



**Guidelines for the selection of biological SSSI's
Part 2: Detailed guidelines for habitats and species groups**

12 NON-VASCULAR PLANTS

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Guidelines for selection of biological SSSIs: non-vascular plants

These Guidelines supersede those given in Chapter 12 of *Guidelines for selection of biological SSSIs* as published in 1989 (Ratcliffe 1989). The groups covered are bryophytes, lichens, fungi and non-marine algae. Only bryophytes, lichens and charophytes are treated in detail, for reasons explained in the text, but it is intended to update the guidelines on site selection for other groups of algae and fungi as and when information becomes available.

The limitations of the guidelines are clear, in that only some groups are covered in detail and a fairly crude – but, I hope, reasonably effective – scoring system is used in site selection. This approach is designed to select sites where there are important *communities* of lower plants, as well as rare species. Occasionally, however, individual rare species grow in small, man-made habitats such as on a length of wall, or on a church roof, where notification of an SSSI may not be the most appropriate – or effective – way of protecting the species. This must be borne in mind when using the guidelines. In cases of doubt, consult the lower plant specialist.

In some parts of the UK, such as the western highlands of Scotland, a large number of sites are likely to achieve high scores, and so be considered for notification. The key word here is "considered". It will probably be both impractical and undesirable to notify *every* site in the west of Scotland that scores 300 points or more, but all these sites should nonetheless be *considered*. The scores will not be unrealistic, because they will reflect the extreme international importance for lower plants of those parts of the country: – a phenomenon much more applicable to lower plants than to most other groups in the British Isles. The scoring system also provides a means of *ranking* sites, so that we can ensure that the very best of the lower plant sites have some protection, and that Regional Staff are at least aware of the importance of the others.

Reference

Ratcliffe, D.A., ed. 1989. *Guidelines for selection of biological SSSIs*. Peterborough, Nature Conservancy Council.

1. Introduction

- 1.1 The groups covered by these guidelines are bryophytes, fungi, lichens and non-marine algae. Nomenclature follows Corley & Hill (1981) for mosses, Smith (1991) for liverworts, Purvis *et al.* (in prep.) for lichens and Stewart (in prep.) for charophytes.

This document should be used in combination with the original *Guidelines for selection of biological SSSIs* (Ratcliffe 1989) in which there is an explanation of the rationale behind the SSSI system and of terms such as Areas of Search.

- 1.2 Many sites important for non-vascular plants will have been selected on the basis of habitat and vegetation types: bogs are the prime example. Other sites consist of habitats which are characteristically dominated by non-vascular plants (e.g. rock outcrops) or which may have non-vascular plants as the major interest (e.g. woodlands with the distinctive *Lobarion pulmonariae* lichen association but only a limited vascular plant flora). Similarly, bryophyte and lichen-rich Atlantic woodlands sometimes do not form particularly good examples of woodland community types, and as a consequence some woods of great importance for these groups have hitherto escaped notification.

- 1.3 There are problems in both the construction and the use of guidelines for the selection of important sites for non-vascular plants.

1.3.1 The data on distribution for some groups is inadequate, so that it is often difficult to determine what is rare and what is not.

1.3.2 Most species are inconspicuous, sometimes requiring microscopic examination for identification, and usually only have Latin names.

1.3.3 The literature is inadequate for many groups. There are no up-to-date and comprehensive Floras for lichens, fungi or algae, though a number of important works are underway. Consequently, identification of species is often a problem, even for the expert.

1.3.4 The non-vascular plants do not consist of a single group but are in fact very heterogeneous. In this sense they are more analogous to the invertebrates than to the vascular plants. Not

only are the various groups of non-vascular plants – bryophytes, lichens, fungi and algae –biologically distinct, but they also differ in the amount known about their taxonomy, distribution, ecology and conservation requirements. Each group of non-vascular plants has its experts and enthusiasts, but in all cases they are fewer in number than in fields such as ornithology or vascular plant botany, so recording has inevitably taken place at a lower level than in these more popular groups. However, knowledge of the non-vascular plants is by no means as scanty as is sometimes supposed.

