

A Bryophyte Red Data List for Wales

Rhestr Data Coch Bryoffytuar gyfer Cymru

Sam Bosanquet
Countryside Council for Wales &
British Bryological Society
Trevor Dines
Plantlife Cymru



Summary



Llywodraeth Cymru
Welsh Government



PARTNERIAETH BIOAMRYWIAETH CYMRU

WALES BIODIVERSITY PARTNERSHIP

This report assesses the threats to those Welsh plants that belong to three groups: mosses, liverworts and hornworts, collectively known as bryophytes. Despite their relatively small size, these plants play a critical role in Welsh ecosystems – especially water regulation and nutrient cycling – as well as imparting the ‘mossy’ appearance so characteristic of the Welsh uplands, woodlands and wetlands.

Wales supports, or has supported, almost three quarters of the 1110 British bryophyte species, but many of our 811 species are under threat of extinction. Habitat loss and degradation are still the most significant threats, enhanced by exceptionally high nutrient levels in the general environment and ongoing climate change. Already, 26 mosses and liverworts (3%) are believed to have been lost from Wales in the last 150 years, many of them from Snowdonia. Another 173 have shown such significant declines, and/or have such restricted ranges that they are threatened with extinction – 18 (2%) are Critically Endangered, 64 (8%) are Endangered, 64 (8%) are Vulnerable, 12 (1%) are Near Threatened, and 15 (2%) are thought to be threatened but lack sufficient information for a full assessment.

Thus, 34% of the Welsh bryophyte flora requires action to safeguard it for the future, or to understand its true status. This figure is the same as that for Great Britain as a whole, but is made up of a different selection of species reflecting regional priorities. It is hoped that identifying mosses and liverworts that are specifically threatened in Wales will help with prioritising future conservation actions and will highlight those plants that most urgently need protection.

Crynodeb

Mae'r adroddiad hwn yn asesu'r bygythiadau sy'n wynebu'r planhigion Cymreig sy'n perthyn i dri grŵp; Mwsoglau, Llysiau Afu a Chyrndail. Gyda'i gilydd, adwaenir y grwpiau hyn fel Bryoffytiau. Er eu bod yn blanhigion cymharol fychan maen nhw'n rhan allweddol o ecosistemau Cymru – yn enwedig o ran rheoleiddio dŵr a chylchu maetholion. Maen nhw hefyd yn creu'r naws 'fwsoglaidd' sydd mor nodwediadol o ucheldiroedd, coedwigioedd a gwlyptiroedd Cymru.

Mae Cymru yn cynnal, neu wedi cynnal, bron i dri chwarter o'r 1110 o rywogaethau o fryoffytiau sydd i'w cael ledled Prydain. Ond mae nifer fawr o'r 811 rhywogaeth sydd gennym yma yng Nghymru yn wynebu difodian. Diflaniad a dirywiad cynefinoedd yw'r prif fygithiadau o hyd, ac mae'r lefelau uchel iawn o faetholion yn yr amgylchedd cyffredinol a hefyd newidiadau yn yr hinsawdd yn cyfrannu at yr effeithiau niweidiol hyn. Eisoes tybir bod 26 o fwsoglau a llysiau afu (3%) wedi diflannu o Gymru yn ystod y 150 mlynedd ddiwethaf – nifer ohonynt o Eryri. Mae poblogaethau 173 o rywogaethau eraill wedi dirywio i'r fath raddau ac/neu wedi crebachu o ran dosbarthiad fel eu bod yn syrthio i categoriâu bygythiadau yr IUCN – mae 18 (2%) mewn Perygl Enbyd; mae 64 (8%) mewn Perygl ; mae 64 (8%) yn Fregus; ac mae 12 (1%) yn agos at fod dan Fygithiad – tra bod prinder gwybodaeth yn golygu nad oes modd priodoli categori bygythiad i 15 (2%) ohonynt.

Felly mae angen gweithredu mewn perthynas â 34% o ffllora bryoffytiau Cymru er mwyn sicrhau dyfodol i'r elfen bwysig hon o'n hamgylchedd naturiol neu i ddeall ei statws gwirioneddol. Mae'r ffigur hwn yr un peth ar gyfer Prydain gyfan ond mae angen rhoi sylw i wahanol rywogaethau mewn gwahanol rannau o Brydain, yn ôl blaenoriaethau rhanbarthol. Gobeithir y bydd y gwaith o adnabod mwsoglau a llysiau afu sydd dan fygithiad yng Nghymru yn helpu blaenoriaethu gweithgaredd cadwraethol yn y dyfodol ac yn helpu adnabod y planhigion hynny sydd angen sylw brys os am eu gwarchod.

Featured species

These two species have been selected to illustrate the value of producing a Bryophyte Red Data List for Wales.

Green Blackwort (*Southbya tophacea*)

Vulnerable in Great Britain but **Least Concern** in Wales

This leafy liverwort is characteristic of Mediterranean Europe, and is very close to the northern edge of its global range on Anglesey. It is restricted to lime-rich ground where there is an almost constant seepage of water. The Anglesey colony is in a dune slack, and there are three further colonies in south Wales on limestone cliff slopes: two in Pembrokeshire and one in the Vale of Glamorgan.

The decline in England that led to the Red List status at the British level has not been apparent in Wales, although invasion with non-native Cotoneaster threatens one Pembrokeshire site and a colony in Flintshire has not been surveyed for a number of years.



SAM BOSANQUET

Drooping-leaved Beard-moss

(*Paraleptodontium recurvifolium*)

Least Concern in Great Britain but **Endangered** in Wales

Drooping-leaved Beard-moss is a beautiful yellow-green species with long, tapering, toothed leaves that all curve downwards, and a tongue-twisting scientific name.

It grew in small quantity in at least 8 sites in north Wales, in areas with high humidity, seeping water and slightly limey rock. Many of the sites have been revisited regularly in recent years, and *Paraleptodontium* could not be found: only two sites in Snowdonia have recent (post-1980) records.

At least three of the ravines where Drooping-leaved Beard-moss was recorded in the past have been considered for hydro-electric power generation, although no HEP schemes have been installed on these ravines yet. HEP is believed to be a significant threat, potentially causing reduced spray and humidity around *Paraleptodontium* colonies. The ability of this species to cope with environmental change is uncertain, but its extremely restricted range and tendency to occur in small quantity on any site where it grows suggest that it is unlikely to be particularly flexible.



GORDON ROTHERO

Cover image

Orobus-seed Liverwort (*Targionia hypophylla*)

© Jonathan Sleath

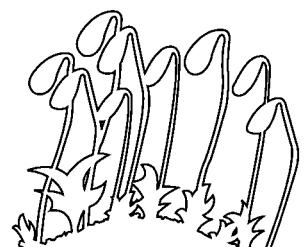
A Bryophyte Red Data List for Wales

Rhestr Data Coch Bryoffytiau ar gyfer Cymru

Sam Bosanquet
**Countryside Council for Wales & British
Bryological Society**

Trevor Dines
Plantlife Cymru

Cite as: Bosanquet, S. and Dines, T. (2011), A Bryophyte Red Data List for Wales,
Plantlife, Salisbury.



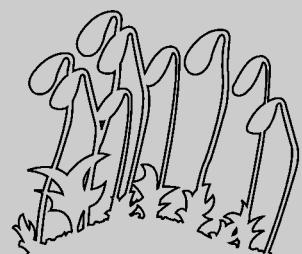
A Bryophyte Red Data List for Wales

A Bryophyte Red Data List for Wales

Following the publication of *A Vascular Plant Red Data List for Wales* (Dines, 2008), Plant Link Cymru is promoting the production of similar Red Data Lists for other groups of plants in Wales where possible, especially where this will improve our knowledge of the threats facing these species and the availability of data.

This report is the first to assign threat categories to Welsh mosses, liverworts and hornworts (bryophytes), and the first to use IUCN categories at a regional scale for this taxon group in Great Britain. Wales has a particularly rich bryophyte flora, with a greater proportion of Britain's species occurring within its borders than is the case for vascular plants, and a far greater number reaching the limits of their range within the country. Some bryophytes have been found to be more threatened in Wales than in Britain as a whole, whilst others appear to be holding their own more effectively in Wales than in England or Scotland. Wales has a responsibility to protect and conserve all of these threatened species, and the list of bryophytes that appear on the next revision of Section 42 of the Natural Environmental and Rural Communities Act (NERC) 2006 (*Habitats and species of principal importance in Wales*) should be informed by the findings of this study.

This report has been produced by Plantlife Cymru with the support of the Countryside Council for Wales and the British Bryological Society.



A Bryophyte Red Data List for Wales

Contents

1	Introduction	6
2	Implementation of this Red Data List	7
3	Coverage	8
3.1	Taxonomic coverage	8
3.2	Alien status	8
3.3	Geographic coverage	9
4	Data sources	10
5	Application of IUCN criteria	11
5.1	IUCN categories at the regional level	11
5.2	Treating Wales as a region	12
5.3	IUCN categories in Wales	13
5.4	Limitations of the analysis	14
6	Explanation of the Wales Red Data List	15
6.1	Species information	15
6.2	National responsibility and edge of range	15
6.3	Wales Red Data List categories, criteria and justification	16
7	Analysis	17
7.1	Comparison of Welsh and British Red Data Lists	17
7.2	Taxa extinct in Wales	19
7.3	Taxa “doing better” in Wales	20
7.4	Taxa “doing worse” in Wales	21
7.5	Taxa reaching the edge of their range in Wales	23
7.6	Species for which Wales has a particular responsibility	26
8	Bryophyte Red Data List for Wales	28
9	Excluded taxa	49
10	Acknowledgements	50
11	References	51

1. Introduction

Wales supports almost three quarters of all British bryophyte species with 811 of the 1110 listed in the latest *Census Catalogue* (Hill *et al.*, 2008), or 73% – a remarkably high proportion compared with the 54% of British vascular plants found in Wales. Bryophytes range from the lowland mosses of the Wye Valley woodlands and Gower coast to montane species of Snowdonia's cliffs, and from the tiny liverworts of raised bogs in west Wales, to the drought-tolerant rarities of Stanner Rocks in Radnorshire. This flora has been studied for more than 150 years and documented in a series of papers and books (e.g. Smith, 2004; Hill, 1988; Bosanquet *et al.*, 2005; Woods, 2006).

Habitat loss and environmental changes have put much of our biodiversity under threat, and bryophytes are no exception. Some of our rarest species are found in arable fields, exposed to constantly changing farming practices, whilst others are at the southern edge of their British range in the mountains of Snowdonia and are vulnerable to climate change. Yet mosses and liverworts are generally overshadowed by their larger and more glamorous flowering relatives, or by flagship species like birds and butterflies. It is Wales' responsibility to protect not just our most obvious species, but also the more subtle rarities. With such a large proportion of British bryophytes found in Wales, we also have a special responsibility to care for them.

The *Vascular Plant Red Data List for Wales* (Dines, 2008) applied IUCN criteria (version 3.1) to Welsh vascular plants in order to identify Wales' most threatened species. This study applies the same criteria to our bryophytes. By using these scientifically robust criteria, modified where necessary to take into account differences in levels of recording, we can select a list of priority species that are threatened with extinction at a regional level. Many of these are at the southern or northern limit of their British range in Wales, so loss from Wales would mean a significant reduction in British range. Already, some 26 bryophytes are thought to have been lost from Wales since the early 20th century, more than half of which are northern species that previously had their southern British limit in Wales.

This report has been produced by Plantlife Cymru and the Countryside Council for Wales with assistance from several Welsh bryologists and from the Biological Records Centre, Wallingford.

2. Implementation of this Red Data List

One aim of this report is to assess the risk of extinction facing bryophytes in Wales so that the current conservation priority list - Section 42 of the Natural Environmental and Rural Communities Act (NERC) 2006, *Habitats and species of principal importance in Wales* – which was based on 2005 British threat levels (Hodgetts, unpublished, on www.jncc.gov.uk, updating Church *et al.*, 2001), can be modified to take into account species that are threatened in Wales. However, Wales is a political, not biogeographic, area and this list should not be used in isolation without reference to Hodgetts' revised British *Bryophyte Red List* (Hodgetts, 2011). Because two threat lists now exist for Welsh bryophytes, some guidance is needed on how these lists should be used, especially given that some taxa have different threat levels in Wales and the whole of Britain.

Any taxon that is threatened (Critically Endangered, Endangered, Vulnerable) or Near Threatened in Great Britain (Hodgetts, 2011) should also be regarded as a priority for conservation in Wales, regardless of its threat status in Wales. The bryophytes currently listed under Section 42 are based on the GB Red Data List and this remains legally binding. The categories of threat given by Hodgetts are based on an assessment of national distribution and decline, and apply throughout the current range of each taxon in Great Britain.

If a taxon is less threatened in Wales than it is in Great Britain (i.e., it has a lower category of threat than it has in Great Britain as a whole or is even classified as Least Concern in Wales), the Welsh population must still be regarded as a critically important component of the GB population and deserves full protection in Wales with appropriate conservation measures. This is because it represents a part of the whole GB population that has more chance of surviving and recovering than the GB population as a whole. Should the GB population outside Wales continue to decline, the Welsh population will become increasingly important, again regardless of its status within Wales. Should the Welsh population begin to decline, or decline more rapidly than before, the species will be regarded as even more threatened in GB as a whole.

Taxa that are more threatened in Wales than they are in Great Britain should naturally be considered as priorities for conservation within Wales. The results of this Red Data List should inform the list of bryophytes that appear on the next revision of Section 42 of the Natural Environmental and Rural Communities Act (NERC) 2006 (*Habitats and species of principal importance in Wales*).

The most pressing issue for bryophyte conservation is that many of the taxa listed here have not been looked for since the 1970s and it is perfectly possible that colonies have been lost without anyone realising. Accurate documentation of the location and size of remaining populations of Wales' rarest bryophytes is urgently needed.

3. Coverage

3.1 Taxonomic coverage

All of the mosses, liverworts and hornworts recorded in Wales have been assessed for this Red Data List. This amounts to 848 taxa according to the latest *Census Catalogue* (Hill *et al.*, 2008) with two species, *Daltonia splachnoides* and *Schistidium helveticum*, added subsequently. These 850 taxa comprise: 587 moss species with 31 additional varieties and 1 additional subspecies; 221 liverwort species with 4 additional varieties and 2 additional subspecies; and 4 hornwort species. A further 22 varieties and one species (*Fossumbronia husnotii*) which were listed in the previous *Census Catalogue* (Blockeel & Long, 1998) were originally assessed, but many of these have been so poorly recorded in recent decades that it was impossible to determine whether they have declined or merely been ignored recently. Despite this, bryologists tend to take infraspecific taxa very seriously – perhaps more so than vascular plant botanists – and many subspecies and varieties are recorded with as much rigour as species. Some varieties appear to be almost distinctive enough to be species anyway, but are known to intergrade either in Britain or elsewhere in their range. All taxa have therefore been assessed, although some of the less well-known varieties have been placed on the Waiting List or the Data Deficient list.

The *Schistidium apocarpum* aggregate was subdivided by Blom (1996) and is something of a bryological equivalent of the vascular genus *Euphrasia* (Eyebrights), but thankfully without the hybridisation. Its members have not been evenly recorded in Wales and the status of most remains uncertain. Three that are thought to be particularly uncommon, judging by recent records, are assigned a threat status although *S. trichodon* was downgraded from Regionally Extinct to Critically Endangered because its apparent loss may not be genuine. Six others are on the Waiting List or Data Deficient list because they are so poorly known. No other bryophyte genus is as taxonomically problematic.

Hybrids are much less of an issue in bryophytes than in vascular plants because the hybrid generation is the sporophyte, which is never produced in isolation from the photosynthesising gametophyte generation. The only hybrid sporophytes confirmed from Wales are *Weissia brachycarpa* x *longifolia*, although *Aphanorhynchma patens* x *Physcomitrium sphaericum* has been found just across the border in Cheshire and could occur at the latter's two Welsh sites. Hybrid sporophytes are not thought to be of conservation concern at present.

3.2 Alien status

Only six Welsh bryophyte species were considered to be of recent introduced origin by Hill *et al.* (2007) (i.e. they are neophytes, meaning they were introduced after 1500AD):

Atrichum crispum, *Campylopus introflexus*, *Didymodon umbrosus*, *Hennediella stanfordensis*, *Lophocolea semiteres* and *Orthodontium lineare*. The *Didymodon* and *Lophocolea* are rare in Wales but have not been assigned to a threat category because of their non-native status. It is possible that other Welsh bryophytes are archaeophytes (introduced before 1500AD), especially some arable taxa and metalophytes (species of substrates rich in heavy metals, such as some mine spoil). Hill *et al.* considered *Anthoceros agrestis*, *Bryum ruderale*, *Bryum violaceum*, *Cephaloziella massalongi**, *Cephaloziella nicholsonii**, *Dicranella staphylina*, *Didymodon tomaculosus**, *Ditrichum plumbicola*, *Phaeoceros carolinianus**, *Scopelophila cataractae**, *Targionia hypophylla* and *Weissia squarrosa** to be possible archaeophytes, but the lack of proof means that all have been included in the Red Data List analysis and several of them (marked *) have been assigned a threat category.

3.3 Geographic coverage

This Red Data List covers the country of Wales, including the 13 vice-counties of Monmouthshire (vice-county number 35), Glamorgan (41), Brecknockshire (42), Radnorshire (43), Carmarthenshire (44), Pembrokeshire (45), Cardiganshire (46), Montgomeryshire (47), Merionethshire (48), Caernarvonshire (49), Denbighshire (50), Flintshire (51) and Anglesey (52).

In the absence of more detailed tetrad recording, decline statistics were based on data for Welsh hectad (10 km square of the Ordnance Survey grid) records from the British Bryological Society database held by the Biological Records Centre. Almost all these records are correctly attributed to a vice-county, but a few records from the Welsh border result from hectad record cards put together for the bryophyte *Atlas* (Hill *et al.*, 1991-1994) and could come from England (R.G. Woods, pers. comm.). The western distribution of most of Wales' threatened bryophytes means that this is unlikely to be much of an issue when assessing declines.

4. Data sources

The British Bryological Society (BBS) database is maintained by the Biological Records Centre (BRC) at the Centre for Ecology and Hydrology, Wallingford. Almost all records in the database were assigned to a hectad (10 km square of the Ordnance Survey grid) for production of the bryophyte *Atlas* (Hill *et al.*, 1991-94), and the majority are assigned to a vice-county (see section 3.3 for a caveat about border hectads). In 2010, Chris Preston at BRC generated hectad counts for all Welsh bryophytes using two date classes: all records and post-1970 records. The difference between these counts was used to inform IUCN threat criterion A, which for the purpose of this study looks exclusively at levels of decline in distribution or Area of Occupancy (AOO). The only alteration to these figures resulted from some contract surveys of north Wales sites that resulted in post-2000 records of various important species, which had not reached the BBS database. The 1970 cut-off was used in light of the paucity of recent north Wales recording: if 1980 were used, as in Hodgetts (2011) then apparent declines due to the lack of data would be even more of a problem.

