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Ganllwyd SSSI: site dossier of epiphytic lichen interest



Report No: 779

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1. Crynodeb Gweithredol

Cafodd Dave Lamacraft ei contractio gan Cyfoeth Naturiol Cymru i gynhyrchu ffeil safle o'r diddordeb o ran cennau yn SoDdGA Ganllwyd ger Dolgellau, Meirionnydd. Casglwyd data o gronfa ddata Cymdeithas Cennau Prydain ac o adroddiadau arolygon amrywiol, sef cyfanswm o 5,049 o gofnodion. Roedd hyn yn cynnwys 1,165 o gofnodion newydd a gafodd eu hychwanegu at y gronfa ddata o adroddiadau arolygon, a 329 o gofnodion newydd o arolygon o'r newydd fel rhan o'r prosiect hwn.

Ceir 71 o 'ddigwyddiadau cofnodi' gyda chronfa ddata BLS ac arolygon ychwanegol; mae'r rhain wedi'u crynhoi isod, gyda'r cofnodion cyntaf yn dyddio o 1920 a'r olaf yn 2024. Cafodd y prif arolygon yn y blynyddoedd diwethaf eu cynnal gan Sanderson yn 2012 a 2013 ac fel rhan o'r prosiect hwn. Cafodd nifer rhyfeddol o 398 tacson o gennau a ffyngau cysylltiedig eu cofnodi yn SoDdGA Ganllwyd ers y cofnodion cyntaf yn 1920. O'r rhain, mae 146 yn nodedig e.e. rhywogaethau casgliadau SoDdGA rhestr goch, sy'n brin yn genedlaethol. Daw naw o'r rhain o gynefinoedd creigiau yn unig, ac mae'r gweddill yn epiffytau.

Ystyrir bod rhai cofnodion yn wallus: *Bryobilimbia hypnorum*, *Parmotrema robustum*, *Phaeographis lyellii* a *Sticta canariensis*. Mae hepgor y cofnodion hyn yn lleihau'r rhestr tacsonau i gyfanswm o 394, ac mae 141 o'r rhain yn nodedig. Mae'r rhan fwyaf o'r rhain wedi'u cofnodi ers 2000 ond cofnodwyd 10 ohonynt cyn 2000 ond nid ers hynny: *Gyalecta derivata*, *Gyroglyphax saxigena*, *Lepra monogona*, *Pectenica atlantica*, *Peltigera collina*, *Sphinctrina turbinata*, *nanodes Stereocaulon*, *Stereocaulon pileatum* ac *Usnea ceratina*.

Y casgliadau SoDdGA perthnasol ar gyfer y diddordeb o ran cennau epiffytig yw Casgliad Coedwig Gefnforol Ddeheuol (SOWI) a Mynegai Coedwig Law Ucheldir (URI) (Sanderson et al 2018). Gan gymhwyso'r meini prawf ar gyfer y casgliadau hyn i SoDdGA Ganllwyd mae'r safleoedd yn sgorio:

- 63 ar SOWI, gan ddefnyddio cofnodion o bob blwyddyn;
- 60 ar SOWI, gan ddefnyddio'r torbwynt 25 mlynedd (Sanderson et al 2018) a chan ddefnyddio cofnodion o'r cyfnod ar ôl 2000 yn unig (*Pectenica atlantica*, *Peltigera collina* ac *Usnea ceratina* yw'r rhywogaethau sydd 'ar goll');
- 28 ar URI, gan ddefnyddio cofnodion o bob blwyddyn;
- 27 ar URI, defnyddio'r torbwynt 25 mlynedd (Sanderson et al 2018) a chan ddefnyddio cofnodion o'r cyfnod ar ôl 2000 yn unig (*Usnea dasopoga* yw'r rhywogaeth 'goll');

Mae'r rhain i gyd yn uwch na'r trothwyon ar gyfer dethol y safle fel SoDdGA, sef 30 a 15 yn eu trefn.

Byddai'r SoDdGA hefyd yn gymwys oherwydd ei boblogaethau o dan faen prawf 3.3 yn y canllawiau (Sanderson et al 2018) Cennau dan fygythiad ym Mhrydain: *Leptogium brebissonii*, *Nevesia sampaiana*, *Parmeliella testacea*.

