Guidelines for the Selection of Biological SSSIs

Part 2: Detailed Guidelines for Habitats and Species Groups

Chapter 4 Lowland Heathland

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Cover note

This chapter updates and replaces the previous Lowland Heathland SSSI Selection Guidelines chapter (Nature Conservancy Council 1989). It was prepared by Isabel Alonso (Natural England), Graham Sullivan (Scottish Natural Heritage) and Jan Sherry (Natural Resources Wales) and provides detailed guidance for use in selecting lowland heathland 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 lowland heathland chapter are:

- the definition of the habitat has been refined;
- the minimum size of features qualifying for notification has been reduced;
- M15 *Scirpus cespitosus-Erica tetralix* wet heath has been added to the list of types eligible for selection;
- new sections have been added to provide guidance on boundary determination and survey standards/methodology; and
- an Annex 1 has replaced Table 1 in the original version to provide more detailed information on the different NVC types.

This chapter has been subjected to appropriate levels of evidence quality assurance. It is compliant with the JNCC Evidence Quality Assurance Policy 2014, and has been subjected to external peer review by Dr Ian Strachan and Professor Adrian Newton.

1 Introduction

1.1 Lowland heathland is a broadly open habitat on impoverished, acidic mineral and shallow peat soil, characterised by the presence of heathers and dwarf gorses. To be considered as heathland for these guidelines, an area should normally have at least 25% cover of ericaceous dwarf shrubs. However, some heathland types characteristically have lower dwarf shrub cover, such as certain heaths in inland dune habitats or some Breckland grass-heaths, where the percentage of acid grassland species is high and dwarf shrubs are less frequent (section 1.4) and in those situations a minimum of 10% cover is more appropriate. Lowland heathland is generally found below 250-300m altitude in Great Britain, but in the north the altitudinal limit is often lower. Above 300m, or at lower altitude in northern England and Scotland, lowland heathland usually shows a transition to upland heath. More montane species, such as bearberry *Arctostaphylos uva-ursi*, often appear in those intermediate types. Although heathland of distinctly lowland type occurs up to the north of mainland Scotland, in the north and west heathland of upland character can also occur down to sea level, with lowland heathland absent. The definition of lowland heathland in this guidance excludes heathlands on coastal sand, coastal shingle and cliffs which show maritime influence from the effects of salt spray and exposure (selection of these habitats is covered by the Coastal SSSI Selection Guidelines). A full overview of lowland heathland geographical diversity can be found in Annex 1.

1.2 Lowland heathland is a dynamic habitat which undergoes significant changes through ecological succession, from bare ground and grassy stages (e.g. after burning or tree clearing), to mature, dense ericaceous-dominated heath, and, potentially, scrub or acidic woodland. These different stages often co-occur on a site. Lowland heathland in favourable condition (JNCC 2009) should have an ericaceous dwarf shrub layer of varying height and structure, along with some or all of the following, depending on environmental and/or management conditions: areas of bare ground; an herbaceous component; lichens; bryophytes; gorse; bracken; and scattered and clumped trees and scrub. It will also usually be associated with other habitats, such as acid grassland, mire and open water. The presence and numbers of characteristic birds, reptiles, invertebrates, vascular plants, bryophytes and lichens are important indicators of habitat quality and these might merit selection as SSSI features in their own right (see the species chapters of the Guidelines).

1.3 Hawley *et al* (2008) described the range of parent materials on which lowland heathland can develop. In Britain, this includes aeolian deposits of sand and loess (i.e. fine, windblown material derived from glacial deposits), glacial till, fluvio-glacial deposits and other fairly well-drained substrata. Heathlands tend to be less represented on soils derived from sedimentary rocks, especially those containing clay and rich in calcium, although there are a few unusual exceptions, for example, in the Bovey Basin, Devon, where heathland has developed on ball clay. Lowland wet heathlands are also found widely on shallow acid peat and, in some cases, may replace mire vegetation on deeper peat where there has been damage and drying of the surface. As well as regional variability in soils, there can be great small-scale lateral and vertical variability in heathland soils, related to local differences in the underlying geology, past and present land-use, subtle changes in topography, and the effect this has on water movement and storage.

