

6. Upland Heath

6.1 Description

Dry heaths

Botanically, heath communities form a continuum throughout the uplands, lowlands and coasts of the UK. They are generally found on free draining acidic mineral soils or thin peat; usually of low nutrient content. The major component of the dry heaths are the ericaceous dwarf shrubs, particularly ling (also called heather) *Calluna vulgaris*. Heath exists as a wide range of different communities which are the result of geographical and altitudinal conditions, soils, hydrology and variations in management. Dry heath communities are separated into lowland (including Cornish heath *Erica vagans*-rich heath), maritime (including dune heath) and upland and montane heath (see section 5. for montane heath).

Upland dry heath

The upland dry heaths are found above the limit of enclosed land and below the natural tree line; generally between 300 or 400 metres to 600 or 700 metres. Heather dominated heath covers approximately 269,700 hectares in England (Felton and Marsden, 1990). These anthropogenic communities are a result of woodland and scrub clearance followed by rotational burning and grazing and are, therefore, semi-natural habitats whose composition is made up mainly of native species.

Floristically, heather is the dominant and characteristic species in all the upland dry heath NVC communities with the exception of H18. Found throughout north-west Europe, its major strongholds are in western and southern Norway and in the UK and Ireland. Other dwarf shrubs which are found in association with heather include bell heather (*Erica cinerea*), bilberry, crowberry (*Empetrum nigrum*), cowberry (*Vaccinium vitis-idaea*), bearberry (*Arctostaphylos uva-ursi*) and, on wetter ground, cross-leaved heath (*Erica tetralix*). Rodwell (1991) describes eight upland heath National Vegetation Communities:

H4 *Ulex gallii*-*Agrostis curtisii* heath.

This is a lower altitude community confined to the south-west and maintained by burning and grazing in Exmoor and the Quantocks, Dartmoor and Bodmin Moor. Deer-grass (*Scirpus cespitosus*) and fescue (*Festuca*) sub-communities are the most common in these upland situations.

H8 *Calluna vulgaris*-*Ulex gallii* heath.

Heather, western gorse (*Ulex gallii*, and bell heather are the characteristic, often co-dominant, species of this lower altitude heath community. The climate is the key determinant of the species composition; the vigour of the dwarf shrubs being dependent on warm summers and mild winters. This community is, thus, generally confined to extensive stands throughout the south-west of England and Wales.

- H9 *Calluna vulgaris* - *Deschampsia flexuosa* heath.
This community is the predominant heath found at low to medium altitudes in the Southern Pennines and the North York Moors. It is characterised by dominant heather associated with bilberry and wavy hair-grass. Frequent burning, high grazing pressures and atmospheric pollution are thought to be the major influence over the floristics of this vegetation type.
- H10 *Calluna vulgaris* - *Erica cinerea* heath.
This community occurs mainly in Scotland although stands without gorse occur in locations throughout northern England and in the south-west. It is again heather-dominated but with bell heather as a subordinate and shade tolerant undershrub which makes a varied contribution depending on management. After burning, in areas where there is little grazing, bell heather can become locally abundant. The frequency of grasses is significant in this community and wavy hair-grass (*Deschampsia flexuosa*) is most often present although brown bent-grass (*Agrostis canina*) and mat-grass (*Nardus stricta*) can also be seen. Sedges, especially ribbed sedge (*Carex binervis*) and pill sedge (*Carex pilulifera*), are characteristic and many of these species become locally abundant after burning. The other feature of this community is the abundance of lower plants particularly *Polytrichum* moss and *Cladonia* lichens. This community generally occurs only as small and localized stands in England with the only extensive examples occurring in the Cumbrian Fells and Dales.
- H12 *Calluna vulgaris* - *Vaccinium myrtillus* heath.
This heath is most extensive in areas which suffer severe winter conditions favouring bilberry, crowberry and cowberry (*Vaccinium vitis-idaea*) as well as heather. The commonest type of heather-dominated vegetation, this more upland heath is found in the west (more oceanic) and north of England. It is especially important in Exmoor and the Quantocks, Dartmoor, Cumbrian Fells and Dales, North Pennines and the North York Moors. Although it is generally found on free draining soils, the rainfall in these areas is high enough such that the soils are almost always wet. Its distribution is thought to have been greater in the past, particularly in the Southern Pennines where pollution and management has given rise to H9 *Calluna-Deschampsia* heath (Rodwell 1991).
- H16 *Calluna vulgaris* - *Arctostaphylos uva-ursi* heath
This community has a variegated woody cover. Heather is frequently dominant with bearberry reaching modest abundance in the gaps in the heather cover. It occurs at moderate altitudes and is largely confined to the east central Highlands of Scotland. There is a record for this community in the Cumbrian Fells and Dales.
- H18 *Vaccinium myrtillus* - *Deschampsia flexuosa* heath.
The bilberry - wavy hair-grass heath includes a variety of moss-rich and grassy dwarf shrub vegetation in which bilberry is, generally, the most abundant ericoid, with heather (*Calluna vulgaris*) usually having a rather inconspicuous role. It is typical of moist but free-draining, base-poor to neutral soils over steeper slopes

