26. Merseyside

26.1 Physical

Geology

Merseyside is mostly on New Red Sandstone, with Coal Measures in the north. Glacial drift and, on the coast, blown sands are important recent deposits.

Soils

The remaining non-urban parts of the county include many areas dominated by podzols and brown sands (**Map 1e**).

26.2 Landscape history

19th Century

In the 1840's Liverpool was already a substantial urban development, but extensive warrens were recorded on the coast to the north west. A few commons existed on the Wirral.

Current landscapes and Natural Areas

The area is included within the Urban Mersey Basin Natural Area (NA26). This is dominated by urban development but significant sand dune systems survive on the Sefton coast.

26.3 Existing information

Flora

The coincidence maps (**Maps 2-4**) of lowland grassland species listed in **Table 1** show concentrations in the coastal dune areas and on the Wirral. These areas contained rich northern out-posts of the lowland acid grassland flora and still have some interest, although seven species have been lost from the Wirral. Provisional lists of lowland acid grassland species are given for both areas in **Table 6** (relevant extract given below).

Habitat surveys

The Heathland Inventory includes areas of dune heath on the coast, enclosure relics and the surviving Thurstone Common on the Wirral, and fragments on industrial wasteland elsewhere. The Grassland Inventory indicates that areas of acid grassland occur on the dune systems and on industrial wasteland.

The national sand dune survey (Radley, 1994) records 10.02ha of *Deschampsia* grass heath (U2a) from the Mersyside dunes. Other reports refer to moist acid grassland (U4a & U4b) (Edmondson & Gateley, 1989, Edmondson, Gateley & Nissenbaum, 1989a & 1989b). However, the presence of species such as *Ornithopus perpusillus*, *Rumex acetosella*, *Aira praecox*, *Polytrichum juniperinum*, *Erodium cicutarium*, *Cladonia* spp, *Aphanes inexspectata* and *Corynephorus canescens* suggest these are parched acid grasslands (U1) rather than moist acid grassland (U4). The quadrat data presented appears to be from either Festuca-Agrostis-Rumex grassland Typical sub-community (U1b) or indeterminate *Festuca-Agrostis* swards. There seems to be no evidence that U4 grasslands exist in this dune system. Target notes suggests that the Anthoxanthum-Lotus sub-community (U1d) also occurs.

Nardus grassland (U5) is also recorded. The 'U4 grasslands' appear to be more widespread than the U2 grasslands, and may extend to twice the area.

Summary of consultations with Local Team Conservation Officers and local experts

There is likely to be 100-500 ha of acid grassland in Merseyside, on dunes, soils over sandstone and a little on drained peat. U1 and U2 occur on the dunes while U4 is found on derelict land. Colonisation of derelict land usually proceeds towards acid grassland rather than neutral grassland because of the acidity of the substrates. County Parks, including Sefton Country Park, have managed areas of acid grassland. (P. Gateley, C. Bennett, pers. comms. 1998). Small areas of grassland (<50 ha) occur on heathlands and golf courses on the Wirral (Dr. H. Ash, pers. comm. 1998).

26.4 Summary of resource

Extent and composition

Acid grassland in the county includes interesting transitions from parched acid grassland (U1) to dune communities, along with areas of Deschampsia flexuosa grassland (U2) and Nardus-Galium grassland (U5), and some moist acid grassland (U4).

Conservation value

The important dunes of the Sefton coast appear to contain northerly examples of parched acid grassland, with a typical flora, among the general mosaic of dune habitats.

26.5 Future requirements for survey and conservation

Survey

No high survey priorities but it would be useful to clarify the character of the dune grasslands.

Conservation

The extensive dune ecosystem of the Sefton coast, in which the acid grasslands are a minor component, is a priority site for conservation action and much management work has already been carried out there.

26.6 References

EDMONDSON, S.E. & GATELEY, P.S. 1989. *National sand dune vegetation survey Sefton Coast, Division 5.* Peterborough: Nature Conservancy Council.

EDMONDSON, S.E., GATELEY, P.S. & NISSENBAUM, D.A. 1989a. *National sand dune vegetation survey Sefton Coast, Division 4.* Peterborough: Nature Conservancy Council.

EDMONDSON, S.E., GATELEY, P.S. & NISSENBAUM, D.A. 1989b. *National sand dune vegetation survey Sefton Coast, Division 8.* Peterborough: Nature Conservancy Council.

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

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

County: Merseyside		
Natural Areas:	**26a**	**26b**
Corynephorus canescens	1	
Other Vascular Plants		
Dianthus deltoides		0
Filago minima	1	1
Hypochaeris glabra	0	
Moenchia erecta	0	0
Ornithopus perpusillus	1	1
Sagina subulata		0
Stellaria pallida	1	1
Teesdalia nudicaulis	1	0
Trifolium ornithopodioides		1
Trifolium striatum	0	1
Trifolium subterraneum		0
Vicia lathyroides	1	0
Total no. of species extant	**6**	**5**
Total no. of species extinct	**3**	**6**
Total no. of species recorded	**9**	**11**

26a = The Sefton Coast)
26b = The Wirral) Urban Mersey Basin Natural Area

1 = Recent record
0 = Apparently extinct

Merseyside acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1983-94	Sand dunes, Waste	Mainly inland of dune systems & on industrial sites	28	368.4	3.0	3.0		
Estimates, classes		1998		C. Bennett, P. Gateley				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.																						
Estimates, class	A		A		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

27. Norfolk

27.1 Physical

Geology

The solid geology of Norfolk consists of Pleistocene Crag deposits over Tertiary deposits to the east, Chalk under most of the west of the county and a band of Lower Cretaceous rock to the west of the Chalk, including Lower Greensand. Most of these deposits are, however, obscured by drift deposits of glacial or fluvial glacial origin, including wind blown sand in the Breckland area. Other areas of sand and gravel deposits occur, including areas of terminal moraine along the coast and north of Norwich. There are also acidic coastal deposits.

