



National Plant Monitoring Scheme

Online Training Materials 13: Introduction to Upland grassland

Plantlife



UK Centre for
Ecology & Hydrology



Botanical Society
of Britain & Ireland



JNCC



NIEA Northern Ireland
Environment
Agency
www.daera-ni.gov.uk



An Agency within the Department of
**Agriculture, Environment
and Rural Affairs**
www.daera-ni.gov.uk



National Plant Monitoring Scheme

An introduction to UK National Plant Monitoring Scheme broad habitat type

UPLAND GRASSLAND



Produced by Ben Averis for the NPMS in July 2020

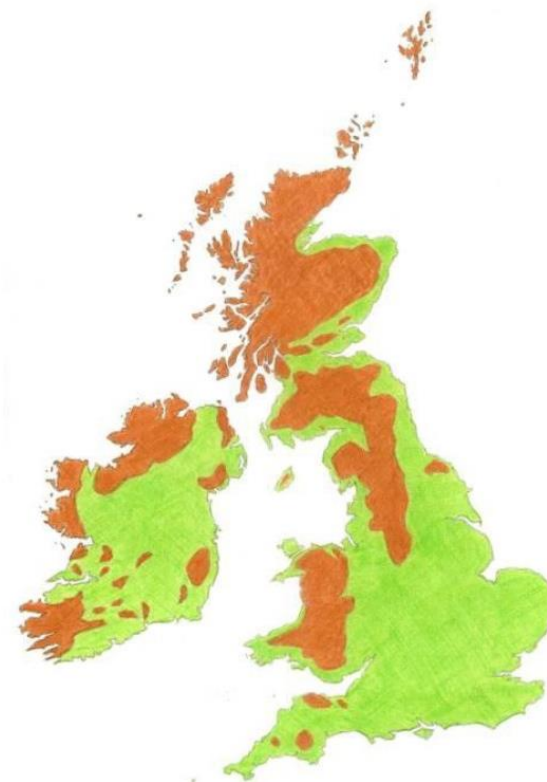


UH-OH! OFF TO A DIFFICULT START WITH 'UPLAND' AND 'MONTANE'!

The NPMS UPLAND GRASSLAND BROAD HABITAT is divided into two NPMS fine-scale habitats: **MONTANE ACID GRASSLAND** and **MONTANE CALCAREOUS GRASSLAND**. There's potential for confusion here in the use of the words 'upland' and 'montane', whose meanings are not exactly the same.

In the ecological sense in Britain and Ireland, '**upland**' refers to areas with a cooler/wetter climate – the areas coloured brown in this map (which is based on an index of climatic severity that combines temperature and rainfall). The lower altitudinal limits of 'upland' vary from sea level in the NW to about 300 m in the south-easternmost upland areas (SW England NE to N York Moors).

The term '**montane**' refers to those parts of the upland zone that are above the natural altitudinal limit of woodland; their climate is particularly cold and/or windy. Montane areas make up just a small proportion of the total area of upland. The lower altitudinal limits of the montane zone are lowest in NW Scotland (about 300-500 m, varying in relation to topography and descending in some very wind-exposed places to below 300 m) but higher in eastern Scotland and higher still further south (very roughly 700-800 m in Wales). The montane zone is too patchy, discontinuous and scattered to show in this upland/lowland map. It is extensive in parts of the central to eastern Scottish Highlands, but even the largest area, in the Cairngorms, would be no more than a small dot on this map. There are smaller areas (these would be tiny dots in the map) scattered widely and plentifully in the Scottish Highlands and islands, and less commonly on the highest ground in the Southern Uplands, Cheviot, Lake District, N and mid Pennines, NW Wales, the Brecon Beacons and Ireland. There is nowhere with a comparably montane climate in SW England.





SO – HOW ARE THE TWO FINE-SCALE NPMS HABITATS DEFINED?

Reading through the published NPMS guidance, one can see that:

- ☺ The **Montane acid grassland fine-scale habitat** actually includes **all upland acid grasslands** (montane + non-montane) as well as some non-montane **fern** vegetation (e.g. bracken) and, very differently, high montane **snowbeds** and **summit heaths**. So ‘montane’ here really means more generally ‘upland’.
- ☹ The **Montane calcareous grassland fine-scale habitat** appears for the most part to be more truly montane, but the mention that it extends down to sea level in the N and W of Scotland suggests inclusion of non-montane upland grassland too. The guidance also says that grasslands dominated by blue moor-grass *Sesleria caerulea* on Carboniferous limestone in N England and Scotland belong in the Lowland grassland NPMS broad habitat, even though some of them are distinctly upland. (Note: *Sesleria* in Scotland is rare and montane, scattered among various vegetation types but not forming *Sesleria*-dominated grassland.) Other non-montane calcareous upland grassland seems to be missed in the NPMS guidance, though it is extensive and accounts for most of the upland calcareous grassland in Scotland, Wales and N Ireland. As ‘montane’ seems to really mean ‘upland’ in the acid grasslands NPMS fine-scale habitat, it seems best to follow suit and define the Montane calcareous grassland fine-scale habitat as: **all upland calcareous grassland – except for non-montane *Sesleria* grassland on Carboniferous limestone.**