- 1.3.5 The bryophytes are relatively well-known. The British list is unlikely to undergo any major changes, and bryologists have recorded species enthusiastically over the years. In recent years recording has been on a 10km square basis, and an atlas is in preparation. The state of knowledge for the larger lichens is in a similar state, but there are many small crustose species for which distributional data are inadequate. In addition, new species are frequently added to the British list.
 - 1.3.6 The distribution patterns of most fungi and algae are much less well known, with the exceptions of the charophytes, which have often been regarded as "honorary flowering plants", and marine algae, which have been the subject of an atlas (Norton 1985). Fungi are uniquely difficult to record effectively, since they are recognised by their fruiting bodies, which are only available at certain times of the year and whose appearance is often very erratic. To know the fungus flora of any site reasonably well therefore involves visits at different times of the year over many years.
 - 1.3.7 Most sites known to be important for non-vascular plants have at least a species list, which can be compared with the lists at the end of the chapter (Tables 1-8), even by a non-specialist. However, the uncertainties inherent in recording these groups must be borne in mind when using the lists.
- 1.4 As is the case for vascular plants, particular attention in site selection has to be given to the rarer and more threatened species, in order to represent all species listed in the British flora. The British non-vascular flora comprises about 1000 bryophytes, 1,500 lichens, 10,000 fungi (at

a conservative estimate) and many thousands of species of marine and freshwater algae. Definitions of rarity and scarcity (see 3.3.1) are the same as for the vascular plant guidelines (Ratcliffe 1989) and also the same as used in the British cryptogamic Red Data Lists (Stewart in prep.). Data on distribution were gathered from the database used for the British Bryological Society atlas (Hill, Preston & Smith in prep.), from the cryptogamic Red Data Book database (Stewart in prep.) and from maps supplied by the British Lichen Society (Seaward & Hitch 1982). A number of species of non-vascular plants may be added to Schedule 8 of the Wildlife and Countryside Act 1981 at the 1991 Quinquennial Review. Currently, the only species given specific protection by the act is the charophyte *Lamprothamnium papulosum*. The plants proposed for inclusion in Schedule 8 are either very rare (confined to 1-5 10 km squares), considered to be particularly endangered or relatively attractive and vulnerable to collecting.

2. International Importance

2.1 The British non-vascular flora is one of the richest in Europe, mainly because of Britain's geographical position in the path of the North Atlantic Drift, which brings relatively warm, wet conditions to western areas. Britain is also placed so that its southern extremes contain elements of the Mediterranean and Mediterranean-Atlantic floras, while in the north there are representatives of the arctic-alpine flora, which has its headquarters in northern Scandinavia. There is also a great variety of topography and geology, leading to further diversity. While Britain's vascular flora consists of only about 18% of the total European vascular flora, the figure for bryophytes, for example, is about 70%.

2.2 Britain is the best place in Europe for Atlantic bryophytes and lichens, including many near-endemic species. Some of these species, rare or restricted in Europe as a whole, are relatively common in Britain (e.g. the liverworts *Saccogyna viticulosa* and *Plagiochila spinulosa* and the moss *Breutelia chrysocoma*). Ratcliffe (1968) has described the Atlantic bryophytes and their habitats, including the range of variation that needs to be considered. Most of the Atlantic lichens are included in the Indices of Ecological Continuity (Rose in prep). Particularly important elements of our non-vascular flora are:

2.2.1 Atlantic woodland bryophytes, lichens and myxomycetes. The western Scottish semi-natural ravine woodlands, in particular, are without parallel elsewhere in Europe.

- 2.2.2 The 'Northern Atlantic hepatic mat', a community endemic to western Scotland.
- 2.2.3 Arctic-alpine communities. These are often bryophyte and lichen-dominated, and have to some extent been covered previously (Ratcliffe 1989). The distinctive Atlantic facies of some communities are of particular importance.
- 2.2.4 Endemic species (and subspecies and varieties).
- 2.2.5 Species with markedly disjunct distributions (e.g. Scottish Highlands – Himalayan disjunctions).
- 2.2.6 Species declining in Europe as a whole through habitat loss and pollution, but still locally frequent in parts of Britain.
- 2.2.7 Bog communities.
- 2.2.8 Caledonian pinewoods. These are important mainly for lichens.
- 2.2.9 Parkland/pasture woodland. Comparable areas, with ancient, lichen-rich trees, do not occur on the continent. One of the best examples is the New Forest, the largest remaining area of this type of woodland in western Europe.
- 2.2.10 Lichen-rich machair.
- 2.2.11 Marine algal communities.
- 2.2.12 Lowland lichen heath (including maritime cliff-top heath).
- 2.2.13 Lagoon species.