Mae SoDdGA Ganllwyd yn safle hynod gyfoethog, amrywiol a phwysig o ran cennau. Mae hyn yn cynnwys diddordeb da o ran cennau creigdrig, ond mae'n fwyaf arwyddocaol oherwydd ei ddiddordeb o ran cennau epiffytig; mae'n un o'r safleoedd cyfoethocaf a phwysicaf, os nad y pwysicaf un ar gyfer cennau cefnforol sy'n gysylltiedig â choetiroedd

hen dyfiant drwy Gymru a Lloegr. Y prif gymunedau o gennau yw'r gymuned rhisgl llai asid neu 'base-rich' y *Lobarion*, neu Lysiau'r Ysgyfaint, y gymuned *Parmelion*, neu goedwig law ucheldirol o risgl asid trwytholch mewn ardaloedd o lawiad uchel, a chymuned *Graphidion* o risgl llyfn megis rhisgl coed cyll, criafol a chelyn a chymunedau pren noeth ar bren agored asidig a bonion coed. Rhai o rywogaethau mwyaf arwyddocaol y SoDdGA yw: *Lecanora strobilina*, *Varicellaria velata*, *Agonimia octospora*, *Leptogium brebissonii*, *Megalospora tuberculosa*, *Melaspilea amota*, *Mycoporum lacteum*, *Nevesia sampaiana*, *Parmeliella testacea* a *Porina hibernica*.

Mae meintiau poblogaethau o dacsonau nodedig, yn seiliedig ar y cysyniad o 'achos cyfwerth ag unigolyn' e.e. coeden a feddiennir (Bergamini 2019) wedi'u hamcangyfrif gan ddefnyddio rhai o'r prosiectau arolwg arwahanol mwy ac fe'u cyflwynir yn Atodiad 6. Mae'r SoDdGA gyfan bron yn cynnal diddordeb sylweddol o ran cennau, a'r unig rannau sydd heb fod yn gwneud hynny yw'r ardaloedd nad ydynt wedi cael eu gorchuddio gan goed am gyfnod hir e.e. y ffridd yn Ffridd Maes-mawr yn ne'r SoDdGA a'r ffridd agored sy'n ymestyn hyd at lethrau isaf y Rhinogydd yng ngorllewin y SoDdGA. I raddau helaeth bydd dosbarthiad y diddordeb yn adlewyrchu'r gwaith arolygu a chofnodi, gyda'r rhannau o'r SoDdGA yr ymwelir â hwy fwyaf o amgylch ystâd Dolmelynlllyn e.e. y parcdir, GNG Coed Ganllwyd, fferm Coed Berth-lwyd yn cynnal y diddordeb cyfoethocaf i bob golwg. Cafodd rhannau o'r SoDdGA eu harolygu yn ystod y blynyddoedd diwethaf yn unig e.e. Mwynglawdd Glasdir, a Hafod-y-fedw a arolygwyd yn 2024 fel rhan o'r prosiect hwn (ynghyd ag ail arolwg o Fwynglawdd Glasdir), neu beth amser yn ôl e.e. Coed Aber Eden.

Ymgwymerodd Plantlife â'r gwaith o fonitro coed oedd wedi'u cofnodi a'u monitro yn y gorffennol yn 2023 fel rhan o gontract i'r Ymddiriedolaeth Genedlaethol fel rhan o adolygiad cynllun rheoli (Plantlife 2023) a dod i'r casgliad yn fras:

- Ei bod yn ymddangos fod poblogaethau'n gwneud yn dda, er eu bod yn wynebu bygythiadau sy'n datblygu;
- Bod arwyddion clir o dwf a chytrefu ymhlith rhai rhywogaethau pwysig, fel bo poblogaethau ar y cyfan yn ymddangos yn iach ac yn hyfyw;
- Bod eithriadau yn bodoli, e.e. *Hypotrachyna endochlora* wedi'i golli yn Nhŷ Cerrig.

Fel rhan o'r prosiect hwn roedd y gwaith monitro yn canolbwyntio'n bennaf ar ardaloedd y parcdir deheuol a'r parcdir dwyreiniol fel sy'n cael ei nodi yn Atodiad 6. Y bwriad oedd cwmpasu ardaloedd nad oedd wedi cael sylw gan waith monitro Plantlife yn 2023 ac yn benodol canolbwyntio ar ardaloedd lle'r oedd Sanderson (2012) wedi cofnodi'r colledion mwyaf, e.e. y cae gogleddol ar y parcdir dwyreiniol. I grynhoi, mae hyn wedi dangos:

- Rhai colledion gan fod coed wedi disgyn;
- Ychydig iawn o golledion yn y pen deheuol pellaf gyda *Nevesia sampaiana* yn dal i fod yn bresennol a *Lobarina scrobiculata* ar gynnydd;
- Tuedd gyffredinol o ddirywiad a cholled parhaus yn y parc dwyreiniol, a hyn i'w weld yn enwedig agosaf at y fferm tua'r gogledd.