Other IUCN criteria (B, C and D) examine the current number of sites, populations or individuals in the area being considered. Criteria B and C also require evidence of any ongoing decline, or fragmented or restricted locations or extreme fluctuations. For these criteria, detailed information from the *Threatened Bryophytes Database* (Hodgetts, 2003) was used, along with vice-county Floras and registers. These are vice-counties: 35 (Bosanquet, 2003); 41 (Perry, 1994); 42 (Woods, 2006); 43 (Woods, 1993); 44 (Bosanquet *et al.*, 2005); 45 (Bosanquet, 2010); 46 (Hale, 1998); 47-52 (Hill, 1988). All have been supplemented by more recent recording, especially by the BBS (46 & 50), P.M. Benoit (48), T.H. Blackstock (north Wales), S.D.S. Bosanquet (south Wales), M. Lawley (42, 43 & 47), G.S. Motley (35 & 42), M.E. Newton (48), J.D. Sleath (42) and M.J.M. Yeo (north Wales). In general there is little data on population sizes, either in terms of number of individuals or extent, so criteria C and D were seldom applicable.

5. Application of IUCN criteria

5.1 IUCN categories at the regional level

The standard IUCN Red Data List Categories (IUCN, 2001) are used with the following modifications to take into account the regional nature of this analysis:

1. Taxa extinct within the region but extant in other parts of Great Britain are classified as Regionally Extinct (RE). A taxon is RE when there is no reasonable doubt that the last individual in the region has died. In this report, taxa extinct in Great Britain as a whole are classified as EX, while those extinct in Wales but still present elsewhere in Great Britain are classified as RE. The list of extinctions for Wales therefore includes both EX and RE taxa.
2. Taxa that are (or have been) present in Wales but are not eligible for assessment at the regional level are assigned the category Not Assessed (NA) and are listed in section 9. These are mainly taxa that are no longer considered valid in the latest *Census Catalogue* (Hill *et al.*, 2008), but also includes the neophytes mentioned in 3.2.

5.2 Treating Wales as a region

Considerable guidance is given by IUCN (2003) regarding the application of standard IUCN criteria and categories (IUCN, 2001) to a region (defined as any subglobal geographically defined area, such as a continent, country, state, or province). Provided that the regional population being assessed is isolated from conspecific populations outside the region, the IUCN Red Data List Criteria (IUCN, 2001) can be used without modification within any geographically defined area.

However, when the criteria are applied to part of a population defined by a geopolitical border, as in the case of Wales sharing a border with England, the threshold values listed under each criterion may be inappropriate because the unit being assessed is not the same as the whole population or subpopulation. As a result, the estimate of extinction risk may be inaccurate.

In order to address this, the *Vascular Plant Red Data List for Wales* (Dines, 2008) considered whether the Welsh population of vascular plant taxa experiences any significant immigration of viable propagules from England. Any taxa that were found to experience significant propagule immigration and not to be threatened in Great Britain as a whole were downgraded by one threat category.

The ecology and population dynamics of most threatened bryophytes in Wales are simply too poorly known to allow this approach to be adopted for the current Red Data List. Some taxa are obviously poor dispersers - for example *Isopterygiopsis muelleriana* and *Radula voluta* have never been recorded with sporophytes in the British Isles and do not produce asexual propagules. Others, such as *Encalypta alpina* and *E. rhaftocarpa*, fruit profusely in parts of Britain but have not recolonised Snowdonia since their loss in the early 20th century, so the regular production of sporophytes is no guide to colonisation ability or dynamism. Yet others have asexual propagules, but these are probably seldom transported over great distances. Bryophytes certainly can be highly dynamic, as typified by the epiphytic mosses and liverworts that are rapidly expanding eastwards into eastern England, but the only one of these obviously dynamic epiphytes that appears on the Red Data List is *Ulota calvescens* (which might be a casual colonist from Ireland but is thought to have genuinely declined in north Wales); no *Orthotrichum* have been included.

5.3 IUCN categories in Wales

As well as the modifications given in section 5.1 above, IUCN criteria were adapted and modified to produce the GB Red Data List (Cheffings & Farrell, 2005), and these same criteria have been used to produce this Red Data List. This means that the same thresholds used to determine categories in the GB Red Data List have been used for Wales, and the lists are therefore directly comparable. Because of this, a detailed treatment of how each criterion was applied is not reproduced here, but readers are referred to the GB Red Data List for bryophytes (Church *et al.*, 2001) for further information. Table 1, however, gives a brief summary of the categories and criteria used here.

Threat Category	Criterion	Thresholds
EX Extinct		Extinct in Great Britain (but was present in Wales)
RE Regionally extinct		Extinct in Wales but still present elsewhere in Great Britain
EW Extinct in the wild		Extinct in Great Britain (but was present in Wales) but is still present in cultivation
CR Critically Endangered	A	AOO trend or hectad trend > 80% decline
	B	1 location + continuing decline
	C	<250 individuals + continuing decline
	D	< 50 individuals
EN Endangered	A	AOO trend or hectad trend > 50% decline
	B	5 locations + continuing decline
	C	< 2500 individuals + continuing decline
	D	< 250 individuals
VU Vulnerable	A	AOO trend or hectad trend > 30% decline
	B	10 locations + continuing decline
	C	< 10000 individuals + continuing decline
	D1	< 1000 individuals
	D2	< 5 locations
NT Near Threatened*	A	AOO trend or hectad trend > 20% decline
	B	30 locations + continuing decline
	D	< 10000 individuals
LC Least concern		Evaluated against criteria and does not qualify for threatened or Near Threatened.
DD Data deficient		Threat suspected but there is insufficient data for analysis
WL Waiting list** (not an IUCN category – see below)		Inadequate data, taxonomic uncertainties or uncertainties over native or archaeophyte status means no assessment can be made.

Table 1. IUCN Categories and criteria as adapted for use in Great Britain by Cheffings & Farrell (2005) and Wales (Dines, 2008). In essence, criterion A looks at decline in hectads or Area of Occupancy (AOO), criterion B deals with declining taxa that occur in a small number of sites, criterion C also deals with declining taxa but those that have a small number of individuals, and criterion D looks at those taxa in a small number of sites or with few individuals that are not necessarily declining. A taxon may qualify as threatened or near threatened on one or more criteria.

* No standard IUCN criteria exist for the Near Threatened category; those used were developed by Cheffings and Farrell (2005) for the GB Red Data List.

** The term Waiting List is not an IUCN category but one adopted for use by Cheffings & Farrell (2005) to deal with the taxa described.

5.4 Limitations of the analysis

While considerable efforts have been made to compile and use the best available data for this analysis, two factors are effective in compromising the application of IUCN criteria in Wales.

For Criterion A the GB Red Data List (Hodgetts, 2011) used data from nearly 3000 hectads (10 km squares) for the analysis of Area of Occupancy (AOO) and hectad decline. This number of hectads allowed a fairly robust analysis, as each unit represents 0.035% of the total area under consideration. In Wales, however, the same scale of data has been used, with 285 hectads being included in the analysis. Each unit therefore represents 0.35% of the area. This makes the analysis much more sensitive and less reliable. As a result, more caution has been applied and the A criterion has only been used with species that have been recorded from more than 10 hectads. It is hoped that, with more tetrad (2km square) data becoming available, criterion A can be applied at this scale in the future, although considerably more work is needed in mid and north Wales to make this practical.

A further difficulty, which is more of an issue with bryophytes than vascular plants, is the low number of active recorders in Wales. Wales is fortunate to be home to three or four of Britain's top bryologists, but it is impossible for them and the small number of other British Bryological Society (BBS) members to record across the whole country. At the time of the *Atlas* (Hill *et al.*, 1991-94), north Wales was the epicentre of British bryology and was extremely well-recorded, whilst most of south Wales was almost unknown. Subsequently there has been an upsurge in south Wales, but general recording in the north has been almost non-existent since the Flora by Hill (1988) was published (Preston *et al.*, 2009). Contract surveys of a number of key sites in the north have been carried out since 2000, but data flow issues mean that much data from these is not yet on the NBN Gateway. This imbalance in recording effort means that it is very difficult to assess declines because many north Wales rarities were found in the 1960s and have not been noted (or looked for) since. Some taxa that appear to have declined are probably just under-recorded, especially moderately rare species such as *Hypnum callichroum* and *Radula aquilegia*, which are just about common enough not to warrant a specific dated record but rare enough to be restricted to a limited number of sites. These species may genuinely have declined, but it is unlikely that they have experienced the >50% decline suggested by the current data. They have therefore been dropped by one threat level and flagged with a hyphen ‘-’ next to the threat category in the tables.

6. Explanation of the Wales Red Data List

The columns that appear in the Bryophyte Red Data List for Wales (Section 8) are described below.

6.1 Species information

Taxonomy of the Wales Red Data List (as given in the **TAXON** column) follows that of the latest *Census Catalogue* (Hill *et al.*, 2008). Whether the taxon is a moss (M), liverwort (L) or hornwort (H) is indicated in the **MLH** column.

The threat category of the species in Great Britain is given in the **GB Red List** column, and follows Hodgetts (unpublished). The current list of bryophytes on Section 42 of the Natural Environment and Rural Communities Act (NERC) 2006 (*Habitats and species of principal importance in Wales*) is given in the **Section 42 Wales** column. European Red Data Book species (ECCB, 1995) are shown in the **Europe Red List** column.

The native or alien status of each taxon in Britain (and therefore Wales) is given in the **Native/alien status** column, following Hill *et al.* (2007). Almost all taxa are considered to be natives except for a few possible archaeophytes (see section 3.2). Neophytes have been excluded and are listed in Section 9.

6.2 National responsibility and edge of range

An assessment has been made of what proportion of the British distribution of each taxon is found within Wales. This has been done using the number of hectads for which there are modern records in the BBS database (see Hill *et al.*, 2007) compared with the count for Wales made by the Biological Records Centre (BRC). Although crude, this does provide an indication of how much of the GB resource is located within Wales. For taxa with more than 25% of the GB distribution in Wales (and for which Wales has a national responsibility) the percentage is given in the **Prop (%) of GB population** column (see section 7.6).

Taxa that reach the edge of their British range in Wales are identified in the **Edge of GB range?** column. The edge of range in question is indicated by "N", "S", "E" and "W", where "S" indicates that the taxon reaches its southern limit in Wales. Notes indicate the county in which this edge lies, and where necessary gives information on outlying colonies when the edge is almost reached in Wales (e.g. *Adelanthus decipiens* with single outliers in Devon and Cornwall but the southern edge of its core range in Cardiganshire). Disjunctions from Scotland are indicated in the **Disjunct from Scotland?** column because taxa that 'skip' northern England and are (or were until they were lost from Wales) found only in the mountains of Scotland and Wales are believed to be more vulnerable to climate change than those also found in the lower mountains of the Lake District and the north Pennines.

6.3 Wales Red Data List categories, criteria and justification

The **IUCN** category (as defined in section 5.3 above) for Wales is given in the **Wales Red List** column (note that blanks indicate an assessment of Least Concern). The criterion/criteria under which each threatened taxon qualifies is/are given in the **Criteria** column.

The number of extant hectads (with a post-1970 record) is given in the **Wales extant (post-1970)** column and can be compared with the **Wales hectads (all records)** column. The former is equivalent to the locations column in Dines (2008): hectads were used in place of locations because that was the case for the GB Red Data List (Hodgetts, 2011). The number of locations of rare bryophytes is seldom precisely known – especially because many old records have vague location details amounting to little more than a nearby village or a whole mountain – and is often equivalent to hectads anyway. In some cases, declines appear smaller with hectad counts than location counts, especially in Snowdonia where Hill (1988) reports losses from two or three localities within a range spanning one or two hectads, and this was taken into account when decline criteria were assessed.

The number of individuals of any one species has not been included in the Red List table, although *Fossombronia fimbriata* was included in the Critically Endangered category on the basis of its known tiny population (<40 individuals). Otherwise, the number of individuals is only known for a handful of Welsh bryophytes.

Continued decline was difficult to assess because of the lack of comparable data from decade to decade (see 5.4). A **Significant decline?** column highlights taxa that have shown a >50% decline in hectad occupancy between all records and post-1970 records (see Section 4). It is assumed that past declines are unlikely to have slowed much given the continuing loss of habitat in Wales coupled with climate change and site dereliction, but in the small number of cases where the only populations are known to be holding their own (for example *Bartramia stricta* at its sole GB site), past declines have been ignored and Criterion B has not been met (in most such cases the species meet Criterion D2 of the Vulnerable category).

7. Analysis

7.1 Comparison of Welsh and British Red Data Lists

When drawing comparisons between taxa on the Welsh and GB Red Data Lists it is important to remember that identical criteria were used in their selection. Obviously, a much smaller area was under consideration (Wales being only 10% of the size of Great Britain) so it is not surprising that the proportion of taxa in each threat category in each area is so dissimilar in some cases (Table 2 and Figures 1 & 2).

	Great Britain		Wales	
	No. of taxa	% of total	No. of taxa	% of total
Extinct (EX+RE)	25	2	26	3
Critically Endangered (CR)	16	1	18	2
Endangered (EN)	40	4	64	8
Vulnerable (VU)	87	8	64	8
Near Threatened (NT)	78	7	12	1
Data Deficient (DD)	19	2	15	2
Least Concern (LC)	845	76	651	77
Total	1110		850	

Table 2. Number and proportion of taxa in each Red Data List category in Great Britain and Wales. Taxa on the Waiting List are excluded.

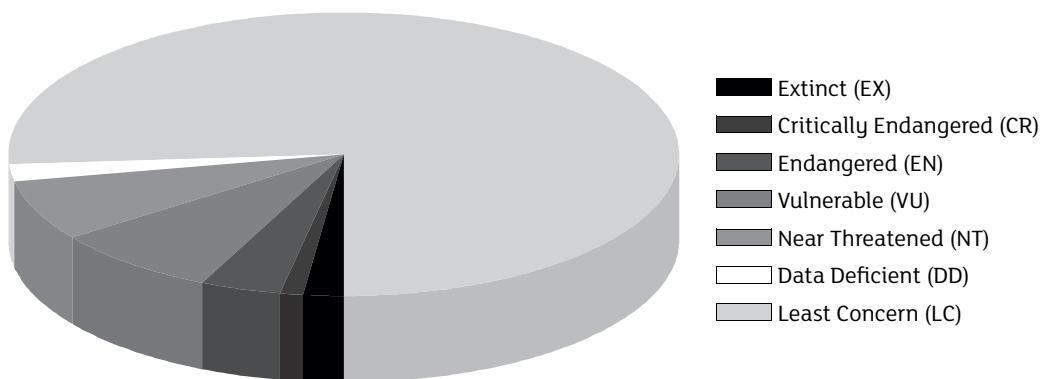


Figure 1. The proportion of taxa in each IUCN category in Great Britain (following Hodgetts, 2011).

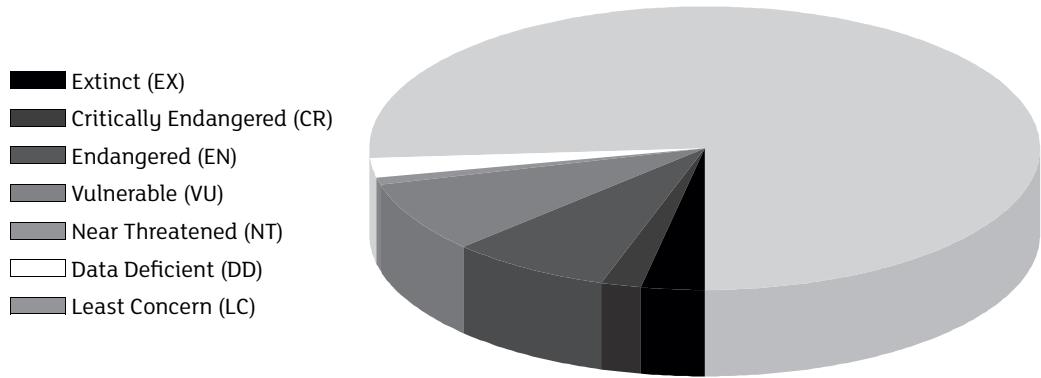


Figure 2. The proportion of taxa in each IUCN category in Wales (Extinct includes both EX and RE taxa).

Although the overall proportion of Threatened to Least Concern taxa is the same in Wales and Great Britain, the proportion within each category is quite strikingly different. Wales has a higher proportion of Extinct (EX & RE) taxa than Great Britain, many of which are boreal taxa lost from Snowdonia since the early 20th century but still persisting in Scotland (see section 7.2). This is to be expected. Less expected was the relatively high proportion of Endangered taxa. These mostly qualify under criterion B (<5 locations and a continuing decline) and/or criterion A (>50% decline), and many (41%) are boreal or montane species that are believed to be vulnerable to climate change. In a few cases the apparent decline may be because of the paucity of very recent data from north Wales (see 5.4), but each taxon retained in EN rather than demoted to VU is montane and therefore at particular risk. Countering the high number of Endangered taxa is a low number in the Near Threatened category. This was used very cautiously in Wales because historic data are not sufficient to detect the >20% decline (criterion A) as opposed to a lack of recent recording, and criterion D (<10,000 individuals) is almost impossible to apply to bryophytes. The 12 Near Threatened taxa were therefore selected using criterion B (<30 localities and continuing decline), usually where site losses had been witnessed in recent years.

An interesting facet of Red Listing that is visible in the Welsh bryophytes on the GB Red List is the number of species that dropped by one threat category between the 2005 and 2011 assessments. In many cases this results from survey work revealing that apparent declines were artificial. 25 of the 65 GB 2005 Red List species present in Wales were downgraded by at least one category by 2011, including Section 42 species such as *Bryum marratii*, *B. warneum*, *Entosthodon pulchellus*, *Grimmia elongata*, *Habrodon perpusillus* and *Rhytidadelphus subpinnatus*. In all, 14 of the 33 Section 42 bryophytes are now considered less threatened at the GB level than they were before, despite no action other than survey having taken place. Just 9 taxa have gone up a threat category, including 6 that were formerly considered Least Concern. All but 1 of these 9 taxa meet the IUCN criteria for Wales and are included on the Welsh Red List as well as the revised GB list.

7.2 Taxa extinct in Wales

The higher proportion of extinct taxa (EX+RE) in Wales than in Great Britain (3.1% as opposed to 1.6% for GB, see Table 2) is to be expected. There will always be a higher rate of extinction at the local site level long before extinctions become apparent from larger areas. In a few cases, taxa that appear to be heading for GB-wide extinction have been targeted by special projects, for example *Bryum schleicheri* (Rothero *et al.*, 2006), but this was not the case for any of the species in Table 3, most of which were lost from Wales long before active conservation began. The only taxa that have received active help in Wales have been conserved because of GB-wide threat rather than potential loss from Wales.