3. Site Selection Requirements

The main requirements for site selection are as follows:

3.1 Schedule 8 species

Currently only *Lamprothamnium papulosum* (a charophyte) is on the list, but further species are being recommended for addition at the 1991 Quinquennial Review. All sites with viable populations should be selected. An exception may be made for any species added as a result

of an international commitment but relatively common in Britain. Our international responsibility should be acknowledged by selecting outstanding sites for these species, but not all sites. This will only apply to a very small number of species: for example, it is possible that the moss *Drepanocladus vernicosus* will fall into this category.

3.2 Red Data Book species

All Red Data Book species' localities should be regarded as candidate sites.

One RDB species qualifies a site for selection if it has:

- 3.2.1 the largest population of this species in Great Britain.
- 3.2.2 a good population of the species on a site which is itself a good example of a habitat type but has not already been chosen.
- 3.2.3 a good population of the species in an Area of Search (AOS) supporting a substantial proportion of localities for the species.
- 3.2.4 a good population on the edge of the species' geographical range.
- 3.2.5 the only occurrence of the species in the particular AOS.

3.3 Combinations of species — bryophytes, lichens and charophytes

A simple scoring procedure is used to assess combinations of species. Species taken into consideration are nationally rare and nationally scarce species (Tables 1 and 2), Atlantic species (Tables 3-5) and 'indicator' species (Tables 6 and 7). In most parts of Britain a total score of 200 or more qualifies a site for selection. It is necessary to modify this to 300 in parts of the south-west, Wales, the Lake District and much of Scotland (see Fig 1). Bryophytes, lichens and charophytes should be scored separately. It should be emphasised that these are only guidelines: if a site only just fails to reach the 200 point or 300 point threshold it may still be considered for notification, in consultation with the lower plant specialist.

3.3.1 Rare and scarce species.

Schedule 8 species score 200 points.

Nationally rare species score 100 points.

Nationally scarce species score 50 points in most parts of Britain and 30 points in some upland areas (see Figure 1) .

Nationally rare (i.e. Red Data Book) species are those recorded recently (i.e. since 1950) in 1-15 10 km squares. Nationally scarce species are those recorded recently in 16-100 10 km squares.

3.3.2 Atlantic, sub-Atlantic and western British bryophytes

Strictly Atlantic species score ten points.

Sub-Atlantic and western British species score five points.

Only species that have not already scored on grounds of rarity or scarcity should be given a score here.

These scores should be added to the scores derived from the rare and scarce species lists.

Many communities dominated by these groups of bryophytes will not be taken into account using either criteria of rarity or habitat type. However, as mentioned under 2.2, these communities are of international importance, and are particularly well represented in western Britain. Atlantic, sub-Atlantic and western British species (mostly as defined by Ratcliffe 1968) are listed in Tables 3-5.

3.3.3 'Woodland Indicator' bryophytes

Regionally important woodland bryophyte communities in the eastern, south-eastern and midland lowlands are often not selected using only the scoring system based on rare and scarce species. Table 6 lists a number of characteristic woodland bryophytes, and should be used in addition to the criteria described under 3.3.1 and 3.3.2 in these areas. Each species scores five points.

3.3.4 'Indicator' lichens

In addition to the lists of rare and scarce lichens, the Indices of Ecological Continuity (Rose in prep.) should be used in ancient woodland and parkland sites. This system is designed to identify

sites of potential richness for epiphytic lichens using relatively short lists of species, the presence of which is believed to signify ecological continuity in the past. There are different indices for use in different parts of the country (Table 7 and Figure 2). In some areas, different indices may have to be used for different woods. For example, the NIEC works reasonably well over much of lowland Cornwall, but the EUOCIEC is more appropriate to high altitude woodland on Bodmin Moor. A similar altitudinal distinction applies in the Lake District and parts of North Wales. Some central Scottish woods are intermediate in character, and the ESIEC and the EUOCIEC may be equally useful. It is possible that these woods may be becoming more acidic, gradually making the EUOCIEC the more appropriate index to use.

