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A review of non-vascular plant and fungal SSSI features in Wales - Lichens



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Natural Resources Wales

Evidence Report No 369

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1. Crynodeb Gweithredol

Mae fflora cennau Cymru'n cynrychioli mwy na 70% o gyfanswm Prydain, gyda mwy na 1300 o rywogaethau wedi'u cofnodi ledled y wlad. Mae'r adroddiad hwn yn gwerthuso 14 casgliad o gennau a mwy na 200 o rywogaethau cen sydd ar y Rhestr Goch, ac yn nodi pa gasgliadau a rhywogaethau sy'n gymwys fel nodweddion SoDdGA gan ddefnyddio'r cyhoeddiad diwygiedig o 2018, *Guidelines for Selection of Biological SSSIs: Lichens and associated microfungi*.

Mae gan gyfanswm o 109 SoDdGA ledled Cymru o leiaf un nodwedd cen sy'n gymwys i'w dewis, ac mae gan 68 (62%) ohonynt o leiaf un o'r nodweddion cymwys hynny a restrir fel rhai 'dynodedig' yng Nghronfa Ddata Nodweddion CNC. Mae gan lawer o safleoedd nifer o nodweddion cymwys, ac mae gan SoDdGA helaeth Eryri chwe chasgliad cen sy'n nodweddion cymwys a 45 o rywogaethau cen sy'n nodweddion cymwys. Mynegai'r Coetiroedd Cefnforol Deheuol (SOWI) yw'r nodwedd a gynrychiolir amlaf yng Nghymru o ran casgliadau, gyda chasgliadau cymwys mewn 33 SoDdGA presennol, tra bod gan Fynegai Coedwigoedd Glaw yr Ucheldir (URI) gasgliadau cymwys ar 28 SoDdGA. Nodwyd bod *Teloschistes flavicans* yn gymwys ar 12 SoDdGA a *Lobaria pulmonaria* ar ddeg, ac mae cynrychiolaeth dda hefyd o ran rhywogaethau fel *Fuscopannaria mediterranea* sydd â chyfran sylweddol o'i safleoedd ym Mhrydain Fawr yng Nghymru. Mae llawer o gennau sydd ar y Rhestr Goch wedi'u cyfyngu i nifer fach iawn o safleoedd SoDdGA, gyda chyfran sylweddol i'w cael ar un safle yn unig yn ôl yr hyn a wyddwn ar hyn o bryd, sy'n golygu bod eu cydnabod fel nodweddion cymwys yn arbennig o bwysig.

Mae'n amlwg bod gwaith dynodi nodweddion cen wedi bod yn ganlyniad i hap a damwain ac ymwybyddiaeth swyddogion, er bod nifer fwy o safleoedd cen pwysig

wedi'u dynodi'n swyddogol na safleoedd bryoffytau. Mae ychwanegu nodweddion cen at safleoedd SoDdGA presennol yn cael ei gymhlethu gan weithdrefnau ailddynodi statudol hirwyntog, ond mae'r adroddiad presennol o leiaf yn nodi pa nodweddion sy'n gymwys ac y dylid eu dynodi os yw'n bosibl.

Er mwyn sicrhau bod rhywogaethau cen sydd ar y Rhestr Goch a chasgliadau cen pwysig yn cael eu diogelu'n ddigonol, mae angen rhai safleoedd SoDdGA ychwanegol, ynghyd ag o leiaf dri estyniad i safleoedd SoDdGA presennol. Mae'r rhan fwyaf o'r safleoedd cymwys a nodwyd yn ystod yr astudiaeth gyfredol yn fwyngloddiau metel yn Ardal Chwilio Ceredigion, y mae rhai ohonynt yn sgorio'n fwy na'r SoDdGAau presennol mewn mwyngloddiau yn yr Ardal Chwilio honno. Mae sawl safle SOWI pwysig ychwanegol, gan gynnwys yn Ardal Chwilio Sir Drefaldwyn ac Ardal Chwilio Caerfyrddin a Dinefwr, ynghyd â safleoedd AQUI a Chasgliadau Calchfaen unigol. Ychydig o ddynodiadau ar gyfer rhywogaethau unigol sy'n cael eu hargymell, ond mae poblogaeth *Pseudocyphellaria norvegica* yng Ngheunant Mawr yn cyfiawnhau statws SoDdGA oherwydd presenoldeb y rhywogaeth honno yn unig.

2. Executive Summary

The lichen flora of Wales represents more than 70% of the British total, with more than 1300 recorded Welsh lichen species. This report evaluates 14 assemblages of lichens and more than 200 Red Listed lichen species, and identifies which assemblages and species qualify as SSSI features using the revised 2018 *Guidelines for Selection of Biological SSSIs: Lichens and associated microfungi*.

A total of 109 SSSI across Wales have at least one lichen feature that qualifies for selection, of which 68 (62%) have at least one of those qualifying features listed as 'notified' in the NRW Features Database. Many sites have multiple qualifying features, and the extensive Eryri SSSI has six qualifying lichen assemblage features and an astonishing 45 qualifying lichen species features. The Southern Oceanic Woodland Index (SOWI) is the most frequently represented assemblage feature in Wales, with qualifying assemblages in 33 current SSSI, whilst the Upland Rainforest Index (URI) has qualifying assemblages on 28 SSSI. *Teloschistes flavicans* has been identified as qualifying on 12 SSSI and *Lobaria pulmonaria* on ten, and there is also good representation of species such as *Fuscopannaria mediterranea* that has a substantial proportion of its GB sites in Wales. Many Red Listed lichens are restricted to a very small number of SSSI, with a substantial proportion currently known from just a single site, making recognition of them as qualifying features especially important.

Notification of lichen features has clearly been the result of happenstance and officer awareness, although a larger number of important lichen sites have been officially notified than is the case for bryophytes. Adding lichen features to existing SSSIs is complicated by lengthy statutory renotification procedures, but the current report at least sets out which features qualify and should be notified if possible.

To ensure adequate protection of Red Listed lichen species and important lichen assemblages, some additional SSSI are needed, along with at least three extensions to existing SSSI. The great majority of qualifying sites identified during the current study are metal mines in Ceredigion Area of Search, some of which score more highly than existing mine SSSI in that AoS. There are several additional important SOWI sites, including in Montgomeryshire AoS and Carmarthen & Dinefwr AoS, along with single AQUI and Limestone Assemblage sites. Few notifications for single species are recommended, but the population of *Pseudocyphellaria norvegica* in Ceunant Mawr warrants SSSI status just for that species.

3. Background and definitions

3.1. Background

Wales has an exceptionally diverse lichen flora, with more than 1300 recorded lichen species (Woods, 2010), representing more than 70% of the British total. Sites of national importance for lichens have been notified as SSSI since 1992, when guidelines for selecting SSSI for 'lower plants and fungi' were published (Hodgetts, 1992), although many of our most important sites predate the 1992 guidelines. The Natural Resources Wales *Features Database* lists 92 SSSI as having qualifying lichen features, although only 77 of these have these features officially notified.

There are three principal types of SSSI lichen feature in the *Features Database*: independently qualifying species, assemblages of Nationally Rare and Scarce species, and woodland lichen assemblages assessed using Indices of Ecological Continuity. The 1992 *Guidelines* gave criteria for selection of individual Red List species, with the rarity status Nationally Rare being confounded at the time with the Red List threat statuses, and also allowed selection of sites that support species which are protected under Schedule 8 of the Wildlife and Countryside Act. Assemblages were assessed by adding together scores for all of the Nationally Rare and Nationally Scarce species on a site, along with those with an Atlantic or Western distribution in Britain; the threshold for selection as a SSSI feature varied across Britain, as did the score for Nationally Scarce species. The woodland indices had been developed over several decades by the British Lichen Society (Rose, 1976; Coppins & Coppins, 2002) as a way of providing consistent assessment of a site's importance, with the indices being primarily composed of species considered to indicate a long history of tree cover. They were difficult to understand, however, with some being expressed as

percentages of a theoretical maximum rather than as a straight score, and with 'bonus species' scoring separately.

The 'lower plants' chapter of the *Guidelines for Selection of Biological SSSIs* was revised in 2017, leading to the publication of three separate chapters covering bryophytes, lichenised and lichenicolous fungi, and non-lichenised fungi. The lichen chapter (Sanderson *et al.*, 2018) uses similar criteria to those employed in 1992, but has a range of additional indices to allow selection of non-woodland lichens, uses habitat-specific TNTN (Threatened, Near Threatened and Notable) in place of Nationally Rare & Scarce species assemblages, and removes criteria for individual selection of Nationally Rare species unless they are listed as CR, EN or VU in the British Red List (Woods & Coppins, 2012).

3.2. Aims

The current report has six aims:

- to review SSSI lichen assemblage features in Wales in the light of the revised guidelines, identifying the most important sites for each assemblage in Wales and in each Area of Search;
- to review independently qualifying lichen species features to take account of both the GB and Welsh Red Lists;
- to identify SSSI that have notified lichen features that no longer qualify;
- to identify SSSI that have qualifying lichen features which are not notified;
- to identify sites that are not currently SSSI which would qualify for selection;
- to assign SSSI Guidelines paragraph references to as many features as possible (see Appendix 2 for cross-tabulation).

3.3. Definitions

Most of the terms in this review are in common use, but some may be unfamiliar; the following definitions come from Sanderson *et al.* (2018):

- Areas of Search are the areas of Britain within which sites are compared to identify important examples of habitats or species. There are 12 in Wales: Brecknock, Carmarthen & Dinefwr, Ceredigion, Clwyd, East Gwynedd, Gwent, Mid & South Glamorgan, Montgomeryshire, Preseli & South Pembroke, Radnorshire, West Glamorgan & Llanelli, and West Gwynedd.
- Ecologically coherent assemblages are groups of species that grow together in particular habitats, for example bryophytes that grow in sand dunes, wetland birds, or insects that are found primarily in parkland/wood pasture. Some species may be found in more than one habitat and may therefore be constituents of more than one assemblage.
- International Responsibility (IR) species are listed in the current GB Red List. Following Woods and Coppins (2012), the following definition of IR was used in Sanderson *et al.* (2018): Britain probably has more than 10% of the extant European and/or world population. Endemic species are considered to be a subset of IR and have been treated in the same way for site selection.
- TNTN (Threatened, Near Threatened and Notable) is a system devised by Neil Sanderson to identify lichen assemblages that are rich in uncommon lichens but where there has been insufficient work to formulate an Index. It is a weighted system that scores more for Threatened species than for those which are Nationally Scarce, and it deliberately excludes taxa that are

considered by experts to be under-recorded. TNTN assemblages are scored separately, habitat by habitat, and assessed against thresholds.

- Woodland Indices have been revised by Sanderson *et al.* (2018) to replace the original Indices of Ecological Continuity used by Hodgetts (1992). SOWI (Southern Oceanic Woodland Index) replaces the New Index of Ecological Continuity (NIEC) and URI (Upland Rainforest Index replaces the Euro-Oceanic Index of Ecological Continuity (EUOIEC). The East Scottish Index of Ecological Continuity, which was recommended for use in parts of eastern Wales by Hodgetts (1992), has been replaced by the SWI (Suboceanic Woodland Index), but the SWI is not supposed to be used in Wales. The Boreal Woodland Index (BWI) and Lowland Rainforest Index (LRI) are considered by Sanderson *et al.* (2018) to be inappropriate for use in Wales and are not considered here.

In each assemblage assessment table, species are scored if they have been recorded within the SSSI/site within the last 50 years, following Sanderson *et al.* (2018, paragraph 3.1.2). Older records, or those known to be extinct on a site, are shown with the score in brackets, and are not included in the assemblage total.

3.4. Acknowledgements

Brian Coppins very kindly looked through the species accounts and highlighted various taxonomic changes, record locations etc. Graham Motley – NRW's most experienced lichenologist – peer reviewed the report and his comments led to several improvements to the text and layout of the report. Any errors that remain are my own though.

4. Assemblage features

4.1. Internationally important lichen assemblages

Three British lichen assemblages are considered outstandingly rich and important in a European context. This is partly associated with our oceanic climate, but also results from the extent of semi-natural habitat with relatively clean unpolluted air, and significant numbers of old trees in parkland and old growth pasture woodland. Wales holds a large number of sites for two internationally important woodland lichen assemblages, but is outside the core range of the internationally important montane rock/soil assemblage in north-western Scotland (Sanderson *et al.*, 2018) although some of its constituent species are found in Eryri.

4.1.1. Temperate rainforest

Wales holds many rich sites for temperate rainforest lichens, especially in Meirionnydd, although most lack the diversity and abundance of lichens in the core rainforest area of north-western Scotland (Coppins & Coppins, 2012). The combined effects of habitat loss and air pollution have fragmented the Celtic Rainforest, and Invasive Non-native Species dominate some areas (Celtic Rainforest Wales, 2019), but the remaining sites continue to be of international significance. Sites are assessed primarily using the Upland Rainforest Index (see 4.2.7), as the *Parmelion laevigatae* is the main rainforest community in Wales. Some Lowland Rainforest Index (LRI) species occur in Wales but are not considered part of qualifying assemblage features: Sanderson *et al.* (2018) say “the assemblage occurs in a reduced form eastwards into the Scottish Highlands, in North Wales and the Lake District, but other indexes are more effective in these areas.”

4.1.2. Hyperoceanic acid montane rock/soil

Sanderson *et al.* (2018) identify the north-west highlands of Scotland as supporting a “lichen assemblage of hyperoceanic acid montane rock is unique in Europe and probably the world”. This assemblage is characterised by Orange (2009) and is assessed using the TNTN Montane Acid Rock score (see 4.3.1). Although the assemblage is found primarily in Scotland, 31 of the 213 scoring TNTN species have been found in Eryri SSSI, with smaller numbers elsewhere in upland Wales.

4.1.3. Southern oceanic woodland assemblage

Wales is one of the key areas of Britain for internationally important lichen assemblages of old growth woodland and wood pasture. Internationally important sites include both woodland, for example in Cwm Gwaun and Dyffryn Ffestiniog, and parkland, as at Dinefwr and Gregynog. Many of the best sites, such as Ganllwyd SSSI and Parc Nannau SSSI, include parkland, wood pasture and closed canopy woodland. Lichen communities are more varied than in temperate rainforest and include not only base-rich bark (*Lobarion pulmonariae* and *Agonimion octosporae*), acid bark (*Parmelion laevigatae*) and smooth mesic bark (*Graphidetum scriptae* and *Pyrenuletum chlorospilae*), but also those found on rough mesic bark (*Pertusarietum amarae*), dry bark and lignum on veteran and dead trees (*Lecanactidetum premneae*, *Calicietum hyperelli* and *Calicietum abietinae*) and wound-tracks (*Gyalectinetum carneoluteae*). Evaluation primarily uses SOWI, but URI is also relevant.

4.2. Lichen Indices

Indices are lists of characteristic species of a particular habitat, which have been developed by lichen experts to assess lichen diversity within that habitat in a more refined way than examination of a complete site inventory. Some of the lichen indices

presented in the *Guidelines* (Sanderson *et al.*, 2018) have been developed over many years, and there is strong consensus over what score indicates a nationally or internationally important assemblage, a few are more recent. Most of the Indices have been used to assess lichen assemblages in Wales, but it is clear from the *Guidelines* that the Boreal Woodland Index (BWI), Lowland Rainforest Index (LRI) and Sub-oceanic Woodland Index (SWI) only apply to Scotland.

4.2.1. Pinhead Index

The majority of pinhead lichens grow on sheltered, base-poor lignum or in deep bark crevices, away from rainfall. A small number are widespread and frequent, but many are scarce, especially in the wetter western parts of Britain. Ancient trees are essential for a rich Pinhead assemblage, and many sites with high SOWI scores support only a relatively small number of Pinhead lichens. More than 30 SSSI support at least one Pinhead lichen, but only 11 sites hold five or more species, and just five SSSI pass the selection threshold of **ten species** (Table 1). Two of these are parklands with exceptional numbers of ancient trees, and the other three are ancient wood pasture sites in Cwm Elan. It is notable that most of the top 10 sites are in the southern and eastern half of Wales, rather than in the SOWI hotspots of Meirionnydd, Pembrokeshire and Ceredigion.

Table 1: Pinhead Lichen scores for the top 12 scoring sites in Wales; another 13 SSSI hold 3 or fewer members of the assemblage. See Appendix Table A1 for full lists of species.

SSSI	Area of Search	Score
Gregynog SSSI	Montgomeryshire	16 qualifies
Carn Gafallt SSSI	Brecknock + Radnor	14 qualifies
Dinefwr Estate SSSI	Carmarthen & Dinefwr	13 qualifies
Caban Lakeside Woodlands SSSI	Radnor	11 qualifies
Elenydd SSSI	Brecknock + Ceredigion + Radnor	10 qualifies
Allt-y-gest SSSI	Brecknock	9
Parc Nannau SSSI	East Gwynedd	8
Coedydd Glannau a Cwm Coel SSSI	Radnor	8
Cwm Doethie - Mynydd Mallaen SSSI	Carmarthen & Dinefwr	8
Coedydd De Dyffryn Maentwrog SSSI	East Gwynedd	7
Coed Copi'r Graig SSSI	Montgomeryshire	5
Coed Ty-canol (Ty-canol Wood) SSSI	Preseli & South Pembrokeshire	5
Nannerth Fawr	Radnor	5



Figure 1: typical Pinhead lichen habitat – ancient oaks with deep bark crevices at Dinefwr SSSI, the left tree supports *Microcalicium ahlneri* (from Sanderson, 2014a)



Figure 2: *Chaenotheca brunneola* in Coedydd Llawr-y-glyn SSSI (Sam Bosanquet).

4.2.2. Heathland, Moorland and Coastal Heath Index (HMCHI)

This index began as a way of assessing the lichen interest of heathland in southern England, but was expanded by Sanderson *et al.* (2018) to cover lowland heathland throughout Britain as well as moorland. The index score is calculated by adding the number of recorded taxa in the genera *Alectoria*, *Bryoria*, *Cetraria*, *Cladonia*, *Heterodermia*, *Icmadophila*, *Pycnothelia*, *Teloschistes* and *Thamnolia*, plus six additional species, and comparing this total to a **threshold of 20**. The index was designed for assessing sites of “about 100ha”, but there are no lichen surveys of heathlands of this size in Wales. NBN searches reveal scores of 44 for Eryri SSSI (20,341 ha), 40 for Elenydd SSSI (22,598 ha) and 32 for Black Mountains SSSI (7,922 ha) and 29 for the rather smaller Marcheini Uplands, Gilfach Farm & Gamallt SSSI (810 ha).

An additional problem is that some species of *Cladonia* do not grow in a heathland context, so records of *C. caespiticia* and *C. parasitica* from a SSSI that holds patches of ancient woodland would score on the HMCHI unless deliberately excluded. Carn Ingli SSSI, which is 429ha in extent, has an index score of 30, and supports the rare species *Cladonia peziziformis* is probably the closest thing that we have in Wales to an accurately assessed heathland lichen site. At present, however, no SSSI in Wales should be recognised as having a qualifying HMCHI assemblage without specific, targeted survey. Given the inclusion of *Alectoria*, *Flavocetraria* and *Thamnolia* in the index, assessment of 100 ha areas of large, upland sites such as Eryri SSSI and Rhinog SSSI should be carried out as well as lichen surveys in smaller, more discrete lowland heaths.

4.2.3. Maritime Rock and Coastal Slope Index

Many British lichens are restricted to coastal habitats (Fletcher, 2001), and the Welsh coast is an important area for lichen conservation. Three of the famous islands of west Wales – Ynys Enlli, Skomer and Skokholm – have well-recorded, notified lichen assemblage features, whilst other coastal sites hold notable species and a few have qualifying assemblage (Table 2) as they exceed the threshold of **35** used in the more lichen-rich coastal areas of Wales. Although some coastal lichens are large and distinctive, including the flagship species *Teloschistes flavicans* (Fig. 3), many are small and have exacting habitat requirements. Recent work in mainland Pembrokeshire (Hudson, 2020) showed some mainland sites come close to qualifying, even without including small species that are hard to identify (Jon Hudson, pers. comm.). The St David's Peninsula Coast SSSI does reach the 35 point threshold but only when three discrete areas, totalling over the 5km length for which the index was designed, are scored together. Nevertheless, smaller species were not included in the survey and it is likely that most if not all of the three discrete subsites would qualify if surveyed again. A survey in Ceredigion (Lamacraft & Chambers, 2021) indicated qualifying assemblages can be found even where prominent rarities such as *Teloschistes* and *Roccella* are absent. Additional work is needed on Llŷn and Ynys Môn and is being commissioned in 2022.



Figure 3: *Teloschistes flavicans* is a flagship coastal lichen (Sam Bosanquet).

Table 2: Maritime Rock and Coastal Slope Lichen scores for 16 key coastal sites in Wales. See Appendix Table A2 for full lists of species.

SSSI	Area of Search	Score
Ynys Enlli SSSI	West Gwynedd	48 qualifies
Skomer Island and Middleholm SSSI	Preseli & South Pembrokeshire	48 qualifies
Skokholm SSSI	Preseli & South Pembrokeshire	42 qualifies
Glannau Aberdaron SSSI	West Gwynedd	38 qualifies
St David's Peninsula Coast SSSI	Preseli & South Pembrokeshire	37 qualifies, length >5km but more survey needed
Aberarth - Carreg Wylan SSSI	Ceredigion	35 qualifies
Ramsey/Ynys Dewi SSSI	Preseli & South Pembrokeshire	31 more survey needed
Dale and South Marloes Coast SSSI	Preseli & South Pembrokeshire	31 more survey needed
Strumble head - Llechdafad Cliffs SSSI	Preseli & South Pembrokeshire	28 more survey needed
Castlemartin Range SSSI	Preseli & South Pembrokeshire	21
Mynydd Penarfynydd SSSI	West Gwynedd	19 more survey needed
Glannau Rhoscolyn SSSI	West Gwynedd	15 more survey needed
Stackpole SSSI	Preseli & South Pembrokeshire	12
Porth Ceiriog, Porth Neigwl ac Ynysoedd Sant Tudwal SSSI	West Gwynedd	11 more survey needed
Glannau Ynys Gybi / Holy Island Coast SSSI	West Gwynedd	10 more survey needed
Cemlyn Bay	West Gwynedd	7

4.2.4. Acid Watercourses Quality Index

Lichens and bryophytes play important roles in riverine ecosystems, especially in terms of sediment trapping, erosion control and niche provision for invertebrates. A diverse assemblage of lichens has evolved to live in this dynamic environment, and some Welsh rivers such as the Wye and Usk have very well-defined zonation that depend on inundation frequency as well as flow velocity. Riverine lichens are well represented on watercourses in Wales, but survey coverage is very patchy: the Conwy, Usk and Wye are well surveyed, but the Teifi only has information for a few hotspots and the Dee appears to be lichenologically unknown. Some larger upland SSSI hold many small watercourses with notable aquatic lichens, and detailed surveys in both Eryri SSSI (Orange, 2017) and the more lowland Dyffrynnoedd Nedd a Mellte SSSI (Douglass, 2018) show remarkably little overlap between rivers in terms of representation of the rarer aquatic lichen species.



Figure 4: *Bryobilimbia ahlesii* with *Verrucaria aquatilis* on the Nedd Fechan (from Douglass, 2018).

Threats to aquatic lichens include flow regulation, either through reservoir impoundment or Hydropower abstraction, increased siltation, and eutrophication. The majority of the rivers that pass the **SSSI selection threshold of 11** are in upland or upland-edge Wales, with limited eutrophication and siltation pressures, although significant parts of the Teifi, Usk and Wye are surrounded by intensive agriculture. Acid rain was a very significant pressure in the 20th century and its effects continue to be felt; the concentration of lichen diversity around base-rich igneous outcrops in Eryri SSSI (Orange, 2017) may reflect buffering of acid rain impacts, suggesting lichen diversity may expand now that acid rain is reducing in much of Wales.

Table 3: Acid Watercourse Quality Index scores for 14 SSSI and one SSSI extension in Wales. See Appendix Table A3 for full lists of species.

SSSI	Area of Search	Score
Eryri SSSI	West Gwynedd	29 qualifies
River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI	Brecknock + Ceredigion + Monts + Radnor	20 qualifies
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	Brecknock + Mid & South Glam + W Glam & Llanelli	15 qualifies
Fairy Glen Woods SSSI (Afon Conwy)	East Gwynedd	14 qualifies
River Usk / Afon Wysg SSSI	Brecknock + Gwent	14 qualifies
Marcheini Uplands, Gilfach Farm & Gamallt SSSI	Radnor	13 qualifies
Afon Ysgethin (Coed Cors y Gedol SSSI & extension)	East Gwynedd	12 qualifies
Gwynfynydd SSSI	East Gwynedd	11 qualifies
Cadair Idris SSSI	East Gwynedd	11 qualifies and more survey needed
Elenydd SSSI	Brecknock + Ceredigion + Radnor	11 qualifies and more survey needed
Coed Copi'r Graig SSSI (Afon Vyrnwy)	Montgomeryshire	6
Afon Irfon SSSI	Radnor	5 more survey needed
Brecon Beacons SSSI	Brecknock	5
Mynydd Du (Black Mountain) SSSI	Brecknock + Carmarthen & Dinefwr	3
Afon Teifi SSSI	Carmarthen & Dinefwr + Ceredigion	2 more survey needed

4.2.5. Limestone Index

Carboniferous Limestone outcrops in north and south Wales support rich assemblages of calcicolous lichens, both along the coast and inland. The Limestone Index is composed of species that grow directly on limestone, whereas the TNTN score for Lowland Calcareous Ground covers terricolous lichens in calcareous grassland (see 4.3.5). The richest assemblages are on four coastal SSSI – two in north Wales and two in the south-west – but the inland limestone of Clwyd and the Brecon Beacons National Park also holds significant assemblages. Some Limestone Index species such as *Acrocordia conoidea*, *Clauzadea immersa* and *Porina linearis* are widespread, but many are restricted to just one or two sites in Wales, including *Biatorella fossarum* on Great Orme's Head and *Sagiolechia protuberans* at Glaswelltiroedd Eryrys.

Orange (2020) concluded that a high Index score “depends upon the possession of a good number of relatively widespread species” as well as rarities, and “is likely to be positively correlated with the microhabitat diversity of the site... as well as size” after a wide-ranging survey of north Wales limestone SSSI. Substantial variation between sites backs up the need to have limestone lichens identified as SSSI features on a suite of sites, rather than on just one or two hotspots. The SSSI selection threshold is **30 points**.

Table 4: Limestone Index scores for 24 key limestone SSSI in Wales. See Appendix Table A4 for full lists of species.

SSSI	Area of Search	Score
Pen-y-Gogarth/Great Orme's Head SSSI	East Gwynedd	61 qualifies
Stackpole SSSI	Preseli & South Pembroke	52 qualifies
Gower Coast: Rhosilli to Port Eynon SSSI	West Glamorgan & Llanelli	50 qualifies
Llanddulas Limestone & Gwrych Castle Wood SSSI	East Gwynedd	47 qualifies
Foxhole cSSSI	West Glamorgan & Llanelli	43 qualifies
Glaswelltiroedd Eryrys SSSI	Clwyd	41 qualifies
Mynydd Llangattwg SSSI (including Craig y Cilau NNR)	Brecknock	40 qualifies
Creuddyn SSSI	East Gwynedd	38 qualifies
Little Orme's Head SSSI	East Gwynedd	36 qualifies
Castlemartin Range SSSI	Preseli & South Pembroke	35 qualifies
Pwll-du Head and Bishopston Valley SSSI	West Glamorgan & Llanelli	32 qualifies
Ruabon/Llantysilio Mountains and Minera SSSI	Clwyd	30 qualifies
Graig, Llanarmon-yn-Ial SSSI	Clwyd	27
Ogof Ffynnon Ddu - Pant Mawr SSSI	Brecknock	25
Comin Helygain a Glaswelltiroedd Treffynnon / Halkyn Common & Hollywell Grasslands SSSI	Clwyd	25
Carreg Cennen SSSI	Carmarthen & Dinefwr	24
Graig Fawr SSSI	Clwyd	23
Dyffrynnoedd Nedd a Mellte a Moel Penderyn SSSI	Brecknock	20
Bwrdd Arthur SSSI	West Gwynedd	20
Y Bonc SSSI	West Gwynedd	18
Great Tor (Three Cliff Bay) SSSI	West Glamorgan & Llanelli	18
Cors Goch SSSI	West Gwynedd	17
Llanymynech & Llyncllys Hills SSSI	Montgomeryshire	14 more survey needed
Bloreng & Gilwern Hill pSSSI	Gwent	12 more survey needed



Figure 5: Limestone outcrops with diverse slope, aspect and vegetation cover on Little Orme's Head SSSI, supporting a qualifying Limestone Index lichen assemblage (from Orange, 2020).