Ceir rhai eithriadau, e.e. coeden 038 lle gwelwyd cytrefu a thyfiant rhywogaethau *Lobarion* deiliog, e.e. *Nephroma parile*, a 026 lle mae'n ymddangos fod cynnydd wedi bod mewn

Ricasolia virens ar goeden 026 sydd wedi dod yn fwyfwy cysgodol. Mewn rhai achosion gellir priodoli colledion/dirywiad i gysgod cynyddol a/neu gynnydd mewn eiddew, a defaid yn rhwbio yn erbyn gwaelodion coed. Yn y rhan fwyaf o achosion eraill ychydig o achos ffisegol amlwg sydd, ond efallai bod iechyd gwael ymddangosiadol llawer o'r cennau *Lobarion* deiliog, a dirywiad cyffredinol y grŵp hwn, yn awgrymu problem o ran ansawdd yr aer.

Y prif fygythiadau a phroblemau yw:

- *Rhododendron ponticum*;
- Clefyd coed ynn;
- Nitrogen/amonia;
- Rheolaeth amaethyddol;
- Pori a rheoli pori;
- Ffensys parcdir yn atal pori;
- Diffyg cenedlaethau olynol o goed.

2. Executive summary

Dave Lamacraft was contracted by Natural Resources Wales to produce a site dossier of the lichen interest at Ganllwyd SSSI near Dolgellau, Meirionnydd. Data was collated from the British Lichen Society database and from various survey reports, amounting to 5,049 records. This included 1,165 new records entered to the database from survey reports, and 329 new records from *de novo* surveys as part of this project.

There are 71 'recording events' with the BLS database and additional surveys; these are summarised below, with the first records from 1920 and the last in 2024. The main surveys in recent years have been by Sanderson in 2012 and 2013 and as part of this project. A remarkable 398 taxa of lichens and associated fungi have been recorded at Ganllwyd SSSI since the first records in 1920. Of these, 146 are notable e.g. red-listed, nationally rare, SSSI assemblage species. Nine of these are from rock habitats only, the remainder are epiphytes.

Some records are considered erroneous: *Bryobilimbia hypnorum*, *Parmotrema robustum*, *Phaeographis lyellii* and *Sticta canariensis*. Omitting these records reduces the taxa list to 394 in total, 141 of which are notable. Most of these have been recorded since 2000 but 10 were recorded pre-2000 but not since: *Gyalecta derivata*, *Gyrographa saxigena*, *Lepra monogona*, *Pectenaria atlantica*, *Peltigera collina*, *Sphinctrina turbinata*, *Stereocaulon nanodes*, *Stereocaulon pileatum* and *Usnea ceratina*.

The relevant SSSI assemblages for the epiphytic lichen interest are the Southern Oceanic Woodland Assemblage (SOWI) and Upland Rainforest Index (URI) (Sanderson et al 2018). Applying the criteria for these assemblages to Ganllwyd SSSI the sites scores:

- 63 on the SOWI, using records from all years;
- 60 on the SOWI, applying the 25-year cut-off (Sanderson et al 2018) and using records from post-2000 only (*Pectenaria atlantica*, *Peltigera collina* and *Usnea ceratina* being the 'missing' species);
- 28 on the URI, using records from all years;
- 28 on the URI, applying the 25-year cut-off (Sanderson et al 2018) and using records from post-2000 only;

These all exceed the thresholds for SSSI consideration of 30 and 15 respectively.

The SSSI would also qualify for its populations under criterion 3.3 in the guidelines (Sanderson et al 2018) of Threatened lichens in Britain: *Leptogium brebissonii*, *Nevesia sampaiana*, *Parmeliella testacea*.

