Guidelines for the Selection of Biological SSSIs

Part 2: Detailed Guidelines for Habitats and Species Groups

Chapter 9 Upland Habitats

Authors

Crowle, A.J.W., Coupar, A.M., Glaves, D.J., Key, D., Noble, A.K., Ratcliffe, J.B., Rentoul, K.R. & Thompson, D.B.A.

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Cover note

This chapter updates and replaces the previous Upland Habitats SSSI Selection Guidelines chapter drafted by Derek Ratcliffe, David Horsfield, Chris Sydes and Des Thompson, which had considerable input from John and Hilary Birks and Philip Oswald (Nature Conservancy Council 1989). It was prepared by Alistair Crowle (Natural England), Andrew Coupar (NatureScot), David Glaves (Natural England), David Key (Natural England), Alice Noble (Natural England), John Ratcliffe, (Natural Resources Wales), Karen Rentoul (NatureScot) and Des Thompson (NatureScot) and provides detailed guidance for use in selecting upland sites throughout Great Britain to recommend for notification as SSSIs. It should be used in conjunction with Part 1 of the SSSI Selection Guidelines, as published in 2013 (Bainbridge *et al.* 2013), which detail the overarching rationale, operational approach and criteria for selection of SSSIs.

The main changes from the previous version of the chapter are set out below.

- substantial updating and restructuring of the text and references to reflect developments in the description of upland vegetation types understanding of the international importance of upland habitats in Great Britain and revisions made to Part 1 of the Guidelines;
- addition of further information on the classification of upland habitats (Appendices 1 and 2);
- updating of faunal interests and plant taxonomy;
- removal of text relating to the amenity value of upland features as this is no longer relevant.

The chapter has been subjected to appropriate levels of evidence quality assurance. It is compliant with the JNCC Evidence Quality Assurance Policy 2022 and has been subjected to external peer review by Professor Robin Pakeman.

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1 Introduction

1.1 The uplands contain by far the most extensive of Great Britain's natural and semi-natural habitats, occupying large and often continuous expanses of unenclosed land in the north and west, and cover least 6.5 Mha (or 28% of the country).

1.2 Within the uplands, a distinction is made between lower sub-alpine and higher sub-alpine zones, the boundary of which corresponds to the potential climatic tree line. This is the zone in which trees transition from woodland into scattered trees, which are naturally stunted in size and shape due to the climate and substrate at higher altitudes. Above the tree line, scrub consisting of dwarf birch and willow transition into the alpine zones (Bartlett *et al*. 2020). A natural tree line is seldom observable in Britain, where historic management and deforestation have been so prevalent. The upper limit at which tree growth is currently seen is around 800m within the Cairngorms (Hetherington 2018). Changes in management and a warming climate are likely to mean that the tree line will be dynamic for the foreseeable future and will vary by geographic region (Grace *et al*. 2002). The distinction between the sub-alpine and alpine zones is thus often blurred, and the two usually merge through a broad band of transitional vegetation. In some districts the attitudinal range of uplands falls entirely within the sub-alpine zone, and only in the Scottish Highlands is the alpine zone strongly represented (Thompson *et al.* 1987; Averis *et al.* 2004).

1.3 The uplands contain some of the best and most extensive examples of near-natural vegetation in Britain (Ratcliffe 1977; Rodwell 1991a, 1991b, 1992; Averis *et al.* 2004; Proctor 2013). Cliff faces and ledges, whether on open hillsides or in enclosed ravines and gills, usually support fragmentary occurrences of plant communities which have been modified or eradicated by land management practices in more accessible situations. Within the sub-alpine zone these include certain types of woodland and their characteristic herbaceous field layer communities that are widespread in the mountains of Scandinavia. Islands in lakes and rivers sometimes support fragments of original woodland, scrub or heath, but some have been modified by grazing and/or burning. Cliffs within the montane zone often provide refuges for relict communities and assemblages of Arctic-Alpine plants which are sensitive to grazing, fire or competition; they are also the important habitat of rupestral mosses, liverworts and lichens. However, with a change in management, these species and communities are able to recover and colonise beyond inaccessible locations. This can only occur where browsing and grazing pressure are reduced to low densities, and other damaging management is ceased. The higher levels of many remoter and more acidic mountains in the Highlands have escaped significant modification by grazing animals and show relatively large areas of near-natural montane vegetation in inaccessible situations (Thompson *et al.* 1987; Averis *et al.* 2004). While blanket bog has been extensively degraded by past land-use and atmospheric deposition, in England in particular (Caporn and Emmett 2009), there still remain numerous areas, especially in northern Scotland, with relatively undisturbed vegetation dominated by bog moss (*Sphagnum*) species (see the Bogs SSSI Selection Guidelines).

1.4 Within any upland district, variations in geology and topography produce differences in drainage, aspect and soil fertility which have considerable influence on the nature of the terrain, flora and fauna, and land-use history (Pearsall 1950; Ratcliffe and Thompson 1988; Averis *et al.* 2004; Newton 2020). There are sharp contrasts between steep-sided, rocky mountains, with mainly thin, well-drained soils, crags and screes, and the gentler, undulating moorlands, which are often largely peat-covered and almost devoid of exposed rock. Whilst there is a prevalence of hard acidic rocks which give rise to infertile soils and a low carrying capacity for animals, local areas of limestone or other calcareous rock yield fertile soils and good productivity for both domestic stock and wild animals. Uplands typically contain a varied range of these habitats, some of which are dealt with in separate SSSI Selection Guideline chapters. Habitats which are associated with flowing fresh waters, originating as springs, flushes and rills which may feed into larger watercourses, or associated with tarns and lakes, are detailed in the Fens chapter. Limestone pavements are detailed in the Non-montane rock chapter. Blanket bog is a widespread upland habitat type and most uplands also support various soligenous mires; these habitat types are covered by the Bogs chapter. Some upland areas, mainly in Scotland, have escaped the almost total deforestation of the past and have variously sized expanses of native, semi-natural woodland on their lower slopes, albeit mostly well below the altitudinal limit.

1.5 In practice, the lower limits of upland sites are most usually defined by the boundary walls, fences or hedges of the uppermost enclosed fields of hill farms. In England, for example, this is generally around the 250-300m contour and within the Moorland Line. Although the distinction between upland and lowland is useful, it is arbitrary and cannot be expressed by any single altitudinal level applicable across Britain, for it has a latitudinal and exposure component. The gradual descent of the lower limits of the sub-montane zone of the uplands (as defined above) in a north-westerly direction is, indeed, an important gradient of climatically induced variation which the national SSSI series seeks to represent. Transitional vegetation communities between upland/northern and lowland/southern types are also of much interest. Under the extreme cool oceanic climate of the north and west Highlands of Scotland, the lower agricultural zone is extinguished altogether in places, and the uplands become continuous with the coastlands. Where extensive commercial afforestation of sub-alpine uplands has occurred, as in so many areas (e.g. Dumfries and Galloway), there is now an artificially lower limit of agriculture, and such truncation tends to reduce appreciably the nature conservation value of the massifs concerned (e.g. Ratcliffe 2007).

1.6 For practical reasons of site definition, it has been necessary to deal with uplands as geographical/topographical units and where appropriate to include, in the assessment of an upland unit, the evaluation of other major habitats within or contiguous with that unit. This follows the procedure in *A Nature Conservation Review* (Ratcliffe 1977) which should be consulted for a summary of the geographical and ecological diversity of upland ecosystems (Vol. 1, pages 312-329) and for a discussion of the definition of the lower limits of the upland formation (Vol. 1, pages 22-23 and 288-289). The National Vegetation Classification (NVC) makes no specific distinction between upland and lowland types but classifies plant communities purely on floristic affinities, so that, for example, all dwarf shrub heaths (Rodwell 1991a) or all calcicolous grasslands (Rodwell 1992) are grouped together, regardless of geographical or altitudinal distribution. It should be noted however, that some NVC types are more typical of, or in some cases restricted to, the uplands or lowlands. This does not present a problem provided it is recalled that the reference classification for upland plant communities is distributed across a wide range of vegetation types (see Appendices 1 and 2).

2 International importance

2.1 The hyperoceanic climate of Britain at the western Atlantic edge of the European continent, combined with historically widespread human impact, has produced a distinctive landscape and range of ecosystems, which are not closely replicated anywhere in the world. There is an unusually wide range of podzolic soils, grading into blanket peat which in Britain has one of its most extensive world occurrences (see Lindsay *et.al.* 1988). The upland biological features listed below are particularly important. For reviews see Ratcliffe and Thompson (1988), Averis *et al.* (2004) and Woods and Coppins (2012). Reference has also been made to other SSSI Selection

Guideline chapters. Details of the NVC types are given in Rodwell (1991a, 1991b, 1992), Averis *et al.* (2004) and Appendices 1 and 2.

2.2 Acidophilous dwarf shrub heath and scrub

These include not only sub-montane types dominated by *Calluna vulgaris, Vaccinium myrtillus* and *Ulex* spp. (NVC types H4, H8, H9, H10, H12, H16, H18, H21 and W23), but also montane types with a wider range of ericoids (H13, H14, H15, H17, H19, H20 and H22). Thompson *et al.* (1995) and Averis *et al.* (2004) provide further details.

2.3 Acidic and calcicolous grassland

Both sub-montane and montane grassland types are dominated by species of wide distribution, but their occurrence as widespread communities (NVC types U1, U2, U3, U4, U5, U6, U7, U16, U17c, U20, CG9, CG10, CG11, CG12, CG13, CG14, and M25b) is often limited to Britain and Ireland (Proctor 2013).

2.4 Fern and bryophyte-rich vegetation

Many upland plant communities are rich in ferns and there are distinctive scree types (NVC types U18, U19, U21, U22 and U23). The presence of a bryophyte layer, usually dominated by mosses, is characteristic of many heaths, but in the western Highlands there is a very local community in which this layer beneath dwarf shrubs is dominated by leafy liverworts (H21b) – a type arguably unique in the world (Ratcliffe 1968; Hobbs 1988). The extent of montane moss heaths dominated by *Racomitrium lanuginosum* and *Rhytidiadelphus loreus* is also a globally rare feature (U10, U13 and H20). Alpine plant communities generally represent southern and oceanic outliers of Arctic-Alpine fell-field and mountain tundra; and are especially important in the Scottish Highlands. Though these communities cover only a small area compared with the main continental occurrences, they show considerable diversity and some communities contain distinctive oceanic facies (H19, U8, U9, U11, U12 and U14). Additional information is given in the Bryophytes SSSI Selection Guidelines (Bosanquet *et al.* 2018; see also Orange 2009 and Sanderson *et al.* 2018).

2.5 Mires

Blanket (ombrotrophic) bog, soligenous mire, topogenous mire and wet heath communities (NVC types M1, M2, M3, M4, M6, M7, M8, M9, M10, M11, M12, M15, M16, M17, M18, M19, M20, M21, M22, M23, M25 and M26) are included here. Additional information is given in the Bogs SSSI Selection Guidelines and Fens SSSI Selection Guidelines.

2.6 Phytogeographical interest

In addition to the uniqueness in floristic composition of many upland plant communities, there are unusual combinations of species representing different geographical elements of flora – Arctic-Alpine, Arctic, Alpine, Southern Atlantic, Mediterranean, Northern Continental, Southern Continental, etc. (Matthews 1955).

