of grasslands close to, or synonymous with, U1 in shingle sites.

Summary of consultations with Local Team Conservation Officers

The definition given for lowland heath as areas of heath below 250m is too high for defining lowland acid grassland in Cumbria. This limit, let alone the even higher limit of 350m suggested by the brief for this project, would include far too much acid grassland in the upland fringes which is clearly upland in character.

Acid grassland with a lowland character is confined to valley bottoms and to loess on the limestone in the fringes of the Lake District, the Eden Valley and the coastal fringe. A recent full Phase 1 survey of Cumbria produced a total of 110,000ha of upland and lowland unimproved acid grassland for the county. Of this, it is considered that there is about 30,000 to 50,000ha, probably nearer 30,000ha, of acid grassland below 300m, mostly Festuca-Agrostis-Galium grassland (U4), and that truly lowland acid grassland probably covers between 500-1,000ha of this area.

The lowland acid grassland is mainly U4 on enclosed land, but with some Deschampsia flexuosa grassland (U2) associated with heathland on the sandstone in the Eden Valley, and on the coast. Both U4 and U2 also occur on loess over limestone in the south. There are few special features but one exception is the occurrence of the northern orchid *Pseudorchis albida* in U4 grassland at one of its few sites in Cumbria.

One particular feature in the upland fringes are the stands of Festuca-Agrostis-Rumex grassland (U1) that occur on the shallow soils of south-facing outcrops of Silurian slates and shales, which are present in allotments and fields in the south of the Lake District. These stands can be regarded as the upper extent of lowland acid grassland, extending into the uplands in the most favourable conditions, and they have species such as *Aira praecox, Rumex acetosella, Sedum anglicum, Festuca ovina, Galium saxatile* and *Potentilla erecta.* The rare and scarce species typical of similar situations in the Welsh Marches are, however, largely absent with the possible exception of a recent record of Maiden Pink *Dianthus deltoides.* From these descriptions it would appear that the grasslands belong to the Galium-Potentilla sub-community (U1e)

Coastal grasslands in dune systems and shingle structures on the coast also contain some U1 and U4 grasslands and can be of value for lichens.

A number of rare and scarce invertebrates occur on lowland acidic grasslands within the area, in particular on the sandstones in the Eden Valley, on coastal dunes and on loess deposits on limestone around Morecambe Bay. The nationally rare High Brown Fritillary (*Argynnis adippe*) occurs in some Bracken areas in the south of the county.

9.4 Summary of resource

Extent and composition

Lowland acid grasslands are collectively quite extensive with moist acid grassland (U4) dominant but with U1, U2 and U6 grasslands also present. For the most part lowland acid grassland forms a minor

part of neutral grassland, mire, rush pasture, coastal and heathland habitat mosaics and generally has a limited vascular plant interest.

Conservation value

Acid grassland has usually been regarded as a minor habitat associated with habitats of greater interest and has been included within SSSIs where associated with other habitats such as coastal habitats and heathland.

9.5 Future requirements for survey and conservation

Survey

There are no obvious priorities for Phase 2 survey of acid grassland. The Eden Valley heaths appear to have harboured a northern outpost of lowland acid grassland species at one time. The condition of this flora and its conservation needs to be investigated. The fungi flora of U4 in particular may be worth investigating.

Conservation

Conservation requirements are largely for appropriate management of lowland acid grasslands within complexes of other habitats.

9.6 References

RADLEY, G.P. 1994. *National sand dune vegetation survey of Great Britain: a national Inventory. Part 1: England.* Peterborough: Joint Nature Conservation Committee.

SNEDDON P. & RANDALL, R.E. 1994. *Coastal vegetated shingle structures of Great Britain: Appendix 3. Shingle Sites in England.* Peterborough: Joint Nature Conservation Committee.

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

County: Cumbria	
Natural Areas:	**All**
Dianthus deltoides	0
Filago minima	1
Herniaria glabra	1
Moenchia erecta	0
Ornithopus perpusillus	1
Potentilla argentea	1
Silene conica	0
Stellaria pallida	1
Teesdalia nudicaulis	1
Trifolium striatum	1
Vicia lathyroides	1
Total no. of species extant	**8**
Total no. of species extinct	**3**
Total no. of species recorded	**11**

1 = Recent record
0 = Apparently extinct

* Note: Halliday, G. 1997, records *Dianthus deltoides* as present in the county in *A Flora of Cumbria*. Centre for North-West Regional Studies, University of Lancaster.