Soils

Much of Norfolk is dominated by brown earths but brown sands are locally dominant in Breckland. Less extensive areas dominated by brown sands, together with some podzolic soils, are found on the Lower Greensand, an area north of Norwich, and along the north coast (**Map 1d**). In Breckland, complex mixtures of acidic soils are characteristic, reflecting the depth of the sand deposits over the underlying Chalk. These mixtures can occur as small stripes and in polygonal patterns, which are the fossilised remains of periglacial processes. Blown sand and sand dunes have historically made an important contribution to the ecology of the area. Acidic drained peats in the Broads have resulted from oxidization of previously pyritic-rich peats.

27.2 Landscape history

19th Century

The 1820 and 1830 1 inch OS maps show extensive rabbit warrens and rough grazings in Breckland. Beyond this area straight roads and many names relating to heathland indicate extensive recent enclosure across the rest of Norfolk. However, large unenclosed areas still existed on the Greensand and a scatter of commons survived elsewhere, mostly on areas of acid soil.

In Breckland, large areas survived into the 20th century with the area of grass heath in 1900 nearly double that of 1824. It should be remembered that intermittent recolonisation of arable by grass heath has been much more of a integral feature of Breckland than other heathlands in the country. In the 1930's 34% of the then existing heath was 'new' heath. Since that time there have been large-scale losses to agriculture and forestry (Lambley, 1994c).

Current landscapes and Natural Areas

English Nature picks out the Breckland Natural Area (NA46) and divides the rest into the East Anglian Plain (NA50) and the Broads (NA48), where there are some areas of brown sand, North Norfolk (NA47) which includes the Lower Greensand and areas of glacial sands and gravels, and the fringe of the Fens (NA 37).

27.3 Existing information

Flora

The coincidence maps (**Maps 2-4**) of lowland acid grassland species listed in **Table 1** show very high concentrations in Breckland, the Greensand heaths, the north coast and areas to the north and south of

Norwich. A decline is evident from inspection of the recent records throughout the county. In some inland areas, the losses have been very severe.

The flora of Breckland was covered by Trist (1979) and the flora of the whole of Norfolk by Petch & Swann (1968). The flora was analysed according to the following units, and species from **Table 1** were listed in **Table 6** in these units (extract below).

- Breckland Natural Area (NA46). The whole of the Natural Area, including Suffolk, was used, with no distinction between the two counties.
- North Norfolk and areas of NA50 to the south of Norwich.
- The river corridor along the River Waveney in both Suffolk and Norfolk in the East Anglian Plain (NA50) and the Broads (NA48) Natural Areas.

Breckland (all of NA46) is famed for its exceptionally rich grass heath flora, including species characteristic of dry acidic and base-rich soils, as well as sand dunes. It is the richest area in Britain for lowland acid grassland species with 24 species of the 33 species in **Table 1** extant and two apparently extinct. Many other species are present and include large populations of *Carex arenaria*, rare species such as *Silene otites* and many more widespread species. Trist (1979) and data on lower plant distibutions indicate that about 64 species listed on both **Tables 2** and **3** occur in Breckland in general, probably the highest total in Britain. *Holosteum umbellatum* has long been extinct and many surviving species are in a precarious situation, eg *Scleranthus perennis prostratus*. There are rich *Cladonia* communities in the acid grasslands but the lichen flora of the calcicolous grass heaths are much richer in rare lichen species. The bryophyte flora of the acid grasslands is not very distinctive and the fungi flora is unknown (Lambley, 1994a).

Along with the terraces along the Waveney described in the Suffolk section below, rich floras have been recorded from all the acid soil areas in Norfolk. However, extinctions have been widespread, and squares such as TG20 appear to have lost nearly all their species. Within Breckland, concentrations of species characteristic of disturbed acid sandy soils (**Maps 8-10**) still survive but these species are now rare beyond this area.

Fauna

Breckland harbours an important bird fauna including 10% of British Nightjars, 30% of British Woodlarks and over 50% of British Stone Curlews. It is one of the few areas where grass heaths are still sufficiently extensive to support Stone Curlew and although this species is increasingly using arable fields in which to nest, positive management of grass heath is resulting in a gradual return to this habitat.

Other species such as Woodlark and Nightjar depend more on the ephemeral appearance of acid grassland habitat types within clear felled conifer plantations rather than on grass heath, from which they are nearly extinct, although Woodlark has recently expanded back on to the grass heaths.