at moderate to high altitudes. It is mostly confined to altitudes above 400 metres and often extends up to 800 metres. The generally cold and damp character of the climate here is often locally enhanced by a sunless aspect and snow-lie in sheltered situations. At higher altitudes this kind of vegetation is probably natural but, towards the sub-montane zone, it may be derived from burning and grazing. As a consequence, this community is frequently seen in sub-montane habitats and is widespread throughout the upland Natural Areas.

H21 *Calluna vulgaris-Vaccinium myrtillus-Sphagnum capillifolium* heath.

Heather, bilberry and, almost always, crowberry are the species which characterise this community. The other significant feature is a luxurious damp layer of bryophytes. The main area of distribution of this community is in Scotland, however there are outlying localities in the Cumbrian Fells and Dales and the North Pennines.

6.2 Status

Dwarf shrub communities are mainly confined to the UK, Ireland and the Western seaboard of Europe. The communities found in the UK are therefore of global significance. See table 3 for the international importance of upland dry heath in England.

The international importance of this habitat has been recognised by:

- a) The EC Directive on the Conservation of Natural and Semi-natural Habitat and of Wild Fauna and Flora (Directive 92/43/EEC) listing dry heath as an annex 1 habitat type. All the NVC communities listed above are included in the 'dry heath - all subtypes' category.
- b) The United Nations Conference on Environment and Development Convention on Biological Diversity was ratified by the UK Government which published the UK Biodiversity Action Plan in 1994. The production of a upland heathland habitat statement will be followed by a costed action plan.
- c) A series of Environmentally Sensitive Areas, part of a UK package of measures implemented under the agri-environment regulation 2078/92 have been designated from 1987 onwards. Upland ESAs include Exmoor, Dartmoor, North Peak, Shropshire Hills and the Lake District. All include prescription tiers to encourage sympathetic moorland management and sustainable grazing.

Table 3: International importance of upland heathland NVC communities occurring in England (Birks, pers comm.)

NVC code	Community Name	Only found in the UK or rare elsewhere	Especially well developed in the UK but found elsewhere
H4	<i>Ulex gallii</i> - <i>Agrostis curtisii</i>	✓	
H8	<i>Calluna vulgaris</i> - <i>Ulex gallii</i> heath	✓	
H9	<i>Calluna vulgaris</i> - <i>Deschampsia flexuosa</i> heath		✓
H10	<i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath		✓
H12	<i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> heath		✓
H21	<i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> - <i>Sphagnum capillifolium</i> heath	✓	

7. Mires

7.1 Description

Mires fall into two broad categories: ombrotrophic mires which are fed exclusively by rainfall and minerotrophic mires which are fed by surface and groundwater. Ombrotrophic mires are found in the sub-montane zone above the unenclosed agricultural land and are a post-glacial climax vegetation found particularly in western and northern areas. They can be separated into raised mires and blanket mires (including wet heath). Minerotrophic mires include a wide range of communities such as sedge-dominated rich fens, valley mires, soakways and springs.

Blanket and Raised Mires, Wet Heaths and Valley Mires

The following communities generally occur on thick blanket peats in upland areas and there are often continuous transitions between different vegetation types. Blanket and raised mires are typified by *Sphagnum* mosses, dwarf shrubs, sedges and grasses. They

show considerable variation in composition, altitude, oceanicity and surface patterning. Wet heaths tend to occur on thinner peats which are too dry for the development of the blanket mires and too wet for the formation of dry heath communities. As such, they often exist adjacent to blanket mires and they grade into these communities on the deeper peats. The scarcity of cotton-grasses (*Eriophorum sp.*) and the increased cover of purple moor-grass (*Molinia caerulea*) is a helpful distinction between wet heath and blanket mire. Valley mires are included here as, although largely found in the southern lowlands, they do occur locally on the periphery of upland blanket peats.