1.4 Locally, in areas of chalk and limestone, there are interesting communities intermediate between lowland acidophilous heathland and calcicolous grassland. In the East Anglian Breckland, a patchy overlay of blown sand on chalky till gives a range of community types from calcicolous grassland to acidophilous dwarf shrub heath, sometimes in an intimate mixture (Watt 1936; see also the discussion of mosaics in section 9 in Bainbridge *et al* 2013). Similarly, in Wales and England, limestone heathland is found where thin soils with acidified and decalcified upper horizons have developed over calcareous bedrock. Such heathland occurs in both south-west and north Wales, as

well as in south-east England. The Breckland and Lincolnshire and Humberside Coversands contain areas dominated by sand sedge *Carex arenaria*, representing inland dunes with variable heather cover (see also Lowland Grasslands SSSI Selection Guidelines). On the Lizard Peninsula in south-west England, heathlands associated with ultrabasic serpentine rocks occur; these are the only locations where Cornish heath *Erica vagans* is found. Other rare heathland types are found in association with river shingle, such as the metalliferous shingle heaths of mid-Wales, or secondary substrates, such as those from coal waste that develop either naturally or as a result of restoration efforts.

1.5 Some lowland heathland examples contain an abundance of grasses and form frequent transitions to, and mosaics with, grassland, resulting either from natural processes influenced by soils and geology or from impacts such as inappropriate management or nitrogen deposition. Many lowland heathlands occur in association with woodland of birch and Scots pine and can be invaded by these species. The woodland and scrub components, including common gorse *Ulex europaeus,* can have value in their own right and as part of the succession, but they usually pose a management problem. The area of heathland will often need to be expanded at the expense of the tree and scrub cover. See Annex 2 for habitats commonly found in association with lowland heathland.

2 Recent history of change

2.1 Heathland was a relatively widespread lowland habitat in historic times. It started to expand during Neolithic times as woodland was cleared, and became particularly extensive on free-draining sites, on sand and gravel substrates, in the Midlands and the south and east of England (Rackham 1986). The associated podzolic soils, which formed as a result of nutrient leaching under acidic conditions, allowed heather *Calluna vulgaris*, bell heather *Erica cinerea,* and other dry heathland plants to thrive. In places, wet heathland developed on periodically waterlogged soils. Here, the anaerobic soil conditions inhibit decomposition of vegetation and peat accumulates. Nutrients are leached and highly soluble nitrogen compounds are lost in solution. These conditions can result in the development of stagnopodzols, which have peaty topsoil. The cross-leaved heath *Erica tetralix*, along with a variety of bog mosses *Sphagnum* species, favour these damp, acid conditions. Soil and vegetation transitions between dry and wet heathlands occur, in addition to 'humid heathlands' where soil waterlogging is only seasonal. Transitions also arise where mires occur within heathland sites, usually within distinct channels or shallow valleys as part of a valley mire.

2.2 Lowland heathlands have decreased enormously due to various human impacts, including agricultural reclamation, afforestation and urban development. Some have scrubbed over or been converted to birch or Scots pine woodland through natural succession in the absence of grazing or other management. The decline of heathland started in the mid-18th century, with the rate of loss having increased greatly during the 20th century (Rackham 1986). Moore (1962), and later Rose *et al* (2000), charted the decline of the once vast Dorset heaths from about 40,000ha in 1750 to a quarter of that area by 1960, and this remnant has since been reduced to roughly half. In the six most important lowland heathland English districts, there was an overall loss of 40% between 1950 and the 1990s (Farrell 1993). Similar or greater losses have been documented in Wales, with 95% loss in lowland wet heath (51% of dry heath) between early 1920s and late 1980s in the Lleyn Peninsula (Blackstock *et al* 1995). In many areas, lowland heathland has been reduced to mainly small fragments.

2.3 Lowland heathland is particularly sensitive to lack of appropriate management to maintain an open and diverse structure; increased nutrients, in particular atmospheric nitrogen deposition (Bobbink *et al* 1998); and disturbance (e.g. excessive trampling, inappropriate burning). These impacts result in botanical and structural changes, with an increase in generalist species, a loss of specialist species, and therefore a general loss of biodiversity. A recent threat is disease caused by the fungus-like *Phytophthora*

species, which can kill bilberry/blaeberry *Vaccinium myrtillus*, and therefore affect vegetation composition and structure.

2.4 Lowland heathland has not only reduced in overall extent, it has become more fragmented at site and landscape level, with habitat patches increasingly isolated within the more intensively managed agricultural landscape. This trend can be reversed by improving site condition, increasing habitat patch size, developing buffers around patches, developing stepping stones between patches, and improving the condition of land between habitat patches to increase permeability (Lawton 2010). Network modelling (Latham *et al* 2013) and habitat potential mapping for lowland heathland (e.g. RSPB 2008) will help to identify where the most effective action can be taken to improve network coherence and resilience.

2.5 Lowland heathland is considered to have medium sensitivity to climate change, partly due its fragmented character (Taylor *et al* 2014). Climatic changes are likely to adversely affect the condition of lowland heaths and may even lead to further habitat loss. Wet heathland will be particularly affected by hydrological changes.

3 National and International importance

3.1 All lowland heathland types (as listed in Annex 1) are covered by the country-level lists of 'priority habitats' in England, Scotland and Wales. These are habitats that are of principal importance or highest priority for the conservation of biological diversity in the respective countries.