New Index of Ecological Continuity (NIEC):

Any site with twenty or more species present out of a possible 70 should be considered for selection.

East Scotland Index of Ecological Continuity (ESIEC):

Any site with ten or more species present out of a possible 30 should be considered for selection.

Eu-Oceanic West Scotland Index of Ecological Continuity (WSIEC):

Any site with 25 or more species present out of a possible 50 should be considered for selection.

Eu-Oceanic Calcifuge Woodlands Index of Ecological Continuity (EUOCIEC):

Any site with ten or more species present out of a possible 30 should be considered for selection.

The indices are most effective when applied to an area of woodland of about 1 km².

This criterion does not contribute directly to the scoring system described under 3.3.1, but should be used separately. In most cases it will serve to confirm results obtained using the system.

3.4 Combinations of species – other groups

Distributional data for fungi and algae are, on the whole, too scanty to allow lists of rare and scarce species to be assembled. For the present, their representation in SSSIs will have to depend either on their chance occurrence in sites selected on other grounds or on information from specialists who know some of the good localities for their particular groups.

3.5 Endemic species

This applies only to bryophytes. Insufficient is known about the other groups to identify endemic species.

The largest population of endemic species (see Table 8) in each AOS should be selected, where practicable, in consultation with the lower plant specialist. This will not be possible in some cases. The endemic moss *Oxystegus hibernicus*, for example, is frequent in parts of the west of Britain, and locating its largest population in any AOS is not a realistic proposition. On the other hand, another endemic moss, *Brachythecium appleyardiae*, occurs in small, easily identified and discrete populations, and is in any case a RDB species.

3.6 Non-endemic species threatened in Europe

3.6.1 Bryophytes.

In Britain, these number 163 species, of which 83 are RDB species. Four of these are presumed extinct. 56 are nationally scarce (see Table 2). This leaves:

Adelanthus decipiens, *Aphanolejeunea microscopica*, *Cephalozia leucantha*, *Douinia ovata*, *Drepanolejeunea hamatfolia*, *Frullania microphylla*, *F. teneriffae*, *Gymnomitrium crenulatum*, *Jubula hutchinsiae*, *Jungermannia paroica*, *Kurzia trichoclados*, *Lophocolea fragrans*, *Plagiochila exigua*, *Radula aquilegia* (all liverworts), and *Campylopus atrovirens*, *Seligeria paucifolia*, *Splachnum ampullaceum*, *S. sphaericum*, *Tetraplodon mnioides*, *Tetradontium brownianum* (all mosses). The best population of each species in every AOS in which it occurs should be selected, where practicable. Data on bryophytes threatened in Europe are taken from Schumacker (1990).

3.6.2 Lichens

There are 71 species of lichen known to occur in Britain which are threatened in the European Community. Of these, 33 are RDB species, and 21 are nationally scarce (see Table 2). This leaves: *Cetraria sepincola*, *Cladonia luteoalba*, *Lobaria amplissima*, *L. scrobiculata*, *L. virens*, *Pannaria conoplea*, *P. rubiginosa*, *Parmelia sinuosa*, *P. taylorensis*, *Parmeliella atlantica*, *P. jamesii*, *P. plumbea*, *Peltigera britannica*, *Sticta fuliginosa*, *S. limbata*, *S. sylvatica* and *Usnea articulata*. Most of these plants are strongly Atlantic in distribution. The best population of each species in every AOS in which it occurs should be selected, where practicable. Particular attention should be given to good populations of *Lobaria* species, which have declined dramatically in parts of Britain and the rest of Europe in recent decades. Data on lichens threatened in Europe are taken from Serusiaux (1989).

3.6.3 Other groups

There are insufficient data to comment on the international status of most other groups.

3.7 Declining species and species at the edge of their range

If an AOS contains species which are known to have declined markedly within Britain but are not yet considered nationally rare or nationally scarce, particularly large populations may be selected, in consultation with the lower plants specialist. Examples are *Antitrichia curtispindula* (a moss) and *Anaptychia ciliaris* (a lichen). In addition, any particularly large population of a species with restricted distribution at the edge of its range or a population which appears phenotypically distinct from the prevailing form may be selected.

4. References

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