2.7 Ornithological features

These include large and important populations of some species (e.g. Golden eagle *aquila chrysaetos*, White-tailed eagle *Haliaeetus albicilla* and Peregrine falcon *Falco peregrinus*), high breeding densities (e.g. Common raven *Corvus corax*, Common buzzard *Buteo buteo* and Rock ptarmigan *Lagopus muta*), Red Grouse *Lagopus scotica*, and European golden plover *Pluvialis apricaria*), specific ecological adaptations (Greenshank *Tringa nebularia* and Wood sandpiper *Tringa glareola*) and southern tundra assemblages (notably in the Flow Country and on extensive mountain plateaux). Additional information is given in the Birds SSSI Selection Guidelines (Drewitt *et al.* 2023).

2.8 Other faunal features

Invertebrates. The invertebrate communities are in general less well studied than their lowland counterparts. There are recognisably distinct communities, but their monitoring or study is challenging (e.g. Hewitt 2017). Some species, e.g. Mountain ringlet *Erebia epiphron*, have a limited distribution, the reasons for which are currently not understood (Ewing *et al*. 2020). Additional information is given in the Invertebrates SSSI Selection Guidelines (Curson *et al.* 2019).

Mammals. The uplands are important for species such as Mountain hare *Lepus timidus* (Capreolus Wildlife Consultancy 2005; McGuire and Morse 2020), in addition to being refugia for other mammal species such as Water vole *Arvicola amphibius* (Yalden 2009; Mathews *et al.* 2018). Additional information is given in the Mammals SSSI Selection Guidelines (Walsh *et al.* 2022).

Amphibians and reptiles. Although not well studied, the uplands can host important numbers of some species (e.g. Adder *Vipera berus*, Common toad *Bufo bufo* and Palmate newt *Lissotriton helveticus*). Additional information is given in the Amphibians and Reptiles SSSI Guidelines (Bernhard *et al.* 2022).

2.9 There are four primary nature conservation designations in the uplands: SSSIs, Ramsar Sites, Special Protection Areas and Special Areas of Conservation. The latter two designations stem from EU legislation and identify species and habitats that are of European importance. Appendix 1 shows which upland habitats this applies to by way of their inclusion on Annex I of the EU Habitats Directive. Ramsar Sites are wetlands of international importance. Usually, the designation of SSSI status will have taken place prior to any international classification.

3 Selection requirements

3.1 The overall requirement is that sites are selected which adequately represent the variety and extent of upland habitats, flora and fauna present within each Area of Search (AoS) as defined for each individual country (e.g. this is done by National Character Areas in England), and thus within Britain as a whole (Bainbridge *et al.* 2013). For some habitats, it is appropriate to select several of the best remaining examples in each area, especially where these are localised (e.g. south of the Scottish Highlands). In regions with a wide range of upland features, the following habitats are characteristically present:

- Dwarf shrub heath, dry to wet
- Grassland, dry to wet
- Moss and lichen heath (both fell-field and snow-bed types)
- Minerotrophic mires (soligenous and topogenous), springs, rills and flushes, and swamps
- Ombrogenous mires (blanket bog and raised mire)
- Crags, screes and boulder-fields
- Rivers
- Lakes and tarns
- Woodland and scrub (including willow, juniper and temperate rainforest)

3.2 All variants of these habitats that are present, including alpine and sub-alpine types, must be represented across the selected sites, as well as the strictly alpine late snowbeds, fell-fields and solifluction and ablation features. All except the blanket bogs also have a range of types according to varying soil base status, from acidic to calcareous, and this range of variation must also be represented. Other geological differences, reflected in soils and vegetation, within the ranges of both acidic rocks (gritstone, granite, rhyolite, quartzite, etc.) and basic rocks (dolerite, gabbro, peridotite, serpentine, etc.), need to be represented.

3.3 The general range of variation in upland habitats within an AoS must be determined by survey. While there will always be local climatic gradients and variations, especially according to altitude, the major climatic differences (in comparing similar situations) will be between and not within AoS, and these main geographical gradients and their ecological expression are covered by the overall guiding principle of establishing an ecological coherent national network of sites (see section 2 in Bainbridge *et al.* 2013). Nevertheless, in some parts of Britain there are fairly steep regional gradients of climate, especially in an east-to-west direction, and, where these produce clear vegetational differences between different upland areas within an AoS, they should be represented by the selection of separate sites to represent such variation. Major differences in vegetation within the uplands of any one AoS are, nevertheless, related mainly to geology and topography. **The primary choice is, thus; to select areas representing those main geological formations which appear to account for significant ecological variability between upland massifs within the AoS.** This does not necessarily mean that all the main formations must be represented as a matter of course; for example, the greywackes and shales of the Ordovician Series often give very similar ecological conditions to the comparable rocks of the Silurian. It is more important to be aware of pedogenically important differences in petrology within rocks of similar age, for example between the calcareous mica-schists and the acidic granulites and gneisses of the Moine Series.

3.4 In assessing these geologically determined ecological differences between uplands, there are three major kinds of variation to consider:

- differences in physiographic and especially glacial history, which can result in large topographic differences;
- physical differences in rock types, especially the weathering properties of rocks, which give rise to differences in topography, permeability of soils and development of erosion and solifluction features; and
- chemical differences in rock types, especially those affecting the base-status (notably Calcium ions, Ca^{2+}) of the derived soils and drainage waters which is reflected in vegetation composition and land-use history (McVean and Ratcliffe 1962; Ratcliffe and Thompson 1988; Averis *et al.* 2004).

3.5 In the most mountainous AoS, the selection of sites usually includes at least one of the highest massifs, because these have the greatest development of alpine and sub-alpine habitats. It may be that a single area can be identified which contains a good range of variation in most of the important upland habitat types present within an AoS. More usually, the best examples of various major features will occur in separate massifs, so that their representation will require choice of more than one upland area. The steep mountain terrain with an abundance of open rock habitats tends to occur in different areas from the gentle, heathery dry heath grouse moors and extensive blanket bogs. Important areas of calcareous rocks may be well separated from the best acidic mountains. The best alpine areas do not always adjoin the best sub-alpine ground. Ornithological interest may not always coincide with that for botanical features, and so on.

3.6 In fact, a single massif rarely contains all the distinctive features, and certainly not all the best examples, in an AoS with extensive occurrence of uplands. **It is therefore necessary to build up a suite of sites for each AoS according to the amount of ecological variety present and how it is distributed.** So much depends on the extent of upland habitats and their variability that more precise guidance is difficult, but the aim should be to select sites sufficient in both number and extent to represent the best examples of the main features listed above, in so far as they are present within an AoS. There is a presumption that AoS with the most extensive occurrence of uplands will require the largest representation of sites, in both number and extent.

3.7 Both the exemplary site principle and the critical standard principle guide the choice of site selection (see section 4.6 in Bainbridge *et al.* 2013). For many of the widespread upland habitats, it may be sufficient that the best example (exemplary site) within an AoS is represented, with their extent determined by the choice of the appropriate topographic unit for the site as a whole. Vegetation types of wide ecological amplitude (i.e. those that are tolerant of a range of environmental conditions) may, however, receive multiple representation when several sites are selected to represent the range of upland habitats within an AoS: this is appropriate for reasons discussed in 3.4 above. For rare and specialised features, and particularly for those habitats which occur only within one or a few AoS, single examples will not be enough and larger representation should be sought. For rare or highly localised features or those of outstanding international importance, the selection of all examples above a given quality should apply.

3.8 For the following **rare habitats**, the critical standard principle should be applied as there should be a presumption in favour of selecting all good examples determined by their extent and the presence of key features, components and supporting processes that are special to the particular habitat (see section 5 in Bainbridge *et al.* 2013):

- Calcareous habitats forming notable montane plant refugia (cliffs, screes, grasslands, marshes and flushes) (NVC types CG9, CG10, CG11, CG12, M8, M9, M10, M11, M12, U14, U15 and U17)
- Calcicolous heaths of mixed dwarf shrubs and herbs (including *Dryas octopetala* and species-rich *Calluna vulgaris* heaths) (NVC types CG13, CG14, H10d and H16a)
- Limestone pavements (see the Non-montane rock SSSI Selection Guidelines for details)
- Serpentine habitats including open rock and closed heath
- Ungrazed ledge vegetation (willow scrub, tall herbs and ferns) (NVC types U16, U17, U19, U24 and W20) – note though that ecologically these habitats are not confined to ledges
- Hepatic-rich dwarf shrub heath (NVC type H21b) (see paragraph 2.4)

3.9 Some habitats have an extremely localised distribution but can be fairly extensive within their range (e.g. some communities of late snow-beds in the Scottish Highlands). For these, representation should lie somewhere between one and every example within an AoS: up to five of the best examples will often be appropriate, but this may sometimes be increased. Published descriptions in McVean and Ratcliffe (1962) and those available in the Rodwell (1991a, 1991b, 1992, 1995) and Averis *et al.* (2004) indicate distribution and size range of types against which to judge selection needs, but the opinion of habitat specialists should be sought. The following vegetation types belong to this category and any others becoming rare through land-use impacts should be added:

- Montane dwarf shrub heaths (examples particularly rich in *Arctostaphylos uva-ursi*, *Arctostaphylos alpinus*, *Loiseleuria procumbens*, *Salix herbacea* and *Juniperus communis* ssp. *Nana*) (NVC types H13, H14, H15, H17 and H19)
- Lichen heaths (NVC types H13 and H19 – stands with abundant lichens)
- Moss heaths (NVC types U10, U13 and H20), including:
  - Species-poor *Racomitrium lanuginosum* (extensive areas in the Highlands, any remaining area south of the Highlands) (U10a, U10b, and H20)
  - Species-rich *Racomitrium lanuginosum* (U10c)
  - *Rhytidiadelphus - Hylocomium* (U13)
- Montane fell-fields and patterned ground (*Juncus trifidus* and dwarf herb communities) (NVC type CG12 and U9)
- Late snow-bed communities (*Sibbaldia procumbens*, *Salix herbacea*, *Dicranum starkei* and *Cryptogramma crispa-Athyrium alpestre*) (NVC types U11, U12, U14 and U18)
- Complexes of montane springs, rills and flushes
- Several plant communities may be relatively common in some areas but are rare or absent from others; where this is the case, these communities should be given special consideration (NVC types H4, H8, H10, H12, H19, H21a, H22a, U13, U16, U17, CG11, M10, M11, S9, S10 and S27)

4 Boundary definition: topographic units, minimum size and site integrity

4.1 Since upland ecosystems usually extend continuously over large tracts of country, sites are seldom self-defined in the manner of those representing habitats which now exist as fragmented ‘islands’ in the lowlands. The definition of boundaries is thus a most crucial part of the identification and selection of upland sites, and this will include the consideration of where the separation of upland and lowland takes place (see Section 1.5 above). This raises questions about the appropriate size of each site and the extent of its component features. **Areas must be large enough to give adequate representation of the important features** which they intend to conserve. The general principles to be considered and followed in the delineation of upland site boundaries are set out in the following sections. Consideration of blanket bog is covered in the Bogs SSSI Guidelines.

4.2 Most mountain massifs have a common topographic structure consisting of a main summit, upper slopes and shoulders, subsidiary summits, spurs, lower slopes and drainage streams. There is also a range of aspects, reflecting varying exposure to sun and wind, which becomes more pronounced with increasing steepness of slope. Variation within, as well as between, massifs arises from differences in altitude, aspect, exposure, steepness and the influence of the presence and extent of crags, screes, ridges, hollows, lakes and other topographic structures, of which the biological features are a product. High and heavily glaciated mountains tend to have the greatest variety of these geological/topographic features. Yet even low-lying areas of the uplands often have a variety of terrain, producing wide differences in ground wetness and hence the presence and depth of peat, and in the case of standing water bodies, ranging from small pools to large lakes.

