

Common Standards Monitoring Guidance

for

Lowland Grassland Habitats

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1. Introduction

1.1 Lowland grassland features qualify a large number of SSSIs and SACs in England, Scotland and Wales, and also ASSIs and SACs in Northern Ireland. The features include a wide range of semi-natural plant communities on acid, neutral and calcareous soils, together with a variety of rare and scarce individual plant and animal taxa. Both dry and damp pastures and hay meadows are included. These guidelines concentrate on monitoring procedures for plant community features.

1.2 For several years prior to the present attempt to develop SSSI condition assessment procedures, considerable attention has been given to grassland monitoring by the country agencies, led in particular by English Nature. Over a three-year period from 1997, EN grassland specialists have undertaken extensive field trials, in conjunction with local staff and representatives from other parts of the UK, to develop a practical approach to grassland condition appraisal. The resulting methodological framework has been published (Robertson & Jefferson, 2000), together with a comparative test of the methods against a more rigorous data gathering exercise at a group of neutral hay-meadows and calcareous grasslands in England (Robertson, Bingham & Slater, 2000).

1.3 The guidelines outlined here are developed from the EN method, with guidance included for incorporating local characteristics of designated site grassland features. Primary attributes, which are the main determinants of condition assessment, are distinguished from secondary attributes. The former largely concern the composition of the grassland sward, while the latter are principally concerned with sward structure.

1.4 Some of the attribute thresholds specified in Robertson & Jefferson (2000), and in particular sward composition, more or less equate to the minimum standards for SSSI selection (NCC, 1989); that is, they attempt to define the state of grassland features below which a grassland stand is no longer in acceptable condition. We have attempted here to introduce and infuse characters of local stands within the target-setting procedures, for a very similar set of grassland attributes.

1.5 The guidelines developed here do not include generic condition features specifically for invertebrates or other animal groups. Guidance on grassland structure beneficial for invertebrates needs to be formulated for the full range of lowland grassland types. In some cases, a mixed structure or mosaic of tussocky and short patches may be optimal. However, grassland invertebrate conservation needs to take a wider range of local site attributes into account, including associated habitat types, as well as the cutting or grazing regime.

2. Definition of features

2.1 For the purposes of this guidance, 'lowland' grasslands (including upland hay meadows) are essentially those which lie below the limit of agricultural enclosure. Grasslands in unenclosed, upland landscapes are covered by the Upland habitat guidance section (see Table 1). For grasslands in coastal habitats the relevant coastal section should also be consulted. For fen meadows and related grasslands on lowland peatlands the Lowland wetland guidance should be consulted.

2.2 For lowland grassland features, the focus of attention is on plant communities (and sub-communities) defined by the National Vegetation Classification (Rodwell, 1992). The NVC syntaxa are now widely used in operational work on designated sites throughout Britain. They provide a workable framework into which special lowland grasslands can be subdivided. There is no implication that the NVC dataset represents a blueprint for SSSI grassland composition; it simply provides a convenient classification. For applying condition assessment protocols, the communities are aggregated into broader categories covering calcareous, neutral, acid and marshy grasslands (i.e. priority habitats for which Biodiversity Habitat Action Plans are in place). The plant communities covered include the full range for which designated sites are selected, also lowland forms of metallophyte or calaminarian grassland (Table 1). Further details of relevant NVC, Phase 1 and Habitats Directive Annex I types are given in Tables 2-6.

Table 1. Plant communities covered by lowland grassland condition assessment guidelines

Guidance table	NVC communities
Lowland meadows and upland hay meadows	MG3 <i>Anthoxanthum odoratum</i> - <i>Geranium sylvaticum</i> grassland MG4 <i>Alopecurus pratensis</i> - <i>Sanguisorba officinalis</i> grassland MG5 <i>Cynosurus cristatus</i> - <i>Centaurea nigra</i> grassland MG8 <i>Cynosurus cristatus</i> - <i>Caltha palustris</i> grassland
Lowland dry acid grasslands	U1 <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Rumex acetosella</i> grassland U3 <i>Agrostis curtisii</i> grassland* U4 <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland*
Lowland calcareous grasslands	U4/U20-related. Species-rich bracken CG1 <i>Festuca ovina</i> - <i>Carlina vulgaris</i> grassland CG2 <i>Festuca ovina</i> - <i>Avenula pratensis</i> grassland CG3 <i>Bromus erectus</i> grassland CG4 <i>Brachypodium pinnatum</i> grassland CG5 <i>Bromus erectus</i> - <i>Brachypodium pinnatum</i> grassland CG6 <i>Avenula pubescens</i> grassland CG7 <i>Festuca ovina</i> - <i>Hieracium pilosella</i> - <i>Thymus praecox/pulegioides</i> grassland CG8 <i>Sesleria albicans</i> - <i>Scabiosa columbaria</i> grassland CG9 <i>Sesleria albicans</i> - <i>Galium sternerii</i> grassland* MG2 <i>Arrhenatherum elatius</i> - <i>Filipendula ulmaria</i> tall-herb grassland
Lowland purple moor grass and rush pastures	M22 <i>Juncus subnodulosus</i> - <i>Cirsium palustre</i> fen-meadow M23 <i>Juncus effusus/acutiflorus</i> - <i>Galium palustre</i> rush pasture* M24 <i>Molinia caerulea</i> - <i>Cirsium dissectum</i> fen meadow M25 <i>Molinia caerulea</i> - <i>Potentilla erecta</i> mire* M26 <i>Molinia caerulea</i> - <i>Crepis paludosa</i> mire*

Lowland calaminarian grasslands	OV37 <i>Festuca ovina</i> - <i>Minuartia verna</i> community*
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* These types may also occur in upland situations – see Upland habitat guidance section

3. Attributes and targets

3.1 Selection of attributes

3.1.1 Attributes have been selected to provide information about changes in condition brought about by nutrient treatment, grazing and cutting management, and hydrological changes, as well as more obvious damaging impacts, such as ploughing and reseeded. Other influences, such as impacts of disease organisms and subtle shifts in climate, may interact with management effects. Grasslands have a relatively simple structure compared to many other habitats, with one principal layer of vegetation, usually ranging in height from about 2-100 cm. There may be patches of bare ground and scrub, but for the most part habitat condition is determined primarily by the species composition of the herbaceous sward.

3.1.2 For all lowland grasslands, habitat extent and specified features of the sward composition (according to grassland type) should be treated as **primary** attributes. These are the habitat characteristics that are recommended for determination of community condition. If a sward falls below the quality threshold or target for one or more of these, then the feature is deemed to be in unfavourable condition.

3.1.3 Structural aspects of semi-natural grasslands, such as sward height, litter accumulation and bare ground, are valid and informative monitoring attributes, although it is recommended that in most cases they are treated as **secondary** or **supporting** attributes, rather than primary determinants of grassland condition. This is because they may change rapidly and usually reversibly in response to changes in the local grazing and/or cutting regime. Nevertheless, they are important characteristics of grassland habitats, and may provide early indication of impending decline in compositional attributes. It should often be possible to ameliorate structural deterioration before unfavourable condition is reached. For example, a neutral grassland site that is currently favourable for both positive and negative indicator species and yet exceeds the upper limits for sward height and litter accumulation may be subject to under-grazing which, unless rectified, would probably affect the species composition in the near future. Thus the structural secondary attributes should be used to prompt a management response where necessary, but should not be used for formal condition appraisal.

3.1.4 There are two grassland attributes that are not taken directly into account, because of resource constraints. These are species diversity and productivity. Many conservationists may be concerned at the absence of species richness as a primary attribute of grassland condition, but to obtain good diversity data would be prohibitively time-consuming. A reduction in species diversity could theoretically occur while a sward is scored as being in favourable condition, but the expectation is that other surrogate attributes will indicate such changes. Likewise, measures of sward productivity may give the best indication of undesirable changes in nutrient loading, but again would be too costly to obtain. It is also worth noting that soil attributes are not considered, for similar reasons.

3.1.5 In the sub-sections below, attributes and target setting are considered in outline, and further detail for particular grassland habitats and communities is summarised in Tables 2-6. For structural attributes, limits are mostly set fairly broadly to accommodate site-to-site and seasonal variation. If local targets need to be set to maintain particular structural conditions, they should normally fall within the generic ranges given in the tables.

3.2 Primary attribute: extent

3.2.1 In general, it is recommended that there should be no loss in extent of stands of qualifying lowland grassland vegetation. Trivial reductions due to slightly increased poaching in the vicinity of gateways or other localised disturbance that frequently occur on lowland farms are not considered as serious losses. Similarly, it may be appropriate to consent minor loss to ensure continuation of suitable site management, e.g. the installation of a water source for livestock. But in many other cases, such as the construction of a new farm track through a special lowland grassland, the loss is likely to be significant.

3.2.2 There may occasionally be a target to exceed the current stand extent (e.g. when invasive scrub or bracken is earmarked for clearance to promote the grassland interest). Conversely, at some sites (usually of large extent) there may be an aim to increase the cover of scrub somewhat, especially when this is required for qualifying invertebrates or other associated features. In addition, there may be some acceptable flux in the extent of different grassland conservation communities in the same recording unit, and this should be taken into account when interpreting changes in stand area.

3.3 Primary attribute: sward composition - grass:herb ratio

3.3.1 The relative cover of grasses and forbs provides a coarse indication of conservation status. In general, semi-natural swards in good condition have a much higher broad-leaved herb component compared to agricultural grasslands.

3.3.2 Robertson & Jefferson (2000) suggest that for neutral and calcareous grasslands, the broadleaved herb component should lie within a specified range, often 40-90%. Local thresholds could be set within these limits. It should be noted that some broad-leaved herbaceous species (e.g. *Trifolium repens* and *Cirsium arvense*) might respond to fertiliser treatment so that a high forb cover is not necessarily desirable. Also, weather patterns can influence the relative cover of grasses and other grassland constituents. So this attribute has to be treated judiciously, and the target ratio of non-graminaceous taxa should not be unrealistically high.

3.3.3 Since the grass: herb ratio may often be estimated by eye at points across a stand, observer effects need to be taken into account. It is suggested that local targets should be set to register a decrease in herb cover by 20% or more as unfavourable.

3.3.4 Both wet pastures and dry acid grassland often have high grass cover when in good condition. Forb cover may also be difficult to estimate even when such grasslands are in favourable condition, so this attribute is not recommended for these types of conservation grassland.

3.4 Primary attribute: sward composition - positive indicator species

3.4.1 In recognition of the impracticality of monitoring species diversity in full, the frequency of a sub-set of component taxa can be used to gauge condition. It is intended

that such species will indicate whether the ecological conditions are suitable for the maintenance of the local form of grassland. For the most part, it is predicted that their frequency (and/or cover) will decline in the face of unfavourable developments, notably eutrophication impacts. Alterations in nutrient status may take place as a result of fertiliser treatment, contamination of groundwater and surface run-off inputs, as well as atmospheric sources. Changes in indicator species frequency may also come about through excessive grazing and other disturbances, as well as successional development following management neglect.

3.4.2 Several factors make condition indicators suitable. The taxa should be characteristic of unimproved and usually low nutrient-status lowland grassland habitats (i.e. they will often be ‘stress-tolerators’, *sensu* Grime, Hodgson & Hunt, 1988). They should exhibit high fidelity to designated site features as opposed to derivative communities. The species should also be relatively straightforward to identify and be evident in the sward for much of the growing season.