M15 *Scirpus cespitosus* - *Erica tetralix* wet heath

Although very variable, this community can be recognized by the high frequency of at least two or three of the following: purple moor grass, heather, cross-leaved heath (*Erica tetralix*) and deer-grass (*Scirpus cespitosus*). Of these, purple-moor grass is the most constant species and is often the most abundant, depending upon management and climate. It occurs in areas of high rainfall in the west of the country and is most prevalent in Bodmin, Dartmoor, Exmoor and the Quantocks and the Cumbrian Fells and Dales.

M16 *Erica tetralix* - *Sphagnum compactum* wet heath

This community is characteristically dominated by variable mixtures of cross-leaved heath, heather and purple moor-grass. *Sphagnum compactum* occurs preferentially and provides a reliable identification indicator. Frequent burning and drainage can result in a very impoverished form of this community with the loss of bryophytes and an increasing dominance of heather or purple moor-grass. It is largely found in areas with a drier climate at relatively low altitudes, though always on waterlogged soils. In the uplands it is perhaps most commonly seen fringing valley mires. It is only extensive in the North York Moors and Southern Pennines (Horsfield and Thompson, 1993).

M17 *Scirpus cespitosus* - *Eriophorum vaginatum* blanket mire

This community is dominated by hare's-tail cotton-grass (*Eriophorum vaginatum*), dwarf shrubs and *Sphagnum* mosses. It is the characteristic blanket bog of lower lying western areas and is extensive in Dartmoor and Exmoor and the Quantocks with smaller areas in the Cumbrian Fells and Dales, Yorkshire Dales and Border Uplands. Burning, grazing and drainage have contributed to a wide scale deterioration of this community.

M18 *Erica tetralix* - *Sphagnum papillosum* raised and blanket mire

This community is generally dominated by *Sphagnum* mosses at the expense of dwarf shrubs and sedges, although this dominance is reduced in drier conditions and under certain types of management such as peat-cutting, burning and draining. It is largely a community of raised bogs although it can be found within stretches of blanket mire. It generally occurs below the usual limit of upland although it is frequently seen in the Cumbrian Fells and Dales, Border Uplands, Bowland Fells and North Pennines.

- M19 This vegetation type is usually dominated by hare's-tail cotton-grass and dwarf-shrubs, often with abundant *Sphagnum* in the wetter areas. The proportion of dwarf shrub to cotton-grass is very variable and often reflects management conditions. Burning and overgrazing increases the dominance of cotton-grass with the loss of the dwarf shrubs. This is the typical blanket mire of the uplands of northern England and covers extensive areas of the Border Uplands, Cumbrian Fells and Dales, Bowland Fells, North and South Pennines and the Staffordshire Uplands.
- M20 *Eriophorum vaginatum* blanket and raised mire
This is a species-poor bog community overwhelmingly dominated by hare's-tail cotton-grass (*Eriophorum vaginatum*) with dwarf shrubs much less abundant than in M19 and at best frequent or only locally abundant. This vegetation is often the result of long-term overgrazing together with burning, drainage and perhaps atmospheric pollution. It is most frequently seen on blanket mires at higher elevations and shows a similar distribution to M19 with additional extensive areas in the Yorkshire Dales and the Dark and South West Peaks. It is the predominant type of blanket mire in the Southern Pennines (Horsfield and Thompson, 1993).
- M21 *Narthecium ossifragum-Sphagnum papillosum* valley mire
This vegetation is closely similar to the wetter blanket mires and wet heath, with carpets of *Sphagnum* below frequent heather and cross-leaved heath. It differs from blanket mires in the scarcity of cotton-grass and deer-grass and the frequent abundance of bog asphodel (*Narthecium ossifragum*) and bog myrtle (*Myrica gale*). More often found in lowland valley mires, this community can occur as a transition to M16 and M17 on blanket peat in the uplands. It is locally but frequently found in the southern and western uplands, including Bodmin, Dartmoor and the Central Marches, and also further north in the North York Moors.

Bog Pools

These are typically wet carpets of *Sphagnum* mosses or cotton-grasses floating over or around water. They are generally associated with a range of blanket and raised mires.