Acid and calcareous upland grasslands
in Glen Tilt, Perthshire,
in June



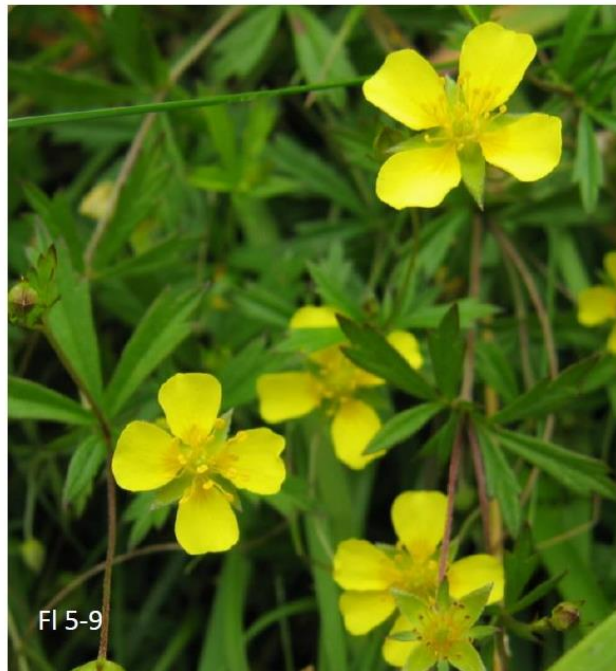
So let's now look at the **MONTANE ACID GRASSLAND FINE SCALE NPMS HABITAT** to see its most characteristic species and the variation in its plant communities. (Then we'll do the same for the calcareous fine-scale habitat.) To start with, these three species are very common in upland acid grasslands:



Fl 6-7

Wavy hair-grass *Deschampsia flexuosa*

Open flower head with thin, wavy branches and shiny flowers. Leaves very thin and wiry; ligule to 3 mm (longer than in wiry-leaved fescues/mat grass). On acid soil in grassland, heath, woods, etc. NPMS negative indicator for montane acid grassland fine-scale habitat, but grows here naturally and not a problem species.



Fl 5-9

Tormentil *Potentilla erecta*

Flowers with four yellow petals. Each leaf is divided into three leaflets (each leaflet with a few marginal teeth), and there are two leaflet-like stipules at the point where the leaf base joins the stem. Grows mainly on acid soils in grasslands, heaths and woods.



Fl 6-8

Heath bedstraw *Galium saxatile*

Small leaves in whorls of 4 to 8. Tiny hairs along leaf edge point outwards and forwards. No hairs on stem. Grows in grasslands, heaths, woods, etc, on acid soils.

Note: in this document, flowering periods of plant species are given numerically (e.g. 5-6 = May-June); this information is taken from Collins Flower Guide ISBN 978-0-00-718389-0



Talking of **wavy hair-grass** (previous page), here is a species-poor sward of it mixed with abundant **heath bedstraw**. Photographed in East Lothian in June. This type of plant community also occurs in the lowlands (dry acid grassland fine-scale subdivision of lowland grassland NPMS broad habitat). Acid grasslands with swards of wavy hair-grass are commonest on ground that has previously been disturbed by such things as burning of heather or felling of woodland. Over time they tend to acquire additional grass species and develop into more mixed and diverse swards.





Here are other grasses typical of the 'more mixed and diverse swards' just mentioned on the previous page:



Common bent *Agrostis capillaris*. Very common in all upland grasslands. Leaf to 4 mm wide, tapering gradually to a pointed tip. Ligule <2 mm long. Conical branched flower head (old ones persist well into winter).

Sweet vernal-grass *Anthoxanthum odoratum*. Leaf to 5 mm wide + long hairs at base of blade. Ligule to 5 mm long. Unbranched flower head with long flowers: glossy green at first; pale gold later. Very common in all upland grasslands.

Sheep's fescue *Festuca ovina*. Short dense tufts of v. thin wiry leaves <15 cm long, and flowering stems 10-25 cm tall (flower head narrow). Ligule very short and hard to see. Very common on upland acid and calcareous grasslands.

Red fescue *F. rubra*. Basal leaves wiry, to 40 cm long; stem to >30 cm tall with open-branched flower head; stem leaves to 3 mm wide. Ligule very short (hard to see). Very common in all non-montane grassland types.

Yorkshire fog *Holcus lanatus*. Leaves softly hairy and up to 10mm wide. Ligule up to 4 mm long. Lower leaf sheaths commonly striped pink-purple. Branched, softly hairy flower head. Very common in non-montane grassland (esp. neutral).