3.4.3 Two differing but compatible approaches are available for assessing positive indicator status in a lowland grassland stand in a designated site. In the scheme of Robertson & Jefferson (2000), sets of indicator taxa are pre-selected for individual grassland communities (and some sub-communities) that qualify SSSIs. Threshold requirements are identified for each community across its geographical range, so that at least x indicator taxa should be frequent and y occasional for any example in favourable condition. The lists of community indicators are quite long, and it is anticipated that they should accommodate the range of floristic variation expressed locally in special conservation sites across Britain.

3.4.4 Alternatively or additionally, indicator species can be chosen separately for each stand, and it is recommended that usually two to six locally frequent indicators be selected for a particular community feature. In many cases, locally selected indicators are likely to include (but do not necessarily include) constant or preferential taxa recognised in the NVC. Thus for neutral *Cynosurus cristatus-Centaurea nigra* grassland (MG5), indicator species may often include *Centaurea nigra* and *Lotus corniculatus*, while for calcareous *Festuca ovina-Avenula pratensis* grassland (CG2), equivalent indicators may be *Leontodon hispidus*, *Sanguisorba minor* and *Thymus* spp. But choice of indicators should reflect local frequencies, and there is no intention that the NVC data set provides a standard to which stands in designated sites should aspire. In some instances, there may be certain management-dependent taxa that could serve as appropriate indicators (e.g. *Sanguisorba officinalis*, which can be frequent in hay-meadows but is not associated with pasture systems). Further examples are listed in Tables 2-6.

3.4.5 Threshold values can be set as the starting point frequencies of the local taxa. Despite best efforts to choose species with stable characteristics, populations will still vary to some extent in the absence of damaging perturbation (e.g. as a result of seasonal effects or changes in associated invertebrate or fungal populations). Normally, decline in frequency class of key indicators, associated with declining quality, will be accompanied by changes in other primary or secondary attributes. In such cases, a decline in frequency of one key indicator species would normally be sufficient to register the stand as unfavourable. In order to take account of possible natural fluctuations, if key indicator species have declined without associated changes in other attributes, it is recommended that two or more species should have declined in frequency class before the stand is scored as unfavourable.

3.4.6 It should be emphasised that future refinement in the guidelines concerning use of indicator species for lowland grassland condition assessment is likely to come about once practice in different parts of the UK is assessed. It must also be acknowledged that we know little detail of how species frequency alters with minor change in agricultural treatment.

3.4.7 The frequency classes should be interpreted as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

3.5 **Primary attribute: sward composition - negative indicator species**

3.5.1 There are four ecological groups of species which can indicate that undesirable developments are taking place when they increase in frequency or cover within a special semi-natural grassland community.

- Agricultural weeds, such as *Cirsium arvense* and *Rumex obtusifolius*, may indicate an increase in soil nutrient levels when they become prominent in previously low-nutrient status swards. Other forms of disturbance may also result in an increase in weed species; a well-known example is *Senecio jacobaea* which responds to poaching, associated with high grazing levels.
- Other negative trends, especially again indicating eutrophication, are due to increases in agriculturally favoured species, notably *Lolium perenne* and *Trifolium repens*. Such taxa may be present at low cover in semi-natural mesotrophic swards. Since a number of the species can be difficult to identify and assess in the field, this group of negative indicators is included as an optional primary attribute. These species should be recorded if apparent, but not if cover estimation is problematic due, for example, to heavy grazing.
- Another group of negative indicators comprises bulky grasses, rushes and sedges. These are characteristic at moderate to quite high cover in a range of good quality semi-natural lowland grasslands, but when unchecked by grazing, cutting or waterlogging they may become overwhelmingly abundant, suppressing a number of less competitive associated taxa.
- More adverse and obvious successional changes following management neglect in grasslands are demonstrated by incursion and spread of bracken, scrub and other woody species. The presence of scrub and bracken often provides structural and ecological diversity to grassland features, and long-established stands that help significantly to support a site's biodiversity value should often be retained. However, scrub and bracken can rapidly invade grassland features if left unchecked by sufficient grazing or management. Introduced scrub (and forb) species in calcareous swards are considered to be particularly detrimental.

3.5.2 Target levels for the cover of these grassland constituents are considered for a range of communities in Tables 2-6. Generic minimum targets are set, to register grasslands with an unacceptable frequency or cover of one or more of these species groups as unfavourable. For grassland features in significantly better condition at baseline

recording, targets could be set on a site-by-site basis to register an increase in any one species group as (locally) unfavourable.

3.6 Primary attribute - indicators of local distinctiveness

This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features).

3.6.1 Rare and scarce species

Rare grassland plant species that are selection features in designated sites have independent monitoring protocols (see Plants guidance section). Many grasslands also have less rare yet often declining species. Examples might include *Colchicum autumnale*, *Genista tinctoria*, *Platanthera chlorantha*, *Trollius europaeus* or *Vicia orobus*. There are many other such taxa that impart an important local conservation dimension to the site, and may have influenced selection of grassland site features. Where they are particularly significant as part of the grassland interest, targets should be set locally for such taxa that will at least maintain the existing population size class and will often retain local distribution characteristics.

3.6.2 Transitional zonation

Transition zones between different habitats and communities may be a special feature of some grasslands, for instance in a site with intergrading stands of dry and wet grassland, or grassland and heath or flush. Targets may be put forward to ensure the conservation of such features. In most cases, confirmation that these transitions remain intact where originally mapped will be all that is required. Such zonation is only important at certain sites and is thus treated as a discretionary attribute, but where it is applicable it should be treated as mandatory.

3.6.3 Other factors

Any further local attributes should be approved by specialist staff within each agency. Examples may include habitat requirements for invertebrate or bird features.

3.7 Secondary attribute: sward structure - height

Ranges for sward height are suggested for lowland grassland habitats in Tables 2-6. An attempt is made to define a generic target for the height of grassland vegetation that is not considered to be either over- or under-grazed, both of which may lead to a decline in species diversity. If local targets are appropriate, these should normally be set within the specified range, taking into account the particular site conditions and especially the requirements of noteworthy associated taxa.

3.8 Secondary attribute: sward structure - litter

Litter accumulation is often a sign that a grassland is being under-managed, with an excess of plant material not being removed by grazing or hay-making. Litter build-up and extent are difficult to estimate and in most cases an upper level of cover (25%) is used to trigger a conservation response. The presence of some litter is acceptable on many grassland sites, although local targets below 25% cover may be required in some circumstances.

3.9 Secondary attribute: sward structure - bare ground

3.9.1 There is a widely held view that some bare ground is required in many forms of semi-natural lowland grassland to promote regeneration from seed. Evidence from in-depth studies is generally lacking, and since it is also very difficult to estimate the extent of small amounts of bare ground, lower limits are omitted at this stage. Until the relationship between disturbance and propagule regeneration in the long-term maintenance of British lowland meadows and pastures is better understood, it seems more appropriate to concentrate on higher undesirable levels of bare ground brought about by poaching and other disturbance, which may favour ingress of undesirable and often competitive species, such as *Cirsium arvense*, *Senecio jacobaea* and *Juncus effusus*.

3.9.2 It is usually recommended that only quite low cover of bare ground (often <5%) is acceptable. Exceptions include calaminarian (OV37) grassland and some forms of acid (U1) and calcareous (CG1, CG7) grasslands, where relatively high cover of bare ground is perfectly acceptable. For some acid and calcareous grassland the extent of bare ground associated with rabbit burrows is taken into account. At some sites, higher cover of bare ground may be required, at least locally, to provide suitable micro-habitat for various insect taxa and other invertebrates.

3.10 Mixtures and mosaics

3.10.1 In many lowland grassland designated sites, special grassland communities (and sub-communities) exist in intimate mosaics or fine-scale zonation, and such patterning needs to be taken into account in monitoring conservation attributes. Both within-habitat (e.g. mixtures of different forms of wet grassland) and between-habitat (e.g. mixtures of acid and neutral grassland or heath) combinations occur frequently in lowland designated sites. In such circumstances, there should be a target for the relative amounts of each vegetation type, and the cover of each component can probably be estimated to the nearest 10%. Supplementary recording, for instance use of fixed-point photography or GPS, may be helpful.

3.10.2 Difficulties can arise over the selection of positive indicators, but it is recommended that representative taxa of the target communities be examined separately in each component. For negative indicators, there may be common targets for some species across the mixed stands, but for others (e.g. the cover of bulky grasses in mixtures of dry and wet swards) community-specific targets may be required.

3.11 Future considerations

3.11.1 At this early stage in the development of monitoring protocols, it is essential that flexibility and adaptation in methodological approaches be accepted. There is still much to learn about the most efficient and effective procedures for assessing monitoring attributes and also about how to set targets in a judicious and ecologically appropriate manner. Considerable future refinement is likely to be required as field experience with the monitoring procedures is gained.

3.11.2 Spatial and temporal floristic variation in composition may be normal features of many semi-natural grasslands, so restrictive target setting may lead to inappropriate negative evaluation of grassland condition. Conversely, targets that are too lax may result in carefree acceptance of condition when negative trends are taking place. For some attributes, it may be appropriate to assess time-series floristic changes in grassland composition under stable management conditions to assess the magnitude of flux in attribute values under acceptable conditions. Finally, it is worth noting that many of the

grassland attributes considered here are unlikely to vary independently in response to perturbation. It may thus be possible to reduce the number of attributes for measurement of lowland grassland condition in due course.

4 Field procedures

4.1 General approach and timing

4.1.1 Grassland designated sites vary in size from small uniform stands of one plant community occupying a single field, to much more extensive sites covering several or many enclosures with a number of different plant communities. In the latter case, feature condition may be highly variable and such sites may need to be subdivided into floristically homogeneous stands. Difficulties can arise when the condition of a particular community is variable within compartments, and special consideration is required for fine-scale mosaics and community mixtures (see 3.10).

4.1.2 In view of the likely resource constraints, a practical approach for most lowland grassland designated sites may be to make observations in a structured and consistent fashion during a fairly brief field inspection. This should only be undertaken by experienced staff, familiar with lowland grassland vegetation and the floristic cues and signals necessary for the accurate scoring of attribute features. If these skills are not available, particularly for features in borderline condition, systematic recording at 20 or more sample points is strongly advised. These approaches to routine designated site feature monitoring could be supplemented by rigorous recording at a set of reference sites covering the range of UK designated site habitat features. Fuller discussion of field methods is given in Robertson & Jefferson (2000).

4.1.3 Timing of monitoring needs to be planned in advance. In most cases, pasture sites can be assessed over much of the spring-summer growing season when the indicator species are evident. Hay-meadow stands should be visited before cutting wherever practical.

4.2 Requirements for monitoring

A guiding principle has been to keep field procedures for attribute assessment straightforward and practical, with the aim of acquiring maximum amount of useful information with the minimum amount of field recording effort. Nevertheless, certain basic information and observer skills are required, and these are outlined below.

- Monitors are required to be able to recognise NVC units in the field, for assessing community extent and other attributes.
- For the most part, it is recommended that there should be no significant reduction in the extent of special grassland at a particular site. A good quality vegetation map is thus a prerequisite for this aspect of condition assessment. It may be necessary to undertake careful field survey to establish a base-line vegetation map during the initial phase of monitoring. In some cases where scrub or bracken expansion is an issue, aerial or fixed-point photographs may also be valuable.
- Sward composition plays a key role in determining condition. Observers thus need to be able reliably to identify a range of British grassland vascular plant species. It is suggested that critical and difficult taxa should be avoided in target formulation; even so, field

identification can be troublesome especially in heavily grazed pastures when determination has to rely on vegetative characters.