- M1 *Sphagnum auriculatum* bog pool
This community is confined to pools and the wetter hollows of bogs and valley mires in the far western parts of the Britain. It has been reduced in extent due to drainage and peat-cutting.
- M2 *Sphagnum cuspidatum/recurvum* bog pool
Distinguished from M1 by wet carpets of *Sphagnum cuspidatum* or *S. recurvum* rather than *S. auriculatum*, this community is found in the less oceanic areas of Britain and is often associated with M18 raised mires. It appears to be most frequent in the mires of the Border Uplands, Bowland Fells, Dartmoor and the North Pennines. It has been much reduced by widespread drainage and cutting.

- M3 *Eriophorum angustifolium* bog pool
Unlike the previous bog pools, *Sphagnum* mosses are sparse in this community and are replaced by common cotton-grass *Eriophorum angustifolium*. It generally occurs as small stands on bare peat in erosion channels and cuttings, and is particularly associated with eroded blanket mire in the North and South Pennines and in Dartmoor.

Small sedge and bryophyte fens

This group includes a wide range of communities of generally small extent, found in conditions ranging from acid conditions through to base-rich. They are generally dominated by one or several species of small sedge growing over a carpet of mosses and generally occur as small pools or flushes within more extensive mire systems or on the fringes of upland areas.

- M4 *Carex rostrata-Sphagnum recurvum* mire
This community is formed by a cover of bottle sedge (*Carex rostrata*) and other sedges over a wet carpet of *Sphagnum* mosses. It is characteristic of seepage areas and pools in a range of mires and is widely distributed.
- M5 *Carex rostrata-Sphagnum squarrosum* mire
This community occurs in less acidic and nutrient-poor conditions than M4. A consequence of this is a greater diversity of wetland plants associated with the sedges and mosses, often including marsh cinquefoil (*Potentilla palustris*) and devil's-bit scabious (*Succisa pratensis*). This is a local but widespread community, most often associated with the edges of basin mires and lakes with some calcareous influence (eg Malham Tarn in the Yorkshire Dales).
- M6 *Carex echinata-Sphagnum recurvum/auriculatum* mire
A very variable community, M6 is essentially species-poor with either rushes or small sedges dominant over a carpet of *Sphagnum* mosses. The rush-dominated forms have either soft rush (*Juncus effusus*) or sharp-flowered rush (*J. acutiflorus*). Alternatively, in the sedge-dominated stands star sedge (*Carex echinata*) is generally present, often with common sedge (*C. nigra*) and carnation sedge (*C. panicea*). This is the most abundant and widespread community found along acid seepage lines and streams within mire systems and upland fringes. It is most common between 200–400 metres, often with dry heath on plateaux or gentle slopes and is replaced by M7 in montane areas.
- M9 *Carex rostrata-Calliergon cuspidatum/giganteum* mire
This very variable community is generally distinguished from others dominated by bottle sedge by the replacement of *Sphagnum* with a carpet of *Calliergon* mosses. It has a very local distribution as it is restricted to areas where there is high water-table and a through-flow of base-rich or calcareous waters. Small areas are present in the Border Uplands, Oswestry Uplands, South West Peak and the Yorkshire Dales.

- M10 *Carex dioica-Pinguicula vulgaris* mire
 This is variously dominated by small sedges, the most common being carnation sedge, tawny sedge (*Carex hostiana*), glaucous sedge (*C. flacca*) and yellow sedge (*C. demissa*). This community is only found in flushed areas fed by calcareous water and is characterised by the abundance of small calcicoles. It requires grazing and trampling to maintain its typically short and open sward. It has a widespread but local distribution with different forms occurring in the Cumbrian Fells and Dales, Border Uplands, North and South Pennines and Yorkshire Dales, with small areas in the West Midlands and North York Moors.
- M11 *Carex demissa-Saxifraga azoides* mire
 This community is very similar to M10 and it can often be distinguished by the presence of montane species including yellow mountain saxifrage (*Saxifraga azoides*) and starry saxifrage (*S. stellaris*). It is characteristic of open, stony flushes fed by base-rich waters on steep slopes. It occurs in the Cumbrian Fells and Dales and the North Pennines.
- M13 *Schoenus nigricans-Juncus subnodulosus* mire
 This community is generally dominated by black bog-rush (*Schoenus nigricans*), which often occurs with blunt-flowered rush (*Juncus subnodulosus*), purple moor-grass and a range of small sedges and other wetland plants. It is generally found in lowland mires fed by calcareous mires but does extend into sub-montane areas where it occurs in transition with M10. It occurs in the North York Moors.

Purple moor-grass, rush and tall herb fens

This group comprises a range of communities which occur in both lowland and upland situations. In the uplands these communities tend to occur in enclosed or allotment land, including areas that may have received some agricultural improvement.