Common bent + sweet vernal-grass listed as NPMS negative indicators in Montane acid grassland fine-scale habitat, but they occur here naturally and are not associated with poor condition of the grassland habitat.



Some blue to pink flowers of upland acid grasslands:



Germander speedwell
Veronica chamaedrys

Whitish hairs in 2 lines down stem; stem leaves hardly stalked. Wood speedwell differs in stalked leaves + hairs spread out all around stem.



Heath speedwell
Veronica officinalis

Has oval, toothed, hairy leaves in opposite pairs, and upright spikes of pale blue flowers. On well-drained acid soils in grasslands, heaths and woods. Listed as a NPMS positive indicator in the Montane acid grassland fine-scale habitat.



Heath milkwort
Polygala serpyllifolia

Widespread and common in dry heaths and acid grasslands, especially in upland areas. Lower leaves in opposite pairs (all leaves not opposite in common milkwort *P. vulgaris*). NPMS positive indicator in Montane acid grassland fine-scale habitat.



Bitter vetch
Lathyrus linifolius

Only 2-4 pairs of leaflets (more in most vetches); leaflets oval to narrow and linear. Pink flowers in groups of 2 to 6. On acid to neutral soils. Can be common in unimproved species-rich forms of acid grassland. Also in woods and heaths.



Lousewort
Pedicularis sylvatica

Short, with pink flowers and intricately divided leaves. Plants commonly branched from the base. (Marsh lousewort *P. palustris* is taller, with slightly darker flowers and has side branches growing out from a vertical main stem; and grows in neutral to basic mires.)



Four more herbs found in upland acid grasslands:



Lesser stitchwort
Stellaria graminea

Narrow oval leaves in opposite pairs on thin, square-sectioned stems. Flowers on very thin, wiry stalks and with white petals cut deeply in from their tips. Flowers and leaves smaller, and stems thinner, than in greater stitchwort *S. holostea*.



Pignut
Conopodium majus

A slender umbellifer with umbels of white flowers and leaves divided into many very narrow lobes/leaflets. On acid to neutral soils. Can be common in unimproved acid grassland. Also in woods and heaths.



Common dog-violet
Viola riviniana

The commonest violet in upland acid grasslands. Has purple flowers (each with a very pale 'spur' projecting up and backwards) and rather dark green heart-shaped leaves. Also in calcareous grasslands. Listed as a NPMS positive indicator species in Montane calcareous grassland habitat type.



Mountain pansy
Viola lutea

A beautiful plant with large, distinctive purple or yellow (or purple + yellow) flowers. Leaves oval and toothed. Stipules with narrow side lobes + narrow end lobe. Mainly in unimproved upland acid grasslands, especially the more herb-rich forms. Listed as a NPMS positive indicator species for only the Montane calcareous grassland fine-scale habitat, where it can also grow, but generally not as commonly as in acid grasslands.



FI 5-8



Any of these five dwarf shrub species can occur in upland acid grasslands, typically as short (grazed) or sparsely scattered plants. Bilberry, cowberry and crowberry are also listed as NPMS positive indicator species in the Montane acid grassland NPMS fine-scale habitat.



Fl 7-9



Fl 7-9



Fl 4-6



Fl 6-8



Fl 5-6

Heather
Calluna vulgaris

Leaves tiny and not in whorls. Very small pale pink flowers.

Bell heather
Erica cinerea

Leaves in whorls of 3. Bright mid pink-purple flowers.

Bilberry (Scottish = blaeberry)
Vaccinium myrtillus

Stems green and ridged. Leaves oval and pointed, with toothed edges. Small reddish or red-green flowers develop into edible dark blue berries.

Cowberry
Vaccinium vitis-idaea

Stems browner, not ridged. Leaves dark, evergreen, blunt and untoothed.

Crowberry
Empetrum nigrum

Leaves in whorls or not; quite thick + white stripe running up underside.



'TYPICAL' ACID GRASSLAND

The most common and 'typical' type of upland acid grassland has mixtures of grasses including common bent, sweet vernal-grass, sheep's fescue, red fescue, wavy hair-grass and Yorkshire fog *Holcus lanatus*, dotted with small herbs such as tormentil and heath bedstraw. This example is in the Lammermuir Hills (SE Scotland) in June.





LOOK! ACID GRASSLAND CAN BE **SPECIES-RICH!**

Some people seem to think that the only interesting grasslands are calcareous or neutral and that acid grasslands are just species-poor and uninteresting. But no! They can be species-rich. And even the species-poor ones can be interesting.

Here is an example of a floristically rich type of acid grassland that is found on what appear to be slightly mineral-enriched acid soils. This example, in Perthshire in July, has a fine show of mountain pansy as well as heath bedstraw, tormentil, germander speedwell, eyebright, ribwort plantain, and bulbous buttercup *Ranunculus bulbosus*. The last two species mark a shift towards neutral or calcareous grassland, but the species composition of the vegetation on the whole is still a better fit for acid grassland.





