Guidelines for the Selection of Biological SSSIs

Part 2: Detailed Guidelines for Habitats and Species Groups

Chapter 3 Lowland Grasslands

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Cover note

This chapter updates and replaces the previous Lowland Grassland SSSI Selection Guidelines chapter (Nature Conservancy Council 1989). It was prepared by Richard Jefferson (Natural England), Stuart Smith (Natural Resources Wales), and Jane MacKintosh (Scottish Natural Heritage), and provides detailed guidance for use in selecting lowland grassland 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:

- the addition of nine grassland types to the list of high-value types eligible for selection, including types of calaminarian grassland and fen-meadow/rush pasture, and types not previously covered by any chapters, such as inland dune grassland and three sub-types of MG1 *Arrhenatherum elatius* grassland;
- the adoption of a minimum standards approach, for all scarce grassland types in Great Britain (25 NVC types), with exemplar representation applying to the remaining six high-value types;
- the addition of new sections providing guidance on boundary determination and survey standards/methodology;
- the movement of four types formerly listed as high-value to the list of types of lower botanical value.

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.

In July 2019, additional text was added to Annex 1 A to clarify why there are differences between the extent figures for grassland types quoted in these guidelines and those derived from the Natural England Priority Habitat Inventory and used for the England Biodiversity Indicator Report.

1 Introduction

1.1 Lowland semi-natural grasslands are largely the product of human activity, having originally been created by woodland clearance and wetland drainage to provide fodder for domestic stock. Grazing and cutting for hay have been important factors in both their creation and their maintenance. The general definition of semi-natural lowland grassland adopted here, and indeed by others (e.g. JNCC 2004), is grasslands that occur either in enclosed or unenclosed situations but typically below the upper level of agricultural enclosure in any area and usually below 300m. The definition excludes grasslands on coastal sand and shingle, intertidal saltmarsh and maritime cliff communities. The sward usually contains a mixture of grasses and dicotyledonous herbs (forbs), and sedges and rushes may be prominent, especially in wetter types. The component plant species may have been mainly derived from the original woodland field layer, from open 'dry' habitats or from the drier edges of fens and marshes. Certain semi-natural grassland types, such as calcareous and parched acid grasslands, also have diverse assemblages of bryophytes and lichens, or fungi.

In contrast, improved or semi-improved grasslands, which now make up the vast bulk of grassland swards in the lowlands and upland fringes, are generally more species-poor. This is especially true of improved grasslands which are dominated by a few species of productive grasses and legumes as a result of the application of high levels of fertiliser, ploughing, reseeding and drainage (see section 2.1).

The important factor is that semi-natural grasslands have the status of mostly ancient communities composed almost entirely of native species. Some grassland plant species are ubiquitous, but many have more specific ecological requirements and restricted geographical distributions, so that soil characteristics, both physical and chemical, together with soil hydrology and location within Great Britain, play a major role in influencing sward composition.

Lowland grasslands and related habitats fall into six main groups, as described below. Further details are presented in Annex 1.

1.1.1 Neutral grasslands

These occur mostly within enclosed field systems on free-draining or moist infertile or moderately fertile brown soils such as clay loams, with pH in the range 5.0 to 6.5. Taken together, they once covered a large proportion of lowland Great Britain. However, individual areas are now small in extent, seldom exceeding 10ha, and are highly fragmented. They are usually managed as hay meadow or as pasture although some types are maintained solely by cutting or episodic grazing.

1.1.2 Calcareous grasslands

Lowland calcareous (calcicolous) grasslands mostly occur on shallow, infertile lime-rich soils over chalk and limestone bedrock with pH in the range 6.5 to 8.5. They are occasionally found on other base-rich substrates such as basic igneous rocks and calcareous glacial drift deposits. These grasslands may be either unenclosed or enclosed, with many now being confined to steep valley slopes, escarpments, and coastal cliffs and headlands. More rarely they may occur on relatively level ground such as in the East Anglian Breckland and Salisbury Plain.

These agriculturally unproductive grasslands were traditionally grazed by sheep or cattle. They are floristically-rich and form an especially important habitat for butterflies and other invertebrates.

1.1.3 Acid or calcifugous grasslands

These occur on non-calcareous substrata such as sandstones and igneous rocks, or over sands and gravel deposits. They can also occur over calcareous strata where leaching of bases occurs in area of high rainfall or where drift overlies the country rock. Lowland acid grassland can occur in a wide variety of topographical situations, ranging from level plains such as in the East Anglian Breckland to steep valley slopes, and are especially frequent in the upland fringes.

The soils are typically infertile with pH less than 5 and range from being summer parched to moist in character. These grasslands are typically agriculturally unproductive and are thus most suitable for extensive livestock grazing, like their calcareous counterparts. Away from the uplands, they seldom occur in large areas in isolation. Acid grasslands are often associated with dwarf-shrub heath communities.

1.1.4 Fen-meadows and rush-pastures

These marshy grassland communities occur on infertile, seasonally-waterlogged sites with slowly permeable, humic or peaty gleys, as well as peat soils. The pH range for the component types is wide, ranging from 4.7 (acidic) to 7.4 (alkaline) (section A in Annex 1). They occur mostly on flat and gently sloping ground, often associated with valley-side springs and seepage lines, but also on river and lake floodplains. They tend to be dominated by purple moor-grass and/or rush species and various sedges can be abundant. They are usually managed as pasture or, more rarely nowadays, as hay meadows. Neglect results in dominance by tall herbaceous species, potentially leading to the development of tall-herb fen and/or invasion of woody species. They may be very small, for example a few square metres around a discrete spring, or may form part of larger tracts of semi-natural vegetation with habitats including dwarf-shrub heath, bogs, flushes, tall-herb fens and dry grassland.

1.1.5 Calaminarian grasslands

This habitat type consists of vegetation occurring on soils enriched with heavy metals such as lead, zinc and copper and other minerals in both near-natural and artificial situations. The soils are often skeletal, and the substrate is nutrient-poor, usually with poor water retention.

Calaminarian grassland occurs on artificial mine waste, metal-enriched river shingle or more rarely in near-natural situations over serpentine and mineral vein outcrops. The habitat is usually associated with limestones and granites and is found in both the lowlands and the uplands.

The vegetation usually consists of an open mixture of metal-tolerant strains of grasses and dicotyledonous herbs, including metallophyte species such as spring sandwort *Minuartia verna* and alpine penny-cress *Thlaspi caerulescens*. Some stands are characterised by varied assemblages of lichens and/or bryophytes including metallophyte species such as the endemic *Ditrichum cornubicum*. Bare ground may make up a high proportion of overall cover in examples with particularly high heavy metal concentrations.

1.1.6 Dune grassland vegetation in inland areas

In eastern and southern England, sands derived from glacial or wind (aeolian) activity give rise to dunes and fixed dune grassland in inland areas away from the coast. These occur very locally, often in association with lowland acid grassland. The vegetation is variable in its species richness and composition depending on factors such the mobility and lime content of the substrate and management. In general, the vegetation is dominated by one or more of sand sedge *Carex arenaria*, red fescue *Festuca rubra*, sheep's fescue *F. ovina* and common bent *Agrostis capillaris*. There are varying amounts of annual and perennial dicotyledonous herbs, mosses and lichens depending on the particular vegetation community.