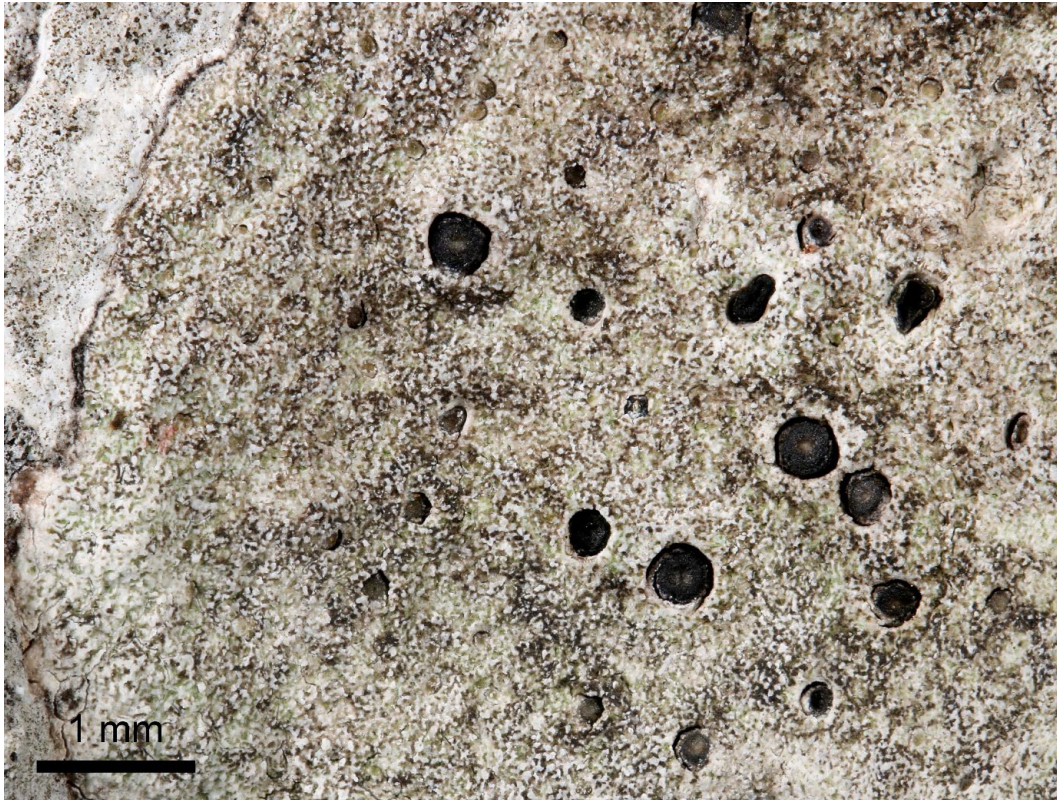


Figure 6: the Nationally Scarce *Sturothele caesia* in Glaswelltiroedd Eryrys SSSI (from Orange, 2015a).

4.2.6. Metalliferous Habitats Index

The orefields of mid and north Wales are among the most important in Britain for lichens that have evolved to grow on rock with levels of metals such as copper, lead and zinc which are toxic to most plants and fungi. Many mines on the Mid Wales Orefield have been surveyed by lichen experts (Martin *et al.*, 1994; Simkin, 2015), but knowledge of the lichens of copper mines in Gwynedd and Ynys Môn, and lead mines in Gwydyr Forest and Clwyd remains patchier. Historically metallophyte lichens would have grown on naturally metal-rich rock outcrops, but the majority are now restricted to spoil on disused mines; imported ore in the Lower Swansea Valley provides an additional, even more artificial substrate for a qualifying assemblage (Chambers, 2008). Some metallophyte lichens are almost ubiquitous, at least on lead mines, including *Placopsis lambii* and *Stereocaulon leucophaeopsis*, but others such as *Placynthiella hyporhoda* and *Rhizocarpon cinereovirens* are much more localised. The SSSI selection threshold for the Index is **10 points**.



Figure 7: Cwmystwyth, the top metallophyte site in Wales (Forster Brown & Chambers, 2017).

Table 5: Metalliferous Habitats Index scores for 28 mines in Wales. See Appendix Table A5 for full lists of species.

SSSI	Area of Search	Score
Mwyngloddfa Cwmystwyth SSSI	Ceredigion	29 qualifies
Mwyngloddfeydd Esgair Hir ac Esgair Fraith SSSI	Ceredigion	28 qualifies
Mwyngloddiau a Chreigiau Gwydyr SSSI	East Gwynedd	27 qualifies
Cwm Rheidol Mine cSSSI	Ceredigion	25 qualifies
Dylife Mine SSSI & extensions	Montgomeryshire	21 qualifies
Cwmsymlog SSSI	Ceredigion	19 qualifies
Mwyngloddfa Nantymwyn SSSI	Carmarthen & Dinefwr	19 qualifies
Mwyngloddfa Nant-y-cagl (Eaglebrook Mine) SSSI	Ceredigion	18 qualifies
Frongoch and Wemyss Mines cSSSI	Ceredigion	17 qualifies
Mwyngloddfa Cwmbwyno SSSI	Ceredigion	16 qualifies
Mwyngloddfa Esgair Mwyn cSSSI	Ceredigion	16 qualifies
Ceunant Mine cSSSI	Ceredigion	15 qualifies
Gwynfynydd SSSI	East Gwynedd	17 qualifies
Henfwlch Mine cSSSI	Ceredigion	14 qualifies
Pumlumon Mine cSSSI	Ceredigion	14 qualifies
Six Pit, Swansea Vale and White Rock SSSI	West Glamorgan & Llanelli	14 qualifies
Mwyngloddfa Llety Ifan Hen (Vaughan Mine) SSSI	Ceredigion	13 qualifies
Mynydd Parys SSSI	West Gwynedd	13 qualifies
Pen Glog-fawr and Pen Glog-fach Mines cSSSI	Ceredigion	13 qualifies
Mwyngloddfa Bwlch Glas cSSSI	Ceredigion	11 qualifies
Nant y Creiau Mine cSSSI	Ceredigion	11 qualifies
Ruabon/Llantysilio Mountains and Minera SSSI	Clwyd	11 qualifies
Mwyngloddfa Castell SSSI	Ceredigion	10 qualifies
Carn Owen cSSSI	Ceredigion	9
Glaswelltiroedd Trelogan/Trelogan Grasslands SSSI	Clwyd	9
Comin Helygain a Glaswelltiroedd Treffynnon / Halkyn Common & Hollywell Grasslands SSSI	Clwyd	7
Abbey Consols Mine	Ceredigion	7
Gro Ystwyth SSSI	Ceredigion	5

4.2.7. Upland Rainforest Index

Base-poor bark in high rainfall areas of north-western Britain supports a rich assemblage of epiphytic lichens characterised by species such as *Hypotrachyna laevigata*, *Lepraria membranacea*, *Mycoblastus sanguinarius* and *Sphaerophorus globosus*, named recently as the Upland Rainforest Index (URI) (Sanderson *et al.*, 2018). Distinctive rarities such as *Menegazzia terebrata* and *Parmelinopsis horrescens* (Fig. 8) are concentrated in Meirionnydd, alongside smaller species such as *Arthonia leucopellaea* and *Lopadium disciforme*. The temperate rainforests of Wales, especially Meirionnydd and parts of Powys, are internationally important (see 4.1.1) and the URI assemblage is a key element of the Annex 1 ‘Old Sessile Oak Woodland with Ilex and Blechnum’ habitat for which many Welsh SAC were selected. The **SSSI selection threshold** is **15** in lichen-rich NW Wales, including Gwynedd, Meirionnydd and northernmost Ceredigion, but **10** in most of the country.



Figure 8: *Parmelinopsis horrescens* in Coed Pengwern, Meirionnydd (Sam Bosanquet).

Survey coverage is remarkably good, and there are recent, detailed specialist surveys covering most of the top known sites for the Index. All of the top ten highest scoring sites are in Meirionnydd (East Gwynedd AoS), whilst the eleventh, Coedydd Nantgwynant SSSI, is just across the boundary in West Gwynedd AoS. Further south-east in Wales, Caban Lakeside Woodlands SSSI and Carn Gafallt SSSI in Cwm Elan, Powys have diverse URI, as does the very extensive Elenydd SSSI which includes woodland by Caban Reservoir, in Nant Irfon NNR and at Hafod. Monitoring is needed to determine the impact that N pollution is having on URI lichens, and the Celtic Rainforest LIFE Project has identified ammonia sources around key SAC woodlands.



Figure 8: birch - oak woodland in Cwm Doethie - Mynydd Mallaen SSSI, Carmarthenshire with a rich URI lichen assemblage (Sam Bosanquet).

Table 6: Upland Rainforest Index scores for sites in north-west Wales where the selection threshold is 15 points. See Appendix Table A6 for full lists of species.

SSSI	Area of Search	Score
Coedydd De Dyffryn Maentwrog SSSI	East Gwynedd	27 qualifies
Coed y Rhygen SSSI	East Gwynedd	27 qualifies
Ceunant Cynfal SSSI	East Gwynedd	26 qualifies
Parc Nannau SSSI	East Gwynedd	26 qualifies
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	East Gwynedd	24 qualifies
Rhinog SSSI	East Gwynedd	23 qualifies
Ganllwyd SSSI	East Gwynedd	23 qualifies
Gwynfynydd SSSI	East Gwynedd	21 qualifies
Afon Eden - Cors Goch Trawsfynydd SSSI	East Gwynedd	19 qualifies
Cadair Idris SSSI	East Gwynedd	19 qualifies
Coedydd Nantgwynant SSSI	West Gwynedd	19 qualifies
Coedydd Abergwynant SSSI	East Gwynedd	18 qualifies
Coed Cwm-mynach cSSSI	East Gwynedd	17 qualifies
Coed Garth Gell cSSSI	East Gwynedd	17 qualifies
Coedydd Dyffryn Wnion SSSI	East Gwynedd	17 qualifies
Coedydd Nanmor SSSI	West Gwynedd	17 qualifies
Cwm Llyfnant SSSI	Ceredigion	16 qualifies
Coedydd Bronaber cSSSI	East Gwynedd	16 qualifies
Coedydd Beddgelert a Cheunant Aberglaslyn SSSI	East Gwynedd	14
Craig y Benglog SSSI	East Gwynedd	13
Coedydd Aberartro cSSSI	East Gwynedd	13
Coed Graig Uchaf SSSI	East Gwynedd	12
Eryri SSSI	West Gwynedd	12
Ceunant Coch and Caerwych cSSSI	East Gwynedd	12
Coedydd Aber SSSI	West Gwynedd	11
Coed Cwm Einion SSSI	Ceredigion	11
Trawscoed cSSSI	East Gwynedd	11
Coed Cae-awr SSSI	East Gwynedd	9
Migneint - Arenig - Dduallt SSSI	East Gwynedd	9
Cefndeuddwr SSSI	East Gwynedd	8
Coed Llechwedd SSSI	East Gwynedd	5

Table 7: Upland Rainforest Index scores for sites away from the north-west, where the selection threshold is 10 points. See Appendix Table A7 for full lists of species.

SSSI	Area of Search	Score
Elenydd SSSI	Brecknock + Ceredigion + Radnor	20 qualifies
Caban Lakeside Woodlands SSSI	Radnor	18 qualifies
Coedydd a Cheunant Rheidol (Rheidol Woods & Gorge) SSSI	Ceredigion	18 qualifies
Cwm Doethie - Mynydd Mallaen SSSI	Carmarthen & Dinefwr	18 qualifies
Carn Gafallt SSSI	Brecknock + Radnor	17 qualifies
Coed Ty-canol (Ty-canol Wood) SSSI	Preseli & South Pembrokeshire	16 qualifies
Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI	Montgomeryshire	16 qualifies (20 with annexes)
Coedydd Glannau a Cwm Coel SSSI	Radnor	16 qualifies
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	Brecknock + Mid & South Glamorgan + West Glamorgan & Llanelli	14 qualifies
Marcheini Uplands, Gilfach Farm & Gamallt SSSI	Radnor	13 qualifies
Allt-y-gest SSSI	Brecknock	12 qualifies (15 with annexes)
Dyffryn Gwaun SSSI	Preseli & South Pembrokeshire	10 qualifies
Gallt Llanerch - Coed Gelli-deg SSSI	Preseli & South Pembrokeshire	10 qualifies
Nannerth Fawr	Radnor	10 qualifies
Cwm Marlais cSSSI	Carmarthen & Dinefwr	9
Garn Wood, Kilkiffeth Wood & Dan-Deri-Cwm Felin-Ban SSSI	Preseli & South Pembrokeshire	8
Gregynog SSSI	Montgomeryshire	8
Cwm Cothi cSSSI	Carmarthen & Dinefwr	8
Dinefwr Estate SSSI	Carmarthen & Dinefwr	7
Coedydd Llawr-y-glyn SSSI	Montgomeryshire	6
Fairy Glen Woods SSSI	East Gwynedd	6
Hafod Walled Garden cSSSI	Ceredigion	6
Allt Pontfaen - Coed Gelli-fawr SSSI	Preseli & South Pembrokeshire	5

4.2.8. Southern Oceanic Woodland Index

Lichens characteristic of base-rich bark in Old Growth forests and wood pasture remain widespread in Wales, although 20th century industrial pollution caused significant losses in the south, east and north-east. Meirionnydd (East Gwynedd Area of Search) is the standout area of Wales for Southern Oceanic lichens, although there are also rich assemblages in Pembrokeshire (Preseli & South Pembroke AoS) and Cwm Elan (Brecknock AoS and Radnor AoS). The richest assemblages of Lobarion and dry bark lichens occur where ancient trees have survived in the parklands of Parc Nannau and Parc Dolmelynlyn, both in Meirionnydd, and Dinefwr in Carmarthenshire, whilst rich Graphidion and 'Pyrenuletum' are found in the woodlands of Meirionnydd including Ceunant Llennyrch NNR and Coedydd Maentwrog NNR. The **SSSI selection threshold** is **30** in the most lichen-rich areas of NW Wales, including Gwynedd, Meirionnydd and northernmost Ceredigion, but **20** in most of the country.

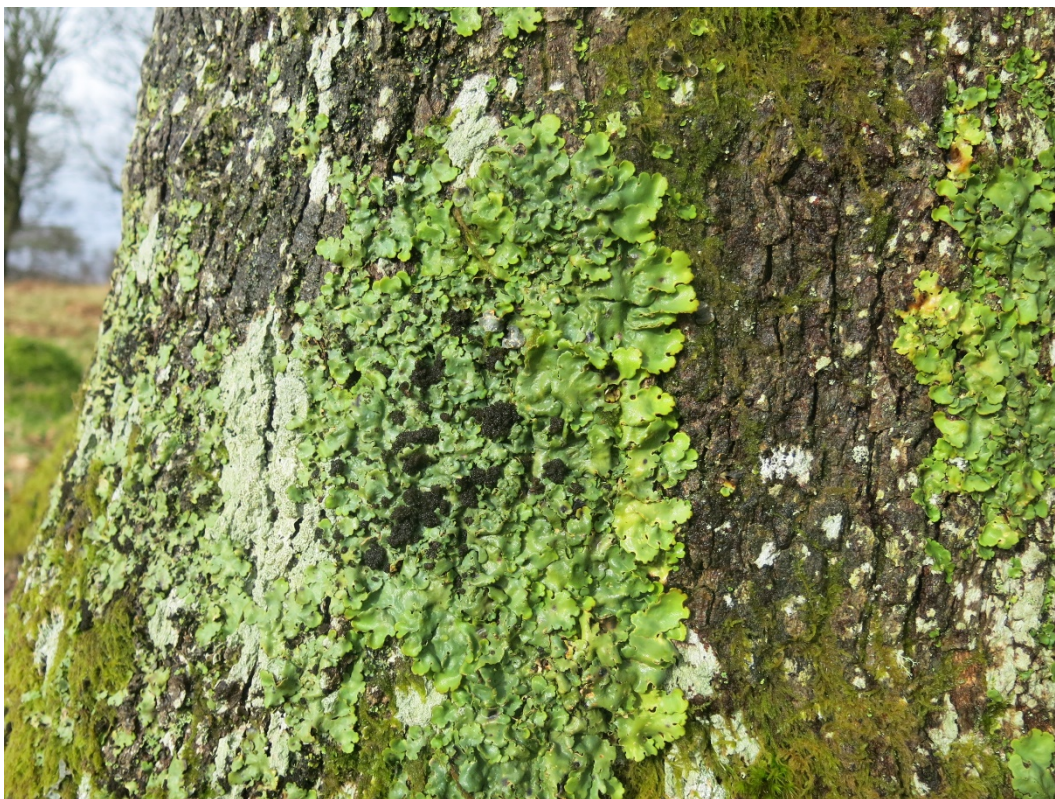


Figure 9: *Lobaria amplissima* on base-rich oak bark in Cefndeuddwr SSSI, Meirionnydd (Sam Bosanquet).

Some species of the Southern Oceanic Woodland Index (SOWI) appear to be spreading, perhaps due to Climate Change, notably *Pannaria conoplea*, *Parmeliella triptophylla*, *Sticta fuliginosa* and *S. limbata* in both Meirionnydd and Carmarthenshire (e.g. Lamacraft, 2017; Bosanquet, 2020), but others continue to decline, especially *Lobaria* spp. (e.g. Hotchkiss, 2010; Hotchkiss pers. comm. 2020), probably because of ongoing air pollution. As is the case with URI lichens, recent survey coverage is extremely good especially in Meirionnydd (e.g. Sanderson 2012, 2015, 2019), although some sites elsewhere in Wales require additional survey and monitoring. Recent work in Dyfi Forest has shown this area of Montgomeryshire, close to the border with Meirionnydd, is very rich in SOWI lichens and the current Coed Maes-mawr, Coed Esgairneiriau a Cheunant Caecenau SSSI warrants expansion. Monitoring has commenced in SAC in both Meirionnydd and mid Wales as part of the Celtic Rainforest LIFE Project (e.g. Acton, 2020).

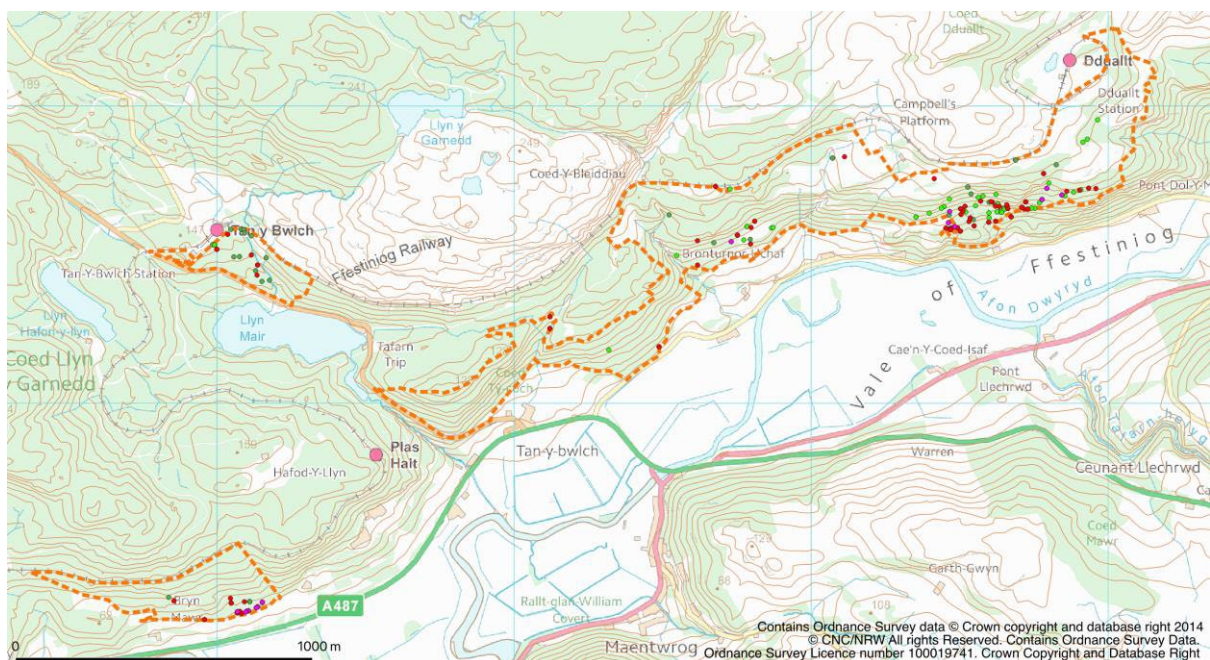


Figure 10: map showing the distribution of trees supporting the SOWI assemblage in Coedyd Maentwrog NNR, Meirionnydd (from Sanderson, 2019).

Table 8: Southern Oceanic Rainforest Index scores for sites in north-west Wales where the selection threshold is 30 points. See Appendix Table A8 for full lists of species.

SSSI	Area of Search	Score
Parc Nannau SSSI	East Gwynedd	60 qualifies
Coedydd De Dyffryn Maentwrog SSSI	East Gwynedd	59 qualifies
Rhinog SSSI	East Gwynedd	57 qualifies
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	East Gwynedd	56 qualifies
Ganllwyd SSSI	East Gwynedd	55 qualifies
Coedydd Nanmor SSSI	West Gwynedd	52 qualifies
Gwynfynydd SSSI	East Gwynedd	42 qualifies
Ceunant Cynfal SSSI	East Gwynedd	37 qualifies
Coedydd Abergwynant SSSI	East Gwynedd	37 qualifies
Craig y Benglog SSSI	East Gwynedd	37 qualifies
Coed Cwm Einion SSSI	Ceredigion	35 qualifies
Eryri SSSI	West Gwynedd	34 qualifies
Ceunant Coch and Caerwylch cSSSI	East Gwynedd	31 qualifies
Coedydd Aber SSSI	West Gwynedd	30 qualifies
Trawscoed cSSSI	East Gwynedd	29
Afon Eden - Cors Goch Trawsfynydd SSSI	East Gwynedd	29
Coedydd Nantgwynant SSSI	West Gwynedd	27
Coed Garth Gell cSSSI	East Gwynedd	26
Cadair Idris SSSI	East Gwynedd	25
Cwm Llyfnant SSSI	Ceredigion	25
Coedydd Aberartro cSSSI	East Gwynedd	25
Coedydd Dyffryn Wnion SSSI	East Gwynedd	25
Coedydd Bronaber cSSSI	East Gwynedd	25
Coed y Rhygen SSSI	East Gwynedd	24
Coed Cae-awr SSSI	East Gwynedd	22
Cefndeuddwr SSSI	East Gwynedd	19
Coedydd Beddgelert a Cheunant Aberglaslyn SSSI	East Gwynedd	17
Coed Cwm-mynach cSSSI	East Gwynedd	13
Migneint - Arenig – Ddualt SSSI	East Gwynedd	13 more survey needed
Coed Graig Uchaf SSSI	East Gwynedd	12
Coed Llechwedd SSSI	East Gwynedd	8
Gallt y Bwlch SSSI	West Gwynedd	5
Coed Aber Artro SSSI	East Gwynedd	4 more survey needed

Table 9: Southern Oceanic Rainforest Index scores for sites away from the north-west, where the selection threshold is 20 points. See Appendix Table A9 for full lists of species.

SSSI	Area of Search	Score
Dinefwr Estate SSSI	Carmarthen & Dinefwr	43 qualifies
Coed Ty-canol (Ty-canol Wood) SSSI	Preseli & South Pembrokeshire	42 qualifies
Coedydd a Cheunant Rheidol (Rheidol Woods & Gorge) SSSI	Ceredigion	39 qualifies
Carn Gafallt SSSI	Brecknock + Radnor	37 qualifies
Coedydd a Chorsydd Aber Teifi (Teifi Estuary Woodlands & Marshes) SSSI	Ceredigion/Preseli & South Pembrokeshire	37 qualifies
Gregynog SSSI	Montgomeryshire	34 qualifies
Cwm Doethie - Mynydd Mallaen SSSI	Carmarthen & Dinefwr	34 qualifies
Stackpole SSSI	Preseli & South Pembrokeshire	30 qualifies
Garn Wood, Kilkiffeth Wood & Dan-Deri-Cwm Felin-Ban SSSI	Preseli & South Pembrokeshire	28 qualifies
Gallt Llanerch - Coed Gelli-deg SSSI	Preseli & South Pembrokeshire	27 qualifies
Milford Haven Waterway SSSI	Preseli & South Pembrokeshire	26 qualifies
Dyffrynoedd Nedd a Mellte a Moel Penderyn SSSI	Brecknock + Mid & South Glamorgan + West Glamorgan & Llanelli	26 qualifies
Marcheini Uplands, Gilfach Farm & Gamallt SSSI	Radnor	25 qualifies
Coed Copi'r Graig SSSI	Montgomeryshire	24 qualifies
Allt-y-gest SSSI	Brecknock	23 qualifies (29 with annexe)
Fairy Glen Woods SSSI	East Gwynedd	23 qualifies
Caban Lakeside Woodlands SSSI	Radnor	23 qualifies
Elenydd SSSI	Brecknock + Ceredigion + Radnor	23 qualifies
Cwm Bach, Sychpant SSSI	Preseli & South Pembrokeshire	22 qualifies
Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI	Montgomeryshire	22 qualifies (37 with annexe)
Coedydd Glannau a Cwm Coel SSSI	Radnor	21 qualifies
Allt Pontfaen - Coed Gelli-fawr SSSI	Preseli & South Pembrokeshire	20 qualifies
Cwm Marlais cSSSI	Carmarthen & Dinefwr	20 qualifies
Dyffryn Gwaun SSSI	Preseli & South Pembrokeshire	17
Hafod Walled Garden cSSSI	Ceredigion	17 (19 with annexe)
De Porth Sain Ffraid / St Bride's Bay South SSSI	Preseli & South Pembrokeshire	16
Talhenbont SSSI	West Gwynedd	14
Corsydd Llangloffan SSSI	Preseli & South Pembrokeshire	13
Cwm Cothi cSSSI	Carmarthen & Dinefwr	12
Powis Castle cSSSI	Montgomeryshire	9
Coed Aberedw SSSI	Radnor	8
Coedydd Llawr-y-glyn SSSI	Montgomeryshire	7

4.3. TNTN assemblages

The TNTN system can be used to assess lichen assemblages that have not received sufficient expert attention to allow an Index to be developed. TNTN can only be used to assess specific assemblages, and is not a system for adding together all scoring species within a large SSSI to get an overall quality score, in contrast to the previous *Guidelines* (Hodgetts, 1992). Not all of the TNTN thresholds presented in the revised *Guidelines* (Sanderson *et al.*, 2018) are relevant to Wales: the Hyperoceanic & euoceanic acid montane rock/soil TNTN is designed for the north-west Highlands of Scotland but seems pertinent to north-west Wales, whereas the Hemiocceanic acid montane rock/soil TNTN is clearly aimed at north-east Scotland and does not work in Wales, whilst the Old trees of open places TNTN has not currently been used because SOWI identifies Wales' key parklands.

The approach required to assess TNTN assemblages is outlined in section 3.4 of the *Guidelines* (Sanderson *et al.*, 2018) and the TNTN spreadsheet that accompanies the *Guidelines*. Table 1 in the *Guidelines* shows which lichen assemblages can be assessed using an Index and which can be assessed using TNTN.

4.3.1. Hyperoceanic & euoceanic acid montane rock/soil TNTN

Most mountains in Wales are not of sufficient altitude to support significant numbers of truly montane lichens, with the notable exceptions of Eryri SSSI and Cadair Idris SSSI. Elenydd SSSI also holds diverse montane species despite its moderate altitude, but Rhinog SSSI holds very few montane species with survey in Rhinog NNR producing no acid montane rock/soil lichens at all (Douglass, 2020). Only Eryri SSSI, which was highlighted as an important area by Fryday (1996), passes the SSSI selection threshold of **30** points. However, the TNTN scores for Cadair Idris SSSI

and Elenydd SSSI are probably sufficiently high to qualify as the best in each AoS (Table 10). Most of the montane lichens that make up the TNTN Assemblage on Welsh SSSI are on the southern edge of their British range there, and some are also Red Listed in GB and Wales, including *Belonia russula*, *Coccotrema citrinescens* and *Micarea submilliaria*.

Table 10: TNTN Hyperoceanic & euoceanic acid montane rock/soil lichens from five upland Welsh SSSI. See Appendix Table A10 for full lists of species.

SSSI	Area of Search	Score
Eryri SSSI	West Gwynedd	87 qualifies
Elenydd SSSI	Brecknock + Ceredigion + Radnor	25
Cadair Idris SSSI	East Gwynedd	24
Brecon Beacons SSSI	Brecknock	5 more survey needed
Black Mountains SSSI	Gwent/Brecknock	2 more survey needed

4.3.2. Non-montane acid rock TNTN

Acid rock lichen importance is best assessed in the majority of Wales using the Non-montane Acid Rock TNTN score, even in upland areas such as the Brecon Beacons and Black Mountains. 137 scoring species have been recorded on Welsh SSSI, and there is an order of magnitude difference in score between Eryri SSSI and most upland blocks further south in Wales. The score is supposed to be assessed across an “ecologically coherent landscape”, and there is a threshold of **10** points for recognition as a SSSI feature. The high score for Elenydd SSSI comes mostly from Nant Irfon NNR, whilst Gilfach NR holds the majority of the scoring species of Marcheini Uplands, Gilfach Farm & Gamallt SSSI. The acid rocks on these reserves lie between 200 and 400 m aOD and are therefore very clearly non-montane, whereas the scoring species in Eryri SSSI occur up to 900 m aOD and are in a mix of lowland and upland contexts. Most of the higher scoring sites are clearly the best in their respective Areas of Search, but it is difficult to determine the significance of some sites

in southern Wales because comparative sites are under-recorded. Among the rarer lichens that occupy non-montane acid rocks are *Protoparmelia atriseda*, *Rhizocarpon furfurosum* and *Umbilicaria hirsuta*, whilst *Bryoria smithii* may now be extinct in Wales but formerly grew in Eryri and Rhinog SSSIs.



Figure 11: the TNTN lichen *Claurouxia chalybeioides* in Yr Wyddfa NNR, Eryri SSSI (from Douglass, 2020).

Table 11: TNTN Non-montane Acid Rock scores for 16 SSSI in Wales. See Appendix Table A11 for full lists of species.