4.3 The aim should be to **select a topographic unit** as complete as possible to take account of these physical features, so that it runs from the highest to the lowest feasible elevation, in relation to all directional aspects. Ideally, this means representing all the different catchments which drain from the main watershed, down to the point at which open hill ground changes to enclosed land or plantation woodland. This may justify inclusion of areas that may not in themselves be interest features, but which are integral to the maintenance of the site. For example, consideration should be given to selecting the whole ecological/hydrological unit to ensure the site is coherent (see also sections 8.2 and 8.5 in Bainbridge *et al.* 2013); this is especially important for blanket bog habitat. The walls, fences or hedges forming the edges of these contrasting habitats often make appropriate boundaries, but stream and river courses, lake margins or roads sometimes best delimit part of a site (Figure 1). High watersheds should preferably not be used as boundaries. They produce very artificial limits to an upland site, effectively reducing it to an inadequate segment of the full massif and especially curtailing the extent of the summit habitats, communities and species which are usually amongst the most important but most restricted features. In an extensive massif, a relatively high-level boundary may, however, be necessary for part of the site if the ideal boundary would include incursions, e.g. of forestry (Figure 1), though the potential value of such areas should be considered as described in section 5.12 on potential value in Bainbridge *et al.* (2013). In coastal massifs, where there is continuity between upland and maritime habitats, the site boundary may be best defined, at least in part, by the seashore, see also 6.1 in Bainbridge *et al*. (2013).

4.4 The use of transects or vertical belts and slices to delineate upland SSSIs will not suffice. Such a procedure gives a wholly artificial character to the site, omits the full pattern of relationships among the different physical and biological site features, and tends to exclude many of the important site attributes. It also puts the viability of many animal species at risk, especially the more mobile which need to cover a large area. Each pair of the larger predators may need an area of a few thousand hectares to support it, and species such as the Golden eagle, Merlin *Falco columbarius* and Hen harrier *Circus cyaneus* are especially vulnerable to habitat fragmentation. Some birds, such as Twite *Carduelis flavirostris*, Golden plover and Greenshank, also feed in one habitat but breed in another, often some distance apart, including more intensively managed land below the limit of enclosure.

4.5 The **ecological complexity that needs to be represented** within a single site can be illustrated through the example of a widespread plant community, such as dry heath. Across the British uplands, there are 15 distinct heath communities in which heather *Calluna vulgaris* is a conspicuous component (Rodwell *et al*. 1991a; Averis *et al*. 2004). The variation in form and floristic composition accords with aspect, geology and altitude within a single massif and usually also shows a series of growth stages resulting from disturbance, including anthropogenic management (e.g. Usher and Thompson 1993; Thompson *et al.* 1995). Its full range of flora and fauna depends on this ecological diversity, which changes both spatially and over time. Golden plover will, for instance, only nest on dry heath when the heather height is fairly short. The population sizes of the associated bird species may reflect the extent and intensity of management of the dry heath. Red grouse numbers, for example, can be affected by heather management, but current distribution of this and many other upland bird species demonstrates a dependency upon the habitat even in the absence of human intervention.

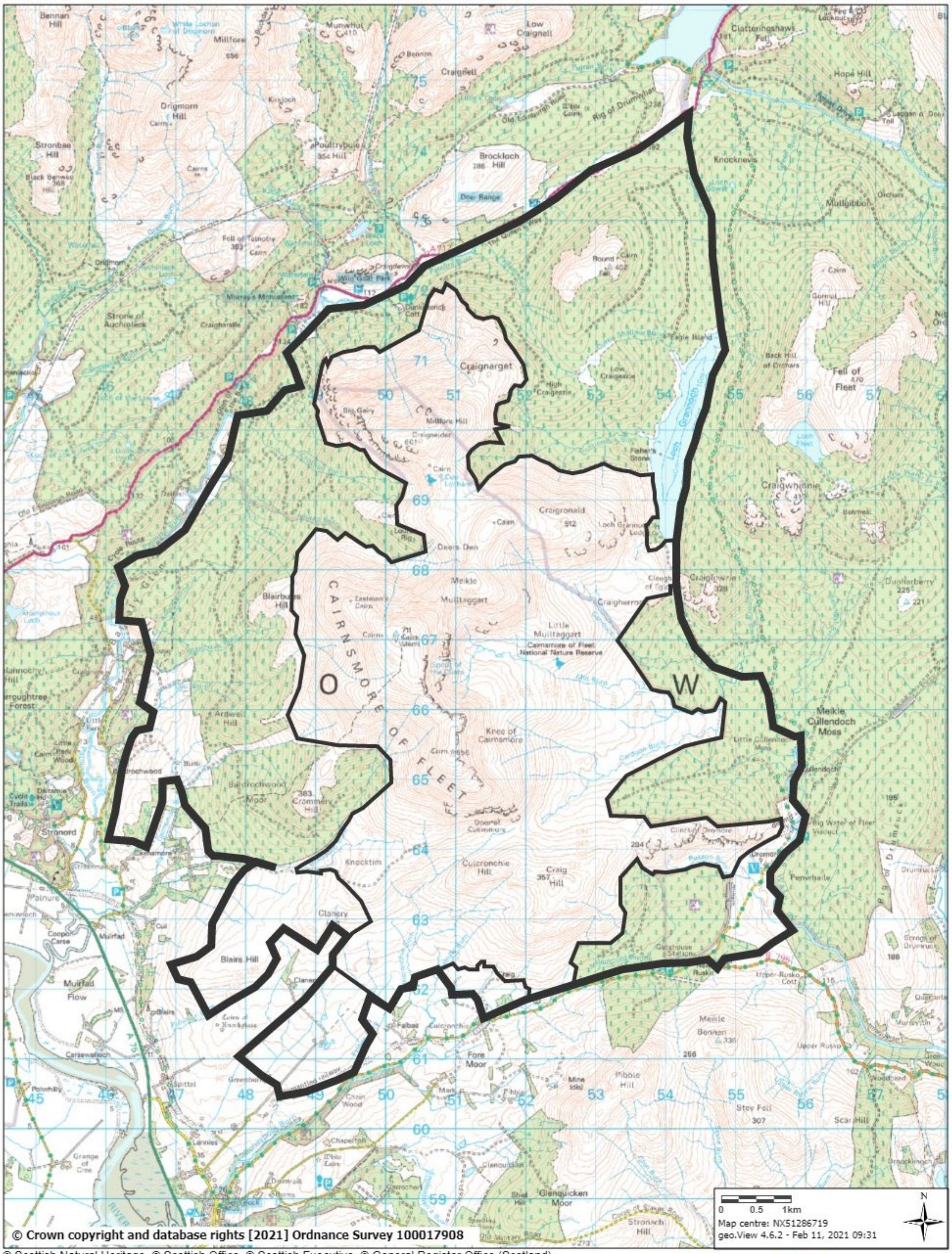

Figure 1. Example of the selection of a topographic unit (see paragraph 4.3). The map of Cairnsmore of Fleet, Galloway, shows (thicker line) what might have been an ideal SSSI boundary based upon the whole massif, following rivers, roads, limits of enclosed land, etc., and the much less satisfactory boundary finally notified (thinner line), which was greatly influenced by the intrusion of large blocks of conifer plantations.

4.6 Within a single massif, there are a range of upland habitats that are not classified as dry heath that have heather as a component. An example is wet heath that can occur in association with carpets of *Sphagnum* and, on wetter, steep, shaded slopes, an abundance of liverworts. As altitude and exposure increases, so does the abundance of lichens along with development of a more prostrate sward where other plant species become more dominant especially on base-rich soils; these are montane heaths that can occur above the limit of typical human management intervention (e.g. drainage, burning, cutting or liming) though grazing may still occur. Dry and especially wet heath vegetation communities give way to blanket bog on the wettest ground, to flushes where seepage water comes to the surface, to snow-bed communities in sheltered hollows, to moss and lichen heaths on high exposed tops, and to grasslands on base-rich soils. Some of these variations and transitions are encountered only on different massifs or even in different districts, but the representation of the range of communities and of the totality of their relationships even within a single massif usually requires selection of a large upland area.

4.7 The selection objective is to **represent within each upland site the range of recorded features in their particular dynamic and spatial relationships and processes**. Selection of topographic units is the best way of achieving this and also ensures that proportional areas of the different habitats are appropriately represented. For instance, except where afforestation or agricultural intensification has removed large areas, the sub-alpine zone will usually occupy a far more extensive area than the alpine zone. While the sub-alpine zone may sometimes be considered to contain only large areas of widespread vegetation types, most of these are confined to Britain and Ireland (see paragraph 2.3) and are crucially important as the primary habitat for many of the vertebrate animal populations. Whenever possible, the important and varied relationship between these two zones should be represented by the continuity which exists within a single site. The topographic unit expresses the completeness of this range of habitats, communities and species and their relationships, but it is a concept best appreciated on the ground or from a map (Figure 1).

4.8 It is important that **sites are ecologically coherent and that potential value is also considered**. Guidance on this is given in sections 5.11 and 5.12 in Bainbridge *et al.* (2013). Thus sites which contribute to ecological networks may be ascribed preference to equivalent sites which are ecologically isolated. In a changing climate, it will also be necessary to consider the role of dynamism within habitats. For example, the maintenance or restoration of a dynamic, semi-natural habitat that has developed from woodland in response to anthropogenic activity, should consider natural dynamism and the role of woodland or scrub in increasing habitat diversity.

4.9 There are, nevertheless, **situations in which selection of an upland topographic unit is inappropriate**. This applies especially where there has been substantial encroachment on the lower slopes of an upland area by intensive agriculture or afforestation, but where the remaining natural and semi-natural habitats above this enclosed ground retain a high interest or are the only good examples within the AoS. This can include a site that is in poorer condition that the rest, but it contributes strongly to the overall interest. This could apply to safeguarding a suite of high-quality sites and recognising that movement between them is important. Anticipating the effects of climate change on habitat persistence can also be considered. Another example is where the interest lies mainly in cliff and scree vegetation and these habitats are located within areas where the surrounding land has vegetation of much lower nature conservation value (e.g. species-poor *Nardus* grassland) which is adequately represented within other sites chosen as topographic units. In these situations, boundary determination will be a matter of taking each case on its own merits. Conversely, there may be some areas, especially with ornithological interest, where it will be desirable to include within a site some of the enclosed land lying below the upland boundary and consisting of grassland, mire or even woodland. In such cases, the selection of appropriate areas and boundaries should be considered with references to the relevant chapter of these Guidelines in addition to consultation with the appropriate Statutory Conservation Body specialists. The land that sits along the interface of the enclosed and unenclosed boundary is often of considerable importance for certain species-groups, especially of animals; and for some it is the 'hill-edge' juxtaposition between the enclosed and unenclosed land which is important (Milsom *et al*. 2003), the two types both being essential segments of a home range (e.g. Twite, Black grouse *Lyrurus tetrix*, Golden plover). In Wales this is the *ffridd*, increasingly recognised as a valuable entity in its own right, where it is the mosaic of heath, grass, scrub, flush, bracken and scattered trees that is important for species such as Ring ouzel *Turdus torquatus* and Whinchat *Saxicola rubetra,* in addition to those listed above. Where these land types are recognised components of the upland ecosystem being considered, they should be included within the notified area.