2 Recent history of change

2.1 The ancient semi-natural lowland grasslands have been a particular focus for the processes of agricultural intensification that have been so marked since World War II. This was fuelled by a combination of technological innovation, grants for land improvement, commodity price support and tax concessions on farm infrastructure facilitated by the UK Government and the European Union in the second half of the 20th century. These changes have involved conversion of grassland to arable, intensification by ploughing, drainage and reseeding, improvement with fertilisers and herbicides and a shift from hay to silage. This has led to a major expansion of more uniform, species-poor, agriculturally productive swards dominated by perennial rye-grass and white clover. Others, through one or more of these treatments or simply through heavy grazing and manuring, have more slowly been converted to semi-improved grassland dominated by a few grass species, with few remaining forbs.

Large areas of ancient semi-natural lowland grassland have been lost during this period, though it is rarely possible to provide accurate figures. For example, it has been estimated that 97% of lowland unimproved grassland was lost between 1930 and 1984 in England and Wales (Fuller 1987). More recent studies have shown that losses continued in Great Britain over the last two decades of the 20th century (Natural England 2008; Stevens *et al.* 2010; Dadds & Averis 2014).

Grassland surveys conducted during the late 1980s and 1990s by the statutory nature conservation bodies and other non-governmental organisations, such as The Wildlife Trusts, showed that losses of semi-natural grassland continued during this period. For example, a survey of Berkshire's neutral grassland in 1995 (previously surveyed between 1984 and 1987), showed that 50% of sites (60% by area) had been damaged or destroyed (Redgrave 1995). Devon Wildlife Trust (1990) recorded a 62% loss of culm grassland sites (mostly comprising purple moor-grass and rush pasture) between 1984 and 1989/90. These examples of declining extent are supported by local surveys undertaken by other county wildlife trusts during a similar timeframe (Plantlife 2002). More recently, a survey of about 500 non-SSSI semi-natural grassland sites in England (Hewins *et al.* 2005) revealed that 24% of these sites more closely resembled agriculturally improved grassland types than semi-natural grassland habitats, indicating further losses of semi-natural grassland between 1980 and 2003. Dadds and Averis (2014) found that 16% of non-designated species-rich lowland grasslands recorded in Scotland in the 1980s and 1990s were lost by 2011 and only 41% were in favourable condition. In Wales, survey in 2004 recorded significant decline at 25% of non-designated sites over an average eight-year period since the previous survey (Stevens *et al.* 2010).

However, there is circumstantial evidence that the decline due to agricultural intensification has recently slowed due to the influence of conservation measures (Bullock *et al.* 2011). The temporal dynamics of semi-natural grassland change over this period have been influenced by the withdrawal of grants for land improvement and a gradual introduction of incentives for conservation management from the late 1980s onwards (Bullock *et al.* 2011). The notification of lowland grasslands as SSSIs by the statutory nature conservation bodies continues to be an important mechanism for conserving the remaining semi-natural grassland resource. Details of the portfolio of lowland grassland SSSIs can be found on the websites of the statutory nature conservation bodies, and some generic data on representation of semi-natural grassland in SSSIs can be found in Natural England (2008) and, for Wales, Bullock *et al.* (2011).

The residual total area of lowland semi-natural grasslands in Great Britain is estimated at around 170,000ha, which equates to only 0.8% of the land area (Bullock *et al.* 2011).

2.2 Semi-natural grasslands have also become increasingly fragmented and isolated amongst intensively-managed farmland, often surviving as isolated fields, as inaccessible parts of intensively-managed fields or small groups of fields in the possession of elderly farmers (Blackstock *et al.* 1999). For example, there are still concentrations of extensively-managed meadows in the crofting areas of north-west Scotland and the Western Isles.

2.3 The abandonment or inadequate management by grazing or cutting of semi-natural grassland, as a result of their increasing irrelevance to modern intensive farming systems is another major cause of decline in their nature conservation value in Great Britain and across continental Europe (e.g. Crofts & Jefferson 1999; Veen *et al.* 2009; Bullock *et al.* 2011). This has led to many grasslands becoming subject to natural processes of plant succession. First, robust and vigorous grasses tend to assume dominance, suppressing or reducing the smaller herbs. Then, sooner or later, species of tall shrub typically begin to invade and develop dense growths of scrub. Ultimately the succession will, in most cases, result in woodland (Duffey *et al.* 1974).

2.4 Grazing and mowing of semi-natural grasslands with low agricultural productivity has become less economically viable due to low forage yields, higher labour costs and limitations imposed by difficult terrain or isolation, especially in areas dominated by arable farming. Changes in social factors, including demographic changes, have also exacerbated the trend towards abandonment.

2.5 The deposition of atmospheric nitrogen from fossil-fuel burning has been a further factor that is considered to have caused widespread degradation of British semi-natural grasslands (Bobbink *et al.* 1998). In addition, for certain wetter grasslands, changes in hydrology due to drainage, abstraction and flood relief are significant causes of loss and unfavourable condition (Wheeler *et al.* 2009).

3 National and International importance

3.1 All lowland grasslands of high botanical nature conservation value (as listed in section A of Annex 1) are covered by the country-level lists of ‘priority habitats’ in England, Scotland and Wales (see Annex 2). These are habitats that are considered to be of principal importance or highest priority for the conservation of biological diversity in the respective countries.

3.2 Many of the NVC lowland grassland communities have analogues in continental Europe and some have even closer affinities with grasslands in Ireland (Rodwell *et al.* 2007). Most of them are, nevertheless, distinctively British in their detailed floristic composition, and a few of the sub-communities are not close to any other described types. This range of grasslands has also lost much ground on the continent and continues to do so, through the same processes of agricultural improvement and abandonment that have caused their extensive modification in Britain. Semi-natural lowland grasslands thus represent internationally threatened high-value habitats which are likely to become still rarer (Veen *et al.* 2009). Many of the semi-natural NVC lowland grassland types correspond, for example, to habitats listed on Annex I of the EU Habitats Directive (see Annex 2), conferring status as habitats of European nature conservation significance.

4 Selection requirements

4.1 The distinction as to what constitutes lowland grassland as opposed to upland grassland for the purposes of the guidelines has been broadly defined using the upper level of enclosure supported by altitude (section 1.1). In practice, there is rarely a clear ecological cut-off between lowland and upland grassland of the various types, as grassland vegetation exhibits a continuum of change from the lowlands to uplands influenced by a range of factors but particularly the temperature, rainfall and insolation regimes which, in turn, influence soil

characteristics. For example, with calcareous grasslands there is a gradation from lowland south eastern England to the northern and western uplands in terms of the distribution of communities, sub-communities and individual plant species (Rodwell 1992).

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. This may be a particular issue in the limestone areas of the Yorkshire Dales and Cumbria and the 'ffridd' of Wales with respect to calcareous and acid grasslands respectively. 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 in forming a decision.

4.2 The approach in the previous lowland grassland guidelines was to establish a minimum size threshold for NVC types of high botanical value (0.5ha) below which single or mixed types would not normally qualify for selection. For neutral grassland and acid grassland types of 5ha or more, or 10ha or more of mixed types, there was a presumption that all examples would be selected. For calcareous grassland, the equivalent thresholds were 10ha and 20ha respectively. For examples of neutral, calcareous and acid grasslands under 5ha but over 0.5ha, an exemplar approach was advocated involving the selection of the best or highest quality examples of the communities of high botanical interest.