Betony *Stachys officinalis* grows in some unimproved acid and neutral grasslands (as well as woods and hedgebanks) in both upland and lowland areas of England and Wales, and, much more rarely, in Scotland. This impressive population of it is one of its northernmost sites in Britain, in lightly grazed, rather species-rich upland acid grassland (in mosaics with acid woodland) in Perthshire. Photographed in July.





Mat grass *Nardus stricta*

This grass forms distinctive dense tufts of rough-textured wiry leaves, many of the leaf blades sticking out at a wide angle. The flower head is very narrow and dark, but later turns pale with individual flowers sticking out in a fishbone-like way (see small photo immediately to right). Indeed, the whole plant turns very pale in winter. Unlike the grasses on page 6, mat grass is not very palatable to sheep, deer and cattle, so in places where those other grasses are much reduced in cover and height by heavy grazing, mat grass gets a stronger competitive edge and can become very abundant. *Nardus* grassland, as seen in this photo taken in Galloway in August, is very much an upland type of vegetation.





Species-rich mat grass grassland. Grassland dominated by mat grass is most commonly species-poor and tends to get a bad press because of this and its association with heavy grazing. However, some *Nardus* grasslands are more species-rich, presumably because the soils are enriched by flushing. Here's an example, in the Perthshire hills in July. It is on the damp side, and species indicative of soil enrichment include fen bedstraw, lady's bedstraw, meadowsweet, water avens and marsh thistle. The surrounding vegetation here is acidic dry heath.





All these wiry-leaved grasses! Mat grass, sheep's fescue, red fescue and wavy hair-grass! What if there are no flowering heads? How do I tell them apart then?

That's for **YOU** to **TELL ME!** Because it's **QUESTION TIME!**

Q1: Without flowers, how do you tell mat grass from those other wiry-leaved grasses?

Q2: You've found wavy hair-grass without flowers. You know it's not mat grass because of your (presumably correct!) answer to the previous question. But how do you know it isn't sheep's fescue or red fescue?



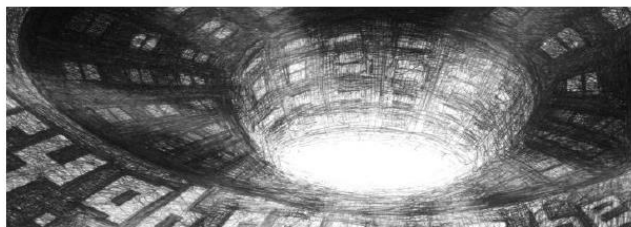
A1: As seen just a few pages back, **many of the leaf blades at the base of the mat grass plant stick out abruptly** from the leaf sheath and stem. A very distinctive and easily observed feature. Here's that photo again.



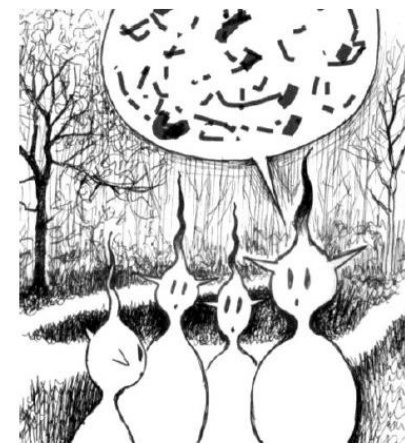
Also, mat grass forms particularly **dense tussocks**, and its leaves have quite a **stiff and rough texture**.

A2: **Wavy hair-grass has a longer ligule** than that of sheep's and red fescues. It's up to 3 mm long, which doesn't sound very much but is long enough to show up easily when you're examining a few leaves of wavy hair-grass.

Sheep's and red fescue leaves have ligules so short as to appear almost invisible. Unmeasurable? Well, even **C. E. Hubbard** (1900-1980) who wrote *the* book on grasses (in 1954), had to resort to describing them in these desperate terms: **"very short"** (red fescue);



"extremely short" (sheep's fescue). I'm sure I speak for him and *Homo sapiens* in general when I say that we obviously need outside help on this.





Heath rush *Juncus squarrosus*

Just like mat grass *Nardus stricta*, this species forms short, very dense tussocks of narrow, tough-textured leaves that aren't very palatable to sheep, cattle or deer. And again, as with mat grass, this unpalatability allows the species to spread in response to heavy grazing that reduces the cover and height of (and competition with) palatable grasses such as bents and fescues. The leaves aren't as thin and wiry as those of mat grass; they are quite thick (from upper to lower surfaces), glossy and tough. The stems are very stiff and strong. Heath rush 'acid grassland', as seen in the lower right photo (Galloway, in September) is a type of vegetation found mainly on damp acid soils in the uplands.





Bracken *Pteridium aquilinum* can be common in upland acid grassland, though it doesn't extend up into the truly montane zone. On acid soils in the uplands it can be so plentiful as to be the dominant species in vegetation that is otherwise like a typical acid grassland, as seen here where acid grassland adjoins bracken-dominated vegetation in the Lammermuir Hills (photographed on a misty day in June) or with a lower layer more like dry heath (as seen commonly in close association with heath, and therefore better placed in the NPMS Heathland habitat).