4.10 When all these factors are considered, the desirable **minimum size** for an upland site, based on selection of a topographic unit, will often be of the order of several thousand hectares, though some isolated, compact or especially steep massifs or those with special but localised geological features may be smaller. Sites in other situations where it is not appropriate to select topographic units will also tend to be smaller. Other sites, with more massive mountain landforms or more varied geology or with important features spread over a large area, need to be larger still.

4.11 Once an upland site is thus delineated, it is considered to have a completeness or **integrity** which should be defended against damaging operations and the process of fragmentation, as described in section 8.1 of Bainbridge *et al.* (2013). Many sites are also likely to require restoration of natural function and ecosystem processes (e.g. Mainstone *et al.* 2018).

4.12 Designation of SSSIs requires accurate and robust data. On occasion, this data may be subject to challenge. When commissioning surveys to identify the presence and distribution of interest features, the following principles should be adhered to:

a) the survey should be at a time of year that is appropriate to identify the species and vegetation communities;

b) mapping should use the best available technologies for accurately recording the extent of the interest;

c) vegetation should be mapped at an appropriate scale depending on the minimum mapping unit – for example, sites were mapped using the NVC at 1:5000 for the Lowland Grassland Survey of Wales (Stevens *et al.* 2010), whilst the Lowland Peatland Survey of Wales (Bosanquet *et al.* 2013) was mapped at 1:2500 – small-scale habitats, such as localised flushes, springs, snow-beds and bog-pools, may be captured best using target notes (Rodwell 2006);

d) the description of communities should be supported by species lists, including their abundance, distribution maps, including the location of rare or distinctive species and communities, and appropriate supporting statistical analysis;

e) consideration needs to be given to the age of surveys, especially where habitats are dynamic or subject to considerable anthropogenic interventions, so that information is relevant and robust;

f) use of NVC survey methodology as detailed in Rodwell (2006) – note that whilst the NVC does not describe the full range of variation within vegetation communities, this does not mean these communities are not of value, and some may indicate valuable local peculiarities.

5 Total extent of upland SSSIs

5.1 The combined extent of upland habitats within SSSIs, as a proportion of the total area remaining, will vary between AoS because of geographical differences in occurrence of the especially important features. Because they represent some of the last large expanses of semi-natural and natural habitat in Britain, the uplands as a whole have a particularly high value for nature conservation. Despite still being extensive, some upland habitats are highly vulnerable to further loss, deterioration or modification, and outside SSSIs their long-term survival is at best uncertain. The pressure for development of hill land is substantial for forestry, recreation and renewable energy. Outwith SSSIs, all uplands are at considerable risk of declining in nature conservation interest through change or intensification of land-use. This does not mean that all the other remaining uplands are going to be rapidly transformed; substantial areas will no doubt remain relatively unchanged into the foreseeable future. The worst-case scenario is that sites which are protected will become ‘island refugia’. While there should be consideration of nature networks and natural capital in determining what developments or land management are appropriate in the upland landscape context, there should also be consideration of the contribution that a selected site can make to such networks.

5.2 Another factor relevant to upland site selection is that, although the wildlife includes so many important animal species, their populations are often thinly scattered in comparison, for instance, with those of coastal habitats, so that relatively large areas are necessary to support a reasonable population of many species.

5.3 Only a few upland birds are so rare or localised (e.g. Snow bunting *Plectrophenax nivalis* and Whimbrel *Numenius phaeopus*) that most of their breeding populations can be contained within a few sites. For the rest, including those species for which Britain has an international conservation obligation (see Drewitt *et al.* 2023), both a considerable number and a substantial extent of sites are necessary to safeguard even as much as a quarter of their populations (Thompson *et al.* 1988).

5.4 Upland sites should be selected in both variety and total extent to adequately represent the various features of international importance (see section 2). In most instances, this need will be satisfied by taking account of the guidance given here; the international factors then reinforce the justification for site selection. These guidelines cannot cover all eventualities and any queries arising from their application should be referred to the relevant Statutory Conservation Body specialists.

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7 Glossary

Acidophilous – a plant or other organism growing relatively well in an acidic environment

Alpine zone – in the UK, the area above the tree line

Calcicolous – soils or limestone bedrock with pH in the range 6.5 to 8.5

Ericoids – a member of, or related to, the family Ericaceae

Hepatic-rich – liverwort-rich oceanic heaths

Hyperoceanic – a climate that has a very small difference between the mean temperatures of the warmest and coldest months of the year (typically less than ten degrees centigrade); cool, wet and windy

Lower sub-alpine and higher sub-alpine zones – the area just below the tree line

Mineotrophic – refers to environments that receive nutrients primarily through groundwater flowing through mineral-rich soils or rock, or surface water flowing over land

Ombrotrophic – soils or vegetation that receive their water entirely from precipitation

Pedogenically – relates to the formation or evolution of soil (pedogenesis)

Petrology – the branch of geology concerned with the compositions, structures, and origins of rocks

Phytogeopgraphical – relates the geographical distribution of plant species

Rupestral mosses – growing on rocks or cliffs

Rill – a small stream; tends to trickle (formed through erosion of topsoil on hillsides)

Soligenous mire – a mire that receives water from both rain and slope run-off

Solifluction – the gradual movement of material down slope, especially where frozen subsoil acts as a barrier to the percolation of water; and **ablation** – the process by which snow and ice are lost from the surface of a glacier; can occur through melting or sublimation (snow and ice changing into water vapour)

Topogenous – mires with a virtually flat water table, located in terrain basins with or without inlets and outlets

Appendix 1. Upland feature/habitat type correspondence table

The table below is partly based on the Common Standards Monitoring (CSM) guidance for upland habitats (JNCC 2009), which is used to assess the condition of SSSI habitat features. Details of the National Vegetation Classification (NVC) types are given in Rodwell (1991a, 1991b, 1992, 1995, 2000); Averis *et al.* (2004) also provide useful accounts of upland NVC (and other vegetation) types, together with distribution maps and a dichotomous key. Strachan (2017) provides correspondence tables for Scotland for SSSI habitat features, the EUNIS (European Nature Information System) classification (including EU Habitats Directive Annex I types), and NVC, UK Biodiversity Action Plan Priority Habitat and JNCC Phase 1 habitat types. The table takes account of planned updates to the JNCC Resource Hub spreadsheet of habitat correspondences, though some further minor changes may occur to the relationships between the EU Habitats Directive Annex I habitats and NVC types.

CSM Monitoring guidance feature	CSM Reporting category	EU Habitats Directive Annex I types (* = part only)	NVC types (* = part only)	Birks & Ratcliffe (1980) types (* = part only)
Acid grassland (upland)	Acid grassland	None	U2*, U3*, U4*, U5, U6	C1a, C1b, C1c, C2a, C2c, C3
Alkaline fen (upland, excluding alpine pioneer)	Fen, marsh and swamp	H7230 Alkaline fens*	M9a, M10*, M11*, M13	H3f, H3g*, H4*, I1a, I1b
Alpine dwarf-shrub heath	Montane habitats	H4060 Alpine and Boreal heaths*	H13, H14, H15, H17, H19, H20, H22*	B2 (all subtypes), B3b, B3e, B3f, E1d
Alpine flush	Fen, marsh and swamp	H7240 Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*	M10* (with arctic-alpine element), M11*, M12, M34*	H3i, H3j, I1c
Alpine summit communities of moss, sedge and three-leaved rush	Montane habitats	H6150 Siliceous alpine and boreal grasslands	U7*, U8*, U9, U10, U11*, U12, U14*	C2b*, C6, C7, E3AS, E1a, E1b, E1c, E1e, E3
Blanket bog and valley bog (upland)	Bogs	H7130 Blanket bogs; H7140 Transition mires and quaking bogs*; H7150 Depressions on peat substrates of the *Rhynchosporion**	M1*, M2*, M3*, M17*, M18*, M19*, M20, M21; and when on deep peat H9, H12, M15, M16, M25, U6	G1, G4, G5, H4*; and when on deep peat G2, G3, C4a, C4c, B1a, C3

CSM Monitoring guidance feature	**CSM Reporting category**	**EU Habitats Directive Annex I types (* = part only)**	**NVC types (* = part only)**	**Birks & Ratcliffe (1980) types (* = part only)**
Calaminarian grassland and serpentine heath (upland)	Various	H6130 Calaminarian grasslands of the *Violetalia calaminariae**	OV37 and various others (not fully covered by the NVC)	C1e (in some situations)
Calcareous grassland (upland)	Calcareous grassland	H6170 Alpine and subalpine calcareous grasslands; H6230 Species-rich *Nardus* grassland, on siliceous substrates in mountain areas*; H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)*	CG9*, CG10*, CG11, CG12, CG13*, CG14, U4* (species-rich types with tall herbs), U5c	B4 (all subtypes), C1d, C1e, C1f, C1g, C2c, D3 (all subtypes)
Calcareous rocky slope	Inland rock	H8210 Calcareous rocky slopes with chasmophytic vegetation	OV39*, OV40* and other types not described by the NVC	D4
Calcareous scree	Inland rock	H8120 Calcareous and calcshist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)	OV38*, OV40*; plus CG14 and various other NVC types and types not covered by the NVC that occur in fragmentary form where the scree is more stable	No specific corresponding types
Fellfield	Montane habitats	H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)*	No communities described	No specific corresponding types
Fern-dominated snowbed	Montane habitats	H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)*	U18*	D2b

CSM Monitoring guidance feature	CSM Reporting category	EU Habitats Directive Annex I types (* = part only)	NVC types (* = part only)	Birks & Ratcliffe (1980) types (* = part only)
Juniper heath and scrub (upland)	Coniferous woodland/ Broadleaved, mixed and yew woodland	H5130 *Juniperus communis* formations on heaths or calcareous grasslands*	W19*, plus other heath and grassland NVC types where non-prostrate juniper is abundant and frequent	A1
Limestone pavement	Inland rock	H8240 Limestone pavements	OV38*, OV39*, OV40*, CG9*, CG10*, CG13*, various woodland/scrub types on wooded pavements	D4, C1e, C1g, J3
Mire grasslands and rush pastures (upland)	Fen, marsh and swamp	None	M23* (reasonably species-rich upland stands, mainly M23a), M25*, M26	C4, H1*, H2c
Montane willow scrub	Montane habitats	H4080 Sub-Arctic *Salix* spp. Scrub	W20	A2
Moss, dwarf-herb, and grass-dominated snow-bed	Montane habitats	None	U7*, U8*, U11*, U12*, U13, U14*	C2b*, C5a, E3AS, E2, E3
Short-sedge acidic fen (upland)	Fen, marsh and swamp	H7140 Transition mires and quaking bogs*	M4*, M5*, M6	H2a, H2b, H3b, H3c*
Siliceous rocky slopes	Inland rock	H8220 Siliceous rocky slopes with chasmophytic vegetation	U18*, U21* and various other types not covered by the NVC	No specific corresponding types
Siliceous scree	Inland rock	H8110 Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)*	U18*, U21* and various other types not covered by by the NVC	D2a, D2b
Soakway and sump (upland)	Fen, marsh and swamp	H7140 Transition mires and quaking bogs*; H7150 Depressions on peat substrates of the *Rhynchosporion**	M29*	No specific corresponding types