Cumbria acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1979-90	Field, Out-by, Mire	Virtually all in NA10, mainly upland	51	688.6	52.7	0.3		
Heathland Inventory		1982-91	Heath,Out- by, Mire	Not comprehensive	42	17714.0			100.1	
Sand Dune Survey		1980s	Coastal	U1 & U6 grassland at the back of dune systems				52.8		
Estimates ha		1996	Also rock outcrop	Ian Slater, EN				500-1000		
Estimates classes		1996		Ian Slater, EN				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.																						
Dune Survey	29.5																		23.4			
Estimates ha	100+					100+																+
Estimates class	C					C		C				D							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,
E = 1,000-5,000 ha
F = 5,000-10,000 ha
G = Greater than 10,000 ha
+ = Present but no area given
? = Possibly present

10. Derbyshire

10.1 Physical

Geology

The Peak District in the north east and centre of Derbyshire consists of hills, dales and plateaux of Millstone Grit and Carboniferous Limestone. The lowlands to the east are on Coal Measures with some Magnesium Limestone. To the south New Red Sandstone dominates.

Soils

Areas dominated by dry acid soils in the lowlands are very limited in Derbyshire. The only areas mapped are small patches of brown sands around Derby (**Map 1e**).

10.2 Landscape history

19th Century

The 1 inch OS maps of the 1830's and 1840's show very little unenclosed land in the lowlands.

Current landscapes and Natural Areas

Derbyshire covers a diverse series of landscapes with the predominant upland Natural Areas in the north west and more lowland Natural Areas in the remainder of the county. These comprise the Coal Measures (NA24), Trent Valley and Rises (NA33), The Derbyshire Peak Fringe and Lower Derwent (NA31), the western fringe of the Southern Magnesian Limestone (NA23) and the eastern part of the Needwood and South Derbyshire Claylands (NA40). The lowland Areas have very little heathland or unenclosed land left and enclosed unimproved grassland is scarce. In the uplands, the White Peak (NA30) has extensive and important limestone grasslands that are transitional between the uplands and the lowlands, and which include some acidic grassland.

10.3 Existing information

Flora

The coincidence maps of the lowland acid grassland species listed in **Table 1** (**Maps 2** to **4**) suggest a rather limited lowland acid grassland resource in Derbyshire. At least 9 species have been recorded but there are no obvious concentrations. This is confirmed by the Flora of Derbyshire (Clapham, 1969). The relevant data extracted from **Table 6** is given below.

Habitat surveys

The Grassland Inventory shows many limestone grassland sites in the White Peak, and within these fringing acid grasslands were often recorded. Habitat studies in the Flora of Derbyshire suggest NVC community U4c on the edge of limestone (SK177744) in the White Peak, and U2 in the southern lowlands, at Carver's Rocks (SK332228). All the samples of U4c in the NVC, Volume 3, are in the Derbyshire Dales.

The Heathland Inventory records only small fragments of heathland, mainly to the east. This is confirmed by the Biological Survey of Common Land (Crowther & Aitchison, 1993a) which records a

single lowland, ungrazed, common with acid grassland (Wessington, SK371577). This has *Nardus* and *Deschampsia flexuosa* dominated grassland (U2 & U5).

Summary of consultations with Local Team Conservation Officers

Although acid grassland is widespread in the uplands it is generally rare in enclosed and lowland situations. It was frequently recorded during limestone grassland surveys in the dales of the White Peak (NA30), which is regarded as lowland in character by the Local Team, but it only forms a small part of the grassland resource in this area.

Typically acid grassland occurs as small patches and strips at the top of the dale sides where the drift obscures the limestone. Most dales have fragments, but a large area of grassland has been recorded in the Wardlow Hay Cop area of Cressbrook Dale (SK1773). All this acid grassland is Festuca-Agrostis-Galium grassland (U4) with unimproved examples conforming to the Vaccinium sub-community (U4e) or the *Lathyrus montanus - Stachys betonica* sub-community (U4c). However, semi-improved examples of acid grassland are frequent. These are likely to belong to the Holcus-Trifolium sub-community (U4b). The U4e can grade into dry heath (Calluna-Ulex gallii heath, H8). The Lathyrus-Stachys sub-community (U4c) is recognised as a typically very narrow transition between calcicolous grassland and acid grassland. Longstone Moor SSSI in the White Peak has limestone heath and quite a large area of U5. It may represent the type of grassland which was formerly more widespread in the White Peak plateau.