5. References/Bibliography

- Grime, J.P., Hodgson, J.G. & Hunt, R. 1988. *Comparative Plant Ecology: a Functional Approach to Common British Species*. Unwin Hyman, London.
- Nature Conservancy Council. 1989. *Guidelines for selection of biological SSSIs*. Nature Conservancy Council, Peterborough.
- Robertson, H.J., Bingham, J. & Slater, I. 2000. *Monitoring the condition of lowland grassland SSSIs. II. A test of the rapid assessment approach*. English Nature Research Report 315, Peterborough
- Robertson, H.J. & Jefferson, R.J. 2000. *Monitoring the condition of lowland grassland SSSIs. I. English Natures rapid assessment method*. English Nature Research Report 315, Peterborough.
- Rodwell, J. S. (ed.) 1992. *British plant communities: Volume 3. Grasslands and montane communities*. Cambridge University Press, Cambridge.
- Scottish Natural Heritage. 2000. *Site condition monitoring. Guidance folder*. Scottish Natural Heritage, Edinburgh.

Table 2. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES: LOWLAND MEADOWS AND UPLAND HAY MEADOWS

Interest feature: Lowland meadows and upland hay meadows

Includes the following NVC types: MG3, MG4, MG5, MG8.

Equivalent Phase 1 category: B2 Neutral grassland (part)

Includes the following Annex I types: 6510 Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*), 6520 Mountain hay meadows

Reporting category: Neutral grassland

NB All primary attributes (listed in bold) are mandatory. Secondary or supporting attributes (marked *) often provide valuable substantiating evidence but should not generally be used as primary indicators of condition. Hashed attributes (#) are to be used when conditions allow (see text) and/or when appropriate.

Frequency classes for positive indicator species should be as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

Attributes	Targets	Method of assessment	Comments
Extent	No significant loss of feature.	Comparative assessment with vegetation map and/or aerial photos.	<p>Target may exceed current extent if there is evidence of recoverable reduction.</p> <p>In exceptional circumstances, target may be set to accept some loss to other habitat, e.g. if required by specialist taxa.</p> <p>Threshold areas for assessing 'significant' loss will vary according to site and the quality of available vegetation maps and/or aerial photos.</p> <p>Recoverable reduction = unfavourable Non-recoverable reduction = partially destroyed</p>
Sward composition: grass:herb ratio	<p>Target should be set to register a low or decreasing herb cover as unfavourable.</p> <p>As a generic standard, the grass:herb ratio normally should fall within the range 40-90% herb cover.</p> <p>Within this range, local targets can be set to register a decrease in herb cover by 20% or more as unfavourable.</p>	Structured observation.	<p>The grass:herb ratio is often regarded as a useful indicator of soil nutrient status, where competitive grasses generally increase at the expense of other taxa under high nutrient conditions. Care must be taken with this attribute, as some herbs (e.g. <i>Trifolium repens</i> and several agricultural weeds) also respond to nutrient enrichment.</p> <p>The grass:herb ratio can also fluctuate due to weather effects; for example, a wet spring may favour grasses over herbs. Therefore the target should give scope for natural variation. Occasionally, examples may be considered favourable at a lower ratio, for example some floristically rich Welsh MG4 stands have only 30% herb cover.</p>
Sward composition: frequency of positive indicators	<p>Targets should be set to register a low or declining frequency of key indicators (Table 2a) as unfavourable.</p> <p>As a generic standard, the frequencies of positive indicators should, at the very least, confirm the presence of the</p>	Structured observation or sampling.	<p>Further guidance on setting the generic minimum standard will be provided by the individual country agencies.</p> <p>When setting local targets, select a number of representative species (normally 2-6, taking into account the need to choose ecologically informative and readily identifiable taxa). Care should be taken to choose species that show high fidelity to unimproved neutral grassland, that have reasonably stable populations given suitable ecological</p>

Attributes	Targets	Method of assessment	Comments
	<p>target community.</p> <p>Local targets could also be set for site-specific positive indicator species, to register a decrease in frequency of 20% or more as unfavourable.</p>		<p>conditions, and those that are visible in the sward for much of the growing season.</p> <p>Normally, a decline in the frequency of key indicators will suggest declining quality, where accompanied by changes in other primary or secondary attributes. If this were the case, a decline in frequency of one key indicator species would normally be sufficient to register the stand as unfavourable. If key indicator species have declined without associated changes in other attributes, in order to allow for possible natural population fluctuations, it is recommended that 2 or more species should have declined in frequency class before the stand is judged unfavourable.</p>
<p>Sward composition: frequency of negative indicators - agricultural weeds</p>	<p>Target should be set to register high or increasing frequency/cover as unfavourable.</p> <p>As a generic standard, no species should be more than occasional throughout the sward or together more than 5% cover.</p> <p>Occasionally, local targets for <i>S. jacobaea</i> and <i>A. sylvestris</i> may be set to accept swards with either species frequent as favourable.</p> <p>More stringent local frequency targets can be set, if appropriate, to register increase in frequency of 10% or more as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p><u>Examples of negative indicators (agricultural weeds):</u> <i>Anthriscus sylvestris</i>, <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Galium aparine</i>, <i>Plantago major</i>, <i>Rumex crispus</i>, <i>Rumex obtusifolius</i>, <i>Senecio jacobaea</i>, <i>Urtica dioica</i>, <i>Equisetum arvense</i> Bracken is considered with scrub.</p> <p>The majority of the listed agricultural weeds respond to some form of nutrient enrichment. Therefore high or increasing frequency/cover will generally indicate unfavourable condition.</p> <p>However, <i>S. jacobaea</i> often reflects grazing management rather than soil nutrient status, and some horse-grazed pastures with frequent <i>S. jacobaea</i> can be potentially favourable, where other agricultural weeds are absent or at very low levels.</p> <p>Likewise, potentially favourable MG3 stands can support frequent <i>A. sylvestris</i>, in the absence of high levels of other agricultural weeds.</p> <p>At some sites, with very low levels of agriculturally favoured species, it</p>

Attributes	Targets	Method of assessment	Comments
			<p>may be appropriate to set more stringent targets, e.g. no more than rare (20% frequency). Cover targets of less than 5% are not generally recommended.</p>
<p>#Sward composition: cover of negative indicators - agriculturally favoured species</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, no species should be individually at more than 10% cover, or collectively at more than 20% cover.</p> <p>More stringent local cover targets can be set, if appropriate, to register an increase of cover of 5% individually or 10% collectively as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p><u>Examples of negative indicators (agriculturally favoured species):</u> <i>Lolium perenne</i>, <i>Phleum pratense</i>, <i>Bromus hordeaceus</i>, <i>Holcus lanatus</i>, <i>Trifolium repens</i></p> <p>This attribute should be used when conditions allow. All listed species are good markers for unfavourable condition if present at high cover, but cover estimation may be problematic under certain conditions (e.g. when heavily grazed)</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets.</p>
<p>Sward composition: cover of negative indicators - rank grasses and sedges</p>	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, <i>Arrhenatherum</i> and <i>Dactylis</i> together should cover less than 10% of the sward. Bulky wetland species collectively should cover less than 20% of the sward.</p> <p>It is probably unlikely that lower local thresholds would need to be set. Occasionally, thresholds may need to be raised, according to wider</p>	<p>Structured observation or sampling.</p>	<p>Care should be taken with the setting of these targets as thresholds may vary considerably by site and conservation goals.</p> <p><u>Examples of negative indicators (rank grasses and sedges):</u> Grasses and rushes e.g. <i>Arrhenatherum elatius</i>, <i>Dactylis glomerata</i>, <i>Deschampsia cespitosa</i>, <i>Juncus</i> species Large <i>Carex</i> species (with leaves more than 5mm wide) e.g. <i>Carex acutiformis</i> Large grasses (with leaves more than 10mm wide and stout stems) e.g. <i>Glyceria maxima</i>, <i>Phalaris arundinacea</i>, <i>Phragmites australis</i></p> <p><i>Arrhenatherum</i> and <i>Dactylis</i> are good indicators of under-grazed, rank stands, approaching MG1e, and therefore increasing or high cover will</p>

Attributes	Targets	Method of assessment	Comments
	conservation objectives.		<p>generally indicate unfavourable conditions. An exception to this can be MG3, particularly with the <i>Arrhenatherum elatius</i> sub-community, where tussock grasses, such as <i>Arrhenatherum</i> and <i>Dactylis</i>, can be more abundant, though they rarely dominate swards in good condition.</p> <p>The upper limit for wetland species can be as high as 25% <i>Juncus</i> spp. or <i>C. acutiformis</i> for some Welsh MG5 stands, but for many sites a maximum cover of 10% wetland species could be used.</p> <p>Care is often required on ridge-and-furrow and other topographically variable fields where the furrows or depressions may support different wet grassland communities.</p>
Sward composition: cover of negative indicators – scrub and tree species, and bracken	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, woody species and bracken together should be at no more than 5% cover.</p> <p>It is probably impractical to set local targets at below 5% cover, but see comments. Very occasionally a higher cover may be acceptable.</p>	Structured observation or sampling.	<p>These targets should be used with caution. Scrub and tree cover can form a useful transition habitat across part of a site, but if more than occasional throughout a sward, even at less than 5% cover, scrub and bracken can soon become a problem if grazing levels are not sufficient or if control measures are not being carried out.</p> <p>High scrub cover may be required at sites with specialist invertebrate interest.</p>
#Indicators of local distinctiveness	<p>Targets should be set to register low or declining population size/extent (species) or loss of cover (transitions) as unfavourable. Additional targets may be set for other attributes as appropriate.</p> <p>There are no generic targets for this</p>	Structured observation or sampling.	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features)</p> <p>It is recommended that the appropriate size class and extent of scarce taxa be recorded. For plants, recommended size classes are as follows for number of shoots (or ramets): very small 1-10; small 11-100;</p>

Attributes	Targets	Method of assessment	Comments
	<p>attribute.</p> <p>Local targets should be set to ensure:</p> <ul style="list-style-type: none"> - existing populations of rare/scarce species are maintained at least at current levels and often local distribution characteristics - community and habitat transitions are maintained at current levels and in current locations - other locally distinctive attributes are maintained. 		<p>medium 101-1000, large 1001-10000; very large >10000.</p> <p>In principle, equivalent approximate population measures could be developed for invertebrates and other taxa.</p> <p>Check that significant transitions have not been adversely modified.</p>
<p>*Sward structure: average height</p>	<p>Targets should be set to register both over- and under-grazed conditions as unfavourable.</p> <p>As a generic standard, pastures should usually be within the range 5-20 cm. In hay meadows, the lower limit is 5 cm, with no upper level.</p> <p>Locally it may be appropriate to reduce the upper threshold or increase the lower one, depending upon conservation objectives. It is probably unlikely that the generic range would need to be broadened.</p>	<p>Direct measurement at points across stand.</p>	<p>Locally, sward height may vary considerably and in some cases may be in patchily unfavourable condition.</p> <p>The lower limit for some MG4 hay meadows measured in summer may be more appropriately set at 10 cm.</p> <p>Bear in mind that some invertebrates require a range of sward heights.</p>