4.3 The approach adopted below places much more of an emphasis on a minimum or critical standards approach. This is in response to the increased knowledge of the status of British semi-natural grasslands gained over the 25 years since the guidelines were published and the urgency of conserving the remaining resource by a suite of measures, of which SSSI designation is pre-eminent.

4.4 A few changes have also been made to the lists of NVC types considered to be of high and lower botanical interest. This has involved adding relevant types for calaminarian grassland, dune grassland vegetation in inland areas, and fen-meadows and rush-pastures (see Annex 1). These types were previously covered by the SSSI Selection Guidelines for Artificial Habitats, Coastlands and Fens respectively. These changes have been made to reflect increased knowledge of the ecology, distribution, European context and conservation value of British grasslands and related vegetation. They also reflect changes to the treatment of grasslands and related habitats in country and UK strategies, institutional and organisational frameworks and legislation.

4.5 Lowland grasslands can be very important for certain species groups, in particular, bryophytes, lichens, fungi, birds and invertebrates, as well as for scarce and declining vascular plants. Thus, reference should also be made to the SSSI Selection Guidelines for these taxa. They may also occur in a mosaic with, or form transitions to, other high-value habitats such as fens, dwarf-shrub heaths, maritime cliffs, limestone pavements and woodlands and scrub. Such mosaics and transitions in themselves may also be important in supporting species that rely on the ecotones and juxtapositions between habitats (see section 4.17 and section 9 in Bainbridge *et al.* 2013).

4.6 Only those areas or sites supporting the NVC lowland grassland communities of high conservation value listed in section A of Annex 1, or covered by sections 4.14, 4.15 and 4.16 below, will normally qualify for SSSI selection on lowland grassland habitat grounds. However, the provisions of sections 5.1 and 5.2 may also need to be applied.

4.7 The NVC grassland communities listed in section B of Annex 1 are generally modified types of lower botanical interest. These should not be used as the basis for SSSI selection unless they have rare plant species or assemblages or special faunal interest (MG9, MG10, MG11 and MG13 may do so, in particular). They can, however, be included within an SSSI

where they form a mosaic with more important communities or as part of a practical management unit (see section 5). MG11 and MG13 can be an integral part of the spatial and temporal sequence of floodplain meadow vegetation, associated with communities of higher botanical interest such as MG4, MG7c-related and MG8. There is sufficient evidence for dynamism in floodplain grassland that inclusion within an SSSI of continuities of MG4-MG5-MG7c-MG8 and related vegetation MG11-MG13 could be justified, because it is likely that the communities will fluctuate in extent or move around over time through processes of colonisation and extinction. Similarly, calaminarian grassland (OV37 and related vegetation) often occurs as a dynamic habitat occurring as patches within a matrix of lower value habitat. Inclusion of the full mosaic of habitats in this context is advocated and justifiable.

4.8 The addition of fertilisers or nutrients and herbicides and land drainage, lack of management or over-grazing are all factors that can result in adverse changes to the high-value grasslands listed in section A of Annex 1. This may result in conversion of these semi-natural grasslands to semi-improved or degraded types such as MG1a, MG1b, MG6, MG9 and MG10. The cut-off point between MG6 and its precursors and between fen-meadows (eg M23) and MG9 and MG10 can often be blurred. Thus, MG6 is an NVC type which at one extreme borders on SSSI quality and at the other extreme on MG7, which clearly has very little botanical interest.

4.9 Examples of grassland with any of the communities or sub-communities listed in section A of Annex 1, either singly or in combination, should normally be at least 0.5 ha in area to qualify for selection. In exceptional cases, examples of rare grassland types or sub-types which are under 0.5 ha may be considered to qualify for selection if they are represented by one or very few sites in an Area of Search (AOS). For example, spring or seepage sites supporting high-value examples of fen-meadow/rush-pasture communities are, by their very nature, small in extent and thus a minimum size threshold may be inappropriate. Such sites should be considered on a case-by-case basis, bearing in mind habitat viability as outlined in section 5.7.1 in Bainbridge *et al.* (2013).

4.10 The national extent of any grassland type should be taken into account during the selection of sites for notification from those that qualify for selection. For those grassland communities that are now rare (less than 10,000ha in Great Britain or less than 10,000ha in the British lowlands, as shown in section A of Annex 1) the presumption is that all examples which are at least 0.5ha should be selected for notification, singly or in combination. Similarly, all examples of particularly rare and distinctive NVC sub-communities of less scarce NVC types (U1a, c, f, U4c) (see section 4.11 below and section A of Annex 1) should also be selected at this level.

4.11 For those grassland types where the total British resource exceeds 10,000 ha (as shown in section A of Annex 1), an exemplar approach to the selection of sites should be taken. The selection should include the best examples within an AOS, ensuring representation of the range of sub-communities and other significant variation. There should be a general presumption to select sites of 5ha or more, although in the upland fringes and in AOS with extensive representation of the habitat, selection should focus on the largest, diverse and least modified examples.

Sites under 5ha but over 0.5ha can be selected if they satisfy one of the following three attributes.

4.11.1 They are deemed to be high quality examples and rate highly on one or more of the following criteria based upon two of the broad criteria outlined in Bainbridge *et al.* (2013).

Diversity

(i) The diversity of sub-types within a site: diversity of types is more highly valued than uniformity.

(ii) Plant species-richness: very species-rich sites are often of higher value but this should be used carefully as a measure of value, because it may include species indicative of unfavourable site conditions and non-native species. This criterion can be judged using the data in Rodwell (1991, 1992, 2000) or other summary NVC data such as Stevens *et al.* (2010).

(iii) Number and relative abundance of character or positive indicator plant species, including NVC preferential species (e.g. Rodwell 1991, 1992, 2000; Robertson & Jefferson 2000; JNCC 2004).

Rarity

(iv) Presence, number and abundance of species of local distinctiveness, restricted distribution or threatened at national, regional and local scales in the grassland type.

Sites scoring highly on the above criteria will have additional value if they lack, or have low cover of, negative indicator species or other agriculturally favoured species.

4.11.2 They are located in a country or AOS where a) there are few areas of the type and selection would contribute to representing the geographical range of the NVC type nationally or conversely b) the geographical unit contains the only, or a high proportion of, localities for a particular sub-community or an unusual variant (e.g. the *Pimpinella saxifraga* variant of MG1e).

4.11.3 They provide additional ecological coherence and functionality by contributing to a network in the sense of Lawton *et al.* (2010). For example, such sites might be adjacent to or near existing semi-natural grassland sites, add to more dispersed habitat networks or be juxtaposed to land that has high restoration potential, enabling potential site expansion and linkages or increasing connectivity at the landscape scale. In such cases, generic advice is inappropriate and each case needs to be considered on its merits and advice should be sought from national habitat and species specialists.

4.12 For MG1 c-e, sites should be 5ha or more and be species-rich to be eligible for selection. While caution is needed in taking a very prescriptive approach, stands that contain 15 or more species per 4m^2 would normally be considered to be species-rich for this community. However, consideration should also be given to the number and abundance of positive indicator or character species that are typical of semi-natural neutral grasslands such as MG5 and calcareous grassland types such as CG2, but which are also associated with MG1 c-e (Rodwell 1992; Robertson & Jefferson 2000; JNCC 2004).