GB Red List	Taxon	Wales Red List	Year last recorded	Vice-county last recorded	Welsh habitat
DD	<i>Andreaea alpestris</i>	EX	1879	Caerns	Montane
CR	<i>Atrichum angustatum</i>	RE	1926	Carms	Upland stream
RE	<i>Bryum turbinatum</i>	EX	1904	Meirionydd	Dunes & river shingle
RE	<i>Bryum uliginosum</i>	EX	1904	Meirionydd	Dunes
	<i>Cinclidium stygium</i>	RE	1939	Meirionydd	Upland fen
	<i>Conostomum tetragonum</i>	RE	1919	Caerns	Montane
VU	<i>Dalytrichia saxicola</i>	RE	1927	Meirionydd	Damp rock
	<i>Diplophyllum taxifolium</i>	RE	1844	Caerns	Montane
	<i>Encalypta alpina</i>	RE	1931	Caerns	Montane
	<i>Encalypta rhaftocarpa</i>	RE	1880	Caerns	Montane
VU	<i>Fissidens serrulatus</i>	RE	1968	Meirionydd	Sea cave
NT	<i>Gymnomitriion coralliooides</i>	RE	1912	Caerns	Montane
	<i>Lophozia longidens</i>	RE	1966	Meirionydd	Atlantic woodland
	<i>Myurella julacea</i>	RE	1912	Caerns	Montane
VU	<i>Orthodontium gracile</i>	RE	1924	Denb/Flint	Woodland
RE	<i>Philonotis cernua</i>	EX	1939	Meirionydd	Montane
	<i>Philonotis seriata</i>	RE	1960s	Caerns	Montane
	<i>Pseudoleskeella catenulata</i>	RE	1960s	Caerns	Montane
	<i>Pterigynandrum filiforme</i>	RE	1928	Caerns	Montane
	<i>Pterygoneurum ovatum</i>	RE	1830	Denbs/ Anglesey	Limestone soil
	<i>Rhynchostegiella curviseta</i>	RE	1925	Mons	Abbey wall
	<i>Scapania nimboosa</i>	RE	1909	Caerns	Montane
	<i>Solenostoma confertissimum</i>	RE	1965	Carms	Limestone quarries
	<i>Sphagnum strictum</i>	RE	1960s	Merionydd	Blanket bog
	<i>Tetraplodon angustatus</i>	RE	1899	Caerns	Montane
	<i>Ulota coarctata</i>	RE	1914	Merionydd	Atlantic woodland

Table 3. The 26 taxa that have become extinct in Wales, along with the vice-county and year of the last record, and their Red Data List status in Great Britain and Wales. The four Extinct (EX) taxa have been lost from Britain; Regionally Extinct (RE) taxa remain extant elsewhere in Britain.

It is difficult to be sure precisely when the mosses and liverworts in Table 3 became extinct in Wales because many were based on single collections from sites that have only been visited by competent bryologists on a small number of occasions. Indeed it is possible that some of the montane species may persist on some remote rock outcrops in Snowdonia. Five taxa were only recorded in the 19th century, whilst 15 last records date from the golden age of Welsh bryology between 1900 and 1930 when the outstanding D.A. Jones was collecting in north Wales (Hill, 1988) and there were numerous visitors. The remaining six date from the 1960s, the start of another period when north Wales was the epicentre of British bryology. The site for *Fissidens serrulatus* was revisited in 2009 and no sign of the Fissidens was seen, whilst *Solenostoma confertissimum* has not been relocated during several recent visits. The remaining four taxa technically qualify as Extinct because the last record was made before 1970, but it is possible that none of them has been sought subsequently and it is perhaps premature to accept their loss.

7.3 Taxa “doing better” in Wales

Because identical IUCN threat criteria have been used to identify threatened taxa in both Great Britain and Wales, we can compare the two floras directly to see how various taxa are faring. Some are “doing better” in Wales (in other words they are less threatened in Wales than they are in Great Britain), whilst others are “doing worse” (they are more threatened in Wales than Great Britain).

As one would expect when comparing a smaller area with a larger one, there are only a few taxa that are “doing better” in Wales (Table 4).

TAXON	GB RED LIST	WALES RED LIST
<i>Bartramia stricta</i>	CR	EN
<i>Southbya tophacea</i>	VU	LC
<i>Tomentypnum nitens</i>	VU	NT
<i>Amblystegium radicale</i>	NT	LC
<i>Bryum kunzei</i>	NT	LC
<i>Entosthodon pulchellus</i>	NT	LC
<i>Fissidens monguillonii</i>	NT	LC
<i>Grimmia atrata</i>	NT	LC
<i>Myrinia pulvinata</i>	NT	LC
<i>Phaeoceros carolinianus</i>	NT	LC
<i>Rhytidadelphus subpinnatus</i>	NT	LC

Table 4.The 11 taxa that are “doing better” in Wales compared with Great Britain, arranged by decreasing GB threat category. Taxa are included if they are Threatened (CR, EN, VU) or Near Threatened (NT) in GB, but have a lower threat category or are Least Concern (LC) in Wales.

That only 11 of the 71 GB Red List bryophytes recorded in Wales are “doing better” here is a worry. 13 were assigned the same threat level, albeit not necessarily using the same criteria, 34 are “doing worse” (see 7.4), 8 are Regionally Extinct (see 7.2) and 5 are Data Deficient. Most of the species on the “doing better” list remain at a reasonable number of Welsh sites and have been discovered at new localities in recent years. This does not necessarily mean that they have not declined overall, nor that they are not potentially threatened, but there is no evidence of declines in *Rhytidadelphus subpinnatus*, *Entosthodon pulchellus*, *Southbya tophacea*, *Fissidens monguilloni* or *Phaeoceros carolinianus* and only questionable losses of colonies of *Myrinia pulvinata* in an area that has not been well surveyed. *Bartramia stricta* is stable at its only extant British site, whilst the dramatic decline in *Tomentypnum nitens* in southern Britain is slightly masked by the relatively small number of historic sites in Wales: it is declining here as well.

7.4 Taxa “doing worse” in Wales

The taxa that are more threatened in Wales than they are in Great Britain are listed in Table 5. Many taxa are more threatened in Wales than GB as a whole because of small Welsh ranges, despite caution over applying criteria B and D when declines are questionable. A significant number of species are considered Least Concern in Great Britain but are restricted to a very small number of Welsh sites and therefore qualify under criterion D. For example, *Dicranodontium asperulum* is at the southern edge of its British range at a single site in Snowdonia, *Scapania calcicola* has only been recorded south of Scotland at a single site in the Brecon Beacons, and the southern *Ricciocarpos natans* only crosses the border from England in a couple of places. Others have declined more rapidly in Wales than in Britain as a whole, with *Antitrichia curtipendula*, *Bazzania tricrenata* and perhaps *Calypogeia azurea* retreating northwards, *Leptodon smithii* retreating southwards, and *Dicranella cerviculata* almost lost from south Wales.

In some cases, taxa are “doing worse” in Wales because of different criteria. *Fossombronia fimbriata* is Near Threatened in Britain because of the paucity of recent records, whereas all Welsh records are modern so there is no evidence of a decline but the population is fewer than 50 individuals (CR criterion D).

Perhaps of most interest are the 20 species that are “doing worse” because the declines that were sufficient for Red List status in Great Britain are even more severe in Wales. The dune moss *Bryum callophyllum* has been lost from five of its six Welsh sites, *Cephalozia nicholsonii* has declined somewhat in southern Britain but is almost lost from Wales, and *Dicranum undulatum* has declined slightly on British bogs but is now restricted to a single Welsh site.

A Bryophyte Red Data List for Wales

Taxon	GB Red List	Wales Red List
<i>Micromitrium tenerum</i>	EN	CR
<i>Bryum calophyllum</i>	VU	CR
<i>Bryum knowltonii</i>	VU	CR
<i>Cephaloziella massalongi</i>	VU	CR
<i>Schistidium flaccidum</i>	VU	CR
<i>Seligeria brevifolia</i>	VU	CR
<i>Anomodon longifolius</i>	VU	EN
<i>Bryum marratii</i>	VU	EN
<i>Cephaloziella nicholsonii</i>	VU	EN
<i>Dicranum undulatum</i>	VU	EN
<i>Gymnocolea acutiloba</i>	VU	EN
<i>Riccia canaliculata</i>	VU	EN
<i>Scopelophila cataractae</i>	VU	EN
<i>Solenostoma caespiticium</i>	VU	EN
<i>Tortula wilsonii</i>	VU	EN
<i>Philonotis tomentella</i>	NT	CR
<i>Bryum muehlenbeckii</i>	NT	EN
<i>Weissia squarrosa</i>	NT	VU
<i>Weissia sterilis</i>	NT	VU
<i>Aloina rigida</i>	LC	CR
<i>Dicranodontium asperulum</i>	LC	CR
<i>Fossombronia fimbriata</i>	LC	CR
<i>Grimmia alpestris</i>	LC	CR
<i>Leiocolea fitzgeraldiae</i>	LC	CR
<i>Meesia uliginosa</i>	LC	CR
<i>Pohlia wahlenbergii</i> var. <i>glacialis</i>	LC	CR
<i>Scapania calcicola</i>	LC	CR
<i>Schistidium trichodon</i>	LC	CR-
<i>Abietinella abietina</i> var. <i>abietina</i>	LC	EN
<i>Amblyodon dealbatus</i>	LC	EN
<i>Anthelia juratzkana</i>	LC	EN
<i>Antitrichia curtipendula</i>	LC	EN
<i>Bryum mildeanum</i>	LC	EN
<i>Bryum weigelii</i>	LC	EN
<i>Buxbaumia aphylla</i>	LC	EN
<i>Campylostelium saxicola</i>	LC	EN
<i>Cephalozia leucantha</i>	LC	EN
<i>Cephalozia macrostachya</i> var. <i>macrostachya</i>	LC	EN
<i>Cephaloziella spinigera</i>	LC	EN
<i>Cladopodiella francisci</i>	LC	EN
<i>Cynodontium polycarpon</i>	LC	EN
<i>Dicranella crispa</i>	LC	EN
<i>Dicranoweisia crispula</i>	LC	EN
<i>Drepanocladus sendtneri</i>	LC	EN
<i>Frullania microphylla</i> var. <i>deciduifolia</i>	LC	EN
<i>Glyphomitrium daviesii</i>	LC	EN
<i>Grimmia montana</i>	LC	EN
<i>Hypnum imponens</i>	LC	EN
<i>Kiaeria falcata</i>	LC	EN

Taxon	GB Red List	Wales Red List
<i>Bryum warneum</i>	NT	EN
<i>Hygrohypnum duriusculum</i>	NT	EN
<i>Pseudocalliergon lycopodioides</i>	NT	EN
<i>Scapania gymnostomophila</i>	NT	EN
<i>Barbilophozia kunzeana</i>	NT	VU
<i>Bryum dyffrynense</i>	NT	VU
<i>Cephaloziella calyculata</i>	NT	VU
<i>Dendrocyphaea lamyana</i>	NT	VU
<i>Fossombronia maritima</i>	NT	VU
<i>Grimmia tergestina</i>	NT	VU
<i>Habrodon perpusillus</i>	NT	VU
<i>Orthotrichum obtusifolium</i>	NT	VU
<i>Seligeria campylopoda</i>	NT	VU
<i>Sematophyllum substrumulosum</i>	NT	VU
<i>Syntrichia princeps</i>	NT	VU
<i>Riccia crozalsii</i>	LC	EN
<i>Ricciocarpus natans</i>	LC	EN
<i>Scapania ornithopodoides</i>	LC	EN
<i>Scapania paludosa</i>	LC	EN
<i>Scapania uliginosa</i>	LC	EN
<i>Sphagnum fuscum</i>	LC	EN
<i>Splachnum ampullaceum</i>	LC	EN
<i>Tortula canescens</i>	LC	EN
<i>Uloa calvescens</i>	LC	EN
<i>Uloa hutchinsiae</i>	LC	EN
<i>Atrichum tenellum</i>	LC	VU
<i>Barbilophozia hatcheri</i>	LC	VU-
<i>Bryum elegans</i>	LC	VU
<i>Calypogeia azurea</i>	LC	VU-
<i>Catoscopium nigritum</i>	LC	VU
<i>Cephalozia loitlesbergeri</i>	LC	VU
<i>Cephalozia macrostachya</i> var. <i>spiniflora</i>	LC	VU
<i>Cephaloziella elachista</i>	LC	VU
<i>Dicranum flagellare</i>	LC	VU
<i>Didymodon tomaculosus</i>	LC	VU
<i>Ditrichum pusillum</i>	LC	VU
<i>Entodon concinnus</i>	LC	VU-
<i>Ephemerum recurvifolium</i>	LC	VU
<i>Fissidens polypHYLLUS</i>	LC	VU
<i>Grimmia funalis</i>	LC	VU-
<i>Grimmia longirostris</i>	LC	VU
<i>Hageniella micans</i>	LC	VU
<i>Hedwigia ciliata</i> var. <i>ciliata</i>	LC	VU
<i>Herzogiella seligeri</i>	LC	VU
<i>Hygroamblystegium humile</i>	LC	VU
<i>Hypnum callichroum</i>	LC	VU-
<i>Hypnum hamulosum</i>	LC	VU-
<i>Isopterygiopsis muelleriana</i>	LC	VU-
<i>Jungermannia borealis</i>	LC	VU
<i>Leptoscyphus cuneifolius</i>	LC	VU

Taxon	GB Red List	Wales Red List
<i>Lophozia obtusa</i>	LC	EN
<i>Marsupella stableri</i>	LC	EN
<i>Mnium thomsonii</i>	LC	EN
<i>Molendoa warburgii</i>	LC	EN
<i>Paraleptodontium recurvifolium</i>	LC	EN
<i>Philonotis rigida</i>	LC	EN
<i>Plagiothecium platyphyllum</i>	LC	EN
<i>Pohlia elongata</i> var. <i>greenii</i>	LC	EN
<i>Pohlia filum</i>	LC	EN
<i>Pohlia ludwigii</i>	LC	EN
<i>Radula voluta</i>	LC	EN
<i>Rhytidium rugosum</i>	LC	EN
<i>Schistidium pruinosa</i>	LC	VU
<i>Solenostoma subellipticum</i>	LC	VU-
<i>Sphagnum austini</i>	LC	VU
<i>Sphagnum pulchrum</i>	LC	VU
<i>Sphagnum riparium</i>	LC	VU
<i>Thuidium recognitum</i>	LC	VU-
<i>Tortella densa</i>	LC	VU
<i>Bazzania tricrenata</i>	LC	NT
<i>Dicranella cerviculata</i>	LC	NT

Taxon	GB Red List	Wales Red List
<i>Leucodon sciuroides</i>		
var. <i>morensis</i>	LC	VU
<i>Marsupella adusta</i>	LC	VU-
<i>Marsupella alpina</i>	LC	VU-
<i>Marsupella sphacelata</i>	LC	VU-
<i>Microbryum floerkeanum</i>	LC	VU
<i>Orthothecium rufescens</i>	LC	VU-
<i>Physcomitrium sphaericum</i>	LC	VU
<i>Plagiochila heterophylla</i>	LC	VU
<i>Pottiopsis caespitosa</i>	LC	VU
<i>Racomitrium macounii</i>	LC	VU-
<i>Radula aquilegia</i>	LC	VU-
<i>Schistidium agassizii</i>	LC	VU
<i>Entosthodon muhlenbergii</i>	LC	NT
<i>Grimmia decipiens</i>	LC	NT
<i>Grimmia laevigata</i>	LC	NT
<i>Leptodon smithii</i>	LC	NT
<i>Oedipodium griffithianum</i>	LC	NT
<i>Pallavicinia lyellii</i>	LC	NT
<i>Targionia hypophylla</i>	LC	NT
<i>Tortella inclinata</i>	LC	NT

Table 5. The 140 taxa that are “doing worse” in Wales than they are in Great Britain, arranged by decreasing GB threat category. Taxa are included if they are Threatened (EN & VU) or Near Threatened (NT) in GB but have a higher threat category in Wales, or if they are Least Concern (LC) in GB but Threatened or Near Threatened in Wales. Taxa that are threatened in GB but extinct in Wales are excluded (see section 7.2).

7.5 Taxa reaching the edge of their range in Wales

Nearly 30 taxa reach the northern edge of their British range in Wales (Table 6) and nearly 150 are at their southern edge (Table 7). The former is comparable to the equivalent count for vascular plants, but the latter is a far larger total. It is becoming increasingly important to identify such species in order to select priorities for conservation and for monitoring the impacts of climate change. Small, edge-of-range populations of species that might be vulnerable to change are particularly important as they are often genetically distinct.

16 montane taxa that were at their southern edge in Wales are believed to be extinct. Several were last seen in the 19th century, but there remains a faint chance that populations may exist undiscovered in Snowdonia. They are listed separately at the end of Table 7.

Taxon	Wales Red List	Taxon	Wales Red List
<i>Bryum gemmiparum</i>	EN	<i>Micromitrium tenerum</i>	CR
<i>Bryum kunzei</i>		<i>Pottiopsis caespitosa</i>	VU
<i>Cephaloziella calyculata</i>	VU	<i>Riccia crozalsii</i>	EN
<i>Cephaloziella massalongi</i>	CR	<i>Riccia nigrella</i>	EN
<i>Cephaloziella nicholsonii</i>	EN	<i>Scorpiurium circinatum</i>	
<i>Dendrocyphaea lamyana</i>	VU	<i>Seligeria campylopoda</i>	VU
<i>Dalytrichia saxicola</i>	RE	<i>Sematophyllum substrumulosum</i>	VU
<i>Ditrichum subulatum</i>	VU	<i>Southbya tophacea</i>	
<i>Fissidens curvatus</i>	EN	<i>Tortula cuneifolia</i>	EN
<i>Fissidens monguilloni</i>		<i>Tortula wilsonii</i>	EN
<i>Fissidens serrulatus</i>	RE	<i>Weissia levieri</i>	EN
<i>Fossombronia caespitiformis</i>	WL	<i>Weissia multicapsularis</i>	CR
<i>Fossombronia maritima</i>	VU	<i>Weissia sterilis</i>	VU
<i>Leptodon smithii</i>	NT		
<i>Microbryum davallianum</i> var. <i>commutatum</i>	DD		

Table 6. Taxa that reach the northern edge of their GB distribution in Wales.