- M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow
 This is a community of enclosed pastures and meadows that occurs predominantly in the southern lowlands. However, it is included here as it may occur on base-rich flushes and seepages on the fringes of upland areas, particularly the North York Moors.
- M23 *Juncus effusus/acutiflorus-Galium palustre* rush pasture
 This widespread, rush-dominated vegetation is an important pasture community in both enclosed and unenclosed situations on the periphery of upland areas. It is characterised by the abundance of rushes, especially sharp-flowered rush (*Juncus acutiflorus*) and soft rush (*J. effusus*), and is often difficult to separate from MG10 *Holcus lanatus-Juncus effusus* rush-pasture. It is widespread though local and chiefly occurs in the western uplands and the Yorkshire Dales. This is an important community associated with the Rhos pastures of the south-west which are described below.

- M25 *Molinia caerulea-Potentilla erecta* mire
 This community is usually overwhelmingly dominated by purple moor-grass. It is generally species-poor with only a limited number of herbs and occasional dwarf shrubs. It is greatly influenced by burning and grazing and this management has probably increased the dominance of purple moor-grass in most areas. Although widespread on poorly drained peaty soils throughout the uplands, it is most abundant in the south-west. The Rhos pastures of the south-west are an enclosed and species-rich form of this community along with M23 and several other mire communities that characteristically have abundant purple moor-grass.
- M26 *Molinia caerulea-Crepis paludosa* mire
 Again largely dominated by purple moor-grass, this community is usually more species rich having a range of sedges and wetland flowering plants. It has a localized distribution and is most frequent in base-rich flushes in the Yorkshire Dales.
- M27 *Filipendula ulmaria-Angelica sylvestris* mire
 This is predominantly a community of lowland areas and usually occurs in enclosed and ungrazed situations.

Springs, flushes and soakways

These are small, localized communities associated with flowing water along soakways, springs and flushes. They are generally species-poor and are often dominated by a single species of moss.

- M29 *Hypericum elodes-Potamogeton polygonifolius* soakway
 This community consists of floating mats of marsh St. John's wort (*Hypericum elodes*) and bog pondweed (*Potamogeton polygonifolius*). It is found in shallow soakways and seepages around mires and in heathland pools in the south and west, including Dartmoor, Exmoor and the Quantocks and the Shropshire Hills.
- M32 *Philonotis fontana-Saxifraga stellaris* spring
 This community has been described in the section on montane communities.
- M35 *Ranunculus omiophyllus-Montia fontana* rill
 Again, this is a distinctive community of spring heads and rills with a characteristic abundance of water crowfoot (*Ranunculus omiophyllus*). It replaces M32 at moderate altitudes in the south and west and occurs in Dartmoor and the Shropshire Hills
- M37 *Cratoneuron commutatum-Festuca rubra* spring
 This species-poor community is dominated by another distinctive moss *Cratoneuron commutatum*, and often forms large golden green mounds around springs and seepage lines in more base-rich or calcareous areas. It is widespread but local throughout the northern uplands of the Cumbrian Fells and Dales, North Pennines and Yorkshire Dales.

M38 *Cratoneuron commutatum*-*Carex nigra* spring

This is similar to M37 but here there is a greater diversity of species including a range of sedges and wetland flowering plants. It is very local and confined to base-rich montane springs and flushes in the North Pennines.

7.2 Status

Many of the mire communities described above are internationally rare (see table 4). This is particularly so for blanket mires which are internationally rare because of the restricted climatic conditions which give rise to their formation. In the northern hemisphere they can be found in Norway, Newfoundland, Alaska, Kamchatka, and Japan, whilst their range is confined in the southern hemisphere to Tierra del Fuego, the Falkland Islands, Tasmania and New Zealand. Britain is thought to contain about 2 million hectares, some 10-15% of the total global area of blanket mire (Lindsay et al 1988). The international importance of mires, and the species and communities they support, are recognised by:

- a) The EC Directive on the Conservation of Natural and Semi-natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC) which lists active raised and blanket bog (priority habitats), petrifying springs, alkaline fen, degraded raised bog and northern Atlantic wet heath.
- b) The United Nations Conference on Environment and Development Convention on Biological Diversity was ratified by the UK Government which published the UK Biodiversity Action Plan in 1994. The UK Steering Group Report includes blanket and raised bogs as key habitats.
- c) Ramsar Convention on Wetlands
- d) The Convention on the Conservation of European Wildlife and Natural Habitats - The Bern Convention
- e) The EC Directive on the Conservation of Wild Birds (Directive 79/409/EEC)

In England, many mires still remain, in some form, across their original range. However, their condition has been variously modified from that which we would consider to be their natural climax condition.