Ganllwyd SSSI is an incredibly rich, diverse and important site for lichens. This includes good saxicolous interest, but it is for the epiphytic interest that it is most significant; it is one of if not the richest and most important site for oceanic lichens associated with old-growth woodland in all of Wales and England. The main lichen communities are the *Lobarion*, or Lungwort, community of base-rich bark, the *Parmelion*, or upland rainforest, community of leached acid bark in high rainfall areas, and the *Graphidion* community of smooth bark of trees such as hazel, rowan and holly and bare wood communities on acidic exposed wood and stumps. Some of the most significant species in the SSSI are: *Lecanora strobilina*,

Varicellaria velata, *Agonimia octospora*, *Leptogium brebissonii*, *Megalospora tuberculosa*, *Melaspilea amota*, *Mycoporum lacteum*, *Nevesia sampaiana*, *Parmeliella testacea* and *Porina hibernica*.

Population sizes of notable taxa, based on the concept of 'individual equivalents' e.g. an occupied tree (Bergamini 2019) have been estimated using some of the larger discrete survey projects and are presented in Appendix 6. Almost the whole SSSI supports significant lichen interest, the only parts that do not are those areas that have not had long-standing tree cover e.g. the ffridd at Ffridd Maes-mawr in the south of the SSSI and the open ffridd that extends on to the lower slopes of the Rhinogydd in the west of the SSSI. To a fair extent the distribution of interest will reflect the survey and recording effort, with the most visited parts of the SSSI around the Dolmelynlyn estate e.g. the parkland, Coed Ganllwyd NNR, Coed Berth-lwyd farmstead seemingly supporting the richest interest. There are parts of the SSSI that only had some survey effort in recent years e.g. the Glasdir Stope, and Hafod-y-fedw which was surveyed in 2024 as part of this project (along with a second survey of the Glasdir Stope), or some time ago e.g. Coed Aber Eden.

Plantlife undertook monitoring of past-recorded and monitored trees in 2023 as part of a contract to the National Trust as part of a management plan review (Plantlife 2023) summarising that in general terms:

- Populations appear to be doing well, although do face developing threats;
- There are clear signs of growth and colonisation of some important species, such that populations on the whole appear healthy and viable;
- There are exceptions e.g. the loss of *Hypotrachyna endochlora* at Ty Cerrig.

Monitoring as part of this project focussed mainly on the parkland southern and eastern parkland areas and is detailed in Appendix 6. The intention was to cover areas not looked at by the Plantlife monitoring in 2023 and specifically to focus on areas where Sanderson (2012) had recorded the greatest losses e.g. the northern field on the eastern parkland. In summary this has shown:

- Some losses to fallen trees;
- Little loss in the far south with *Nevesia sampaiana* still present and *Lobarina scrobiculata* increasing;
- A general trend of continuing decline and loss in the eastern park, especially notable closest to the farm to the north.

There are some exceptions e.g. tree 038 which has seen both colonisation and growth of leafy *Lobarion* species e.g. *Nephroma parile*, and 026 which seems to have seen an increase in *Ricasolia virens* on tree 026 which has become increasingly shaded. In some cases losses/declines can be attributed to increasing shade and or ivy increase, and sheep rubbing against the bases of trees. In most other cases there is little obvious physical cause, but apparent poor health of a lot of the leafy *Lobarion* lichens, and general decline in this group, perhaps points towards an air quality issue.

The main threats and issues are:

- *Rhododendron ponticum*;
- Ash Dieback;
- Nitrogen/ammonia;
- Agricultural management;
- Grazing and browsing management;
- Parkland fencing preventing grazing;
- Lack of successive generations of trees.

3. Introduction

Dave Lamacraft was contracted by Natural Resources Wales (NRW) to produce a site dossier of the epiphytic lichen interest of Ganllwyd SSSI

3.1. Scope of the project

This project aimed to produce a site dossier of the epiphytic lichen interest for Ganllwyd SSSI, including *de novo* surveys of epiphytic lichens in parts of Ganllwyd SSSI that have had little or no formal survey – Hafod-y-fedw and the Glasdir mine stope – along with monitoring of some of the interest in the lower parkland areas of the SSSI. This report is the site dossier, separate reports have been produced for the other elements (Lamacraft 2024a, 2024b).

The location of Ganllwyd SSSI is shown in Figure 1 and the most relevant parts of the citation are below:

‘Ganllwyd SSSI is of special interest for its biological and geological features. These comprise, semi-natural broadleaved woodland, mosses, liverworts, lichens, slime moulds, lesser horseshoe bats, a rare hoverfly and two mine sites of mineralogical interest.