Wheatear is increasingly scarce, whilst Stonechat and Whinchat numbers are extremely low. Ring Plover, abundant in rabbit warrens in the 19th century, is now confined to arable fields and gravel pits. Montagu and Hen Harriers were lost by the middle of this century. However, a positive feature is the colonisation of grass heaths by Curlew, which utilise longer grass than Stone Curlew and other species (Gibbons *et al*, 1993 & Dolman, 1994).

The long term conservation of most species is thought to require the restoration of heavier grazing and greater physical disturbance. It is worth noting that many of these species (Woodlark, Nightjar, Ring

Plover, Wheatear, Stonechat and Whinchat) currently have larger populations on acid grasslands in the New Forest than they do in Breckland (see Hampshire section).

The importance and status of the invertebrates of Breckland is summarised in Ecological Change in Breckland (Hagget, 1994, Duffey, 1994 & Lambley, 1994b). Numerous RDB (160) and Notable (154) species are recorded from Breckland habitats, including grass heaths, fen, pingo pools and ruderal communities. The grass heath represents an important habitat with 34.2% of the RDB species recorded from it.

Interestingly the taller Heather stands which have appeared since myxomatosis reduced rabbit populations have no particular spiders of interest. This is in contrast to the rich spider fauna of the grass heaths. For groups which there is sufficient data, such as the moths and butterflies, there is firm evidence to indicate the decline and extinction of many species of disturbed grass heath or early succession communities.

Habitat surveys

The Grassland Inventory records large areas of acid grassland and calcicolous and acid grassland mosaics in Breckland and many small to medium patches elsewhere, mostly in North Norfolk, but with some also occurring in the East Anglian Plain and the border of the Broads. The Heathland Inventory indicates relatively large areas of heath in Breckland, on the Greensand, the area north of Norwich and on the north coast, as well as small fragments in other areas. The majority of the sites recorded on both Inventories are either commons or the relics of large scale enclosure of commons, warrens or rough grazings.

Norfolk grassland survey (Roberts & Smyth, 1990)

The Norfolk grassland survey was a systematic survey of non-SSSI, unimproved grasslands, in the county. It covered mainly neutral grasslands but sites with acid grasslands were also surveyed. Seventeen of these had a total of 61.22ha of parched acid grassland (U1) and two totalled 4ha of *Deschampsia flexuosa* grassheath (U2); the U1 sub-communities were not identified and the floristics were not discussed. An approximation of the areas of acid grasslands was given for the SSSIs, with 792.9ha of U1, 333.4ha of U2 in west Norfolk and 43.8ha of U2 for east Norfolk.

The Stanford Training area in Breckland was described as accounting for nearly 690ha of the U1, and in east Norfolk, Buxton Heath held 20.1ha of the U1 community. Bridgham and Brettenham Heaths in Breckland supported 312.2ha of U2. Inland, *Carex arenaria* communities (SD10 & 11?) were recorded as covering 100.6ha, of which 91.9ha occurred in the Stanford Training area.

Other than the above survey, the national sand dune vegetation survey recorded 7.3ha of U2 from Winterton to Horsey Dunes (Radley, 1994) and Norfolk was given as an area of important coastal stands of Carex arenaria-Cornicularia dune (SD11), the dune equivalent of lichen-rich parched acid grassland (U1a).

As far as can be judged from the national shingle survey, most of the stable shingle grassland in Norfolk is referable to MC5. However, at Snettisham Spit, parched acid grassland is clearly widespread, and to a greater extent than is indicated by the NVC synonymies of the survey (Sneddon & Randall, 1994).

Summary of consultations with Local Team Conservation Officers and personal observations

The extent of acid grassland in Norfolk is estimated as between 1,000-5,000 hectares. As well as the 1235.0ha identified in Roberts & Smyth (1990) there is probably about 50ha in Thetford forest and

possibly up to 500ha in MOD land outside of SSSIs. Up to 200-300ha has also been reported in the Broadlands area.

Parched acid grassland (U1) is the dominant type present but there have been no surveys to identify sub-communities. The largest area by far is in the Breckland with patches in north Norfolk and limited areas elsewhere. Breckland is notable for its small scale mosaics of acid grassland with calcicolous grassland and sand dune communities. Chalk grassland surveys indicate that the Festuca-Agrostis-Rumex grassland Erodium-Teesdalia sub-community (U1c) may still survive in the Stanford Training Area.

The mix of communities in the Norfolk Breckland likely to be similar to that of Suffolk with Deschampsia flexuosa grassland (U2a) largely an artefact of neglect and the decline of rabbit grazing; grazing seems to convert it to Festuca-Agrostis-Rumex grassland Galium-Potentilla sub-community (U1e).

In the Greensand area little appears to survive, but EPR is aware of an area where grazing has been restored under Countryside Stewardship to the east of Roydon Common, where an interesting grassland mosaic occurs. Rich *Junco-Molinion* Communities (M23) on wet ground dominate but drier sandy mounds support a zone of *Nardo-Galion* vegetation dominated by *Nardus* . These represent the only few good examples of *Nardus-Galium Grassland* (U5) seen by the author in southern England. The drier parts of the mounds were dominated by *Thero-Airion* parched acid grassland (U1e).