Taxon	Wales Red List	Taxon	Wales Red List
<i>Amphidium lapponicum</i>		<i>Grimmia torquata</i>	
<i>Anastrophyllum hellerianum</i>		<i>Gymncolea acutiloba</i> !	EN
<i>Andreaea alpina</i>		<i>Hageniella micans</i>	VU
<i>Andreaea megistospora</i>		<i>Hedwigia ciliata</i>	
<i>Andreaea mutabilis</i>		var. <i>leucophaea</i>	DD
<i>Andreaea rupestris</i>		<i>Hedwigia integrifolia</i>	
var. <i>papillosa</i>	WL	<i>Herbertus aduncus</i>	
<i>Anomobryum concinnatum</i>		<i>Herbertus stramineus</i>	
<i>Anomodon longifolius</i>	EN	<i>Hygrobiella laxifolia</i>	
<i>Anthelia julacea</i>		<i>Hygrohypnum duriusculum</i>	EN
<i>Anthelia juratzkana</i> !	EN	<i>Hygrohypnum eugyrium</i>	
<i>Aphanolejeunea microscopica</i>		<i>Hylocomiastrum umbratum</i>	
<i>Arctoa fulvella</i>		<i>Hypnum callichroum</i>	VU-
<i>Barbilophozia atlantica</i>		<i>Hypnum hamulosum</i>	VU-
<i>Barbilophozia hatcheri</i>	VU-	<i>Isopterygiopsis muelleriana</i>	VU-
<i>Barbilophozia kunzeana</i>	VU	<i>Isothecium myosuroides</i>	
<i>Bartramia halleriana</i>		var. <i>brachythecioides</i>	
<i>Bazzania tricrenata</i>	NT	<i>Jungermannia borealis</i>	EN
<i>Bryum calophyllum</i>	CR	<i>Jungermannia exsertifolia</i>	
<i>Bryum elegans</i>	VU	<i>Kiaeria blyttii</i>	
<i>Bryum marratii</i>	EN	<i>Kiaeria falcata</i>	EN
<i>Bryum mildeanum</i>	EN	<i>Leiocolea collaris</i>	
<i>Bryum muehlenbeckii</i> !	EN	<i>Leiocolea fitzgeraldiae</i> !	CR
<i>Bryum riparium</i>		<i>Leiocolea heterocolpos</i>	
<i>Calypogeia azurea</i>	VU-	<i>Lepidozia pearsonii</i>	
<i>Campylopus gracilis</i>		<i>Leptoscyphus cuneifolius</i> !	VU
<i>Campylopus setifolius</i>		<i>Lophozia obtusa</i>	EN
<i>Catoscopium nigritum</i>	VU	<i>Marsupella adusta</i>	VU-
<i>Cephalozia loitlesbergeri</i>	VU	<i>Marsupella alpina</i>	VU-
<i>Cololejeunea calcarea</i>		<i>Marsupella emarginata</i>	
<i>Cynodontium jenneri</i>		var. <i>pearsonii</i>	WL
<i>Cynodontium polycarpon</i>	EN	<i>Marsupella stableri</i>	EN
<i>Dicranodontium asperulum</i>	CR	<i>Meesia uliginosa</i>	CR

Taxon	Wales Red List
<i>Dicranoweisia crispula</i>	EN
<i>Dicranum leioneuron</i>	
<i>Dicranum undulatum</i>	EN
<i>Ditrichum zonatum</i>	
<i>Encalypta ciliata</i>	
<i>Eremnotus myriocarpus</i>	
<i>Fissidens rufulus</i>	
<i>Fossombronia fimbriata</i>	CR
<i>Frullania microphylla</i>	
var. <i>deciduifolia</i>	EN
<i>Glyphomitrium daviesii</i>	EN
<i>Grimmia alpestris</i> !	CR
<i>Grimmia arenaria</i>	VU-
<i>Grimmia atrata</i>	
<i>Grimmia elongata</i>	VU-
<i>Grimmia funalis</i>	VU-
<i>Grimmia incurva</i>	
<i>Pohlia ludwigii</i>	EN
<i>Pohlia proligera</i>	DD
<i>Pohlia wahlenbergii</i>	
var. <i>glacialis</i>	CR
<i>Pseudobryum cinclidiooides</i>	
<i>Racomitrium ellipticum</i>	
<i>Racomitrium macounii</i>	VU-
<i>Radula aquilegia</i>	VU-
<i>Radula voluta</i>	EN
<i>Rhabdoweisia crenulata</i>	
<i>Rhytidadelphus subpinnatus</i>	
<i>Scapania aequiloba</i>	
<i>Scapania calcicola</i> !	CR
<i>Scapania cuspiduligera</i>	
<i>Scapania gymnostomophila</i> !	EN
<i>Scapania lingulata</i>	
<i>Scapania ornithopodioides</i>	EN
<i>Scapania paludosa</i>	EN
<i>Schistidium agassizii</i>	VU
<i>Schistidium confertum</i>	WL
<i>Schistidium flaccidum</i> !	CR
<i>Schistidium frigidum</i>	
var. <i>frigidum</i>	DD
<i>Schistidium frigidum</i>	
var. <i>havaasii</i> !	DD
<i>Schistidium helveticum</i> !	DD
<i>Schistidium papillosum</i> !	DD
<i>Schistidium pruinosum</i>	VU
<i>Schistidium robustum</i>	WL
<i>Schistidium trichodon</i>	CR-

Taxon	Wales Red List
<i>Metzgeria leptoneura</i>	
<i>Metzgeria pubescens</i>	
<i>Mnium thomsonii</i>	EN
<i>Molendoa warburgii</i>	EN
<i>Oedipodium griffithianum</i>	NT
<i>Orthothecium rufescens</i>	VU-
<i>Paraleptodontium recurvifolium</i>	EN
<i>Philonotis tomentella</i>	CR
<i>Physcomitrium sphaericum</i>	VU
<i>Plagiobryum zieri</i>	
<i>Plagiochila exigua</i>	
<i>Plagiochila heterophylla</i>	VU
<i>Plagiopus oederianus</i>	
<i>Plagiothecium platyphyllum</i>	EN
<i>Pohlia elongata</i>	
var. <i>greenii</i>	EN
<i>Seligeria brevifolia</i>	
<i>Solenostoma obovatum</i>	
<i>Sphagnum affine</i>	
<i>Sphagnum balticum</i>	EN
<i>Sphagnum platyphyllum</i>	
<i>Sphagnum skyense</i> !	DD
<i>Sphagnum warnstorffii</i>	
<i>Sphenolobopsis pearsonii</i>	
<i>Tomentypnum nitens</i>	NT
<i>Tortella bambergeri</i>	
<i>Tritomaria exsecta</i>	
<i>Ulota drummondii</i>	
<i>Andreaea alpestris</i> !	EX
<i>Conostomum tetragonum</i>	RE
<i>Diplophyllum taxifolium</i> !	RE
<i>Encalypta alpina</i>	RE
<i>Encalypta rhaptocarpa</i>	RE
<i>Gymnomitrion coralliooides</i> !	RE
<i>Lophozia longidens</i>	RE
<i>Myurella julacea</i>	RE
<i>Philonotis cernua</i> !	RE
<i>Philonotis seriata</i> !	RE
<i>Pseudoleskeella catenulata</i>	RE
<i>Pterigynandrum filiforme</i>	RE
<i>Scapania nimbosa</i> !	RE
<i>Solenostoma confertissimum</i>	RE
<i>Sphagnum strictum</i> !	RE
<i>Tetraplodon angustatus</i> !	RE

Table 7. Taxa that reach the southern edge of their GB distribution in Wales. Taxa which are/were disjunct from Scotland are marked '!' next to the species name, whilst taxa believed to be extinct in Wales are listed at the end of the table. A hyphen '-' next to the threat category indicates taxa downgraded by one threat category because they are potentially under-recorded in north Wales (see section 5.4 above).

7.6 Species for which Wales has a particular responsibility

Consideration is given here to those taxa for which Wales has a particular responsibility for conservation. In the GB Red Data List (Hodgetts, unpublished), taxa for which Great Britain has an international responsibility are indicated by showing those for which we probably or definitely have more than 25% of the European population.

For this study a very crude assessment of responsibility has been made using the number of hectads occupied by each taxon in Great Britain. This total was compared with the number of extant (post-1970) Welsh hectads. Any taxon for which Wales has 25% or more of the GB population is indicated in the Red Data List. In order to highlight conservation priorities, all of these taxa that are also threatened in Wales are listed in Table 8. In addition, the list includes 10 taxa that are of Least Concern in Wales but for which Wales holds 50% or more of the GB population. Several of these are considered Threatened or Near Threatened in GB as a whole.

Taxon	Wales Red Data List	Proportion (%) of GB population
<i>Bartramia stricta</i>	EN	100
<i>Ephemerum crassinervium</i> subsp. <i>rutheanum</i>	VU	100
<i>Frullania microphylla</i> var. <i>deciduifolia</i>	EN	100
<i>Seligeria oelandica</i>	VU	100
<i>Sematophyllum demissum</i>	VU	100
<i>Gymnocolea acutiloba</i>	EN	75
<i>Seligeria campylopoda</i>	VU	71
<i>Grimmia arenaria</i>	VU	45
<i>Grimmia elongata</i>	VU	45
<i>Riccia nigrella</i>	EN	40
<i>Weissia levieri</i>	EN	40
<i>Dendrocryphaea lamyana</i>	VU	36
<i>Philonotis rigida</i>	EN	35
<i>Anomodon longifolius</i>	EN	33
<i>Bryum gemmiparum</i>	EN	33
<i>Ditrichum subulatum</i>	VU	33
<i>Grimmia alpestris</i>	CR	33
<i>Grimmia laevigata</i>	NT	33
<i>Fissidens curvatus</i>	EN	31
<i>Scopelophila cataractae</i>	EN	29
<i>Tortella inclinata</i>	NT	29
<i>Targionia hypophylla</i>	NT	26
<i>Cephaloziella calyculata</i>	VU	25
<i>Habrodon perpusillus</i>	VU	25
<i>Hedwigia ciliata</i> var. <i>ciliata</i>	VU	25
<i>Micromitrium tenerum</i>	CR	25
<i>Seligeria brevifolia</i>	CR	25
<i>Sematophyllum substrumulosum</i>	VU	25
<i>Scapania paludicola</i>		89
<i>Southbya tophacea</i>		75
<i>Rhytidiodelphus subpinnatus</i>		73
<i>Amblystegium radicale</i>		64
<i>Entosthodon pulchellus</i>		60
<i>Porella pinnata</i>		59
<i>Ditrichum plumbicola</i>		56
<i>Petalophyllum ralfsii</i>		55
<i>Coscinodon cribrosus</i>		52
<i>Fissidens monguillonii</i>		50

Table 8. Threatened Welsh taxa for which Wales has 25% or more of the total GB hectads, in order of decreasing proportion, and taxa that are not considered threatened in Wales but which have 50% or more of the total GB hectads in Wales.

8.

Bryophyte Red Data List **for Wales**

GB Red List 2005		GB Red List 2011		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments			
Taxon	M/LH	Critera		Native	A, B	Native	>50%	10	3	5																	
<i>M Abietinella abietina</i> var. <i>abietina</i>	EN																										
<i>M Acaulon muticum</i>				Native																							
L <i>Adelanthus decipiens</i>				Native																							
M <i>Aloina aloides</i>				Native																							
M <i>Aloina ambigua</i>				Native																							
M <i>Aloina rigida</i>				Native	CR	A, B, C	Native																				
M <i>Amblyodon dealbatus</i>				Native	EN	B	Native																				
M <i>Amblystegium confervoides</i>				Native																							
DD NT M <i>Amblystegium radicale</i>				Native	Rare																						
M <i>Amblystegium serpens</i> var. <i>salinum</i>				Native																							
M <i>Amblystegium serpens</i> var. <i>serpens</i>				Native																							
M <i>Amphidium lapponicum</i>				Native																							
M <i>Amphidium mougeotii</i>				Native																							
L <i>Anastrepha orcadensis</i>				Native																							
L <i>Anastrophylillum hellerianum</i>				Native																							
L <i>Anastrophylillum minutum</i>				Native																							
DD DD M <i>Andreaea alpina</i>				Native	EX																						
M <i>Andreaea alpina</i>				Native																							
M <i>Andreaea megistospora</i>				Native	Rare																						
M <i>Andreaea mutabilis</i>				Native																							
M <i>Andreaea rothii</i> subsp. <i>falcata</i>				Native																							
M <i>Andreaea rothii</i> subsp. <i>rothii</i>				WL																							
M <i>Andreaea rupestris</i> var. <i>papillosa</i>				WL																							
M <i>Andreaea rupestris</i> var. <i>rupestris</i>				Native																							
M <i>Andreaea mirabilis</i>				Native																							
L <i>Andreaea pinguis</i>				Native																							
M <i>Anomobryum concinnatum</i>				Native																							
M <i>Anomobryum julaceum</i>				Native																							
EN VU M <i>Anomodon longifolius</i>	EN	B	Native	S42					2	2	33	5															
M <i>Anomodon viticulosus</i>				Native																							
L <i>Anthelia julacea</i>				Native																							
L <i>Anthelia juratzkana</i>				EN	B	Native																					
H <i>Anthoceros agrestis</i>				Arch?																							
H <i>Anthoceros punctatus</i>				Native																							
M <i>Antitrichia curtipendula</i>				Native																							
L <i>Aphanolejeunea microscopica</i>				Native																							
M <i>Aphanorhynchia patens</i>				Native																							
M <i>Archidium tenuifolium</i>				Native																							
M <i>Arctia fulvella</i>				Native	S42				6	6	11	5															
CR CR M <i>Atrichum angustatum</i>				Native	NA				2	0	0	W															
M <i>Atrichum crispum</i>				Native	VU	D2	Native																				
M <i>Atrichum tenellum</i>																											

Taxon		GB Red List 2005		GB Red List 2011		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
M	<i>Atrichum undulatum</i> var. <i>undulatum</i>	Native																							
M	<i>Aulacomnium androgynum</i>	Native																							
M	<i>Aulacomnium palustre</i>	Native																							
L	<i>Barbilophozia atlantica</i>	Native																							
L	<i>Barbilophozia attenuata</i>	Native																							
L	<i>Barbilophozia barbata</i>	Native																							
L	<i>Barbilophozia flokei</i>	Native																							
VU	<i>Barbilophozia hatcheri</i>	VU	A- B-	Native	S42			>50%	6	3	2	S													
VU	<i>Barbilophozia kunzeana</i>	VU	D2	Native					3	3	18	S													
M	<i>Barbula convoluta</i>	Native																							
M	<i>Barbula unguiculata</i>	Native																							
M	<i>Bartramia halleriana</i>	Native																							
M	<i>Bartramia ityphylla</i>	Native																							
M	<i>Bartramia pomiformis</i>	Native																							
CR	<i>Bartramia stricta</i>	EN	A, B	Native	S42			>50%	2	1	100														
L	<i>Bazzania tricrenata</i>	NT	B	Native					20	16	5	S													
L	<i>Bazzania trilobata</i>	Native																							
L	<i>Blasia pusilla</i>	Native																							
L	<i>Blepharostoma trichophyllum</i>	Native																							
M	<i>Blindia acuta</i>	Native																							
N	<i>Brachydontium trichodes</i>	Native																							
M	<i>Brachythecium acutum</i>	Native																							
M	<i>Brachythecium albicans</i>	Native																							
M	<i>Brachythecium glaucosum</i>	Native																							
M	<i>Brachythecium mildeanum</i>	Native																							
N	<i>Brachythecium rivulare</i>	Native																							
M	<i>Brachythecium rutabulum</i>	Native																							
M	<i>Brachythecium salebrosum</i>	WL																							
M	<i>Breutelia chrysocoma</i>	Native																							
M	<i>Bryoerythrophyllum ferruginoscens</i>	Native																							
M	<i>Bryum bonniense</i>	Native																							
M	<i>Bryum caespiticium</i>	Native																							
EN	<i>Bryum caespiticium</i>	CR	A, B	Native	S42	Rare	>50%	6	1	7	S														
VU	<i>Bryum calophyllum</i>																								
M	<i>Bryum canariense</i>	Native																							
M	<i>Bryum capillare</i>	Native																							
M	<i>Bryum creberinum</i>	DD	Native																						
M	<i>Bryum dichotomum</i>	Native																							
M	<i>Bryum donianum</i>	Native																							
NT	<i>Bryum duffynense</i>	VU	D2	Native					14	9	30														
M	<i>Bryum elegans</i>	VU	D2	Native																					
M	<i>Bryum gemmiferum</i>	Native																							

Taxon		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments				
MLH		EN	M	<i>Bryum gemmiparum</i>	EN	A, B	Native	S42	>50%	4	2	33	N	Northern wold edge in Brecknock, where extant at two sites (River Usk at Sennybridge & Fenni-fach; TBDB), lost from 3 others & from Monmouthshire										
DD	DD	<i>Bryum intermedium</i>	CR	A, B	Native				>50%	8	1	1		Lost from dune systems in 6 vice-counties; recently recorded only in Flintshire (Ddol Hill, 1988) and not looked for there subsequently										
M	M	<i>Bryum Klinggaeffii</i>	CR	A, B	Native	S42	>50%	5	1	5				Lost from 4 sites and now extant as a single small patch at Morfa Dyffryn SSSI (Holyoak, 2001b)										
VU	VU	<i>Bryum kunzei</i>	NT	M	<i>Bryum kunzei</i>	Native	S42	RT	>50%	9	9	44	N	Northern edge in Anglesey/Caernarfon										
NT	NT	<i>Bryum marinarii</i>	EN	VU	<i>Bryum marinarii</i>	EN	A, B	Native	>50%	4	2	13	S	Southern edge in Cardiganshire, lost from 3 sites and now extant over 26x3m in Ynyslas carpark and in a 30m strip near Minford (Holyoak, 2001b)										
M	M	<i>Bryum mildaeum</i>	EN	A, B	Native				>50%	8	2	12	S	Southern edge in Brecknock, lost from Caernarfon since 1892, only seen twice in south Wales since 1965 (Moel Penderyn 2007 & Foul Fawr 2009; SDSB pers. obs.)										
M	M	<i>Bryum motavicum</i>	EN	A	Native																			
DD	NT	<i>Bryum muehlenbeckii</i>	EN	B	Native					1	1	8	S	Yes		Southern edge in Caernarfon (Rhaedr Ogwen 1988 & Carnedd Llewelyn 1988; TBDB), otherwise no further south than Perthshire								
M	M	<i>Bryum pallens</i>	M	Bryum pallens	Native					12	8	8		Under-recorded because of identification difficulties										
M	M	<i>Bryum pseudotriquetrum</i> var. <i>bifidum</i>	M	<i>Bryum pseudotriquetrum</i> var. <i>pseudotriquetrum</i>	Native																			
M	M	<i>Bryum radiculosum</i>	M	<i>Bryum radiculosum</i>	Native																			
M	M	<i>Bryum riparium</i>	M	<i>Bryum riparium</i>	Native					11	9	16	S	Southern edge in Glamorgan (Cwm Dimbath; Perry, 1994)										
M	M	<i>Bryum rubens</i>	M	<i>Bryum rubens</i>	Native																			
M	M	<i>Bryum rufulale</i>	M	<i>Bryum rufulale</i>	Native																			
M	M	<i>Bryum sauteri</i>	M	<i>Bryum sauteri</i>	Native																			
M	M	<i>Bryum subapiculatum</i>	M	<i>Bryum subapiculatum</i>	Native																			
M	M	<i>Bryum tenuisetum</i>	M	<i>Bryum tenuisetum</i>	Native					DD		16	15	23	Scattered in north Wales (Hill, 1988) and south to Radnorshire; easily overlooked									
N	N	<i>Bryum torquescens</i>	N	<i>Bryum torquescens</i>	Native							9	6	15	Rare on carboniferous limestone near the coasts of north and south Wales									
RE	RE	<i>Bryum turbinatum</i>	CR	RE	<i>Bryum turbinatum</i>	EX						>50%	5	0	0	Lost from Brecknock, Monmouthshire & Merionydd; now extinct in GB								
CR	RE	<i>Bryum utiginosum</i>	M	<i>Bryum utiginosum</i>	EX							RT	>50%	2	0	0	Lost from Merionydd (Morfa Dyffryn to 1904; Holyoak, 2001b), almost extinct in GB							
M	M	<i>Bryum violaceum</i>	M	<i>Bryum violaceum</i>	Native							Arch?												
VU	NT	<i>Bryum waneum</i>	EN	A, B	Native	S42	Rare	>50%	8	3	15			Extant at 2 SSSI in Merionydd (Morfa Dyffryn & Morfa Harlech) and 1 in Anglesey (Tywyn Aberffraw), lost from 7 other sites (Holyoak, 2001b)										
N	N	<i>Bryum weigelii</i>	M	<i>Buxbaumia aphyllea</i>	EN	B	Native			2	2	3		One outlier in Shropshire, otherwise southern edge in Caernarfon (six sites in Caernarfon (upper Duffi 1896) and Montgomeryshire (Breidden Hill 1960s), and could not be refound in Radnorshire in 2007 having been seen in 1999 (Burfa Bank, Lawley, 2007))										
M	M	<i>Calliergon cordifolium</i>	M	<i>Calliergon cordifolium</i>	Native																			
M	M	<i>Calliergon giganteum</i>	M	<i>Calliergon giganteum</i>	Native																			
M	M	<i>Calliergonella cuspidata</i>	M	<i>Calliergonella lindbergii</i>	Native																			
M	M	<i>Calypogeia angulta</i>	L	<i>Calypogeia angulta</i>	Native																			
L	L	<i>Calypogeia azurea</i>	VU-	B-	Native																			
L	L	<i>Calypogeia fissa</i>	L	<i>Calypogeia fissa</i>	Native																			
L	L	<i>Calypogeia muellerae</i>	L	<i>Calypogeia muellerae</i>	Native																			
L	L	<i>Calypogeia neesiana</i>	L	<i>Calypogeia neesiana</i>	Native																			
L	L	<i>Calypogeia sphagnicola</i>	L	<i>Calypogeia sphagnicola</i>	Native																			
M	M	<i>Campylidium chrysophyllum</i>	M	<i>Campylidium chrysophyllum</i>	Native																			
M	M	<i>Campilodes elodes</i>	M	<i>Campilodes elodes</i>	Native																			
M	M	<i>Campilium proteinum</i>	M	<i>Campilium proteinum</i>	Native																			
M	M	<i>Campilium stellatum</i>	M	<i>Campilium stellatum</i>	Native																			
M	M	<i>Campilophyllum calcareum</i>	M	<i>Campilophyllum calcareum</i>	Native																			
M	M	<i>Campilopus atrocivens</i> var. <i>atrocivens</i>	M	<i>Campilopus atrocivens</i> var. <i>atrocivens</i>	Native																			
M	M	<i>Campilopus brevipilus</i>	M	<i>Campilopus brevipilus</i>	Native																			
M	M	<i>Campilopus flexuosus</i>	M	<i>Campilopus flexuosus</i>	Native																			