Sites less than 5ha but exceeding 0.5ha can exceptionally be selected if they are deemed to be particularly high-quality examples and rate very highly on one or more of the attributes in section 4.11.

It is important to recognise that, in the longer term, the objective for some stands of MG1d and MG1e might be to manage them towards calcareous grassland (e.g. CG3) and neutral grassland (e.g. MG5) respectively by, in particular, introduction of grazing or hay meadow management.

4.13 In the evaluation of sites that contain grassland community mixtures, size thresholds for SSSI selection correspond with those used in the (sub-) community assessment i.e. 0.5ha for mixtures of rare communities and 5ha for more widespread types (sections 4.10 and 4.11). For combinations of rare and more widespread grassland types, decisions should be

taken on a site by site basis, taking account of the criteria in sections 4.9, 4.11 and 4.12.

4.14 Grassland communities which either are a very poor fit to existing NVC types (excepting those already highlighted as 'related' in section A of Annex 1) or do not fit within the NVC framework should be considered on a case-by-case basis, taking into account the standard evaluation criterion set out in Bainbridge *et al.* (2013) such as diversity, naturalness and rarity. Examples include forms of species-rich calcareous fringe or 'saum' vegetation (Rodwell *et al.* 2000), the distinctive grasslands associated with the Whin Sill in north-east England that are most closely related to various types of acid and calcareous grassland (Simkin 2011) and the *Nardus stricta-Succisa pratensis* grassland recorded by Stevens *et al.* (2010).

4.15 It is conceivable that further sampling of British vegetation may lead to the description of new forms, variants, communities/sub-communities or transitional types of high botanical value. There should be a presumption that these should be considered for selection using the evaluation criteria in these guidelines.

4.16 Grasslands that have undergone restoration from semi-improved grassland or have been created on former arable land (by introduction of seed or green hay or by natural colonisation) or are the result of translocation of existing semi-natural grassland may key out as NVC communities listed in section A of Annex 1. These grasslands will generally be of lower quality when criteria such as species richness, number of character or indicator species (e.g. Robertson & Jefferson 2000; JNCC 2004) and overall environmental heterogeneity are assessed. They would also be rated less highly against the naturalness criterion, where less modified types or forms which occur in a semi-natural context are generally rated more highly. In such cases, generic advice is inappropriate; each case needs to be considered on its merits and specialist advice should be sought.

4.17 Scrub can be an integral part of some semi-natural grassland types and may be of value either as a community in its own right or as a supporting structural component feature for species, including a range of scarce species of priority for nature conservation (Mortimer *et al.* 2000). The scrub-grassland interface or transition and its spatial and architectural configuration may too be important in the latter context. High-value scrub communities include species-rich types of W21*Crataegus monogyna-Hedera helix* scrub, especially W21d, the *Viburnum lantana* sub-community, which forms part of the H5130 *Juniperus communis* formations on heaths and calcareous grassland type. Scrub is also a component of H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (Annex 2).

There will be situations on grassland sites where scrub will be a lower priority and will need to be reduced or managed to restore favourable condition to high-value grassland types (Robertson & Jefferson 2000). In addition, restoration of recent scrub to grassland may also be a valid objective in some cases (section 5.2).

Although the Woodland SSSI Selection Guidelines specifically list NVC scrub types (W21-W25) as qualifying features, the implication is that where such communities occur away from woodlands and form part of open habitats such as lowland grasslands, they would normally be considered in the context of those habitats. Thus, where scrub occurs as a part of, or adjacent to, a lowland grassland area, the value of scrub should be evaluated during the selection process and during the determination of site boundaries (section 5). Evaluation should take account of the guidance provided in sections 4.5, 4.18 and 5.2.

4.18 Sites with a complex of semi-natural habitats reflecting variation in particular environmental parameters or exhibiting transitions between habitats are considered to have greater value. Evaluation of mosaics composed of different habitat types is discussed further

in section 9 of Bainbridge *et al.* (2013). The cases which are most difficult to evaluate are combinations of different habitats (and species) where no one component type clearly exceeds the SSSI standards or thresholds, but their combined value appears to merit selection. The advice of species and habitat specialists should be sought in these difficult cases.

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. Some examples of this are given in the box below. Consideration should be given to the inclusion of whole management units, entire ecological units and land required for supporting processes, such as hydrology. Thus, for example, this may require the inclusion within a site boundary of areas of land supporting grassland communities of lower botanical interest (section B of Annex 1), or non-grassland vegetation.

Some examples of where the inclusion of supporting land containing vegetation types lacking special interest within a lowland grassland SSSI may be required:

- the protection of an SSSI interest feature from adverse impacts which are the result of treatments or the management of land adjacent to a management unit supporting the interest feature e.g. damaging fertiliser or pesticide drift or the transfer of nutrients through soil, water or in livestock dung;
- the inclusion of land that is necessary for sustaining wet grassland features by ensuring water quality standards and supporting hydrological processes and function are maintained e.g. inclusion of adjacent 'catchment' land including springs, watercourses or aquifers which may feed a site with water;
- the need to account for the ecological requirements of specific species or species assemblages that contribute to the site's special interest;
- to allow for notifying to an identifiable boundary.

5.2 In the case of a candidate SSSI grassland site where recent survey has recorded a community listed in section B of Annex 1 (excepting MG7) or a scrub type (W21-W25) or bracken (U20), but a survey within the last ten years demonstrated the former presence there of a notifiable grassland type, then inclusion of this area within a proposed site may be considered. This would be confined to situations where the grassland of the types listed in section B of Annex 1 is adjacent to types of high botanical interest (section A of Annex 1), such as in contiguous fields, or where a grassland area occurs between two high-quality parts of a compound site and where its restoration might benefit all three elements of the site.

However, each case would need to be considered on its individual merits, taking account of the potential for restoration informed by the current floristic composition, including condition, and soil nutrient status, plus other contextual information such as site size and proximity to other features of interest.

5.3 The normal minimum size threshold for grassland communities of high botanical interest is 0.5 ha and this applies at the site level including where the total extent may be spread across a number of discrete fields or management units.

5.4 Decisions as to what constitutes a 'site' where there are non-contiguous fields or units (a compound site) should be guided by one or more of the following criteria applying, with the exception of the first which may not be enough on its own, depending on the distance apart of fields or units:

- the component fields are similar in terms of their vegetation composition (e.g. same NVC community type or broad NVC grouping) and occur on similar soil types/geology within a discrete landscape or occur in similar topographical situations (e.g. disjunct flushes along a valley);
- it is very likely that local habitat fragmentation has caused the current disjunct nature of the habitat(s) and that the elements would formerly have been linked;
- where different vegetation types are present, there is evidence that these once occurred in previously contiguous mosaics and transitions reflecting local changes in soils, hydrology *etc*, within a similar landscape setting;
- there is a high likelihood that individual sub-components provide an overall habitat resource for certain wide-ranging species.

6. Survey requirements

6.1 To enable sites to be properly evaluated against the guidelines, there is a requirement for detailed survey information to determine accurately the vegetation types present, their species composition and spatial configuration, including their area.

6.2 Sites should be surveyed using the NVC survey methodology detailed in Rodwell (2006). It is essential that the surveyors are experienced botanists with a good knowledge of the grassland sections of the NVC (Rodwell 1991, 1992, 2000) and variation described subsequently. For sites supporting wet grassland and fen-meadows and rush-pasture communities, some understanding of ecohydrology and water chemistry is important in understanding and characterising vegetation types.