3.2 British lowland heathland forms part of the Atlantic heathland of western coastal regions of Europe, where the climate is mild and humid. This is an internationally restricted class of vegetation, and the types occurring in other continents have very little floristic affinity with those in Britain and Ireland (Specht 1979). As in Britain, Atlantic heathlands on the European mainland have also contracted rapidly through the same kinds of land-use change (Diemont *et al* 1996), reinforcing the importance of the remaining fragments of the habitat in lowland Britain.

3.3 All lowland heathland within Britain falls within the scope of the habitats listed on Annex I of the EU Habitats Directive (see Annex 3 for details). This confers status as a habitat of European nature conservation significance. Most of the habitats fall within the European dry heaths (H4030) or Northern Atlantic wet heaths with *Erica tetralix* (H4010) types. The Cornish heaths on the Lizard Peninsula include all areas of the Dry Atlantic coastal heaths with *Erica vagans* type (H4040) in Britain, whilst the Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* type (H4020) is a very rare habitat in Britain occurring only in Cornwall, the Somerset/Devon border, and Dorset.

4 Selection requirements

4.1 The distinction between lowland heathland and upland heathland in these guidelines is broadly represented by the upper level of agricultural enclosure; in England, this approximates to the Moorland Line. However, in practice, there is rarely a clear ecological cut-off between lowland and upland heathland, as the vegetation exhibits a continuum of change from the lowlands to uplands influenced by a range of factors, particularly the temperature, rainfall and insolation regimes, which, in turn, influence soil characteristics. As also indicated in Chapter 9 (Upland Habitats), the NVC makes no distinction between upland and lowland dwarf shrub heaths (Rodwell 1988) but classifies plant communities purely on floristic affinities, regardless of geographical or attitudinal distribution, or land use. In some cases, decisions as to whether sites should be selected using the upland or lowland guidelines may be problematic where there is no clear distinction based on enclosure or altitude. Usually In such cases, the full range of evidence relating to the botanical composition, other environmental factors, land management and landscape history and setting should be taken into account. The presence of rare and characteristic fauna (in particular reptiles, invertebrates and birds - Webb *et al* 2010) may help in their differentiation (see Guidelines Chapters 14, 15 and

17). The same type of issue and resolution applies to other habitats, notably coastal heathland and various types of grassland and mire.

4.2 Section 5.6 *et seq* of Part 1 of the Guidelines defined the basis for the selection of habitats as SSSIs with reference to a series of principles and criteria, mainly: size, diversity, naturalness, rarity, ecological coherence and potential value (Bainbridge *et al* 2013).

4.3 As indicated in the section 2.1 of this Chapter, most lowland heathlands are not natural, but cultural (ie the result of human intervention over centuries), so "naturalness" criteria refer more to public perceptions and less to the lack of human intervention, although the presence of functioning natural processes (e.g. hydrology) is important in the SSSI selection.

4.4 Annex 1 addresses the application of the "diversity" and "rarity" criteria by describing 15 lowland heathland National Vegetation Classification (NVC) types and selection recommendations for each depending on the size of individual occurrences. The rarity of additional factors such as local prominence of blaeberry/bilberry *Vaccinium myrtillus*, creeping willow *Salix repens*, petty whin *Genista anglica* and bearberry *Arctostaphylos uva-ursi* as 'special features' should be considered to add value to a site and increase priority for selection.

4.5 There is clearly a premium on size of area in the selection of lowland heathland SSSI features (section 1). All the larger remaining examples are important, and fragments in proximity may be combined in single sites. In some geographical areas in England the average heathland size is less than 10ha; many Welsh heathland sites also consist of small parcels (Sherry 2007). Given the scarce and fragmented nature of the habitat, in most cases all heathland parcels larger than 5ha in extent should be recommended for selection (Annex 1). The equivalent threshold was 10ha in previous version of the lowland heathland guidelines, but further losses have occurred in the last 25 years (Rose *et al* 2000). Examples of heathland NVC types which are below the extent threshold for selection where they occur in few, small patches, may be combined with other heathland NVC types in a lowland heathland feature. Any size of especially rare and naturally small heathland types (such as lichen, chalk/limestone or river shingle heathland) should also qualify for notification. The merits of selecting examples smaller than 5ha, alone or in combination, should be considered on a case by case basis. Any size can form part of a mosaic feature (section 5.4).

4.6 Lowland heathlands currently in unfavourable condition (JNCC 2009) due to succession or poor management can be notified if they have potentially greater value and still contain some characteristic attributes such as heathland flora and fauna (ericaceous species, fine-leaved grasses, characteristic invertebrates, *etc*) and show potential to recover. Designation in these cases should be a precursor to instituting management to achieve favourable condition, and should help to secure resources for this purpose.