Taxon		Native/alien status		Wales Red List		Europe Red List		Section 42 Wales		Prop (%) of GB population		Wales extinct (post-1970)		Edge of GB range?		Disjunct from Scotland?		Comments	
M	<i>Campylopus fragilis</i>	Native	Native	11	9	5	Southern edge in Cardiganshire (Maesnant, Pumllymon; Hill, 1988), rare in north Wales (Hill, 1988)												
M	<i>Campylopus gracilis</i>	NA	Neo	10	10	37	Present in six places in Pembrokeshire (Bosanquet, 2010) and several on the Barmouth-Porthmadog coast (Hill, 1988), but intermediates to <i>C. introflexus</i> are confusing												
M	<i>Campylopus introflexus</i>	Native	Native																
M	<i>Campylopus pilifer</i>																		
M	<i>Campylopus pyriformis</i>	Native	Native	14	12	17	S	Southern edge in Meirionydd, occasional in north Wales (Hill, 1988)											
M	<i>Campylopus setifolius</i>	Native	Rare	27	15	19	A widespread weed of damp gravelly ground, probably overlooked												
M	<i>Campylopus subulatus</i>	EN	A, B	Native	>50%	8	3	9	Lost from Meirionydd (2 sites to 1911) and sites in Caernarfon (Hill, 1988) and Brecknock (Woods, 2006) probably extant in Brecknock (Ffalgont & Gwryne Fawr), Cardiganshire (Pontewydd) & Caernarfon (Moel Hebog & Eryri)										
M	<i>Campylostelium saxicola</i>	VU	D2	Native	2	2	6	S	Southern edge on Anglesey (Tywyn Aberffraw & Newborough Warren; Hill, 1988)										
M	<i>Catascopium nigritum</i>																		
L	<i>Cephaloziella bicuspidata</i>	Native	Native																
L	<i>Cephaloziella catenulata</i>	Native	Native																
L	<i>Cephaloziella connivens</i>	EN	A, B	Native	>50%	4	1	1	A few Cornish colonies, otherwise southern edge in Meirionydd (Arthog Bog)										
L	<i>Cephaloziella leucantha</i>	VU	D2	Native	4	4	8	S	Southern edge in Cardiganshire (Cors Caron)										
L	<i>Cephaloziella loitlesbergeri</i>																		
L	<i>Cephaloziella lunulifolia</i>	Native	Native																
L	<i>Cephaloziella macrostachya</i> var. <i>macrostachya</i>	EN	A, B	Native	>50%	7	3	8	Lost from Pembrokeshire (3 sites), still thriving on Cors Fochno (S.D.S. Bosanquet pers. obs., 2009), apparent decline may be because some records not assigned to variety										
L	<i>Cephaloziella macrostachya</i> var. <i>spiniflora</i>	VU	D2	Native	2	2	14	Only Welsh records are from Cardiganshire (Cors Caron 1990) and Anglesey (Heath nr Brynrefail 1994)											
VU	<i>Cephaloziella pinniceps</i>								Found to be frequent in south Wales suggesting it is overlooked elsewhere (Bosanquet & Motley, 2005), unlikely to be threatened										
VU	<i>Cephaloziella calcicula</i>	VU	D2	Native	S42	Rare	21	19	28	Northern world edge in Pembrokeshire (2 sites), also in Glamorgan (2 sites) (Bosanquet, 2008b)									
L	<i>Cephaloziella divaricata</i>	VU	D2	Native	3	3	25	N											
L	<i>Cephaloziella elachista</i>																		
L	<i>Cephaloziella hampeana</i>	Native	DD																
NT	<i>Cephaloziella massalongi</i>	CR	A, B	Arch?	Rare	>50%	9	1	7	N	Northern edge on Anglesey (last seen 1959), still extant at Figa Mine (Des Callaghan pers. obs., 2011) otherwise last seen near Llanfrothen in (IBDB)								
VU	<i>Cephaloziella nicholsonii</i>	EN	A, B	Arch?	S42	Rare	>50%	2	1	6	N	Lost from Meirionydd (Bontddu) since 1923 (Hill, 1988), now northern world edge in Cardiganshire (Cwmystwyth 1998)							
L	<i>Cephaloziella rubella</i>																		
L	<i>Cephaloziella spinigera</i>	EN	A, B	Native	>50%	2	1	4	Lost from Anglesey (Llandonna Common), perhaps extant at single site in Cardiganshire (Cors Caron 1970; Hale, 1998)										
NT	<i>Cephaloziella stellulifera</i>																		
NT	<i>Cephaloziella turneri</i>	NT	B	Native			31	22	24	Relatively frequent on the Welsh coast and probably somewhat under-recorded									
M	<i>Ceratodon purpureus</i>																		
L	<i>Chiloscyphus pallescens</i>	Native	Native																
M	<i>Cinclidotus fontinaloides</i>	RE	Native																
M	<i>Cinclidotus stygium</i>	Native	Native																
M	<i>Cladopodiella francisci</i>	EN	A, B	Native	>50%	7	3	4	Lost from Monmouthshire, Meirionydd & 1 site in Pembrokeshire, extant at single sites in Glamorgan, Pembrokeshire & Anglesey										
M	<i>Climacium dendroides</i>	Native	Native																
L	<i>Cololejeunea calcarea</i>																		
L	<i>Cololejeunea minutissima</i>	Native	Native																
L	<i>Cololejeunea rosettiana</i>	Native	RT																
L	<i>Colura calyptrifolia</i>																		
L	<i>Conocephalum conicum</i>	Native																	

Taxon		Criteria		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
L	<i>Conocephalum salebrosum</i>	Native		34	34	61		Recently recognised and under-recorded in Britain - not threatened															
M	<i>Conostomum tetragonum</i>	RE	Native	>50%	1	0	0	S	Lost from Caermafon (Glyders 1910, Snowdon 1919; Hill, 1988)														
M	<i>Coscinodon cribrosus</i>	Native		28	22	52		Frequent on the north coasts of Pembrokeshire & Cardiganshire, apparently more so than elsewhere in GB, but perhaps under-recorded in England and Scotland															
M	<i>Cratoneuron filicinum</i>	Native																					
M	<i>Cryptphaea heteromalla</i>	Native																					
M	<i>Ctenidium molluscum</i>	Native																					
M	<i>Ctenidium molluscum</i> var. <i>condensatum</i>	Native																					
M	<i>Ctenidium molluscum</i> var. <i>robustum</i>	DD	Native																				
M	<i>Cynodontium bruntonii</i>	Native																					
M	<i>Cynodontium jenneri</i>	Native																					
VU	<i>Cynodontium polycarpum</i>	EN	A, B	Native	>50%	2	1	17	S														
VU	<i>Daltonia sphacelloides</i>	DD	Native																				
VU	<i>Dendrocyrtidea lanigera</i>	VU	D2	Native	S42	VU		5	5	N													
NE	<i>Dendrocyrtidea mucronata</i>	RE	Native																				
NE	<i>Dialytrichia saxicola</i>	RE	Native																				
M	<i>Dichodontium flavescens</i>	Native																					
M	<i>Dichodontium palustre</i>	Native																					
M	<i>Dichodontium pellucidum</i>	NT	B	Native		30	17	7															
M	<i>Dicranella cerniculata</i>	EN	A, B	Native	>50%	2	1	2															
M	<i>Dicranella crispa</i>	Native																					
M	<i>Dicranella heteromalla</i>	Native																					
M	<i>Dicranella rufescens</i>	Native																					
M	<i>Dicranella schreberiana</i>	Native																					
M	<i>Dicranella staphylina</i>	Native																					
M	<i>Dicranella subulata</i>	Native																					
M	<i>Dicranella vania</i>	Native																					
M	<i>Dicranodontium acerulum</i>	CR	B	Native	DD		1	1	3	S													
M	<i>Dicranodontium denudatum</i>	Native																					
M	<i>Dicranoweisia cirrata</i>	EN	B	Native		2	2	4	S														
M	<i>Dicranum bonjeanii</i>	VL	D2	Native		3	3	8															
DD	DD	<i>Dicranum leporinum</i>	Native			7	6	43	S														
M	<i>Dicranum majus</i>	Native																					
M	<i>Dicranum montanum</i>	Native																					
M	<i>Dicranum polysetum</i>	Native																					
M	<i>Dicranum scoparium</i>	Native																					
M	<i>Dicranum scottianum</i>	Native																					
VU	VU	<i>Dicranum undulatum</i>	EN	A, B	Native	S42	>50%	4	1	5	S												
M	<i>Didymodon acutus</i>	Native																					
M	<i>Didymodon fallax</i>	Native																					
M	<i>Didymodon ferrugineus</i>	Native																					

Taxon		MLH		GB Red List 2005		GB Red List 2011		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments		
M	<i>Didymodon insulanus</i>	Native																										
M	<i>Didymodon lurioides</i>	Native																										
M	<i>Didymodon nicholsonii</i>	Native																										
M	<i>Didymodon rigidulus</i>	Native																										
M	<i>Didymodon sinuosus</i>	Native																										
M	<i>Didymodon spadiceus</i>	Native																										
LC	LC	<i>Didymodon tomentulosus</i>	VU	D2	Ach?	S42	DD	2	2	9	Only recorded in Wales from Pembrokeshire and Monmouthshire, but probably overlooked																	
M	<i>Didymodon tophaceus</i>	Native																										
M	<i>Didymodon umbrosus</i>	NA																										
M	<i>Didymodon vinealis</i>	Native																										
M	<i>Diplophyllum foliosum</i>	Native																										
L	<i>Diplophyllum albicans</i>	Native																										
L	<i>Diplophyllum obtusifolium</i>	Native																										
L	<i>Diplophyllum taxifolium</i>	RE																										
M	<i>Desium nudum</i>	Native																										
M	<i>Distichium capillaceum</i>	Native																										
M	<i>Distichium inclinatum</i>	Native																										
N	<i>Districhum flexicaule</i>	DD	Native																									
M	<i>Districhum gracile</i>	Native																										
M	<i>Districhum heteromallum</i>	Native																										
M	<i>Districhum lineare</i>	Native																										
NT	LC	N	<i>Districhum plumbeum</i>	VU	D2	Native	Arch?	S42	VU	10	10	56	Outlying colony in Cornwall, otherwise southern edge in Carmarthenshire															
M	<i>Districhum pusillum</i>	Native																										
VU	VU	M	<i>Districhum subulatum</i>	UV	D2	Native	S42	D2	Native	5	4	13	The Mid Wales outlier is the British headquarters of this species															
M	<i>Districhum zonatum</i>	Native																										
L	<i>Douinia ovata</i>	Native																										
M	<i>Drepanocladus aduncus</i>	Native																										
M	<i>Drepanocladus polygamus</i>	Native																										
M	<i>Drepanolejeunea hamatifolia</i>	EN	A, B	Native	RT	>50%	11	4	10	Lost from Monmouthshire, still extant in dunes of Glamorgan and north Wales; inland records from Radnorshire & Flintshire (Halkyn Mountain)																		
L	<i>Drepanolejeunea hamatifolia</i>	Native																										
M	<i>Encalypta alpina</i>	RE	Native																									
M	<i>Encalypta ciliata</i>	Native																										
M	<i>Encalypta rhaptocarpa</i>	RE	Native																									
M	<i>Encalypta steptocarpa</i>	Native																										
M	<i>Encalypta vulgaris</i>	Native																										
M	<i>Entodon concinnus</i>	VU-	B-	Native						8	5	2	BBS spring meeting in 2008 showed <i>Entodon</i> to be more frequent in Denbighshire limestone than previously thought, possibly lost from Glamorgan (Oxwich)															
M	<i>Entodon attenuatus</i>	Native																										
M	<i>Entodon fascicularis</i>	Native																										
M	<i>Entodon mühlenbergii</i>	NT	B	Native						13	7	21	Western edge in Glamorgan (Mewslade; Bosanquet, 2008a), lost from Meirionydd (Harlech Castle 1908; Hill, 1988)															
M	<i>Entodon obtusus</i>	Native																										
VU	NT	M	<i>Entodon pulchellus</i>		Native	S42				10	9	60	One outlier in Aberdeenshire, otherwise northern edge in Caernarfon (Great Orme's Head), large part of GB population in Glamorgan (Bosanquet, 2008a)															
NE	NE	M	<i>Ephemerum crassinervium</i>	UV	D2	Native				2	2	100	Only British colonies are in Monmouthshire (Wentwood Reservoir), also in Carmarthenshire (Pant-y-Llyn Turlough) (Motley & Bosanquet, 2005); taxonomy revised by Holroyd (2010), formerly <i>E. hibernicum</i>															
LC	NE	M	<i>Ephemerum rutheum</i>		subsp. <i>rutheum</i>								Six sites in Monmouthshire, 2 in Brecknock, 1 in Carmarthenshire & 2 in Pembrokeshire make south Wales significant for this taxon, only 1 north Wales record (Llyn Alaw 1988)															

Taxon		Criteria		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales Red List		Welsh hectads (all records)		Wales extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments		
M	<i>Ephemerum minutissimum</i>	Native		Rare		4	4	3	W	Western edge in Pembrokeshire where 2 sites, 1 site in Monmouthshire & 1 in Caernarfon, perhaps under-recorded																
M	<i>Ephemerum recurvifolium</i>	VU	D2	Native																						
M	<i>Ephemerum senatum</i>	Native		Native																						
M	<i>Epibrygium tozeri</i>	Native		Native																						
L	<i>Eremnotus myriocarpus</i>	Native		Native																						
M	<i>Eucladium verticillatum</i>	Native		Native																						
M	<i>Eurychium striatum</i>	Native		Native																						
M	<i>Fissidens adianthoides</i>	Native		Native																						
M	<i>Fissidens bryoides</i> var. <i>bryoides</i>	EN	B	Native	S42	DD		8	5	N	Probably better-recorded in Wales than elsewhere in GB															
M	<i>Fissidens bryoides</i> var. <i>caespitans</i>	Native		Native	101	84	35																			
M	<i>Fissidens celticus</i>	Native		Native																						
M	<i>Fissidens crassipes</i>	Native		Native																						
EN	EN	<i>Fissidens curvatus</i>	WL	Native	>50%	17	8	12			Apparent decline as records based on herbarium review, few bryologists seem to find this species now but it is scattered in Pembrokeshire															
M	<i>Fissidens dubius</i>	Native		Native																						
M	<i>Fissidens exilis</i>	Native		Native																						
M	<i>Fissidens fontanii</i>	Native		Native																						
M	<i>Fissidens gracillifolius</i>	Native		Native																						
M	<i>Fissidens incurvus</i>	Native		Native																						
NT	NT	<i>Fissidens mongolianii</i>	Native	Rare	8	8	50	N			Northern edge on Anglesey (Gwredog 1988), also Denbighshire (Trefiwl 1978), 2 sites in Carmarthenshire and 6 in Pembrokeshire															
M	<i>Fissidens osmundoides</i>	Native		Native																						
M	<i>Fissidens polyphyllus</i>	VU	D2	Native		5	5	23			Still thriving on the Afon Glaslyn and in nearby sea caves															
M	<i>Fissidens pusillus</i>	Native		Native																						
M	<i>Fissidens rivularis</i>	Native		Native																						
M	<i>Fissidens nivalis</i>	Native		Native																						
VU	VU	<i>Fissidens serulatus</i>	RE	Native	S42	>50%	1	0	N																	
M	<i>Fissidens taxifolius</i> var. <i>pollichia</i>	Native		Native																						
M	<i>Fissidens taxifolius</i> var. <i>taxifolius</i>	Native		Native																						
M	<i>Fissidens viridulus</i>	Native		Native																						
M	<i>Fontinalis antipyretica</i> var. <i>antipyretica</i>	Native		Native																						
M	<i>Fontinalis antipyretica</i> var. <i>gracilis</i>	WL	Native	Native																						
M	<i>Fontinalis squamosa</i> var. <i>squamosa</i>	Native		Native		7	7	30			Apparent decline because of lack of interest in varieties of <i>Fontinalis antipyretica</i>															
L	<i>Fossumbronia foveolata</i>	Native	S42	Native		9	5	14	N																	
L	<i>Fossumbronia angulosa</i>	Native		Native																						
L	<i>Fossumbronia caespitiformis</i>	WL																								
NT	LC	<i>Fossumbronia fimbriata</i>	CR	D	Native	Rare	4	4	S																	
M	<i>Fotinella antipyretica</i> var. <i>gracilis</i>	WL	Native	Native																						
M	<i>Fotinella squamosa</i> var. <i>squamosa</i>	Native		Native																						
L	<i>Fossumbronia incurna</i>	Native	S42	Native																						
L	<i>Fossumbronia maritima</i>	VU	D2	Native																						
NT	NT	<i>Fossumbronia fimbriata</i>	CR	D	Native	Rare	3	3	17	N																
LC	LC	<i>Fossumbronia foveolata</i>	Native	Native																						
L	<i>Fossumbronia pusilla</i>	Native		Native																						
L	<i>Fossumbronia wondracekii</i>	Native		Native																						
L	<i>Frullania dilatata</i>	Native		Native																						
L	<i>Frullania fragilifolia</i>	Native		Native																						
L	<i>Frullania microphylla</i> var. <i>decidua</i>	EN	B	Native			3	2	100	S																