Attributes	Targets	Method of assessment	Comments
<p>*Sward structure: litter</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 25% cover of the sward.</p> <p>More stringent local targets can be set, if appropriate, to register increase in litter cover of 10% or more as unfavourable. It is probably unlikely that the threshold would need to be raised.</p>	<p>Structured observation.</p>	<p>The percentage litter cover can be difficult to estimate, so it is recommended that only a continuous, readily observable layer is included in the cover estimate. Beyond 25% cover, this would generally indicate insufficient removal of biomass by grazing or cutting.</p> <p>Some stands have negligible litter cover, and it may be appropriate in these cases to reduce the threshold.</p>
<p>*Sward structure: extent of bare ground (not rock)</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 5% of the sward.</p> <p>Locally it may be appropriate to increase the threshold if there are specific conservation objectives requiring bare ground. Targets of less than 5% are not recommended and would be hard to assess.</p>	<p>Structured observation.</p>	<p>The percentage bare ground can also be difficult to estimate, so it is recommended that only the bare ground visible without disturbing the vegetation be included in the cover estimate.</p> <p>Occasionally a higher cover of bare ground may be acceptable in May – early June, particularly for MG8.</p> <p>Rabbit warren activity is unlikely to be welcome, as in general neutral grasslands are not tolerant of heavy grazing.</p> <p>In some stands, higher amounts of bare ground may be required for specialist taxa.</p>

Table 2a. Examples of positive indicator species for each community: lowland meadows and upland hay meadows

MG3	MG4	MG5	MG8
<p><i>Alchemilla</i> spp., <i>Anemone nemorosa</i>, <i>Centaurea nigra</i>, <i>Cirsium heterophyllum</i>, <i>Conopodium majus</i>, <i>Euphrasia</i> spp., <i>Filipendula ulmaria</i>, <i>Geranium sylvaticum</i>, <i>Geum rivale</i>, <i>Lathyrus pratensis</i>, <i>Leontodon</i> spp., <i>Lotus corniculatus</i>, <i>Persicaria bistorta</i>, <i>Rhinanthus minor</i>, <i>Sanguisorba officinalis</i>, <i>Succisa pratensis</i>, <i>Trollius europaeus</i>.</p>	<p><i>Centaurea nigra</i>, <i>Filipendula ulmaria</i>, <i>Galium verum</i>, <i>Leontodon hispidus</i>, <i>Lotus corniculatus</i>, <i>Oenanthe silaifolia</i>, <i>Persicaria bistorta</i>, <i>Primula veris</i>, <i>Rhinanthus minor</i>, <i>Sanguisorba officinalis</i>, <i>Serratula tinctoria</i>, <i>Silaum silaus</i>, <i>Stachys officinalis</i>, <i>Succisa pratensis</i>, <i>Thalictrum flavum</i></p>	<p><i>Agrimonia eupatoria</i>, <i>Alchemilla</i> spp., <i>Anemone nemorosa</i>, <i>Centaurea nigra</i>, <i>Filipendula vulgaris</i>, <i>Galium verum</i>, <i>Genista tinctoria</i>, <i>Lathyrus linifolius</i>, <i>Leontodon hispidus</i>, <i>L. saxatilis</i>, <i>Lotus corniculatus</i>, <i>Pimpinella saxifraga</i>, <i>Polygala</i> spp., <i>Potentilla erecta</i>, <i>Primula veris</i>, <i>Sanguisorba minor</i>, <i>S. officinalis</i>, <i>Serratula tinctoria</i>, <i>Silaum silaus</i>, <i>Stachys officinalis</i>, <i>Succisa pratensis</i></p>	<p><i>Berula erecta</i>, <i>Caltha palustris</i>, <i>Cirsium dissectum</i>, <i>Eupatorium cannabinum</i>, <i>Filipendula ulmaria</i>, <i>Galium palustre</i>, <i>G. uliginosum</i>, <i>Geum rivale</i>, <i>Hydrocotyle vulgaris</i>, <i>Lotus pedunculatus</i>, <i>Lychnis flos-cuculi</i>, <i>Mentha aquatica</i>, <i>Orchidaceae</i> spp., <i>Potentilla palustris</i>, <i>Ranunculus flammula</i>, <i>Succisa pratensis</i>, <i>Thalictrum flavum</i>, <i>Valeriana dioica</i>, <i>Viola palustris</i></p>

Table 3. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES: LOWLAND DRY ACID GRASSLANDS

Interest feature: **Lowland dry acid grasslands**

Includes the following NVC types: U2, U3, U4, U4/U20-related (species-rich bracken). Lowland U2 is not included as it is essentially a heathland vegetation. Upland stands of U2-4 are covered by the upland guidance.

Equivalent Phase 1 categories: B1 Acid grassland (lowland stands), D3 Lichen/bryophyte heath (part only), D5 Dry heath/acid grassland mosaic (part only).

Includes no Annex I types

Reporting category: **Acid grassland**

NB All primary attributes (listed in bold) are mandatory. Secondary or supporting attributes (marked *) often provide valuable substantiating evidence but should not generally be used as primary indicators of condition. Hashed attributes (#) are to be used when conditions allow (see text) and/or when appropriate.

Frequency classes for positive indicator species should be as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

Attributes	Targets	Method of assessment	Comments
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Attributes	Targets	Method of assessment	Comments
Extent	No significant loss of feature .	Comparative assessment with vegetation map and/or aerial photos.	<p>Target may exceed current extent if there is evidence of recoverable reduction.</p> <p>In exceptional circumstances, target may be set to accept some loss to other habitat (e.g. if required by specialist taxa).</p> <p>Threshold areas for assessing significant loss will vary according to site and the quality of available vegetation maps and/or aerial photos.</p> <p>Recoverable reduction = unfavourable Non-recoverable reduction = partially destroyed</p>
Sward composition: frequency of positive indicators	<p>Targets should be set to register a low or declining frequency of key indicators (Table 3a) as unfavourable.</p> <p>As a generic standard, the frequencies of positive indicators should at the very least, confirm the presence of the target community.</p> <p>Local targets could also be set for site-specific positive indicator species, to register a decrease in frequency of 20% or more as unfavourable.</p>	Structured observation or sampling.	<p>Further guidance on setting the generic minimum standard will be provided by the individual country agencies.</p> <p>When setting local targets, select a number of representative species (normally 2-6, taking into account the need to choose ecologically informative and readily identifiable taxa). Care should be taken to choose species that show high fidelity to lowland acid grassland, that have reasonably stable populations given suitable ecological conditions, and those that are visible in the sward for much of the growing season.</p> <p>Normally, a decline in the frequency of key indicators will suggest declining quality, where accompanied by changes in other primary or secondary attributes. If this were the case, a decline in frequency of one key indicator species would normally be sufficient to register the stand as unfavourable. If key indicator species have declined without associated changes in other attributes, in order to allow for possible natural population fluctuations, it is recommended that 2 or more species should have declined in frequency class before the stand is judged unfavourable.</p>

Attributes	Targets	Method of assessment	Comments
			<p>For U3, <i>Agrostis curtisii</i> should be at least frequent throughout the sward, but normally below 80% cover.</p> <p>For U1a, the cover of terricolous lichens and acrocarpous bryophytes, would normally be within the range 15-90%, with pleurocarpous bryophytes at less than 50% cover</p> <p>The cover of ericaceous species (<i>Calluna vulgaris</i>, <i>Erica</i> spp., <i>Vaccinium myrtillus</i>) should normally be less than 25% if grassland rather than heathland is the conservation interest feature.</p>
<p>Sward composition: frequency of negative indicators - agricultural weeds</p>	<p>Target should be set to register high or increasing frequency/cover as unfavourable.</p> <p>As a generic standard, no species should be more than occasional throughout the sward or together more than 5% cover.</p> <p>More stringent local frequency targets can be set, if appropriate, to register an increase in frequency of 10% or more as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p><u>Examples of negative indicators (agricultural weeds):</u> <i>Bellis perennis</i>, <i>Carduus nutans</i>, <i>Cerastium fontanum</i>, <i>Chamerion angustifolium</i>, <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Plantago major</i>, <i>Senecio jacobaea</i>, <i>Urtica dioica</i></p> <p>Bracken is considered with scrub.</p> <p>The majority of the listed agricultural weeds respond to some form of nutrient enrichment. Therefore high or increasing frequency/cover will generally indicate unfavourable condition.</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets, e.g. no more than rare (20% frequency). Cover targets of less than 5% are not generally recommended.</p>
<p>#Sward composition: cover of negative</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, no species</p>	<p>Structured observation or sampling.</p>	<p><u>Examples of negative indicators (agriculturally favoured species):</u> <i>Lolium perenne</i>, <i>Phleum pratense</i>, <i>Holcus lanatus</i>, <i>Trifolium repens</i></p> <p>This attribute should be used when conditions allow. All listed species</p>

Attributes	Targets	Method of assessment	Comments
indicators - agriculturally favoured species	<p>should be individually at more than 10% cover, or collectively at more than 20% cover.</p> <p>More stringent local cover targets can be set, if appropriate, to register an increase of cover of 5% individually or 10% collectively as unfavourable.</p>		<p>are good markers for unfavourable condition if present at high cover, but cover estimation may be problematic under certain conditions, e.g. when heavily grazed.</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets.</p>
Sward composition: cover of negative indicators - rank grasses	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, <i>Arrhenatherum</i> and <i>Dactylis</i> together should cover less than 10% of the sward.</p> <p>It is probably unlikely that lower local thresholds would need to be set. Occasionally, thresholds may need to be raised, according to wider conservation objectives.</p>	Structured observation or sampling.	<p>Care should be taken with the setting of these targets as thresholds may vary considerably by site and conservation goals.</p> <p><u>Examples of negative indicators (rank grasses):</u> <i>Arrhenatherum elatius</i>, <i>Dactylis glomerata</i></p> <p><i>Arrhenatherum</i> and <i>Dactylis</i> are good indicators of under-grazed, rank stands, and therefore increasing or high cover will generally indicate unfavourable conditions.</p> <p><i>Deschampsia flexuosa</i>, although not one of the rank grasses, can also cause problems at some U1 sites. In these cases, cover should be generally less than 20%.</p>
Sward composition: cover of negative indicators – scrub	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, woody species and bracken together should</p>	Structured observation or sampling.	<p>These targets should be used with caution. Scrub and tree cover can form a useful transition habitat across part of a site, but if more than occasional throughout a sward, even at less than 5% cover, scrub and bracken can soon become a problem if grazing levels are not sufficient or if control measures are not being carried out.</p>