The ecological condition of Breckland grass heaths is recovering under the ESA scheme, with sheep grazing occurring on most sites. Only two SSSIs are ungrazed whilst one is mown. Heathland restoration is under way in Breckland, the Greensand area and north Norfolk.

The Natural Area profile for the Broads Natural Area describes acid grassland (U1) of high botanical interest as present in the Broads in the Upper Thurne area, particularly around the Calthorpe Broad (Holve, 1996). There is also mention of valley side heathlands which must have once had U1 grasslands, but which are now largely lost, although restoration is proposed.

27.4 Summary of Resource

Extent and composition

The acid grassland resource is concentrated in Breckland but with floristically significant patches elsewhere. The composition has not been studied recently in terms of the NVC, but overall is similar to that of Suffolk, with the exception of the U1c that may have survived in the Stanford Training Area.

Breckland has a rich invertebrate fauna and is, with the New Forest, the only area with a surviving lowland acid grassland bird fauna of significance.

Conservation value

Breckland is the premier area for lowland acid grassland in England, and the heathland habitat mosaic of which it is part is clearly of international importance. Its condition has, however, given serious cause for concern and many of the distinctive species are severely reduced (Lambley, 1994c). Lack of heavy grazing by both stock and rabbits is a major cause of this decline, but the legacy of past fragmentation is probably also significant. The fact that with the exception of Stone Curlew, the acid grassland bird fauna is faring much better in the New Forest than in Breckland may be related to these factors. The areas in the county beyond Breckland are still important but not to the same level as Breckland itself.

27.5 Future requirements for survey and conservation

Survey

There is an urgent need for detailed Phase 2 surveys of remaining unsurveyed acid grassland areas in Norfolk. These surveys are valuable for monitoring purposes as well as to establish the composition of the resource, and would complement the Phase 2 surveys of Suffolk that have been carried out for these purposes.

Conservation

The restoration work that is possible under the ESA and Countryside Stewardship schemes needs to be carried out in both the Breckland part of Norfolk and the rest of the county. Green (1995) has produced a report for EN which sets out a heathland re-creation plan for Breckland. The long term future of the habitats and species of Breckland probably depends on a substantial reduction in the fragmentation of grass heaths through the reversion of arable and forestry land back to heathland. The acidic grassland areas in the Broads ESA need to be recognised within the objectives of restoration schemes.

27.6 References

DOLMAN, P. 1994. Changes in the populations of typical Breckland bird species. *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, pp. 85-96. Norwich: English Nature.

DUFFEY, E. 1994 Araneae (Spiders). *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, p. 105. Norwich: English Nature.

GIBBONS, D.W., RIED, J.B. & CHAPMAN R.A. 1993. *The new atlas of breeding birds in Britain and Ireland 1988-1991*. London: Poyser.

GREEN, J. 1995. *A heathland re-creation plan for Breckland.* A report for English Nature.

HAGGETT, G. 1994. Lepidoptera. *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, pp. 99-103. Norwich: English Nature.

HOLVE, H. 1996. *Broads Natural Area Profile*. Norwich: English Nature & Broads Authority.

LAMBLEY, P.W. 1994a. Non-vascular plants. *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, pp. 75-79. Norwich: English Nature.

LAMBLEY, P.W. 1994b Other invertebrate groups. *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, pp. 107-110. Norwich: English Nature.

LAMBLEY, P.W. 1994c. Breckland habitats. *In*: P.W. LAMBLEY, ed. *Ecological change in Breckland*, pp. 19-33. Norwich: English Nature.

LAMBLEY, P.W. (ed.) 1994d. *Ecological change in Breckland.* Norwich: English Nature.

PETCH, C.P. & SWANN, E.L. 1968. *Flora of Norfolk.* Norwich: Jarrold & Sons.

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

ROBERTS, N. & SMYTH, W. 1990. *Norfolk grassland survey 1987-1988.* Norwich: English Nature.

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

TRIST, P.J.O. 1979. *An ecological flora of Breckland.* East Ardsley: EP Publishing Limited.

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

County: East Anglia (Norfolk)			
Natural Areas:	**46**	**47/50**	**48/50**
Grasses			
Apera interrupta	1	1	0
Corynephorus canescens	1		0
Festuca longifolia	1		
Vulpia ciliata ambigua	1	1	1
Other Vascular Plants			
Chamaemelum nobile	0	0	0
Crassula tillaea	1	1	1
Dianthus deltoides	1	0	
Filago minima	1	1	1
Herniaria glabra	1	0	
Hypochaeris glabra	1	1	1
Medicago minima	1	1	0
Moenchia erecta	0	0	1
Ornithopus perpusillus	1	1	1
Potentilla argentea	1	1	1
Sagina subulata		0	
Scleranthus perennis	1	0	
Silene conica	1	1	1
Stellaria pallida	1	1	1
Teesdalia nudicaulis	1	1	1
Thymus serpyllum	1		
Trifolium glomeratum	1	0	1
Trifolium ornithopodioides			1
Trifolium scabrum	1	1	1
Trifolium striatum	1	1	1
Trifolium subterraneum	1	1	
Trifolium suffocatum	1		1
Veronica verna	1		
Vicia lathyroides	1	1	1
Total no. of species extant	**24**	**15**	**16**
Total no. of species extinct	**2**	**7**	**4**
Total no. of species recorded	**26**	**22**	**20**