GB Red List 2005

GB Red List 2011

The only British records are from Caernarfon (Moel Hebog 1967; TBBB) and Brecknock (Craig Cerrig Gleisiad 1999 & Fan Nedd 2000; Woods, 2006)

Taxon		Critera		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales Red List		Wales hecads (all records)		Welsh extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
		M	LH																						
		L		<i>Frullania microphylla</i> var. <i>microphylla</i>		Native																			
		L		<i>Frullania tamnisci</i>		Native																			
		L		<i>Frullania teneriffae</i>		Native																			
		M		<i>Funaria hygrometrica</i>		Native																			
		M		<i>Glyptothrium daviesii</i>		EN	A, B	Native	Rare	>50%	8	4	3	S											
		M		<i>Grimmia alpestris</i>		CR	B	Native		1	1	33	S	Yes											
VU	VU	M		<i>Grimmia arenaria</i>		VU-	B-	Native	DD	8	5	45	S												
LC	NT	M		<i>Grimmia atrata</i>		NT	B	Native	Rare	12	8	35	S												
		M		<i>Grimmia decipiens</i>		NT	B	Native		17	9	17													
		M		<i>Grimmia donniana</i>		EN	VU	<i>Grimmia elongata</i>	B-	Native	S42	7	5	45	S										
		M		<i>Grimmia funalis</i>		VU-	A-	Native		>50%	16	7	5	S											
		M		<i>Grimmia hartmanii</i>		NT		Native			8	6	27	S											
		M		<i>Grimmia incurva</i>		NT	B	Native			21	14	33												
		M		<i>Grimmia laevigata</i>		NT		Native			22	19	49												
		M		<i>Grimmia lisae</i>		NT	D2	Native			5	5	11												
		M		<i>Grimmia longirostris</i>		NT		Native																	
		M		<i>Grimmia montana</i>		EN	A, B	Native		>50%	7	2	9												
		M		<i>Grimmia orbicularis</i>		NT		Native			18	11	20												
		M		<i>Grimmia ovalis</i>		NT		Native			19	15	34												
		M		<i>Grimmia pulvinata</i>		NT		Native																	
		M		<i>Grimmia ramondii</i>		NT	D2	Native			1	1	10												
VU	NT	M		<i>Grimmia terestina</i>		NT		Native			23	17	11	S											
		M		<i>Grimmia torquata</i>		NT		Native																	
		M		<i>Grimmia trichophylla</i>		EN	B	Native			3	3	75	S	Yes										
VU	VU	L		<i>Gymnocolea acutiloba</i>		NT		Native																	
		L		<i>Gymnocolea inflata</i>		NT		Native																	
		L		<i>Gymnomitrion concinnatum</i>		NT		Native			9	7	5												
		L		<i>Gymnomitrion crenulatum</i>		NT		Native		>50%	1	0	0	S	Yes										
		L		<i>Gymnomitrion obtusum</i>		NT		Native			3	3	75	S											
		M		<i>Gymnostomum aeruginosum</i>		NT		Native			11	7	9												
		M		<i>Gymnostomum calcareum</i>		NT		Native			21	21	29												
		M		<i>Gymnostomum viridulum</i>		NT		Native																	
		M		<i>Gyrocolea tenuis</i>		NT		Native																	
		EN	NT	<i>Habrodon perpusillus</i>		NT	D2	Native	RT		3	2	5	S											
		M		<i>Hageniella nicanus</i>		NT		Native	DD		59	52	49												
		M		<i>Hamatocaulis vernicosus</i>		NT		Native																	
		L		<i>Haplomitrium hookeri</i>		NT		Native			8	8	7												
		L		<i>Harpaljeunea molleri</i>		NT		Native			23	19	7												

Taxon		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Welshes extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
		L	<i>Harpanthus scutatus</i>	Native	B	Native		11	6	25													
NT	LC	M	<i>Hedwigia ciliata</i> var. <i>ciliata</i>	VU	DD	Native		1	1	25	S												
NT	LC	M	<i>Hedwigia ciliata</i> var. <i>leucophaea</i>	DD	Native	Rare		19	12	17	S												
	M	<i>Hedwigia integrifolia</i>																					
	M	<i>Hedwigia stellata</i>																					
	M	<i>Hennediella heimii</i>																					
	M	<i>Hennediella stanfordensis</i>																					
	L	<i>Herbertus aduncus</i>																					
	L	<i>Herbertus stramineus</i>																					
	M	<i>Herzogella selligeri</i>																					
	M	<i>Heterocladium heteropterum</i>																					
			var. <i>flaccidum</i>																				
	M	<i>Heterocladium heteropterum</i>																					
			var. <i>heteropterum</i>																				
	M	<i>Heterocladium wulfbergii</i>																					
	M	<i>Homalothecium lutescens</i>																					
	M	<i>Homalothecium senicum</i>																					
	M	<i>Hookeria lucens</i>																					
	M	<i>Hygroamblystegium fluviatile</i>																					
	M	<i>Hygroamblystegium humile</i>																					
	N	<i>Hygroamblystegium tenax</i>																					
	M	<i>Hygroamblystegium varium</i>																					
	L	<i>Hygrobiella latifolia</i>																					
	LC	NT	M	<i>Hygrohypnum duriusculum</i>	EN	A, B	Native	>50%	4	2	10	S											
	M	<i>Hygrohypnum eugynium</i>																					
	M	<i>Hygrohypnum lundum</i>																					
	M	<i>Hygrohypnum ochraceum</i>																					
	M	<i>Hylocomiastrium umbratum</i>																					
	M	<i>Hylocomium splendens</i>																					
	M	<i>Hymenostylium recurvirostrum</i>																					
			var. <i>recurvirostrum</i>																				
	M	<i>Hyocomium amonicum</i>																					
	M	<i>Hyponum anoldi</i>																					
	M	<i>Hyponum callichroum</i>																					
	M	<i>Hyponum cupressiforme</i>																					
	M	<i>Hyponum cupressiforme</i> var. <i>lacunosum</i>																					
	M	<i>Hyponum cupressiforme</i>																					
	M	<i>Hyponum cupressiforme</i> var. <i>resupinatum</i>																					
	M	<i>Hyponum hamulosum</i>																					
	M	<i>Hyponum imponens</i>																					
	M	<i>Hyponum juthandicum</i>																					
	M	<i>Isoperigaeopsis muellerae</i>																					
	M	<i>Isoperigaeopsis pulchella</i>																					
	M	<i>Isothecium alopecuroides</i>																					

Taxon		Comments						
GB Red List 2005	GB Red List 2011	Wales Red List	Native/alien status	Section 42 Wales	Europe Red List	Siginificant decline?		
M <i>Isotherium holtii</i>	Native							
M <i>Isotherium myosuroides</i>	Native	8	7	5	Southern edge in Carmarthenshire (Bannau Sir Gaer)	Disjunct from Scotland?		
M <i>Isotherium myosuroides</i> var. <i>brachythecoides</i>	Native							
M <i>Isotherium myosuroides</i> var. <i>myosuroides</i>	Native							
L <i>Jamesoniella autumnalis</i>	Native	21	19	19	Widespread but scarce on decaying logs in humid woodland or on rocks, south-east to Monmouthshire (Wye Valley)	Edge of GB range?		
L <i>Jubula hutchinsiae</i>	Native							
L <i>Jungermannia atrorubens</i>	Native							
L <i>Jungermannia borealis</i>	VU	D2	5	14	S	Southern edge in Brecknock, where locally frequent in Brecon Beacons (Bosanquet & Motley, 2008)		
L <i>Jungermannia exsertifolia</i>	Native	41	30	10	S	Southern edge in Monmouthshire (Afon Rhymney)		
L <i>Jungermannia pumila</i>	Native							
M <i>Kiaeria blyttii</i>	Native							
M <i>Kiaeria falcatia</i>	EN	A, B	Native	>50%	2	1	S	Southern edge in Caernarfon, lost from Carnedd Llewellyn but extant on Snowdon (Hill, 1988)
M <i>Kindbergia praelonga</i>	Native							
L <i>Kurzia pauciflora</i>	Native							
L <i>Kurzia Sylvatica</i>	Native							
L <i>Kurzia trichoclados</i>	Native							
L <i>Leiocolea badensis</i>	Native							
L <i>Leiocolea batniensis</i>	Native							
L <i>Leiocolea collaris</i>	Native							
L <i>Leiocolea fitzgeraldiae</i>	CR	B	Native	1	1	S	Southern edge in Caernarfon (Cwm Idwal 1988)	
L <i>Leiocolea heterocolpos</i>	Native							
L <i>Leiocolea turbinata</i>	Native							
L <i>Lejeunea caudifolia</i>	Native							
L <i>Lejeunea lamacerina</i>	Native							
L <i>Lejeunea patens</i>	Native							
L <i>Lepidozia cupressina</i>	Native							
L <i>Lepidozia personii</i>	Native							
L <i>Lepidozia reptans</i>	Native							
M <i>Leptobarbula berica</i>	Native							
M <i>Leptobryum pyriforme</i>	Native							
M <i>Leptodictyum riparium</i>	Native							
M <i>Leptodon smithii</i>	NT	B	Native	542	13	7	N	Southern edge in NE Carmarthenshire (Mynydd Mallau area)
M <i>Leptodontium flexifolium</i>	Native							
M <i>Leptoscyphus cuneifolius</i>	VU	D2	Native		2	2	S	Lost from Cumberland, so northern edge on Anglesey, lost from Mynydd Mallaen area
M <i>Leskeia polycarpa</i>	Native							
M <i>Leucobryum glaucum</i>	Native							
M <i>Leucobryum juniperoidem</i>	Native							
M <i>Leptodon sciuroides</i> var. <i>morensis</i>	VU	D2	Native		1	1	13	Only Welsh record is from Pembrokeshire (Llanychaer 1973)
M <i>Leucodon sciuroides</i> var. <i>sciuroides</i>	Native							
M <i>Loeskeobryum brevirostre</i>	Native							
L <i>Lophocolea bidentata</i>	Native							
L <i>Lophocolea fragrans</i>	Native							
L <i>Lophocolea heterophylla</i>	Native							
L <i>Lophocolea semiteres</i>	NA							Recently found at two sites in Pembrokeshire & one in Mynydd Preseli, increasing in GB
L <i>Lophozia bicrenata</i>	Native							
L <i>Lophozia excisa</i>	Native							
L <i>Lophozia incisa</i>	Native							

Taxon		GB Red List 2005		GB Red List 2011		Criteria		Native/alien status		Section 42 Wales		Prop (%) of GB population		Wales hectads (all records)		Edge of GB range?		Disjunct from Scotland?		Comments			
LC	DD	L	<i>Moerchia hibernica</i> agg.			Native		20	13	15													
M	<i>Molendoa warburgii</i>	EN	B	Native	Rare			4	4	5	Southern edge in Merionydd (Ceunant Cynffordd)												
L	<i>Mylia anomala</i>			Native																			
L	<i>Mylia taylorii</i>			Native																			
NT	NT	M	<i>Myntia pulvinata</i>			Native		10	8	28	Uncommon on the Severn, Wye and Usk and their tributaries												
M	<i>Myurella julacea</i>	RE		Native		>50%	1	0	0	S	Lost from Caernarfon (Snowdon 1912; Hill, 1988)												
L	<i>Nardia compressa</i>			Native																			
L	<i>Nardia geosyphus</i>			Native																			
L	<i>Nardia scalaris</i>			Native																			
M	<i>Neckera complanata</i>			Native																			
M	<i>Neckera crispa</i>			Native																			
M	<i>Neckera pumila</i>			Native																			
L	<i>Nowellia curvifolia</i>			Native																			
L	<i>Odontoschisma denudatum</i>			Native																			
L	<i>Odontoschisma sphagni</i>			Native																			
M	<i>Oedipodium griffithianum</i>	NT	B	Native				18	10	18	S	Southern edge in Carmarthenshire, lost from Brecknock & a several sites in the north (TBDB)											
M	<i>Oligotrichum hercynicum</i>			Native		EN		>50%	1	0	0	Lost from Denbighshire & Flintshire (Nant y Ffrith, Hill, 1988; Portley & Matcham, 2003) and not refound in 2008 (SDSB pers. obs.)											
VU	VU	M	<i>Orthodontium gracile</i>	RE		Native																	
M	<i>Orthodontium lineare</i>	NA		Neo																			
M	<i>Orthotrichum intricatum</i>			Native																			
M	<i>Orthotrichum rufescens</i>	VU	A, B-	Native																			
N	<i>Orthotrichum affine</i>			Native																			
M	<i>Orthotrichum anomalum</i>			Native																			
M	<i>Orthotrichum cupulatum</i>			Native																			
M	<i>Orthotrichum diaphanum</i>			Native																			
M	<i>Orthotrichum lyelli</i>			Native																			
VU	NT	M	<i>Orthotrichum obtusifolium</i>	VU	D2	Native					1	1	9	W	Western edge in Cardiganshire (Aberystwyth 2008), which is the only Welsh site								
M	<i>Orthotrichum pulchellum</i>			Native																			
M	<i>Orthotrichum rivulare</i>			Native																			
M	<i>Orthotrichum rupestre</i>			Native																			
M	<i>Orthotrichum sprucei</i>			Native																			
N	<i>Orthotrichum stramineum</i>			Native																			
M	<i>Orthotrichum striatum</i>			Native																			
M	<i>Orthotrichum tenellum</i>			Native																			
M	<i>Oxyrrhynchium hians</i>			Native																			
M	<i>Oxyrrhynchium pamphilum</i>			Native																			
M	<i>Oxyrrhynchium schlechteri</i>			Native																			
M	<i>Oxyrrhynchium speciosum</i>			S42	VU																		
L	<i>Pallavicinia lyelli</i>	NT	B								11	6	22		Found at single new sites in Brecknock, Carmarthenshire, Pembrokeshire, Cardiganshire & Merionydd in last 10 years, in addition to 2 known sites in Merionydd & 1 in Cardiganshire, but lost from 3 others in those two counties								
M	<i>Palustriella commutata</i>			Native																			
M	<i>Palustriella falcatula</i>			Native																			
M	<i>Paraleptodontium recurvifolium</i>	EN	A, B	Native	Rare				5	1	2	S	Southern edge in Merionydd, lost from all but one (near Tal-y-llyn) north Wales sites (Hill, 1988) and perhaps now extinct										
L	<i>Pellia endiviifolia</i>			Native																			
L	<i>Pellia epiphylla</i>			Native																			
L	<i>Pellia neesiana</i>			Native																			

Taxon		MLH		GB Red List 2005		GB Red List 2011		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments		
	L <i>Petalophyllum rafsiif</i>			Native	VU	17	16	55																				
NT	NT	H <i>Phaeoceros carolinianus</i>		Arch?		6	5	29																				
	H <i>Phaeoceros laevis</i>			Native																								
	M <i>Phascum cuspidatum</i> var. <i>cuspidatum</i>			Native																								
	M <i>Phascum cuspidatum</i> var. <i>papillosum</i>			WL	Native	>50%	1	0	0																			
	M <i>Philonotis amellii</i>			Native		8	7	11																				
	M <i>Philonotis caespitosa</i>			Native		40	32	36																				
	M <i>Philonotis calcarea</i>			Native		31	18	23																				
CR	RE	M <i>Philonotis cernua</i>		EX	Native	Rare	>50%	1	0	0	S	Yes	Lost from Merionydd (Cwm Bychan to 1939; Hill, 1988) and last seen in Britain in 1960, so perhaps almost extinct in Europe															
	M <i>Philonotis fontana</i>			Native																								
	M <i>Philonotis rigida</i>			EN	A	Native																						
	M <i>Philonotis seriata</i>			RE	Native																							
LC	NT	M <i>Philonotis tomentella</i>		CR	B	Native																						
	M <i>Physcomitrium pyriforme</i>			VU	D2	Native	Rare																					
NT	LC	M <i>Physcomitrium sphæricum</i>		VU																								
	M <i>Plagiobryum zieri</i>			Native																								
	L <i>Plagiochila asplenoides</i>			Native																								
	L <i>Plagiochila biliaria</i>			Native																								
	L <i>Plagiochila britannica</i>			Native																								
	L <i>Plagiochila exiguia</i>			Native																								
	L <i>Plagiochila heterophylla</i>			VU	D2	Native	Rare																					
	L <i>Plagiochila porelloides</i>			Native																								
	L <i>Plagiochila punctata</i>			Native																								
	L <i>Plagiochila spinulosa</i>			Native																								
	M <i>Plagiomnium affine</i>			Native																								
	M <i>Plagiomnium cuspidatum</i>			Native																								
	M <i>Plagiomnium elatum</i>			Native																								
	M <i>Plagiomnium ellipticum</i>			Native																								
	M <i>Plagiomnium rostratum</i>			Native																								
	M <i>Plagiomnium undulatum</i>			Native																								
	M <i>Plagiotpus oedentarius</i>			Native																								
	M <i>Plagiomnium cuspidatum</i>			Native																								
	M <i>Plagiotpus oedentarius</i>			Native																								
	M <i>Plagiotrichum curvifolium</i>			Native																								
	M <i>Plagiotrichum denticulatum</i>			Native																								
	M <i>Plagiotrichum denticulatum</i>			Native																								
	M <i>Plagiotrichum curvifolium</i>			Native																								
	M <i>Plagiotrichum latibracteola</i>			Native																								
	M <i>Plagiotrichum nemorale</i>			Native																								
	M <i>Plagiotrichum platyphyllum</i>			EN	B	Native																						
	M <i>Plagiotrichum succulentum</i>			Native																								
	M <i>Plagiotrichum undulatum</i>			Native																								