SSSI	Area of Search	Score
Eryri SSSI	West Gwynedd	111 qualifies
Elenydd SSSI	Brecks + Ceredigion + Radnor	56 qualifies
Marcheini Uplands, Gilfach Farm & Gamallt SSSI	Radnor	48 qualifies
Cadair Idris SSSI	East Gwynedd	38 qualifies
Rhinog SSSI	East Gwynedd	26 qualifies
Migneint - Arenig – Dduallt SSSI	East Gwynedd	14 qualifies
Cwm Doethie - Mynydd Mallaen SSSI	Carmarthen & Dinefwr	13 qualifies
Carn Ingli SSSI	Preseli & South Pembrokeshire	12 qualifies
Carn Owen cSSSI	Ceredigion	12 qualifies
Brecon Beacons SSSI	Brecknock	11 qualifies
Berwyn SSSI	East Gwynedd	10 qualifies
Afon Eden - Cors Goch Trawsfynydd SSSI	East Gwynedd	9 more survey needed
Black Mountains SSSI	Gwent/Brecknock	8 more survey needed
Coedydd a Cheunant Rheidol SSSI	Ceredigion	8 more survey needed
Mynydd Du (Black Mountain) SSSI	Brecks + Carmarthen & Dinefwr	7 more survey needed
Coedydd a Chorsydd Aber Teifi SSSI	Ceredigion + Preseli & South Pembrokeshire	7

4.3.3. Non-montane mixed siliceous/calcareous rock outcrops TNTN

Five SSSI in Powys have the *Lecanoretum sordidae* lichen community notified as a SSSI feature, but this community is no longer considered a qualifying feature under the revised SSSI *Guidelines*. These five sites and Stanner Rocks SSSI all have an intimate mixture of base-rich and base-poor rocks at low altitude and are therefore best assessed using the Non-montane mixed siliceous/calcareous rock outcrops TNTN list. A threshold of **10** points is applied to an “individual outcrop”, which in the case of the Welsh SSSI is considered to mean any one of these small, discrete lowland sites rather than a large, geographically scattered upland site such as Eryri SSSI. Only one site currently passes the threshold (Table 12), but more survey work is required elsewhere.

Table 12: TNTN Non-montane mixed siliceous/calcareous rock outcrop scores for six SSSI in eastern Wales where the *Lecanoretum sordidae* community has been reported. See Appendix Table A12 for full lists of species.

SSSI	Area of Search	Score
Breidden Hill SSSI	Montgomeryshire	12
Roundton Hill SSSI	Montgomeryshire	4 more survey needed
Stanner Rocks SSSI	Radnor	4 more survey needed
Coed Aberedw SSSI	Radnor	4 more survey needed
Craig Fawr SSSI	Radnor	1 more survey needed
Llanelwedd Rocks SSSI	Radnor	0 more survey needed

4.3.4. Montane calcareous rock/soil TNTN

The montane calcareous lichen assemblage of Eryri SSSI is similarly outstanding as its bryophyte (Bosanquet, 2019a) and vascular plant floras, scoring 67 compared with a qualifying threshold of **40** points (Table 13). In contrast, other areas of Wales with notable upland calcareous bryophytes and vascular plants, such as Cadair Idris SSSI, Moel yr Ogof SSSI, Brecon Beacons SSSI and Mynydd Du SSSI score very poorly for montane calcareous lichens. This may reflect the nature of the rock on these

sites, with the bryophytes and vascular plants favouring seeping calcareous crevices that are unsuitable for lichens, or may be because the base-rich areas of the more southerly SSSI are insufficient altitude to support truly montane lichens. Among the rare species present on the calcareous rocks of Eryri SSSI are *Buellia insignis*, *Collema parvum* and *Vestergrenopsis elaeina*, although both *Collema ceraniscum* and *Peltigera venosa* have not been seen for several decades.



Figure 12: *Vestergrenopsis (Tingiopsidium) elaeina* is one of the rarest Montane Calcareous lichens recorded in Eryri SSSI (from Douglass, 2020).

Table 13: TNTN Montane calcareous rock/soil scores for five SSSI that have high scores for Basic Montane Cliff bryophytes (Bosanquet, 2019a). See Appendix Table A13 for full lists of species.

SSSI	Area of Search	Score
Eryri SSSI	West Gwynedd	67
Mynydd Du (Black Mountain) SSSI	Brecknock + Carmarthen & Dinefwr	9 more survey needed
Cadair Idris SSSI	East Gwynedd	8 more survey needed
Moel Hebog SSSI	West Gwynedd	2 more survey needed
Brecon Beacons SSSI	Brecknock	2 more survey needed

4.3.5. Lowland calcareous ground TNTN

This is the TNTN assessment for assessment of areas away from hard limestones, such as chalk downland, Breckland grasslands, base-rich sand dunes and soft coast cliffs. Most calcareous ground in Wales is associated with hard Carboniferous Limestone, and the TNTN is only really applicable to base-rich sand dunes. The richest dune lichen assemblages are in south Pembrokeshire on Castlemartin Range SSSI and Stackpole SSSI, although assessment is confused by the occurrence of so many TNTN species on limestone ledges on these two sites. Nevertheless, reports of several species explicitly in terricolous habitat at Castlemartin and Stackpole by Edwards (2008a & b), coupled with the presence of *Fulgensia fulgens* and its parasite *Lichenochora epifulgiens* on blown sand, strongly suggests that the TNTN assemblages on the dunes of Castlemartin and Stackpole are of SSSI quality, scoring well above the 6 point qualification threshold. Various other SSSI in Wales appear to have qualifying Lowland Calcareous Ground TNTN scores, including Elenydd SSSI and Eryri SSSI, but these are because of overlaps in ecology between some metallophyte and montane calcareous lichens and those of truly lowland calcareous areas. Other dune systems, such as Morfa Dyffryn SSSI and Tywyn Aberffraw SSSI, do not appear to have been systematically surveyed for terricolous lichens.

Table 14: TNTN lowland calcareous ground assemblages for the two key Welsh SSSI. See Appendix Table A14 for full lists of species.

SSSI	Area of Search	Score
Stackpole SSSI	Preseli & South Pembs	29
Castlemartin Range SSSI	Preseli & South Pembs	28

4.3.6. Lakes TNTN

Only three lakes, or groups of lakes, in Wales have been assessed using the Lakes TNTN assessment: Llyn Glas and Ffynnon Lloer in Eryri SSSI (Gilbert & Giavarini, 2000), West Gwynedd AoS and Llynnau Cregennen cSSSI in East Gwynedd AoS (Giavarini, 2015). All three exceed the selection threshold of 6 points (Table 15). Ffynnon Lloer has the most diverse assemblage and is also the key locus for the Red Listed species *Lecanora achariana* in Wales. Some other lakes in Eryri SSSI are likely to qualify but no others have been specifically assessed and many Lakes TNTN lichens also occur in a riverine context in Eryri SSSI which confuses assessment. Additional assessment of lake lichens is urgently needed elsewhere in north Wales.

Table 15: TNTN Lakes assessments from three lakes in Wales. See Appendix Table A15 for full lists of species.

SSSI	Area of Search	Score
Ffynnon Lloer, Eryri SSSI	West Gwynedd	13
Llyn Glas, Eryri SSSI	West Gwynedd	9
Cregennen cSSSI	East Gwynedd	8

5. Species features

5.1. Internationally important species

5.1.1. Globally Threatened species

Sanderson *et al.* (2018) say that “all sites that support viable populations of species listed as Critically Endangered on the global IUCN Red List of Threatened Species should be considered for notification. Species listed as Endangered or Vulnerable on the global Red List should be considered for notification at one site in each Area of Search in which they occur, with the largest population prioritised.” The Global Fungal Red List Initiative assesses fungus species individually, in contrast to most Red Listing projects which consider entire taxonomic groups, and thus a constantly changing suite of lichenised fungi are globally Red Listed. At the end of 2020, no Welsh lichens were included on the list: the only British representative, *Buellia asterella*, grows/grew in eastern England. Additional species are currently being assessed, including *Arthonia zwackhii*, *Collema dichotomum* and *Lecanographa lyncea*, although these are Red Listed at the GB or Wales level anyway. At present, no Welsh lichen species can be recognised as a SSSI feature under this criterion.

5.1.2. IR and Endemic species

Britain is considered to have an International Responsibility (IR) for lichens which have more than 10% of their global or European population here (see definition in 3.3, above). Sanderson *et al.* (2018) allow individual selection of species which are Near Threatened on the GB Red List, thus not qualifying for individual selection because of their Red List status, if they are also included on the IR list. Many of these NT-IR species, such as *Fuscopannaria sampaiana*, *Leptogium brebissonii* and *Pseudocyphellaria intricata*, are Red Listed in Wales (Woods, 2010) and can therefore

qualify individually (see 5.2, below). This leaves 18 NT-IR species which would not otherwise be selected as SSSI features, the majority of which are listed as NT in Wales and are currently listed under Section 7 of the Environment (Wales) Act as being of “of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales”. Each of these 18 species is discussed below to allow assessment of whether any may be regarded as an individually qualifying SSSI feature.

- *Arthonia (Synarthonia) astroidestra* (NT-IR, Wales NT) has been recorded on four trees in Ceunant Llennyrch (Sanderson, 2016) and was also noted in 1977 in Milford Haven Waterway SSSI and in Talhenbont SSSI in 1971. The population in Ceunant Llennyrch qualifies independently as a feature of Coedydd De Dyffryn Maentwrog SSSI (Criteria 3.2.3 & 3.3.4.1).
- *Arthonia atlantica (Reichlingia dendritica)* (NT-IR, Wales NT) grows on rocks in relatively well-lit coastal sites between Pembrokeshire and Porthmadog, with a poorly localised inland record from Nantgwynant. Its status was reviewed by Orange & Chambers (2017) who concluded that it is genuinely rare in Wales and deserved its position on the Environment (Wales) Act Section 7 list. A large population in Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (East Gwynedd) qualifies under 3.3.4.1. The population in Skomer Island and Middleholm SSSI is the only one in Preseli & South Pembrokeshire AoS and should be regarded as a feature (Criterion 3.3.4.4), but only one of the three recorded colonies in Ceredigion can qualify. Orange & Chambers (*loc. cit.*) indicate that the population in Coedydd a Chorsydd Aberteifi SSSI is larger than those in Aberarth - Carreg Wylan SSSI and Dyfi SSSI, and is therefore the one which qualifies under Criterion

3.3.4.4. The Porthmadog colony, near Prenteg, is not within a SSSI and should be considered for notification.



Figure 13: *Arthonia atlantica* (white patch) in Coedydd a Chorsydd Aberteifi SSSI (from Orange & Chambers, 2017).

- *Atla wheldonii* (NT-IR, Wales NT) occurs on five SSSI in five different AoS across montane and coastal Wales: Cadair Idris SSSI, Eryri SSSI, Mynydd Du SSSI, Mynydd Llangattwg SSSI and Stackpole SSSI. Each of these qualifies as a feature under Criterion 3.3.4.4.
- *Enterographa sorediata* (NT-IR) was recorded new for Wales subsequent to Woods (2010). It has recently been shown to be the soresdiate morph of *Syncesia myrticola* (Wales VU) and no longer qualifies under IR criteria, but see under 3.2.1.3 for discussion of its status as a potential SSSI feature under the latter name.

- *Jamesiella scotica* (NT-IR, Wales DD) has the southern edge of its British range in Eryri SSSI. As a species vulnerable to Climate Change on its range edge the population qualifies under Criteria 3.3.4.1 and 3.3.4.3.
- *Lecania chlorotiza* (NT-IR, Wales NT) is relatively widespread in Ceredigion AoS and has also been recorded from Preseli & South Pembrokeshire AoS and East Gwynedd AoS. It is difficult to determine which site in Ceredigion holds the largest population – Coed Cwm Clettwr SSSI, Coed Cwm Einion SSSI or Coedydd a Chorsydd Aberteifi SSSI – and it is probably inappropriate to regard any as a feature. Stackpole SSSI holds the only Pembrokeshire population and qualifies under Criterion 3.3.4.4. The colony at Dolgoch Falls in East Gwynedd would also qualify for notification, but as Orange & Chambers (2017) say “this is a Nationally Scarce but rather widespread species... it is suggested that there is no particular reason for it to remain on the Section 7” it may also be an inappropriate SSSI feature.
- *Lecanora sublivescens* (NT-IR, Wales NT) has its global headquarters in the Welsh Marches, but most of the widely scattered colonies are on single trees and are not on SSSI; recognising the largest population in Brecknock AoS or Radnorshire AoS is not possible. Sanderson (2018) identifies the Gregynog SSSI population in Montgomeryshire AoS as “an exceptionally large population, potentially one of the largest in Europe” and this already notified population qualifies under Criterion 3.3.4.1 as presumably the largest in Wales. The Dinefwr Park SSSI colony was lost to air pollution (Sanderson, 2014a) and cannot be regarded as a feature, but if the Chirk Castle & Parkland SSSI colony remains extant it would qualify as the largest known in the Clwyd AoS (3.3.4.4).

- *Melaspilea (Stictographa) lentiginosa* (NT-IR) has its only Welsh record from Lawrenny Wood in 1982. This record is too old to be recognised as a feature of Milford Haven Waterway SSSI, but survey is urgently required.
- *Nephroma tangeriense* (NT-IR, Wales DD) has four scattered Welsh colonies. The most recent record is from the Y Wenallt section of Eryri SSSI, which is probably the largest population in West Gwynedd AoS (Criterion 3.3.4.4) because the colony in Glannau Aberdaron SSSI has not been seen since 1975. A 1973 record from Mwnt in Aberarth - Carreg Wylan SSSI is also too old to be considered a qualifying feature. A non-SSSI population on the Afon Ysgethin should be notified as an extension of Coed Cors y Gedol SSSI, as the only known population in East Gwynedd AoS (3.3.4.4).
- *Parmelinopsis horrescens* (NT-IR, Wales NT) is locally frequent in Meirionnydd and has substantial populations on several SSSI. Recognition of a resilient suite of sites for this species in its GB heartland is desirable under Criterion 3.3.4.2: it should be identified as a feature of Coed y Rhygen SSSI, Coedydd De Dyffryn Maentwrog SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI, Gwynfynydd SSSI and Rhinog SSSI because these are believed to hold the largest populations. Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau holds the only known population in Montgomeryshire AoS (3.3.4.4) and Coed Cwm Einion SSSI probably holds a slightly larger population than Cwm Llyfnant SSSI in Ceredigion AoS (3.3.4.4). Coedydd Nantgwynant SSSI is believed to hold the largest of the four known populations in West Gwynedd AoS (3.3.4.4).
- *Porina rosei* (NT-IR, Wales NT) is widespread but very sparsely distributed across Wales, albeit apparently absent from Clwyd and Ynys Môn. Its

distribution is rather confused because many records are now considered to be misidentifications of *Coenogonium confusum* (Brian Coppins *in litt.*). It is a scoring species in the SOWI Index, generally occurring in higher-scoring examples, and the majority of its sites will be selected for a qualifying SOWI score. Isolated occurrences at Blackcliff - Wyndcliff SSSI (Gwent) and Garwnant (non-SSSI, Mid & South Glamorgan), which are not part of qualifying SOWI assemblages, should be identified as qualifying features (3.3.4.4) assuming their identify is correct. Elsewhere in Wales it is difficult or impossible to determine which SSSI holds the largest population.

- *Ptychographa xylographoides* (NT-IR, Wales NT) has been recorded in three SSSI in Cwm Elan, as well as in Cwm Doethie - Mynydd Mallaen SSSI. Recent survey at two Cwm Elan sites (Sanderson, 2019b) failed to reveal any *Ptychographa* and nor did survey of the Mynydd Mallaen woodlands (Bosanquet, 2020). The status of *P. xylographoides* in Wales is therefore uncertain and recognition of any SSSI features is probably inadvisable.
- *Ramonia chrysophaea* (NT-IR, Wales NT) is an ephemeral species known from five sites in Wales, usually in small quantity. Colonies in Coedydd a Cheunant Rheidol SSSI (Ceredigion AoS), Carn Gafallt SSSI (Brecknock/Radnorshire AoS) and Stackpole SSSI (Preseli & South Pembrokeshire AoS) are the only ones known in each Area of Search and they therefore qualify under Criterion 3.3.4.4. Sanderson (2016) reports occurrence of *R. chrysophaea* on five different trees in Coedydd De Dyffryn Maentwrog SSSI, albeit never on more than two in any particular year, whereas it was only found on one tree in Ganllwyd SSSI (Sanderson, 2012); the colony in Coedydd De Dyffryn Maentwrog therefore qualifies under Criterion 3.3.4.4.

- *Rinodina isidioides* (NT-IR, Wales NT) has been recorded from eight SSSI in Meirionnydd (East Gwynedd AoS) as well as the non-statutory sites Ceunant Coch and Coed Garth Gell. Along with the New Forest, Meirionnydd is one of the key areas of Europe for this species, and it can therefore be identified as a feature on a suite of SSSI under Criterion 3.3.4.2: it should be listed as a feature of Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (nearly 50 trees), Ganllwyd SSSI (10 trees), Parc Nannau SSSI (9 trees) and Coedydd De Dyffryn Maentwrog SSSI (4 trees) because these are believed to hold the largest populations, with Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI also qualifying under Criterion 3.3.4.1.



Figure 14: fertile *Rinodina isidioides* on an oak trunk in Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (from Sanderson, 2019a).

- *Thelocarpon magnussonii* (NT-IR, Wales NT) has its sole confirmed Welsh record from a woodland near Esgyrn in the Afon Cleddau

Gorllewinol/Western Cleddau River SSSI. The record dates from 1988 and the *Thelocarpon* has not been searched for subsequently. It might qualify as a SSSI feature, but as it is somewhat ephemeral and grows in Britain on substrates such as “bonfire sites or on old leather” (Smith *et al.*, 2009) it is probably unsuitable for SSSI protection.

- *Thelocarpon opertum* (NT-IR, Wales DD) is known from Castlemartin Range SSSI and Gower Coast: Rhossili to Port Eynon SSSI, qualifying in both as the only known population in the Preseli & South Pembrokeshire AoS and West Glamorgan & Llanelli AoS respectively. A record from Cwm Elan falls outside the surrounding Elenydd SSSI.
- *Wadeana minuta* (NT-IR, Wales DD) was recorded in 2009 in Cadair Idris SSSI and should be regarded as a qualifying feature of that site under Criterion 3.3.4.1 (the largest population in Wales).
- *Xerotrema quercicola* (NT-IR, Wales LC) is known from several SSSI in Meirionnydd (East Gwynedd AoS) but is otherwise recorded in Wales only from Gregynog SSSI in Montgomeryshire AoS. The Gregynog population qualifies as a feature under Criterion 3.3.4.4, it is uncertain which of the six Meirionnydd sites – Coed y Rhygen SSSI, Coedydd De Dyffryn Maentwrog SSSI, Coedydd Nanmor SSSI, Ganllwyd SSSI, Parc Nannau SSSI or Rhinog SSSI (Coed Crafnant) – holds the largest colony and therefore qualifies.

5.2. Threatened Lichens in Britain

Sanderson *et al.* (2018 paragraph 3.3.1) state that “sites of Threatened taxa, listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) in the GB IUCN Red List for lichens, can qualify for site selection”. They also (3.3.2) say that country

Red Lists can be used for site selection: “Where a species has been assessed under multiple Red Lists covering different geographical scales, the highest level of threat applicable to the site locality should be used. Thus, for site selection purposes, a taxon listed as CR at country level should be treated as such, even though it may not be Threatened in the GB Red List (and vice versa).” This presents a potential problem in Wales because 206 species are Red Listed by either Woods (2010) or Woods & Coppins (2012). In some cases, it is straightforward to determine which SSSI support key populations of these Red Listed species, but in others, such as *Leptogium tenuissimum*, *Mennegazzia terebrata* or *Opegrapha fumosa*, it is almost impossible to identify which site supports the largest population in each Area of Search.

5.2.1. Red List species

5.2.1.1. Current independently qualifying Red List lichen species features

A total of 36 lichen species are currently listed in the NRW Features Database as independently qualifying features, on 40 SSSI. Only 38 site-species combinations are notified features, on 25 SSSI, and the remainder were identified as qualifying features during a review carried out by Alan Hale of the Countryside Council for Wales. Most of these features still qualify under the revised *Guidelines*, but a few do not. These recognised features will be discussed first, followed by sections on qualifying GB and Welsh Red List lichens that are not currently recognised as SSSI features in Wales.

- *Anaptychia ciliaris* ssp. *ciliaris* (GB-EN, Wales-EN) is a notified feature of Parc Pontfaen SSSI in Ceredigion AoS where it would qualify under Criterion 3.3.4.4 if it has survived ammonia pollution; the colony was moribund in 2018 (Bosanquet, 2019b). Only two more of the 12 recorded

Welsh sites are from SSSIs. The species is believed to be lost from Stackpole SSSI, although it survives close by in Castle Dock Wood. The colony in Llandeilo, Rhulen & Llanbedr Hill SSSI is probably not the largest in Radnorshire AoS, but the precipitous decline of this species in Wales may justify its recognition under Criterion 3.3.4.3 (a viable population on the edge of the species' geographical range) along with the surviving non-SSSI colonies at Old Radnor, Stanage Park (moribund in 2020, Ray Woods pers. comm.) and at Tynwain Farm.



Figure 15: moribund, N-damaged *Anaptychia ciliaris* in Parc Pontfaen SSSI (from Bosanquet, 2019b).

- *Bacidia (Scutula) circumspecta* (GB-VU, Wales-VU) is listed as a qualifying feature of Allt-y-gest SSSI, Carn Gafallt SSSI and Duhonw SSSI but is not notified for any of these sites. It has been recorded from at least eight Welsh sites, but is considered extinct at the majority, including Llandeilo, Rhulen & Llanbedr Hills SSSI and River Wye (Upper Wye) / Afon

Gwy (Gwy Uchaf) SSSI. A colony in Marcheini Uplands, Gilfach Farm & Gamallt SSSI is the largest remaining in Radnorshire AoS and qualifies as a feature (3.3.4.4). Llwyn Madoc, adjacent to Allt-y-gest SSSI, holds the largest extant population in Brecknock AoS, ahead of Carn Gafallt SSSI and Duhonw SSSI (Sanderson, 2022), qualifying under Criterion 3.3.4.4.

- *Bacidia (Bellicidia) incompta* (GB-VU, Wales-CR) is a notified feature of Parc Nannau SSSI and a qualifying feature of Stanner Rocks SSSI. It has been recorded from more than 20 Welsh sites but is extant at just three. In addition to the sites mentioned above, Pen-y-rhiw, Llysdinam is the only extant population in Brecknock AoS and warrants notification as SSSI for this species.
- *Buellia hyperbolica* (GB-VU, Wales-EN) is a notified feature of Parc Nannau SSSI (East Gwynedd AoS), where it qualifies under Criterion 3.3.4.4, but has its largest GB population Dinefwr Park SSSI where it should be recognised as a feature (3.3.4.1). Its third known Welsh site, Glan Bran, is also in Carmarthen & Dinefwr AoS but has not been assessed since 1981.
- *Calicium adpersum* (GB-CR, Wales-CR) is a notified feature of Gregynog SSSI, but was last seen there in 1979 despite a recent detailed survey (Sanderson, 2018). It may persist in a sterile state so should remain as a feature of the SSSI.
- *Caloplaca lucifuga* (GB-VU, Wales-VU) is a notified feature of Pwll-y-wrach SSSI, but it was last seen there in 1989 and may no longer be extant. Its largest GB population is at Gregynog SSSI (Sanderson, 2018) (Montgomeryshire AoS) so this qualifies under Criterion 3.3.4.1. Carn

Gafallt SSSI is one of five sites in Brecknock AoS with records, and it is unclear which of these holds the largest population; the same is true of two non-SSSI sites in each of Ceredigion AoS and Radnorshire AoS.

- *Cetraria sepincola* (Wales-VU) is a notified feature of Cors y Llyn SSSI, where it remains extant (Bosanquet, 2019c) and qualifies as a feature under Criterion 3.3.4.1 as the largest (and only surviving) population in Wales. This species was formerly widespread in Powys but has been lost from Aberithon and Bedw Turbaries SSSI, Brecon Beacons SSSI, Carn Gafallt SSSI, Cors Llyn Coethlyn SSSI and Elenydd SSSI.



Figure 16: *Cetraria sepincola* (olive-brown) at Cors y Llyn SSSI (from Bosanquet, 2019c).

- *Cladonia peziziformis* (GB-CR, Wales-NT) is listed as a qualifying feature of Carn Ingli SSSI, Dowrog Common SSSI and Glannau Ynys Gybi/Holy Island Coast SSSI, and remains extant on Carn Ingli and at South Stack in the third of these SSSI. Two thirds of the GB population is in Wales

according to Woods (2010), so all three sites would qualify as SSSI features under Criterion 3.3.4.2 if they retain the species.

- *Collema (Lathagrium) dichotomum* (GB-VU, Wales-EN) is a notified feature of Afon Irfon SSSI and River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI and probably has its largest global population on the Wye (3.3.4.1); Den of Airlie SSSI in Scotland is the only site with a comparable population (David Genney, SNH pers. comm.). *Collema dichotomum* is extinct on the Grwyne Fawr and records from the Dee, Teifi, Tywi and Usk are all unconfirmed.
- *Collema (Scytinium) fragile* (GB-VU, Wales-EN) is a notified feature of Castlemartin Range SSSI (Preseli & South Pembrokeshire AoS) and is also listed in the NRW Features Database as a feature of Stackpole SSSI (Preseli & South Pembrokeshire AoS); the wider Castlemartin-Stackpole population is the largest in Wales and qualifies under 3.3.4.1. The Gower Coast: Rhossili to Porteynon SSSI (West Glamorgan & Llanelli AoS) is the largest known in the AoS and qualifies under Criterion 3.3.4.4, as does a small population at Bwrdd Arthur SSSI (West Gwynedd AoS). None of the three East Gwynedd AoS colonies, in Little Orme's Head SSSI, Llanddulas Limestone SSSI and Pen y Gogarth / Great Ormes Head SSSI, appears to be particularly large (Orange, 2020) so identifying any as a feature appears inappropriate.
- *Cryptolechia carneolutea* (GB-EN, Wales-VU) has its only known Welsh population in Stackpole SSSI, where it qualifies under Criterion 3.3.4.1, although it is not yet a notified feature there.

- *Degelia (Pectenaria) ligulata* (GB-VU, Wales-VU) is a rare, coastal species in Wales that has been recorded from two SSSI in Preseli & South Pembrokeshire AoS and one in West Gwynedd AoS. The De Porth Sain Ffraid / St Bride's Bay South SSSI population is probably larger than that in Dale and South Marloes Coast SSSI although it is difficult to choose between them (Jon Hudson, pers. comm.), whilst the colony in Porth Towyn i Borth Wen SSSI is the only one in West Gwynedd (Criterion 3.3.4.4). None of these populations is a notified feature.
- *Endocarpon adscendens* (GB-EN, Wales-CR) is a notified feature of the River Usk (Upper Usk) / Afon Wysg (Wysg Uchaf) SSSI that was studied in detail by Alan Orange (2013a). It is present at six localities on the river, growing on sunny riverside rocks. Although *E. adscendens* also grows on an artificial waterfall in a park in Cardiff, the River Usk population is much the largest in Wales and therefore qualifies under Criterion 3.3.4.1.
- *Fulgensia fulgens* (GB-EN, Wales-EN) is restricted in Britain to the far south-west except for an outlier in East Anglia, and has a significant number of colonies on the south Pembrokeshire limestone. Both Castlemartin Range SSSI and Stackpole SSSI therefore qualify under Criterion 3.3.4.2, although only the Castlemartin colony is currently notified.



Figure 17: *Fulgensia fulgens* on blown sand in Stackpole SSSI (from Edwards, 2008b).

- *Graphina pauciloculata* (GB-VU, Wales-EN) is listed in the Features Database for Elenydd SSSI, but is now known from six Welsh SSSI (Ceunant Cynfal SSSI, Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI, Coed y Rhygen SSSI, Coedydd a Cheunant Rheidol SSSI, Coedydd De Dyffryn Maentwrog SSSI and Elenydd SSSI) as well as the Cwm Marlais cSSSI in Carmarthenshire and several other localities nearby. Identifying which population in each Area of Search is the largest is unlikely to be possible and this species was probably under-recorded when it was listed as Vulnerable in the GB Red List; it should not be regarded as a qualifying feature on any Welsh SSSI.
- *Heterodermia leucomelos* (GB-EN, Wales-VU) is a notified feature of Glannau Aberdaron SSSI and Ynys Enlli SSSI and also occurs in Glannau Rhoscolyn SSSI, Glannau Ynys Gybi/ Holy Island Coast SSSI (last four

are all in West Gwynedd AoS), St. David's Peninsula Coast SSSI and Stackpole SSSI (both Preseli & South Pembrokeshire AoS). The four sites in West Gwynedd definitely represent a “substantial proportion of localities for the species in Britain” and the notified sites therefore qualify under Criterion 3.3.4.2, as do the other two West Gwynedd SSSI if *Heterodermia* is still extant. It is more difficult to choose between the Pembrokeshire colonies, and it is arguable that both qualify because they are both viable and *Heterodermia* is declining rapidly in Britain.



Figure 18: *Heterodermia leucomelos* in coastal grassland in Stackpole SSSI (from Edwards, 2008b).

- *Lecanographa amylacea* (GB-VU, Wales-EN) is a notified feature of Gregynog SSSI and Parc Nannau SSSI, but Sanderson (2018 & 2014b respectively) considers both to be misidentifications of *L. lyncea*. The only SSSI with a confirmed population of *L. amylacea* is Carn Gafallt SSSI (Sanderson, 2014c), and this should be regarded as a feature under

Criterion 3.3.4.1. The Lichens of Wales website mentions four more sites in Powys, but none is definitely correctly identified. Orange (1997) showed that a record from Dinefwr Estate SSSI was also a misidentification.