The site is located in the Mawddach Valley, just to the south of the village of Ganllwyd at an altitude of between 20 m and 450 m. It includes Coed Ganllwyd, parkland at Dolmelynlyn and a small area of woodland by the Afon Wen tributary at Glasdir, as well as the Cefn Coch and Glasdir mines. The Afon Gamlan, with its spectacular waterfall, Rhaedr Ddu, flows through the northern part of the site. The woodland at Ganllwyd is considered to be one of the best in Wales/UK/Europe for its mosses and liverworts. The lichen flora of the woodland and parkland trees is of exceptional importance.

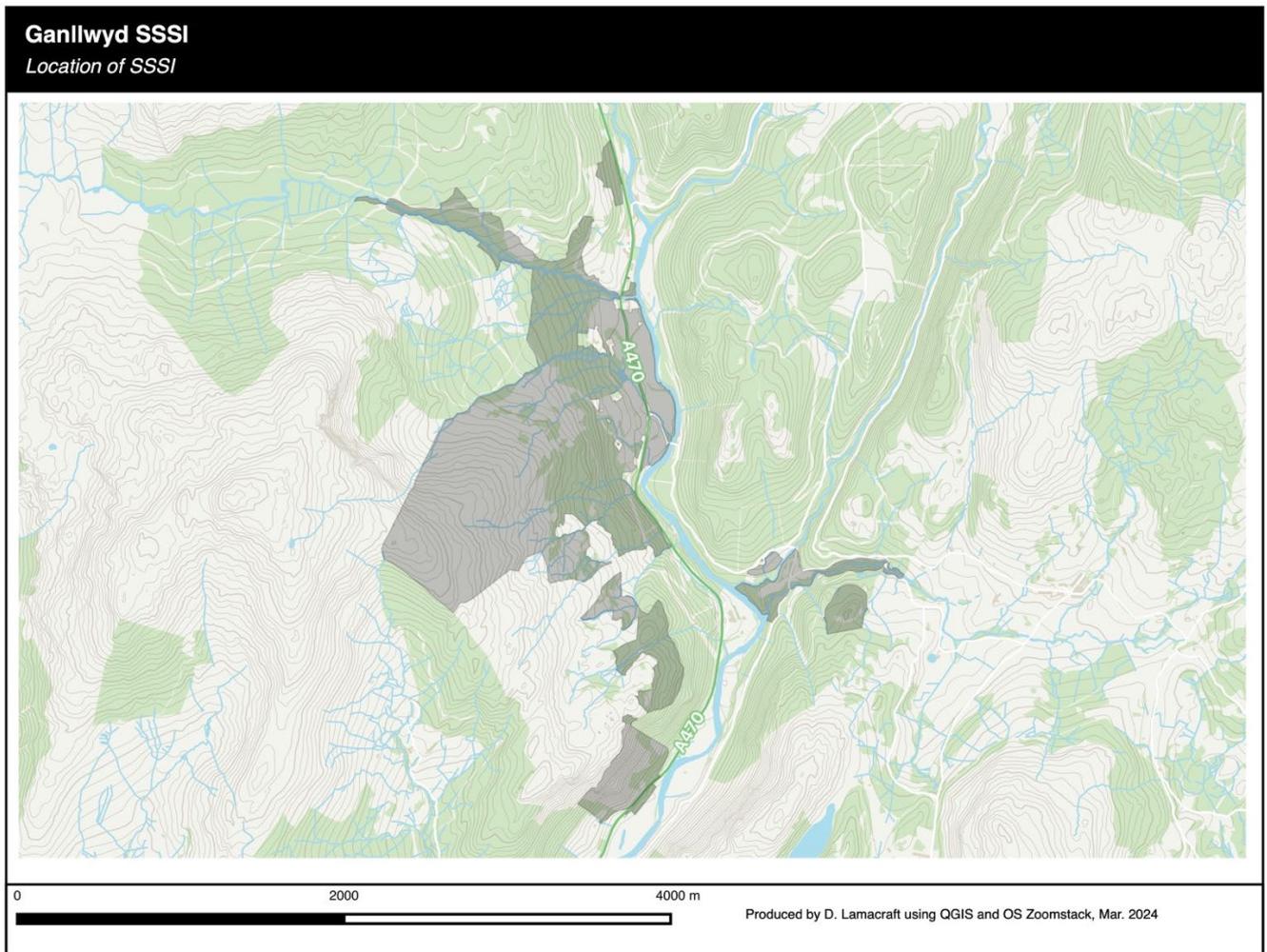
Biology:

The sessile oak woodlands of southern Snowdonia form one of the most important areas for woodland nature conservation in the Atlantic Region of Europe. The high rainfall and mild climate encourage the development of a luxuriant growth of ferns, lichens, mosses and liverworts, particularly beside rivers and within gorges where the high humidity is maintained. This type of humid Atlantic woodland is often described as “temperate rainforest”.