CSM Monitoring guidance feature	CSM Reporting category	EU Habitats Directive Annex I types (* = part only)	NVC types (* = part only)	Birks & Ratcliffe (1980) types (* = part only)
Spring-head, rill and flush (upland)	Fen, marsh and swamp	H7220 Petrifying springs with tufa formation (*Cratoneurion*)*	M7, M8*, M31, M32, M33, M34*, M35, M37, M38	H3e*, H3h, I4
Subalpine dry dwarf-shrub heath	Dwarf shrub heath	H4030 European dry heaths*; H4060 Alpine and Boreal heaths*	H4*, H8*, H9, H10*, H12*, H16, H18*, H21*, H22*	B1 (all subtypes), B3a, B3c, B3d, B3g
Tall herbs	Inland rock	H6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*	U16, U17, U19	C5b, D1, D6a, D6b, C8
Transition mire, ladder fen and quaking bog (upland)	Fen, marsh and swamp	H7140 Transition mires and quaking bogs*	M4*, M5*, M8*, M9b*, S27*	H3c*, H3e*, H3g*
Wet heath (upland)	Dwarf shrub heath	H4010 Northern Atlantic wet heaths with *Erica tetralix**	M15*, M16* (and some instances of M25 and U6, possibly H5 and M14)	G2, G3, H1*, H3a, H4*, I3
Yellow saxifrage bank	Montane habitats	None	U15	D5

Appendix 2. Synonymy of Birks & Ratcliffe's (1980) upland vegetation types and those of the National Vegetation Classification

During the 1970s and 1980s, when vegetation maps were first produced for upland SSSIs (and provisional SSSIs), the Upland Vegetation Survey adopted the classification of Birks & Ratcliffe (1980). Some additional codes (* marked with an asterisk) in common use are also included. Where applicable, codes refer to a type given in the earlier book by McVean & Ratcliffe (1962). The McVean & Ratcliffe (McV & R) association, epithet or trivial name, and page and table number follow the Birks & Ratcliffe (or other) type name. Most of the types additional to Birks & Ratcliffe's are derived from McVean & Ratcliffe. The National Vegetation Classification vegetation types are given in Rodwell (1991a, 1991b, 1992, 1995), and in some cases updates on species nomenclature are given in the relevant vegetation communities in Averis *et. al.* (2004). Some species names have been updated, e.g. *Scirpus* to *Trichophorum*, but others have been left unchanged, noting that some former names are more familiar to botanists, and others will have changed recently. The Botanical Society of Britain and Ireland provide considerable detail on 'Taxon lists' https://bsbi.org/taxon-lists. This includes a link to updates to the lists in Stace, C. (ed.) (2019) *New Flora of the British Isles* (4th edition) https://bsbi.org//wp-content/uploads/dlm_uploads/STACE-EDITION-4-CHANGES-Issue-7.pdf. The UK Species Index (UKSI) https://www.nhm.ac.uk/our-science/data/uk-species/index and the International Plant Name Index (IPNI) are excellent sources of detailed information on changes https://www.ipni.org/. For upland vegetation, Averis *et. al.* (2004) provides the most accessible accounts of vegetation types, with a key, distribution maps and landscape illustrations depicting occurrence.

High-rank categories and codes

Birks & Ratcliffe type		National Vegetation Classification type	
A	Medium-shrub communities	W	Woodlands (Rodwell 1991b)
B	Dwarf-shrub communities	H	Heaths (Rodwell 1991a)
		CG	Calcicolous grasslands (Rodwell 1992)
C	Grasslands	U	Upland communities (Rodwell 1992)
		CG	Calcicolous grasslands (Rodwell 1992)
		M	Mires (Rodwell 1991a)
D	Herb- and fern-rich communities	U	Upland communities (Rodwell 1991a)
		CG	Calcicolous grasslands (Rodwell 1992)
E	Bryophyte heaths	U	Upland communities (Rodwell 1991a)
		H	Heaths (Rodwell 1991a)
G	Blanket bogs (ombrogenous mires)	M	Mires (Rodwell 1991a)

Birks & Ratcliffe type		**National Vegetation Classification type**	
H	Flush bogs and fens (soligenous and topogenous mires)	M	Mires (Rodwell 1991a)
I	Flushes and springs	M	Mires (Rodwell 1991a)
J*	Woodlands	W	Woodlands (Rodwell 1991b)

Lower-rank categories and codes

Birks & Ratcliffe type (pp = part only)		**National Vegetation Classification type**	
A	**Medium-shrub communities**	**W**	**Woodlands**
A1	*Juniperus communis* - fern scrub *Juniperus-Thelypteris* nodum (McV & R p.25, Table 9)	**W19**	*Juniperus communis - Oxalis acetosella* woodland
A2	*Salix lapponum-Luzula sylvatica* scrub *Salix lapponum-Luzula sylvatica* nodum Montane willow scrub (McV & R p.26, Table 10)	**W20**	*Salix lapponum - Luzula sylvatica* scrub
A3	*Salix aurita* scrub	**W1** **W7**	*Salix cinerea - Galium palustre* woodland *Alnus glutinosa - Fraxinus excelsior - Lysimachia nemorum* woodland **c** *Deschampsia cespitos*a sub-community
A4*	*Ulex europaeus* scrub	**W23**	*Ulex europaeus - Rubus fruticosus* agg. scrub
B	**Dwarf-shrub communities**	**H** **CG**	**Heaths** **Calcicolous grasslands**
B1	Sub-montane *Calluna vulgaris* heaths	**H9**, **H10**, **H12**, **H16**, **H21**	

B1	**a**	*Calluna* dry heath Callunetum vulgaris Dry heather moor (McV & R p.28, Table 11)	**H9**	*Calluna vulgaris - Deschampsia flexuosa heath* **a** *Hypnum cupressiforme* sub-community **b** *Vaccinium myrtillus - Cladonia* spp. sub-community **c** Species-poor sub-community **d** *Galium saxatile* sub-community **e** *Molinia caerulea* sub-community
			H10	*Calluna vulgaris - Erica cinerea* heath **a** Typical sub-community **b** *Racomitrium lanuginosum* sub-community **c** *Festuca ovina - Anthoxanthum odoratum* sub-community
			H12	*Calluna vulgaris - Vaccinium myrtillus* heath **a** *Calluna vulgaris* sub-community **b** Vaccinium *vitis-idaea - Cladonia impexa* sub-community **c** *Galium saxatile - Festuca ovina* sub-community
B1	**b**	*Calluna vulgaris-Sphagnum* damp heath Vaccineto-Callunetum, suecicosum facies (McV & R p.31, Table 13) *Calluna vulgaris-Sphagnum* damp heath *sensu.* Upland Survey	**H22**	*Vaccinium myrtillus - Rubus chamaemorus* heath **a** *Polytrichum commune - Galium saxatile* sub-community
			H21	*Calluna vulgaris - Vaccinium myrtillus - Sphagnum capillifolium* heath **a** Typical sub-community
B	**c**	*Calluna vulgaris* - hepatic heath Vaccineto-Callunetum, hepaticosum facies (McV R p.31, Table 13)	**H21**	*Calluna vulgaris - Vaccinium myrtillus - Sphagnum capillifolium* heath **b** *Mastigophora woodsii - Herbertus aduncus hutchinsiae* sub-community
B1	**d**	*Calluna vulgaris-Danthonia decumbens* heath Callunetum vulgaris, herb-rich facies (McV & R p.29, Table 11A)	**H10**	*Calluna vulgaris - Erica cinerea* heath **d** *Thymus praecox* - *Carex pulicaris* sub-community

B1 **e**	*Arctostaphylos uva-ursi-Calluna vulgaris* heath Arctostaphyleto-Callunetum *Arctostaphylos uva-ursi*-rich heather moor (McV & R p.30, Table 12)	**H16** *Calluna vulgaris - Arctostaphylos uva-ursi* **a** *Lathyrus montanus - Pyrola media* sub-community **b** *Vaccinium myrtillus - V. vitis-idaea* sub-community **c** *Cladonia impexa* sub-community
B2	Montane (prostrate) *Calluna vulgaris* heaths	**H13, H14, H15, H17**
B2 **a**	Species-poor dwarf *Calluna* heath Cladineto-Callunetum, typicum Lichen-rich dwarf *Calluna* heath pp (McV & R p.35, Table 16)	**H13** *Calluna vulgaris - Cladonia arbuscula* heath **a** *Cladonia arbuscula - C. rangiferina* sub-community
B2 **b**	*Calluna-Racomitrium lanuginosum* heath Rhacomitreto-Callunetum *Racomitrium*-rich dwarf *Calluna* heath (McV & R p.38, Table 17)	**H14** *Calluna vulgaris - Racomitrium lanuginosum* **a** *Festuca ovina* sub-community **b** *Empetrum nigrum* ssp. *hermaphroditum* sub-community **c** *Arctostaphylos uva-ursi* sub-community
B2 **c**	*Calluna*-lichen heath Cladineto-Callunetum, sylvaticosum facies Lichen-rich dwarf *Calluna* heath pp. (McV & R p.35, Table 16) Cladineto-Callunetum, arctostaphyletosum facies Lichen-rich dwarf *Calluna* heath pp (McV & R p.35, Table 16)	**H13** *Calluna vulgaris Cladonia arbuscula* heath **a** *Cladonia arbuscula - C. rangiferina* sub-community **b** *Empetrum nigrurn* ssp*. hermaphroditum Cetraria nivalis* sub-community **c** *Cladonia crispata - Loisleuria procumbens* sub-community
B2 **d**	Mixed prostrate dwarf shrub heath **(i)** Arctoeto-Callunetum, species-rich dwarf shrub heath (McV & R p.34, Table 15)	**H17** *Calluna vulgaris - Arctostaphylos alpinus* heath **a** *Loisleuria procumbens - Cetraria glauca* sub-community **b** *Empetrum nigrum* ssp. *nigrum* sub-community
B2 **d**	Mixed prostrate dwarf shrub heath **(ii)** *Loiseleuria-Empetrum* provisional nodum (McV & R p.35, Table 15)	**H13** *Calluna vulgaris - Cladonia arbuscula* heath **b** *Empetrum nigrurn* ssp*. hermaphroditum - Cetraria nivalis* sub-community

B2 d Mixed prostrate dwarf shrub heath **(iii)** Juniperetum nanae dwarf juniper scrub (McV & R p.33, Table 14)	**H15** *Calluna vulgaris - Juniperus communis* ssp. *nana* heath
B3 *Vaccinium myrtillus-Empetrum nigrum* heath	**H18, H19, H20, H22**
B3 a Southern *Vaccinium myrtillus* heath Sub-montane *Vaccinium myrtillus* heath	**H18** *Vaccinium myrtillus - Deschampsia flexuosa* heath **a** *Hylocomium splendens - Rhytidiadelphus loreus* sub-community **c** *Empetrum nigrurn* ssp. *nigrum - Racomitrium lanuginosum* sub-community
B3 b Snow-bed *Vaccinium myrtillus* heath Vaccinetum-Chionophilum *Vaccinium myrtillu*s snow-bed (McV & R p.39, Table 18)	**H22** *Vaccinium myrtillus - Rubus chamaemorus* heath **a** *Polytrichum commune - Galium saxatile* sub-community **b** *Plagiothecium undulatum - Anastrepta orcadensis* sub-community
B3 c Species-rich *Vaccinium* heath Festuceto-Vaccinetum *Alchemilla*-rich *Festuca-Vaccinium* heath (McV & R p.45, Table 21)	**H18** *Vaccinium myrtillus - Deschampsia flexuosa* heath **b** *Alchemilla alpina - Carex pilulifera* sub-community
B3 e *Vaccinium myrtillus-Empetrum nigrum* ssp. *hermaphroditum* heaths Vaccineto-Empetretum *Vaccinium-Empetrum* heath (McV & R p.41, Table 19) *Empetrum nigrum* ssp. *hermaphroditum* hypnaceous moss heath (McV & R p.42, Table 19)	**H18** *Vaccinium myrtillus - Deschampsia flexuosa* heath **a** *Hylocomium splendens - Rhytidiadelphus loreus* sub-community **c** *Empetrum nigrum* ssp. *nigrum - Racomitrium lanuginosum* sub-community **H20** *Vaccinium myrtillus - Racomitriurn lanuginosum* heath **d** *Rhytidiadelphus loreus - Hylocomium splendens* sub-community