- *Lecanora achariana* (GB-CR, Wales-EN) has a strong colony by Ffynnon Lloer in Eryri SSSI, which qualifies as a feature under Criterion 3.3.4.1 as the largest extant population in Wales. A small colony occurs further north in Eryri SSSI on the Afon Llafar, but it is extinct at its third Welsh site – Llyn Bodlyn in the Rhinog Mountains – where it was last recorded in 1879.
- *Lecanora quercicola* (GB-VU, Wales-VU) is a notified feature of Gregynog SSSI, which Sanderson (2018) reports as one of the strongest populations in Britain. It is the only known site in Montgomeryshire and qualifies under Criteria 3.3.4.1 and 3.3.4.4. Otherwise, *L. quercicola* is known from five sites in Powys (Brecknock AoS and Radnorshire AoS), with unconfirmed records from Meirionnydd and Clwyd. The only other SSSI with a record of *L. quercicola* is Lake Wood, Llandrindod Wells SSSI (Radnorshire AoS), but this was last recorded in 1985 and the relative size of this population compared with others in Powys is uncertain. A full assessment of this species is needed before other qualifying sites can be identified.
- *Leptogium cochleatum* (GB-VU, Wales-CR) is listed as a feature of Coedydd Abergwynant SSSI but is believed to be extinct there, if not in the whole of Wales, having last been recorded in 1989 despite more recent targeted surveys. There are records from three other sites – Coed Cwm Einion SSSI, Freshwater East Cliffs to Skrinkle Haven SSSI and Skokholm SSSI – but these are either known or believed to be erroneous: Hudson (2020b) showed that the most recent record, from Freshwater East Cliffs

to Skrinkle Haven SSSI, was misidentified *L. britannicum*. An undescribed species “*Leptogium* aff. *cochleatum*” grows in Gwynfynydd SSSI and Coedydd a Cheunant Rheidol SSSI (Steve Chambers pers. comm.) and may warrant recognition as a SSSI feature when it is formally described; at present *L. cochleatum* should not be listed as a qualifying feature of any SSSI in Wales.

- *Leptogium* (*Pseudoleptogium*) *diffractum* (GB-NT, Wales-NT) is a notified feature of Castlemartin Range SSSI, but no longer qualifies as a feature because it is not red-listed VU to CR. This species also grows on Gower, Ogof Ffynnon Ddu and the north Wales coastal limestone.
- *Lobaria amplissima* (Wales-VU) is extant on approximately 87 trees on 15 sites in Wales (Table 16); there are historic records from 20 sites that have subsequently lost *L. amplissima*, and one record from rock at Mynydd Penarfynydd SSSI. Ganllwyd SSSI clearly qualifies under 3.3.4.1 as the largest population in Wales, whilst selection of a suite of sites on the edge of this species’ (pollution-restricted) range (Criterion 3.3.4.3) would take in the other three large, resilient populations at Parc Nannau SSSI, Cefndeuddwr SSSI (notified feature) and Trawscoed & Dolhendre cSSSI.

Table 16: occupied tree counts at Welsh sites for *Lobaria amplissima*.

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Ganllwyd SSSI (Parc Dolmelynllyn)	SH7223	2012	19	33	Neil Sanderson report
Parc Nannau SSSI	SH7421	2014	20	16	Neil Sanderson report
Trawscoed and Dolhendre	SH8432	2020	3	12	Andrew Graham email
Cefndeuddwr SSSI	SH7226	2019	8	8	Sam Bosanquet report
Coed Cae Awr SSSI	SH7457	2015	2	4	Sam Bosanquet report
Foel Friog, Aberllefenni	SH7709	2005	3	3	-
Llannerch Elsi	SH7854	2017	1	2	Huw Green email
Gwynfynydd SSSI	SH7428	2002	2	2	-
Glyn Lledr	SH7853	2020	1	1	Huw Green email
Ganllwyd SSSI (Glasdir carpark)	SH7322	2020	1	1	Dave Lamacraft email
Nannerth Fawr	SN9472	1989	3	1	-
Coedydd Aber SSSI	SH6670	1998	1	1	Dave Lamacraft report
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	SH6641	2001	1	1	-
Ganllwyd SSSI (Coed Ganllwyd)	SH7124	2016	1	1	-

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Ochr-cefn	SN9468	2011	1	1	-
Coedydd Nanmor SSSI	SH5945	2001	2	0	Neil Sanderson report
Rhinog SSSI (Crafnant)	SH6128	1971	2	0	Neil Sanderson report
Afon Glasgwm, Penmachno	SH7850	1984	1	0	-
Cae'n-y-Coed area	SH7657	1970	1	0	-
Bryn Derw, Llennyrch	SH6539	2001	1	0	Neil Sanderson report
Lawrenny	SN0107	2011	1	0	-
Nant Gwastadedd	SJ0037	1965	1	0	-
Slebech Park	SN0214	1986	1	0	-
Ty Hyll area	SH7557	1970	1	0	-
Unknown SH52	SH52	Pre-1960	1	0	-
Unknown SH55	SH55	1850	1	0	-
Unknown SH56	SH56	Pre-1960	1	0	-
Unknown SH57	SH57	Pre-1960	1	0	-
Unknown SH61	SH61	Pre-1960	1	0	-
Unknown SH65	SH65	Pre-1960	1	0	-
Unknown SH76	SH76	Pre-1960	1	0	-
Unknown SH85	SH85	Pre-1960	1	0	-
Unknown SN59	SN59	Pre-1960	1	0	-
Unknown SN69	SN69	Pre-1960	1	0	-
Unknown SN77	SN77	Pre-1960	1	0	-
Mynydd Penarfynydd SSSI	SH2126	2015	3	rock	-

- Lobaria virens* (Wales-EN) is extant on approximately 110 trees on 27 sites in Wales (Table 17), with a slightly less restricted distribution than *L. amplissima* including a suite of sites in Pembrokeshire. There are historic records from 19 sites that have subsequently lost *L. virens*, and records from rock at three sites. *Lobaria virens* is a notified feature of Carn Gafallt SSSI – the largest colony in the Radnorshire AoS. The colonies at Parc Nannau SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI, Rhinog SSSI, Ganllwyd SSSI and Glyn Lledr deserve recognition as features as the only potentially resilient ones on the edge of its (pollution-restricted) range (3.3.4.3) and the Goulthrop Roads colony in De Porth Sain Ffraid / St Bride's Bay South SSSI should also be notified under Criterion 3.3.4.4 as the largest in the Preseli & South Pembrokeshire AoS. Foel Friog (Montgomeryshire AoS) warrants notification as the largest colony in that AoS, but it is uncertain whether Coedydd Aber SSSI or the disjunct colonies in Eryri SSSI should be regarded as the largest population in West Gwynedd AoS.

- *Opegrapha fumosa* (Wales-VU) is widespread in old forest and parkland habitats in Wales, with records from 15 SSSI: Allt-y-gest SSSI (3 trees), Caban Lakeside Woodlands SSSI (2 trees), Cadair Idris SSSI, Carn Gafallt SSSI (3 trees), Ceunant Cynfal SSSI (4 trees), Coed y Rhygen SSSI (15 trees), Coedydd De Dyffryn Maentwrog SSSI (5 trees), Coedydd Glannau a Cwm Coel SSSI (2 trees), Coedydd Nanmor SSSI, Dinefwr Estate SSSI (1 tree), Elenydd SSSI (notified feature), Ganllwyd SSSI, Gregynog SSSI (4 trees), Gwynfynydd SSSI and Parc Nannau SSSI (17 trees). Parc Nannau SSSI should have this species recognised as a feature as the largest population in Wales (3.3.4.1), whilst Gregynog SSSI (Montgomeryshire AoS), Dinefwr Estate SSSI (Carmarthen & Dinefwr AoS) and the combined site of Allt-y-gest SSSI and Llwyn Madoc (with 8 trees in total) each qualify under Criterion 3.3.4.4. It is uncertain how many trees in Gro wood, Elenydd SSSI supported *O. fumosa* in 1998, nor why it was singled out as a feature; it was not relocated in 2021 (Acton, 2022b).

Table 17: occupied tree counts at Welsh sites for *Lobaria virens*.

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Parc Nannau SSSI	SH7420	2015	14	22	Neil Sanderson report
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	SH6540	2002	9	18	Neil Sanderson report
De Porth Sain Ffraid / St Bride's Bay South SSSI	SM8412	2021	10	15	Jon Hudson survey
Glyn Lledr	SH7853	2021	14	14	Huw Green survey
Rhinog SSSI (Coed Crafnant)	SH6228	2014	7	7	Neil Sanderson report
Ganllwyd SSSI (Dolmelynlllyn)	SH7223	2012	13	5	Neil Sanderson report
Foel Friog, Aberllefenni	SH7710	2005	3	3	-
Carn Gafallt SSSI	SN9364	2014	8	2	Neil Sanderson report
Coedydd Aber SSSI	SH6671	2017	1	2	-
Eryri SSSI (Nant Gwynant)	SH6452	2015	2	2	-
Coed Tremadog SSSI	SH5741	2002	2	2	-
Coed y Gribyn	SH6616	2002	2	2	-
Coed Maes-mawr etc SSSI	SH7710	1999	2	2	-
Milford Haven Waterway SSSI (Lawrenny)	SN0006	2011	4	1	Jon Hudson comment
Eryri SSSI (Hafod y Llan)	SH6351	2015	1	1	-
Coedydd Nanmor SSSI (Hafod Garregog)	SH6044	2014	1	1	-
Trawscoed and Dolhendre	SH8432	2012	1	1	-
Milford Haven Waterway SSSI (Minwear Wood)	SN0513	2011	1	1	-
Gregynog SSSI	SO0897	2005	1	1	-
Coed y Garth	SH6516	2002	1	1	-

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Eisengrug	SH6336	2002	1	1	-
Gwynfynydd SSSI	SH7327	2002	1	1	-
Plas Tan y Bwch	SH6540	2002	1	1	-
Bryn Derw, Llennyrch	SH6539	2001	1	1	-
Rhinog SSSI (Coed Gerddi Bluog)	SH6129	2000	1	1	-
Mochdre Dingles SSSI	SO0887	1997	1	1	-
Coedydd a Corsydd Aberteifi (Teifi Estuary Woodlands & Marshes) SSSI	SN1943	1996	1	1	-
Picton Park	SN0113	1987	1	0	-
Blackpool Mill	SN0614	1986	1	0	-
Fairy Glen Woods SSSI	SH8053	1974	1	0	-
Slebech Park	SN0314	1971	1	0	-
Tanhelbont SSSI	SH4639	1971	1	0	-
Afon Llugwy SSSI	SH7657	1970	1	0	-
Unknown in SH52	SH52	1991	1	0	-
Unknown in SH46	SH46	1960	1	0	-
Unknown in SH50	SH50	1960	1	0	-
Unknown in SH51	SH51	1960	1	0	-
Unknown in SH53	SH53	1960	1	0	-
Unknown in SH55	SH55	1960	1	0	-
Unknown in SH82	SH82	1960	1	0	-
Unknown in SJ06	SJ06	1960	1	0	-
Unknown in SN03	SN03	1960	1	0	-
Unknown in SN69	SN69	1960	1	0	-
Unknown in SN77	SN77	1960	1	0	-
Unknown in SR99	SR99	1960	1	0	-
Unknown in SN62	SN62	1959	1	0	-
Afon Cleddau Gorllewinol/Western Cleddau River SSSI	SM9624	2011	4	rocks	-
Coedydd a Cheunant Rheidol SSSI	SN7477	2022	1	rocks	-
Ynys Enlli SSSI	SH1121	1977	1	rocks	-
Glannau Aberdaron SSSI	SH1325	1975	1	rocks	-

- *Parmotrema robustum* (GB-CR, Wales-CR) is known in Britain only from Cornwall and three SSSI in Wales – Coed Cwm Clettwr SSSI and Coed Cwm Einion SSSI (both Ceredigion AoS) and the Coed Crafnant unit of Rhinog SSSI (East Gwynedd AoS). Only the Coed Cwm Einion population is a notified feature, but both Ceredigion colonies qualify under Criterion 3.3.4.2, whilst the Rhinog population qualifies under 3.3.4.4.
- *Porocyphus kenmorensis* (GB-NT, Wales-NT) is a notified feature of the River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI, but no longer qualifies individually because it is only Near Threatened. It is a constituent species of qualifying AQUI assemblages on three SSSI (see 4.2.4, above).
- *Protoparmelia atriseda* (GB-VU, Wales-NT) is listed in the Features Database as a qualifying feature of Marcheini Uplands, Gilfach Farm &

Gamallt SSSI (Radnorshire AoS) and has also been recorded in Cerrig-Gwlach SSSI (Radnorshire AoS), Eryri SSSI (West Gwynedd) and Mwyngloddiau a Chreigiau Gwydyr SSSI (East Gwynedd). The relative size of the two Radnorshire colonies is unknown, but continuing to recognise the Gilfach population as a feature under Criterion 3.3.4.4 seems sensible. The Eryri SSSI and Mwyngloddiau a Chreigiau Gwydyr SSSI populations also qualify under Criterion 3.3.4.4.

- *Pterygiopsis lacustris* (Wales-VU) is a notified feature of the River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI, and qualifies under Criterion 3.3.4.4 because it includes the largest known population of this species in Radnorshire AoS. Two other sites also hold the largest known populations in their respective Areas of Search - Afon Eden - Cors Goch Trawsfynydd SSSI (East Gwynedd) and Eryri SSSI (West Gwynedd). The Marcheini Uplands, Gilfach Farm & Gamallt SSSI colony is contiguous with that on the Wye and arguably this should be the qualifying Radnorshire site.
- *Ramalina polymorpha* (GB-NT, Wales-NT) is a notified feature of Ramsey / Ynys Dewi SSSI and is also listed in the Features Database as occurring in Carn Ingli SSSI. Assessment of the MRCSI assemblage (see 4.2.3, above) reveals colonies in five more Pembrokeshire SSSI: Skomer Island and Middleholm SSSI, Skokholm SSSI, St David's Peninsula Coast, Dale and South Marloes Coast SSSI and Strumble head - Llechdafad Cliffs SSSI. Because *R. polymorpha* is only Near Threatened, it is not an individually qualifying feature on any site.
- *Sticta limbata* (Wales-NT) is a notified feature of Carn Gafallt SSSI, but no longer qualifies because it is not Threatened (CR, EN or VU) in GB or

Wales. This species is considered to be increasing in much of west and north-west Wales (e.g. Bosanquet, 2020), but continues to decline in Powys (Ray Woods, pers. comm.). Sanderson (2014c) reports a decline at Carn Gafallt from two trees to one since 1991.

- *Sticta sylvatica* (Wales-NT) is a notified feature of Coed Copi'r Graig SSSI and Cwm Clydach, Cydweli SSSI, but no longer qualifies at either because it is not Threatened. The population at Coed Copi'r Graig SSSI is part of a qualifying SOWI assemblage and is therefore still part of a lichen feature, but the one at Cwm Clydach, Cydweli SSSI is not associated with any other notified lichens. There are records of *S. sylvatica* from more than 50 SSSI in Wales.



Figure 19: *Sticta sylvatica* in non-SSSI woodland in Dyfi Forest, Montgomeryshire (Sam Bosanquet).

- *Teloschistes flavicans* (GB-VU, Wales-VU) is one of the most distinctive, high profile maritime lichens in Wales, with a widely scattered presence

around the coast from Pembrokeshire to Ynys Môn. It is a notified feature of Dale and South Marloes Coast SSSI, Freshwater East Cliffs to Skrinkle Haven SSSI, Ramsey / Ynys Dewi SSSI, Skokholm SSSI, Skomer Island and Middleholm SSSI, St. David's Peninsula Coast SSSI and Stackpole SSSI (all Preseli & South Pembrokeshire AoS), and Glannau Aberdaron SSSI, Newborough Warren - Ynys Llanddwyn SSSI and Ynys Enlli SSSI (all West Gwynedd AoS), also occurring in Glannau Ynys Gybi/ Holy Island Coast SSSI and Mynydd Penarfynnydd SSSI (both West Gwynedd AoS). Although there are also substantial populations in Devon and Cornwall, the Welsh colonies of *T. flavicans* represent important concentrations of this declining species and arguably all qualify under Criterion 3.3.4.2 (“a viable population of the species in an Area of Search (AoS) supporting a substantial proportion of localities for the species in Britain.”).

- *Thamnolia vermicularis* (Wales-VU) has its southernmost British population on Cadair Idris SSSI, where it is a notified feature. It also occurs in Eryri SSSI and should be considered a qualifying feature there as this is the largest population in Wales (3.3.4.1 & 3.3.4.4). As a snowbed species *Thamnolia* is particularly vulnerable to Climate Change, and a decline on Cadair Idris – “Almost all likely habitat was more or less completely grassed over, presumably either grazing-related or climate change with lack of semipermanent snow cover in winter” (Douglass, 2020 p. 5) – coupled with its fewer than five remaining Welsh sites suggests that it would be upgraded to Endangered if the Lichen Red List was revised.

5.2.1.2. Additional independently qualifying GB Red List lichen species features

As well as the GB Red Listed lichens that are already listed in the NRW Features Database, either as notified or qualifying features, there are records of another 39 GB Red Listed lichens from Wales. Some of these species are extinct in Wales or have only been recorded erroneously, but 19 qualify for recognition as features of existing SSSI or *de novo* notification.

- *Bacidia subincompta* (*Toniniopsis separabilis*) (GB-VU, Wales-RE) had its sole Welsh record from a dead elm by Elan Village and is now extinct here. It does not qualify as a feature of any SSSI.
- *Biatora ligni-mollis* (GB-VU) was recorded new for Wales on three trees in Caban Lakeside Woodlands SSSI (Sanderson, 2019b). This internationally rare lichen qualifies under Criterion 3.3.4.1.



Figure 21: *Biatora ligni-mollis* on lignum in Caban Lakeside Woodlands SSSI (from Sanderson, 2019b).

- *Biatoridium monasteriense* (GB-EN, Wales-CR) has its sole Welsh population in Craig-y-Benglog SSSI, where it qualifies under Criterion 3.3.4.1. The wych elm supporting *B. monasteriense* fell over in 2013, but was winched upright by NNR staff and is now re-growing – it looked healthy in 2021 (Dave Lamacraft *in litt.*). Orange (2015b) located two additional elms supporting the lichen during a survey of Allt-y-Benglog NNR.
- *Bryoria smithii* (GB-CR, Wales-RE) has three or four historic localities in north-west Wales, perhaps within Eryri SSSI or Rhinog SSSI, but the most recent 1959 record has recently been redetermined by Alan Orange as *B. bicolor*. At present, *B. smithii* cannot be regarded as a feature of any SSSI.
- *Caloplaca atroflava* (GB-CR, Wales-DD) has been reported historically from four 10km squares in West Gwynedd AoS, but no details of the sites are known. A record from the River Usk (Upper Usk) / Afon Wysg (Wysg Uchaf) SSSI (Orange, 2013a) involved atypically coloured thalli. At present, this species does not qualify as a feature of any Welsh SSSI.
- *Caloplaca flavorubescens* (GB-EN, Wales-CR) was recorded in Glynllifon SSSI (West Gwynedd) in 1971 and from Baron Hill Park SSSI (West Gwynedd) in 1895. It is probably extinct in Wales, and was not relocated at Baron Hill Park during surveys in 1996 and 2003, but Glynllifon has not been subject to recent lichen survey. The Glynllifon record is too old to qualify as a SSSI feature.
- *Caloplaca herbidella s. str.* (GB-VU, Wales-VU) is known from 10 sites in Wales, but only from two SSSI. It should be regarded as a feature of Gregynog SSSI (Montgomeryshire) under Criterion 3.3.4.4 because it is the only colony known in the Area of Search, although Sanderson (2018)

reports the population to be small and declining. The colony at Carngafallt SSSI (Brecknock/Radnorshire) is more stable (Sanderson, 2014c) but only occupies two trees. A fruiting colony on two trees near Llanwrthwl is perhaps the largest in Brecknock (<http://wales-lichens.org.uk/species-account/caloplaca-herbidella>), and warrants a full survey and perhaps notification. Notification of a suite of sites for *Caloplaca herbidella* in Brecknock AoS and Radnorshire AoS under Criterion 3.3.4.2 is justified, because this area of Powys is the British headquarters for the species. Glan Bran Deer Park in Carmarthen & Dinefwr AoS requires survey, because that site supports the only recorded population in that AoS but the last record was made in 1995.

- *Caloplaca luteoalba* (GB-EN, Wales-CR) has been recorded historically from a handful of non-SSSI sites in Powys, and the last Welsh record coming from Plas Heaton in Clwyd in 1996. The only record from a Welsh SSSI came from Baron Hill Park SSSI in 1972, but it was not relocated at Baron Hill Park during surveys in 1996 and 2003 and has certainly been lost from there. At present, *C. luteoalba* cannot be regarded as a feature of any Welsh SSSI.
- *Catapyrenium psoromoides* (GB-CR, Wales-RE) was collected from Harlech Castle in 1924 but has not been seen subsequently in Wales. The rocks around Harlech Castle have not been surveyed recently for lichens, and *C. psoromoides* cannot be considered as a SSSI feature in Wales until/unless it is rediscovered.
- *Catillaria subviridis* (GB-VU, Wales-DD) is primarily a lichen of coastal rock, but the sole Welsh record is from Ruabon/Llantysilio Mountains and

Minera SSSI in 1924. It cannot be regarded as a SSSI feature given doubts over its continued presence and even the original identification.

- *Chaenotheca phaeocephala* (GB-CR, Wales-RE) has been recorded from two Welsh sites but is believed to have been lost from both. Neither Llanerchydol Park, Montgomeryshire (1996 record) nor Draen Farm, Radnorshire (2003 record) is a SSSI.
- *Cladonia mediterranea* (GB-CR, Wales-DD) was recorded in Carn Ingli SSSI in 1995, but Alan Orange has redetermined the specimen and there are now no confirmed Welsh records of this species.
- *Collema (Scytinium) fragrans* (GB-EN, Wales-RE) was recorded in the 1970s and 1980s in Stanner Rocks SSSI and in River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI at Erwood, but has been lost from both sites because of Dutch Elm Disease. The last Welsh record came from Dinefwr Park SSSI in 1994, but a recent survey (Sanderson, 2014a) suggests this site has also lost *C. fragrans*. Miraculously, *C. fragrans* was discovered in 2022 on a parkland oak at Llwyn Madoc, adjacent to Allt-y-gest SSSI. This colony qualifies under Criterion 3.3.4.1 as the only one known in Wales.
- *Collema (Scytinium) parvum* (GB-VU, Wales-VU) has its sole known Welsh site in Cwm Uchaf, Eryri SSSI, where it was recorded in 1994. No lichen monitoring work has taken place in that area subsequently and the status of the colony is unknown, but it qualifies under Criterion 3.3.4.1.
- *Hymenelia heteromorpha* (GB-VU, Wales-VU) has its sole recorded Welsh site on the limestone crags of Creigiau Eglwyseg in Ruabon/Llantysilio Mountains and Minera SSSI, where it qualifies under Criterion 3.3.4.1.

Wide-ranging limestone lichen surveys by Orange (2020) did not reveal any additional colonies in north Wales.

- *Lecanora strobilina* (GB-VU, Wales-VU) grows at six Welsh sites, including four SSSI. It grows on a sweet chestnut in Parc Nannau SSSI, an oak fencepost in Ceunant Cynfal SSSI and oak lignum at Hafod-y-Illan (Eryri SSSI), and has also been recorded from Coed Cwm Einion SSSI. The species should be regarded as a feature of Parc Nannau SSSI, Eryri SSSI and Coed Cwm Einion SSSI as these hold the most resilient, if very small, colonies in each Area of Search.
- *Lecidea erythrophaea* (GB-VU, Wales-DD) was last recorded in Wales at Talybont Reservoir in 1985 and has three older records including one from Cwm Doethie - Mynydd Mallaen SSSI in 1965. Several subsequent surveys of the latter site have failed to reveal its continued presence and it is probably best not to regard it as a SSSI feature until it is relocated.
- *Lichenochora epifulgens* (GB-EN) is a parasitic fungus of the Endangered *Fulgensia fulgens*, occurring at one of the two Welsh sites for that species. It should be considered a qualifying feature of Stackpole SSSI (3.3.4.1).
- *Parmelina carporrhizans* (GB-VU, Wales-VU) occurs at scattered sites in coastal Ceredigion and Meirionnydd, including Coed Llechwedd SSSI and Glaslyn SSSI, as well as a street in central Aberystwyth, a disused mine and a ruined castle. It is unclear which of the SSSI in East Gwynedd AoS supports the most *P. carporrhizans* and recognition of either as a SSSI may be inappropriate given the apparent tendency of this species to occur in otherwise unremarkable localities.

- *Peltigera venosa* (GB-VU, Wales-CR) has been recorded three times in central Eryri, most recently from Llyn Llydaw in 1981. It should be recognised as a qualifying feature of Eryri SSSI under Criterion 3.3.4.1 and urgently needs a survey to determine whether it is still extant.
- *Pertusaria (Lepra) melanochlora* (GB-EN, Wales-EN) is known from five upland sites in Wales and is a qualifying feature of Eryri SSSI which holds two of the four extant populations and therefore qualifies under Criterion 3.3.4.1. Carn Owen cSSSI in Ceredigion holds the larger of two known Ceredigion populations and qualifies under Criterion 3.3.4.4. There is an historic record from Meirionnydd.
- *Pertusaria pustulata* (GB-VU, Wales-RE) was found on an ash tree near Dolgellau in 1870 but has not been seen subsequently in Wales.
- *Physcia tribacioides* (GB-VU, Wales-CR) is known in Wales from a tree at Orielton FSC Centre (Preseli & South Pembrokeshire AoS) and from a street tree in Machynlleth (Montgomeryshire AoS). Both technically qualify under Criterion 3.3.4.4, but SSSI notification may not be appropriate for single trees.
- *Poeltinula cerebrina* (GB-VU, [Wales-RE]) has two historic records from Wales, but both are considered to be erroneous because they are from non-limestone habitats and are not backed up by specimens.
- *Porina effilata* (GB-CR, Wales-EN) grows on one rockface in Coedydd a Chorsydd Aberteifi / Teifi Estuary Woodlands and Marshes SSSI and one rockface in Ceunant Coch near Talsarnau. It qualifies as a feature of both sites under Criterion 3.3.4.4 and consideration should be given to notifying Ceunant Coch for this species. *Porina effilata* is a rare specialist of base-

rich rock in mild, oceanic areas and often grows on rock outcrops with basiphilous bryophytes (Fig. 22).



Figure 22: rockface supporting *Porina effilata* in Coedydd a Chorsydd Aberteifi / Teifi Estuary Woodlands and Marshes SSSI (from Orange & Chambers, 2017).

- *Pseudocyphellaria lacerata* (GB-VU, Wales-CR) is known in Wales only from two ash trees in Cwm Nantgwynant, within the Hafod-y-llan section of Eryri SSSI. It qualifies as a feature under Criterion 3.3.4.1.
- *Pyrenula coryli* (GB-VU, Wales-RE) was recorded from Cadair Idris in the 19th century, but has not been seen for over 100 years in Wales and cannot be considered as a SSSI feature.
- *Pyrenula hibernica* (GB-VU, Wales-CR) has its only Welsh population in Ceunant Llennyrch NNR, where Sanderson (2016) reports occurrence on 23 hazels. Elsewhere in Europe it is known from three sites in western

Scotland, a handful in western Ireland, one in the Pyrenees and some in the Azores. It is a feature of Coedydd De Dyffryn Maentwrog SSSI under Criterion 3.3.4.1.



Figure 23: *Pyrenula hibernica* photographed in Ceunant Llennyrch (Dave Lamacraft).

- *Schismatomma graphidioides* (*S. ricasolii*) (GB-VU, Wales-VU) has an intriguingly widespread distribution in western Wales, often growing in otherwise unremarkable localities. The only population known from a designated site is in Dinefwr Park SSSI, technically qualifying under Criterion 3.3.4.4, but there are several larger colonies elsewhere in Wales

and this species is probably best considered under-recorded and therefore not worthy of recognition as a qualifying feature on any site.

- *Staurothele rufa* (GB-EN, Wales-EN) was recorded from a limestone quarry near Porthkerry (Mid & South Glamorgan AoS) in 1964 but has not been seen subsequently including during a targeted, detailed survey (Orange, 1997). This is the only British record and would qualify for notification if the colony was relocated.
- *Stereocaulon symphycheilum* (GB-EN, Wales-VU) grows on a basic igneous rockface on Clogwyn y Garnedd in Eryri SSSI and is otherwise known in Britain from just one site in England and one or two in Scotland. It clearly qualifies as a feature of Eryri SSSI under Criterion 3.3.4.1, and urgently needs monitoring because the only record dates from 1996.
- *Sticta canariensis* (green morphotype) (GB-VU, Wales-EN) is shrouded in secrecy because of its astonishing appearance (Fig. 24), very limited Welsh distribution, and past desirability to collectors. Its mystique is compounded by confusion caused by past name changes, with the commoner *Sticta canariensis* cyanobacterial morphotype sometimes being separated as *S. dufourii* and sometimes being recorded simply as *S. canariensis*: several apparent records result from confusion in databases. There are only three Welsh sites where the green morphotype definitely grows independently from the cyanobacterial morphotype, but records from Coedydd a Cheunant Rheidol SSSI, Fairy Glen SSSI and Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI might be correctly assigned to this taxon. Only Hafod-y-llan in Eryri SSSI and two valleys a couple of miles apart in the North Mawddach cSSSI are known

to hold populations. Given the rarity of this taxon, notification of the North Mawddach valley woodlands as SSSI is urgently needed.



Figure 24: *Sticta canariensis* in North Mawddach cSSSI (Ray Woods).