Attributes	Targets	Method of assessment	Comments
<p>(including <i>Rubus fruticosus</i>) and tree species, and bracken</p>	<p>be at no more than 5% cover, or <i>Rhododendron</i> spp. no more than rare.</p> <p>It is probably impractical to set local targets at below 5% cover, but see comments. Occasionally e.g. for some U3 stands, a higher cover of <i>Ulex</i> may be acceptable. For U4/U20-related stands, bracken may be at 50-90% cover.</p>		<p>Elimination of <i>Rhododendron</i> from sites is desirable in view of the invasive potential of this species.</p> <p>Some U3 stands can still be in favourable condition with up to 25% cover of <i>Ulex gallii</i> or <i>U. minor</i>. Species-rich bracken stands (U4/U20) could still be in favourable condition at up to 90% cover of bracken.</p> <p>High scrub cover may be required at sites with specialist invertebrate interest.</p>
<p>#Indicators of local distinctiveness</p>	<p>Targets should be set to register low or declining population size/extent (species) or loss of cover (transitions) as unfavourable. Additional targets may be set for other attributes as appropriate.</p> <p>There are no generic targets for this attribute.</p> <p>Local targets should be set to ensure:</p> <ul style="list-style-type: none"> - existing populations of rare/scarce species are maintained at least at current levels and often local distribution characteristics - community and habitat 	<p>Structured observation or sampling.</p>	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features)</p> <p>It is recommended that the appropriate size class and extent of scarce taxa be recorded. For plants, recommended size classes are as follows for number of shoots (or ramets): very small 1-10; small 11-100; medium 101-1000, large 1001-10000; very large >10000.</p> <p>In principle, equivalent approximate population measures could be developed for invertebrates and other taxa.</p> <p>Check that significant transitions have not been adversely modified.</p>

Attributes	Targets	Method of assessment	Comments
	<p>transitions are maintained at current levels and in current locations</p> <ul style="list-style-type: none"> - other locally distinctive attributes are maintained. 		
<p>*Sward structure: average height</p>	<p>Targets should be set to register both over- and under-grazed conditions as unfavourable.</p> <p>As a generic standard, sward height should usually be within the range 1-25 cm.</p> <p>In some cases, according to site, community and conservation objectives, it may be appropriate to set local limits within the generic range. Occasionally, particularly for U1a, the lower limit could be reduced to <1 cm.</p>	<p>Direct measurement at points across stand.</p>	<p>Locally, sward height may vary considerably, and in some cases may be in patchily unfavourable condition.</p> <p>Preliminary guidance for individual communities is as follows:</p> <p>U1 <10 cm U3 1-15 cm U4 3-25 cm U4/U20 3-25 cm excluding bracken</p> <p>Bear in mind that some invertebrates require a range of sward heights.</p>

Attributes	Targets	Method of assessment	Comments
<p>*Sward structure: litter</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 25% cover of the sward.</p> <p>More stringent local targets can be set, if appropriate, to register increase in litter cover of 10% or more as unfavourable. Only occasionally (some U4/U20 stands) would it be necessary to raise the threshold cover.</p>	<p>Structured observation.</p>	<p>The percentage litter cover can be difficult to estimate, so it is recommended that only a continuous, readily observable layer is included in the cover estimate. Beyond 25% cover, this would generally indicate insufficient removal of biomass by grazing or cutting.</p> <p>Some U1 stands have negligible litter cover, and it may be appropriate in these cases to reduce the threshold.</p> <p>Some U4/U20-related stands with little grazing may have up to 50% litter cover and still be in favourable condition.</p>
<p>*Sward structure: extent of bare ground (not rock)</p>	<p>Target should be set to register high or increasing cover as unfavourable. For U1, decreasing cover could also be cause for concern.</p> <p>As a generic standard, total extent should be no more than 10% of the sward.</p> <p>Locally it may be appropriate, particularly for U1, to increase the threshold and to include a minimum extent of bare ground. For other communities, occasionally an upper threshold of 5% may be appropriate. Targets of less than</p>	<p>Structured observation.</p>	<p>The percentage bare ground can also be difficult to estimate, so it is recommended that only the bare ground visible without disturbing the vegetation be included in the cover estimate.</p> <p>For some communities a higher cover of bare ground may be acceptable, particularly U1 (up to 25% or 50% for U1a). For these communities, cover of bare ground at less than 5% (or 10% for U1a) would normally indicate unfavourable conditions.</p> <p>Care should be taken here, particularly in relation to rabbit warrens. Rabbit grazing is important in maintaining some grasslands, but large population size can lead to undue disturbance and bare ground associated with warren activity. The area of warrens that can be tolerated is at least partially dependent upon site size. As a general guide, localised bare ground around rabbit warrens should be no more than 0.05 ha (20 x 20 m) for large sites (>50 ha) or 0.1% of the stand (up</p>

Attributes	Targets	Method of assessment	Comments
	5% are not recommended and would be hard to assess.		to 0.25 ha / 0.5% for U1). In some stands, areas of bare ground may also be required for specialist invertebrate taxa.

Table 3a. Examples of positive indicator species for each community: lowland dry acid grasslands

U1	U3	U4
<p><i>Aira</i> spp., <i>Aphanes</i> spp., <i>Astragalus danicus</i>, <i>Campanula rotundifolia</i>, <i>Centaureum erythraea</i> <i>Cetraria</i> spp., <i>Cladonia</i> spp., <i>Erodium cicutarium</i>, <i>Galium saxatile</i>, <i>G. verum</i>, <i>Lotus corniculatus</i>, <i>Ornithopus perpusillus</i>, <i>Pilosella officinarum</i>, <i>Plantago coronopus</i>, <i>Potentilla erecta</i>, <i>Rumex acetosella</i>, <i>Sedum acre</i>, <i>S. anglicum</i>, <i>Thymus</i> spp.</p>	<p><i>Agrostis curtisii</i>, <i>Calluna vulgaris</i>, <i>Cladonia</i> spp., <i>Erica cinerea</i>, <i>E. tetralix</i>, <i>Galium saxatile</i>, <i>Polygala</i> spp., <i>Potentilla erecta</i>, <i>Vaccinium myrtillus</i></p>	<p><i>Anemone nemorosa</i>, <i>Calluna vulgaris</i>, <i>Campanula rotundifolia</i>, <i>Erica cinerea</i>, <i>E. tetralix</i>, <i>Galium saxatile</i>, <i>G. verum</i>, <i>Genista tinctoria</i>, <i>Lathyrus linifolius</i>, <i>Leontodon taraxacoides</i>, <i>Lotus corniculatus</i>, <i>Orchidaceae</i> spp., <i>Pedicularis sylvatica</i>, <i>Pilosella officinarum</i>, <i>Pimpinella saxifraga</i>, <i>Polygala</i> spp., <i>Potentilla erecta</i>, <i>Rumex acetosella</i>, <i>Sanguisorba officinalis</i>, <i>Serratula tinctoria</i>, <i>Stachys officinalis</i>, <i>Succisa pratensis</i>, <i>Vaccinium myrtillus</i>, <i>Veronica officinalis</i>, <i>Vicia orobus</i>, <i>Viola</i> spp.</p>

Table 4. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES: LOWLAND CALCAREOUS GRASSLANDS

Interest feature: **Lowland calcareous grasslands**

Includes the following NVC types: CG1-9, MG2 (included here as a scrub transition on calcareous substrate)

Equivalent Phase 1 categories: B3 Calcareous grassland, C2 Upland species-rich ledges (below the limit of enclosure)

Includes the following Annex I types: 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)
 6211 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (important orchid sites)

Reporting category: **Calcareous grassland**

NB All primary attributes (listed in bold) are mandatory. Secondary or supporting attributes (marked *) often provide valuable substantiating evidence but should not generally be used as primary indicators of condition. Hashed attributes (#) are to be used when conditions allow (see text) and/or when appropriate.

Frequency classes for positive indicator species should be as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

Attributes	Targets	Method of assessment	Comments
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Attributes	Targets	Method of assessment	Comments
Extent	No significant loss of feature.	Comparative assessment with vegetation map and/or aerial photos.	<p>Target may exceed current extent if there is evidence of recoverable reduction.</p> <p>In exceptional circumstances, target may be set to accept some loss to other habitat (e.g. if required by specialist taxa).</p> <p>Threshold areas for assessing significant loss will vary according to site and the quality of available vegetation maps and/or aerial photos.</p> <p>Recoverable reduction = unfavourable Non-recoverable reduction = partially destroyed</p>
Sward composition: grass:herb ratio	<p>Target should be set to register a low or decreasing herb cover as unfavourable.</p> <p>As a generic standard, the grass:herb ratio normally should fall within the range 30-90% herb cover.</p> <p>Within this range, local targets can be set to register a decrease in herb cover by 20% or more as unfavourable.</p>	Structured observation.	<p>The grass: herb ratio is often regarded as a useful indicator of soil nutrient status, where competitive grasses generally increase at the expense of other taxa under high nutrient conditions. Care must be taken with this attribute, as some herbs (e.g. <i>Trifolium repens</i> and several agricultural weeds) also respond to nutrient enrichment.</p> <p>The grass: herb ratio can also fluctuate due to weather effects; for example, a wet spring may favour grasses over herbs. Therefore the target should give scope for natural variation.</p> <p>For CG1 and CG7c, it may be preferable to substitute this attribute with one for cover of terricolous lichens and acrocarpous bryophytes e.g. for CG1 generally at least 5%, and CG7c normally within the range 15-90%, with pleurocarpous bryophytes at less than 50% cover.</p>
Sward composition: frequency of positive indicators	Targets should be set to register a low or declining frequency of key indicators (Table 4a) as unfavourable.	Structured observation or sampling.	<p>Further guidance on setting the generic minimum standard will be provided by the individual country agencies.</p> <p>When setting local targets, select a number of representative species (normally 2-6, taking into account the need to choose ecologically</p>

Attributes	Targets	Method of assessment	Comments
	<p>As a generic standard, the frequencies of positive indicators should at the very least, confirm the presence of the target community.</p> <p>Local targets could also be set for site-specific positive indicator species, to register a decrease in frequency of 20% or more as unfavourable.</p>		<p>informative and readily identifiable taxa). Care should be taken to choose species that show high fidelity to lowland calcareous grassland, that have reasonably stable populations given suitable ecological conditions, and those that are visible in the sward for much of the growing season.</p> <p>Normally, a decline in the frequency of key indicators will suggest declining quality, where accompanied by changes in other primary or secondary attributes. If this were the case, a decline in frequency of one key indicator species would normally be sufficient to register the stand as unfavourable. If key indicator species have declined without associated changes in other attributes, in order to allow for possible natural population fluctuations, it is recommended that 2 or more species should have declined in frequency class before the stand is judged unfavourable.</p>
<p>Sward composition: frequency of negative indicators - agricultural weeds</p>	<p>Target should be set to register high or increasing frequency/cover as unfavourable.</p> <p>As a generic standard, no species should be more than occasional throughout the sward or together at more than 5% cover.</p> <p>More stringent local frequency targets can be set, if appropriate, to register an increase in frequency of 10% or more as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p><u>Examples</u> include negative indicators (agricultural weeds): <i>Anthriscus sylvestris</i>, <i>Bellis perennis</i>, <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Carduus</i> spp., <i>Chamerion angustifolium</i>, <i>Galium aparine</i>, <i>Plantago major</i>, <i>Rumex crispus</i>, <i>Rumex obtusifolius</i>, <i>Senecio jacobaea</i>, <i>Sonchus</i> spp., <i>Urtica dioica</i></p> <p>Bracken is considered with scrub.</p> <p>The majority of the listed agricultural weeds respond to some form of nutrient enrichment. Therefore high or increasing frequency/cover will generally indicate unfavourable condition.</p> <p>For MG2, <i>Anthriscus sylvestris</i> and <i>Urtica dioica</i> may be present at up to combined cover of 25% before the stand would be considered unfavourable.</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets, for example no more than rare (20% frequency).</p>