4.7 Evaluation of mosaic features is discussed in section 9 of Bainbridge *et al* (2013). A mosaic feature can include, and be notified for, different types of habitats (e.g. a mosaic of acid grassland and heathland, or wet and dry heath). Mosaics and transitions are ecologically valuable, diverse and important as a variety of species associated with heathland use different habitats at different stages in their life cycle or for other reasons (e.g. hunting or thermoregulation). A habitat mosaic including heathland will be considered to be of special value where there is clear evidence that associated heathland species such as adder *Vipera berus*, specialised invertebrates or breeding birds are dependent upon each habitat for part of their life cycle or feeding/resting/territorial behaviour. Where the habitat components are collectively of interest or form part of a practical management unit, even though they may be limited in individual size, the whole area can be treated as a mosaic feature. Both the heathland and other component habitats should be identified in the site citation.

4.8 Where a tree component has value as part of heathland succession, it is important to represent this relationship, whilst remembering that it usually poses a management

problem. Several birds and other wildlife find their optimum nesting or hunting habitat on heathland with trees and shrubs. A small percentage of tree cover, as scattered trees or small copses, is usually acceptable on heathlands, but this should not normally exceed 15% of the area (10% on a wet heath). Heathlands with a higher cover of trees can be considered for designation, but they will need to undergo restoration.

4.9 Developing and mature scrub can be an important component of lowland heathland sites, especially in southern Britain where Dartford warblers nest in mature gorse. Common gorse *Ulex europaeus* is frequently found in and along the margins of heathland, as it benefits from disturbance and recolonizes quickly after fire, although it can often be a management problem. Juniper *Juniperus communis* is an important species of some northern heaths.

4.10 The two smaller gorse species, western gorse *Ulex gallii* and dwarf gorse *U. minor*, are important components of certain oceanic and southern heaths, and selection should ensure that these heathlands are well represented in the heathland SSSI series.

5 Boundary definition

5.1 SSSI boundaries should be drawn to encompass the special features of the site and all land necessary to ensure the protection and sustainability of those features. Consideration should be given to the inclusion of whole management units, entire ecological units and land required for supporting processes, such as hydrology. Lowland heathlands are often adjacent to other semi-natural habitat types. The most frequent juxtapositions are with valley mires, acidic grassland, upland communities, woodland, developing or mature scrub habitats, and coastal grassland and dunes. It is important to consider not only the selection of habitat combinations, transitions and successional stages, but also how these influence the condition and function of each other as ecological units.

5.2 Where lowland heathland and valley mires are contiguous, all of the heathland that contributes to the valley mire catchment area (the hydrological system and supporting habitat) should be included in the area recommended for notification. This applies even if the heathland is in unfavourable condition, as it influences the quality of the mire (see also the Fens SSSI Selection Guidelines). In these cases, an ecohydrological assessment may be required in the process of site selection.

5.3 The boundaries of an SSSI should be drawn after appropriate survey (section 6). The boundary should include the notified feature(s) and, where possible, surrounding semi-natural habitats that can act as buffers against negative external impacts (e.g. trees against exhaust fumes from roads). Defined natural boundaries are preferred, while others such as walls, fences or railway lines may also be used. Boundaries difficult to identify on the ground should be avoided. Habitat network and inventory data (e.g. Latham *et al* 2013) can inform the boundary line by taking into account the contribution of heathland fragments and other habitats to site coherence and resilience.

5.4 Compound sites (sometimes called archipelago sites) are those composed of similar habitat parcels geographically separated by a few metres (e.g. by a road) to several kilometres (e.g. by improved grassland or arable land). For lowland heathland, the option of combining non-contiguous units into a compound site is most likely to be justified when:

- inclusion of non-contiguous units enhances habitat connectivity, for example by protecting stepping stones between larger blocks of habitat or providing foci for habitat restoration and expansion within a key network;

- the components are similar in vegetation composition within a discrete landscape or occur in similar topographical situations, e.g. patches of wet heathland separated by arable fields;

- fragmentation has reduced a former stand of a single heathland type, or a former mosaic of different heathland types, into a series of discrete parcels; or

- individual components will provide an overall habitat/resource for wide-ranging species.

It is not possible to provide completely prescriptive advice and the issues will need to be examined on a site-specific basis. A judgment will be required as to whether to notify a compound site or separate SSSIs.

6 Survey requirements

6.1 A vegetation survey is required for potential sites to determine the vegetation types present, their extent, location and condition. Boundaries within and around the surveyed areas should be accurately mapped and their structure (fence, wall, *etc*) shown. Where wet heathland and valley mires are involved, an ecohydrological assessment will be required to determine the area of catchment necessary to protect the hydrological function of a site.