46 = Breckland (includes Suffolk)
47/50 = North Norfolk
48/50 = The Broads and East Anglia Plain - River Waveney area (includes Suffolk)

1 = Recent record
0 = Apparently extinct

Norfolk acid grassland surveys

Survey	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1984-92	Grass heath, Heath, Enc. relic, Field	Large areas in NA46+many smaller areas in NA47	37	6424.3	605.7	68.8		
Heathland Inventory		1982-93	Grass heath, Heath, Enc. relic	In the 4 main areas of brown sands/podzols	70	8820.0			505.4	33.3
Grassland Survey		1990		Includes estimates of area in SSSIs+sites surveyed				1235.0		
Estimates, classes		1996		Claire Warnsbury, English Nature				E		

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.																						
Grassl'd Survey	897.6							337.4												100.6		
Estimates, class	E	+	+	+	+	+		C	C									A		B	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

28. Northamptonshire

28.1 Physical

Geology

Northamptonshire extends entirely over Lower and Middle Jurassic rocks from the Lower Lias to the Oxford Clay. Most of the rocks are clays and limestones but the Northampton Sand Formation, which includes ironstone and sandy limestone also occurs. Locally, glacial and river sands and gravels also exist.

Soils

None of the areas of acid soils are large enough to be recorded by the soil map, but the Northampton Sand Formation gives rise to localised brown sands (Gent & Wilson, 1995).

28.2 Landscape history

19th Century

The 1830 1 inch OS map shows few unenclosed areas with Harlestone and Dallington Heaths already planted with trees.

Current landscapes and Natural Areas

Among the Natural Areas that make up the county, the Midlands Clay Pastures (No. 44) has unimproved acid grassland, which occurs in individual fields, within golf courses and in some areas of coniferised heathland.

28.3 Existing information

Flora

The coincidence maps (**Maps 2-4**) of lowland acid grassland species listed in **Table 1** show that a slight concentration existed to the south west of Northampton, mainly on the Northampton Sand Formation. The distribution of *Deschampsia flexuosa* reflects this (Gent & Wilson, 1995). The recent flora of Northamptonshire (Gent & Wilson, 1995) provides a detailed account; a total of eight acid grassland species have been recorded from the area but five are now apparently extinct. The extinct species include an old record of the now threatened Red Data Book species *Scleranthus perennis*. The best site for this species was Harlestone Firs (SP714640), once part of Harlestone and Dallington Heaths, but long enclosed and planted with conifers. The rides still have rare *Ornithopus perpusillus*, *Trifolium striatum* and *Spergularia rubra* but *Moenchia erecta* is apparently extinct. Billings Lings (SP800635) was also once the home of many sand-loving plants but is now a conifer plantation.

Habitat surveys

The Grassland Inventory records 12 sites with acid grassland, most within the south-western part of the county. The largest site recorded is the Harlestone Golf Course but the area of grassland here is not given. The Heathland Inventory only records the remains of Harlestone Heath.

Acid grassland at Coombe Hollow (SP679838) is close to Festuca-Agrostis-Galium grassland Holcus-Trifolium sub-community (U4b) but lacks *Festuca ovina* and has much *Trisetum flavescens* while

individual quadrats have strong tendencies to MG5c and U1c (Max Coleman, pers. comm. 1996). Significantly the site is on an acid clay soil derived from Middle Lias Clay rather than being on a sandy soil.

Summary of consultations with Local Team Conservation Officers

There are a total of 8ha of acid grassland in SSSIs. County Wildlife Sites known to include areas of acid grassland cover a total area of 54.6ha but the area of acid grassland within them is smaller than this total. NVC data does not exist for most sites but parched acid grassland (U1) has been identified from High Wood and Meadow and moist acid grassland (U4) from Coombe Hill Hollow. It is thought that U1 will dominate on most sites which are on the Northampton Sand Formation, and U4 may be confined to one site on the Lias. Problems have been experienced in finding a grazier for High Wood and Meadow SSSI.

Outside the SSSIs, golf courses are of major importance for supporting acid grassland, at least in terms of area. Recent conifer felling at Harlestone Firs has resulted in the reappearance of acid grassland and heath species, most notably *Ulex minor*, not recorded in the county for over 100 years. The future of the cleared areas is not, however, secure.

28.4 Summary of resource

Extent and composition

Northamptonshire has very little surviving acid grassland and has suffered a high level of extinctions of characteristic acid grassland species. U1 probably is the most extensive type and there is a small area of U4.

Conservation value

The surviving U1 and U4 grasslands are probably critical to the biodiversity of the county. The occurrence of a small area of U4 on acid clay soil is a curiosity of some intrinsic interest.

28.5 Future requirements for survey and conservation

Survey

Further Phase 2 surveys would be useful but are not a high national priority.

Conservation

Restoration of a large area of heathland at Harlestone Heath would be the most efficient method of conserving species-rich acid grassland.