Mature oak, ash and sycamore provide the substrate for a very rich and diverse assemblage of lichens. Whilst the majority of rare and scarce lichens occur on trees, in well-lit situations amongst open areas of ‘parkland’ and / or at the woodland edges, some notable species occur on rocks and stone walls. All four British species of tree lungwort, *Lobaria pulmonaria*, *L. amplissima*, *L. scrobiculata* and *L. virens* occur here. These are large leafy or foliose species which, due to their sensitivity to air pollution, are in decline across Britain and are rare in Europe. Three nationally rare species are present *Milaspilea amota*, *Micarea xanthonica* and *Ramonia dictyospora*. Thirty-two nationally scarce species are present which have restricted ranges in the British Isles. These include *Hypotrachyna endochlora*, a leafy lichen growing on rocks and on

acidic bark; the globally scarce lichen *Parmelinopsis horrescens*, a pale coloured leafy lichen which grows on acidic bark of mature to ancient trees in sheltered situations; *Graphina ruiziana*, a crust forming species on acidic tree bark in sheltered humid locations; *Arthothelium ruanum*, a crust forming species restricted to smooth hazel bark; *Lecanactis dilleniana*, a crusty species of shady rocks and a very small lichen *Rinodina isidiodes* growing on bark. The quality of the lichen flora here generally indicates clean air and a long history of continuous woodland cover.'

Figure 1. Location of Ganllwyd SSSI



4. Method

Records for VC48 Meirionnydd were obtained from the British Lichen Society (BLS) and filtered for records pertaining to the SSSI. This was done both using GIS and by searching through the database for records where a grid reference placed a record outside the SSSI but the text placed it within e.g. where noted as being 'Ganllwyd NNR' or 'Rhaeadr ddu'. This amounted to 3,406 records.

Additional records from the *de novo* surveys of Hafod-y-fedw and Glasdir Stope, and monitoring at Dolmelynlyn completed as part of this project, were added to the BLS dataset. These amounted to a further 476 records.

Available survey reports were also checked against records in the BLS database. Where records were either not included at all, or where records were in reports at higher resolution grid references than in the BLS database, these were added to the dataset. These amounted to an additional 1,165 records.

The total number of records in the dataset for the SSSI is 5,049.

The records were then filtered for notable species using Appendix 2 of the SSSI guidelines for lichens (Sanderson et al 2018) and with reference to the Wales Lichen Red List (Woods 2010). This dataset was then 'cleaned' to remove any obvious duplication and this has been used as the basis for this report.

The monitoring was based on the 2012 Sanderson work, which was itself based on the 1990s recording. The areas targeted were the eastern parkland, as that was area where declines had been recorded by Sanderson in 2012, some of the southern parkland/pasture areas west of the A470 near Ty'n y groes and some of the locations for rarer species in the Coed Berth-lwyd.

The concept of individual equivalents (Bergamini et al 2019) is applied here as a means to assess population size. This has only been possible using some limited individual surveys, typically the bigger ones where recording effort has been more comprehensive and consistent e.g. Sanderson 2012 and the *de novo* surveys undertaken as part of this work.

Mapping has been done using Quantum GIS using the TomBio plugin, and data input and manipulated in MS Excel.

Any new records have been input into the standard British Lichen Society recording spreadsheet and sent to BLS.

4.1. Synonyms

Recent name changes for species recorded are listed below. The current names – per British Lichen Society Taxon Dictionary – are used in the report. With the recent realisation that *Mycoblastus sanguinarioides* is present in Britain, old records of *M. sanguinarius f. sanguinarius* have been assigned to *M. sanguinarius f. sanguinarius s. lat.*

Current name

Alyxoria culmigena
Alyxoria ochrocheila
Alyxoria varia
Arthonia atra
Bacidina phacodes
Blastenia crenularia
Brianaria bauschiana
Brianaria lutulata
Brianaria sylvicola
Bryobilimbia hypnorum
Coniocarpon cinnabarinum
Circinaria caesiocinerea
Coenogonium luteum
Coenogonium diluta
Coniocarpon fallax
Dendrographa decolorans
Graphis inustuloides
Graphis ruiziana
Gyrographa gyrocarpa
Gyrographa saxigena
Hypotrachyna horrescens
Inoderma subabietinum
Lepra albescens
Lepra amara
Lepra aspergilla
Lepra corallina
Lepra monogona
Lepra multipuncta
Lepra ophthalmiza
Leproplaca chrysodeta
Lobarina scrobiculata
Mycobilimbia epixanthoides
Mycobilimbia sphaeroides
Myriolecis antiqua
Myxobilimbia sabuletorum
Naetrocymbe punctiformis
Nevesia sampaiana
Pachnolepia pruinata
Parmeliella triptophylla
Pectenien atlantica
Pectenien plumbea s. lat.
Pectenien plumbea s. str.