Table 4: International importance of mire NVC communities occurring in England (Birks, pers comm.)

NVC code	Community name	Only found in the UK or rare elsewhere	Especially well developed in the UK but found elsewhere
M6	<i>Carex echinata-Sphagnum recurvum/auriculatum</i> mire	✓	
M10	<i>Carex dioica-Pinguicula vulgaris</i> mire		✓
M11	<i>Carex demissa-Saxifraga azoides</i> mire		✓
M15	<i>Scirpus cespitosus - Erica tetralix</i> wet heath		✓
M16	<i>Erica tetralix - Sphagnum compactum</i> wet heath	✓	
M17	<i>Scirpus cespitosus - Eriophorum vaginatum</i> blanket mire	✓	
M18	<i>Erica tetralix - Sphagnum papillosum</i> raised and blanket mire		✓
M19	<i>Calluna vulgaris - Eriophorum vaginatum</i> blanket mire		✓
M20	<i>Eriophorum vaginatum</i> blanket and raised mire		✓
M23	<i>Juncus effusus/acutiflorus-Galium palustre</i> rush pasture	✓	
M25	<i>Molinia caerulea-Potentilla erecta</i> mire	✓	
M26	<i>Molinia caerulea-Crepis paludosa</i> mire	✓	
M29	<i>Hypericum elodes-Potamogeton polygonifolius</i> soakway	✓	

8. Grasslands and fern communities

8.1 Description

Much of the grassland habitat found above the line separating enclosed from unenclosed land in England is of two broad types; swards with a calcifuge flora (acid or acidic grasslands) and grasslands where calcicoles are the prominent feature. Both are anthropogenic, plagioclimax communities where the impact of grazing stock (wild and domesticated) has an important influence. These grassland types often occur together as complex mosaics in the uplands, especially where peat and drift deposits mask the influence of the calcareous bedrocks. In addition to these, there is one form of mesotrophic grassland which occurs frequently in the uplands and also calamarian grassland which is usually associated with old lead-mining spoil. The fern-dominated communities are also included here.

Acid (calcifuge) grasslands

Acid grasslands are derived from woodland clearance generally followed by the heavy grazing of the resulting dwarf shrub communities. Although acid grasslands are the most extensive grassland type in England, they have largely been overlooked by vegetation specialists due to their relative lack of species diversity. However, acid grasslands are now being increasingly recognised for their invertebrate and vertebrate interest and, some, for their botanical diversity. Agriculturalists are also concerned with these swards as they provide more palatable grazings of higher nutritional value, especially in the spring, than the ericaceous communities from which they are derived.

U1 *Festuca ovina*-*Agrostis capillaris*-*Rumex acetosella* grassland

This is largely a lowland community of small tussocky grasses with patchy bare ground and an abundance of small herbs. It is very local in the uplands and usually associated with disturbed ground and areas where bracken has been recently eradicated by herbicide.

U2 *Deschampsia flexuosa* grassland.

Wavy hair-grass (*Deschampsia flexuosa*) can become dominant on free draining, drought free mineral soils and drier peats leading to the appearance of this distinctive community. This grassland is more important agriculturally as wavy hair-grass provides a better 'bite' than bristle bent (*Agrostis curtisii*). Although mainly a lowland grassland type, it is common in the upland fringes of northern England.

U3 *Agrostis curtisii* grassland.

This community is formed where bristle bent dominates swards on free draining podzolised soils moistened by high rainfall. This grass seeds prolifically, is seemingly fire resistant and often becomes temporarily dominant in the early years following a burn. Where burning is used judiciously with grazing it can be more permanent. Exmoor and the Quantocks, Dartmoor and Bodmin Moor are its strongholds in the England. Bristle bent is occasionally found within U4 *Festuca*

ovina-Agrostis capillaris-Galium saxatile grassland in the warmer oceanic climate of the south-west of England and south Wales.