B3 f *Vaccinium* - lichen heath Cladineto-Vaccinetum Lichen-rich *Vaccinium* heath (McV & R p.43, Table 20)	**H19** *Vaccinium myrtillus - Cladonia arbuscula* heath **a** Typical sub-community **b** *Racomitrium lanuginosum* sub-community **c** *Empetrum nigrum - Cladonia rangiferina* sub-community
B3 g *Vaccinium vitis-idaea* heaths Peak District only	**H9** *Calluna vulgaris - Deschampsia flexuos*a heath **b** *Vaccinium myrtillus - Cladonia* spp. sub-community
B4 *Dryas octopetala* heaths	**CG13, CG14**
B4 a Low altitude *Dryas* heath on Durness limestone and shell sand *Dryas-Carex rupestris* nodum *Dryas-Carex flacca* nodum (McV & R p.47, Table 23)	**CG13** *Dryas octopetala - Carex flacca* heath **a** *Hieracium pilosella - Ctenidium molluscum* sub-community **b** *Salix repens - Empetrum nigrum* ssp. *nigrum* sub-community
B4 b High altitude *Dryas* heath on ledges of mica-schist mountains *Dryas-Salix reticulata* nodum (McV & R p.47, Table 23)	**CG14** *Dryas octopetala - Silene acaulis* ledge community
B4 x* *Arctostaphylos*-grass heath (McV & R p.50) **B4 y*** *Dryas-Arctostaphylos* heath (McV & R p.50)	**CG13** *Dryas octopetala - Carex flacca* heath
C Grassland	**U Upland communities** **CG Calcicolous grasslands** **M Mires**
C1 *Agrostis-Festuca* grasslands Agrosto-Festucetum (McV & R p.52-57, Tables 24, 25, 26)	**U1, U2, U4, CG9, CG10, CG11**

No Birks & Ratcliffe equivalent sub-community, though **C1b** may have been used	**U1** *Festuca ovina - Agrostis capillaris - Rumex acetosella* grassland **f** *Hypochaeris radicata* sub-community
C1 a *Agrostis canina-A. capillaris* (*tenuis*) grassland Species-poor Agrosto-Festucetum *Agrostis-Festuca* acid grassland pp (McV & R p.52, Table 24)	**U4** *Festuca ovina - Agrostis capillaris - Galium saxatile* grassland **a** Typical sub-community **b** *Holcus lanatus - Trifolium repens* sub-community **c** *Lathyrus montanus - Stachys betonica* sub-community **d** *Luzula multiflora - Rhytidiadelphus loreus* sub-community **e** *Vaccinium myrtillus - Nardus stricta* sub-community
C1 b *Festuca ovina* grassland Species-poor Agrosto-Festucetum *Agrostis-Festuca* acidic grassland pp (McV & R p.52, Table 24)	**U4** *Festuca ovina - Agrostis capillaris - Galium saxatile* grassland **a** Typical sub-community **b** *Holcus lanatus - Trifolium repens* sub-community **c** *Lathyrus montanus - Stachys betonica* sub-community **d** *Luzula multiflora - Rhytidiadelphus loreus* sub-community **e** *Vaccinium myrtillus - Nardus stricta* sub-community
C1 c *Deschampsia flexuosa* grassland	**U2** *Deschampsia flexuosa* grassland **a** *Festuca ovina - Agrostis capillaris* sub-community **b** *Vaccinium myrtillus* sub-community
No Birks & Ratcliffe equivalent	**U3** *Agrostis curtisii* grassland
C1 d *Alchemilla-Festuca* grassland Alchemilleto-Agrosto-Festucetum *Alchemilla*-rich *Agrostis-Festuca* grassland (McV & R p.53, Table 25)	**CG11** *Festuca ovina - Agrostis capillaris - Alchemilia alpina* grass-heath **a** Typical sub-community **b** *Carex pulicaris - Carex panicea* sub-community
C1 e Southern species-rich *Agrostis-Festuca* grassland Species-rich Agrosto-Festucetum *Agrostis-Festuc*a basic grassland pp (McV & R p.54, Table 26)	**CG10** *Festuca ovina - Agrostis capillaris - Thymus praecox* grassland **a** *Trifolium repens Luzula campestris* sub-community **b** *Carex pulicaris - Carex panicea* sub-community

C1	**f**	Northern species-rich *Agrostis-Festuca* grassland Species-rich Agrosto-Festucetum *Agrostis Festuca* basic grassland pp (McV & R p.54, Table 26) Saxifrageto-Agrosto-Festucetum *Saxifraga aizoides-rich Agrostis-Festuca* grassland (McV & R p.54, Table 26)	**CG10**	*Festuca ovina - Agrostis capillaris Thymus praecox* grassland **c** *Saxifraga aizoides - Ditrichum flexicaule* sub-community
C1	**g**	*Sesleria albicans-Festuca ovina* grassland	**CG9**	*Sesleria albicans - Galium sterneri* grassland **a** *Helianthemum canum - Asperula cynanchica* sub-community **b** Typical sub-community **c** *Carex pulicaris - Carex panicea* sub-community **d** *Carex capillaris - Kobresia simpliciuscula* sub-community **e** *Saxifraga hypnoides - Cochlearia alpine* sub-community
C2		*Nardus stricta* grasslands	**U5, U7**	
C2	**a**	Sub-montane *Nardus* grassland (species-poor) Nardetum sub-alpinum, species-poor facies Sub-alpine *Nardus* grassland (McV & R p.58, Table 28)	**U5**	*Nardus stricta - Galium saxatile* grassland **a** Species-poor sub-community **b** *Agrostis canina - Polytrichum commune* sub-community **d** *Calluna vulgaris - Danthonia decumbens* sub-community **e** *Racomitrium lanuginosum* sub-community

C2	**b**	Snow-bed *Nardus* grassland Low-alpine *Nardus* noda *Nardus* snow-beds *Nardus-Pleurozium* nodum *Nardus-Scirpus (Trichophorurn)* nodum *Nardus-Racomitrium* provisional nodum (McV & R p.67-68, Table 32) Nardetum medio-alpinum Alpine *Nardus* grassland (McV & R p.69, Table 33)	**U7**		*Nardus stricta - Carex bigelowii* grass-heath **a** *Empetrum nigrum ssp. hermaphroditum - Cetraria islandica* sub-community **b** Typical sub-community **c** *Alchemilla alpina - Festuca ovina* sub-community
C3		*Juncus squarrosus* grasslands Juncetum squarrosi sub-alpinum Sub-alpine *Juncus squarrosus* 'grassland' (McV & R p.59, Tables 28, 29)	**U6**		*Juncus squarrosus - Festuca ovina* grassland
C3	**a**	Species-poor *Juncus squarrosus* grassland Juncetum squarrosi sub-alpinum, species-poor facies (McV & R p.59, Table 28)	**U6**	**b** **c**	*Carex nigra - Calyyogeia trichomanis* sub-community *Vaccinium myrtillus* sub-community
C3	**b**	*Sphagnum*-rich *Juncus squarrosus* grassland *Juncus squarrosus* bogs (McV & R p.59, Table 28)	**U6**	**a**	*Sphagnum* sub-community
C3	**c**	Species-rich *Juncus squarrosus* grassland Juncetum squarrosi sub-alpinum, species-rich facies (McV & R p.59, Table 29)	**U6**	**d**	*Agrostis capillaris - Luzula multiflora* sub-community
C3	**x***	*Juncus squarrosus* with short *Calluna* (McV & R p.60)	**U6**		No NVC equivalent type

C4 *Molinia caerulea* grasslands/bog (McV & R p.64)	**M25** *Molinia caerulea - Potentilla erecta* mire
C4 a Species-poor *Molinia* grassland	**M25 b** *Anthoxanthum odoratum* sub-community
C4 b Species-rich *Molinia* grassland	**M25 c** *Angelica sylvestris* sub-community
C4 c* *Sphagnum*-rich *Molinia* bog	**M25 a** *Erica tetralix* sub-community
C5 *Deschampsia cespitosa* grasslands Deschampsietum caespitosae alpinum Alpine *Deschampsia cespitosa* grassland (McV & R p.61, Table 30)	**U13, U17**
C5 b Species-rich *Deschampsia cespitos*a grassland Descharnpsietum caespitosae alpinum, species-rich facies (McV & R p.61, Table 30)	**U17** *Luzula sylvatica - Geum rivale* tall-herb community **c** *Agrostis capillaris - Rhytidiadelphus loreus* sub-community
C6 *Carex bigelowii* snow-beds/heaths Polytricheto-Caricetum bigelowii *Polytrichum alpinum-Carex bigelowii* snow-beds (McV & R p.72, Table 34) Dicraneto-Caricetum bigelowii *Kiaeria (Dicranum) fuscescens-Carex bigelowii* heath (McV & R p.73, Table 35)	**U8** *Carex bigelowii - Polytrichum alpinum* grass-heath **a** *Polytrichum alpinum - Ptilidium ciliare* sub-community **b** *Dicranum fuscescens - Racomitrium lanuginosum* sub-community
C7 *Juncus trifidus* heaths Cladineto-Juncetum trifidi Lichen-rich *Juncus trifidus* heath (McV & R p.75, Table 36)	**U9** *Juncus trifidus - Racomitrium lanuginosum* rush-heath **a** *Cladonia arbuscula - Cetraria islandica* sub-community **b** *Salix herbacea* sub-community

C8* *Luzula sylvatica* grassland *Luzula sylvatica* grassland nodum (McV & R p.64, Table 31)	**U16** *Luzula sylvatica - Vaccinium myrtillus* community **c** Species-poor sub-community
D Herb- and fern-rich communities	**U Upland communities** **CG Calcicolous grasslands**
D1 *Sedum rosea-Alchemilla glabra* communities Tall Herb nodum (McV & R p.80, Table 38)	**U17** *Luzula sylvatica - Geum rivale* tall-herb community **a** *Alchemilla glabra - Bryum pseudotriquetrum* sub-community **b** *Geranium sylvaticum* sub-community **d** *Primula vulgaris - Hypericum pulchrum* sub-community
D2 *Cryptogramma crispa* communities	**U18, U21**
D2 b Northern, snow-bed *Cryptogramma-Athyrium alpestre* community Cryptogrammeto-Athyrietum chionophilum *Cryptogramma-Athyrium* snow-bed (McV & R p.82, Table 39)	**U18** *Cryptogramma crispa - Athyrium alpestre* snow-bed
D3 *Silene acaulis-Festuca ovina* sward (typical) **D3 a** Closed *Silene-Festuca* community Dwarf Herb nodum (McV & R p.84, Table 40) *Silene acaulis*, with other herbs and grasses on basic soil **D3 b** Open *Silene-Festuca* community of rock faces Small herbs, grasses and bryophytes on basic rock faces	**CG12** *Festuca ovina - Alchemilla alpina - Silene acaulis* dwarf-herb community