Patches of other big ferns, especially **lemon-scented fern *Oreopteris limbosperma*** and **scaly male-fern *Dryopteris affinis*** also belong here in the Montane acid grassland fine-scale NPMS habitat. They occur mainly on acid soils on upland slopes. Lemon-scented fern grows most commonly on cool north-facing slopes, as in the photo on the left which was taken in the Lammermuir Hills in June. Scaly male-fern can be locally dominant on a wide range of slope aspects; a patch of it is shown in the photo on the right, which is on a SW-facing slope in the Ochil Hills (photographed in July). Among and beneath these ferns the mix of plant species is generally quite similar to that of typical forms of upland acid grassland, including bent grasses, fescues, sweet vernal-grass, heath bedstraw and tormentil.





Patches of **greater woodrush** *Luzula sylvatica* can occur on cliff ledges where they belong in the Rock outcrops, cliffs and scree NPMS habitat, and on slopes away from cliffs, where they are best placed in this acidic fine-scale habitat of the NPMS Upland grassland broad habitat. This species is very palatable to large herbivores – hence its abundance on many inaccessible cliffs. Where vegetation dominated by greater woodrush occurs well away from cliffs it is generally in places where grazing is no more than light. In the hills it commonly forms patches in mosaics with acid grasslands and heaths, as here among acid grassland in the Southern Uplands in October.





Bristle bent *Agrostis curtisii*

Before moving on (or, rather, up) to montane forms of the Montane acid grassland fine-scale habitat we should whizz down to SW England to see bristle bent *Agrostis curtisii*. This strongly south-western grass grows on dry to damp acid soils in grasslands and heaths in upland and lowland situations, and can be locally very abundant to dominant, especially where there has been some burning previously. It resembles wavy hair-grass in forming tufts of wiry leaves on acid and commonly disturbed soils, but differs in that its leaves are stiffer and more of a greyish-green colour. Also, the flower head has more branches than in wavy hair-grass and the branches are generally held close in so that the head as a whole is narrow. Here it is on Exmoor in June.



Fl 67



TRULY MONTANE ACID GRASSLANDS

Some truly montane forms of the acid grassland fine-scale NPMS habitat type are vegetation that most of us would happily recognize as grassland, but some are not because they consist mainly of mosses, liverworts, sedges and rushes. Here's one of the more obvious montane acid grasslands, on the summit ridge of Cadair Idris (Wales) in October: a very short **montane form of fescue-bent grassland** that includes abundant moss and scattered mat grass and sedges.





And here on a high ridge in the west Highlands in May is a **montane form of mat grass grassland** forming a pale zone where the ridge top starts to descend down to the slopes below (with some late-lying snow within this grassland). Above it, along the top of the ridge, the vegetation is mainly moss with sedges and some grass.





Another montane grassland of places where snow lies late has swards of **tufted hair-grass** *Deschampsia cespitosa*. Up here this species grows shorter than it does at low altitudes.



This grassland looks a bit ordinary. So did the last two. What's in them to show that they are properly montane?



MONTANE SPECIES IN THESE ACIDIC HABITATS

These montane plant species grow among the commoner and more widespread species in the properly montane forms of the Montane acid grassland NPMS fine-scale habitat:



Fl 6-7 (fruits 7-8)

Stiff sedge *Carex bigelowii*

Has relatively stiff stems – hence the name. On acid soils. In montane grasslands, moss heaths, dwarf shrub heaths and snowbeds. NPMS positive indicator in the Montane acid grassland fine-scale NPMS habitat.



Fl 6-7

Least willow *Salix herbacea*

A tiny willow with broad oval to roundish leaves. On thin soils, especially in exposed places.



Fl 6-8

Alpine lady's-mantle *Alchemilla alpina*

Distinctive starry leaves with silvery undersides. On acid to basic soils. NPMS positive indicator in both fine-scale habitat types of the Upland grassland broad habitat.



These two **clubmosses** grow in montane acid grasslands...



Alpine clubmoss *Diphasiastrum alpinum*. Low and creeping, with short, overlapping, scale-like leaves. In short montane and submontane vegetation. NPMS positive indicator in the montane acid grassland habitat.



Fir clubmoss *Huperzia selago*. Tufts of upright shoots with stiff leaves like short, thick, spreading, yellowish-green conifer needles. In short montane and submontane vegetation. NPMS positive indicator in the montane acid grassland fine-scale habitat.

... and this **rush** too.



Three-leaved rush *Juncus trifidus*. Short tufts of wiry stems and leaves that start green but turn a golden colour from their tips downwards. Small brown flowers arising where leaves leave the stems. Grows on thin acid soils in exposed places high in the mountains in the Scottish Highlands, where it is locally abundant (especially extensively on the Cairngorm plateau).