- *Strigula stigmatella* var. *stigmatella* (GB-EN, Wales-CR) grows in Allt Dihanog, Hafod (Ceredigion AoS) and qualifies as a feature of the Elenydd SSSI under Criterion 3.3.4.1. Although this is the sole Welsh population of var. *stigmatella*, the related var. *alpestris* (Wales-VU) is known from Cadair Idris SSSI and Eryri SSSI (see 5.2.1.3, below).
- *Synalissa ramulosa* (GB-VU, Wales-VU) has its largest Welsh population in Pen y Gogarth / Great Ormes Head SSSI, where it qualifies individually under Criterion 3.3.1.1. Gower Coast: Rhossili to Port Eynon SSSI holds the only known population in south Wales, qualifying under Criterion

4.4.1.4. A colony recorded in 1961 in Bwrdd Arthur SSSI was not relocated by Orange (2020).

- *Teloschistes chrysophthalmos* (GB-CR) has been recorded recently from three sites in south-east Wales and one on the Ceredigion-Montgomeryshire border. This species is increasing in southern Britain and would no longer qualify as CR in Britain; indeed it is probably not even Threatened nationally. As such, notification of any Welsh site for this species should be a low priority.
- *Varicellaria velata* (GB-VU, Wales-VU) is mapped on NBN for nine Welsh sites, but several of these lack details and may be the result of misidentification or inputting errors. Only the colony in Coed Berthllwyd, Ganllwyd SSSI is known to be extant (Sanderson, 2013), and this therefore qualifies under Criterion 3.3.1.1. The beech tree on which *V. velata* grew in Parc Nannau SSSI had fallen by the time it was surveyed by Sanderson (2014b) and the species has been lost. A 1970s record from Fairy Glen Woods SSSI has never been repeated, and nor has a 1960s record from Coed Victoria.
- *Verrucaria madida* (GB-VU, Wales-DD) has a single Welsh record: from a riverside rock on the Afon Hepste (Brecknock AoS). The colony is upstream of the Dyffrynnoedd Nedd a Mellte SSSI and outside any protected site. Further survey work on the watercourses in this area is needed before notification can be considered.
- *Vestergrenopsis elaeina* (GB-VU, Wales-CR) has its only British site south of Scotland on a rockface on Clogwyn y Garnedd, Eryri SSSI. This qualifies under Criteria 3.3.1.1 and 3.3.4.3.

- *Xanthoparmelia tinctoria* (GB-VU, Wales-EN) is a coastal species, which has conclusively been recorded in Wales only from Skokholm SSSI and Skomer Island and Gateholm SSSI. The lack of monitoring data makes it impossible to determine which site has the larger population, but these are the northernmost colonies in Britain and therefore qualify under Criterion 3.3.4.3. Additional records from inland limestone in Pembrokeshire and inland rock in eastern Carmarthenshire, northern Ceredigion and the northern edge of Eryri SSSI are questionable.

5.2.1.3. Additional independently qualifying Welsh Red List lichen species features

An astonishing 146 lichen species are listed as threatened on the Welsh Lichen Red List (Woods, 2010) but are not threatened in GB as a whole (Woods & Coppins, 2012). Six of these are currently listed in the Features Database (see 5.2.1.1), leaving 140 which require consideration here.

- *Acarospora badiofusca* (Wales-VU) was noted on a single rock on the summit of Yr Wyddfa in 2003, qualifying as a feature of Eryri SSSI under Criterion 3.3.4.1.
- *Agonimia octospora* (Wales-VU) is an oceanic epiphyte with records from 11 SSSI, especially in East Gwynedd AoS. A suite of sites in East Gwynedd warrant recognition under Criterion 3.3.4.3: Coedydd de Dyffryn Maentwrog SSSI, Coedydd Dyffryn Ffestiniog (gogleddol) SSSI, Ganllwyd SSSI and Parc Nannau SSSI support the strongest colonies. Dinefwr Park SSSI supports the only known population in Carmarthen & Dinefwr AoS and qualifies under 3.3.4.4. Hafod-y-llan in Eryri SSSI is believed to be

the largest colony in West Gwynedd AoS, but the relative size of three colonies in Ceredigion is unknown.

- *Alectoria nigricans* (Wales-VU) has declined substantially in Wales since the 20th century and would probably now be assessed as Critically Endangered if re-evaluated. There are historic records from 14 1km squares in 10 hectads, but the species has only been recorded from four sites since 2000 and Turner (2021) only relocated *Alectoria* at one of those four sites during a specific survey. This last extant Welsh population, on Glyder Fawr in Eryri SSSI, qualifies under Criterion 3.3.4.1.



Figure 25: the habitat of *Alectoria nigricans* on Esgair Felen, Glyder Fawr (from Turner, 2021).

- *Allantoparmelia alpicola* (Wales-VU) was recorded in Moel Hebog SSSI in 1997 and also has an historic record from Eryri SSSI. This species qualifies as a feature of Moel Hebog under Criterion 3.3.4.1.

- *Arthonia ligniariella* (Wales-VU) is a rather 'weedy' species known from at least four sites in Ceredigion: a cliff-top in Borth - Clarach SSSI and three non-SSSI metal mines. It is a facultative metallophyte (Steve Chambers *in litt.*) and may be better protected as an element of the Metalliferous Habitats Index (see 4.2.6), although it is not currently listed on that Index, rather than through recognition as an individually qualifying species.
- *Arthonia mediella* (Wales-VU) has only been recorded in Wales from rocks in Nant Irfon NNR, qualifying as a feature of Elenydd SSSI under 3.3.4.1.
- *Arthonia zwackhii* (Wales-VU) is only known from three sites in Wales: Coedydd Aber SSSI in West Gwynedd AoS, and Stackpole SSSI and Lawrenny Quay in Preseli & South Pembrokeshire AoS. The first two sites qualify under Criterion 3.3.4.4 as the largest populations in their areas.
- *Arthopyrenia carneobrunneola* (Wales-VU) has been recorded from three SSSI in Meirionnydd: Coed y Rhygen SSSI (3 trees), Coedydd De Dyffryn Maentwrog SSSI (3 trees) and Ceunant Cynfal SSSI (1 tree). Sanderson (2019c) also mentions its occurrence in the Artro Valley. It is impossible to select one site, so this species should be recognised as a feature of both Coed y Rhygen SSSI and Coedydd De Dyffryn Maentwrog SSSI (3.3.4.4).
- *Bacidia absistens* (Wales-VU) is a north-western species with very few Welsh records. The colony in Afon Rheidol ger Capel Bangor SSSI probably qualifies as the largest in Ceredigion AoS, as does one in Afon Llugwy SSSI (West Gwynedd AoS), but more survey work is required to determine whether Afon Eden - Cors Goch Trawsfynydd SSSI or Gwynfynydd SSSI should be selected in East Gwynedd AoS.

- *Belonia russula* (Wales-VU) has a somewhat uncertain 1994 record from Eryri SSSI – listed on NBN with a note ‘on 1994 printed card’ but not mentioned in the review of Eryri’s montane lichens by Fryday (1996). Given the nature of the record this cannot be regarded as a SSSI feature until relocated.
- *Biatora globulosa* (Wales-CR) was noted in Caban Lakeside Woodlands SSSI in 1988 but was not relocated by Sanderson (2019b) and is probably extinct in Wales. It cannot be regarded as a SSSI feature until refound.
- *Bryoria bicolor* (Wales-VU) has historic records from 20 hectads in Wales but has only been seen recently at four sites. It qualifies in Cwm Llyfnant SSSI (Ceredigion) and Aber Mawddach/Mawddach Estuary SSSI (East Gwynedd) under Criterion 3.3.4.4, whilst a colony at Allt Cynant in north-eastern Carmarthen & Dinefwr AoS warrants notification.
- *Bryoria chalybeiformis* (Wales-VU) was last recorded in Wales in Eryri SSSI in the 1970s and cannot be regarded as a feature unless refound. It is taxonomically questionable anyway (Brian Coppins pers. comm.).
- *Bryoria fuscescens* (Wales-VU) has undergone a decline of >50% of recorded 10km squares in Wales since the 20th century combined with a similarly dramatic reduction of range due to losses in the south-west, south and east of Wales (Bosanquet, 2019b). Its survival correlates closely with areas of very low N-deposition in mid Wales, and even there colonies are small and scattered. Despite losses from at least 9 SSSI, it is believed to be extant in 12 SSSIs and warrants recognition as a feature in most of those. It should be a feature of Allt-y-gest SSSI (3.3.4.4) and Black Mountains SSSI (3.3.4.3 as the most south-easterly in Wales) in

Brecknock AoS, Caban Lakeside Woodlands SSSI, Carnhafallt SSSI and Marcheini Uplands, Gilfach Farm & Gamallt SSSI in Radnorshire AoS (all 3.3.4.2 as the AoS with most extant Welsh colonies), Migneint-Arenig-Dduallt SSSI in East Gwynedd AoS (3.3.4.4), Elenydd SSSI in Brecknock (3.3.4.2) and Ceredigion (3.3.4.4) AoS and Gregynog SSSI in Montgomeryshire AoS (3.3.4.4). Either Glannau Aberdaron SSSI or Glannau Ynys Gybi/ Holy Island Coast SSSI in West Gwynedd AoS should be selected if a resilient population is confirmed on these coastal sites.

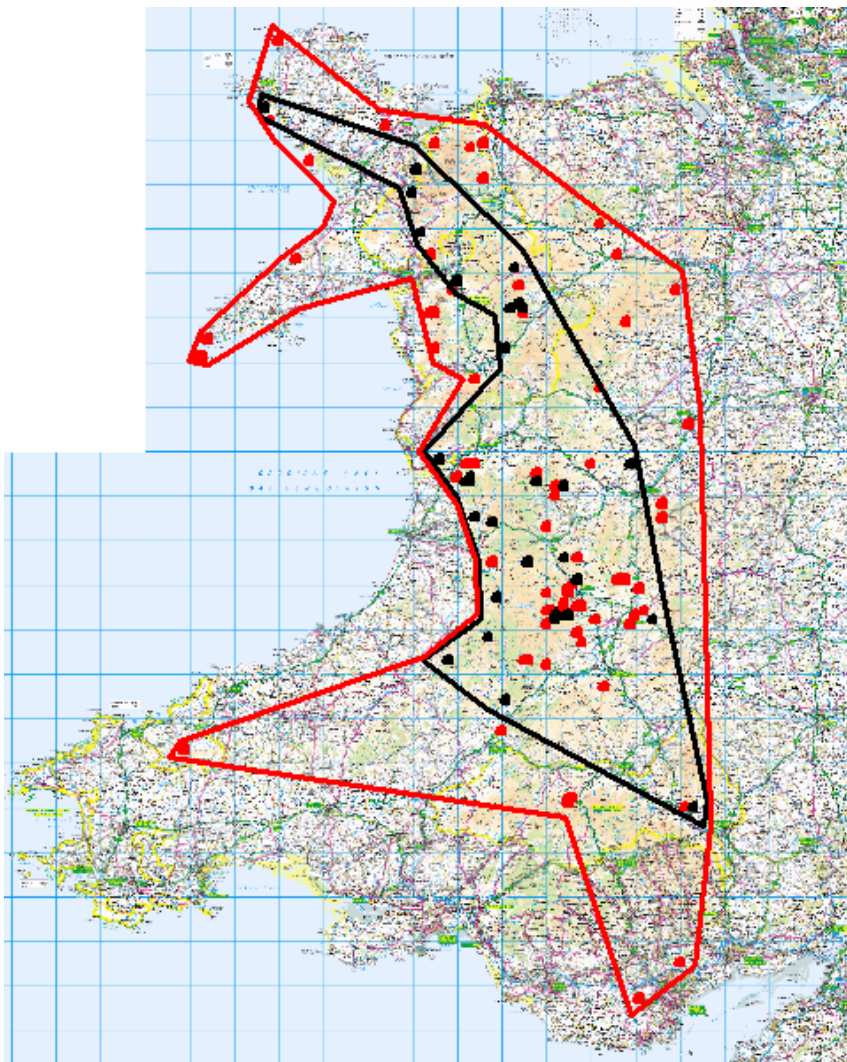


Figure 26: the range reduction of *Bryoria fuscescens* in Wales, with post-2000 records and range in black and pre-2000 records and range in red (from Bosanquet, 2019b).

- *Byssoloma subdiscordans* (Wales-EN) was apparently recorded in Cwm Doethie - Mynydd Mallaen SSSI in 1983 but the specimen was redetermined as *B. marginatum* (Brian Coppins *in litt.*) and this species should not therefore be regarded as a SSSI feature.
- *Catillaria aphana* (Wales-VU) is known in Wales only from Breidden Hill SSSI, where it was recorded in 1985. There is no reason to anticipate the Breidden Hill colony has been lost, and as there have been no subsequent detailed lichen surveys, recognition under Criterion 3.3.4.1 is appropriate.
- *Catillaria contristans* (Wales-VU) was found in 2006 by Marchlyn Mawr Reservoir in Eryri SSSI. It qualifies under Criterion 3.3.4.1 as the only extant Welsh site, although there are historic records from two other areas.
- *Chaenotheca brachypoda* (Wales-VU) was thought to be lost from Wales, having last been seen at Gregynog SSSI in 1995; it was not relocated by Sanderson (2018). However, a new population was found in 2020 in Dyffrynnoedd Nedd a Mellte a Moel Penderyn SSSI, which qualifies under Criteria 3.3.4.1 and 3.3.4.4.
- *Chaenotheca chlorella* (Wales-EN) was last seen in Wales in 1999 and neither of its two recorded sites, in Radnorshire, is designated. This rare species needs to be rediscovered and then notified if possible.
- *Chaenotheca stemonea* (Wales-VU) occurs in five SSSI in Wales. Caban Lakeside Woodlands SSSI (Radnorshire) and Carn Gafallt SSSI (Brecknock) have this species as part of a qualifying Pinhead Assemblage (see 4.2.1), but Coedydd Glannau a Cwm Coel SSSI (Radnorshire) does not qualify for its Pinhead lichens. Protection is probably best achieved by considering *C. stemonea* as a qualifying species (under 3.3.4.4) alongside

the Pinhead Assemblage feature on the first two sites. Gregynog SSSI (Montgomeryshire AoS) and Coedydd a Chorsydd Aberteifi / Teifi Estuary Woodlands and Marshes SSSI (Ceredigion AoS) qualify under 3.3.4.4.

- *Chaenothecopsis savonica* (Wales-VU) has populations in three Areas of Search, each of which qualifies under 3.3.4.4. These are Caban Lakeside Woodlands SSSI (Radnorshire AoS), Carn Gafallt SSSI (Brecknock) and Coedydd De Dyffryn Maentwrog SSSI (East Gwynedd).
- *Cladonia macrophylla* (Wales-VU) has its only recent Welsh record from Llyn Cwm Bychan in Rhinog SSSI, where it should be regarded as a feature (3.3.4.4). There is an older record from Eryri SSSI.
- *Cladonia sulphurina* (Wales-VU) has only been recorded twice in Wales: in Ogof Ffynnon Ddu - Pant Mawr SSSI in 1987 and in clearfelled forestry near Eisteddfa Gurig in Ceredigion in 2009. Graham Motley (pers. comm.) has searched for the SSSI colony without success and considers that it may have been a transitory occurrence. The Ceredigion site is thought to be a temporary colonisation (Steve Chambers *in litt.*). Neither colony warrants recognition as a SSSI feature.
- *Cladonia uncialis* subsp. *uncialis* (Wales-VU) has an uncertain distribution in Wales because of numerous ambiguous NBN records. However, a 2018 note by Steve Chambers on Gro Ystwyth SSSI said: “this taxon was found new to Wales on metalliferous river shingle on the Afon Ystwyth above Grogwynion mine in 1996, and since at a couple of Ceredigion metal mines, and more recently on lowland raised bog at Cors Fochno NNR in 2012.” The Gro Ystwyth colony has apothecia and is probably the largest and most viable in Wales, so should be recognised as a feature (3.3.4.1).

- *Coccotrema citrinescens* (Wales-VU) is a rare species of base-rich rock outcrops in Eryri SSSI and Moel Hebog SSSI and qualifies in both as these are the southernmost British sites (3.3.4.3 & 3.3.4.4).
- *Collema (Gabura) fasciculare* (Wales-CR) has been lost from two of its three recorded Welsh sites, including Coed Aberedw SSSI, and persists only in Mynydd Llangattwg (Mynydd Llangattock) SSSI where it urgently needs monitoring. This colony qualifies under Criterion 3.3.4.1.
- *Collema nigrescens* (Wales-VU) has a scattered Welsh distribution, with a particularly strong colony in Stackpole SSSI, which qualifies under Criterion 3.3.4.1. It is also present on Mynydd Penarfynydd SSSI (3.3.4.4), but a record from Ynys Enlli SSSI dates from the 1970s and requires resurvey. Records from inland Wales are either very old or uncertain.



Figure 27: *Collema nigrescens* in Stackpole SSSI (from Edwards, 2008).

- *Collema (Rostania) occultatum* (Wales-VU) may be extinct in Wales. It was last seen in Glynllifon SSSI in 1971, and a colony found in 2002 in Parc Nannau SSSI was not relocated by Sanderson (2014b). Its possible presence at Parc Nannau warrants recognition as a feature there (3.3.4.1).



Figure 28: *Degelia atlantica* in the woodland above Goultrop Roads (Sam Bosanquet).

- *Degelia (Pectenaria) atlantica* (Wales-VU) has six scattered Welsh sites, split between the Celtic rainforests and the west coast. The Goultrop Roads wood in De Porth Sain Ffraid / St Bride's Bay South SSSI has *D. atlantica* on at least 16 trees (Bosanquet & Hudson, 2021) and this is the largest colony in Wales, qualifying under Criterion 3.3.4.1. Coed Crafnant in Rhinog SSSI holds the largest population in East Gwynedd AoS with 10 occupied trees and qualifies under Criterion 3.3.4.2, but Parc Nannau SSSI in the same AoS only has three occupied trees and therefore does

not qualify. The Hafod-y-llan unit of Eryri SSSI supports the largest known population in West Gwynedd AoS (3.3.4.4) although the size of the coastal colony in Mynydd Penarfynydd SSSI is unknown; the latter population is part of an MRCSI assemblage (see 4.2.3). The strength of the coastal colony in Skokholm SSSI is also unknown. Coedydd a Cheunant Rheidol SSSI holds probably the strongest population in Ceredigion AoS (3.3.4.4).

- *Degelia (Pectenaria) cyanoloma* (Wales-VU) is known in Wales only from Parc Nannau SSSI, where it qualifies as a feature under Criteria 3.3.4.1 and 3.3.4.2. It is extinct in England so this is the southernmost GB site.
- *Degelia (Pectenaria) plumbea s. str.* (Wales-VU) occurs as scattered populations from Pembrokeshire to Gwynedd, both coastally and inland, and is the least rare *Degelia* in Wales. Coedydd Aber SSSI holds the largest population in Wales as well as the largest in West Gwynedd AoS and therefore qualifies under Criteria 3.3.4.1 and 3.3.4.4, whilst Cwm Llyfnant SSSI supports the only known population in Ceredigion AoS and qualifies under 3.3.4.4. It is more difficult to select the most robust population in Preseli & South Pembrokeshire AoS and East Gwynedd AoS, with 3 and 4 extant sites apiece but too many colonies in Scotland to allow the use of Criterion 3.3.4.2. The Goulthrop Roads wood in De Porth Sain Ffraid / St Bride's Bay South SSSI probably holds the strongest Pembrokeshire population (3.3.4.4), although it has only been noted on three trees in one area, as the colonies in Treffgarne Gorge and Tors SSSI and on Skokholm SSSI have not been surveyed recently. None of the colonies in East Gwynedd is very large but Glyn Lledr (6 trees) and Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (3 trees) are probably the

most resilient and qualify (3.3.4.4) ahead of Ganllwyd SSSI (2 trees), Rhinog SSSI (not relocated in Coed Crafnant in 2014) or Coedydd Dyffryn Wnion SSSI (no survey details).

- *Dirina massiliensis f. massiliensis* (Wales-VU) has its strongest Welsh population in Pen y Gogarth / Great Ormes Head SSSI, which qualifies under Criterion 3.3.4.1. A wide-ranging survey of north Wales limestone SSSIs by Orange (2020) added a small population in Little Ormes Head SSSI but produced no others. A record from Ramsey/Ynys Dewi SSSI may be erroneous, as may be one from Ynys Enlli SSSI.
- *Endocarpon pusillum var. pusillum* (Wales-EN) is only known in Wales from a 1986 record (Orange, 1997) on the edge of Cnap Twt SSSI in Mid & South Glamorgan AoS. This is a geological SSSI, but should have *E. pusillum* added as a qualifying feature (3.3.4.1) if the colony is relocated.
- *Frutidella caesioatra* (Wales-VU) was noted in the Carneddau, part of Eryri SSSI, in the 1990s and qualifies as a feature under Criterion 3.3.4.1.
- *Fuscopannaria mediterranea* (Wales-VU) has a western distribution in Britain with numerous colonies in Scotland; nevertheless, the cluster of sites in East Gwynedd AoS is probably sufficient for recognition of a suite of SSSI features under Criterion 3.3.4.2. The species should be regarded as a feature of Cadair Idris SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI, Coedydd Nanmor SSSI, Ganllwyd SSSI and Rhinog SSSI. The population in the Hafod-y-llan unit of Eryri SSSI qualifies as the largest in West Gwynedd (3.3.4.4), but the identification of a colony in Coed Ty-canol (Ty-canol Wood) SSSI has been questioned and it is unclear whether there are any qualifying populations in Preseli & South Pembrokeshire AoS.

- *Fuscopannaria (Nevesia) sampaiana* (Wales-EN) (Fig. 29) also has a cluster of sites in East Gwynedd AoS that qualify under Criterion 3.3.4.2: Coedydd De Dyffryn Maentwrog SSSI (1 tree), Ganllwyd SSSI (7+ trees), Parc Nannau SSSI (5 trees) and Rhinog SSSI (1 tree). Unlike *F. mediterranea* these sites are at the southernmost edge of the species' GB distribution and Parc Nannau therefore also qualifies under Criterion 3.3.4.3. The colony in Ganllwyd SSSI is the largest in Wales and qualifies under Criterion 3.3.4.1.
- *Gomphillus calycioides* (Wales-EN) is an ephemeral lichen of ravine ecosystems that has been recorded from five sites in north Wales but only has one recent record: from Hafod-lwfog in Coedydd Nantgwynant SSSI. That colony qualifies under Criterion 3.3.4.1 and the distribution and status of *Gomphillus* there urgently needs investigation.



Figure 29: *Fuscopannaria sampaiana* at Parc Dolmelynlllyn (Dave Lamacraft).

- *Gyalecta foveolaris* (Wales-EN) has its sole known Welsh site in Aberarth - Carreg Wylan SSSI: a remarkable occurrence as this species is predominantly montane in Scotland. It qualifies under Criteria 3.3.4.1 and 3.3.4.3.
- *Gyalidea fritzei* (Wales-EN) has been recorded from basic igneous rock in Eryri SSSI, where it is “not too rare” (Steve Chambers, *in litt.*) and qualifies under Criterion 3.3.4.4, a ruined building near Carn Owen cSSSI in Ceredigion, and a rock at Bodcoll Mine also in Ceredigion. This last site may warrant notification as the southernmost in Britain (3.3.4.3).
- *Heterodermia obscurata* (Wales-VU) is very much rarer in Wales than in south-west England or south-west Scotland, with just a handful of colonies in Pembrokeshire and on the Llŷn Peninsula. Its relative abundance in Skokholm SSSI and Skomer Island and Middleholm SSSI (Preseli & South Pembrokeshire AoS) requires further investigation, as does its relative abundance on Mynydd Penarfynydd SSSI and Ynys Enlli SSSI (West Gwynedd). At present it is impossible to identify any site as qualifying under 3.3.4.4. There are also records from Corsydd Llangloffan SSSI in Pembrokeshire and a potentially casual record from Ceredigion, as well as a very recent record from Nannerth Fawr in Radnorshire (Acton, 2022a).
- *Ionaspis odora* (Wales-VU) was reported from three streams in Eryri SSSI by Orange (2017), where it qualifies under Criteria 3.3.4.1 and 3.3.4.3.
- *Koerberiella wimmeriana* (Wales-VU) is thought to have its largest Welsh population in Eryri SSSI, where it qualifies under 3.3.4.1. It also grows in Moel Hebog SSSI in the same Area of Search and was recently found on the Afon Vyrnwy in Montgomeryshire.

- *Lecanographa lyncea* (Wales-EN) is known from four woodland/parkland SSSI that each protect the largest known populations of this species in their respective Areas of Search and therefore qualify under Criterion 3.3.4.4. They are: Coed Ty-canol (Ty-canol Wood) SSSI (Preseli & South Pembrokeshire AoS), Dinefwr Estate SSSI (Carmarthen & Dinefwr), Gregynog SSSI (Montgomeryshire) and Parc Nannau SSSI (East Gwynedd). Sanderson (2018) considers the Gregynog population to be “one of the largest in Europe”, so as the largest in Wales it also qualifies under Criterion 3.3.4.1.
- *Lecanora cenisia* (Wales-VU) has scattered upland records in Wales, with two in SSSI. This species is a qualifying feature of both Eryri SSSI (West Gwynedd AoS) and Cadair Idris SSSI (East Gwynedd) under 3.3.4.4.
- *Lecanora horiza* (Wales-VU) has scattered records from Wales, but only one of these appears to be from a SSSI: a 1997 record from Stackpole SSSI which was not relocated during monitoring by Edwards (2008a) and is probably best not regarded as a feature. The 2012 record from Dinefwr Park SSSI was shown by Sanderson (2014a) to be a misidentification.
- *Lecidea silacea* (Wales-VU) has a single Welsh record: from Parys Mountain SSSI in 1995. It was not relocated by Orange (2021) and should not be regarded as a qualifying feature unless relocated.
- *Lemmopsis arnoldiana* (Wales-VU) was recorded on limestone in Mynydd Llangattwg SSSI in the 1980s and Pwll Du Head and Bishopston Wood SSSI in the 1990s. Neither site has been subject to a recent survey and so the current status of the populations is unknown. This species qualifies at

both sites under 3.3.4.4 because of the lack of recent surveys, in contrast to the two previous species that were not relocated despite recent work.

- *Lempholemma botryosum* (Wales-VU) is found primarily on limestone and has its largest Welsh population in Pen y Gogarth / Great Ormes Head SSSI, which qualifies under 3.3.4.1. Twyni Chwitffordd, Morfa Landimor a Bae Brychdwn/Whiteford Burrows SSSI qualifies under Criterion 3.3.4.4 as the largest population in West Glamorgan and Llanelli AoS. Breidden Hill SSSI and Eryri SSSI hold populations on basic igneous rock and both qualify under 3.3.4.4, but the species was not relocated at Bwrdd Arthur SSSI by Orange (2020) and cannot be considered a feature there.
- *Lempholemma cladodes* (Wales-VU) has been recorded on base-rich upland sandstone in Black Mountains SSSI and Mynydd Du/Black Mountain SSSI (Woods, 2003). It qualifies at both sites under 3.3.4.4.
- *Lempholemma intricatum* (Wales-VU) is known for certain in Wales only from Coedydd ac Ogofau Elwy a Merchon SSSI, qualifying under 3.3.4.1, although Smith *et al.* (2009) say “North Wales (Snowdonia)”.
- *Leptogium brebissonii* (Wales-VU) has its largest Welsh population in Ganllwyd SSSI, which qualifies under Criterion 3.3.4.1, and is also known from the nearby Cefn Deuddwr SSSI and Gwynfynydd SSSI. These Welsh colonies qualify under Criterion 3.3.4.3 because they are on the south-eastern edge of the range of this species, and all three should be recognised as features. A recently discovered colony in Dyfi Forest warrants notification under Criterion 3.3.4.4 as the only population in Montgomeryshire AoS.



Figure 30: *Leptogium brebissonii* in Cwm Ceirig, Dyfi Forest (Sam Bosanquet).

- *Leptogium burgessii* (Wales-VU) is known from four SSSI in Wales, although NBN hectad maps suggest it was more widespread in the mid 20th century. Hafod-y-llan in Eryri SSSI (West Gwynedd AoS) holds a substantial population at five localities and qualifies under 3.3.4.1 as well as 3.3.4.4. Penygarreg Dam in Eleynydd SSSI (Radnorshire AoS) and two localities in Coed Crafnant in Rhinog SSSI (East Gwynedd AoS) both qualify under 3.3.4.4 as the largest populations in their respective Areas of Search. A non-fertile population on one tree in Craig y Benglog SSSI (East Gwynedd AoS) does not qualify due to the larger colony in Rhinog SSSI.

- *Leptogium (Scytinium) massiliense* (Wales-VU) has its only known extant Welsh population in Glaswelltiroedd Eryrys SSSI in Clwyd AoS, which qualifies under Criteria 3.3.4.1 and 3.3.4.4. There is also a historic record from Porthkerry Bay in Mid & South Glamorgan.
- *Leptogium (Scytinium) subtorulosum* (Wales-EN) is an aquatic species recorded from three Welsh rivers. It grows by the Afonydd Pyrddin and Nedd Fechan in Dyffrynnoedd Nedd a Mellte a Moel Penderyn SSSI (Douglass, 2018) and near Llansteffan Bridge on the River Wye in River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI. Although these SSSI are both in Brecknock AoS, both qualify under Criterion 3.3.4.2 because that AoS holds two of the four known UK populations.
- *Leptogium (Scytinium) tenuissimum* (Wales-VU) is known from the coasts of Ceredigion and Llyn as well as three inland sites. Some of the records may result from misidentifications. It is difficult to determine which SSSI support the largest populations, and *L. tenuissimum* is already a component of assemblages in Eryri SSSI and Stackpole SSSI and should therefore be included in monitoring of those sites. Recent survey suggests Craigyfulfran & Clarach SSSI holds the largest population in Ceredigion (Lamacraft & Chambers 2021). Records from Comin Helygain a Glaswelltiroedd Treffynnon/Halkyn Common and Holywell Grasslands SSSI and Marcheini Uplands, Gilfach Farm & Gamallt SSSI require confirmation before a feature can be recognised.
- *Leptorhaphis atomaria* (Wales-VU) has two records from non-designated sites in inland Pembrokeshire and Monmouthshire. It is too much of a mobile species to warrant specific notification.