28.6 References

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

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

County: Northamptonshire	
Natural Areas:	**All**
Filago minima	0
Hypochaeris glabra	0
Moenchia erecta	0
Ornithopus perpusillus	1
Scleranthus perennis	0
Stellaria pallida	1
Trifolium striatum	1
Total no. of species extant	**3**
Total no. of species extinct	**4**
Total no. of species recorded	**7**

1 = Recent record
0 = Apparently extinct

Northamptonshire acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1980-93	Field, Waste, Enclosure relic	Mostly near and south west of Northampton	12	323.8	149.3	50.3		
Heathland Inventory		1992-93	Enclosure relic	Mainly the remains of Harlestone Heath	3	3.5			1.0	
Coombe Hollow	SP679838	1979-96	Field	Note by Max Coleman, EN. Field with U4b	1	4.4		3.0		
Estimates, classes		1996		Max Coleman English Nature				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.																						
Coombe Hollow												3.0		3.0								
Estimates, class	A							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

29. North East England (Cleveland, Durham, Northumberland, Tyne & Wear)

29.1 Physical

Geology

The south east of the area has Jurassic, Triassic and Permian rocks, including Magnesian Limestone, with Coal Measures dominating the central part of the east coast. The rest of the area lies largely on older Carboniferous rocks including limestones and sandstones. A significant feature in the north and west of the area is the Whin Sill which produce distinctive craggy outcrops. Glacial till overlies much of the area.

Soils

The lowlands of the north east are dominated by surface water gleys, with only a few patches dominated by podzols and brown sands (**Map 1f**). The largest areas of the Whin Sill, which outcrops along Hadrian's Wall, are dominated by humic rankers.

29.2 Landscape history

19th Century

The 1860's 1 inch OS maps show a thoroughly enclosed lowland landscape with little heathland.

Current landscapes and Natural Areas

The north east of England is dominated by two predominantly upland Natural Areas, the Border Uplands Natural Area (NA2) and the North Pennines Natural Area (NA4). A small part of the upland North York Moors and Hills Natural Area (NA17) is also included.

The lowlands are divided into four Natural Areas; the North Northumberland Coastal Plain Natural Area (NA1) which covers the fairly narrow coastal plain to the east of NA2, the large Northumbria Coal Measures Natural Area (NA5), the Durham Magnesium Limestone Natural Area (NA6) and the Tees Lowlands Natural Area (NA7).

29.3 Existing information

Flora

Large areas of the north east are devoid of the lowland acid grassland species listed in **Table 1**, but there are local concentrations of these species, especially in the Border Uplands and Northumberland Coastal Plain Natural Areas (**Map 2** to **4**). These concentrations at least partly correlate with outcrops of the Whin Sill. Declines are apparent from inspection of recent records. The species recorded from Natural Areas 1 and 2 are listed in **Table 6** and the relevant extract is given below.

Habitat surveys

The Grassland Inventories include few records of acid grasslands for Cleveland and Tyne & Wear, and all but three of the acid grasslands noted in Durham are in upland areas in the west of the county. Only Northumberland has significant records of lowland acid grassland, with the distinctive Whin Sill

grasslands being recorded as small patches across the Border Uplands and the Northumberland Coastal Plain.

There have been several surveys of the Whin Sill grasslands. The only survey to utilise the NVC is Dalby (1991). This examined 8 of the 97 site visited by previous surveys. The grassland of greatest interest grows on shallow rankers developed over shelves or ledges of whin stone. The acidity is very variable with acidic and base rich grassland being found in close proximity. The acid stands are clearly referable to Festuca-Agrostis-Rumex grassland (U1). Affinities to the Erodium-Teesdalia sub-community (U1c) and to the lichen-rich sub-community (U1a) are suggested, but from the data given most stands would be more comfortably classified as the Typical sub-community (U1b) with tendencies to U1c. On more base rich areas, the U1 passes into communities related to Festuca-Hieracium-Thymus grassland (CG7) and on coastal cliffs into Festuca-Armeria maritime community (MC8). Distinctive species include *Allium schoenoprasum, Dianthus deltoides, Astragalus danicus, Moenchia erecta, Alchemilia gracilis* (RDB species), *Trifolium arvensis, Trifolium scabrum, Trifolium striatum, Myosotis ramosissima, Sagina subulata, Scleranthus annuus, Sedum villosum* and *Vulpia bromoides.*

Summary of consultations with Local Team Conservation Officers

Other than the presence of parched acid grassland in a few favourable situations in the lowlands, there is little difference in composition between the acid grasslands of the lowlands and the uplands. In the north east, lowland acid grassland is taken as grassland in the lowlands beyond the hills. A Phase 1 survey was carried out for Durham in 1995 and an extrapolation from this suggests that there is less than 300ha of lowland acid grassland in the north east as a whole. Moist acid grassland (U4) occupies about 75% of this area and is not much different from upland acid grassland, except that it is more fragmented. Most of the rest is parched acid grassland (U1). Deschampsia flexuosa grassland (U2) is probably only abundant at a single site. The grassland is fragmented with about 70-75% on the Coal Measures, 10% on the Northumberland Coastal Plain, less than 5% on the Magnesian Limestone and 10% in the Border Uplands. On the Coal Measures, acid grassland is associated with the more acid sandstones and often occurs with heathland. A few areas of acid grassland occur on drift over the Magnesian Limestone.