Attributes	Targets	Method of assessment	Comments
			Cover targets of less than 5% are not generally recommended.
#Sward composition: cover of negative indicators - agriculturally favoured species	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, no species should be individually at more than 10% cover, or collectively at more than 20% cover.</p> <p>More stringent local cover targets can be set, if appropriate, to register an increase of cover of 5% individually or 10% collectively as unfavourable.</p>	Structured observation or sampling.	<p>Examples of negative indicators (agriculturally favoured species): <i>Lolium perenne</i>, <i>Holcus lanatus</i>, <i>Cynosurus cristatus</i>, <i>Trisetum flavescens</i>, <i>Trifolium repens</i></p> <p>This attribute should be used when conditions allow. All listed species are good markers for unfavourable condition if present at high cover, but cover estimation may be problematic under certain conditions (e.g. when heavily grazed).</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets.</p>
Sward composition: cover of negative indicators - rank grasses	<p>Targets to be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard: Coarse grasses together should cover less than 10% of the sward, apart from CG3-6, where higher cover for particular species is acceptable - see comments.</p> <p>It is probably unlikely that lower local thresholds would need to be set. Occasionally it may be appropriate to set higher targets, particularly for CG3-6, where high</p>	Structured observation or sampling.	<p>Care should be taken with the setting of these targets as thresholds may vary considerably according to the site.</p> <p>Examples of negative indicators (rank grasses): <i>Brachypodium pinnatum</i>, <i>Bromopsis erecta</i>, <i>Avenula pubescens</i>, <i>Arrhenatherum elatius</i>, <i>Dactylis glomerata</i></p> <p>In CG3-6, one (or two) of the listed species are constant, often at >10% cover, but always in the virtual absence of other tussock species. The constant species are as follows: CG3 <i>Bromopsis erecta</i>, CG4 <i>Brachypodium pinnatum</i>, CG5 <i>Bromopsis erecta</i> and <i>Brachypodium pinnatum</i>, CG6 <i>Avenula pubescens</i>. Care should be taken to ensure that stands are true forms of CG3-6, rather than degraded forms of other calcareous grassland communities. In many cases any increase of cover in the above constants by 20% or more, would be regarded as unfavourable.</p>

Attributes	Targets	Method of assessment	Comments
	<p>cover for certain species is acceptable, but increasing cover would still be undesirable. In such circumstances local targets could be set to register an increase in cover of <i>Brachypodium pinnatum</i>, <i>Bromopsis erecta</i> or <i>Avenula pubescens</i>, as appropriate, by 20% or more as unfavourable.</p>		<p><i>Arrhenatherum</i> and <i>Dactylis</i> are good indicators of under-grazed, rank stands, and increasing or high cover will generally indicate unfavourable conditions.</p>
<p>Sward composition: frequency of negative indicators – introduced species</p>	<p>Targets to be set to register high or increasing frequency as unfavourable.</p> <p>As a generic standard, no introduced species should be more than occasional throughout the sward.</p> <p>More stringent local frequency targets can be set, if appropriate, to register increases in frequency of 10% or more as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p>It is desirable that non-native scrub is completely eliminated wherever possible, in view of the invasive potential of many of the species.</p> <p>Examples of introduced species include: Herbs - <i>Centranthus ruber</i>, <i>Parietaria judaica</i>, <i>Sedum album</i> Scrub - <i>Arbutus unedo</i>, <i>Berberis</i> spp., <i>Cotoneaster</i> spp.</p>
<p>Sward composition: cover of negative indicators - native scrub and tree species, and bracken</p>	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, woody species (excluding <i>Juniperus communis</i>) and bracken together should be at no more than 5% cover.</p>	<p>Structured observation or sampling.</p>	<p>These targets should be used with caution. Scrub and tree cover can form a useful transition habitat across part of a site, but if more than occasional throughout a sward, even at less than 5% cover, scrub and bracken can soon become a problem if grazing levels are not sufficient or if control measures are not being carried out.</p> <p><i>Rosa</i> spp. should be excluded from this attribute in CG8. For MG2, cover of tree and scrub can be up to 30% before becoming unfavourable.</p>

Attributes	Targets	Method of assessment	Comments
	It is probably impractical to set local targets at below 5% cover, but see comments. Very occasionally a higher cover may be acceptable.		Higher scrub or bracken cover may be required at sites with specialist invertebrate interest.
#Indicators of local distinctiveness	<p>Targets should be set to register low or declining population size/extent (species) or loss of cover (transitions) as unfavourable. Additional targets may be set for other attributes as appropriate.</p> <p>There are no generic targets for this attribute.</p> <p>Local targets should be set to ensure:</p> <ul style="list-style-type: none"> - existing populations of rare/scarce species are maintained at least at current levels and often local distribution characteristics - community and habitat transitions are maintained at current levels and in current locations - other locally distinctive attributes are maintained. 	Structured observation or sampling.	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features)</p> <p>It is recommended that the appropriate size class and extent of scarce taxa be recorded. For plants, recommended size classes are as follows for number of shoots (or ramets): very small 1-10; small 11-100; medium 101-1000, large 1001-10000; very large >10000.</p> <p>In principle, equivalent approximate population measures could be developed for invertebrates and other taxa.</p> <p>Check that significant transitions have not been adversely modified.</p>
*Sward structure: average height	Targets should be set to register both over- and under-grazed conditions as unfavourable.	Direct measurement at points	Locally, sward height may vary considerably, and in some cases may be in patchily unfavourable condition. MG2 could still be in favourable condition at up to 80 cm sward height.

Attributes	Targets	Method of assessment	Comments
	<p>As a generic standard, sward height should usually be within the range 2-50 cm.</p> <p>Locally, according to site and community, it may be appropriate to set local limits within the generic range, depending upon the conservation objectives. For CG1 and CG7, the lower limit could be reduced to <1 cm.</p>	<p>across stand.</p>	<p>Preliminary guidance for individual communities is as follows:</p> <p>CG1 <10 cm CG2 2-20 cm CG3-5 2-50 cm CG6 5-50 cm CG7 <5 cm CG8 2-15 cm CG9 2-15 cm MG2 5-80 cm</p> <p>Bear in mind that some invertebrates require a range of sward heights.</p>
<p>*Sward structure: litter</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 25% cover of the sward.</p> <p>More stringent local targets can be set, if appropriate, to register increase in litter cover of 10% or more as unfavourable. Only occasionally (some CG6 and MG2 stands) would it be necessary to raise the threshold cover.</p>	<p>Structured observation.</p>	<p>The percentage litter cover can be difficult to estimate, so it is recommended that only a continuous, readily observable layer is included in the cover estimate. Beyond 25% cover, this would generally indicate insufficient removal of biomass by grazing or cutting.</p> <p>Some CG1 and CG7 stands have negligible litter cover, and it may be appropriate in these cases to reduce the threshold considerably.</p> <p>Some CG6 and MG2 stands with little or no grazing may have up to 50% litter cover and still be in favourable condition.</p>
<p>*Sward structure: extent of bare ground (not</p>	<p>Target should be set to register high or increasing cover as unfavourable. For CG1 and CG7, decreasing cover could also be cause for</p>	<p>Structured observation.</p>	<p>The percentage bare ground can also be difficult to estimate, so it is recommended that only the bare ground visible without disturbing the vegetation be included in the cover estimate.</p>

Attributes	Targets	Method of assessment	Comments
rock)	<p>concern.</p> <p>As a generic standard, total extent should be no more than 10% of the sward.</p> <p>Locally it may be appropriate, particularly for CG1 and CG7, to increase the threshold and to include a minimum extent of 5% bare ground. For other communities, occasionally an upper threshold of 5% may be appropriate, particularly for CG2 and CG6. Targets of less than 5% are not recommended and would be hard to assess.</p>		<p>For some communities a higher cover of bare ground may be acceptable, particularly CG1 (up to 25%) and CG7 (up to 15% or 50% for CG7c). For these communities, cover of bare ground at less than 5% (or 10% for CG7c) would normally indicate unfavourable conditions.</p> <p>Care should be taken here, particularly in relation to rabbit warrens. Rabbit grazing is important in maintaining some grasslands, but large population size can lead to undue disturbance associated with warren activity. The area of warrens that can be tolerated is at least partially dependent upon site size. As a general guide, localised bare ground around rabbit warrens should be no more than 0.05 ha (20 x 20 m) for large sites (>50 ha) or 0.1% of the stand (up to 0.25 ha / 0.5% for CG7).</p> <p>In some stands, areas of bare ground may also be required for specialist invertebrate taxa.</p>

Table 4a. Examples of positive indicator species for each community: lowland calcareous grasslands

CG1	CG2	CG3, CG4, CG5	CG6
<i>Acinos arvensis</i> , <i>Anthyllis vulneraria</i> , <i>Carex</i> spp., <i>Carlina vulgaris</i> , <i>Helianthemum</i> spp., <i>Leontodon hispidus</i> , <i>L. saxatilis</i> , <i>Lotus corniculatus</i> , <i>Pilosella officinarum</i> , <i>Sanguisorba minor</i> , <i>Scabiosa columbaria</i> , <i>Scilla</i> spp., <i>Thymus</i> spp., <i>Trinia glauca</i> .	<i>Anthyllis vulneraria</i> , <i>Asperula cynanchica</i> , <i>Campanula glomerata</i> , <i>Carex</i> spp., <i>Centaurea nigra</i> , <i>Cirsium acaule</i> , <i>Filipendula vulgaris</i> , <i>Helianthemum</i> spp., <i>Hippocrepis comosa</i> , <i>Leontodon hispidus</i> , <i>L. saxatilis</i> , <i>Lotus corniculatus</i> , <i>Pilosella officinarum</i> , <i>Polygala</i> spp., <i>Potentilla erecta</i> , <i>Primula veris</i> , <i>Sanguisorba minor</i> , <i>Scabiosa columbaria</i> , <i>Serratula</i>	<i>Anthyllis vulneraria</i> , <i>Asperula cynanchica</i> , <i>Campanula glomerata</i> , <i>Carex flacca</i> , <i>Cirsium acaule</i> , <i>Filipendula vulgaris</i> , <i>Galium verum</i> , <i>Helianthemum nummularium</i> , <i>Hippocrepis comosa</i> , <i>Leontodon hispidus</i> , <i>L. saxatilis</i> , <i>Lotus corniculatus</i> , <i>Pilosella officinarum</i> , <i>Polygala</i> spp., <i>Primula veris</i> , <i>Sanguisorba minor</i> , <i>Scabiosa</i>	<i>Agrimonia eupatoria</i> , <i>Anthyllis vulneraria</i> , <i>Carex flacca</i> , <i>Centaurea nigra</i> , <i>Centaurea scabiosa</i> , <i>Clinopodium vulgare</i> , <i>Filipendula vulgaris</i> , <i>Geranium sanguineum</i> , <i>Helianthemum nummularium</i> ,