- *Lobaria pulmonaria* (Wales-VU) is extant on just over 600 trees on 123 sites in Wales (Table 18), which is a very low number considering how widespread and abundant this epiphyte would have been in pre-industrial times. There are historic records from 45 sites that have subsequently lost *L. pulmonaria*, but many colonies will have been lost without documentation. Only a handful of sites support strong colonies, and just six sites protect 50% of the occupied trees. Meirionnydd holds the majority of sites, and a network of sites should be notified here under Criteria 3.3.4.2 and 3.3.4.4 because East Gwynedd AoS holds a substantial proportion of colonies of this species at its south-eastern pollution-derived geographical limit. The East Gwynedd sites that should have *L. pulmonaria* recognised as a feature are Parc Nannau SSSI, Ganllwyd SSSI, Rhinog SSSI (Coed Crafnant), South Mawddach cSSSI (Coed y Gribyn), Glyn Lledr cSSSI, Afon Eden - Cors Goch Trawsfynydd SSSI (Maesgwm), Trawscoed cSSSI and Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (Maentwrog). Coedydd Aber SSSI and Coed Cae Awr SSSI in West Gwynedd AoS should both be recognised under 3.3.4.4 because their populations are equally strong. Stackpole SSSI holds the largest population in Preseli & South Pembrokeshire AoS (3.3.4.4) and Carn gafallt SSSI is the best site in Radnorshire AoS (3.3.4.4). Cwm Ceirig and Aberllefeni in Dyfi Forest should be notified for the largest colony of *L. pulmonaria* in Montgomeryshire (3.3.4.4), and the eastern part of Cwm Llyfnant around Nant-y-Ffactory qualifies as the largest population in Ceredigion AoS (3.3.4.4). Dinefwr Estate SSSI (Carmarthen & Dinefwr AoS) now only holds two trees with *Lobaria*, but this still qualifies as the

largest population in the AoS (3.3.4.4). The largest population in Brecknock is on a group of trees at Beulah, and these may also warrant notification, although the isolated trees may not make a suitable SSSI.

Table 18: occupied tree counts at Welsh sites for *Lobaria pulmonaria*.

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Parc Nannau	SH7421	2015	53	109	Neil Sanderson report
Dolmelynlyn-Ganllwyd	SH7223	2014	20	77	Neil Sanderson report
Coed Crafnant	SH6228	2014	19	51	Neil Sanderson report
Stackpole	SR9796	2020	28	31	Stackpole SSSI report
Glyn Lledr	SH7853	2021	23	30	Huw Green survey
Coed y Gribyn	SH6616	2002	5	20	Bryan Edwards report
Morgans Bridge	SM9219	2020	1	20	Jon Hudson email
Maesgwm	SH7128	2002	6	18	Alan Orange survey report
Cwm Ceirig	SH7908	2019	17	17	Sam Bosanquet report
Trawscoed and Dolhendre	SH8432	2012	6	16	Andrew Graham by email
Coedydd Aber	SH6671	2017	2	15	Dave Lamacraft report
Coed Cae Awr SSSI	SH7457	2018	14	14	Sam Bosanquet report
Eisingrug-Talsarnau	SH6235	2002	14	14	Alan Orange reports
Aberllefeni	SH7709	2005	1	14	Ray Woods notes
Tan y Bwlch-Maentwrog	SH6540	2006	13	12	Alan Orange report
Ceunant Llennyrch	SH6539	2015	5	11	Neil Sanderson report
Hafod	SN7573	2019	3	11	Steve Chambers 2021
Beulah	SN9152	2012	2	10	Ray Woods notes
Gignog	SM8824	2011	1	10	Jon Hudson comment
Carn gafallt	SN9364	2014	18	8	Neil Sanderson report
Allt y Benglog	SH8023	2002	8	8	Simon Davey report
Coed Llechwedd	SH5932	2014	8	8	Alan Orange survey report
Gwynfynydd	SH7428	2002	8	8	Alan Orange survey report
Glaspwll	SN7397	2019	3	8	Joe Hope email
Hafod Garregog NNR	SH6044	2014	4	7	Neil Sanderson report
Cwmyrhaiadr	SN7596	2020	3	5	Dafydd Parry email 2020
Hafod-lwyfog	SH6552	2002	5	6	Alan Orange survey report
Bronaber	SH7131	2002	5	5	Bryan Edwards report
Llanystumdwy	SH4739	2020	3	5	Dafydd Parry pers comm
Minwear Wood	SN0413	2010	1	5	Jon Hudson comment
Cefnduuddwr	SH7226	2019	4	4	Sam Bosanquet report
Coed Maes-mawr etc SSSI	SH7710	2011	4	4	-
Lechfraith Uchaf	SH6619	2002	5	3	Bryan Edwards report
Llwyn Madoc	SN9052	2022	3	3	Neil Sanderson report
Coed y Foel	SN9164	2007	3	3	-
Upton Castle	SN0204	2015	3	3	-
Fairy Glen	SH8153	2013	2	3	Alan Orange HEP report
Camrose Brook	SM9319	2020	1	3	Jon Hudson email
Llannerch Elsi	SH7854	2017	1	2	Huw Green email
Nannerth Fawr	SN9472	2011	5	2	Ray Woods notes
Penygarreg Dam	SN9167	2012	3	2	Ray Woods notes
Dinefwr Park	SN6122	2013	3	2	now extant on two trees
Afon Wen	SH7425	2002	2	2	-
Allt-y-gest	SN8952	2004	2	2	-
Arthog	SH6414	2002	2	2	-
Coed Tremadog SSSI	SH5741	2002	2	2	-
Coed y Garth	SH6515	2002	2	2	-
Cymer	SH7318	2002	2	2	-
Friog	SH6313	2002	2	2	-
Lawrenny Quay	SN0106	2015	2	2	-
Ochr-cefn	SN9468	2017	2	2	-
Picton Ferry	SN0112	2010	2	2	-
Ty-hyll	SH7557	2015	2	2	-
Afon Colwyn, Beddgelert	SH5848	2020	2	2	Dafydd Parry filenote
Betws-y-coed west	SH7856	2021	1	1	Sam Bosanquet record
Cwm Machno	SH7748	2020	1	1	Huw Green email

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Dulas Brook Woodlands	SO0354	2011	4	1	Ray Woods notes
Coed Cofi'r Graig SSSI	SJ0315	2009	3	1	Alastair Hotchkiss dossier
Abergwynant	SH6717	2014	1	1	Alan Orange survey report
Afon Vyrnwy	SJ0414	2007	1	1	-
Black Cliff	SM8519	2010	1	1	-
Caerynwch	SH7617	2002	1	1	-
Camrose Farm	SM9320	2010	1	1	-
Clywedog	SN9186	2006	1	1	-
Coed Cymerau	SH6943	2001	1	1	-
Coed Gerddi Bluog	SH6129	2000	1	1	-
Coed Graig Uchaf	SH6426	2014	1	1	Alan Orange survey report
Craig Cywarch	SH8418	2000	1	1	-
Dolanog	SJ0612	2007	1	1	-
Goultrop Roads	SM8412	2010	1	1	-
Gregynog Park	SO0897	2011	1	1	-
Lawrenny Wood	SN0107	2011	1	1	-
Camrose House	SM9219	2020	1	1	Jon Hudson email
Nant-y-gwyrddail	SH6714	2014	1	1	-
Pencaerhelem	SN9954	2012	1	1	-
Penrhynngwyn	SH6915	2002	1	1	-
SH93 unknown	SH93	2009	1	1	-
SJ11 unknown	SJ11	2012	1	1	-
Wenallt	SH8123	2010	1	1	-
Llwydiarth Park	SJ0215	1979	2	0	-
Merchion Woodlands	SJ0269	1995	2	0	-
Plas Newydd	SH5168	1996	2	0	-
Rug	SJ0544	1996	2	0	-
Slebech Park	SN0314	1986	2	0	-
Afon Cwm	SH9107	1979	1	0	-
Alpine Bridge	SO0963	1986	1	0	Ray Woods notes
Bardsey	SH1121	1992	1	0	-
Blackpool Mill	SN0614	1986	1	0	-
Cann Office	SJ0210	1989	1	0	-
Coed Cors-y-gedol	SH6022	1997	1	0	-
Coed Lletywalter	SH5927	1999	1	0	-
Coed y Ciliau	SN9454	1983	1	0	Ray Woods notes
Coedmore	SN1943	1980	1	0	-
Coedydd Afon Gwynant	SH6816	1999	1	0	-
Coed-yr-odyn	SH6250	1970	1	0	-
Crogen Park	SJ0037	1980	1	0	-
Cwm Bychan	SH6431	1966	1	0	-
Cwm Einion	SN6994	1994	1	0	-
Cwm Rheidol	SN7278	1989	1	0	-
Devil's Bridge	SN7477	1979	1	0	-
Dinas Mawr	SH8053	1970	1	0	-
Fegla Fawr	SH6214	1972	1	0	-
Glas-dir	SH7322	1999	1	0	-
Glynllifon Park	SH4555	1971	1	0	-
Nant Gwynllyn	SN9568	1992	1	0	-
Neuadd-fach	SN9365	1989	1	0	-
Orielton	SR9599	1973	1	0	-
Stanage Park	SO3271	1983	1	0	Ray Woods notes
Swallow Falls	SH7657	1970	1	0	-
Talley Oaks	SN6233	1989	1	0	-
Teifi Gorge Woods	SN1845	1979	1	0	-
Tycanol	SN0937	1973	1	0	-
SH44 unknown	SH44	pre-1999	1	0	-
SH53 unknown	SH53	pre-1999	1	0	-
SH55 unknown	SH55	pre-1999	1	0	-
SH57 unknown	SH57	pre-1999	1	0	-
SH74 unknown	SH74	pre-1999	1	0	-
SH76 unknown	SH76	pre-1999	1	0	-
SH77 unknown	SH77	pre-1959	1	0	-
SM70 unknown	SM70	pre-1959	1	0	-
SN45 unknown	SN45	pre-1999	1	0	-
SN46 unknown	SN46	pre-1999	1	0	-
SN59 unknown	SN59	pre-1959	1	0	-
SS19 unknown	SS19	pre-1999	1	0	-

- *Lobaria scrobiculata* (Wales-CR) is extant on approximately 84 trees on 26 sites in Wales (Table 19). It is thus the rarest *Lobaria* in Wales in terms of tree occupancy, and the equal second rarest in terms of occupied sites. The largest remaining population is on Trawscoed cSSSI in East Gwynedd, which holds 16 trees supporting *L. scrobiculata*, and this site warrants urgent notification under Criterion 3.3.4.1 for this species as well as for other lichens and fungi. As is the case for *L. pulmonaria*, a network of sites in Meirionnydd should be notified for *L. scrobiculata* under Criteria 3.3.4.2 and 3.3.4.4 because East Gwynedd AoS holds a substantial proportion of colonies of this species at its south-eastern pollution-derived geographical limit. The East Gwynedd sites that should have *L. pulmonaria* recognised as a feature are Parc Nannau SSSI, Ganllwyd SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (Maentwrog), Gwynfynydd SSSI, Cefndeuddwr SSSI, Afon Eden - Cors Goch Trawsfynydd SSSI (Maesgwm) and Rhinog SSSI (Coed Crafnant). Nant y Ffactory and eastern Cwm Llyfnant support the only remaining population in Montgomeryshire AoS, warranting notification under 3.3.4.4, although the population on the Ceredigion side of the boundary is believed to have been lost (Steve Chambers, *in litt.*). The single tree with *L. scrobiculata* in Stackpole SSSI qualifies under 3.3.4.4, as the only remaining population in Preseli & South Pembrokeshire AoS. None of the handful of colonies in West Gwynedd AoS occupies more than a single tree, and Coed Cae-awr SSSI is considered the most resilient (3.3.4.4).

Table 19: occupied tree counts at Welsh sites for *Lobaria scrobiculata*.

Site	1km	Last Year	Unique OSGRs	Trees extant	Source of additional data
Trawscoed and Dolhendre	SH8432	2020	3	16	Andrew Graham report
Parc Nannau SSSI	SH7421	2014	14	13	Neil Sanderson report
Ganllwyd SSSI (Dolmelynlyn)	SH7223	2012	14	14	Neil Sanderson report
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	SH6641	2019	11	8	Neil Sanderson report
Gwynfynydd SSSI	SH7327	2002	7	7	Alan Orange reports
Cefndeuddwr SSSI	SH7226	2019	6	6	Sam Bosanquet report
Afon Eden - Cors Goch Trawsfynydd SSSI	SH7128	2002	6	6	Alan Orange reports
Rhinog SSSI (Coed Crafnant)	SH6228	2014	5	4	Neil Sanderson report
Coedydd Nanmor SSSI (Dolfrïog)	SH6145	2002	3	3	-
Ganllwyd SSSI (Glasdir carpark)	SH7322	2020	1	2	Dave Lamacraft email
Cymer	SH7318	2002	2	2	-
Friog	SH6313	2002	2	2	-
Ganllwyd SSSI (Coed Ganllwyd)	SH7224	2002	2	2	-
Coed Lletywalter SSSI	SH5928	2000	2	2	-
Nant y Factory	SN7397	1993	2	2	Lost from VC46 but still present on VC47 side of boundary
Stackpole SSSI	SR9796	2020	2	1	Jon Hudson pers comm
Dolwyddelan Forest	SH7353	2021	1	1	Huw Green email
Coed Cae-awr SSSI	SH7456	2018	1	1	Sam Bosanquet report
Coedydd Nanmor SSSI (Hafod Garregog)	SH6044	2014	1	1	-
Nant-y-gwyrddail	SH6714	2014	1	1	-
Mynydd Penarfynydd SSSI	SH2126	2007	1	1	-
Bronaber	SH7131	2002	1	1	-
Craig y Benglog SSSI	SH8023	2002	1	1	-
Kings	SH6716	2002	1	1	-
Rhinog SSSI (Coed Gerddi Bluog)	SH6129	2000	1	1	-
Tyn-y-groes Bach	SH7223	2000	1	1	-
Coed Ffridd-fawr	SH8703	1995	1	0	Tree felled in 1998
Parc Neuadd	SN4959	1989	2	0	Never refound at the site according to Ray Woods
Coedydd Abergwynant SSSI	SH6717	1989	1	0	-
Hafod	SN7673	1988	1	0	-
St. Davids	SM7525	1985	1	0	-
Unknown SN44	SN44	1972	1	0	-
Arthog	SH6414	1971	1	0	-
Bethania	SH6250	1970	1	0	-
Fairy Glen Woods SSSI	SH8053	1970	1	0	-
Ty Hyll area	SH7557	1970	1	0	-
Unknown SH50	SH50	1960	1	0	-
Unknown SH63	SH63	1960	1	0	-
Unknown SH74	SH74	1960	1	0	-
Unknown SH75	SH75	1960	1	0	-
Unknown SH76	SH76	1960	1	0	-
Unknown SM70	SM70	1960	1	0	-
Unknown SM80	SM80	1960	1	0	-
Unknown SN00	SN00	1960	1	0	-
Unknown SJ06	SJ06	1959	1	0	-

- Megalospora tuberculosa* (Wales-VU): the Coed Crafnant unit of Rhinog SSSI holds the largest population of this species in Wales, with 10 occupied trees, and therefore qualifies under Criterion 3.3.4.1. The Coedydd Maentwrog NNR unit of Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI (7 trees), Parc Nannau SSSI (3 trees), and the Hafod Garregog NNR unit of Coedydd Nanmor SSSI (2 trees) are also significant, and as East

Gwynedd AoS holds a significant proportion of GB sites these should be recognised under Criterion 3.3.4.2. Further south in Wales there are records from Milford Haven Waterway SSSI (Preseli & South Pembrokeshire AoS) and Mwyngloddfa Esgair Hir ac Esgair Fraith SSSI (Ceredigion), which qualify under Criterion 3.3.4.4.

- *Megaspora verrucosa* (Wales-VU) has been found recently in four SSSI on the north Wales Limestone (Orange, 2020). Its largest population occurs in Pen-y-Gogarth/Great Orme's Head SSSI (Giavarini, 2007), which qualifies under Criterion 3.3.4.1.



Figure 31: *Megaspora tuberculosa* on the north Wales limestone, from Orange (2020).

- *Melanelia hepatizon* (Wales-VU) has four Welsh records, but only one in the Ceredigion part of Elenydd SSSI is at all recent or well localised. This scarce upland species should be regarded as a feature of the SSSI under Criterion 3.3.4.1.
- *Melanelia stygia* (Wales-CR) has been recorded in Wales from just two localities west of Rhayader in Elenydd SSSI. Survey is required to

determine the status of both this species and *M. hepatizon* in Elenydd SSSI, but both are considered to qualify under Criterion 3.3.4.1.

- *Menegazzia terebrata* (Wales-VU) is reasonably widespread in Meirionnydd but is very rare further south in Wales. It is difficult to identify which of the ten sites in East Gwynedd AoS supports the largest population and it is probably best to consider the species a key marker of URI assemblages there rather than as an independently qualifying feature. South of Meirionnydd, colonies in Coed Cwm Einion SSSI (Ceredigion AoS) and Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI (Montgomeryshire AoS) qualify under Criterion 3.3.4.4 as the only ones known in their respective areas. *Menegazzia* appears to be extinct in Coed Ty-canol (Ty Canol Wood) SSSI but would otherwise qualify there.
- *Menegazzia subsimilis* (Wales-EN) is listed as Regionally Extinct by Woods (2010) but has subsequently been found in the Coed Crafnant unit of Rhinog SSSI, in Coed y Rhygen SSSI, and in the Cwm Mynach unit of North Mawddach cSSSI. There is also an historic record from Eryri SSSI. The colony in Coed Crafnant is the largest in Wales, occupying five trees, and should be identified as a feature under Criterion 3.3.4.1.
- *Micarea marginata* (Wales-VU) has been noted on montane acid rock in two localities within Cadair Idris SSSI and qualifies under Criterion 3.3.4.1.
- *Micarea pseudomarginata* (Wales-VU) was found in Cwm Idwal, Eryri SSSI in 1994 and qualifies under Criterion 3.3.4.1.
- *Microcalicium ahlneri* (Wales-VU) is a rare species of ancient oak lignum, with colonies in Carn Gafallt SSSI, Dinefwr Estate SSSI, and the Nant Irfon unit of Elenydd SSSI. Each qualifies under Criterion 3.3.4.4, as the largest

populations in Radnorshire AoS, Carmarthen & Dinefwr AoS and Brecknock AoS respectively.

- *Microcalicium disseminatum* (Wales-VU) has been found recently in two sites in Powys, qualifying under Criterion 3.3.4.4 at both. They are Carn Gafallt SSSI in Radnorshire and Gregynog SSSI in Montgomeryshire.
- *Miriquidica atrofulva* (Wales-VU) was found in the Coedydd Maentwrog unit of Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI in 2001 and qualifies under Criterion 3.3.4.1.
- *Miriquidica lulensis* (Wales-VU) has been found on rock at two sites in Ceredigion, neither of which is currently a SSSI.
- *Mycoblastus affinis* (Wales-VU) has one unconfirmed record from Eryri SSSI, as well as three unlocalised records from Meirionnydd and an erroneous report from Dinefwr Estate SSSI (Neil Sanderson *in litt.*).
- *Mycoblastus alpinus* (Wales-NE) was found new for Wales recently in Coed y Rhygen SSSI and qualifies under Criterion 3.3.4.1.
- *Mycomicrothelia atlantica* (Wales-VU) has tiny populations in two sites on either side of the Mawddach Estuary in Meirionnydd: Coedydd De Dyffryn Maentwrog SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI.
- *Normandina acroglypta* (Wales-VU) is widespread in north-west Wales with scattered colonies elsewhere and would be unlikely to qualify as Vulnerable if reassessed. There are records from Carn Gafallt SSSI, Coed Cwm Einion SSSI, Coed Lletywalter SSSI, Coed Tremadog SSSI, Gaer Wood Llangovan SSSI, Glaswelltiroedd Eryrys (Eryrys Grasslands) SSSI, Marcheini Uplands, Gilfach Farm & Gamallt SSSI and Stackpole SSSI, but recognition of any as features seems inappropriate.

- *Opegrapha prosodea* (Wales-VU) has a few poorly localised historic records from Wales, a pre-2000 record from Coed Ty-canol SSSI from an ancient tree stump that has since been lost, and a 1996 record from Coedydd a Chorsydd Aberteifi SSSI. It was not relocated during 2008 and 2017 surveys of those two sites respectively, and cannot be regarded as a feature unless its continued presence is confirmed.
- *Orphniospora moriopsis* var. *moriopsis* (Wales-VU) has two historic records from Eryri SSSI, but it has not been seen there for many decades and cannot be considered a feature unless it is rediscovered.
- *Pannaria rubiginosa* (Wales-CR) has just two extant Welsh populations, in Ceunant Llennyrch NNR and Coed Ganllwyd NNR (both East Gwynedd AoS). The rarity of this species in Wales makes it important that *P. rubiginosa* is recognised as a feature of both Coedydd De Dyffryn Maentwrog SSSI and Ganllwyd SSSI (3.3.4.4), especially as neither population is particularly large.
- *Parmeliella testacea* (Wales-CR) is currently known in Wales only from Coed Ganllwyd NNR in Ganllwyd SSSI, which qualifies under Criterion 3.3.4.1. There are old records for two other hectads in Meirionnydd, but these are uncertain as there has been some confusion over identifications. Relatively recent records from Cadair Idris SSSI and Craig y Benglog SSSI are believed to be misidentifications of *P. triptophylla* and recent monitoring has not relocated *P. testacea* on either site.



Figure 32: *Parmeliella testacea* in Coed Ganllwyd NNR (Sam Bosanquet).

- *Parmelinopsis minarum* (Wales-VU) has been recorded at four Welsh sites, two of which are SSSI: the Hafod Garregog NNR unit of Coedydd Nanmor SSSI and the Coed Crafnant unit of Rhinog SSSI. These are the northernmost colonies in Britain and would qualify under Criterion 3.3.4.3, but the species was not recorded at either site during surveys in 2016 and may no longer be extant.
- *Peltigera polydactylon* (Wales-VU) has widespread historic records from Wales, including from churchyards, coastal woodland, and otherwise lichenologically unremarkable valleys, but many are unconfirmed including some from sites which have been surveyed recently by experts such as Dinefwr Estate SSSI and Parc Nannau SSSI. Due to this confusion it is

unwise to regard *P. polydactylon* as a feature of any Welsh SSSI pending a review of records and resurvey of historic sites.

- *Pertusaria amarescens* (Wales-VU) was found in Breidden Hill SSSI in 1985 and is otherwise unknown in Wales. There is no reason to anticipate the Breidden Hill colony has been lost, and there have been no subsequent detailed lichen surveys, so recognition under Criterion 3.3.4.1 is probably appropriate.
- *Pertusaria chiodectonoides* (Wales-VU) was found on sunny riverside rocks in River Usk (Upper Usk) / Afon Wysg (Wysg Uchaf) SSSI by Orange (2013a) and qualifies there under 3.3.4.4. It was previously known from an unspecified site in coastal south-west Pembrokeshire.



Figure 33: *Pertusaria chiodectonoides* by the River Usk (from Orange, 2013a).

- *Pertusaria (Lepra) dactylina* (Wales-VU) has two unconfirmed Welsh records: from the Craig Cerrig Gleisiad NNR unit of Brecon Beacons SSSI in 1988 and an NBN record from SH55 in Eryri SSSI. Neither record is in the BLS database and this species is best not regarded as a SSSI feature.
- *Pertusaria (Lepra) monogona* (Wales-VU) is known from coastal rocks between Pembrokeshire and the Llŷn Peninsula. More work on coastal lichens is needed to establish whether the colony in Mynydd Penarfynydd SSSI, currently the only one known in West Gwynedd AoS, should qualify under 3.3.4.4. More work is also needed to establish which of Castlemartin Range SSSI, Ramsey/Ynys Ddewi SSSI and Skokholm SSSI should be selected as the largest colony in Preseli & South Pembrokeshire AoS.
- *Phaeographis lyellii* (Wales-VU) has a somewhat confused Welsh distribution. It has been recorded from two sites in Pembrokeshire and a few in Meirionnydd, but the identity of specimens in Ganllwyd SSSI and Craig y Benglog SSSI has been queried leaving just Coed Ty-canol (Ty Canol Wood) SSSI as having a confirmed population of *P. lyellii*. This colony may qualify under 3.3.4.1 if it is still extant, but 2022 survey suggests it is not (Jon Hudson *in litt.*).
- *Physcia clementei* (Wales-VU) has two historic Welsh records and very recent ones from a SSSI on the Llŷn Peninsula and on a Horse Chestnut tree in a garden in central Carmarthenshire. This last record calls into question whether *P. clementei* should really be considered Vulnerable in Wales. *Physcia clementei* should be a feature of Mynydd Penarfynydd SSSI (3.3.4.1) but notification of the garden would be inappropriate.

- *Placynathiella hyporhoda* (Wales-VU) is known from the Mid Wales Orefield, with records from Gro Ystwyth SSSI and Mwyngloddfa Cwmystwyth SSSI, and also has a record from Stanner Rocks SSSI. The Ceredigion colonies are best considered part of Metallophyte Lichen assemblages, but the Stanner Rocks population qualifies under 3.3.4.4.
- *Placynthium asperellum* (Wales-VU) has its only Welsh record from Cwm Glas in Eryri SSSI in 1997, qualifying under Criterion 3.3.4.1.
- *Placynthium flabellosum* (Wales-VU) is known in Wales only from the Afon Ysgethin above Coed Cors y Gedol SSSI. This important lichen site warrants notification, perhaps as an extension of Coed Cors y Gedol SSSI.
- *Placynthium pannariellum* (Wales-VU) has a single poorly localised historic record from the Mawddach area.
- *Polyblastia efflorescens* (Wales-VU) was found in Cwm Glas and Cwm Uchaf, Eryri SSSI in 1994 and qualifies under Criterion 3.3.4.1.
- *Polyblastia (Sporodictyon) terrestris* (Wales-VU) qualifies under Criterion 3.3.4.4 at two sites: Eryri SSSI (West Gwynedd) and Gro Ystwyth SSSI (Ceredigion).
- *Porina curnowii* (Wales-VU) is a coastal species recorded from Skokholm SSSI and Skomer Island and Middleholm SSSI. The relative sizes of the populations is unknown, but both qualify under 3.3.4.3 as the northernmost in Britain.
- *Porina hibernica* (Wales-VU) has been confirmed from five sites in Meirionnydd, along with an unconfirmed record from Parc Nannau SSSI in that county. East Gwynedd AoS is clearly one of the core areas for this species in Britain so a suite of sites warrants recognition under Criterion

3.3.4.2: Ceunant Cynfal SSSI, Coedydd De Dyffryn Maentwrog SSSI, Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI and Rhinog SSSI. Colonies in Coed Cwm Einion SSSI (Ceredigion) and Cwm Doethie - Mynydd Mallaen SSSI (Carmarthen & Dinefwr) each qualify under 3.3.4.4 as the only known occurrences in those Areas of Search.

- *Protoblastenia cyclospora* (Wales-VU) is a limestone lichen, restricted in Wales to the inland limestone of Clwyd AoS. Two sites – Glaswelltiroedd Eryrys (Eryrys Grasslands) SSSI and Llanddulas Limestone & Gwrych Castle Wood SSSI – hold a single colony each, whilst the size of the population in Ruabon/Llantysilio Mountains and Minera SSSI is unknown. Determining the most resilient population is thus impossible, and recognition of the first listed site under Criterion 3.3.4.4 is arbitrary.
- *Protoblastenia siebenhaariana* (Wales-VU) has a single Welsh record from calcareous rock in Eryri SSSI, qualifying under Criteria 3.3.4.1 and 3.3.4.3.
- *Protoparmelia montagnei* (Wales-VU) was recorded in the 1960s from either Skokholm or Skomer and cannot be regarded as a feature until relocated.
- *Protothelenella sphinctrinoidella* (Wales-VU) was found in Cwm Idwal, Eryri SSSI in 1994 and qualifies under Criteria 3.3.4.1 and 3.3.4.3.
- *Pseudocyphellaria crocata* (Wales-CR) was collected from the woodland at Goultrop Roads in De Porth Sain Ffraid / St Bride's Bay South SSSI in 1956, but has not been refound despite recent searching. This beautiful species cannot be considered a feature until it is rediscovered.