In the White Peak, small lenses of refractory silica sand have been quarried in the past, leaving hummock terrain with pools and acid sand. These abandoned quarries support Great Crested Newt colonies in the pools and open, bryophyte-dominated, communities with *Polytrichum* species prominent on sand slopes. These cannot be described as typical parched acid grassland (Festuca-Agrostis-Rumex grassland, U1) although they contain many species from this community. They are largely ungrazed and tend to develop into rank grassland (Arrhenatherum grassland, MG1) or Hawthorn scrub.

The open communities are botanically notable for the occurrence of Clubmosses (Stagshorn Clubmoss *Lycopodium clavatum*, Fir Clubmoss *Huperzia selago* and Alpine Clubmoss *Diphasiastrum alpinum*). The best site, Bees Nest & Green Clay Pits SSSI, has all three Clubmosses and sheep grazing has recently been started to maintain open conditions.

Beyond the White Peak lowland acid grassland is very restricted in extent. On the Gritstone only one SSSI, Colshaw Pasture, has been notified for enclosed acid grassland but at 400m, this is decidedly upland with *Alchemilla* species and has some similarity to Anthoxanthum-Geranium sylvaticum grassland (MG3). Acid grassland is extensive in this area but only as a part of upland moorland complexes.

In the Coal Measures (NA24), Moss Valley Meadows SSSI has some acidic grassland but this is transitional between U4 and Cynosurus-Centaurea grassland Danthonia sub-community (MG5c). Coal waste in this area normally carries only transient acid grassland as Birch rapidly colonisies to produce woodland.

In the Derwent Valley there are a few fragments in fields or associated with relic heath. These include Deschampsia flexuosa grassland (U2), Festuca-Agrostis-Galium grassland (U4) and Nardus grassland (U5), including about 1ha of U4 and U5 in the Mercaston Marsh & Muggington Bottoms SSSI (SK272430). This area is notified for wet acid grassland communities (Juncus-Galium rush pasture, M23 and related communities).

10.4 Summary of resource

Extent and composition

Beyond the acid grasslands associated with the dales, the area of acid grassland is very limited, and probably extends only to a few tens of hectares. Even when added to the area in the dales it is likely that there is less than 50ha of acid grassland in lowland Derbyshire. The communities present are probably U4b, U4c and U4e in the dales and U2, U4 and U5 elsewhere.

Conservation value

The acid grassland at the tops of the dales in the White Peak is an integral part of the very important limestone grassland complexes found here, rated as of outstanding importance by Jefferson (1996). As such it is of interest as part of the habitat mosaic here, and the transition between calcicolous and acid grasslands is a valuable part of this mosaic. In other parts of Derbyshire acid grassland is probably best regarded as being of particular value where it is associated with other features of interest, such as neutral grassland, mires and heath.

10.5 Future requirements for survey and conservation

Survey

The area of lowland acid grassland is so limited that there is little point in any specific survey of this habitat. However it is considered that there is a local need for further Phase 2 survey of neutral grassland, and this could include a survey of any acid grassland found.

Conservation

No national priorities apart from maintaining the mosaic of grassland types in the White Peak.

10.6 References

CLAPHAM, A.R. 1969. *Flora of Derbyshire.* Derby: County Borough of Derby Museum & Art Gallery.

CROWTHER, K. A. & AITCHISON, J.W. 1993a. *Biological survey of common land. No 26: Derbyshire.* Peterborough: English Nature

JEFFERSON, R.G. 1996. Lowland grassland in Natural Areas: national assessment of significance. Peterborough: *English Nature Research Reports*, No. 171.

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

County: Derbyshire	
Natural Areas:	**All**
Chamaemelum nobile	0
Dianthus deltoides	1
Filago minima	1
Moenchia erecta	0
Ornithopus perpusillus	1
Potentilla argentea	1
Stellaria pallida	1
Teesdalia nudicaulis	1
Trifolium striatum	1
Total no. of species extant	7
Total no. of species extinct	2
Total no. of species recorded	9

1 = Recent record
0 = Apparently extinct

Derbyshire acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1987-91	Calc/drift, Field, Park, Waste	Most as part of Dales limestone grassland survey	68	2196.6	806.0	5.5		
Heathland Inventory		1983-95	Field, Waste, Enclosure relic	Small fragments, mainly in east	12	73.0			11.8	
Common Land Survey	SK371 577	1993	Common	One ungrazed lowland common, CL47	1	7.2	6.6	2.8		
Estimates, classes		1996		Ian Taylor, EN				A		

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

Key

Column headings
GR = Grid reference if relevant
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F = 5,000-10,000 ha
G = Greater than 10,000 ha
+ = Present but no area given
? = Possibly present