In the climatically harshest montane environments the Montane acid grassland fine-scale NPMS habitat includes summit heaths and snowbeds that are not really grassland. For example moss heath on wind-exposed summits and ridge tops, consisting of extensive mats of the moss *Racomitrium lanuginosum* dotted with small plants of stiff sedge, least willow, crowberry and blaeberry. This example of **Racomitrium heath**, photographed in July, is on Aonach Mor in the Ben Nevis range in the mid-western Highlands. That's Ben Nevis itself beyond, going up into the clouds.





Here is a close view of that moss – *Racomitrium lanuginosum*. I know the NPMS doesn't include mosses, but this one is so distinctive and is such a common species in the montane zone where it can play a major role in the ecosystem that it is worth knowing.





Juncus trifidus rush-heath, with tufts of **three-leaved rush** and little else (*Racomitrium* moss, some lichens and a sparse growth of a few other vascular species such as stiff sedge and least willow) is found on the highest plateaux, summits and ridges of the Scottish Highlands. This example is on Beinn a' Gho, in Perthshire, in July.





Another high montane vegetation type within this fine-scale NPMS habitat is one that has **swards of stiff sedge** growing among mosses on damp ground (especially in very shallow depressions on high plateaux) that holds snow well into the spring. This example is on the summit area of Glas Maol, on the Perthshire-Aberdeenshire border, in July.





Snow lies longest on very high north-facing slopes. **Late snowbeds** are within the Montane acid grassland fine-scale NPMS habitat. This example of late snowbed habitat on Cairn Gorm was photographed in June.





And here's some **moss and liverwort-dominated late snowbed** in clearer weather, on Aonach Mor (Ben Nevis range) in July. The species diversity can be very high in this kind of habitat, and can include rare moss and liverwort species.





Q3: What species of grass is this? (It has become dominant here in response to ground disturbance associated with the felling of previous woodland.)





A3: Wavy hair-grass *Dexchampsia flexuosa*.

Q4: (a) Is this upland acid grassland montane or not? (b) What are the yellow flowers in it?





A4: (a) Not montane. We can tell because there's bracken in it; bracken doesn't grow in the montane zone.

(b) Tormentil *Potentilla erecta*





NPMS NEGATIVE INDICATORS IN THE MONTANE ACID GRASSLAND FINE-SCALE HABITAT



Stinging nettle *Urtica dioica*. Classed as a negative indicator because it can increase in response to unnaturally (and variably damaging) high levels of nutrients.



Creeping thistle *Cirsium arvense*. Prickles on leaves but not on stems. Favours nutrient-rich and/or disturbed soils. Very scarce in bogs and wet heaths because these habitat are too acid and nutrient-poor.



Common bent *Agrostis capillaris*. Common in all upland grasslands. Leaf to 4 mm wide, tapering gradually to a pointed tip. Ligule <2 mm long. Conical branched flower head (old ones persist well into winter).



Sweet vernal-grass *Anthoxanthum odoratum*. Leaf to 5 mm wide. Long hairs at base of blade. Ligule to 5 mm long. Unbranched flower head is glossy green at first; pale gold later. V. common in all upland grasslands.



Wavy hair-grass *Deschampsia flexuosa*. Open flower head with thin, wavy branches and shiny flowers. Tufts of v. thin wiry leaves; ligule to 3 mm (longer than in wiry-leaved fescues/mat grass). On acid soil in grassland, heath, woods, etc.

The nettle and thistle are understandable as negative indicators, but the three grasses much less so because they are part of the fundamental make-up of so much unimproved upland acid grassland and don't appear problematic. Also surprising are white clover *Trifolium repens*, daisy *Bellis perennis* and crested dog's-tail *Cynosurus cristatus* listed as positive indicators in acid grassland; in this habitat these species are most common in 'semi-improved' examples of acid grassland such as those in which the species composition appears to have been affected by artificial nutrient enrichment.



Now to the **MONTANE CALCAREOUS GRASSLAND FINE SCALE NPMS HABITAT** (= all upland calcareous grassland except non-montane *Sesleria* grassland on Carboniferous limestone). The best indicator species for calcareous grassland in our uplands (and lowlands) is **thyme** *Thymus polytrichus*. Out with heath bedstraw; in with thyme (out with white; in with pink). The grasses here can be similar to those in upland acid grasslands: bents, fescues, sweet vernal-grass, etc, though wavy hair grass is typically absent or very sparse. The usual presence of at least one of common bent, sweet vernal-grass and tormentil marks a difference from lowland calcareous grasslands. Here is some typical non-montane upland calcareous grassland, with abundant thyme of course, in the Lammermuir Hills in July.