6.3 Surveys should be undertaken at a suitable time of year to ensure the identification and cover assessment of most plant species. This is likely to be within the period May to September, although for hay meadows, the optimum time is likely to be May to early July (before the cut). However, surveys undertaken outside this period may be able to collect sufficient botanical data to inform an assessment against the guidelines, depending on, for example, grassland type and site management.

6.4 The NVC methodology (Rodwell 2006) does not specify exactly how many quadrat samples should be recorded for each identified NVC sub-community type, leaving it to be decided according to the objectives of the survey, the nature of the site, its size and complexity, and the level of experience and skills of the surveyor. Thus, when surveying and describing the NVC sub-communities listed in section A of Annex 1 for informing an SSSI notification proposal, the recommendation would be to record the number of quadrats required to sufficiently characterise the NVC sub-communities on the site and their floristic nature and variation. However, a minimum of five quadrats per sub-community type would be desirable good practice and the norm for complex or atypical sites.

6.5 Quadrat sampling allows the construction of a constancy table which can then be compared against the community keys and the published NVC tables (Rodwell 1991, 1992, 2000). The computer matching programs Match and Tablefit can be useful in some cases to help place samples, but it is recommended that the keys, tables and descriptions in the published NVC volumes and other authoritative surveys (e.g. Stevens *et al.* 2010; Prosser *et al.* 2014) should be the main system for identifying NVC types from survey data. Where a stand of vegetation is intermediate in character between two types, it is preferable to opt for one type rather than record for example MG8/M22b. This requires the expertise and confidence to select the nearest described type and to interpret and describe the differences from it in an ecologically informative fashion. Where two or more grassland (sub-) communities occur in a complex, small-scale mosaic which defies mapping then estimates of the percentage extent of each should be made, e.g. U1a 25% CG7b 75%.

6.6 It is important to stress that the NVC is a national framework based on samples of vegetation across Great Britain and does not describe the full range in variation of different vegetation types (Rodwell *et al.* 2000). In addition, many of the communities occur over a wide geographical range. This means that species with a restricted geographical distribution will naturally be absent in certain areas where that community is found. Thus, not every stand of vegetation will closely match the NVC descriptions.

Rodwell (2006) also states that it is mistaken to conclude that vegetation that is atypical or a poor fit is invariably of lower intrinsic conservation value. In fact, both well and ill-fitting stands represent the real field of variation in a vegetation type which is summarised in a floristic table and description. In many cases, a 'poor' fit may indicate valuable local peculiarities.

6.7 It is not necessary to take quadrats in areas which are to be included to ensure the integrity of the interest features (section 5.1) and which clearly have little or no intrinsic value. However, the survey map should be accurate enough to identify these areas on a site and there should be enough evidence to be able to identify where the vegetation fits in the NVC.

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Annex 1. Distribution and extent of grassland communities of different botanical nature conservation value

Lowland grasslands and related vegetation types are described in detail in Volumes 2, 3 and 5 of the NVC (Rodwell 1991, 1992, 2000). In addition, several proposed new forms, variants, sub-communities and transitional types are described or summarised in Rodwell (2000), Stevens *et al.* (2010), JNCC (2011), Prosser *et al.* (2014), and Wallace and Prosser (2014). Updated distribution maps of the lowland grassland NVC communities can be found in Rodwell *et al.* (2007). The relationships between lowland grassland types identified in the NVC and the habitat types within the EU Habitats Directive and country-level lists of priority habitats are given in Annex 2.

A. Distribution of grassland communities of high botanical nature conservation value

♦ = may also occur in the unenclosed uplands or as part of the mosaic of vegetated sea cliffs, shingle, dunes and other maritime habitats
* = estimated to cover less than 10,000ha in Great Britain
+ = estimated to cover less than 10,000ha in the lowlands of Great Britain

Note: *These areas are a subset of the national Priority Habitat areas used for England Biodiversity Indicator Report (Indicator 2A- Extent and condition of priority habitats). The process of mapping inventories in England rounds areas up to parcel level, is based on old survey data so doesn't reflect recent changes and takes a broader definition of 'grassland' – including partially degraded and less species rich grassland than would be considered for designation. Overall, this leads to an overestimate of Priority Habitat cover in England. This is particularly apparent for MG5 communities that are a subset of the Lowland Meadows Priority Habitat. While extent may differ, the England national inventory maps (used in England Biodiversity Indicator reporting) are a good indication of the location of known high quality sites.*

Note that where the following types occur in the unenclosed uplands, or as small areas of ground immediately adjacent to or as part of the mosaic of coastal habitats, they should be assessed using the Upland or Coastal SSSI Selection Guidelines. However, semi-natural grasslands adjacent to coastal habitats that are extensive and continue well inland should be evaluated using the Lowland Grassland SSSI Selection Guidelines. See section A5 below in relation to the treatment of fen-meadow and rush-pasture communities.

A1. Mesotrophic or neutral grasslands

Semi-natural mesotrophic grasslands, while being widespread across lowland Great Britain, are collectively very scarce and fragmented as they have been a particular focus for agricultural improvement. It is estimated that significantly less than 15,000 hectares remain in Great Britain.

MG1 c, d, e, *Arrhenatherum elatius* grassland

The *Filipendula ulmaria*, *Pastinaca sativa* and *Centaurea nigra* sub-communities (MG1c, d, and e) are generally the least modified and the most species-rich of MG1 sub-types. The *Pastinaca sativa* sub-community is confined to calcareous soils in south and east England and south Wales while the *Centaurea nigra* and *Filipendula ulmaria* sub-communities are widely distributed on suitable soils in lowland Great Britain. The *Pimpinella saxifraga* variant of MG1e only occurs on limestones in the Mendips and the Pennines.

*** MG2 *Filipendula ulmaria-Arrhenatherum elatius* tall-herb grassland**

A sub-montane community restricted to calcareous substrates (especially Carboniferous Limestone) in northern England, namely in the Pennine areas of Derbyshire and North Yorkshire, the Scottish borders and the Isle of Mull.

*** MG3 *Anthoxanthum odoratum-Geranium sylvaticum* grassland**

Occurs as valley grasslands and on river-banks and road verges in the northern upland fringes of England and Scotland, and is usually managed as hay meadows. There are major concentrations in the Pennine and Cumbrian Dales. This grassland sometimes occurs in association with upland forms of MG8, especially at higher altitudes, and U4c and M26 on banks in enclosed hay meadows.

*** MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland**

Found on seasonally-flooded land in lowland river and stream flood plains in England and eastern Wales. Widely scattered but with concentrations in the Thames, Yorkshire Ouse, Seven, Trent, Great Ouse and Nene catchments (Jefferson & Pinches 2009). Very rare in Wales. The MG4 floodplain meadow community described in the NVC was poorly defined, with the floristic tables based on a limited number of samples. Prosser *et al.* (2014) provide an updated description based on a large number of samples from across the range of the community.

* **MG5 *Cynosurus cristatus-Centaurea nigra* grassland**

Widely scattered throughout the British lowlands and upland fringes. The community occurs over a wide range of soil types with pH ranging from 5.0 to 6.2 and the sub-communities tend to reflect edaphic conditions. Floristically a very diverse grassland and the published description (Rodwell 1992) does not fully cover the range in variation (Rodwell *et al.* 2000; Jefferson 2013). The *Galium verum* sub-community shows affinities with calcareous grasslands and the *Danthonia decumbens* sub-community with acid grasslands.