- U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland.
This is the most widespread of all acid grasslands in England and associated with better-drained, base poor mineral soils throughout north-west Britain. It is of great agricultural importance as it is the major contributor to rough grazing land and higher enclosed, but unfertilised, allotment pastures. The sward is characteristically tight, and sometimes tussocky, dominated by sheep's fescue (*Festuca ovina*), common bent (*Agrostis capillaris*) and sweet vernal-grass (*Anthoxanthum odoratum*). More species-rich forms of this, and the following community, can occur where there is some calcareous or base-rich influence or where open grassland has developed from a woodland ground flora.
- U5 *Nardus stricta-Galium saxatile* grassland.
On rough grazing land at higher altitudes and on impoverished mineral soils, mat grass can become dominant with common bent, sweet vernal-grass, and wavy hair-grass as subordinates. Mat grass (*Nardus stricta*) is a nutritionally poor grass with a tight tillering habit. Its wiry tussocks, standing proud of the surrounding sward, are characteristic of the poorer grasslands of the north and west of Britain.
- U6 *Juncus squarrosus-Festuca ovina* grassland.
Heath rush (*Juncus squarrosus*) is one of the few species able to compete with mat grass and, unlike that species, is able to survive on non-mineral soils. It therefore thrives in the moister peats in the cooler and wetter parts of northern and western Britain. This grassland often contains mat-grass and common bent on drier areas, and heath bedstraw and tormentil with hair's-tail cotton-grass and common cottongrass in wetter situations in transition to wet heath and mire.

Calcareous grassland

Calcareous grasslands are inherently more species-rich than those grasslands found on acidic substrates. The major resource is at lower altitudes. In both the uplands and lowlands these grasslands are under threat from agricultural improvement and reclamation, inappropriate grazing regimes and neglect. The only upland areas where there are extensive limestone outcrops in the UK are the Craven Pennines in the Yorkshire Dales and Upper Teesdale in the North Pennines. Elsewhere these parent materials are of limited and local occurrence and are sometimes mantled by lime-poor drift including peat.

- CG2 *Festuca ovina-Avenula pratensis* grassland
This is a characteristic and species-rich community that occurs predominantly in enclosed lowland grasslands. A variety of fine-leaved grasses grow alongside sedges and a rich mix of small lime-dependent herbs. It always occurs on free-draining limestone soils on short-grazed slopes. In upland areas it occurs on the Carboniferous limestones of the White Peak and the Yorkshire Dales and the Corallian limestones of the North York Moors.

CG9 *Sesleria albicans*-*Galium sternerii* grassland.

This vegetation varies considerably with location, occurring as open and closed swards, in rocky situations such as on rock ledges and over limestone pavement clints. It can be tall and tussocky in appearance or short and closely cropped. The most prominent grass species in this community is blue moor-grass (*Sesleria albicans*) occurring with crested hair-grass (*Koeleria macrantha*) and sheep's fescue (*Festuca ovina*), and occasionally quaking-grass (*Briza media*) and meadow oat-grass (*Avenula pratensis*). It is confined to the Carboniferous Limestone of the North Pennines, Yorkshire Dales and Cumbrian Fells and Dales. However, although very localised, this is probably the most extensive form of calcareous grassland in the uplands of England.

CG10 *Festuca ovina*-*Thymus praecox* grassland.

This tight and often close-cropped grassland is one of the most widespread forms of calcareous grassland in England. The two grasses which form the basis of the sward are common bent and sheep's fescue, with sweet vernal-grass, mat grass and heath grass (*Danthonia decumbens*) being locally distributed. Sedges are frequently found including, glaucous sedge and spring sedge (*Carex caryophyllea*) and, sometimes, flea sedge (*C. pulicaris*), carnation sedge and pill sedge (*C. pilulifera*) on drier areas. Thyme (*Thymus praecox*) is the most common dicotyledon occurring with rock-rose (*Helianthemum nummularium*), common violet (*Viola riviniana*), ribwort plantain (*Plantago lanceolata*), hare bell (*Campanula rotundifolia*) and self-heal (*Prunella vulgaris*). Northern England is the most important area in Britain for southerly forms of upland calcareous grassland (Horsfield and Thompson, 1993)

Mesotrophic grasslands

These 'neutral grasslands' (lacking any calcareous or acidic elements) occur predominantly in lowland enclosed situations. Only the MG10 *Holcus lanatus*-*Juncus effusus* rush-pasture occurs with any significance on the upland fringes. This community is generally species-poor with abundant and prominent tussocks of soft rush (*Juncus effusus*). The grassy sward beneath the rush includes creeping bent (*Agrostis stolonifera*), Yorkshire fog (*Holcus lanatus*) and creeping buttercup (*Ranunculus repens*). This community is frequently seen in large upland allotments or locally on the more heavily grazed and poached margins of unenclosed moorland. It often results from the invasion of rushes into improved grasslands. This community is replaced by M23 *Juncus effusus/acutiflorus*-*Galium palustre* rush pasture in the wetter and more acidic upland areas (see Mires section).