Recent synonym

Opegrapha herbarum
Opegrapha ochrocheila
Opegrapha varia
Opegrapha atra
Bacidia phacodes
Caloplaca crenularia
Micarea bauschiana
Micarea lutulata
Micarea sylvicola
Lecidea hypnorum
Arthonia cinnabarina
Aspicilia caesiocinerea
Dimerella lutea
Dimerella pineti
Arthonia elegans
Schismatomma decolorans
Graphina anguina, Graphis britannica
Graphina ruiziana
Opegrapha gyrocarpa
Opegrapha saxigena
Parmelinopsis horrescens
Lecanactis subabietina
Pertusaria albescens var. albescens
Pertusaria amara
Pertusaria aspergilla
Pertusaria corallina
Pertusaria monogona
Pertusaria multipuncta
Pertusaria ophthalmiza
Caloplaca chrysodeta
Lobaria scrobiculata
Biatora epixanthoides
Biatora sphaeroides
Lecanora antiqua
Bilimbia sabuletorum
Arthopyrenia punctiformis
Fuscopannaria sampaiana
Arthonia pruinata
Parmeliella triptophylla
Degelia atlantica
Degelia plumbea s. lat.
Degelia plumbea s. str.

Pseudoschismatomma rufescens

Psoronactis dilleniana

Ricasolia amplissima

Ricasolia virens

Scytinium gelatinosum

Scytinium lichenoides

Scytinium teretiusculum

Stenocybe nitida

Sticta dufourii

Sticta ciliata

Sticta fuliginoides

Varicellaria hemisphaerica

Varicellaria lactea

Varicellaria velata

Zwackhia sorediifera

Opegrapha rufescens

Lecanactis dilleniana

Lobaria amplissima

Lobaria virens

Leptogium gelatinosum

Leptogium lichenoides

Leptogium teretiusculum

Stenocybe bryophila

Sticta canariensis (dufourii)

Sticta fuliginosa auct. p.p.

Sticta fuliginosa auct. p.p.

Pertusaria hemisphaerica

Pertusaria lactea

Pertusaria velata

Opegrapha sorediifera

5. History of lichen recording at Ganllwyd SSSI

There are 71 'recording events' with the BLS database and additional surveys, these are summarised below in Table 1.

The first records date from 1920, made by William Travis on what seems to have been a visit to Rhaeadr-ddu, with determinations made later by B J Coppins. Records are then very scarce until the late 1960s with just one record made by Frederick Robert Irvine in 1942. A visit by B.E. Pilcher Blanchard in 1967 seems to have been the first more comprehensive recording visit by a lichenologist. There then followed regular intensive recording visits by Francis Rose until the late 1990's with visits by others including Peter James, Allan Pentecost, Alan Fryday and local naturalists A N and J E Graham. The first formal surveys of the site took place in the mid 1990s as part of a survey of Welsh parklands (Orange 1995) and for a proposed hydro-electric power development on the Afon Gamlan (Orange 1996).

The next century's recording started with a BLS excursion in 2000 and a formal survey of Coed Aber Eden by Steve Chambers. Surveys, including the establishment of quadrat-based monitoring, by Simon Davey and Steve Chambers took place in the early 2000s (Davey 2002). Extensive survey took place throughout Meirionnydd in the early 2000s by the Countryside Council for Wales (CCW) resulting in new areas of interest being found in the SSSI (Edwards 2002). Davey's monitoring was repeated by Neil Sanderson in 2005 (Sanderson 2005).