*** MG7c-related *Alopecurus pratensis-Poa trivialis-Cardamine pratensis* floodplain grassland**

Widely distributed across lowland England. The status of this vegetation type in Scotland and Wales is unknown. A species-rich floodplain grassland related to MG7c and which has been termed *Alopecurus pratensis-Poa trivialis-Cardamine pratensis* floodplain grassland (Wallace & Prosser 2014). This MG7c-related grassland forms an integral part of the spatial and temporal sequence of floodplain meadow vegetation with communities such as MG4 and MG8 and, although it occurs at the higher end of the fertility gradient. It would be reasonable to presume it is semi-natural and not a highly modified type.

*** MG8 *Cynosurus cristatus-Caltha palustris* grassland and related vegetation**

Widespread but with a rather local distribution throughout England; scarce in Wales and Scotland. Characteristic of land with a seasonally high-water table. MG8 is poorly-defined in Rodwell (1992) and further survey has demonstrated that revision is required to embrace vegetation such as the *Agrostis stolonifera-Carex* spp vegetation described from Somerset (Cox & Leach 1996), Scotland (Cooper & MacKintosh 1996) and Yorkshire, and to better encompass northern upland stands with boreal montane species such as *Trollius europaeus*. A recent analysis of quadrat data from wet grassland vegetation conforming to the Calthion alliance (includes MG8 and related grasslands and rush-pastures) from England and Wales has proposed an expanded definition of MG8 (Wallace & Prosser 2014). This has been tentatively termed *Filipendula ulmaria-Cynosurus cristatus* grassland comprising four sub-communities. The analysis also re-affirmed the existence of *Agrostis stolonifera-Carex* spp grassland, re-naming it *Agrostis stolonifera*-Carex spp-*Senecio aquaticus* and *Alopecurus pratensis-Poa trivialis-Cardamine pratensis* floodplain grassland.

A2. Calcareous grasslands

For some of the widely distributed calcareous grasslands, such as CG2, CG3 and CG7, the floristic composition is influenced by geographical location, which is primarily related to changes in local climate within Great Britain. For example, calcareous grassland on the northern chalk and limestones may lack certain plants typical of the southern temperate floristic element but may support others that are typical of boreal montane or boreo-temperate floristic elements (Preston & Hill 1997).

*** CG1 *Festuca ovina-Carlina vulgaris* grassland**

Distribution limited to scattered sites on harder limestones, principally around and near to the southern coasts of England and the northern and southern coasts of Wales.

*** CG2 *Festuca ovina-Avenula pratensis* grassland**

Species-rich grassland widely distributed in Great Britain but with a strong bias over southern lowland calcareous formations. In Wales, it is confined to the limestones in the north and south. It is rare and of small extent in south-east Scotland (MacKintosh 2004; MacKintosh *et al.* 2004).

CG3 *Bromus erectus* grassland

Distribution follows that of the species and so this community is especially frequent over the Chalk, Jurassic Limestone and Magnesian Limestone (Permian). Very rare in Wales and absent from Scotland.

*** CG4 *Brachypodium pinnatum* grassland**

Widespread on the Cretaceous Chalk and Jurassic Limestone in England.

*** CG5 *Bromus erectus-Brachypodium pinnatum* grassland**

Confined to England. Distribution is centred on the Jurassic limestone in central and eastern England.

*** CG6 *Avenula pubescens* grassland**

Occurs in scattered localities over a variety of lowland limestone areas in England and Wales but is nowhere extensive, being often a product of little or no grazing of grasslands over moist, mesotrophic calcareous soils on flat or gently sloping sites. Rare on sand dunes in Wales (Dargie 1995). In certain situations, this grassland may result from abandonment or nutrient enrichment of other types of calcareous grassland types, particularly CG2.

*** CG7 *Festuca ovina-Hieracium pilosella-Thymus praecox/pulegioides* grassland**

Occurs in scattered localities on the Cretaceous Chalk, the Carboniferous Limestone of Derbyshire and the Mendips, with its greatest concentration and extent in Breckland. Very rare in Wales and in south-east Scotland.

*** CG8 *Sesleria albicans-Scabiosa columbaria* grassland**

Distribution is confined to Magnesian (Permian) Limestone in County Durham.

+ ♦ CG9 *Sesleria albicans -Galium sterneri* grassland

Distribution is confined to the Carboniferous Limestone of northern England, with the sub-communities marking regional and altitudinal differences. The *Helianthemum canum-Asperula cynanchica* and Typical sub-communities (CG9a and b respectively) occur in lowland situations.

+ ♦ CG10 *Festuca ovina-Agrostis capillaris-Thymus praecox* grassland

Although widespread in the uplands of Great Britain, it only occurs sporadically in the lowlands and is often associated with both acid grassland (U1 and U4) and other types of calcareous grassland such as CG2. It occurs over limestones and basic igneous and other sedimentary rocks. It may also occur on coarse-textured superficial deposits and on fixed dunes in north-west Scotland.

A3. Acid or calcifugous grasslands

Lowland acid grasslands often occur in association or form transitions with other types of grassland or dwarf-shrub heath.

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

These very diverse and open swards occur widely on shallow soils over acid superficial sands and gravels, various hard sedimentary rocks or acid to mildly basic igneous rocks, mostly in the drier areas of lowland Britain. U1 is widely distributed in Wales but has a small total area. It is rare and of small extent in Scotland (MacKintosh 2004; MacKintosh *et al.* 2004), mostly in the south. It also occurs occasionally on stabilised river shingle and coastal shingle in Great Britain (e.g. Ferry *et al.* 1990; Sneddon & Randall 1993), including occasionally on the west coast of Scotland.

*** U3 *Agrostis curtisii* grassland**

A community based on the abundance of *Agrostis curtisii* and therefore confined to central, southern and south-west England and south Wales. Frequently occurs in a mosaic with H3/H4 heathland.

♦ U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland

Principally a community of upland and upland fringe areas of north and west Britain associated with a range of acidic soils on lime-poor substrates. It is much less common in the lowlands, away from the uplands. U4c (*Lathyrus montanus-Stachys betonica* sub-community) is an especially rare and distinctive sub-type recorded from a few scattered localities in England, Scotland and Wales on suitable soils. Species-rich forms of U4a and U4b with strong affinities to MG5 have been recorded in Wales (Stevens *et al.* 2010).

+ ♦ U5 *Nardus stricta-Galium saxatile* grassland

Although widespread in the north and west of Britain in upland areas, it is rare at low altitudes. In the lowlands, known occurrences often conform to the *Calluna vulgaris - Danthonia decumbens* sub-community (U5d) (Sanderson 1998) and occasionally the typically more species-rich U5c *Carex panicea-Viola riviniana* sub-community.

A4. Dune grassland vegetation in inland areas

*** SD8 *Festuca rubra-Galium verum* fixed dune grassland**

*** SD10 *Carex arenaria* dune community**

*** SD11 *Carex arenaria-Cornicularia aculeata* dune community**

*** SD12 *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland**

These communities occur very locally inland in eastern and southern England, often in association with lowland acid grassland, primarily U1. Particular concentrations occur in Breckland in Norfolk and Suffolk and on the Coversands of north Lincolnshire. Description of these communities can be found in Rodwell (2000).