6.2 The vegetation should be surveyed using standard NVC methodology (Rodwell 2006). This should:

- accurately determine the vegetation types present, their species composition and extent, and map their spatial configuration;

- enable sites to be properly evaluated against these guidelines; and

- consider mosaics and intermediate types.

6.3 Where two or more heathland (sub-) communities occur in a complex, small-scale mosaic that defies mapping, then estimates of the percentage extent of each should be made, e.g. H3 - 45%, M16 - 30%, H2 - 25%.

6.4 Habitat condition should be assessed using the relevant Common Standards Monitoring Guidance (JNCC 2009). Details of any targets which fail, the likely causes, and the potential for features in suboptimal condition to recover, are required.

7 References

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Annex 1. Classification, characteristics and additional selection requirements for different lowland heathland types

1. Dry and humid heathland

Dry and humid heathland in Britain typically occurs on freely-draining, nutrient-poor, acidic soils. The vegetation is characteristically dominated by one or more of the following dwarf shrubs: *Calluna vulgaris*, *Erica cinerea*, *E. tetralix*, *Ulex minor*, *U. gallii*, *Vaccinium myrtillus*, *V. vitis-idaea*, and *Empetrum nigrum* ssp. *nigrum*.

The habitat is generally dependent on grazing, cutting and/or burning to prevent invasion by trees and conversion to woodland. These factors also affect the height and canopy cover, which varies depending on the phase of development and management intensity. Following burning and where grazing is more intense, various grass species can be abundant, such as *Agrostis curtisii*, *Molinia caerulea*, *Festuca ovina*, and *Deschampsia flexuosa*.

Dry and humid heathland varies according to climate and is also influenced by altitude, aspect and soil conditions (especially base-status and drainage). There is a general gradation from southerly to northerly kinds, as well as both western (oceanic) and eastern (continental) forms. Humid heath, which occupies soils with slightly impeded drainage, is included in this group. Various lowland dry and humid heathland communities, with different geographic ranges, have been identified based on differences in vegetation. These are described below. For further details see Rodwell (1991) and Elkington *et al* (2002).

1.1 Eastern continental dry heathland

The semi-continental H1 *Calluna vulgaris-Festuca ovina* heath of south-east and eastern England is generally species-poor and sometimes overwhelmingly dominated by *Calluna vulgaris*. It can include a modest diversity of bryophytes and, especially under more intense management, annual plants and bare ground. When *Cladonia* lichens are very abundant and the vascular flora is sparse (e.g. in Breckland) they are called lichen heaths. *Ulex europaeus* is uncommon, except where there has been disturbance. Such heathland often supports an important fauna, including birds such as the European nightjar and Dartford warbler, and reptiles such as the sand lizard and smooth snake. The H1d sand sedge-dominated *Carex arenaria* sub-community is typical of areas of blown sand or inland dunes. This is a very unusual feature found on the Breckland and Coversands heathlands (see also H11*Calluna vulgaris-Carex arenaria* heath).

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H1 *Calluna vulgaris-Festuca ovina* heath	Very local in south-east and eastern England, Breckland especially	Important part of grass-heaths and transition to inland dunes	*Cladonia* species	Select all areas above 5ha

In south-eastern and central southern parts of England (Kent to Dorset), H2 *Calluna vulgaris-Ulex minor* heath occurs. This is generally dominated by mixtures of *Calluna vulgaris*, *Erica cinerea*, *Ulex minor* and *Deschampsia flexuosa*. After fire, *Erica cinerea* often increases because of its prolific seeding. *Ulex minor* normally plays a subsidiary role, forming a patchy understorey to heather. *Ulex europaeus* is

occasional, but may be locally abundant after disturbance.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H2 *Calluna vulgaris-Ulex minor* heath	Very local from Weald of Sussex westwards to Dorset	Part of southern and south-east England valley mire complex	*Agrostis curtisii*	Select all areas above 5ha

1.2 South-western oceanic dry heathland

The climate becomes increasingly mild and oceanic towards the south-west of England and in southern and mid Wales. The soils here are therefore slightly damp and different types of dry heathland are found.