Here's a close view of **thyme** *Thymus polytrichus* (L) and, talking of thyme, here's **rockrose** *Helianthemum nummularium* too (R). Why the connection? Because they're both dwarf shrubs, with stems that are actually woody (but sufficiently thin that we could easily be fooled on that score) and they both have small evergreen oblong to oval leaves in opposite pairs. Some people might also say "oh yes, and they're both indicators of base-rich or calcareous soils". Whoa! Thyme – yes. But rockrose – yes for the most part, but not everywhere because it can also grow on neutral or even quite acidic (but flushed/enriched) soils too. It seems to be able to tolerate a slightly greater depth of soil than does thyme. So we find it mainly in calcareous grasslands and some of those species-rich acid grasslands where thyme is absent and heath bedstraw commonly present. With flowers thyme and rockrose are easily separated. Without flowers, check the leaves: those of rockrose are bigger, with the main vein prominently sunk in a groove and with very pale undersides. Rockrose also has a pair of tiny leafy stipules where each leaf stalk joins the main stem.





Some other plants of upland calcareous grassland:



Common bird's-foot trefoil *Lotus corniculatus*. Yellow, pea-like flowers and slightly greyish-green leaves with 3 leaflets and 2 stipules at the base of the leaf stalk. NPMS positive indicator in the Montane calcareous grassland fine-scale habitat.



Fairy flax *Linum catharticum*. A short, hairless herb with thin wiry stems, small oval leaves in opposite pairs, and openly branched heads of small white 5-petalled flowers. NPMS positive indicator in the Montane calcareous grassland fine-scale habitat.



Lady's bedstraw *Galium verum*. Very narrow, dark green leaves in whorls of 8-12 (looking a bit like those of bell heather but with more leaves per whorl), and spikes of many tiny yellow flowers. Mainly in calcareous and neutral grassland, but also in some of the more species-rich forms of mildly acid grassland.



Quaking grass *Briza media*. The leaves look ordinary but the flower heads are unmistakable with large flattened spikelets hanging on delicate wiry branches, like a little sculpture. Indeed, who needs sculptures when nature has made its own such as this? (Of course there is good reason to make sculptures too.) Quaking grass grows mainly in calcareous and neutral grasslands; also in base-enriched flushes.



And a few more...



Fl 5-6 (fruits 6-7)

Flea sedge *Carex pulicaris*. Leaves thin and wiry, but plants distinctive in summer with long fruits pointing backwards when ripe. In base-enriched flushes and flushed grassland. NPMS positive indicator in Montane calcareous grassland fine-scale habitat.



Fl 5-6 (fruits 7-8)

Glaucous sedge *Carex flacca*. Leaves mid green on upper side and paler greyish green below. 2-3 mm wide and widely spreading. 2-3 male spikes at top of stem. On dryish to quite wet neutral to basic soils.



Fl 6-7

Mountain everlasting *Antennaria dioica*. Low rosettes of small oval leaves with whitish undersides. Small dense whitish flower heads. In short/sparse vegetation. NPMS positive indicator in both fine-scale types of Upland grassland.



Fl 6-7

Limestone bedstraw *Galium sternerii*. Like heath bedstraw but leaves a bit longer and relatively narrower, more sharply pointed and with tiny backward-pointing marginal hairs (forward-pointing in heath bedstraw). NPMS positive indicator in Montane calcareous grassland fine-scale habitat.



Fl 6-7

Meadow oat-grass *Helictotrichon pratense*. Tufted, with rather stiff leaves grey-green above and shiny darker green below. Leaf tip shortly pointed. NPMS positive indicator in Montane calcareous grassland fine-scale habitat.



WARNING! If you're in grassland in which the main grass species is this:



Leaves are in dense tufts
and have a blue-grey tinge.



Flower head
starts off
darker and
then goes pale
like this.

... **DON'T PANIC!** Just don't call it Upland grassland NPMS habitat (even if it is in the uplands), because this is **blue moor-grass** *Sesleria caerulea* and it seems that all grassland that is dominated by this species and is also on limestone goes into the Dry calcareous grassland fine-scale NPMS habitat category of the Lowland grassland NPMS broad habitat type. These *Sesleria* grasslands occur on limestone in both lowland and upland areas of Cumbria, NW Yorkshire and Co. Durham, and also on limestone in mid-W and NW Ireland. *Sesleria* also grows on schist cliffs on mountains in the southern part of the Scottish Highlands, where it is uncommon and does not form grassland swards.



Here's a photo of some upland calcareous grassland with thyme and rockrose, on Dalradian limestone in Perthshire in July. The white flowers aren't heath bedstraw but are thyme that's flowered white; there's pink thyme there too.





Here are some of the montane species that grow in the truly montane forms of this calcareous grassland fine-scale habitat:



Fl 7-8

Northern bedstraw *Galium boreale*. Leaves hairless, in whorls of four, each with 3 parallel veins. Small white flowers. NPMS positive indicator in Montane calcareous grassland fine-scale habitat.