Taxon		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
M	<i>Plasteurhynchium striatum</i>	Native		21	18	31		Frequent on shaded carboniferous limestone															
M	<i>Platydicya turgemmannioides</i>	Native		11	6	10		Scattered under overhangs in calcareous sandstone or limestone															
M	<i>Platygyrium repens</i>	Native		8	8	8	W	Western edge in Denbighshire (River Elwy 1972; Hill, 1988), still rare in Monmouthshire (5 sites) & Brecknock (1 site) but found frequently on English side of the border (M. Lawley & R. Lansdown pers. comm.) and perhaps increasing															
M	<i>Platyhypnidium lusitanicum</i>	Native		37	27	37		Locally frequent in north and mid Wales south to Carmarthenshire; probably lost from Monmouthshire (Cleddon Shoots)															
M	<i>Platyhypnidium riparioides</i>	Native																					
M	<i>Pleuridium acuminatum</i>	Native																					
M	<i>Pleuridium subulatum</i>	Native																					
M	<i>Pleurochaete squamosa</i>	Native																					
M	<i>Pleurozium schreberi</i>	Native																					
M	<i>Polygonatum aloides</i>	Native																					
M	<i>Polygonatum nanum</i>	Native																					
M	<i>Polygonatum umbrinum</i>	Native																					
M	<i>Pohlia annotina</i>	Native																					
M	<i>Pohlia bulbifera</i>	Native																					
M	<i>Pohlia campiotrachela</i>	Native																					
M	<i>Pohlia cruda</i>	Native																					
M	<i>Pohlia drummondii</i>	Native																					
M	<i>Pohlia elongata</i> var. <i>elongata</i>	EN	A, B		2	1	4	S	Southern edge in Caernarfon, lost from 1 of 2 sites, extant in Cwm Idwal														
M	<i>Pohlia elongata</i> var. <i>greenii</i>	EN	A, B		2	1	2		Lost from Carmarthenshire (foel Fawr 1965; Bosanquet <i>et al.</i> , 2005) but recently found in Radnorshire (Garreg-ddu Reservoir 2006)														
M	<i>Pohlia filum</i>	EN	A, B		2	1	2		Occasional in north Wales (Hill, 1988), mid Wales and Brecon Beacons (Bosanquet & Motley, 2008) and south to Glamorgan (Craig y Llyn)														
M	<i>Pohlia flexuosa</i>	Native			21	17	18																
M	<i>Pohlia lusciciana</i>	EN	A, B		3	1	2	S	Southern edge now in Caernarfon (Cwm Dylu/Llyn Bochwyd), lost from Meirionydd and from Cwm Idwal & Cnenedd Llewelyn														
M	<i>Pohlia ludwigii</i>	Native																					
M	<i>Pohlia lutescens</i>	Native																					
M	<i>Pohlia melanodon</i>	Native																					
M	<i>Pohlia nutans</i>	Native																					
M	<i>Pohlia prolifera</i>	DD	Native		1	1	5	S	Southern edge in Denbighshire, but taxonomically confused and equivocal plants more widespread on mine spoil														
M	<i>Pohlia wahlebergii</i> var. <i>glacialis</i>	CR	B		1	1	2	S	Southern edge in Caernarfon														
M	<i>Pohlia wahlebergii</i> var. <i>wahlenbergii</i>	Native																					
M	<i>Polytrichastrum alpinum</i>	Native																					
M	<i>Polytrichastrum formosum</i>	Native																					
M	<i>Polytrichastrum longisetum</i>	Native																					
M	<i>Polytrichum commune</i> var. <i>commune</i>	Native																					
M	<i>Polytrichum commune</i> var. <i>perigoniale</i>	Native																					
M	<i>Polytrichum juniperinum</i>	Native																					
M	<i>Polytrichum piliferum</i>	Native																					
M	<i>Polytrichum strictum</i>	Native																					
L	<i>Porella arborescens</i>	VU	D2																				
L	<i>Porella cordaeana</i>	Native																					
L	<i>Porella obtusata</i>	Native																					
L	<i>Porella pinnata</i>	Native																					
L	<i>Porella platiphylla</i>	Native																					
M	<i>Pottia capito</i>	Native																					
L	<i>Praissia quadrata</i>	Native																					
M	<i>Pseudephemerum nitidum</i>	Native																					
M	<i>Pseudobryum cincidioides</i>	Native																					
LC	NT	M	<i>Pseudocalliergon lycoptoides</i>	EN	B	Native	RT		5	3	10												
GB Red List 2005																							
GB Red List 2011																							
GB Red List 2005																							

GB Red List 2005										GB Red List 2011									
Taxon										Native/alien status									
Wales Red List					Section 42 Wales					Europe Red List					Significant decline?				
Welsh records (all records)										Welsh records (post-1970)									
MLH	Critera		Native		S42		10 8 73 S		Southern edge in Brecknock/Glamorgan (Nedd & Melte), also in Carmarthenshire (2 extant sites) and Meirionydd (2 extant sites), most recent British records are from Wales		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments		
EN	NT	M	<i>Rhytidodiadelphus subpinnatus</i>		Native		>50%		3 1 2		Very rare in Snowdonia (Hill, 1988) with records from Moel Hebog (to 1979), Cwmglas-mawr (1960) and Craig yr Ysfa (1946)								
M	<i>Rhytidium rugosum</i>		EN		A, B		Native		Native		Native		Native		Native				
L	<i>Riccardia chamedryfolia</i>																		
L	<i>Riccardia incurvata</i>																		
L	<i>Riccardia latifrons</i>																		
L	<i>Riccardia multifida</i>																		
L	<i>Riccardia palmata</i>																		
VU	VU	L	<i>Riccia beyrichiana</i>		EN		A, B		Native		Native		>50%		3 1 10		Lost from 2 of 3 north Wales sites, last seen near Beaumaris in 1972 and not found during several recent searches (TH Blackstock pers. comm., 2010)		
L	<i>Riccia cavenosa</i>				EN		A, B		Native		>50%		6 3 11 N		By reservoirs in Monmouthshire and in dune pools in west Wales and north Wales				
L	<i>Riccia crozalsii</i>								Native		Native		21 19 8 W		Northern world edge on Anglesey, lost from 4 of 6 north Wales sites but recently found new to Pembrokeshire (Ramsey & Skokholm)				
L	<i>Riccia fluitans</i>								Native						Western edge in Carmarthenshire (near Whitland)				
L	<i>Riccia glauca</i>								Native		Rare		No significant decline in Wales, locally abundant on 7 reservoirs in Brecknock and 1 in Carmarthenshire (Mottley & Bosanquet, 2005), also on the Afon Teifi and Lake Vyrnwy, although perhaps lost from Anglesey (Llyn Llywennan 1952; Hill, 1988) and 1 site in Carmarthenshire (Talley Lakes 1907)		Northern world edge in Meirionydd, status in Barnmouth and at Harlech Castle needs to be ascertained, secure in Radnorshire (Stanner Rock)				
EN	EN	L	<i>Riccia nigrella</i>		EN		B		Native		S42		3 2 40 N		Northern world edge in Meirionydd (Wrexham ponds), now only extant Welsh site if still present (Hill, 1988), lost from Monmouthshire (Magor)				
L	<i>Riccia sorocarpa</i>						Native		Native										
L	<i>Riccia subfurfurca</i>						EN		A, B		Native		>50%		2 1 1 W		Western edge in Denbighshire (Wrexham ponds), now only extant Welsh site if still present (Hill, 1988), lost from Monmouthshire (Magor)		
L	<i>Ricciocarpos natans</i>				EN				Native										
L	<i>Saccogyna viticulosa</i>								Native										
M	<i>Sanionia uncinata</i>						Native												
M	<i>Sarmentypnum exannulatum</i>						Native												
M	<i>Sarmentypnum sarmentosum</i>						Native												
L	<i>Scapania aquiloba</i>						Native		Native		9 8 7 S		Southern edge in Monmouthshire/Brecknock (Bosanquet & Mottley, 2008)						
L	<i>Scapania aspera</i>						CR		B		Native		>50%		1 0 0 S		Southern edge in Brecknock where not looked for since 1965 (Woods, 2006), outlying from Perthshire		
L	<i>Scapania calcicola</i>						Native												
L	<i>Scapania compacta</i>						Native												
L	<i>Scapania cupidoiligera</i>						Native												
NT	NT	L	<i>Scapania gymnostomophylla</i>		EN		B		Native		Native		2 2 14 S		Yes		Southern edge in Carmarthenshire (Bannau Sir Gaer), also in Caernarfon (Cwm Glas-bach)		
L	<i>Scapania integrifolia</i>								Native										
L	<i>Scapania lingulata</i>								Native										
L	<i>Scapania nemorea</i>						Native		>50%		1 0 0 S		Yes		Southern edge in Brecknock/Pembrokeshire, scattered upland and coastal sites				
L	<i>Scapania nimbosea</i>		RE		Native		Rare												
L	<i>Scapania omnitrichoides</i>		EN		B		Native												
NT	LC	L	<i>Scapania pallidicola</i>				Native		EN		Native		17 17 89		Very high proportion of British records come from neutral or acid mires in mid Wales, where new sites continue to be discovered				
L	<i>Scapania paludosa</i>						Native						2 2 10 S		Southern edge in Meirionydd (Llyn Owernethin), also in Caernarfon (Nant Ffrancon)				
L	<i>Scapania sandica</i>						Native												
L	<i>Scapania subapicina</i>						Native		EN		Native		5 5 6		One outlier in Black Mountains of Herefordshire, otherwise southern edge in Cardiganshire (Pumllymon)				
L	<i>Scapania uliginosa</i>						Native												
L	<i>Scapania umbrosa</i>						Native												
M	<i>Schistidium apocarpum</i>		VU		D2		Native		4 3 19 S		Southern edge in Meirionydd								
M	<i>Schistidium aquassizii</i>						Native												

Taxon		MLH		GB Red List 2005		GB Red List 2011		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments			
M	<i>Schistidium confertum</i>	WL	Native					7	5	26	S																		
M	<i>Schistidium crassipilum</i>	WL	Native																										
DD	LC	<i>Schistidium elegantulum</i>	WL	Native				4	3	13		Poorly recorded in Britain, hence south Wales biased distribution of combined <i>elegantulum</i> & <i>wilsonii</i> ; widespread on concrete																	
DD	VU	<i>Schistidium flaccidum</i>	CR	B	Native			>50%	1	0	0	S	Southern edge in Caernarfon (Llyn d'ur Arddu 1967; Townsend, 1997), 1 of only 2 known GB sites, the other being on Mull																
NE	NT	<i>Schistidium frigidum</i> var. <i>frigidum</i>	DD	Native				>50%	4	2	18	S	Southern edge in Brecknock (Craig Cerrig Gleisiad 1999; Rothero, 2004; Bosanquet & Mottey, 2008)																
NE	NT	<i>Schistidium frigidum</i> var. <i>havaasii</i>	DD	Native				>50%	2	0	0	S	Southern edge in Caernarfon (Cwm Dylt & Clogwyn d'ur Arddu; Townsend, 1997; Rothero, 2004)																
NE	DD	<i>Schistidium helveticum</i>	DD	Native					1	1	50	S	Southern edge in Montgomeryshire (Breidden Hill), recently discovered new to the UK in Scotland and too poorly known to evaluate																
NT	NT	<i>Schistidium mantinum</i>	DD	Native					2	2	22	S	Southern edge in Brecknock (Craig Cerrig Gleisiad 1999; Rothero, 2004), although identification questionable (Bosanquet & Mottey, 2008)																
M	<i>Schistidium papillosum</i>	DD	Native																										
M	<i>Schistidium platyphyllum</i>	UV	D2	Native					3	3	14	S	Southern edge in Radnorshire (Rock Dingle & Stannan), where collected in 2008, also found in Montgomeryshire (Breidden Hill) in 2009																
M	<i>Schistidium pruinosum</i>	WL	Native																										
M	<i>Schistidium rivulare</i>	WL	Native																										
M	<i>Schistidium robustum</i>	WL	Native																										
M	<i>Schistidium strictum</i>	WL	Native																										
M	<i>Schistidium trichodon</i>	CR-	B	Native				DD	>50%	1	0	0	S	Southern edge was Caernarfon, now perhaps extinct but downgraded to CR- because of identification difficulties peculiar to <i>Schistidium</i> (Clogwyn du'r Arddu 1907; Hill, 1988)															
M	<i>Schistostega pennata</i>			Native																									
M	<i>Sciuro-hypnum plumosum</i>			Native																									
M	<i>Sciuro-hypnum populeum</i>			Native																									
M	<i>Scleropodium cespitans</i>			Native																									
M	<i>Scleropodium touretii</i>	EN	B	Arch?	S42			3	3	29		At three vulnerable metal-toxic sites in Glamorgan (Llansamlet), Cardiganshire (Pontrhdygroes) and Caernarfon (Abersoch)																	
VU	VU	<i>Scopelephila catarractae</i>	EN	B	Native																								
M	<i>Scorpidium cossonii</i>			Native																									
M	<i>Scorpidium scorpioides</i>			Native																									
M	<i>Scorpiurium circinatum</i>			Native																									
M	<i>Seligeria acutifolia</i>			Native					12	9	23		Reasonably common on upland limestone in south Wales																
VU	VU	<i>Seligeria brevifolia</i>	CR	B	Native			DD	1	1	25	S	Southern edge in Caernarfon (Cwmglas-mawr; Hill 1988) only Welsh site																
VU	NT	<i>Seligeria campylopoda</i>	UV	D2	Native			DD	5	5	71	N	Occasional on upland limestone in Monmouthshire, core of GB population is in Wye Valley (Blockeel et al., 2000) where 6 populations exist in Monmouthshire, there are also 2 outliers in north-west Monmouthshire																
M	<i>Seligeria dominiana</i>			Native																									
NE	VU	<i>Seligeria oelandica</i>	UV	D2	Native			DD	1	1	100	E	Recently found in Brecknock (Craig y Clau NNR 2009), otherwise known in UK only from one site in Fermanagh.																
DD	DD	<i>Seligeria patula</i>	UV	D2	Native			DD	1	1	5		Southern edge in Monmouthshire (Blorene SSS) also in Brecknock (Craig y Clau NNR) but not looked for recently at 2nd Brecknock site (Taren y Esgob 1965; Woods, 2006), probably all <i>S. trifaria</i> is <i>S. patula</i>																
M	<i>Seligeria pusilla</i>			Native																									
M	<i>Seligeria recurvata</i>			Native																									
VU	VU	<i>Sematophyllum demissum</i>	UV	D2	Native			Rare	5	4	100	E	Entire GB population is in north Wales, most populations are small and very vulnerable except for the one at Coed Ganllwyd																
NT	NT	<i>Sematophyllum substrumulosum</i>	UV	D2	Native				2	2	25	N	Northem edge in Pembrokeshire (Amroth & Stackpole), where only 2 Welsh colonies																
VU	VU	<i>Solenostoma caespiticium</i>	EN	A, B	Native				>50%	2	1	8		Records from 1965 & 1972 from Radnorshire are only ones in Wales															
L	<i>Solenostoma confertissimum</i>			RE	Native				>50%	1	0	0	S	Southern edge in Carmarthenshire (Foel Fawr 1965; Bosanquet et al., 2005) where only Welsh site, not refound on several recent visits															
L	<i>Solenostoma gracillimum</i>			Native																									
L	<i>Solenostoma hyalinum</i>			Native																									
L	<i>Solenostoma obovatum</i>			Native																									
L	<i>Solenostoma paroicum</i>			Native																									
L	<i>Solenostoma sphaerocarpum</i>			Native																									
L	<i>Solenostoma subellipticum</i>	UV-	B-	Native					18	10	9		Slightly more widespread than <i>S. acutifolia</i> but often growing with it																

GB Red List 2005		GB Red List 2011		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
Taxon		Criteria		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Wales extent (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
MLH		LC	NT	M	<i>Syntrichia princeps</i>	VU	D2	Native		1	1	5		Only Welsh population on Moel Hebog appears stable (SDSB pers. obs., 2003)											
		M		M	<i>Syntrichia ruralis</i> var. <i>ruraliformis</i>			Native																	
		M		M	<i>Syntrichia ruralis</i>			Native		7	7	4	W	Western edge in Pembrokeshire (Milford Haven)											
		M		M	<i>Syntrichia virens</i>			Native																	
L		L		T	<i>Targionia hypophylla</i>	NT	B	Arch?		17	12	26		Lost from one site in Carmarthenshire and present in tiny quantity at other SWales sites; slightly commoner in east Wales (eg Stanner Rocks); widely scattered in sunny sites on Llyn and Anglesey											
		M		M	<i>Taxiphilum wissgrilli</i>			Native																	
		M		M	<i>Tetraphis pellucida</i>			Native																	
		M		M	<i>Tetraplodon angustatus</i>	RE		Native		>50%	1	0	0	S	Yes	Lost from Caernarfon (Snowdon, 1899; Hill, 1988), now southern edge in Perthshire									
		M		M	<i>Tetraplodon mnioides</i>			Native																	
		M		M	<i>Teurodontium brownianum</i>			Native																	
		M		M	<i>Thamnobryum alopecurum</i>			Native																	
		M		M	<i>Thuidium assimile</i>			Native																	
		M		M	<i>Thuidium delicatulum</i>			Native																	
		M		M	<i>Thuidium recognitum</i>	VU-	B-	Native		6	4	11		On limestone pavement in several places in north-east Wales (Hill, 1988) and at one in Monmouthshire (Great Barnets Woods)											
		M		M	<i>Thuidium tamariscinum</i>			Native																	
LC	VU	N		N	<i>Tomentypnum nitens</i>	NT	B	Native		7	4	5		Southern edge in Cardiganshire (Hen-draws); lost from several north Wales sites (K. Birch pers. comm.)											
		M		M	<i>Tortella bambiperen</i>			Native		21	19	51	S	Southern edge in Monmouthshire (Bosanquet, 2006a), recently recognised in Britain and certainly under-recorded											
		M		M	<i>Tortella densa</i>	VU	D2			1	1	4		Only recorded on Great Orme's Head (Hodgetts, 2003b)											
		M		M	<i>Tortella flavovirens</i>			Native																	
		M		M	<i>Tortella inclinata</i>	NT	B	Native		13	10	29		Lost from several sites in south Wales but still present in Glamorgan (Pennard Burrows), as well as on Anglesey (Tywyn Aberffraw, Newborough, Cors Goch, Hill, 1988) and Meirionydd (Morfa Dyffryn, Morfa Harlech, Hill, 1988)											
		M		M	<i>Tortella nitida</i>			Native																	
		M		M	<i>Tortella tortuosa</i>			Native																	
		M		M	<i>Tortula atrovirens</i>	EN	A, B	Native		31	22	28		Locally common on the Pembrokeshire coast, on Llyn and Anglesey											
		M		M	<i>Tortula canescens</i>	EN	A, B	Native		>50%	6	2	11		One outlier in Kintyre, otherwise northern edge in Monmouthshire (Black Mountains 19th century), no Welsh specimens of <i>T. schimpferi</i> located but presumably still on Roundton Hill										
EN	EN	M		M	<i>Tortula cuneifolia</i>	EN	A, B	Native	S42	>50%	5	2	14	N	Northern edge in Cernarfon (Bardsey), lost from Pembrokeshire & Anglesey, otherwise only extant at one site in Meirionydd (near Harlech)										
		M		M	<i>Tortula lanceola</i>			Native																	
		M		M	<i>Tortula marginata</i>			Native																	
		M		M	<i>Tortula modica</i>			Native																	
		M		M	<i>Tortula muralis</i>			Native																	
		M		M	<i>Tortula probryoides</i>			Native		15	11	6	W	Western edge in Pembrokeshire (Castlemartin Range)											
		M		M	<i>Tortula schimpferi</i>	DD		Native		>50%	1	0	0		No Welsh specimens backs up Monmouthshire record of var. <i>angustata</i> (Black Mountains 19th century), no Welsh specimens of <i>T. schimpferi</i> located by Smith (2008)										
		M		M	<i>Tortula subulata</i>			Native																	
		M		M	<i>Tortula truncata</i>			Native																	
		M		M	<i>Tortula wilsonii</i>	EN	A, B	Native	S42	>50%	18	4	15	N	Dramatic decline, northern limit may now be in Pembrokeshire, where 3 colonies remain, but status in Meirionydd (nr Aberdovey 1974; TBDB) needs to be ascertained										
		L		L	<i>Trichocolea tomentella</i>			Native																	
		M		M	<i>Trichodon cylindricus</i>			Native																	
		M		M	<i>Trichostomum brachydontium</i>			Native																	
		M		M	<i>Trichostomum crispulum</i>			Native																	
		M		M	<i>Trichostomum tenuirostre</i>			Native																	
		L		L	<i>Tritomania exsectiformis</i>			Native		15	9	8	S	Southern edge in Brecknock (Pen y Cae; Woods 2006), apparently lost from Monmouthshire											