From the New Forest and west to Dorset, H3 *Ulex minor-Agrostis curtisii* heath occurs. Heather frequently dominates this vegetation, especially where there has been no recent burning. *Ulex minor* is a frequent associate, but very variable in abundance. Unlike on more easterly heathlands, both *Erica cinerea* and *E. tetralix* occur and they can be prominent; *E. cinerea* especially after burning, and *E. tetralix* on more strongly gleyed soils. *Agrostis curtisii* and *Molinia caerulea* are characteristic grasses. After burning they can also become prominent. Various other species can be found occasionally, for example *Pteridium aquilinum*, *Potentilla erecta*, *Polygala serpyllifolia*, *Carex pilulifera*, and the parasitic plant *Cuscuta epithymum*.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H3 *Ulex minor-Agrostis curtisii* heath	New Forest westwards to Dorset	Important part of heathland and woodland mosaics	*Erica ciliaris* *Viola lactea*	Select all areas above 5ha

H4 *Ulex gallii-Agrostis curtisii* heath occurs across south-west England and into southern and mid Wales, and includes forms of H4 found beyond the range of *A. curtisii* (Rodwell *et al* 2000). This is very similar to H3 heath, the major difference being the replacement of *Ulex minor* by *U. gallii*, the eastern limits of which in east Dorset forms the boundary between these two heath types.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H4 *Ulex gallii-Agrostis curtisii* heath	South-west England and parts of south and west Wales and uplands	Whole heathland complex in Dorset and Devon	*Erica ciliaris*	Select all areas above 5ha

1.3 Central warm oceanic heath

At low to moderate altitudes in warm oceanic parts of southern Britain (from south-west England, across Wales and the northern Midlands and round into Norfolk and Suffolk), the typical form of heathland is H8 *Calluna vulgaris-Ulex gallii* heath. This vegetation type is characteristically diverse with abundant *Calluna vulgaris*, *Ulex gallii* and *Erica cinerea*, and no *Erica tetralix* and *Molinia caerulea* or *Agrostis curtisii*. *Ulex europaeus* may be abundant on disturbed ground, and both *Pteridium aquilinum* and *Rubus* species may be present.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H8 *Calluna vulgaris-Ulex gallii* heath	In the south-west of England, Wales and the north Midlands	Extending to moderate altitudes in the Midlands	*Agrostis curtisii* *Viola lactea*	Select all areas above 5ha, except for rare chalk / limestone heathland (mostly H8c) and river shingle heathland stands where smaller areas can be selected

1.4 Cool oceanic heath

In the cooler oceanic climate of western and northern Britain *Ulex gallii* becomes scarce and H10 *Calluna vulgaris-Erica cinerea* heath becomes the common heath type, sometimes associated with H8 and H7 heath. It is typically dominated by *Calluna vulgaris*, although this can be influenced by the intensity and timing of burning and grazing. *Erica cinerea* is frequent, especially on more southerly-facing slopes, and can become dominant in the hyper-oceanic fringes of the north-west. However, *Vaccinium myrtillus*, *V. vitis-idaea*, and *Empetrum nigrum* ssp. *nigrum* are usually relatively scarce.

H10d is found on relatively base rich brown earth soils and is the most species-rich sub-community. This sub-community is local in occurrence.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H10 *Calluna vulgaris-Erica cinerea* heath	Atlantic heathland reaching low altitudes	Characteristic dry heathland community in heathland/mire sequences in western and northern Scotland	*Orobanche alba*	Select up to five areas in each AOS. These can be in association with upland features selected as the major interest of the sites. Areas of H10d of any size can be selected

In marked contrast, in the usually heather-dominated H12 *Calluna vulgaris-Vaccinium myrtillus* heath, *V. myrtillus* is commonly encountered and grows vigorously when not overgrazed, and both *V. vitis-idaea* and *Empetrum nigrum* can be locally abundant, along with *Erica cinerea*. This heath type accounts for much of the heathland from less oceanic, northern and western areas.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H12 *Calluna vulgaris-Vaccinium myrtillus* heath	Transitional lowland heathland, widespread in lower moorland areas in south-west and northern England	Grades into typical sub-montane *Calluna* heath with *Empetrum* and *Vaccinium vitis-idaea*	*Diphasiastrum x issleri*	Select up to five areas in each AOS. These can be in association with upland features selected as the major interest of the sites. Rare river shingle heathland communities of any size can be selected

In even less oceanic areas, at low to moderate elevations from the Midlands, across northern England and in parts of eastern Scotland, extensive stands of H9 *Calluna vulgaris-Deschampsia flexuosa* heath are encountered. This heathland is characteristically species-poor and overwhelmingly dominated by *Calluna vulgaris*, often growing as a fairly low and open canopy with *Deschampsia flexuosa*. No other dwarf shrubs are consistently frequent, although some can be quite common and locally abundant; *V. myrtillus* being the most important, particularly at higher altitudes, with *V. vitis-idaea*, and *Empetrum nigrum* being more localised.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H9 *Calluna vulgaris-Deschampsia flexuosa* heath	In the southern Pennines and Midlands	Often a result of over-grazing and frequent burning	None	Select areas over 5ha, usually in combination with other types