D3 **x*** *Alchemilla-Sibbaldia* nodum (McV & R p.85, Table 41) *Alchemilla alpina-Sibbaldia procumbens* snow-bed Often mapped as **E3**	**U14** *Alchemilla alpina - Sibbaldia procumbens* dwarf-herb community
D4 *Asplenium-Fissidens cristatus* crevice community Rupestrial ferns and calcicolous bryophytes in crevices on basic rock faces	No equivalent NVC type
D5 *Saxifraga aizoides* banks Saxifragetum aizoidis (McV & R p.87, Table 42)	**U15** *Saxifraga aizoides - Alchemilla glabra* banks
D6 *Luzula sylvatica-Dryopteris* communities	**U16, U19**
D6 **b*** *Betula*-herb nodum, fern dominated treeless facies pp (McV & R p.17, Table 6)	**U19** *Thelypteris limbosperma - Blechnum spicant* community
D7* *Pteridium aquilinum* communities	**U20** *Pteridium aquilinum - Galium saxatile* community
D7 **a** Dense stands of *Pteridium* with sparse ground flora	**U20** **c** Species-poor sub-community
D7 **b** *Pteridium* with woodland ground flora *Betula*-herb nodum, treeless facies pp (McV & R p.17, Table 6)	**U20** **a** *Anthoxanthum odoratum* sub-community
No Birks & Ratcliffe equivalent	**U20** **b** *Vaccinium myrtillus - Dicranum scoparium* sub-community
E **Bryophyte heaths**	**U** **Upland communities** **H** **Heaths**
E1 *Racomitrium lanuginosum-Carex bigelowii* heaths	**U10, H20**

E1	**a**	Species-poor *Racomitrium* heath Cariceto-Rhacomitretum lanuginose *Racomitrium* heath (McV & R p.89, Table 43) Typical facies Cushion herb facies *Juncus trifidus*-rich facies	**U10**	*Carex bigelowii - Racomitrium lanuginosum* moss-heath **b** Typical sub-community
E1	**b**	Species-rich *Racomitrium* heath *Poiygoneto-Rhacomitreturn lanuginosi* Species-rich *Racomitrium* heath (McV & R p.92, Table 44)	**U10**	*Carex bigelowii - Racomitrium lanuginosum* moss-heath **c** *Silene acaulis* sub-community
E1	**c**	*Festuca ovina-Deschampsia flexuosa-Racomitrium* heath Abundant grasses among the *Racomitrium lanuginosum*	**U10**	*Carex bigelowii - Racomitrium lanuginosum* moss-heath **a** *Galium saxatile* sub-community
E1	**e**	*Juncus trifidus-Racomitrium heath* *Juncus trifidus-Festuca ovina* nodum (McV & R p.77, Table 37)	**U10**	*Carex bigelowii - Racomitrium lanuginosum* moss-heath **c** *Silene acaulis* sub-community
E2		*Rhytidiadeiphus loreus-Deschampsia cespitosa* heaths Deschampsieto-Rhytidiadelphetum *Rhytidiadelphus* snow bed Species-poor typicum facies Species-rich *triquetrosum* facies (McV & R p.94, Table 45)	**U13**	*Deschampsia cespitosa - Galium saxatile* grassland **b** *Rhytidiadelphus loreus* sub-community

E3 *Kiaeria (Dicranum) starkei* snow-bed heaths Polytricheto-Dicranetum starkei *Polytrichum sexangulare* (norvegicum)-*Kiaeria (Dicranum) starkei* snow-bed (McV & R p.96, Table 46)	**U11** *Polytrichum norvegicum - Kiaeria starkei* snow-bed **U12** *Salix herbacea - Racomitrium heterostichum* snow-bed **U11 a** Typical sub-community **U11 b** Species-poor sub-community
Rhacomitreto-Dicranetum starkei *Racomitrium-Kiaeria (Dicranum)starkei* snow-bed (McV & R p.96, Table 47) Gymnomitreto-Salicetum herbaceae *Gymnomitrium-Salix herbacea* snow-bed (McV & R p.97, Table 48)	**U12 a** *Silene acaulis - Luzula spicata* sub-community **U12 c** *Marsupella brevissima* sub-community **U12 b** *Gymnomitriom concinnatum* sub-community
G Blanket bog (ombrogenous mires)	**M Mires**
G1 *Scirpus cespitosus-Myrica gale* mire Trichophoreto-Eriophoretum typicum Western blanket bog (McV & R p.101, Table 49)	**M17** *Scirpus cespitosus - Eriophorum vaginatum* blanket mire
G1 a *Sphagnum*-rich *Scirpus-Myrica* mire	**M17 a** *Drosera rotundifolia - Sphagnum* sub-community
G1 b *Racomitrium*-rich	**M17 b** *Cladonia* sub-community
No equivalent Birks & Ratcliffe sub-community	**M17 c** *Juncus squarrosus-Rhytidiadelphus loreus* sub-community
G2 *Scirpus cespitosus-Calluna vulgaris* mire Trichophoreto-Callunetum *Scirpus (Trichophorum)-Calluna* bog (McV & R p.106, Table 52)	**M15** *Scirpus cespitosus - Erica tetralix* wet heath **M16** *Erica tetralix - Sphagnum compactum* wet heath
G2 a Typical *Scirpus-Calluna* mire	**M15 b** Typical sub-community **M16 d** *Juncus squarrosus - Dicranum scoparium* sub-community
G2 b *Racomitrium*-rich	**M15 c** *Cladonia* sub-community

G2 c Lichen-rich	**M15 c** *Cladonia* sub-community
G2 d *Scirpus* mire	**M15 b** Typical sub-community
No equivalent Birks & Ratcliffe sub-community	**M15 d** *Vaccinium myrtillus* sub-community
G3 *Molinia caerulea-Calluna vulgaris* mire Molinieto-Callunetum *Molinia-Calluna* bog (McV & R p.108, Table 52)	**M15** *Scirpus cespitosus - Erica tetralix* wet heath **b** Typical sub-community
G4 *Calluna vulgaris-Eriophorum vaginatum* mire Calluneto-Eriophoretum Pennine blanket bog (McV & R p.103, Table 50)	**M19** *Calluna vulgaris - Eriophorum vaginatum* blanket mire **M20** *Eriophorum vaginatum* blanket and raised mire
G4 a Typical *Calluna-Eriophorum* mire	**M19 a** *Erica tetralix* sub-community **b** *Empetrum nigrum* ssp. *nigrum* sub-community **c** *Vaccinium vitis-idaea - Hylocomium splendens* sub-community **ii** Typical variant
G4 c Lichen-rich	**M19 a** *Erica tetralix* sub-community **b** *Empetrum nigrum* ssp. *nigrum* sub-community **c** *Vaccinium vitis-idaea - Hylocomium splendens* sub-community **ii** Typical variant
G4 d Montane dwarf shrub-rich	**M19 c** *Vaccinium vitis-idaea - Hylocomium splendens* sub-community **i** *Betula nana* variant
G4 a *Vaccinium*-rich	**M20** *Eriophorum vaginatum* blanket and raised mire **b** *Calluna vulgaris - Cladonia* sub-community
G4 f *Eriophorum*-dominated mire Dwarf shrubs sparse owing to burning and grazing	**M20** *Eriophorum vaginatum* blanket and raised mire **a** Species-poor sub-community **b** *Calluna vulgaris - Cladonia* sub-community

G5* *Empetrum-Eriophorum* mire Empetreto-Eriophoretum High-level blanket bog (McV & R p.106, Table 51)	**M19** *Calluna vulgaris - Eriophorum vaginatum* blanket mire **c** *Vaccinium vitis-idaea - Hylocomium splendens* sub-community **iii** *Vaccinium uliginosum - Polytrichum alpestre* variant
No Birks & Ratcliffe equivalent	**M18** *Erica tetralix - Sphagnum papillosum* raised and blanket mire **a** *Sphagnum rnagellanicum - Andromeda polifolia* sub-community **b** *Empetrum nigrum* ssp. *nigrum* - *Cladonia* sub-community
No Birks & Ratcliffe equivalent	**M21** *Narthecium ossifragum - Sphagnum papillosum* valley mire **a** *Sphagnum auriculatum - Rhynchospora alba* sub-community **b** *Sphagnum recurvum - Vaccinium oxycoccus* sub-community
H Flush bogs and fens (soligenous and topogenous mires)	**M Mires**
H1 *Myrica gale-Molinia caerulea* mire *Molinia-Myrica* nodum (McV & R p.112, Table 53)	**M15** *Scirpus cespitosus - Erica tetralix* wet heath **a** *Carex panicea* sub-community **M25** *Molinia caerulea - Potentilla erecta* mire **a** *Erica tetralix* sub-community
H2 a *Juncus effusus-Sphagnum recurvum* mire Sphagneto-Juncetum effusi *Juncus effusus-Sphagnum* mire (McV & R p.113, Table 54)	**M6** *Carex echinata - Sphagnum recurvum/auriculatum* mire **c** *Juncus effusus* sub-community **i** *Sphagnum recurvum* variant **ii** *Sphagnum auriculatum* variant
H2 b Juncus *acutiflorus-Sphagnum recurvum* mire	**M6** *Carex echinata - Sphagnum recurvum/auriculatum* mire **d** *Juncus acutiflorus* sub-community **i** *Sphagnum recurvum* variant **ii** *Sphagnum auriculatum* variant

H2 c *Juncus acutiflorus*-herb- and moss-rich mire *Juncus acutiflorus-Calliergon* (*Acrociadium*) *cuspidatum* nodum (McV & R p.117, Table 56)	**M23** *Juncus effusus/acutiflorus - Galium palustre* rush-pasture **a** *Juncus acutiflorus* sub-community **b** *Juncus effusus* sub-community
H3 *Carex*-moss mire	**M4, M6, M7, M8, M9, M10, M12, M15**
H3 a *Erica tetralix-Carex panicea* mire Trichophoreto-Eriophoretum caricetosum *Scirpus (Trichophorum)-Carex* mire (McV & R p.112, Table 49)	**M15** *Scirpus cespitosus - Erica tetralix* wet heath **a** *Carex panicea* sub-community
H3 b Sub-montane *Carex echinata-Sphagnum recurvum* mire Sphagneto-Caricetum sub-alpinum Sub-alpine *Sphagnum-Carex* mire (McV & R p.114, Table 55)	**M6** *Carex echinata - Sphagnum recurvum/auriculatum* mire **a** *Carex echinata* sub-community **i** *Sphagnum recurvum* variant **ii** *Sphagnum auriculatum* variant **b** *Carex nigra - Nardus stricta* sub-community **i** *Sphagnum recurvum* variant **ii** *Sphagnum auriculatum* variant
H3 c Sub-montane *Carex rostrata-Sphagnum recurvum* mire	**M4** *Carex rostrata - Sphagnum recurvum* mire
H3 d Sub-montane *Carex nigra-Sphagnum contortum* mire	**M9** *Carex rostrata - Calliergon cuspidatum* mire **a** *Campylium stellatlum - Scorpidium scorpioides* sub-community
H3 e Sub-montane *Carex rostrata-Sphagnum contortum* mire *Carex rostrata-Sphagnum warnstorfii (warnstorfianum)* nodum (McV & R p.119, Table 57)	**M8** *Carex rostrata - Sphagnum warnstorfii* mire