Fl 2-5

Purple saxifrage *Saxifraga oppositifolia*. Non-flowering plants can look a bit like thyme, but the leaves are relatively shorter with distinct hairs on their edges, and on many shoots are very densely packed together (can look 4-ranked at first glance). Montane base-rich grassland, flushes and rocks.



Fl 6-9

Yellow saxifrage *Saxifraga aizoides*. Rather fleshy, narrow leaves (with hairs along their margins), reddish stems and many narrow-petalled yellow flowers. In basic flushes and damp, flushed calcareous grassland.



Fl 6-8

Alpine bistort *Persicaria vivipara*. Oval hairless leaves dark above and pale (with conspicuously raised central vein) below. Narrow spikes of white flowers later becoming bulbils instead of seeds. NPMS positive indicator in Montane calc. grassl. fine-scale habitat.



A second page of montane species found in the Montane calcareous grassland fine-scale NPMS habitat:



Alpine lady's-mantle *Alchemilla alpina*. Seen earlier when looking at acid grasslands, but here it is again. Distinctive starry leaves with silvery undersides. NPMS positive indicator in both fine-scale types of Upland grassland habitat.



Hair sedge *Carex capillaris*. A delicate species with small tufts of yellow-green leaves and female spikes hanging out or down on very thin, hair-like stalks. In montane calcareous grassland and flushes.



Mountain avens *Dryas octopetala*. Its creeping woody stems bear evergreen crinkly-edged leaves (dark above; pale below) and white flowers later becoming feathery fruits. On montane cliffs and, in the far NW, low altitude limestone terrain.



This species-rich montane calcareous grassland on Dalradian limestone in Perthshire in July has species including yellow saxifrage and alpine bistort.





Much of our truly montane calcareous grassland in the Scottish Highlands, as here in the Drumochter area of the central Highlands in August, has a distinctive abundance of the starry-leaved **alpine lady's-mantle** *Alchemilla alpina*. Thyme is plentiful too, and grasses include common bent, sheep's and viviparous fescues and sweet vernal-grass.





Some montane calcareous grassland on high slopes – as here on basalt mountain ground in Morvern in the west Highlands – contains **moss campion** *Silene acaulis* with its pink flowers among the dense cushions of small, narrow, thick-textured leaves. Other species in such places include thyme, alpine lady's-mantle and various grasses and mosses.





On limestones at low altitude in NW Scotland is an uncommon form of calcareous grassland with abundant **mountain avens** *Dryas octopetala*. As well as *Dryas* there can be other montane species here, though the vegetation otherwise has much in common floristically with non-montane upland calcareous grassland. This example, in the Inchnadamph area of Sutherland in May, has mountain avens in flower (white dots) and Quinag in the background.





Q5: Thyme, rockrose and purple saxifrage. Which is which?





A5:





Q6: What's this?





A6: That was an unfair question because I hadn't yet shown you this species! But I thought you might be interested. Maybe you do know it? **Alpine cinquefoil *Potentilla crantzii*** – an uncommon plant of base-rich montane grassland and rock ledges. It's like tormentil except that the flowers are a bit bigger, with 5 petals (but beware – tormentil can torment us with the occasional 5-petalled rogue flower!), and the leaves are bigger, with 5 leaflets (3 in tormentil).

Oh look – two leaves of alpine bistort! In the middle of the photo on the right. They're long, narrow and pointed.



All three photos of this species taken on the Perthshire-Aberdeenshire border in June-July



NPMS NEGATIVE INDICATORS IN THE MONTANE CALCAREOUS GRASSLAND FINE-SCALE HABITAT



Stinging nettle
Urtica dioica. Classed as a negative indicator because it can increase in response to unnaturally (and variably damaging) high levels of nutrients.



Creeping thistle *Cirsium arvense*. Prickles on leaves but not on stems. Favours nutrient-rich and/or disturbed soils. Very scarce in bogs and wet heaths because these habitat are too acid and nutrient-poor.



Broad-leaved/curled dock
Rumex obtusifolius / *crispus*. These tall docks are most common where there has been some kind of disturbance to the soils; for example from trampling by livestock, or by agricultural vehicles. They are commonest on nutrient-rich soils.



Ragwort *Senecio jacobea*. A robust plant with crinkly-edged lower leaves, narrow-lobed upper leaves and many yellow flowers. Toxic to grazing animals and to people. Can be common in many types of grassland.



Creeping buttercup
Ranunculus repens. Typical yellow buttercup flowers. deeply divided leaves have distinctive pale and dark dots or blotches. Can become very common on more or less neutral soils that have been disturbed or nutrient-enriched.



Here in a mosaic of upland acid and upland calcareous grasslands on the landslipped basalt slopes of Beinn Iadain, in Morvern in the west Highlands, we find ourselves at the end of this brief exploration of the NPMS Upland grassland habitat. I hope you found it interesting and informative. And I hope it helps with any future adventures that you have in these habitats (I was going to say '...helps with any future *work*', but, you know, let's not forget that work and anything and everything else can absolutely be an *adventure!*).