The Whin Sill grasslands are much more distinctive than the above grasslands, with a range of communities that are not well described by the NVC, but which include U1 and a rich and important flora. The Whin Sill sites include a mix of grazed and ungrazed sites. Grazing is essential if the full interest of the habitat is to be retained. Sheep grazing has been restored to some sites on nature reserves but there have been some problems with sheep over-grazing ledges.

Mining waste and derelict land frequently results from modern open-cast mining and former deep-mining. The restoration of heathland on this land is encouraged. There is often little grassland of interest on older waste sites.

29.4 Summary of resource

Extent and composition

Lowland acid grasslands are not extensive in the north east of England, and beyond the Whin Sill is of limited floristic diversity. The Whin Sill grasslands are of necessity, restricted by their specialised habitat, but are much more floristically diverse.

Conservation value

The Whin Sill grasslands are of great conservation value as northern outposts of southern acid grassland communities. The rest of the acid grasslands are of lower botanical interest except for the

association of small areas of acid grasslands with some of the few surviving Magnesian Limestone grasslands. These acidic patches set the much reduced, but still important, calcicolous grasslands of the Magnesian Limestone in their ecological context.

29.5 Future requirements for survey and conservation

Survey

Although there has been much survey work on the Whin Sill there is a lack of detailed Phase 2 recording at an appropriate scale and of sufficient detail to be of value in assessing the national significance of sites and for monitoring purposes. This is felt to be a serious problem by the EN Local Team given the importance of the Whin Sill. Also, if the NVC affinities of the Whin Sill vegetation and its conservation value are to be fully determined, more intensive sampling is required than was carried out by Dalby (1991) and it should extend to non-SSSI sites. The interest of the saxcicolous bryophytes and lichens on the Whin Sill are not known and a small sample survey of sites would be worthwhile.

Conservation

Current conservation work on the Whin Sill should continue and could be extended to include reintroductions of species which have been lost from some sites.

29.6 References

DALBY, G. 1991. *Botanical survey of selected Whin grassland sites within Northumberland.* Newcastle: English Nature.

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

County: North East England	
Natural Areas:	**1 + 2**
Dianthus deltoides	1
Filago minima	1
Moenchia erecta	1
Ornithopus perpusillus	1
Potentilla argentea	1
Sagina subulata	1
Stellaria pallida	1
Teesdalia nudicaulis	1
Trifolium scabrum	1
Trifolium striatum	1
Vicia lathyroides	1
Total no. of species extant	**11**
Total no. of species extinct	**0**
Total no. of species recorded	**11**

1 + 2 = North Northumberland Coastal Plain & Border Uplands Natural Areas

1 = Recent record
0 = Apparently extinct

North East England acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventories:										
Cleveland		1991	Field, enclosure relic	Tiny areas recorded	3	4.6	3.3	3.0		
Durham		1984-87	Field, Drift/calcicolous	All but 3 in NA 5 & 6 are upland grasslands	26	14169.9	53.3	2.8		
Northumberland		1981-92	Mainly Rock on Win Sill outcrops	Mainly NA 2 & 4 on Whin Sill	70	749.4	37.5	0.9		
Tyne & Wear		1986-90	Field	A few sites in NA5	4	94.4	NI	NI		
Heathland Inventories:										
Cleveland				No data						
Durham		1991-4	Enclosure relic	Mainly upland fringe sites in NA5	45	1157.0			99.1	
Northumberland		NI	Enclosure relic, Coast and Rock	Scatter of sites	13	4184.0			31.0	
Tyne & Wear		1985-93	Woods and Fields?	Small fragments	7	174.0			2.4	
Estimates, ha		1996		Stuart Hedley, English Nature				<300		
Estimates, classes		1996		Stuart Hedley, 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:																						
Cleveland																						
Durham																						
Northumberl'd																						
Tyne & Wear																						
Heathland Inv:																						
Cleveland																						
Durham																						
Northumberl'd																						
Tyne & Wear																						
Estimates, ha	c75							+					c225									
Estimates, class	B	?	+	?				A				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
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

30. North Yorkshire

30.1 Physical

Geology

The hills of the Pennines to the west of the county are formed of Millstone Grit and Carboniferous Limestone. The Magnesian Limestone forms a band along the eastern edge of the Pennines, with Triassic and Permian sandstones and mudstones underlying the Vale of York. To the north east, the low Chalk hills of the Wolds are just included, with a narrow band of Lower Cretaceous deposits outcropping on their northern edge. The Vale of Pickering is on Jurassic clays and the North Yorkshire Moors are formed of Jurassic deposits. Glacial drift, including sands, are prominent, especially in the Vale of York.

Soils

In the Pennines and the North York Moors, all areas except for the valley bottoms are dominated by upland complexes of soils. The lowlands of the county are dominated by surface water and ground water gleys but there are localised areas that are dominated by drier acid soils. Areas dominated by podzols and brown sands are present in the Vale of York and a strip of brown sands exists along the southern edge of the Vale of Pickering (**Map 1e**).

30.2 Landscape history

19th Century

The 1850's 1 inch OS map shows a largely enclosed lowland landscape. However, in the southern part of the Vale of York, a few large areas of heathland remained at Skipwith Common and Strensall Common.