H3	**f**	Sub-montane *Carex nigra*-brown moss mire *Carex panicea-Campylium stellatum* nodum (McV & R p.120, Table 58)	**M10**	*Carex dioica - Pinguicula vulgaris* mire **a** *Carex demissa - Juncus bulbosus/kochii* sub-community **i** *Eleocharis quinqueflora* variant **ii** *Carex hostiana* - *Ctenidium molluscum* variant (**iii** *Schoenus nigricans* variant = **H4**) **b** *Briza media - Primula farinosa* sub-community **i** *Cirsium palustre* variant **ii** *Molinia caerulea* - *Eriophorum latifolium* variant **iii** *Thymus praecox - Racomitrium lanuginosum* variant **c** *Gymnostomum recurvirostrum* sub-community
H3	**i**	Montane *Carex nigra*-brown moss mire Hypno-Caricetum alpinum *Carex*-brown moss mire (McV & R p.118, Table 29)	**M10** **U5**	*Carex dioica - Pinguicula vulgaris* mire *Nardus stricta - Galium saxatile* grassland **c** *Carex panicea - Viola riviniana* sub-community
H3	**j**	Montane *Carex saxatilis* mire Caricetum saxatilis (McV & R p.125, Table 59)	**M12**	*Carex saxatilis* mire
H3	**g**	Sub-montane *Carex rostrata*-brown moss mire *Carex rostrata*-brown moss provisional nodum (McV & R p.112, Table 58)	**M9**	*Carex rostrata - Calliergon cuspidatum* mire **a** *Campylium stellatum - Scorpidium scorpioides* sub-community **b** *Carex diandra - Calliergon giganteum* sub-community
H3	**h**	Montane *Carex echinata-Sphagnum recurvum* mire Sphagneto-Caricetum alpinum Alpine *Sphagnum-Carex* mire (McV & R p.115, Table 55) *Carex aquatilis-rariflora* nodum (McV & R p.115, Table 55)	**M7**	*Carex curta - Sphagnum russowii* mire **a** *Carex bigelowii - Sphagnum lindbergii* sub-community **b** *Carex aquatilis - Sphagnum recurvum* sub-community

H4 *Schoenus nigricans* mire *Schoenus nigricans* provisional nodum (McV & R p.124, Table 64)	**M10** *Carex dioica - Pinguicula vulgaris* mire **a** *Carex demissa - Juncus bulbosus/kochii* sub-community **iii** *Schoenus nigricans* variant *Schoenus nigricans* also in: **M11** *Carex demissa - Saxifraga aizoides* mire **M15** *Scirpus cespitosus - Erica tetralix* wet heath **a** *Carex panicea* sub-community **M17** *Scirpus cespitosus - Eriophorum vaginatum* blanket mire **a** *Drosera rotundifolia - Sphagnum* sub-community
I Flushes and springs	**M Mires**
I1 Open *Carex* sward	**M11, M10**
I1 a *Carex hostiana-Eriophorum latifolium* flush	**M10** *Carex dioica - Pinguicula vulgaris* mire
I1 b Sub-montane *Carex demissa-Saxifraga aizoides* flush Cariceto-Saxifragetum aizoidis *Carex-Saxifraga aizoides* flush low-level facies (McV & R p.133, Table 64)	**M11** *Carex demissa - Saxifraga aizoides* mire **b** *Cratoneuron commutatum - Eleocharis quinqueflora* sub-community
I1 c Montane *Carex demissa-Saxifraga aizoides* flush Cariceto-Saxifragetum aizoidis *Carex-Saxifraga aizoides* flush, high-level facies (McV & R p.133, Table 64)	**M11** *Carex demissa - Saxifraga aizoides* mire **a** *Thalictrum alpinum - Juncus triglumis* sub-community **i** *Polygonum viviparum* variant **ii** *Juncus bulbosus/kochii - Saxifraga stellaris* variant
I2 *Eleocharis multicaulis-Rhynchospora alba* flush	**M30** Miscellaneous Littorellion vegetation
I3 *Narthecium ossifragum-Sphagnum* flush *Narthecium-Sphagnum* provisional nodum (McV & R p.132, Table 62)	**M15** *Scirpus cespitosus - Erica tetralix* **a** *Carex panicea* sub-community (?) **M16** *Erica tetralix - Sphagnum compactum* wet heath (?)

I4 Bryophyte springs	**M31, M32, M33, M37, M38**
I4 **b** *Anthelia julacea* springs *Anthelia-Deschampsia cespitosa* provisional nodum (McV & R p.132, Table 61)	**M31** *Anthelia julacea - Sphagnum auriculatum* spring
I4 **c** *Pohlia wahlenbergii* var. *Glacialis* springs Pohlietum glacialis (McV & R p.131, Table 60)	**M33** *Pohlia wahlenbergii* var. *glacialis* spring
I4 **d** *Saxifraga rivularis-Philonotis seriata* springs	**M32** *Philonotis fontana - Saxifraga stellaris* spring
I4 **e** *Cratoneuron commutatum* springs *Cratoneuron commutatum-Saxifraga aizoides* nodum (McV & R p.133, Table 63)	**M37** *Cratoneuron commutatum/filicinum - Festuca rubra* spring **M38** *Cratoneuron commutatum - Carex nigra* spring
J* **Woodlands**	**W** **Woodlands**
J1 Scots pine woods **a** Pinetum Hylocomieto-Vaccinetum Pinewood *Vaccinium*-moss association (McV & R p.11, Table 4) **b** Pinetum Vaccineto-Callunetum Pinewood *Vaccinium-Calluna* association (McV & R p.13, Table 5)	**W18** *Pinus sylvestris - Hylocomium splendens* woodland **a** *Erica cinerea - Goodyera repens* sub-community **b** *Vaccinium myrtillus - Vaccinium vitis-idaea* sub-community **c** *Luzula pilosa* sub-community **d** *Sphagnum capillifolium/quinquefarium - Erica tetralix* sub-community **e** *Scapania gracilis* sub-community

J2	Birch woods (McV & R p.15, Table 6) **a** Betuletum Oxaleto-Vaccinetum *Vaccinium*-rich birch wood (McV & R p.15, Table 6) **b** *Betula*-herb nodum Herb-rich birch wood (McV & R p.16, Table 6)	**W11** **W17**	*Quercus petraea - Betula pubescens Oxalis acetosella* woodland **a** *Dryopteris dilatata* sub-community **b** *Blechnum spicant* sub-community **c** *Anemone nemorosa* sub-community **d** *Stellaria holostea - Hypericum pulchrum* sub-community *Quercus petraea - Betula pubescens - Dicranum majus* woodland **a** *Isothecium myosuroides - Diplophyllum athicans* sub-community **b** Typical sub-community **c** *Anthoxanthum odoratum - Agrostis capillaris* sub-community **d** *Rhytidiadelphus triquetrus* sub-community
J4	Mixed deciduous woodland (McV & R p.11, Table A)	**W7** **W9**	*Alnus glutinosa - Fraxinus excelsior - Lysimachia nemorum* woodland *Fraxinus excelsior - Sorbus aucuparia - Mercuralis perennis* woodland
J5	Alder woods (McV & R p.23, Table B)	**W7**	*Alnus glutinosa - Fraxinus excelsior - Lysimachia nemorum* woodland

NVC mires (Rodwell 1991a) with no Birks & Ratcliffe (1980) equivalent

M1 *Sphagnum auriculatum* bog pool community

M2 *Sphagnum cuspidatum/recurvum* bog pool community

- **a** *Rhynchospora alba* sub-community
- **b** *Sphagnum recurvum* sub-community

M3 *Eriophorum angustifolium* bog pool community

M5 *Carex rostrata - Sphagnum squarrosum* mire

M13 *Schoenus nigricans - Juncus subnodulosus* mire

- **a** *Festuca rubra - Juncus acutiflorus* sub-community
- **b** *Briza media - Pinguicula vulgaris* sub-community
- **c** *Caltha palustris - Galium uliginosum* sub-community

M14 Schoenus nigricans - Narthecium ossifragum mire

M15 *Scirpus cespitosus - Erica tetralix* wet heath

- **d** *Vaccinium myrtillus* sub-community

M16 *Erica tetralix - Sphagnum compactum* wet heath

- **a** Typical sub-community
- **b** *Succisa pratensis - Carex panicea* sub-community
- **c** *Rhynchospora alba - Drosera intermedia* sub-community
- **d** *Juncus squarrosus - Dicranum scorparium* sub-community
- **e** Impoverished stands lacking *Sphagna*

M17 *Scirpus cespitosus - Eriophorum vaginatum* blanket mire

- **c** *Juncus squarrosus - Rhytidiadelphus loreus* sub-community

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

- **a** *Sphagnum magellanicum - Andromeda polifolia* sub-community
- **b** *Empetrum nigrum* ssp. *nigrum - Cladonia* sub-community

M21 *Narthecium ossifragum - Sphagnum papillosum* valley mire

- **a** *Sphagnum auriculatum - Rhynchospora alba* sub-community
- **b** *Vaccinium oxycoccus - Sphagnum recurvum* sub-community

M22 *Juncus subnodulosus - Cirsium palustre* mire

M24 *Molinia caerulea - Cirsium dissectum* fen-meadow

M26 *Molinia caerulea - Crepis paludosa* mire

- **a** *Sanguisorba officinalis* sub-community
- **b** *Festuca rubra* sub-community

M29 *Hypericum elodes - Potamogeton polygonifolius* soak way

M34 *Carex demissa - Koenigia islandica* flush

M35 *Ranunculus omiophyllus - Montia fontana* rill

NVC heaths (Rodwell 1991a) with no Birks & Ratcliffe (1980) equivalent

H1 *Calluna vulgaris - Festuca ovina* heath

- **a** *Hypnum cupressiforme* sub-community
- **b** *Hypogymnia physodes - Cladonia impexa* sub-community
- **c** *Teucrium scorodonia* sub-community
- **d** *Carex arenaria* sub-community
- **e** Species-poor sub-community

H2 *Calluna vulgaris - Ulex minor* heath

- **a** Typical sub-community
- **b** *Vaccinium myrtillus* sub-community
- **c** *Molinia caerulea* sub-community

H3 *Ulex minor - Agrostis curtisii* heath

- **a** Typical sub-community
- **b** *Cladonia* spp. sub-community
- **c** *Agrostis curtisii* sub-community

H4 *Ulex gallii - Agrostis curtisii* heath

- **a** *Agrostis curtisii - Erica cinerea* sub-community
- **b** *Festuca ovina* sub-community
- **c** *Erica tetralix* sub-community
- **d** *Scirpus cespitosus* sub-community

H5 *Erica vagans - Ulex europaeus* heath

- **a** Typical sub-community
- **b** *Eleocharis multicaulis* sub-community

H6 *Erica vagans - Ulex europaeu*s heath

- **a** Typical sub-community
- **b** *Festuca ovina* sub-community
- **c** *Agrostis curtisii* sub-community
- **d** *Molinia caerulea* sub-community

H7 *Calluna vulgaris - Scilla verna* heath

- **a** *Armeria maritima* sub-community
- **b** *Viola riviniana* sub-community
- **c** *Erica tetralix* sub-community
- **d** *Empetrum nigrum* ssp. *nigrum* sub-community
- **e** *Calluna vulgaris* sub-community

H8 *Calluna vulgaris - Ulex gallii* heath

- **a** Species-poor sub-community
- **b** *Danthonia decumbens* sub-community
- **c** *Sanguisorba mino*r sub-community
- **d** *Scilla verna* sub-community
- **e** *Vaccinium myrtillus* sub-community

NVC calcifugous grasslands (Rodwell 1992) with no Birks & Ratcliffe (1980) equivalent

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

U3 *Agrostis curtisii* grassland

NVC herb- and fern-rich communities (Rodwell 1992) with no Birks & Ratcliffe (1980) equivalent

U20 *Pteridium aquilinum - Galium saxatile* community

- **b** *Vaccinium myrtillus - Dicranum scoparium* sub-community