A5. Fen-meadows and rush-pastures

These are classified as mires rather than grasslands in the NVC (Rodwell 1991). However, they are often referred to as marshy grasslands (e.g. JNCC 2010). In many cases, these fen-meadows and rush-pasture types occur as isolated, enclosed sites in the farmed landscape, sometimes in association with other grassland types and wetland vegetation including bogs and wet heath. They may be managed as pastures or more rarely as hay meadows (Tallowin 2014).

Where these types occur predominantly on deep peat, within or closely associated with extensive fen/mire systems and largely separated from the farmed landscape, they should be assessed using the Fens or Bogs SSSI Selection Guidelines. The fen guidelines also list M27 *Filipendula ulmaria-Angelica sylvestris* mire and M28 *Iris pseudacorus-Filipendula ulmaria* mire under the generic heading of 'Fen-meadows'. The intention is that these two communities will be retained in the guidelines for fens, but it is worth noting that they can occasionally occur as small components of grassland sites on mineral soils.

* M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow

Highly variable rush-dominated vegetation which occurs on wet, base-rich peats and mineral soils in lowland Great Britain with notable concentrations in the chalk river valleys of south and eastern England and in Anglesey. Very rare and of small extent in Scotland (MacKintosh 2004; MacKintosh *et al.* 2004). The majority of stands occupy more or less flat situations or hollows, but a large number occur on seepage slopes. In base-rich mesotrophic-eutrophic conditions they can cover spring mounds. M22 may represent the remnants of damaged or degraded rarer oligotrophic base-rich fen types (such as M10 and M13), and where available, historical species data may be useful in identifying such sites.

♦ M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture

Widespread on wet, moderately acid to neutral peaty and mineral soils primarily in the cool and wet lowlands and upland fringes of northern and western Britain. The M23a *Juncus acutiflorus* sub-community is typically more species-rich than the M23b *Juncus effusus* sub-community. The latter is often the product of attempts to agriculturally improve marshy grasslands by drainage, nutrient addition and possibly re-seeding. Local in southern and eastern England.

* M24 *Molinia caerulea-Cirsium dissectum* fen-meadow

A widespread but local community characteristic of moist base-rich to mildly acidic soils in the lowlands of England and Wales. Particular concentrations occur in the New Forest, north Devon, East Anglia and west and south Wales. Recent surveys of base-rich grassland and flushes in the upland fringes of western and northern England, Scotland and lowland north Wales have identified previously undescribed vegetation with strong similarities to M24 and M26 (Cooper & MacKintosh 1996; Stevens *et al.* 2010; Tratt *et al.* 2013). The vegetation is not clearly attributable to either of these communities, as many examples lack character species such as *Cirsium dissectum* for M24, and *Trollius europaeus* and *Crepis paludosa* for M26. It is nevertheless a high-value species-rich vegetation type that, for now can be labelled as M24, but further survey work and phytosociological analysis is required to better define these base-rich fen-meadow/mire types. M24 may represent the remnant of damaged or degraded rarer oligotrophic base-rich fen-types (such as M13 and M10), and where available, historical species data may be useful in identifying such sites.

♦ M25 *Molinia caerulea-Potentilla erecta* mire

This community occurs on moist but well-aerated acid to neutral peats and mineral soils in the western lowlands and upland fringes of Great Britain. It is particularly frequent in south-west England, Wales and southern Scotland. It is characteristic of gently-sloping pastures,

sometimes on the margins of springs and the drier fringes of mires and bogs, and may be closely associated with wet heath and other wet grasslands. It may also dominate drained and degraded blanket bog. In the latter case, and for other upland examples of M25 in northern and western Britain, assessment should be made with reference to the Uplands or Bogs SSSI Selection Guidelines.

*** M26 *Molinia caerulea-Crepis paludosa* mire**

A very rare community occurring on moist, moderately base-rich peats and peaty mineral soils in England, Wales and Scotland with a stronghold in the sub-montane northern Pennines. A scatter of small sites occur in north Wales. The *Festuca rubra* sub-community often occurs on banks in enclosed meadows and pastures in association with MG3 and U4c. The *Sanguisorba officinalis* sub-community is more usually found in transitional vegetation around open water and is particularly uncommon. As noted under M24, vegetation of very similar character to M26 occurs more widely in the north and west of England than previously recognised, including types that appear transitional to M24 (O'Reilly 2011). Further work is required to better define its distribution in England.

A6. Calaminarian grassland (Metallophyte vegetation)

Note that this vegetation type was previously covered in the SSSI Selection Guidelines for Artificial Habitats. Lowland examples should now be considered using the lowland grassland guidelines. Rodwell (2000) and Rodwell *et al.* (2007) provide more detailed descriptions of this vegetation.

*** ♦ OV37 *Festuca ovina-Minuartia verna* community and related grasslands**

This community and related vegetation, which are referred to as calaminarian grassland, is found in the North Pennines, Yorkshire Dales, Cornwall, Mendips and Derbyshire White Peak in England. It occurs in scattered sites in Wales, especially in the north-east and central part, and in Scotland, with near-natural sites being confined to the Highlands and Islands. As OV37 does not describe the complete variation in floristic composition of calaminarian grassland across Great Britain, other vegetation on metal-enriched substrates is included such as the metallophyte vegetation characterised solely by distinctive assemblages of bryophytes or lichens on abandoned mine sites, particularly on tin, lead and copper-contaminated substrates. Vegetation on metal-enriched soils that has an ericaceous component but supports one or more metallophyte species is also included. This applies even if in NVC terms, the vegetation might be best placed under a heath community.

B. Distribution of grassland communities of lower botanical nature conservation interest

Δ = may also occur in coastal situations

Note that where these types occur in coastal situations (estuaries, saltmarshes, shingle, coastal grazing marsh, vegetated sea cliffs and slopes) they should be assessed using the Coastal SSSI Selection Guidelines.

Δ MG1 a, b *Arrhenatherum elatius* grassland, *Festuca rubra* and *Urtica dioica* sub-communities

Unmanaged coarse grasslands occurring throughout the British lowlands on road verges and railway embankments and in neglected agricultural and industrial habitats.

MG6 *Lolium perenne-Cynosurus cristatus* grassland

A widespread and very common grassland type in Great Britain, often brought about by the

action of fertilisers, other nutrients, herbicides and drainage on many other unimproved grassland types or by the agricultural rundown of MG7.

MG7 *Lolium perenne* leys and related grasslands

The major and ubiquitous sown grassland type in lowland Great Britain. Sub-communities a, b, d, e and f are included here plus the typical species-poor form of MG7c described in Rodwell (1992). The recently described species-rich MG7c-related type is excluded and placed under mesotrophic or neutral grasslands of high botanical nature conservation value.

MG9 *Holcus lanatus-Deschampsia cespitosa* grassland

This is characteristic of permanently moist and periodically inundated soils throughout the British lowlands.

∆ MG10 *Holcus lanatus-Juncus effusus* rush-pasture

This is characteristic of permanently moist and periodically inundated soils throughout the British lowlands. It can commonly develop by invasion of *Juncus effusus* or, less frequently, *J. inflexus* in newly established or semi-improved grasslands (MG6 and MG7) where drainage becomes impeded.

∆ MG11 *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland

Characteristic of lowland areas of Great Britain frequently inundated with fresh or brackish water in flood plains and on the coast.