Current landscapes and Natural Areas

The lowlands are flanked to the west and east by the Yorkshire Dales and North York Moors Natural Areas (NA8 & NA17) and the Pennine Dales Fringe (NA15). The limestone and chalk are split off as the Southern Magnesian Limestone and the Yorkshire Wolds Natural Areas (NA23 & NA19 respectively), leaving the rest of the county in Vale of York and Mowbray Natural Area (NA16), the Vale of Pickering Natural Area (NA18) and part of the Humberhead Levels Natural Area (NA22). Of all these Areas, the latter three are alone in having soils recorded which have the potential to support lowland acid grassland.

30.3 Existing information

Flora

The coincidence maps (**Maps 2-4**) of lowland acid grassland species listed in **Table 1** show concentrations on the acid soils of both the Vales of York and Pickering, but few post-1970 records exist. A list of Table 1 species for Natural Areas NA16, 18 and part of NA22, including the former Humberside, is given in **Table 6** and the relevant data is extracted below.

Habitat surveys

The Grassland Inventory includes many acid grasslands recorded in the upland Natural Areas (NA8 & 17) and some in the Wolds (NA19), all areas for which there are no characteristic lowland acid grassland species recorded. Acid grassland has not yet been recorded for areas where a characteristic flora occurs.

English Nature's data set for Chalk grassland shows that "acid grasslands" of the Wolds are recorded as a transition community MG5b/U4. The Heathland Inventory shows two large heathlands surviving in the Vale of York; Skipwith Common and Strensall Common.

Summary of consultations with Local Team Conservation Officers

In the Yorkshire Dales Natural Area (NA8) and the Pennines Dales Fringe Natural Area (NA15), acid grassland occurs around the 300m level. It is mostly U4 and U5, and is best regarded as upland. The North York Moors contain between 100-500ha of Deschampsia flexuosa grassland (U2) and 500 to 1000 ha of moist acid grassland (U4). Acid grassland has a patchy distribution over the Moors, and tends to occur on edges of sites such as heathland commons and in valleys between moors. EN and the North York Moors National Park have carried out recent survey work of the unenclosed moorland. There is about 7,500 ha of acid grassland in the North York Moors National Park, including U2, U4, U5, U6 and U20. U20 is the most abundant, covering more than 6,000 ha.

Outside the uplands and upland fringes of the Dales and North York Moors, acid grassland occurs locally. Small areas exist in the Lower Derwent Valley National Nature Reserve but the majority is found with heathland such as at Skipwith and Strensall Commons in the Vale of York and Mowbray (NA16). These acid grasslands occur on blown sands similar to those of the North Lincolnshire Coversands and Clay Vales Natural Area (NA 34), and are covered by the same WES to promote positive management on SSSIs.

30.4 Summary of resource

Extent and composition

The status of the North York Moors acid grasslands is not clear. They may be at lower altitude than those of the Dales but the rarity of lowland acid grassland species suggests that they would be better regarded as part of an essentially upland landscape and as upland fringe grasslands. Their significance is likely to be related to the moorland to which they are adjacent, and they are not included in the estimates in this report.

There is less than 20ha of acid grassland, or transitions with neutral grassland in the Wolds. The resource in the Vale of York and Humberhead Levels has yet to be assessed but these appear to be the only areas with any fully developed lowland acid grassland. The total area is thought to be well under 50ha.

Conservation value

The surviving grasslands associated with heathland in the Vale of York and Humberhead Levels are probably the only lowland acid grasslands likely to be of more than county value.

30.5 Future requirements for survey and conservation

Survey

The highest priority is the need to assess the lowland acid grassland and its characteristic flora in the Vale of York and Humberhead Levels. This survey will determine what remains of the county's once rich lowland acid grassland flora.

Conservation

The available evidence indicates that heathland and associated lowland acid grassland have suffered a great decline in both extent and quality. Restoring the quality of both these habitats should be a priority.

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

County: North Yorkshire	
Natural Areas:	**16 + 18 + 22 (part)**
Chamaemelum nobile	0
Dianthus deltoides	1
Filago minima	1
Hypochaeris glabra	0
Moenchia erecta	0
Potentilla argentea	0
Stellaria pallida	1
Teesdalia nudicaulis	1
Trifolium scabrum	1
Trifolium striatum	1
Vicia lathyroides	1
Total no. of species extant	**7**
Total no. of species extinct	**4**
Total no. of species recorded	**11**

16 + 18 + 22 = Vale of York and Mowbray, Vale of Pickering + Humberhead Levels (part)

1 = Recent record
0 = Apparently extinct

North Yorkshire acid grassland surveys

Survey Name	GR	Date	Landscape Types	Comments	No Sites	Site Area	Gr Area	AG Area	H Area	LHA
Grassland Inventory		1982-93	Fields, drift/calc	Most in upland fringe (NA8 & 17) few in NA19	62	470.0	63.5	6.0		
Heathland Inventory		1984-92	Heath	Two large heaths in NA16	3	916.9			150.0	
Estimates, classes		1996		Dave Clayden, English Nature				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, class	A																					

Key

Column headings
GR = Grid reference if relevant
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LHA = Area of lichen heath
NI = No information
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U1-U20r = NVC communities/sub-communities

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