- *Pseudocyphellaria intricata* (Wales-CR) is only known in Wales from two ash trees in the Hafod-y-llan unit of Eryri SSSI. This very rare species qualifies under Criterion 3.3.4.1.
- *Pseudocyphellaria norvegica* (Wales-CR) has its sole Welsh colony on a rockface near Ceunant Mawr, which lies just outside the Coedydd Nantgwynant SSSI. Notification of this area to protect this very rare lichen, qualifying under 3.3.4.1, and associated species should be a high priority.
- *Psoroma hypnorum* (Wales-VU) has pre-1950 records from five sites around the coast between Pembrokeshire and Meirionnydd, but in absence of recent records cannot be regarded as a feature of any site.
- *Pterygiopsis concordatula* (Wales-VU) is described by Orange (2017) as “poorly known in Wales, one old record may be from a river”, but NBN gives records from three rivers. It is best not regarded as a SSSI feature.
- *Pyrenula laevigata* (Wales-VU) is restricted to westernmost Wales, with a few colonies in Ceredigion and Meirionnydd. The largest population is in Ceunant Llennyrch in Coedydd De Dyffryn Maentwrog SSSI, which qualifies under Criterion 3.3.4.1. Neither of the Ceredigion sites is currently designated, and notification as SSSI may be appropriate.
- *Pyrenula occidentalis* (Wales-VU) has been recorded from two sites in Wales. The largest population is in Coedydd De Dyffryn Maentwrog SSSI (East Gwynedd AoS), which qualifies under Criterion 3.3.4.1. The population in Coed-yr-allt-goch SSSI (Radnorshire AoS) was last seen in 1991, but qualifies under Criterion 3.3.4.4.



Figure 34: *Pyrenula occidentalis* (centre) in Ceunant Llennyrch NNR (from Sanderson, 2016).

- *Ramonia dictyospora* (Wales-VU) is an elusive epiphytic lichen recorded from woodland in five SSSI in Meirionnydd, Radnorshire and Carmarthenshire, as well as four sites in Ceredigion. Ganllwyd SSSI holds the largest colony in East Gwynedd AoS and qualifies under 3.3.4.4; Coedydd Aber is the best site in West Gwynedd AoS (3.3.4.4); Carn Gafallt has the strongest population in Radnorshire AoS (3.3.4.4); and Cwm Doethie - Mynydd Mallaen SSSI is the only recorded site in Carmarthen & Dinefwr AoS (3.3.4.4). None of the four Ceredigion sites is a SSSI and *R. dictyospora* was recorded on just one tree on each site.
- *Rhizocarpon anaperum* (Wales-VU) has its only notified population in Eryri SSSI, which qualifies under Criterion 3.3.4.1. There are also a few records from non-SSSI areas of the Mid Wales Orefield.

- *Rhizocarpon badioatrum* (Wales-VU) has two questionable records from Eryri SSSI and Meirionnydd, but is probably not accurately recorded from Wales and should not be regarded as a SSSI feature.
- *Rinodina fimbriata* (Wales-VU) has a single record from a non-SSSI site in Ceredigion AoS. Further survey of watercourses in mid Wales would be required before notification.
- *Rinodina milvina* (Wales-VU) is known in Wales only from two colonies on coastal rock in Ceredigion. Further survey is needed.
- *Ropalospora lugubris f. lugubris* (Wales-VU) may have been recorded from Eryri SSSI in the past, but data are imprecise and this may not be a Welsh taxon. Further survey is needed to establish its status before notification.
- *Schismatomma (Snippocia) niveum* (Wales-VU) is found primarily in the Preseli & South Pembrokeshire AoS, reflecting its southern distribution in Britain. Three Pembrokeshire SSSI hold *S. niveum* and determining the relative size of populations is complicated by incomplete survey coverage. The colony occupying at least 7 compartments in Stackpole SSSI (Edwards, 2008b) is considered to be the largest in the AoS, qualifying under Criteria 3.3.4.1 and 3.3.4.4, with those in Coed Ty-canol (Ty-canol Wood) SSSI (potentially lost from the site according to Wolseley & Douglass, 2017) and Milford Haven Waterway SSSI being smaller and/or less well documented. This species also qualifies as a feature of four SSSI because they support the strongest populations in their respective Areas of Search (3.3.4.4): Dinefwr Estate SSSI (Carmarthen & Dinefwr), Coedydd a Chorsydd Aberteifi / Teifi Estuary Woodlands and Marshes

SSSI (Ceredigion), Coedydd De Dyffryn Maentwrog SSSI (East Gwynedd) and Gregynog SSSI (Montgomeryshire).

- *Sporastatia polyspora* (Wales-EN) is known in Wales from two sites in Eryri SSSI and qualifies under Criteria 3.3.4.1, 3.3.4.3 and 3.3.4.4.
- *Sporastatia testudinea* (Wales-EN) has a single record from a snowbed in Eryri SSSI and qualifies under Criteria 3.3.4.1, 3.3.4.3 and 3.3.4.4.
- *Sporodophoron cretaceum* (Wales-VU) is widely distributed in mid and west Wales, with occurrences in seven SSSI and several non-SSSI sites. Its largest population is in Dinefwr Estate SSSI (Carmarthen & Dinefwr AoS), where it occupies at least 25 trees (Sanderson, 2014a) and qualifies under Criteria 3.3.4.1 and 3.3.4.4. There is also a strong population in Gregynog SSSI, on at least 13 trees – the largest known in Montgomeryshire (3.3.4.4). The relative size of colonies in Milford Haven Waterway SSSI and Stackpole SSSI requires evaluation and no Pembrokeshire sites should currently have this species listed as a feature. Similarly, it is uncertain whether SSSIs or non-SSSIs hold the largest populations in Brecknock AoS and Ceredigion AoS.
- *Staurothele hymenogonia* (Wales-VU) was found in Cwm Idwal in 1994, which currently represents the only Welsh record (3.3.4.1 & 3.3.4.4).
- *Stereocaulon delisei* (Wales-VU) grows on Yr Wyddfa and Cnicht in Eryri SSSI, which holds the largest Welsh population qualifying under Criteria 3.3.4.1 and 3.3.4.4. It is also present further south in Cwm Pemprys, Ceredigion, which is part of Pencarreg-Gopa a Moel Hirddod SSSI and lies at the southern edge of the GB range of this species (3.3.4.3 & 3.3.4.4).
- *Stereocaulon glareosum* (Wales-VU) has a significant proportion of its

British sites in Ceredigion AoS, where a suite of sites should have it recognised as a feature under Criterion 3.3.4.2. These are Mwyngloddfa Cwmystwyth SSSI, Mwyngloddfeydd Esgair Hir ac Esgair Fraith SSSI, Cwmsymlog SSSI and Mwyngloddfa Nant-y-cagl (Eaglebrook Mine) SSSI. It should also be considered a feature of Mwyngloddfa Nantymwyn SSSI, as the only known population in Carmarthen & Dinefwr AoS (3.3.4.4).

- *Stereocaulon pileatum* (Wales-VU) is widely recorded on metal-polluted walls and under galvanised roadside barriers, as well as on mine sites, and as such is not an appropriate individually qualifying SSSI feature. It is included as a member of Metaliferous Habitat assemblages on 16 SSSI and cSSSI (see 4.2.6 above).
- *Stereocaulon plicatile* (Wales-VU) is only known in Wales from Eryri SSSI, where it reaches its southernmost British limit. It qualifies under Criteria 3.3.4.1, 3.3.4.3 and 3.3.4.4.
- *Stereocaulon tornense* (Wales-VU) has been found in Eryri SSSI, where it qualifies under 3.3.4.4. It reaches its southern British limit on Craig Clungwyn in Cwm Doethie - Mynydd Mallaen SSSI (Ceredigion), which qualifies under 3.3.4.3 and 3.3.4.4.
- *Sticta canariensis (dufourii)* cyanobacterial morphotype (Wales-VU) has scattered records from northern and western Wales but its distribution is confused because of differing treatment of the green algal morphotype and resulting confusion among records. There appear to be records from 12 SSSI, most of which are in East Gwynedd and West Gwynedd Areas of Search. The relative size of these populations is difficult to establish because *S. canariensis* is seldom discussed in detail in reports, and

identifying the largest population in the two north-west Wales Areas of Search is thus not possible. However, the colony in Coed Aberedw SSSI is the only one in Radnorshire AoS and qualifies under 3.3.4.4, whilst in Ceredigion AoS the largest colony is thought to be in Coedydd a Cheunant Rheidol SSSI (3.3.4.4) where it is found in three sections of the SSSI.

- *Sticta fuliginosa* s. lat. (Wales-VU) is widespread and is apparently increasing and spreading in much of western Wales, although declines may be ongoing in Powys. Even there, *S. fuliginosa* has recently been newly discovered in Dyffrynnoedd Nedd a Mellte a Moel Penderyn SSSI. There are record from at least 18 SSSI in East Gwynedd AoS and at least eight in Preseli & South Pembrokeshire AoS. Identifying *S. fuliginosa* as a SSSI feature is currently not considered appropriate on any site.



Figure 35: *Sticta canariensis* cyanobacterial morphotype (brown) with attached lobes of the green algal morphotype, in Fairy Glen Woods SSSI (from Orange, 2013c).

- *Strangospora microhaema* (Wales-CR) is only known in Wales from three sites: Cadair Idris SSSI, Cwm Llyfnant SSSI, and Hafod in Ceredigion. The relative size of the two Ceredigion colonies is uncertain, but there are so few British populations that Ceredigion is arguably a hotspot for the species so both sites could be notified under Criterion 3.3.4.2. The Cadair Idris population qualifies under Criterion 3.3.4.4.
- *Strigula jamesii* (Wales-VU) has recent records from Coedydd a Ceunant Rheidol SSSI in Ceredigion AoS and Cwm Doethie - Mynydd Mallaen SSSI in Carmarthen & Dinefwr AoS, qualifying under 3.3.4.4 in both. There is also a historic record from Dinefwr Estate SSSI.
- *Strigula phaea* (Wales-VU) is known from single oaks in Ceunant Cynfal SSSI and Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI, and from riverside rocks in River Usk (Upper Usk) / Afon Wysg (Wysg Uchaf) SSSI. Each population is very small and prioritisation of either of the two East Gwynedd sites is problematic, but recognition of the River Usk population as the only one known in Brecknock AoS (3.3.4.4) seems justifiable.
- *Strigula stigmatella* var. *alpestris* (Wales-VU) grows in Cadair Idris SSSI (East Gwynedd) and Eryri SSSI (West Gwynedd), qualifying under 3.3.4.4 for both sites.
- *Strigula thelopsidoides* (Wales-CR) has its only known Welsh site in Coed Cymerau NNR, part of Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI. This qualifies under Criteria 3.3.4.1 and 3.3.4.4.
- *Syncesia myrticola* (Wales-VU) has three Welsh records under that name and two under the name *Enterographa sorediata*. The colony of *S. myrticola* from Skomer Island and Middleholm SSSI in 1987 is sufficiently

recent to qualify under 3.3.4.1 and 3.3.4.4, whilst colonies recorded as *E. sorediata* in Dinefwr Park SSSI and Gregynog SSSI both qualify independently (3.3.4.4) as the only sites in Carmarthen & Dinefwr and Montgomeryshire AoS respectively. One from Arfordir Gogleddol Penmon SSSI in 1881 and/or 1933 and an undated record in the BLS database that appears to be from St David's Peninsula Coast SSSI have the localities named "Penmon" and "Penmaen" respectively; confusion is likely and survey is needed before a feature can be recognised for either site.

- *Thelidium fontigenum* (Wales-VU) has been recorded from Old Red Sandstone in Brecon Beacons SSSI and Carboniferous Limestone in Mynydd Llangattwg (Mynydd Llangattock) SSSI. The relative size of these two colonies, both in Brecknock AoS, is unknown and more survey work is needed before this species can be identified as a feature on either site.
- *Thelidium impressum* (Wales-VU) has only been confirmed in Wales from limestone in Gower Coast: Rhossili to Porteynon SSSI, which qualifies under 3.3.4.1 and 3.3.4.4. There is an unconfirmed record from Pen y Gogarth / Great Ormes Head SSSI.
- *Thelidium papulare f. sorediatum* (Wales-VU) has been recorded from "Caernarvonshire" according to Smith *et al.* (2009), presumably meaning Great Ormes Head, but a survey of Pen y Gogarth / Great Ormes Head SSSI (Giavarini, 2007) did not confirm the presence of this taxon so it cannot be regarded as a feature of the site.
- *Thelopsis melathelia* (Wales-VU) was found in Cwm Uchaf, Eryri SSSI in 1994 and qualifies under Criteria 3.3.4.1, 3.3.4.3 and 3.3.4.4.

- *Thelotrema petraetoides* (Wales-EN) is only known in Wales from Ceunant Llennyrch NNR in Coedydd De Dyffryn Maentwrog SSSI. It qualifies under 3.3.4.1 and 3.3.4.4.
- *Thermutis velutina* (Wales-VU) has been reported from six sites in north-west Wales but was last recorded in 1926. It does not qualify as a feature on any SSSI.
- *Toninia fusispora* (Wales-VU) was recorded from Cwm Idwal in Eryri SSSI in 1994 and in Moel Hebog SSSI in 1997. Both sites are on the southern edge of the range of this species and qualify under Criterion 3.3.4.3.
- *Tylophoron hibernicum* (*Blarneya hibernica*) (Wales-CR) was known until recently in Wales from a single tree in Coed Cwm Clettwr SSSI, but the tree has died and translocations may not have been successful. Nevertheless, this species should be regarded as a SSSI feature under Criterion 3.3.4.4. Recent work by Sanderson (2019b) has revealed a population on two trees in Caban Lakeside Woodlands SSSI, which qualify under Criterion 3.3.4.1 as the largest population in Wales and Criterion 3.3.4.3 because this site is the northernmost globally for *T. hibernicum*.
- *Usnea articulata* (Wales-VU) was rare and declining in Wales until the late 20th century, with the population restricted to Pembrokeshire and the Gower Peninsula, as well as isolated inland sites in Ceredigion and Carmarthenshire, but has undergone a dramatic increase following reductions in Sulphur Dioxide pollution. Bosanquet (in prep.) documents more than 150 sites, including one in eastern Radnorshire, several in the South Wales Valleys, and a handful in the north-west. Although there are

records from 25 SSSI it is not appropriate to recognise this increasing species as a feature of any site.

- *Wadeana dendrographa* (Wales-VU) is currently known in Wales only from Stackpole SSSI, although there are historic records from two additional sites in Pembrokeshire. The Stackpole colony qualifies under 3.3.4.1.
- *Xylographa parallela* (Wales-VU) has two poorly localised records from Ceredigion and Meirionnydd and cannot be recognised as a SSSI feature.

6. Site review

6.1. SSSI with qualifying lichen features

A total of 109 SSSI across Wales have at least one lichen feature that qualifies for selection (Table 20), of which 68 have at least one of those qualifying features listed as 'notified' in the Features Database. Many sites have multiple qualifying features, especially because the *Guidelines* allow for selection of Welsh Red List lichens, which was not the case for bryophytes (Bosanquet, 2019a). The extensive Eryri SSSI has six qualifying lichen assemblage features and an astonishing 47 qualifying lichen species features.

Notification of lichen features has clearly been the result of happenstance and officer awareness, even on SSSI notified since the publication of the 1992 *Guidelines for Selection of Biological SSSIs*, although a larger number of important lichen sites have been officially notified than is the case for bryophytes (Bosanquet, 2019a). There remains some ambiguity over whether identified qualifying features on a SSSI are *de facto* protected, or whether a process of formal notification is needed to ensure full protection of qualifying features that were not mentioned in the original notification package. Renotification of many tens of SSSIs to add on qualifying lichen features

would be a vast undertaking. 32 SSSI have ‘an assemblage of Nationally Rare and Scarce lichens’ as their notified assemblage, and this might be interpreted as indicating that some of their qualifying assemblages or species might be considered notified. These assemblages of Nationally Rare and Scarce species are not covered by the revised *Guidelines*, but are included in Table 21 to give an indication of which sites might already be protected. Furthermore, it is unclear whether the mention of a site being ‘important for lichens’ in a SSSI citation is tantamount to notification of a lichen (assemblage) feature or whether the details of that assemblage need to be mentioned. The current review sets out which lichen species and assemblages qualify under the revised *Guidelines* of Bosanquet *et al.* (2018), and a mechanism is now required to ensure the proper protection of these qualifying features.

Table 20: SSSI in Wales that qualify for at least one lichen assemblage or species feature; notified features are indicated by an N in brackets.

Site	SSSI	Area of Search	Assemblage Features qualifying	Assemblage Features not qualifying	NR/NS Assemblage	Species Features qualifying	Species Features not qualifying
Aber Mawddach/Mawddach Estuary SSSI	SSSI	East Gwynedd	-	-	-	Bryoria bicolor	-
Aberarth - Carreg Wylan SSSI	SSSI	Ceredigion	-	Maritime	-	Gyalecta foveolaris	Arthonia atlantica
Afon Eden - Cors Goch Trawsfynydd SSSI	SSSI	East Gwynedd	URI (N)	SOWI (N) , TNTN Non-montane Acid Rock	NR/NS Assemblage (N)	Lobaria pulmonaria, Lobaria scrobiculata, Pterygiopsis lacustris	-
Afon Irfon SSSI	SSSI	Brecknock	-	Aquatic	-	Collema dichotomum (N)	-
Afon Llugwy SSSI	SSSI	West Gwynedd	-	-	-	Bacidia absistens	-
Afon Rheidol ger Capel Bangor SSSI	SSSI	Ceredigion	-	-	-	Bacidia absistens	-
Afon Teifi SSSI	SSSI	Carmarthen & Dinefwr/Ceredigion	-	Aquatic	-	-	-
Allt Pontfaen - Coed Gelli-fawr SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N)	URI	-	-	-
Allt-y-gest SSSI	SSSI	Brecknock	SOWI, URI (N)	-	-	Bryoria fuscescens	Bacidia circumspecta
Baron Hill Park SSSI	SSSI	West Gwynedd	-	-	NR/NS Assemblage (N)	-	-
Berwyn SSSI	SSSI	East Gwynedd	TNTN Non-montane Acid Rock	-	-	-	-
Black Mountains SSSI	SSSI	Brecknock, Gwent	-	TNTN Non-montane Acid Rock	NR/NS Assemblage	Bryoria fuscescens, Lempholemma cladodes	-
Blackcliff - Wyndcliff SSSI	SSSI	Gwent	-	-	-	Porina rosei	-
Brecon Beacons SSSI	SSSI	Brecknock	TNTN Non-montane Acid Rock	TNTN Montane Calcareous Rock/Soil	NR/NS Assemblage (N)	-	-
Breidden Hill SSSI	SSSI	Montgomeryshire	TNTN Mixed Rock (N)	-	-	Catillaria aphana, Lempholemma botryosum, Pertusaria amarescens	-
Bryn Alyn SSSI	SSSI	Clwyd	-	Limestone	-	-	-
Bwrdd Arthur SSSI	SSSI	West Gwynedd	-	Limestone	-	Collema fragile	-
Caban Lakeside Woodlands SSSI	SSSI	Radnor	Pinhead Lichens, SOWI (N) , URI	-	NR/NS Assemblage (N)	Biatora ligni-mollis, Bryoria fuscescens, Chaenotheca stemonea, Chaenothecopsis savonica, Tylophoron hibernicum	-
Cadair Idris SSSI	SSSI	East Gwynedd	Aquatic, URI, TNTN Non-montane Acid Rock	SOWI, TNTN Acid Montane Rock/Soil, TNTN Montane Calcareous Rock/Soil	NR/NS Assemblage (N)	Atla wheldonii, Fuscopannaria mediterranea, Lecanora cenisia, Micarea marginata, Strangospora microhaema, Strigula stigmatella alpestris, Thamnolia vermicularis , Wadeana minuta	-
Carn Gafallt SSSI	SSSI	Brecknock/Radnor	SOWI (N) , URI, Pinhead Lichens	-	-	Bacidia circumspecta, Bryoria fuscescens, Chaenotheca stemonea, Chaenothecopsis savonica, Lecanographa amylicia, Lobaria pulmonaria, Lobaria virens , Microcalicium ahlneri, Microcalicium disseminatum, Opegrapha fumosa, Ramonia chrysophaea, Ramonia dictyospora	Sticta limbata, Sticta sylvatica
Carn Ingli SSSI	SSSI	Preseli & South Pembrokeshire	TNTN Non-montane Acid Rock	-	-	Cladonia peziziformis	Ramalina polymorpha
Carreg Cennan SSSI	SSSI	Carmarthen & Dinefwr	-	Limestone	-	-	-
Castlemartin Range SSSI	SSSI	Preseli & South Pembrokeshire	Limestone, TNTN Lowland Calcareous Ground (N)	Maritime	-	Collema fragile (N) , Fulgensia fulgens (N) , Thelocarpon opertum	Leptogium diffractum (N)
Cefndeuddwr SSSI	SSSI	East Gwynedd	-	SOWI, URI	-	Leptogium brebissonii, Lobaria amplissima (N) , Lobaria scrobiculata	-
Ceunant Cynfal SSSI	SSSI	East Gwynedd	SOWI, URI (N)	-	-	Porina hibernica, Strigula phaea	-
Coed Aberedw SSSI	SSSI	Radnor	-	SOWI, TNTN Mixed Rock (N)	-	Sticta canariensis dufourii	Porina rosei
Coed Cae-Awr SSSI	SSSI	West Gwynedd	-	SOWI, URI	NR/NS Assemblage (N)	Lobaria pulmonaria, Lobaria scrobiculata	-
Coed Copi'r Graig SSSI	SSSI	Montgomeryshire	SOWI	Aquatic	-	-	Sticta sylvatica
Coed Cors y Gedol SSSI	SSSI	East Gwynedd	-	-	NR/NS Assemblage (N)	-	-
Coed Cwm Cletwr SSSI	SSSI	Ceredigion	-	-	-	Parmotrema robustum, Tylophoron hibernicum	-
Coed Cwm Einion SSSI	SSSI	Ceredigion	SOWI	URI	NR/NS Assemblage (N)	Lecanora strobilina, Menegazzia terebrata, Parmelinopsis horrescens, Parmotrema robustum (N) , Porina hibernica	-
Coed Graig Uchaf SSSI	SSSI	East Gwynedd	-	SOWI, URI	NR/NS Assemblage	-	-

Site	SSSI	Area of Search	Assemblage Features qualifying	Assemblage Features not qualifying	NR/NS Assemblage	Species Features qualifying	Species Features not qualifying
Coed Llechwedd	SSSI	East Gwynedd	-	SOWI, URI	-	-	-
Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI	SSSI	Montgomeryshire	SOWI, URI	-	-	Menegazzia terebrata, Parmelinopsis horrescens	-
Coed Ty-canol (Ty-canol Wood) SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N) , URI	-	-	Lecanographa lyncea	-
Coed y Rhygen SSSI	SSSI	East Gwynedd	URI (N)	SOWI	-	Arthopyrenia carneobrunneola, Mycoblastus alpinus, Parmelinopsis horrescens	-
Coed-yr-allt-goch SSSI	SSSI	Radnor	-	-	-	Pyrenula occidentalis	-
Coedydd a Cheunant Rheidol (Rheidol Woods & Gorge) SSSI	SSSI	Ceredigion	SOWI, URI	TNTN Non-montane Acid Rock	NR/NS Assemblage (N)	Degelia atlantica, Ramonia chrysophaea, Sticta canariensis dufourii, Strigula jamesii	-
Coedydd a Chorsydd Aber Teifi (Teifi Estuary Woodlands & Marshes) SSSI	SSSI	Ceredigion	SOWI	TNTN Non-montane Acid Rock	NR/NS Assemblage (N)	Arthonia atlantica, Chaenotheca stemonea, Porina effilata, Schismatomma niveum	-
Coedydd Aber SSSI	SSSI	West Gwynedd	SOWI	URI	NR/NS Assemblage (N)	Arthonia zwackhii, Degelia plumbea, Lobaria pulmonaria, Ramonia dictyospora	-
Coedydd Abergwynant SSSI	SSSI	East Gwynedd	SOWI, URI	-	-	-	Leptogium cochleatum
Coedydd ac Ogofau Elwy a Merchon SSSI	SSSI	Clwyd	-	-	-	Lempholemma intricatum	-
Coedydd Beddgelert a Cheunant Aberglaslyn SSSI	SSSI	West Gwynedd	-	SOWI, URI (N)	NR/NS Assemblage (N)	-	-
Coedydd De Dyffryn Maentwrog SSSI	SSSI	East Gwynedd	SOWI, URI	Pinhead Lichens	NR/NS Assemblage (N)	Agonimia octospora, Arthonia astroidestra, Arthopyrenia carneobrunneola, Chaenothecopsis savonica, Fuscopannaria sampaiana, Mycomicrothelia atlantica, Pannaria rubiginosa, Parmelinopsis horrescens, Porina hibernica, Pyrenula hibernica, Pyrenula laevigata, Pyrenula occidentalis, Ramonia chrysophaea, Rinodina isidioides, Schismatomma niveum, Thelotrema petractoides	-
Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	SSSI	East Gwynedd	SOWI (N) , URI (N)	-	NR/NS Assemblage (N)	Agonimia octospora, Arthonia atlantica, Degelia plumbea, Fuscopannaria mediterranea, Lobaria pulmonaria, Lobaria scrobiculata, Lobaria virens, Megalospora tuberculosa, Miriquidica atrofulva, Mycomicrothelia atlantica, Parmelinopsis horrescens, Porina hibernica, Rinodina isidioides, Strigula phaea, Strigula thelopsidoides	-
Coedydd Dyffryn Wnion SSSI	SSSI	East Gwynedd	URI (N)	SOWI (N)	NR/NS Assemblage (N)	-	-
Coedydd Glannau a Cwm Coel SSSI	SSSI	Radnor	URI, SOWI (N)	Pinhead Lichens	NR/NS Assemblage (N)	-	-
Coedydd Llaur-y-glyn SSSI	SSSI	Montgomeryshire	-	SOWI, URI	-	-	-
Coedydd Nanmor SSSI	SSSI	West Gwynedd	SOWI, URI (N)	-	NR/NS Assemblage (N)	Fuscopannaria mediterranea, Megalospora tuberculosa	-
Coedydd Nantgwynant SSSI	SSSI	West Gwynedd	URI (N)	SOWI	NR/NS Assemblage (N)	Gomphillus calycioides, Parmelinopsis horrescens	-
Comin Helygain a Glaswelltiroedd Treffynnon / Halkyn Common & Hollywell Grasslands SSSI	SSSI	Clwyd	-	Limestone, Metalliferous	-	-	-
Cors Goch SSSI	SSSI	West Gwynedd	-	Limestone	-	-	-
Cors Y Llyn SSSI	SSSI	Radnor	-	-	-	Cetraria sepincola (N)	-
Corsydd Llangloffan SSSI	SSSI	Preseli & South Pembrokeshire	-	SOWI	NR/NS Assemblage (N)	-	-
Craig Fawr SSSI	SSSI	Radnor	-	TNTN Mixed Rock (N)	-	-	-
Craig y Benglog SSSI	SSSI	East Gwynedd	SOWI (N)	URI	NR/NS Assemblage (N)	Biatoridium monasteriense	-
Creigiau Rhiwledyn/Little Ormes Head SSSI	SSSI	Clwyd	-	Limestone	NR/NS Assemblage (N)	-	-
Creuddyn SSSI	SSSI	Clwyd	Limestone	-	-	-	-
Cwm Bach, Sychpant SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N)	-	-	-	-
Cwm Clydach, Cydweli SSSI	SSSI	West Glamorgan & Llanelli	-	-	-	-	Sticta sylvatica
Cwm Doethie - Mynydd Mallaen SSSI	SSSI	Carmarthen & Dinefwr/Ceredigion	SOWI, URI, TNTN Non-montane Acid Rock	Pinhead Lichens	NR/NS Assemblage (N)	Porina hibernica, Ramonia dictyospora, Stereocaulon tornense, Strigula jamesii	-