Calaminarion grasslands

These have a very local and restricted distribution and are usually associated with mining activities or, less commonly, naturally occurring soils with high concentrations of heavy metals. These grasslands are particularly associated with lead-mining spoil and often have a distinctive range of species able to tolerate high levels of metals (metallophytes). The most frequently encountered of these species is spring sandwort (*Minuartia verna*). The

equivalent provisional NVC community is OV37 *Fetuca ovina-Minuartia verna* community. These grasslands occur in the Yorkshire Dales and White Peak.

Fern communities

These are three very distinctive vegetation types which are largely dominated by one or two fern species. They generally occur on steep banks and valley sides, especially in the west of Britain.

U19 *Thelypteris limbosperma-Blechnum spicant* community

Lemon-scented fern (*Thelypteris limbosperma*) and hard fern (*Blechnum spicant*) dominate this vegetation type, usually in association with dwarf shrubs and acidic grassland species. It is found on damp acidic soils on very steep banks in ravines and along valley sides. It occurs mostly in western Scotland and, in England, it has been recorded in the Cumbrian Fells and Dales, Yorkshire Dales and Exmoor and the Quantocks.

U20 *Pteridium aquilinum-Galium saxatile* community

This commonly encountered and widespread vegetation type is overwhelmingly dominated by bracken (*Pteridium aquilinum*). The bracken usually grows over species-poor acidic grassland or dwarf shrubs, especially bilberry and, occasionally, there are frequent shade-tolerant woodland plants such as bluebell (*Hyacinthoides non-scripta*) and wood-sorrel (*Oxalis acetosella*). The build up of acidic litter under dense old stands can eventually eliminate this understorey vegetation. It is most abundant on the periphery of moorlands, often dominating whole valley sides and hill slopes and marking out areas that once held woodland. It generally occurs below 450 metres. There is some evidence that this community is spreading, particularly at the expense of heathland. Two reasons given for this apparent increase are that bracken is unpalatable to grazing animals and that it spreads quickly following burning. It is particularly abundant in Exmoor and the Quantocks, the Cumbrian Fells and Dales and the North York Moors.

U21 *Cryptogramma crisper-Deschampsia flexuosa* community

This community is found on acidic screes and boulders at moderate altitudes in the north and west of Britain. The most abundant plant is parsley fern (*Cryptogramma crisper*) which grows with small, fine-leaved grasses and mosses. It occurs in the Border Uplands, North Pennines, Yorkshire Dales and, most frequently, the Cumbrian Fells and Dales.

8.2 Status

Acid grasslands are especially well developed in the UK. In general, acid grasslands are of a low conservation status and have commonly been derived from heathland. However, there are more species-rich forms of acidic grasslands which are of high conservation value. Also, they can be important component of the mountain and moorland mosaic of communities. Calcareous grasslands are thought to have been widespread at a European scale at the turn of the century. However, as calcareous grasslands are particularly

sensitive to changes in management, these grassland types are now rare in Europe. Refer to table 5 for the international importance of grassland and fern vegetation in England.

The international importance of upland grasslands is recognized by the following:

- a) The EC Directive on the Conservation of Natural and Semi-natural Habitats and of Wild Fauna and Flora (Directive 92/43/EEC) which lists Calaminarian grasslands, species-rich *Nardus* grasslands and semi-natural dry grasslands and scrublands on limestone.
- b) The United Nations Conference on Environment and Development Convention on Biological Diversity was ratified by the UK Government which published the UK Biodiversity Action Plan in 1994. This contains habitat statements for acidic and calcareous grasslands and requires a costed action plan to be prepared for upland calcareous grassland.

Table 5: International importance of grassland and fern NVC communities in England (Birks, pers comm).

NVC code	Community name	Only found in the UK or rare elsewhere	Especially well developed in the UK but found elsewhere
U3	<i>Agrostis curtisii</i> grassland.	✓	
U6	<i>Juncus squarrosus-Festuca ovina</i> grassland.	✓	
U20	<i>Pteridium aquilinum-Galium saxatile</i> community	✓	
CG9	<i>Sesleria albicans- Galium sternerii</i> grassland.	✓	
CG10	<i>Festuca ovina-Thymus praecox</i> grassland.		✓