	<i>tinctoria, Stachys officinalis, Succisa pratensis, Thymus spp.</i>	<i>columbaria, Succisa pratensis, Thymus spp.</i>	<i>Hypericum spp., Knautia arvensis, Leontodon hispidus, Lotus corniculatus, Orchidaceae spp., Origanum vulgare, Pimpinella spp., Primula veris, Sanguisorba minor, Thalictrum minus, Thymus spp.</i>
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CG7	CG8	CG9	MG2
<i>Aira spp., Aphanes spp., Astragalus danicus, Campanula rotundifolia, Carex spp., Centaurium erythraea, Cetraria spp., Cladonia spp., Dianthus deltoides, Erigeron acer, Erodium cicutarium, Fragaria vesca, Galium saxatile, G. verum, Helianthemum nummularium, Leontodon hispidus, L. saxatilis, Lotus corniculatus, Ornithopus perpusillus, Pilosella officinarum, Plantago coronopus, Potentilla erecta, Rumex acetosella, Sedum acre, S. anglicum, Teesdalia nudicaulis, Thymus spp.</i>	<i>Sesleria caerulea, Anthyllis vulneraria, Galium verum, Gentianella spp., Helianthemum nummularium, Hypericum pulchrum, Linum catharticum, Listera ovata, Lotus corniculatus, Pimpinella saxifraga, Plantago media, Polygala spp., Primula veris, Sanguisorba minor, Scabiosa columbaria, Stachys officinalis, Succisa pratensis, Thymus polytrichus, Viola hirta.</i>	<i>Antennaria dioica, Armeria maritima, Asperula cynanchica, Carlina vulgaris, Campanula rotundifolia, Cochlearia pyrenaica, Draba incana, Dryas octopetala, Euphrasia spp., Filipendula vulgaris, Galium sternerii, Gentiana verna, Gentianella spp., Helianthemum oelandicum, H. nummularium, Hippocrepis comosa, Leontodon hispidus, Lotus corniculatus, Myosotis alpestris, Parnassia palustris, Persicaria vivipara, Pilosella officinarum, Pinguicula vulgaris, Plantago maritima, Primula farinosa, Sanguisorba minor, Saxifraga hypnoides, Scabiosa columbaria, Selaginella selaginoides, Succisa pratensis, Thymus polytrichus</i>	<i>Alchemilla spp., Angelica sylvestris, Centaurea nigra, Cirsium heterophyllum, Fern spp. excluding bracken, Filipendula ulmaria, Galium verum, Geranium sylvaticum, Geum rivale, Mercurialis perennis, Polemonium caeruleum, Sanguisorba officinalis, Succisa pratensis, Valeriana officinalis</i>

Table 5. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES: LOWLAND PURPLE MOOR GRASS AND RUSH PASTURES

Interest feature: Lowland purple moor grass and rush pastures

Includes the following NVC types: M22-26

Equivalent Phase 1 categories: B5 Marsh/marshy grassland

Includes the following Annex I types: 6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

Reporting category: Fen, marsh and swamp

NB All primary attributes (listed in bold) are mandatory. Secondary or supporting attributes (marked *) often provide valuable substantiating evidence but should not generally be used as primary indicators of condition. Hashed attributes (#) are to be used when conditions allow (see text) and/or when appropriate.

Frequency classes for positive indicator species should be as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

Attributes	Targets	Method of assessment	Comments
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Attributes	Targets	Method of assessment	Comments
Extent	No significant loss of feature.	Comparative assessment with vegetation map and/or aerial photos.	<p>Target may exceed current extent if there is evidence of recoverable reduction.</p> <p>In exceptional circumstances, target may be set to accept some loss to other habitat, e.g. if required by specialist taxa.</p> <p>Threshold areas for assessing significant loss will vary according to site and the quality of available vegetation maps and/or aerial photos.</p> <p>Recoverable reduction = unfavourable Non-recoverable reduction = partially destroyed</p>
Sward composition: frequency of positive indicators	<p>Targets should be set to register a low or declining frequency of key indicators (Table 5a) as unfavourable.</p> <p>As a generic standard, the frequencies of positive indicators should at the very least, confirm the presence of the target community.</p> <p>Local targets could also be set for site-specific positive indicator species, to register a decrease in frequency of 20% or more as unfavourable.</p>	Structured observation or sampling.	<p>Further guidance on setting the generic minimum standard will be provided by the individual country agencies.</p> <p>When setting local targets, select a number of representative species (normally 2-6, taking into account the need to choose ecologically informative and readily identifiable taxa). Care should be taken to choose species that show high fidelity to <i>Molinia-Juncus</i> pasture, that have reasonably stable populations given suitable ecological conditions, and those that are visible in the sward for much of the growing season.</p> <p>Normally, a decline in the frequency of key indicators will suggest declining quality, where accompanied by changes in other primary or secondary attributes. If this were the case, a decline in frequency of one key indicator species would normally be sufficient to register the stand as unfavourable. If key indicator species have declined without associated changes in other attributes, in order to allow for possible natural population fluctuations, it is recommended that 2 or more species should have declined in frequency class before the stand is judged unfavourable.</p>

Attributes	Targets	Method of assessment	Comments
<p>Sward composition: frequency and cover of <i>Molinia caerulea</i> and bulky <i>Juncus</i> spp</p>	<p>Target should be set to register both high and low cover as unfavourable.</p> <p>As a generic standard, the cover of all species combined should be within the range 25-80%. For M24-26, <i>Molinia</i> should be at least frequent throughout the sward.</p> <p>Within this range, it may occasionally be appropriate to set local targets to register an increase in cover by 20% or more as unfavourable. Smaller increases or decreases within the generic range may not necessarily be unfavourable.</p>	<p>Structured observation or sampling.</p>	<p>Both taxa may expand to become over-dominant in neglected stands when they may shade out smaller growing species and become highly impoverished. Conversely, the cover of <i>Molinia</i> and <i>Juncus</i> spp. may decline in response to unfavourable treatments including over-grazing and drainage.</p> <p>Although <i>Juncus effusus</i> may be dominant in some good quality stands of M23, in general an increase in cover of 20% or more of <i>J. effusus</i> (and to a lesser extent, <i>J. conglomeratus</i> and <i>J. inflexus</i>) is undesirable and should be considered when setting local limits.</p>
<p>Sward composition: frequency of negative indicators - agricultural weeds</p>	<p>Target should be set to register high or increasing frequency/cover as unfavourable.</p> <p>As a generic standard, no species should be more than occasional throughout the sward or together more than 5% cover.</p> <p>More stringent local frequency targets can be set, if appropriate, to register an increase in frequency of 10% or more as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p>Examples of negative indicators (agricultural weeds): <i>Anthriscus sylvestris</i>, <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Rumex crispus</i>, <i>Rumex obtusifolius</i>, <i>Urtica dioica</i> Bracken is considered with scrub.</p> <p>The majority of the listed agricultural weeds respond to some form of nutrient enrichment. Therefore high or increasing frequency/cover will generally indicate unfavourable condition.</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets, for instance no more than rare (20% frequency). Cover targets of less than 5% are not generally recommended.</p>

Attributes	Targets	Method of assessment	Comments
<p>#Sward composition: cover of negative indicators - agriculturally favoured species</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, no species should be individually at more than 10% cover, or collectively at more than 20% cover.</p> <p>More stringent local cover targets can be set, if appropriate, to register an increase of cover of 5% individually or 10% collectively as unfavourable.</p>	<p>Structured observation or sampling.</p>	<p>Examples of negative indicators (agriculturally favoured species): <i>Lolium perenne</i>, <i>Phleum pratense</i>, <i>Glyceria fluitans</i>, <i>Holcus lanatus</i>, <i>Poa trivialis</i>, <i>Ranunculus repens</i>, <i>Trifolium repens</i></p> <p>This attribute should be used when conditions allow. All listed species are good markers for unfavourable condition if present at high cover, but cover estimation may be problematic under certain conditions (e.g. when heavily grazed).</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets.</p>
<p>Sward composition: cover of negative indicators - rank grasses and sedges</p>	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, <i>Arrhenatherum</i> and <i>Deschampsia</i> together should cover less than 10% of the sward. Bulky wetland species collectively should cover less than 20% of the sward.</p> <p>It is probably unlikely that lower local thresholds would need to be set. Occasionally, thresholds may need to be raised, according to wider conservation objectives.</p>	<p>Structured observation or sampling.</p>	<p>Care should be taken with the setting of these targets as thresholds may vary considerably by site and conservation goals.</p> <p><u>Examples of negative indicators (rank grasses and sedges):</u> Grasses e.g. <i>Arrhenatherum elatius</i>, <i>Dactylis glomerata</i>, <i>Deschampsia cespitosa</i>, <i>Juncus</i> species Large <i>Carex</i> species (with leaves more than 5mm wide) e.g. <i>Carex acutiformis</i> Large grasses (with leaves more than 10mm wide and stout stems) e.g. <i>Glyceria maxima</i>, <i>Phalaris arundinacea</i>, <i>Phragmites australis</i> The upper limit for wetland species can be as high as 20% cover, e.g. in M22d, but for most stands a maximum cover of 10% wetland species could be used. Maximum cover for individual species could also be used if appropriate (e.g. 5% cover of <i>Phragmites australis</i> for M26).</p>

Attributes	Targets	Method of assessment	Comments
<p>Sward composition: cover of negative indicators – scrub and tree species, and bracken</p>	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, woody species and bracken together should be at no more than 5% cover.</p> <p>It is probably impractical to set local targets at below 5% cover, but see comments. Occasionally a higher cover may be acceptable, particularly for <i>Myrica gale</i> and <i>Ulex gallii</i>.</p>	<p>Structured observation or sampling.</p>	<p>These targets should be used with caution. Scrub and tree cover can form a useful transition habitat across part of a site, but if more than occasional throughout a sward, even at less than 5% cover, scrub and bracken can soon become a problem if grazing levels are not sufficient or if control measures are not being carried out.</p> <p>For <i>Myrica gale</i> and <i>Ulex gallii</i> it may be appropriate to set local targets to register increase in cover by 20% or more as unfavourable.</p> <p>High scrub cover may be required at sites with specialist invertebrate interest.</p>
<p>#Indicators of local distinctiveness</p>	<p>Targets should be set to register low or declining population size/extent (species) or loss of cover (transitions) as unfavourable. Additional targets may be set for other attributes as appropriate.</p> <p>There are no generic targets for this attribute.</p> <p>Local targets should be set to ensure:</p> <ul style="list-style-type: none"> - existing populations of rare/scarce species are maintained at least at current levels and often local distribution characteristics 	<p>Structured observation or sampling.</p>	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features)</p> <p>It is recommended that the appropriate size class and extent of scarce taxa be recorded. For plants, recommended size classes are as follows for number of shoots (or ramets): very small 1-10; small 11-100; medium 101-1000, large 1001-10000; very large >10000.</p> <p>In principle, equivalent approximate population measures could be developed for invertebrates and other taxa.</p> <p>Check that significant transitions have not been adversely modified.</p>

Attributes	Targets	Method of assessment	Comments
	<ul style="list-style-type: none"> - community and habitat transitions are maintained at current levels and in current locations - other locally distinctive attributes are maintained. 		
<p>*Sward structure: average height</p>	<p>Targets should be set to register both over- and under-grazed conditions as unfavourable.</p> <p>As a generic standard, swards should usually be within the range 5-80 cm.</p> <p>Locally it may be appropriate to reduce the upper threshold or increase the lower one, depending upon conservation objectives. Very occasionally the lower limit could be reduced.</p>	<p>Direct measurement at points across stand.</p>	<p>Care should be taken with these targets. The upper limit for sward height can be as high as 80 cm for some northern and western M23 and M25 features in good condition, but often a lower limit of 40 cm would be more appropriate for M24 and M26 and other communities in the south and east, where occasionally a 15 cm height limit for some forms of M24 and M25 is valid.</p> <p>The lower limit for some sites with a long history of heavy grazing, particularly in the New Forest, may be more appropriately set at 2 cm.</p> <p>Note that for occupied and potential marsh fritillary sites, variable sward height between 8-25 cm is strongly recommended.</p>