Site	SSSI	Area of Search	Assemblage Features qualifying	Assemblage Features not qualifying	NR/NS Assemblage	Species Features qualifying	Species Features not qualifying
Cwm Llyfnant SSSI	SSSI	Ceredigion	URI	SOWI	-	Bryoria bicolor, Degelia plumbea, Strangospora microhaema	-
Cwmsymlog SSSI	SSSI	Ceredigion	Metalliferous (N)	-	-	-	-
Dale and South Marloes Coast SSSI	SSSI	Preseli & South Pembrokeshire	-	Maritime (N)	-	Degelia ligulata, Teloschistes flavicans (N)	-
De Porth Sain Ffraid / St Bride's Bay South SSSI	SSSI	Preseli & South Pembrokeshire	-	SOWI	-	Degelia atlantica, Degelia ligulata, Degelia plumbea, Lobaria virens	-
Dinefwr Estate SSSI	SSSI	Carmarthen & Dinefwr	SOWI (N) , Pinhead Lichens	URI	-	Agonimia octospora, Buellia hyperbolica, Lecanographa lyncea, Lobaria pulmonaria, Microcalicium ahlneri, Syncesia myrticola (as Enterographa soledata), Opegrapha fumosa, Schismatomma niveum, Sporodophoron cretaceum	-
Dowrog Common SSSI	SSSI	Preseli & South Pembrokeshire	-	-	-	-	Cladonia peziziformis
Duhonw SSSI	SSSI	Brecknock	-	-	-	-	Bacidia circumspecta
Dyfi	SSSI	Ceredigion/East Gwynedd	-	-	-	-	Arthonia atlantica
Dyffryn Gwaun SSSI	SSSI	Preseli & South Pembrokeshire	URI	SOWI (N)	-	-	-
Dyffrynoedd Nedd a Mellt a Moel Penderyn SSSI	SSSI	Brecknock/Mid & South Glamorgan/West Glamorgan & Llanelli	Aquatic, SOWI (N) , URI	Limestone	NR/NS Assemblage (N)	Leptogium subtorulosum	-
Dylife Mine SSSI & extensions	SSSI	Montgomeryshire	Metalliferous	-	-	-	-
Elenydd SSSI	SSSI	Brecknock/Ceredigion/Radnor	Pinhead, SOWI, URI, TNTN Non-montane Acid Rock	Aquatic, TNTN Acid Montane Rock/Soil	NR/NS Assemblage	Arthonia mediella, Bryoria fuscescens, Leptogium burgessii, Melanelia hepatizon, Melanelia stygia, Microcalicium ahlneri, Strigula stigmatella var. stigmatella	Graphina pauciloculata, Opegrapha fumosa
Eryri SSSI	SSSI	East Gwynedd/West Gwynedd	SOWI, Aquatic, TNTN Acid Montane Rock/Soil, TNTN Non-montane Acid Rock, TNTN Montane Calcareous Rock/Soil, TNTN Rocky Lake Shore	URI	NR/NS Assemblage (N)	Acarospora badiofusca, Agonimia octospora, Alectoria nigricans, Atla wheldonii, Catillaria contristans, Coccotrema citrinescens, Collema parvum, Degelia atlantica, Frutidella caesioatra, Fuscopannaria mediterranea, Gyalidea fritzei, Ionaspis odora, Jamesiella scotica, Koerberiella wimmeriana, Lecanora achariana (N) , Lecanora cenisia, Lempholemma botryosum, Leptogium burgessii, Micarea pseudomarginata, Nephroma tangeriense (N) , Peltigera venosa, Pertusaria melanochlora, Placynthium asperellum, Polyblastia efflorescens, Polyblastia terrestris, Protoblastenia siebenhaariana, Protoparmelia atriseda, Protothelenella sphinctrinoidella, Pseudocyphellaria intricata, Pseudocyphellaria lacerata, Pterygiopsis lacustris, Rhizocarpon anaperum, Sporastatia polyspora, Sporastatia testudinaria, Staurothele hymenogonia, Stereocaulon delisei, Stereocaulon plicatile, Stereocaulon tornense, Stereocaulon symphycheilum, Sticta canariensis, Strigula stigmatella alpestris, Thamnotia vermicularis (N) , Thelopsis melathelia, Toninia fusispora, Vestergrenopsis elaeina	-
Fairy Glen Woods SSSI	SSSI	East Gwynedd	SOWI, Aquatic	URI	-	-	-
Freshwater East Cliffs to Skrinkle Haven SSSI	SSSI	Preseli & South Pembrokeshire	-	-	-	Teloschistes flavicans	-
Gallt y Bwch SSSI	SSSI	West Gwynedd	-	SOWI	-	-	-
Gallt Llanerch - Coed Gelli-deg SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N) , URI	-	-	-	-
Ganllwyd SSSI	SSSI	East Gwynedd	SOWI (N) , URI (N)	-	NR/NS Assemblage (N)	Agonimia octospora, Fuscopannaria mediterranea, Fuscopannaria sampaiana, Leptogium brebissonii, Lobaria amplissima, Lobaria pulmonaria, Lobaria scrobiculata, Lobaria virens, Pannaria rubiginosa, Parmeliella testacea, Ramonia dictyospora, Rinodina isidioides, Varicellaria velata	-
Garn Wood, Kilkiffeth Wood & Dan-Deri-Cwm Felin-Ban SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N)	URI	-	-	-
Glannau Aberdaron SSSI	SSSI	West Gwynedd	-	Maritime	-	Heterodermia leucomelos (N) , Teloschistes flavicans (N)	-
Glannau Rhoscolyn SSSI	SSSI	West Gwynedd	-	-	-	Heterodermia leucomelos	-
Glannau Ynys Gybi/ Holy Island Coast SSSI	SSSI	West Gwynedd	-	-	-	Cladonia peziziformis, Heterodermia leucomelos, Teloschistes flavicans	-
Glaswelltiroedd Eryrys SSSI	SSSI	Clwyd	Limestone (N)	-	-	Leptogium massiliense, Protoblastenia cyclospora	-

Site	SSSI	Area of Search	Assemblage Features qualifying	Assemblage Features not qualifying	NR/NS Assemblage	Species Features qualifying	Species Features not qualifying
Glaswelltiroedd Trelogan/Trelogan Grasslands SSSI	SSSI	Clwyd	-	Metalliferous	-	-	-
Gower Coast: Rhossili to Porteynon SSSI	SSSI	West Glamorgan & Llanelli	Limestone	-	NR/NS Assemblage	Collema fragile, Synalissa ramulosa, Thelidium impressum, Thelocarpon opertum	-
Graig Fawr SSSI	SSSI	Clwyd	-	Limestone	-	-	-
Graig, Llanarmon-yn-Ial SSSI	SSSI	Clwyd	-	Limestone	-	-	-
Great Tor (Three Cliff Bay) SSSI	SSSI	West Gwynedd	-	Limestone	-	-	-
Gregynog SSSI	SSSI	Montgomeryshire	SOWI (N) , Pinhead Lichens	URI	NR/NS Assemblage (N)	Bryoria fuscescens (N) , Calicium adpersum (N) , Caloplaca herbidella, Caloplaca lucifuga, Chaenotheca stemonea, Lecanographa lyncea, Lecanora quercicola (N) , Lecanora sublivescens (N) , Microcalicium disseminatum, Opegrapha fumosa, Schismatomma niveum, Sporodophoron cretaceum, Synchesia myrticola (as Enterographa soredata), Xerotrema quercicola	Lecanographa amylacea (N)
Gro Ystwyth SSSI	SSSI	Ceredigion	-	Metalliferous (N)	-	Polyblastia terrestris	-
Gwynfynydd SSSI	SSSI	East Gwynedd	SOWI (N) , URI (N) , Aquatic, Metalliferous	-	NR/NS Assemblage (N)	Leptogium brebissonii, Lobaria scrobiculata, Parmelinopsis horrescens	-
Little Orme's Head SSSI	SSSI	Clwyd	Limestone	-	-	-	-
Llanelwedd Rocks SSSI	SSSI	Radnor	-	TNTN Mixed Rock (N)	-	-	-
Llandeilo, Rhulen & Llanbedr Hill SSSI	SSSI	Radnor	-	-	-	Anaptychia ciliaris ssp. ciliaris	Bacidia circumspecta
Llanddulas Limestone & Gwrych Castle Wood SSSI	SSSI	Clwyd	Limestone	-	-	-	-
Llanymynech & Llyncllys Hills SSSI	SSSI	Montgomeryshire	-	Limestone	-	-	-
Marcheini Uplands, Giffach Farm & Gamallt SSSI	SSSI	Radnor	SOWI, URI, Aquatic, TNTN Non-montane Acid Rock	-	NR/NS Assemblage (N)	Bacidia circumspecta, Bryoria fuscescens, Protopermelia atriseda	-
Migneint - Arenig - Dduallt SSSI	SSSI	East Gwynedd	TNTN Non-montane Acid Rock	SOWI, URI	-	Bryoria fuscescens	-
Milford Haven Waterway SSSI	SSSI	Preseli & South Pembrokeshire	SOWI (N)	-	-	Megalospora tuberculosa	-
Moel Hebog SSSI	SSSI	West Gwynedd	-	TNTN Montane Calcareous Rock/Soil	-	Allantoparmelia alpicola, Coccotrema citrinescens, Toninia fuispora	-
Mwyngloddfa Castell SSSI	SSSI	Ceredigion	Metalliferous	-	-	-	-
Mwyngloddfa Cwmbwyno SSSI	SSSI	Ceredigion	Metalliferous (N)	-	-	-	-
Mwyngloddfa Cwmystwyth SSSI	SSSI	Ceredigion	Metalliferous (N)	-	-	Stereocaulon glareosum	-
Mwyngloddfa Llety Ifan Hen (Vaughan Mine) SSSI	SSSI	Ceredigion	Metalliferous	-	-	-	-
Mwyngloddfa Nant-y-cagl (Eaglebrook Mine) SSSI	SSSI	Ceredigion	Metalliferous	-	-	Stereocaulon glareosum	-
Mwyngloddfa Nantymwyn SSSI	SSSI	Carmarthen & Dinefwr	Metalliferous (N)	-	-	Stereocaulon glareosum	-
Mwyngloddfeydd Esgair Hir ac Esgair Fraith SSSI	SSSI	Ceredigion	Metalliferous (N)	-	-	Megalospora tuberculosa, Stereocaulon glareosum	-
Mwyngloddiau a Chreigiau Gwydyr SSSI	SSSI	East Gwynedd	Metalliferous (N)	-	-	Protopermelia atriseda	-
Mynydd Du (Black Mountain) SSSI	SSSI	Brecknock/Carmarthen & Dinefwr	-	Aquatic, TNTN Non-montane Acid Rock, TNTN Montane Calcareous Rock/Soil	NR/NS Assemblage	Atla wheldonii, Lempholemma cladodes	-
Mynydd Llangatwg (Mynydd Llangattock) SSSI	SSSI	Brecknock	Limestone	-	NR/NS Assemblage (N)	Atla wheldonii, Collema fasciculare, Lemmopsis arnoldiana	-
Mynydd Parys SSSI	SSSI	West Gwynedd	Metalliferous (N)	-	-	-	-
Mynydd Penarfynydd SSSI	SSSI	West Gwynedd	-	Maritime	-	Collema nigrescens, Teloschistes flavicans	-
Mynydd Preseli SSSI	SSSI	Preseli & South Pembrokeshire	-	-	NR/NS Assemblage	-	-
Newborough Warren - Ynys Llanddwyn SSSI	SSSI	West Gwynedd	-	-	-	Teloschistes flavicans (N)	-

Site	SSSI	Area of Search	Assemblage Features qualifying	Assemblage Features not qualifying	NR/NS Assemblage	Species Features qualifying	Species Features not qualifying
Ogof Ffynnon Ddu - Pant Mawr SSSI	SSSI	Brecknock	-	Limestone	-	-	-
Parc Nannau SSSI	SSSI	East Gwynedd	SOWI, URI (N)	Pinhead Lichens	NR/NS Assemblage (N)	Agonimia octospora, Bacidia incompta (N) , Buellia hyperbolica (N) , Collema occultatum, Degelia cyanoloma, Fuscopannaria sampaiana, Lecanographa lyncea, Lecanora strobilina, Lobaria amplissima, Lobaria pulmonaria, Lobaria scrobiculata, Lobaria virens, Megalospora tuberculosa, Opegrapha fumosa, Rinodina isidioides	Lecanographa amylicata (N)
Parc Pont-faen SSSI	SSSI	Ceredigion	-	-	NR/NS Assemblage (N)	Anaptychia ciliaris ssp. ciliaris (N)	-
Pen y Gogarth / Great Ormes Head SSSI	SSSI	East Gwynedd	Limestone (N)	-	NR/NS Assemblage (N)	Dirina massiliensis f. massiliensis, Lempholemma botryosum, Megasporea verrucosa, Synalissa ramulosa	-
Pencarreg-Gopa a Moel Hirddod SSSI	SSSI	Ceredigion	-	-	-	Stereocaulon delisei	-
Porth Ceiriog, Porth Neigwl ac Ynysoedd Sant Tudwal SSSI	SSSI	West Gwynedd	-	Maritime	-	-	-
Porth Towyn I Borth Wen SSSI	SSSI	West Gwynedd	-	-	-	Degelia ligulata	-
Pwll-du Head and Bishopston Valley SSSI	SSSI	West Glamorgan & Llanelli	Limestone	-	-	Lemmopsis arnoldiana	-
Pwll-y-wrach SSSI	SSSI	Brecknock	-	-	-	Caloplaca lucifuga (N)	-
Ramsey / Ynys Dewi SSSI	SSSI	Preseli & South Pembrokeshire	-	Maritime	-	Teloschistes flavicans (N)	Ramalina polymorpha (N)
Rhinog SSSI	SSSI	East Gwynedd	SOWI (N), URI (N), TNTN Non-montane Acid Rock	-	-	Cladonia macrophylla, Degelia atlantica, Fuscopannaria mediterranea, Fuscopannaria sampaiana, Leptogium burgessii, Lobaria pulmonaria, Lobaria scrobiculata, Lobaria virens, Megalospora tuberculosa, Menegazzia subsimilis, Parmelinopsis horrescens, Parmotrema robustum, Porina hibernica	-
River Usk (Upper Usk) / Afon Wysg (Wysg Uchaf) SSSI	SSSI	Brecknock/Gwent	Aquatic	-	-	Endocarpon adscendens (N) , Pertusaria chiodectonoides, Strigula phaea	-
River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI	SSSI	Brecknock/Ceredigion/Montgomeryshire/Radnorshire	Aquatic	-	NR/NS Assemblage (N)	Collema dichotomum (N) , Leptogium subtorulosum, Pterygiopsis lacustris (N)	Bacidia circumspecta, Porocyphus kenmorensis (N)
Roundton Hill SSSI	SSSI	Montgomeryshire	-	TNTN Mixed Rock (N)	-	-	-
Ruabon/Llantysilio Mountains and Minera SSSI	SSSI	Clwyd	Limestone, Metalliferous	-	-	Hymenelia heteromorpha	-
Six Pit, Swansea Vale and White Rock SSSI	SSSI	West Glamorgan & Llanelli	Metalliferous (N)	-	-	-	-
Skokholm SSSI	SSSI	Preseli & South Pembrokeshire	Maritime	-	NR/NS Assemblage (N)	Degelia atlantica, Porina curnowii, Teloschistes flavicans (N) , Xanthoparmelia tinctoria	-
Skomer Island and Middleholm SSSI	SSSI	Preseli & South Pembrokeshire	Maritime	-	NR/NS Assemblage (N)	Arthonia atlantica, Porina curnowii, Synchesia myrticola, Teloschistes flavicans (N)	-
St. David's Peninsula Coast SSSI	SSSI	Preseli & South Pembrokeshire	-	-	-	Heterodermia leucomelos, Teloschistes flavicans, Xanthoparmelia tinctoria	-
Stackpole SSSI	SSSI	Preseli & South Pembrokeshire	Limestone, SOWI, TNTN Lowland Calcareous Ground	Maritime	NR/NS Assemblage (N) , Heathland	Arthonia zwackhii, Atla wheldonii, Collema fragile, Collema nigrescens, Cryptolechia carneolutea, Heterodermia leucomelos, Fulgensia fulgens, Lecania chlorotiza, Lichenochora epifulgens, Lobaria pulmonaria, Lobaria scrobiculata, Ramonia chrysophaea, Schismatomma niveum, Teloschistes flavicans, Wadeana dendrographa	-
Stanner Rocks SSSI	SSSI	Radnor	-	TNTN Mixed Rock	-	Bacidia incompta, Placynthiella hyporhoda	-
Strumble head - Llechdafad Cliffs SSSI	SSSI	Preseli & South Pembrokeshire	-	Maritime	-	-	-
Talhenbont SSSI	SSSI	West Gwynedd	-	SOWI, URI	NR/NS Assemblage (N)	-	-
Twyni Chwitfordd, Morfa Landimor a Bae Brychdwn/Whiteford Burrows SSSI			-	-	-	Lempholemma botryosum	-
Y Bonc SSSI	SSSI	West Gwynedd	-	Limestone	-	-	-
Ynys Enlli SSSI	SSSI	West Gwynedd	Maritime	-	NR/NS Assemblage (N)	Heterodermia leucomelos (N) , Teloschistes flavicans (N)	-

The Southern Oceanic Woodland Index (SOWI) is the most frequently represented assemblage feature (Table 21), with qualifying assemblages in 33 current SSSI, whilst the Upland Rainforest Index (URI) has qualifying assemblages on 28 SSSI. Some of the other assemblages are reasonably well represented, especially the Metalliferous Habitats Index and Limestone Index, but most of the remainder are relatively poorly represented on Welsh SSSI, particularly the majority of TNTN assemblages. *Teloschistes flavicans* has been identified as qualifying on 12 SSSI and *Lobaria pulmonaria* on ten, and there is also good representation of species such as *Fuscopannaria mediterranea* and *Parmelinopsis horescens* that have a substantial proportion of GB sites in Wales. Many Red Listed lichens are restricted to a very small number of SSSI – with a substantial proportion currently known from just a single site, most notably in the case of Eryri SSSI – making recognition of them as qualifying features especially important.

Table 21: The number of lichen assemblage features qualifying on SSSI in Wales

Assemblage	Qualifying SSSI features
SOWI	33
URI	28
Metalliferous	14
Limestone	11
TNTN Non-montane Acid Rock	10
Aquatic	8
Pinhead Lichens	4
Maritime	3
TNTN Lowland Calcareous Ground	2
TNTN Acid Montane Rock/Soil	1
TNTN Mixed Rock	1
TNTN Montane Calcareous Rock/Soil	1
TNTN Rocky Lake Shore	1

6.2. Non-SSSI that qualify for selection

To ensure adequate protection of Red Listed lichen species and important lichen assemblages, some additional SSSI are needed, along with at least three extensions to existing SSSI (Table 22). The great majority of qualifying sites identified during the current study are metal mines in Ceredigion Area of Search, some of which score more highly than existing mine SSSI in that AoS. Carn Owen, which is also in Ceredigion AoS, does not quite reach the qualifying threshold for its metallophyte lichens but stands out as a very diverse site for TNTN Acid Rock lichens despite its relatively limited size compared with other sites assessed for the TNTN assemblages.

There are additional important Old Forest lichen sites in East Gwynedd AoS, whilst the diverse lichens in Dyfi Forest in Montgomeryshire AoS (but close to the border with East Gwynedd) are probably best protected through an extension of Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI. The Afon Ysgethin, which flows through Coed Cors-y-gedol SSSI in East Gwynedd, holds an important AQUI assemblage of riverine lichens and might be notified either in its own right – particularly if surveys extended upstream to Llyn Bodlyn – or as an extension of Coed Cors-y-gedol SSSI. Ceunant Mawr near Coedydd Nantgwynant SSSI is the only site in Wales for *Pseudocyphellaria norvegica* and should be notified either independently or as an extension of that site. Cwm Marlais and Allt Cynant stand out in Carmarthen & Dinefwr AoS, with the former supporting the most luxuriant SOWI assemblage in the county. Much of the limestone coast of the Gower Peninsula is already SSSI, but the non-designated Foxhole section is very important for its limestone lichens, whilst an area of woodland close to Stackpole SSSI should be notified as an extension of that site on account of its *Anaptychia ciliaris* and the presence of *Lobaria pulmonaria*.

Table 22: non-SSSI sites in Wales that qualify for at least one lichen assemblage or species feature

Site	Area of Search	Assemblage qualifying	Features	Species qualifying	Features
Afon Hepste	Brecknock	-		Verrucaria madida	
Afon Ysgethin (Coed Cors-y-Gedol SSSI extension)	East Gwynedd	AQUI		Nephroma tangeriense, Placynthium flabelliforme	
Allt Cynant	Carmarthen & Dinefwr	-		Bryoria bicolor	
Blaenceulan Mine	Ceredigion	Metalliferous		-	
Bodcoll Mine	Ceredigion	Metalliferous		Gyalidea fritzei	
Cardigan Old Bog Mine	Ceredigion	Metalliferous		-	
Carn Owen	Ceredigion	TNTN non-montane acid rock		Pertusaria melanochlora	
Castle Dock Wood	Preseli & South Pembrokeshire	-		Anaptychia ciliaris	
Ceunant Coch and Caerwych	East Gwynedd	SOWI		Pyrenula laevigata, Sticta canariensis (dufourii)	
Ceunant Mawr (Coedydd Nantgwynant SSSI extension)	West Gwynedd	-		Pseudocyphellaria norvegica	
Ceunant Mine	Ceredigion	Metalliferous		-	
Coedydd Bronaber	East Gwynedd	URI		-	
Cwm Marlais	Carmarthen & Dinefwr	SOWI		-	
Cwm Rheidol Mine	Ceredigion	Metalliferous		-	
Dyfi Forest including Foel Friog (Coed Maes-mawr, Coed Esgairneuriau a Cheunant Caecenau SSSI extension)	Montgomeryshire	SOWI, URI		Leptogium brebissonii, Lobaria virens	
Esgairlle & Esgairlle Old Mines	Ceredigion	Metalliferous		-	
Foxhole	West Glamorgan & Llanelli	Limestone		-	
Frongoch and Wemyss Mines	Ceredigion	Metalliferous		-	
Gelli Eirin Mine	Ceredigion	Metalliferous		-	
Glan Bran Deer Park	Carmarthen & Dinefwr	-		Buellia hyperbolica, Caloplaca herbicidella	
Glyn Lledr	East Gwynedd	-		Degelia plumbea, Lobaria pulmonaria, Lobaria virens	
Graig Goch Mine	Ceredigion	Metalliferous		-	
Henfwich Mine	Ceredigion	Metalliferous		-	
Llwyn Madoc (by Allt-y-gest SSSI)	Brecknock	SOWI, URI		Bacidia circumspecta, Collema fragrans, Opegrapha fumosa	
Mwyngloddfa Bwlch Glas	Ceredigion	Metalliferous		-	
Mwyngloddfa Esgair Mwyn	Ceredigion	Metalliferous		-	
Nannerth Fawr	Radnor	URI		-	
Nant y Ffactory	Ceredigion + Montgomeryshire	-		Lobaria pulmonaria, Lobaria scrobiculata	
Nant y Creiau Mine	Ceredigion	Metalliferous		-	
North Mawddach (including Coed Garth Gell & Coed Cwm-mynach)	East Gwynedd	URI		Sticta canariensis green algal morphotype	
Pen Glog-fawr and Pen Glog-fach Mines	Ceredigion	Metalliferous		-	
Pen-y-rhiw, Llysdinam	Brecknock	-		Bacidia incompta	
Pumlumon Mine	Ceredigion	Metalliferous		-	
Talsarnau	East Gwynedd	-		Porina effilata	
Trawscoed	East Gwynedd	-		Degelia plumbea, Lobaria amplissima, L. pulmonaria, L. scrobiculata, L. virens	

6.3. Notified lichen features that no longer qualify

Several SSSI features are listed in Table 20 as not qualifying under the revised criteria. In most cases, these are listed in the Features Database as qualifying under the previous *Guidelines*, but are not notified; however, some notified lichen features are no longer of sufficient interest to be features, or do not pass the revised thresholds. Examples include the aquatic lichen assemblage on Afon Irfon SSSI, and *Ramalina polymorpha* on Ramsey / Ynys Dewi SSSI. If any of these are renotified, references to these obsolete lichen features should be removed from the citation and SMS.

Fortunately, the majority of SSSI that have non-qualifying notified lichen features do still have at least one qualifying lichen species or assemblage. The only four SSSI that had a notified lichen feature and no longer qualify for any lichens are indicated in Table 23. Three of these four had the *Lecanoretum sordidae* notified (see 4.3.3).

Table 23: SSSI in Wales that are listed in the Features Database as having notified lichen features that no longer qualify. The symbol (N) indicates the notified features.

Site	Area of Search	Assemblage Features not qualifying	Species Features not qualifying
Afon Eden - Cors Goch Trawsfynydd SSSI	East Gwynedd	SOWI (N) , TNTN Non-montane Acid Rock	-
Afon Irfon SSSI	Brecknock	Aquatic (N)	-
Castlemartin Range SSSI	Preseli & South Pembrokeshire	Maritime	Leptogium diffractum (N)
Coed Aberedw SSSI	Radnor	SOWI, TNTN Mixed Rock (N)	Porina rosei
Coedydd Beddgelert a Cheunant Aberglaslyn SSSI	West Gwynedd	SOWI, URI (N)	-
Coedydd Dyffryn Wnion SSSI	East Gwynedd	SOWI (N)	-
Craig Fawr SSSI	Radnor	TNTN Mixed Rock (N)	-
Dale and South Marloes Coast SSSI	Preseli & South Pembrokeshire	Maritime (N)	-
Dyffryn Gwaun SSSI	Preseli & South Pembrokeshire	SOWI (N)	-
Gregynog SSSI	Montgomeryshire	URI	Lecanographa amylacea (N)
Gro Ystwyth SSSI	Ceredigion	Metalliferous (N)	-
Llanelwedd Rocks SSSI	Radnor	TNTN Mixed Rock (N)	-
Parc Nannau SSSI	East Gwynedd	Pinhead Lichens	Lecanographa amylacea (N)
Ramsey / Ynys Dewi SSSI	Preseli & South Pembrokeshire	Maritime	Ramalina polymorpha (N)
River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI	Brecknock/Ceredigion/Montgomeryshire/Radnorshire	-	Bacidia circumspecta, Porocyphus kenmorensis (N)
Roundton Hill SSSI	Montgomeryshire	TNTN Mixed Rock (N)	-

6.4. SSSI requiring additional survey

A significant proportion of lichen SSSI in Wales have been subject to baseline lichen surveys over the last 20 years, although relatively few have formal Common Standards Monitoring in place. The current review has identified some SSSI that have not been surveyed recently, however, where additional survey might reveal qualifying Assemblages or Red Listed species. If funding is available, the sites listed in Table 24 should be considered priorities for commissioned specialist survey.

Table 24: SSSI in Wales that require additional survey to confirm potential lichen interest.

Site	Area of Search	Potential Features	Assemblage	Potential Features	Species
Afon Eden - Cors Goch Trawsfynydd SSSI	East Gwynedd	TNTN Non-Montane Acid Rock		Bacidia absistens	
Afon Irfon SSSI	Radnor	Aquatic Watercourses		-	
Afon Teifi SSSI	Carmarthen & Dinefwr + Ceredigion	Aquatic Watercourses		-	
Black Mountains SSSI	Gwent/Brecknock	TNTN Acid Montane Rock, TNTN Non-Montane Acid Rock		-	
Brecon Beacons SSSI	Brecknock	TNTN Acid Montane Rock, TNTN Montane Basic Rock		Thelidium fontigenum	
Cadair Idris SSSI	East Gwynedd	Aquatic Watercourses, TNTN Montane Basic Rock		-	
Cerrig Gwalch SSSI	Radnor	-		Protoparmelia atriseda	
Chirk Castle & Parkland SSSI	Clwyd	-		Lecanora sublivescens	
Cnap Twt	Mid & South Glamorgan	-		Endocarpon pusillum	
Coed Aber Artro SSSI	East Gwynedd	SOWI		-	
Coed Aberedw SSSI	Radnor	TNTN Mixed Rock		-	
Coedydd a Cheunant Rheidol SSSI	Ceredigion	TNTN Non-Montane Acid Rock		-	
Coedydd Dyffryn Wnion SSSI	East Gwynedd	-		Degelia plumbea	
Craig Fawr SSSI	Radnor	TNTN Mixed Rock		-	
Cwm Doethie - Mynydd Mallaen SSSI	Carmarthen & Dinefwr	-		Lecidea erythrophaea	
Dale and South Marloes Coast SSSI	Preseli & South Pembrokeshire	Maritime Rock		-	
Dowrog Common	Preseli & South Pembrokeshire	-		Cladonia peziziformis	
Eryri SSSI	West Gwynedd	-		Belonia russula	
Glannau Rhoscolyn SSSI	West Gwynedd	Maritime Rock		-	
Glannau Ynys Gybi / Holy Island Coast SSSI	West Gwynedd	Maritime Rock		-	
Glynllifon SSSI	West Gwynedd	-		Caloplaca flavorubescens, Collema occultatum	
Gwynfynydd SSSI	East Gwynedd	-		Bacidia absistens	
Lake Wood, Llandrindod Wells SSSI	Radnor	-		Lecanora quercicola	
Llanelwedd Rocks SSSI	Radnor	TNTN Mixed Rock		-	
Llanymynech & Llynclys Hills SSSI	Montgomeryshire	Limestone		-	
Migneint - Arenig – Dduallt SSSI	East Gwynedd	SOWI		-	
Milford Haven Waterway SSSI	Preseli & South Pembrokeshire	-		Arthonia astroidestra, Melaspilea lentiginose,	

Site	Area of Search	Potential Features	Assemblage	Potential Features	Species
				Schismatomma niveum, Sporodophoron cretaceum	
Moel Hebog SSSI	West Gwynedd	TNTN Montane Basic Rock		Artoparmelia alpicola	
Mynydd Du (Black Mountain) SSSI	Brecs + Carmarthen & Dinefwr	TNTN Non-Montane Acid Rock, TNTN Montane Basic Rock		-	
Mynydd Llangattwg SSSI	Brecknock	-		Thelidium fontigenum	
Mynydd Penarfynydd SSSI	West Gwynedd	Maritime Rock		-	
Porth Ceiriog, Porth Neigwl ac Ynysoedd Sant Tudwal SSSI	West Gwynedd	Maritime Rock		-	
Ramsey/Ynys Dewi SSSI	Preseli & South Pembrokeshire	Maritime Rock		Pertusaria monogona	
Rhinog SSSI	East Gwynedd	-		Bryoria smithii	
Roundton Hill SSSI	Montgomeryshire	TNTN Mixed Rock		-	
Skokholm SSSI	Preseli & South Pembrokeshire	-		Degelia atlantica, Degelia plumbea, Heterodermia obscurata, Pertusaria monogona, Protoparmelia montagnei, Xanthoparmelia tinctina	
Skomer Island & Middleholm SSSI	Preseli & South Pembrokeshire	-		Heterodermia obscurata, Protoparmelia montagnei, Xanthoparmelia tinctina	
St David's Peninsula Coast SSSI	Preseli & South Pembrokeshire	Maritime Rock		-	
Stanner Rocks SSSI	Radnor	TNTN Mixed Rock		-	
Strumble head - Llechdafad Cliffs SSSI	Preseli & South Pembrokeshire	Maritime Rock		-	
Talhenbont SSSI	West Gwynedd	-		Arthonia astroidestra	
Treffgarne Gorge & Tors SSSI	Preseli & South Pembrokeshire	-		Degelia plumbea	
Ynys Enlli	West Gwynedd	-		Collema nigrescens	

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8. Appendix 1: full data tables for assemblages

9. Appendix 2: chapter cross-referencing

It has not been possible to make the large data tables comply with Accessibility legislation, so the Appendices have been removed from this PDF version. For a full version of the report please contact the Natural Resources Wales Library on library@cyfoethnaturiolcymru.gov.uk.