H16 *Calluna vulgaris-Arctostaphylos uva-ursi* heath has some similarities to H12 heath, and can grade into, or occur as patches within a matrix of, the latter. It differs in the co-dominance of *Arctostaphylos uva-ursi* and *Calluna vulgaris,* and the presence of several less-common species. Most examples of this community are found in the uplands, but some lower altitude stands form lowland heathland in the east-central Highlands of Scotland. These stands are maintained by rotational burning, ideally in the late-building *Calluna* growth phase, following which they progress from a forb and grass-rich stage, through increased cover of *Arctostaphylos uva-ursi,* to return to *C. vulgaris* domination.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H16 *Calluna vulgaris-Arctostaphylos uva-ursi* heath	East-central Highlands of Scotland	Grades into H12 *Calluna vulgaris-Vaccinium myrtillus* heath, woodland, or wet heathland or mire where drainage is impeded	*Pyrola media* *Orthilia secunda* *Dicranum spurium*	Select all areas over 5ha

1.5 Other dry heath

Small examples of the normally coastal H7 *Calluna vulgaris-Scilla verna* heath, which is characteristically low-growing and usually contains the attractive *Scilla verna*, can sometimes be found in situations which are apparently not maritime. Although dwarf shrubs are a consistent feature of this vegetation, they are not always obvious and rarely continuous; even where more extensive, they are commonly penetrated by herbs such as *Lotus corniculatus* and wild *Thymus praecox*. *Calluna vulgaris* is the most frequent dwarf shrub and is often dominant, though on dry soils it is normally accompanied by *Erica cinerea*. On wetter soils, *Erica tetralix* and/or *Empetrum nigrum* are the usual associates. *Ulex gallii* is found occasionally.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H7 *Calluna vulgaris-Scilla verna* heath	Occasionally away from the coast in Scotland (also very local in coastal cliff areas in England, Wales Scotland, but as coastal heath)	On rocky outcrops, grading into adjacent wet and dry heaths and grassland	*Primula scotica* *Scilla verna*	Areas of any size can be selected

In the warm, oceanic, coastal climate of The Lizard Peninsula in Cornwall, H6 *Erica vagans-Ulex europaeus* heath occurs. This is a nationally rare and distinctive type of dry heath, in which *Erica vagans* and *Ulex europaeus* are the main co-dominants. Both *Ulex gallii* and *Erica cinerea* occur commonly and in places are abundant. *Calluna vulgaris* is, however, notably infrequent. The height and cover of dwarf shrubs is variable, reflecting differences in grazing, burning and soil conditions; in exposed situations the vegetation can be very short. Various grasses and herbs are widespread, including *Stachys officinalis*, *Agrostis vinealis*, *Viola riviniana*, *Polygala vulgaris*, *Carex flacca* and *Filipendula ulmaria*. This reflects the peculiar association of this habitat with well-drained, moderately base-rich soils derived from serpentine rock.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H6 *Erica vagans-Ulex europaeus* heath	Confined to the Lizard, Cornwall	Part of the Lizard complex	*Erica vagans* *Juncus capitatus* *Allium schoenoprasum* *Trifolium bocconei*	Select all areas

H11*Calluna vulgaris-Carex arenaria* heath normally occurs as coastal heathland on acidic sand dunes and sandy shingle. However, it sometimes occurs as lowland heathland in inland sand dunes, such as in the Breckland or the Coversands. Here *Carex arenaria* is a constant and defining feature, and *Calluna vulgaris and Erica cinerea*, are the main dwarf shrubs.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H11 *Calluna vulgaris-Carex Arenaria* heath	Widespread on coastal and inland dunes and sandy shingle	Integral part of some dune systems	*Cladonia* species Ground-growing *Usnea* species	Areas of any size can be selected in inland locations. Select areas in combination with other inland dune features

2. Wet heathland

British wet heathland is associated with acidic, nutrient-poor, shallow peat or sandy soils with impeded drainage. The vegetation is typically dominated by a range of dwarf shrubs and other species including *Erica tetralix, Calluna vulgaris*, *E. cinerea*, *Vaccinium myrtillus*, *Myrica gale*, *Molinia caerulea*, *Scirpus cespitosus*, and various *Sphagnum* bog mosses. Wet heathland is an important habitat for a range of vascular plant and bryophyte species with an oceanic or Atlantic distribution in Europe.

Various lowland wet heathland communities, with different but overlapping geographic ranges, have been identified based on differences in their vegetation. These are described below. For further details see Rodwell (1991) and Elkington *et al* (2001).