Attributes	Targets	Method of assessment	Comments
<p>*Sward structure: litter</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 25% cover of the sward.</p> <p>More stringent local targets can be set, if appropriate, to register increase in litter cover of 10% or more as unfavourable. It is probably unlikely that the threshold would need to be raised.</p>	<p>Structured observation.</p>	<p>The percentage litter cover can be difficult to estimate, so it is recommended that only a continuous, readily observable layer is included in the cover estimate. Beyond 25% cover, this would generally indicate insufficient removal of biomass by grazing or cutting.</p> <p>Some stands have negligible litter cover, and it may be appropriate in these cases to reduce the threshold.</p>
<p>*Sward structure: extent of bare ground (not rock)</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent should be no more than 10% of the sward.</p> <p>Locally it may be appropriate to increase the threshold if there are specific conservation objectives requiring bare ground. Targets of less than 5% are not recommended and would be hard to assess.</p>	<p>Structured observation.</p>	<p>The percentage bare ground can also be difficult to estimate, so it is recommended that only the bare ground visible without disturbing the vegetation be included in the cover estimate.</p> <p>In some stands, areas of bare ground may also be required for specialist invertebrate taxa.</p>

Table 5a. Examples of positive indicator species for each community: lowland purple moor grass and rush pastures

M22	M23	M24	M25	M26
<i>Caltha palustris</i> , <i>Centaurea nigra</i> , <i>Eupatorium cannabinum</i> , <i>Filipendula ulmaria</i> , <i>Galium palustre</i> , <i>G.uliginosum</i> , <i>Hydrocotyle</i> <i>vulgaris</i> , <i>Lotus</i> <i>pedunculatus</i> , <i>Lychnis flos-</i> <i>cuculi</i> , <i>Lythrum salicaria</i> , <i>Mentha aquatica</i> , Orchidaceae spp., <i>Pedicularis</i> sp., <i>Potentilla</i> <i>palustris</i> , <i>Succisa</i> <i>pratensis</i> , <i>Thalictrum</i> <i>flavum</i> , <i>Valeriana dioica</i>	<i>Achillea ptarmica</i> , <i>Caltha</i> <i>palustris</i> , <i>Carum</i> <i>verticillatum</i> , <i>Filipendula</i> <i>ulmaria</i> , <i>Galium palustre</i> , <i>Hydrocotyle vulgaris</i> , <i>Lotus pedunculatus</i> , <i>Lychnis flos-cuculi</i> , <i>Lythrum salicaria</i> , <i>Mentha</i> <i>aquatica</i> , Orchidaceae spp., <i>Viola palustris</i> .	<i>Anagallis tenella</i> , <i>Angelica</i> <i>sylvestris</i> , <i>Calluna</i> <i>vulgaris</i> , <i>Carum</i> <i>verticillatum</i> , <i>Centaurea</i> <i>nigra</i> , <i>Cirsium dissectum</i> , <i>Erica tetralix</i> , <i>Eupatorium</i> <i>cannabinum</i> , <i>Filipendula</i> <i>ulmaria</i> , <i>Galium</i> <i>uliginosum</i> , <i>Narthecium</i> <i>ossifragum</i> , Orchidaceae spp., <i>Pedicularis sylvatica</i> , <i>Potentilla erecta</i> , <i>Salix</i> <i>repens</i> , <i>Serratula tinctoria</i> , <i>Sphagnum</i> spp., <i>Succisa</i> <i>pratensis</i> , <i>Valeriana dioica</i>	<i>Angelica sylvestris</i> , <i>Calluna vulgaris</i> , <i>Carum</i> <i>verticillatum</i> , <i>Centaurea</i> <i>nigra</i> , <i>Erica tetralix</i> , <i>Eupatorium cannabinum</i> , <i>Filipendula ulmaria</i> , <i>Mentha aquatica</i> , <i>Narthecium ossifragum</i> , Orchidaceae spp., <i>Pedicularis sylvatica</i> , <i>Potentilla erecta</i> , <i>Serratula</i> <i>tinctoria</i> , <i>Sphagnum</i> spp., <i>Succisa pratensis</i> , <i>Viola</i> <i>palustris</i> , <i>Valeriana dioica</i> , <i>V. officinalis</i>	<i>Angelica sylvestris</i> , <i>Caltha</i> <i>palustris</i> , <i>Crepis paludosa</i> , <i>Filipendula ulmaria</i> , <i>Geum</i> <i>rivale</i> , <i>Leontodon hispidus</i> , <i>Lychnis flos-cuculi</i> , Orchidaceae spp., <i>Potentilla erecta</i> , <i>Sanguisorba officinalis</i> , <i>Serratula tinctoria</i> , <i>Succisa</i> <i>europaeus</i> , <i>Valeriana</i> <i>dioica</i>

Table 6. UK GUIDANCE ON CONSERVATION OBJECTIVES FOR MONITORING DESIGNATED SITES: LOWLAND CALAMINARIAN GRASSLANDS

Interest feature: **Lowland calaminarian grasslands**

Includes the following NVC types: OV37

Equivalent Phase 1 categories: I1 Natural rock exposure (river shingle) and I2 Artificial rock waste (spoil)

Includes the following Annex I types: 6130 Calaminarian grasslands of the *Violetalia calaminariae*

Reporting category: **Inland Rock**

NB All primary attributes (listed in bold) are mandatory. Secondary or supporting attributes (marked *) often provide valuable substantiating evidence but should not generally be used as primary indicators of condition. Hashed attributes (#) to be used when appropriate. Frequency classes for positive indicator species should be as follows: 1-20% rare, 21-40% occasional, 41-60% frequent, >60% constant. Frequency is defined as the chance of finding a species at a point positioned at random in a stand.

Attributes	Targets	Method of assessment	Comments
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Attributes	Targets	Method of assessment	Comments
Extent	No significant loss of feature.	Comparative assessment with vegetation map and/or aerial photos.	<p>Target may exceed current extent if there is evidence of recoverable reduction.</p> <p>In exceptional circumstances, target may be set to accept some loss to other habitat (e.g. if required by specialist taxa)</p> <p>Threshold areas for assessing significant loss will vary according to site and the quality of available vegetation maps and/or aerial photos.</p> <p>Recoverable reduction = unfavourable Non-recoverable reduction = partially destroyed</p>
Sward composition: frequency of positive indicators – ecological quality	<p>Target should be set to register a low or declining frequency of metallophyte species as unfavourable.</p> <p>As a generic standard, metallophyte species singly or together at least frequent throughout the sward.</p> <p>Local targets should also be set for site-specific metallophyte species, to register a decrease in frequency of 20% or more as unfavourable.</p>	Structured observation or sampling.	<p>Locally, frequency of metallophyte species may be considerably higher than the minimum standard, and local targets should be set accordingly.</p> <p>Examples of positive indicator (metallophyte) species: <i>Armeria maritima</i>, <i>Cochleria pyrenaica</i>, <i>Minuartia verna</i>, <i>Silene uniflora</i>, <i>Thlaspi caerulescens</i>, <i>Viola lutea</i></p> <p>Normally, decline in frequency of metallophyte species associated with declining quality, will be accompanied by changes in other primary or secondary attributes. If this were the case, a decline in frequency of one metallophyte species would normally be sufficient to register the stand as unfavourable. If metallophyte species have declined without associated changes in other attributes, in order to allow for possible natural population fluctuations it is recommended that 2 or more species should have declined in frequency before the stand is judged unfavourable.</p>
Sward composition:	Target should be set to register high or increasing frequency/cover as	Structured observation or	High frequency/cover of the following species indicates a trend towards mesotrophic and less toxic environmental conditions.

Attributes	Targets	Method of assessment	Comments
<p>frequency of negative indicators – undesirable taxa</p>	<p>unfavourable.</p> <p>As a generic standard, no species more than occasional throughout the sward or together more than 5% cover.</p> <p>More stringent local frequency targets can be set, if appropriate, to register an increase in frequency of 10% or more as unfavourable.</p>	<p>sampling.</p>	<p>Examples of undesirable taxa: <i>Anthriscus sylvestris</i>, <i>Cirsium arvense</i>, <i>Cirsium vulgare</i>, <i>Heracleum sphondylium</i>, <i>Urtica dioica</i>, coarse grasses (e.g. <i>Arrhenatherum elatius</i>, <i>Holcus lanatus</i>)</p> <p>At some sites, with very low levels of agriculturally favoured species, it may be appropriate to set more stringent targets, for instance no more than rare (20% frequency). Cover targets of less than 5% are not generally recommended.</p>
<p>Sward composition: cover of negative indicators – scrub and tree species and bracken</p>	<p>Targets should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, woody species and bracken together at no more than 5% cover.</p> <p>It is probably impractical to set local targets at below 5% cover, but see comments. Occasionally a higher percentage cover may be acceptable.</p>	<p>Structured observation or sampling.</p>	<p>These targets to be used with caution. Scrub and tree cover can form a useful transition habitat across part of a site, but if more than occasional throughout a sward, even at less than 5% cover, scrub and bracken can soon become a problem if grazing levels are not sufficient or if scrub control is not being carried out.</p> <p>High scrub cover may be required at sites with specialist invertebrate interest.</p>
<p>#Indicators of local distinctiveness</p>	<p>Targets should be set to register low or declining population size/extent (species) or loss of cover (transitions) as unfavourable. Additional targets may be set for other attributes as appropriate.</p> <p>There are no generic targets for this</p>	<p>Structured observation or sampling.</p>	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not covered adequately by the previous attributes, or by separate guidance (e.g. notified species features)</p> <p>It is recommended that the appropriate size class and extent of scarce taxa be recorded. For plants, recommended size classes are as follows for number of shoots (or ramets): very small 1-10; small 11-100;</p>

Attributes	Targets	Method of assessment	Comments
	<p>attribute.</p> <p>Local targets should be set to ensure:</p> <ul style="list-style-type: none"> - existing populations of rare/scarce species are maintained at least at current levels and often local distribution characteristics - community and habitat transitions are maintained at current levels and in current locations - other locally distinctive attributes are maintained. 		<p>medium 101-1000, large 1001-10000; very large >10000.</p> <p>In principle, equivalent approximate population measures could be developed for invertebrates and other taxa.</p> <p>Check that significant transitions have not been adversely modified.</p>
<p>*Sward structure: average height</p>	<p>Targets should be set to register under-grazed conditions as unfavourable.</p> <p>As a generic standard: upper limit of 5 cm.</p>	<p>Direct measurement at points across stand.</p>	<p>Locally, sward height may vary, and in some cases may be in patchily unfavourable condition.</p> <p>Bear in mind that some invertebrates require a range of sward heights.</p>
<p>*Sward structure: extent of bare ground (not rock)</p>	<p>Target should be set to register high or increasing cover as unfavourable.</p> <p>As a generic standard, total extent between 10 and 90% of the sward.</p> <p>In some cases it may be appropriate to set a local target of decrease in cover by 20% or more as unfavourable.</p>	<p>Structured observation.</p>	<p>The percentage bare ground can at times be difficult to estimate, so it is recommended that only the bare ground visible without disturbing the vegetation be included in the cover estimate.</p>