Taxon		Wales Red List		Native/alien status		Section 42 Wales		Europe Red List		Significant decline?		Wales hectads (all records)		Welsh extant (post-1970)		Prop (%) of GB population		Edge of GB range?		Disjunct from Scotland?		Comments	
L	<i>Tritomania quinquedentata</i>	Native	Native																				
M	<i>Ulota bruchii</i>	Native	Native																				
M	<i>Ulota calvescens</i>	EN	A, B	Native	>50%	3	1	E		Eastern edge was in Meirionydd, but not recorded there since 1970; only recent record was a casual colony in Pembrokeshire (Lamphey)													
M	<i>Ulota coarctata</i>	RE	Native	RT	>50%	2	0	0		Lost from Meirionydd (3 sites; Hill, 1988)													
M	<i>Ulota crispa</i>	Native																					
M	<i>Ulota drummondii</i>	Native																					
M	<i>Ulota hutchinsiae</i>	EN	A, B	Native	>50%	11	4	2		Southern edge in Cardiganshire (Cwm Mwyo)													
M	<i>Ulota phyllantha</i>	Native	Native							Lost from Carmarthenshire, rare in north Wales (Hill, 1988), perhaps genuinely declining													
M	<i>Warnstorfia fluitans</i>	Native	Native																				
M	<i>Weissia brachycarpa</i> var. <i>brachycarpa</i>	Native																					
M	<i>Weissia brachycarpa</i> var. <i>obliqua</i>	Native	Native																				
M	<i>Weissia controversa</i> var. <i>controversa</i>	Native	Native																				
M	<i>Weissia controversa</i> var. <i>crispata</i>	Native	Native																				
M	<i>Weissia controversa</i> var. <i>densifolia</i>	Native	Native																				
EN	EN	<i>Weissia levetii</i>	EN	B	Native	S42	Rare			2	2	40	N										
M	<i>Weissia longifolia</i> var. <i>angustifolia</i>	Native	Native																				
N	<i>Weissia longifolia</i> var. <i>longifolia</i>	Native	EN			1	1	8	N	Northern edge was Monmouthshire, where last seen in 1981, now restricted to Cornwall													
CR	CR	<i>Weissia multicapsulans</i>	CR	B	Native	Rare				Common on the coast and not threatened at all													
M	<i>Weissia personata</i>	Native	Native																				
M	<i>Weissia rostellata</i>	Native	Native																				
M	<i>Weissia ruticans</i>	Native	Native																				
VU	NT	<i>Weissia squarrosa</i>	VU	D2	Arch?	S42	Rare			4	3	12	W	Western edge in Pembrokeshire (2 sites), largest known GB colony is in Monmouthshire (Bosanquet & Myddfai) & Carmarthenshire (Llechryd 1995) but extant in Gower, where still locally frequent (Bosanquet, 2008a)									
VU	NT	<i>Weissia sterilis</i>	VU	D2	Native	Rare								Western edge in Pembrokeshire (Red Hill & Llys y Fan Reservoir), not seen recently (Llyn Alaw 1988 & Cefn Reservoir 1971) or Cardiganshire (Llechryd 1995) but extant in Carmarthenshire (Glan Myddfai) & Monmouthshire (Dingestow & Wentwood Reservoir)									
M	<i>Zygodon conoideus</i> var. <i>conoideus</i>	Native	Native																				
M	<i>Zygodon rupestris</i>	Native	Native																				
M	<i>Zygodon viridissimus</i> var. <i>stintonii</i>	Native	Native																				
M	<i>Zygodon viridissimus</i> var. <i>viridissimus</i>	Native	Native																				

9. Excluded taxa

Six taxa that are thought to be neophytes in Wales have been excluded from the analysis, as have 19 varieties and four species recognised in the 1998 *Census Catalogue* but excluded from the 2008 equivalent. They are all given the IUCN category of Not Applicable (NA) for the purpose of this study. Several of the varieties would qualify as threatened if they were shown to be taxonomically valid because of declines (4 taxa), apparent regional extinction (7 taxa), or restricted ranges (2 taxa); they are marked * below. In some cases the apparent extinction is because recent recorders have ignored the taxon, but some of them are likely to be genuinely rare. Two of the neophytes, marked # below, are rare in Wales and would qualify as Vulnerable if proven to be native.

Taxon	Wales Red Data List	Reason(s) for exclusion
<i>Atrichum crispum</i>	NA	Neophyte
<i>Campylopus introflexus</i>	NA	Neophyte
<i>Didymodon umbrosus</i> #	NA	Neophyte
<i>Hennediella stanfordensis</i>	NA	Neophyte
<i>Lophocolea semiteres</i> #	NA	Neophyte
<i>Orthodontium lineare</i>	NA	Neophyte
<i>Bryum capillare</i> var. <i>rufifolium</i> *	NA	Synonymous with var. <i>capillare</i>
<i>Bryum neodamense</i> *	NA	Synonymous with <i>B. pseudotriquetrum</i>
<i>Campylopus atrovirens</i> var. <i>gracilis</i> *	NA	Synonymous with var. <i>atrovirens</i>
<i>Campylopus pyriformis</i> var. <i>azoricus</i>	NA	Synonymous with var. <i>pyriformis</i>
<i>Ctenidium molluscum</i> var. <i>fastigiatum</i> *	NA	Synonymous with var. <i>molluscum</i>
<i>Ditrichum zonatum</i> var. <i>scabrifolium</i>	NA	Synonymous with var. <i>zonatum</i>
<i>Fissidens exiguus</i> *	NA	Synonymous with <i>F. pusillus</i>
<i>Fontinalis antipyretica</i> var. <i>gigantea</i>	NA	Synonymous with var. <i>antipyretica</i>
<i>Fontinalis squamosa</i> var. <i>dixonii</i> *	NA	Synonymous with var. <i>squamosa</i>
<i>Fossombronia caespitiformis</i> s.str.*	NA	<i>F. husnotii</i> now synonymous with <i>F. caespitiformis</i> so latter is not threatened
<i>Grimmia pulvinata</i> var. <i>africana</i> *	NA	Synonymous with var. <i>pulvinata</i>
<i>Hygrohypnum luridum</i> var. <i>subsphaericarpon</i> *	NA	Synonymous with var. <i>luridum</i>
<i>Hypnum lacunosum</i> var. <i>tectorum</i>	NA	Synonymous with <i>H. cupressiforme</i>
<i>Orthotrichum cupulatum</i> var. <i>riparium</i>	NA	Synonymous with var. <i>cupulatum</i>
<i>Plagiothecium ruthei</i>	NA	Synonymous with <i>P. denticulatum</i>
<i>Polytrichum commune</i> var. <i>humile</i> *	NA	Synonymous with var. <i>perigoniale</i>
<i>Pterigynandrum filiforme</i> var. <i>majus</i> *	NA	Synonymous with var. <i>filiforme</i>
<i>Schistidium elegantulum</i> subsp. <i>wilsonii</i>	NA	Synonymous with var. <i>elegantulum</i>
<i>Tortella flavovirens</i> var. <i>glareicola</i>	NA	Synonymous with var. <i>flavovirens</i>
<i>Tortula muralis</i> var. <i>aestiva</i>	NA	Synonymous with var. <i>muralis</i>
<i>Tortula subulata</i> var. <i>graeffii</i>	NA	Synonymous with var. <i>subulata</i>
<i>Tortula subulata</i> var. <i>subinermis</i> *	NA	Synonymous with var. <i>subulata</i>
<i>Trichostomum tenuirostre</i> var. <i>holtii</i> *	NA	Synonymous with var. <i>tenuirostre</i>

10. Acknowledgements

Thanks go to the British Bryological Society vice-county recorders: 35 & 45 Sam Bosanquet; 41 Roy Perry; 42 & 43 Ray Woods; 44 Graham Motley; 46 Alan Hale; 47-52 Tim Blackstock. Records from all of them, as well as other active Welsh recorders, helped in the development of this Red Data List. Chris Preston at the Biological Records Centre (BRC) supplied hectad counts for Wales almost as soon as requested and modified these counts where necessary to take account of taxonomic splits and other changes. Mark Hill at BRC has been critically checking records for many years and was instrumental in documenting the rich bryophyte flora of north Wales.

11. References

- Bates, J.W., Matcham, H.W. & Lara, F. (2007), *Dalytrichia fragilifolia* (Bryopsida: Pottiaceae) in Berkshire and Caernarvonshire, new to Britain. *J. Bryol.* **29**: 228–234.
- Blackstock, T.H. & Bosanquet, S.D.S. (2004), *Phaeoceros* sex forms in the BBS herbarium. *Field Bryology* **84**: 9–13.
- Blackstock, T.H. & Holyoak, D.T. (2004), *Amblystegium radicale* in England and Wales: an update. *Field Bryology* **82**: 6–8.
- Blockeel T.L. & Long D.G. (1998) *A Check-list and Census Catalogue of British and Irish Bryophytes*. British Bryological Society, Cardiff.
- Blockeel, T.L., Ochyra, R. & Gos, L. (2000), *Seligeria campylopoda* Kindb. in the British Isles. *J. Bryol.* **22**: 29–33.
- Blom, H.H. (1996), A revision of the *Schistidium apocarpum* complex in Norway and Sweden. *Bryophytorum Bibliotheca* **49**. J. Cramer, Berlin & Stuttgart.
- Bosanquet, S.D.S. (2003), *Monmouthshire Register of Rare Bryophytes*. Privately published, Haverfordwest.
- Bosanquet, S.D.S. (2006a), *Tortella bambergeri* (Schimp.) Broth. in the British Isles. *J. Bryol.* **28**: 5–10.
- Bosanquet, S.D.S. (2006b), *Amblystegium radicale* in reed-beds in south Wales. *Field Bryology* **89**: 3–6.
- Bosanquet, S.D.S. (2008a), *A survey and condition assessment of the bryophytes of Rhossili to Port Eynon Point SSSI, Gower, Glamorgan*. CCW report, Pembroke Dock.
- Bosanquet, S.D.S. (2008b), Red Data Book bryophytes on the south Wales limestone coast. *Field Bryology* **95**: 2–7.
- Bosanquet, S.D.S. (2010), *The Mosses and Liverworts of Pembrokeshire*. Privately published, Dingestow.
- Bosanquet, S.D.S., Graham, J.J. & Motley, G.S. (2005) *The Mosses and Liverworts of Carmarthenshire*. Privately published, Dingestow.
- Bosanquet, S.D.S., Hale, A.D., Motley, G.S. & Woods, R.G. (2006), Recent work on *Hamatocaulis vernicosus* in mid and south Wales. *Field Bryology* **90**: 2–8.
- Bosanquet, S.D.S. & Motley, G.S. (2005), A fairly predictable locus for *Cephalozia pleniceps* in south Wales. *Field Bryology* **85**: 6–7.

Bosanquet, S.D.S. & Motley, G.S. (2008), *The bryophytes of upland sandstone cliffs in the Western and Central Brecon Beacons National Park, Wales*. CCW Staff Science Report.

Bosanquet, S.D.S. & Preston, C.D. (2005), *Weissia squarrosa* in Britain: a re-evaluation of its identification and ecology in the light of recent records. *Field Bryology* **86**: 2–13.

Callaghan, D.A. (2006), *Hedwigia ciliata* var. *leucophaea* new to England and Wales (the first British records for over 100 years). *Field Bryology* **90**: 8–11.

Church, J.M., Hodgetts, N.G., Preston, C.D. & Stewart, N.F. (2001), *British Red Data Books, mosses and liverworts*. JNCC, Peterborough.

Crundwell, A.C. & Smith, A.J.E. (2000), *Heterocladium wulfsbergii* I. Hagen in the British Isles. *J. Bryol.* **22**: 43–47.

Dines, T.D. (2008), *A Vascular Plant Red Data List for Wales*. Plantlife, Salisbury.

European Committee for Conservation of Bryophytes (1995), *Red Data Book of European Bryophytes*.

Hale, A.D. (1998), *A Register of Rare Bryophytes in Ceredigion*. CCW, Aberystwyth.

Hill, M.O. (1988), A bryophyte flora of North Wales. *J. Bryol.* **15**: 377–491.

Hill, M.O., Blackstock, T.H., Long, D.G. & Rothero, G.P. (2008), *A Checklist and Census Catalogue of British and Irish Bryophytes*. British Bryological Society, Middlewich.

Hill, M.O. & Preston, C.D. (1998), The geographical relationships of British and Irish bryophytes. *J. Bryol.* **20** 127–226.

Hill, M.O., Preston, C.D., Bosanquet, S.D.S. & Roy, D.B. (2007), *BRYOATT Attributes of British and Irish Mosses, Liverworts and Hornworts*. NERC Centre for Ecology and Hydrology, Monks Wood.

Hill, M.O., Preston, C.D. & Smith, A.J.E. (1991–94) *Atlas of the Bryophytes of Britain and Ireland*. Harley Books, Colchester.

Hodgetts, N.G. (2003a), The threatened bryophyte database. *Bull. Brit. Bryol. Soc.* **80**: 52–59.

Hodgetts, N.G. (2003b), *Bryophyte survey of Pen y Gogarth/Great Ormes Head SSSI*. CCW contract no. CCW/NEA/1.

Hodgetts, N.G. (unpublished), *Final bryophyte Red List, August 2005*. Circulated to BBS committee members.

Hodgetts, N.G. (2011), A revised Red List of bryophytes in Britain. *Field Bryology* **103**: 40–49.

Holyoak, D.T. (2001a), *Tiny fern-moss Fissidens exiguus report to Plantlife on work carried out during 2000*. Report number 181. Plantlife, Salisbury.

- Holyoak, D.T. (2001b), *Coastal mosses in the genus Bryum report to Plantlife on work carried out in Wales during 2001*. Report number 203. Plantlife, Salisbury.
- Holyoak, D.T. (2002), *Petalwort Petalophyllum ralfsii report to Plantlife on work carried out in England and Wales during 2001 and 2002*. Report number 202. Plantlife, Salisbury.
- Holyoak, D.T. (2003), A taxonomic review of some British coastal species of the *Bryum bicolor* complex, with a description of *Bryum dyffrynense* sp. nov. *J. Bryol.* **25**: 107–113.
- Holyoak, D.T. (2010), Notes on taxonomy of some European species of *Ephemerum* (Bryopsida: Pottiaceae). *J. Bryol.* **32**: 122–132.
- Holyoak, D.T. & Hedenäs, L. (2006), Morphological, ecological and molecular studies of the intergrading taxa *Bryum neodamense* and *B. pseudotriquetrum* (Bryopsida: Bryaceae). *J. Bryol.* **28**: 299–311.
- IUCN (2001), *IUCN Red Data List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland & Cambridge, UK.
- Jones, P.S., Turner, A.J., Bosanquet, S.D.S. & Blackstock, T.H. (2006), *Sphagnum riparium* discovered in Wales. *Field Bryology* **89**: 2–3.
- Long, D.G. (2008), *Grimmia* updates. *Field Bryology* **95**: 16–20.
- Motley, G.S. & Bosanquet, S.D.S. (2005), Recent bryophyte records from water bodies in south Wales. *Field Bryology* **87**: 2–5.
- Newton, M.E. (2004), *Meirionydd Oakwoods: Bryophyte Survey*. Report to the Countryside Council for Wales.
- Perry, A.R. (1994), Mosses, Liverworts and Hornworts, in Wade, A.E., Kay, Q.O.N. & Ellis, R.G., *Flora of Glamorgan*. HMSO, London.
- Porley, R.D. & Matcham, H.W. (2003), The status of *Orthodontium gracile* in Britain and Ireland. *J. Bryol.* **25**: 64–66.
- Preston, C.D., Hill, M.O., Bosanquet, S.D.S., Ames, S.L. (2009). Progress towards a new Atlas of Bryophytes. *Field Bryology* **98**: 14–20.
- Rothero, G.P. (2004), Distribution of taxa within the *Schistidium apocarpum* complex in the British Isles. *Field Bryology* **84**: 2–6.
- Rothero, G.P., Duckett, J.G. & Pressel, S. (2006), Active conservation: augmenting the only British population of *Bryum schleicheri* var. *latifolium* via *in vitro* cultivation. *Field Bryology* **90**: 12–16.
- Smith, A.J.E. (1964a), A bryophyte flora of Glamorgan. *Trans. Brit. Bryol. Soc.* **4**: 539–596.
- Smith, A.J.E. (2004). *The Moss Flora of Britain and Ireland*. Cambridge University Press, Cambridge.

Smith, A.J.E. (2008), *Tortula schimperi* in England. *Field Bryology* **94**: 21–22.

Townsend, C.C. (1997), *Schistidium flaccidum* (De Not.) Ochyra in Wales, new to Britain. *J. Bryol.* **19**: 815–817.

Woods, R.G. (1993), *Flora of Radnorshire*. National Museum of Wales, Cardiff & Bentham-Moxon Trust, Kew.

Woods, R.G. (2006), *The Mosses and Liverworts of Brecknock*. Privately published, Llandrindod Wells.



Plantlife Cymru
Uned 14, Llys Castan
Ffordd Y Parc
Parc Menai
Bangor
Gwynedd
LL57 4FD
Tel/ffôn: 01248 670691
E-mail/e-bostiwch: trevor.dines@plantlife.org.uk

www.plantlife.org.uk

Speaking up for the nation's wild plants

Plantlife International - The Wild Plant Conservation Charity is a charitable company limited by guarantee.

Registered in England and Wales, Charity Number: 1059559

Registered in Scotland, Charity Number: SC038951

Registered Company Number: 3166339. Registered in England and Wales