M15 *Scirpus cespitosus-Erica tetralix* wet heath occurs where rainfall is moderate to high in the north and west of the British Isles. This vegetation has few constants and shows wide variation in the pattern of dominance. Most stands comprise mixtures of *Molinia caerulea*, *Scirpus cespitosus*, *Erica tetralix* and *Calluna vulgaris*, though one or more may be lacking entirely. *Erica cinerea*, *Vaccinium myrtillus*, *Myrica gale*, *Sphagnum* species, *Drosera rotundifolia*, *Narthecium ossifragum*, *Eriophorum angustifolium*, *Nardus stricta* and *Juncus squarrosus* are important in particular sub-communities. In the north, there may be a high cover of *Cladonia* lichens.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
M15 *Scirpus cespitosus-Erica tetralix* wet heath	Scotland, through Wales and less extensively in the Lake District, Dartmoor and Exmoor	Moist and generally acid and oligotrophic peats and peaty mineral soils in the wetter western and northern parts of Britain	None	Select all areas over 5ha

Where the conditions are drier in the north and west, but also in the south and east, M16 *Erica tetralix-Sphagnum compactum* wet heath is characteristic. This is usually dominated by mixtures of *Erica tetralix, Calluna vulgaris* and *Molinia caerulea* in variable amounts, being influenced by differences in the water regime, soil nutrient status, grazing and burning. *Sphagnum compactum* is typically abundant. *Erica cinerea* and *Ulex gallii* or *U. minor* may be abundant in transitions to drier heathland in southern England. In the south, species with a mainly southern distribution, such as *Gentiana pneumonanthe* and *Cirsium dissectum*, and others, such as *Rhynchospora fusca,* enrich the vegetation.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
M16 *Erica tetralix-Sphagnum compactum* wet heath	Widespread, but variably present, usually as small areas	Integral part of valley mire zonation throughout lowland Britain, especially in the south	*Erica ciliaris* *Gentiana pneumonanthe* *Rhynchospora fusca*	When present as the only or predominant type, any area above 5ha should be selected

A distinctive and nationally rare form of this habitat grows on The Lizard Peninsula in Cornwall, H5 *Erica vagans-Schoenus nigricans* wet heath. *Erica vagans* makes a constant and prominent contribution to the vegetation, along with *Schoenus nigricans*, *Molinia caerulea* and *E. tetralix*. *Ulex gallii* occurs with some frequency and may be co-dominant, but *Calluna vulgaris* is only occasional and *Erica cinerea* is scarce. *Genista anglica* can occur frequently and is preferential to this community.

NVC community	Distribution	Diversity and gradients	Rare species	Selection recommendations
H5 *Erica vagans-Schoenus nigricans* heath	Confined to the Lizard, Cornwall	Part of the Lizard complex	*Erica vagans*	Select all areas

Annex 2. Other habitats of European importance that can be found in association with lowland heathlands

- H1220 Perennial vegetation of stony banks
- H1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- H2140 Decalcified fixed dunes with *Empetrum nigrum*
- H2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- H5130 *Juniperus communis* formations on heaths or calcareous grasslands
- H6130 Calaminarian grasslands of the *Violetalia calaminariae*
- H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)
- H6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (e.g. in Wales)
- H7140 Transition mire and quaking bog
- H7150 Depressions on peat substrates of the *Rhynchosporion*

Annex 3. Relationships between lowland heathland types identified in the National Vegetation Classification (NVC), Phase 1 habitat survey classification, corresponding habitats listed on Annex I of the EU Habitats Directive, and EUNIS habitats

Component	NVC community code	Phase 1 code and name	EU Habitats Directive code and name	EUNIS
Dry heath	H1-4, H7-10, H12, H16	D1.1 Dry dwarf shrub heath - acid	H4030 European dry heaths	F4.2 Dry heaths
	H6	D1 Dry dwarf shrub heath	H4040 Dry Atlantic coastal heaths with *Erica vagans*	
	H11	H6.6 Dune heath (only locations inland)	H2330 Inland dunes with open *Corynephorus* and *Agrostis* grasslands	
Dry heath/acid grassland mosaic	H1-H4 / U1-U4	D5 Dry heath/acid grassland mosaic	H4030 European dry heaths	
Dry heath/calcareous grassland mosaic	H2, H8 / CG2, CG7, CG9	D1.2 Dry dwarf shrub heath - basic	H4030 European dry heaths	
Lichen heath	H1 / U1a, CG7c	D3 Lichen/bryophyte heath	H4030 European dry heaths	
Wet heath	H5, M15-16	D2 Wet dwarf shrub heath	H4010 Northern Atlantic wet heath with *Erica tetralix*	F4.1 Wet heaths
	H3-H4, M16 with *Erica ciliaris*		H4020 Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix*	
Wet heath/acid grassland mosaic	M16, M24-25	D6 Wet heath/acid grassland mosaic	H4010 Northern Atlantic wet heath with *Erica tetralix*	

Note that this table shows which categories in other classification systems correspond, in whole or part, to Lowland heathland component types. It is not intended to provide a complete correspondence among all classifications shown.