∆ MG12 *Festuca arundinacea* grassland

Almost exclusively a coastal community of estuaries, upper saltmarsh and soft cliffs that receive inundation by brackish water or small amounts of salt-spray.

∆ MG13 *Agrostis stolonifera-Alopecurus geniculatus* grassland

Widely distributed in lowland areas of Great Britain in periodically inundated flood plains, along watercourses and around water bodies. It also occurs in freshwater transitions of upper saltmarshes.

U2 *Deschampsia flexuosa* grassland

Scattered distribution on free-draining, base-poor soils in lowland England and Wales. Usually considered to be the product of dwarf-shrub degradation due to nutrient enrichment, overgrazing or burning.

∆ *Festuca rubra-Holcus lanatus-Anthoxanthum odoratum* grassland

This species-poor, mesotrophic grassland has been recorded by various surveys from Great Britain, especially in Scotland and Wales (e.g. Cooper & MacKintosh 1996; Stevens *et al.* 2010). It is briefly described in Rodwell (2000) and although distinctive, has affinities with MG1 *Arrhenatherum elatius* grassland, MG6 *Lolium perenne-Cynosurus cristatus* grassland and MG5 *Cynosurus cristatus-Centaurea nigra* grassland.

Annex 2. The relationship between lowland grassland communities of high botanical nature conservation value identified in the National Vegetation Classification (NVC) and corresponding habitats listed on Annex I of the EU Habitats Directive and the country-level lists of priority habitats for biodiversity conservation

See Annex 1 for further information on the distribution and extent of the listed NVC types. Note that some examples of the NVC types, particularly those under the Lowland Meadows and Purple Moor Grass and Rush Pasture priority habitat categories, fit within the Coastal and Floodplain Grazing Marsh priority habitat

NVC community code & name	**Phytosociological alliance**	**EU Habitats Directive code & name**	**Priority habitats** [(a)]
CG1 *Festuca ovina-Carlina vulgaris* grassland	*Xerobromion*	H6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) – CG6 and CG10 only assignable to H6210 if they occur over limestone substrates; CG10 stands on other geologies may be referable to H6230 (see below); forms of CG10 may occur as part of H2130 Fixed dunes with herbaceous vegetation ('grey dunes') in western Scotland	Lowland Calcareous Grassland
CG2 *Festuca ovina-Avenula pratensis* grassland	*Bromion erecti*		
CG3 *Bromus erectus* grassland	*Bromion erecti*		
CG4 *Brachypodium pinnatum* grassland	*Bromion erecti*		
CG5 *Bromus erectus-Brachypodium pinnatum* grassland	*Bromion erecti*		
CG6 *Avenula pubescens* grassland	*Bromion erecti*		
CG7 *Festuca ovina-Hieracium pilosella-Thymus praecox/pulegioides* grassland	*Koelerio-Phleion*		
CG8 *Sesleria albicans-Scabiosa columbaria* grassland	*Bromion erecti*		
CG9 *Sesleria albicans-Galium sterneri* grassland [(b)]	*Seslerion*		
CG10 *Festuca ovina-Agrostis capillaris-Thymus praecox* grassland [(b)]	*Violion*		
U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland	*Plantagini-Festucion*	U1 may occur as a component of H1220 Perennial vegetation of stony banks, and a few examples of U4 and U5 in Wales and Scotland have been assigned to H6230 Species-rich *Nardus* grassland on siliceous substrates in mountain areas (and submountain areas in continental Europe)	Lowland Dry Acid Grassland
U3 *Agrostis curtisii* grassland	*Violion*		
U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland [(b)]	*Violion*		
U5 *Nardus stricta-Galium saxatile* grassland [(b)] [(c)]	*Violion*		
SD8 *Festuca rubra-Galium verum* fixed dune grassland [(c)] [(d)]	*Plantagini-Festucion*		
SD10 *Carex arenaria* dune community [(d)]	*Ammophilion*		

NVC community code & name	Phytosociological alliance	EU Habitats Directive code & name	Priority habitats [a]
SD11 *Carex arenaria-Cornicularia aculeata* dune community [d]	*Corynephorion*	H2330 Inland dunes with open *Corynephorus* and *Agrostis* grasslands	Lowland Dry Acid Grassland
SD12 *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland [c] [d]	*Corynephorion*		
MG3 *Anthoxanthum odoratum-Geranium sylvaticum* grassland	*Triseto-Polygonion*	H6520 Mountain hay meadows	Upland Hay Meadows [e]
MG1c-e *Arrhenatherum elatius* grassland, *Filipendula ulmaria, Pastinaca sativa* and *Centaurea nigra* sub-communities [c]	*Arrhenatherion*	None	Lowland Meadows
MG2 *Arrhenatherum elatius-Filipendula ulmaria* tall-herb grassland [c]	*Arrhenatherion*		
MG5 *Centaurea nigra-Cynosurus cristatus* grassland	*Cynosurion*		
MG7c-related *Alopecurus pratensis-Poa trivialis-Cardamine pratensis* floodplain grassland [c] [f]	*Alopecurion*		
MG8 *Cynosurus cristatus-Caltha palustris* grassland [e]	*Calthion*		
MG4 *Alopecurus pratensis-Sanguisorba officinalis* grassland	*Alopecurion*	H6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	
M24 *Molinia caerulea-Cirsium dissectum* fen-meadow	*Junco-Molinion*	H6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*). Some examples of M24 have been included in H7220 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	Purple Moor Grass and Rush Pastures
M26 *Molinia caerulea-Crepis paludosa* mire	*Molinion*		
M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow	*Calthion*	Some very species-rich, short *Carex* spp-brown moss dominated M22 examples that may represent degraded M10/M13 may be included in H7230 Alkaline fens	
M23 *Juncus effusus/acutiflorus-Galium palustre* rush-pasture [b]	*Juncion acutiflori*		
M25 *Molinia caerulea-Potentilla erecta* mire [b]	*Junco-Molinion*		
OV37 *Festuca ovina-Minuartia verna* community [b]	*Thlaspion calaminariae*	H6130 Calaminarian grasslands of the *Violetea calaminariae*	Calaminarian Grassland

[a] based on: (i) the 'Scottish Biodiversity List of habitats of highest priority for biodiversity conservation in Scotland', Section 2(4) of The Nature Conservation (Scotland) Act 2004; (ii) the 'Section 41 list of habitats of principal importance for the conservation of biological diversity in England', Section 41 of the Natural Environment and Rural

Communities Act 2006; and (iii) the 'Section 42 list of habitats and species of principal importance in Wales', Natural Environment and Rural Communities Act 2006 – these lists are all based on the priority habitats identified as requiring action under the former UK Biodiversity Action Plan (UK BAP) (see http://jncc.defra.gov.uk/page-5705)

(b) lowland stands only (see section 1.1)

(c) advances in knowledge have revealed that these types are covered by the country-level lists of priority habitats, despite not being listed explicitly within the original priority habitat grassland definitions

(d) inland stands only

(e) Upland Hay Meadows also include stands of upland MG8 that occur in the same landscape setting as MG3 grassland and support species such as *Geum rivale* and the boreal-montane species *Trollius europaeus* and *Crepis paludosa*

(f) this grassland type is described by Wallace and Prosser (2014), rather than in the NVC grasslands volume (Rodwell 1992) (see Annex 1 for further details)