The next decade saw some significant surveys and wider recording of the SSSI. Neil Sanderson surveyed the Park and the Berth-lwyd woods and ffridd for CCW in 2012, supplementing this for Plantlife in 2013. This work is still the most comprehensive survey for these areas. Wider surveys and recording visits of the SSSI haven taken place since 2020 e.g. of the Glasdir area by the author (Lamacraft 2020) and Sam Bosanquet (Bosanquet 2020), Nerys Jones and Pete Martin and of the southern woods of Hafod-y-fedw as part of this project. In 2023 Plantlife undertook some monitoring of the Davey trees and those recorded in detail by Sanderson in 2012 and 2013 (Plantlife 2023): the first monitoring work to have taken place since 2012.

The available survey reports are listed in Appendix 1, including those listed in Sanderson 2012.

Table 1. Lichen 'recording events' at Ganllwyd SSSI

Year	Recorders	Source	Areas covered
1920	William Travis	BJ Coppins Det Book 1	Coed Ganllwyd - Rhaeadr-du SH7224
1942	Frederick Robert Irvine	Notes in BJ Coppins's Atlas files	Coed Ganllwyd - Rhaeadr-du SH7224
1967	Blanchard;B.E. Pilcher	BLS records	Coed y Ganllwyd SH7224
1967	David Hill	BLS records	Coed y Ganllwyd NNR SH7224
1968	Patrick (Paddy) Coker	BJ Coppins Det Book 1a	Coed Ganllwyd - Rhaeadr-du SH7224
1968	Francis Rose	From FR diaries	Ganllwyd SH7224
1975	Francis Rose	BLS records	Coed Ganllwyd SH7224
1975	Francis Rose	BLS records	Coed Ganllwyd - below Rhaeadr-ddu SH7224
1975	Peter James	BLS records	Ganllwyd SH7224
1976	Allan Pentecost	BJ Coppins Det Book 2	Dolmelynllyn Hotel SH7223
1976	Allan Pentecost	BJ Coppins Det Book 2	Ganllwyd - by Rhaeadr-du SH7224
1976	Peter James	BLS records	Ganllwyd - S side of Afon Gamlan SH7224
1980	Unknown	BLS records	Domelynllyn Estate SH7223
1984	Humphrey Bowen	BJ Coppins Det Book 4	Coed-y-Brenin Forest - Tyn-y-Groes SH7223
1986	Francis Rose	Rose 1986	Coed Tyddyn-bach SH7222, Ty'n-y-groes Bach SH7223, Dolmelynllyn Park SH7224, west of Berth Lwyd SH7123, Berth Lwyd SH7223, Coed Berth-lwyd SH7223, Coed Gelli-Gemlyn SH7222
1986	Francis Rose	Rose 1986	Ty'n-y-groes SH7222, Berth Lwyd SH7123
1986	Francis Rose	Rose 1986	Ganllwyd - valley below, down to river SH7224, Tyn-y-groes Bach SH7223
1987	Francis Rose	Rose 1987	Dolmelynllyn Park SH7223, Coed Berth-lwyd SH7223
1991	Alan Fryday	BLS records	Coed Berth-lwyd SH7224

1992	Alan Fryday	Fryday 1992	Dolmelynlyn Park SH7223
1993	Anon @ National Trust	LRC Record	Ganllwyd - Dolmelynlyn SH7223
1993	A.N. Graham;J.E. Graham	BLS records	Coed Ganllwyd SH7224
1993	A.N. Graham;J.E. Graham	BLS records	Gamlan valley SH7224
1995	Alan Orange	Welsh Parkland Survey	Dolmelynlyn Park SH7223
1996	Alan Orange	HEP survey	Afon Gamlan
1997	A.N. Graham;J.E. Graham	BLS records	Dolmelynlyn SH7223
1997	Francis Rose	From FR diaries	Dolmelynlyn SH7223
1998	A.N. Graham;J.E. Graham	BLS records	Dolmelynlyn - Berth-Lwyd SH7223
1999	Francis Rose	Rose 1999	Dolmelynlyn SH7223, SH7224, Ty'n y groes SH7223, Glas-dir SH7322, Berth-lwyd SH7223
1999	Francis Rose	Rose 1999	Dolmelynlyn Park - south of cottages, west of road SH7224
2000	Steve Chambers	Survey for Woodland Trust?	Coed Aber Eden (Woodland Trust)
2000	Anon @ BLS (excursion);Francis Rose;Frank Dobson;Ivan Pedley;Steve Chambers	BLS visit	Dolmelynlyn Park SH7223, Berth-lwyd area SH7223
2000	Neil Sanderson	BLS records	Coed Ganllwyd SH7224
2001	Simon Davey	BLS records	Dolmelynlyn SH7223
2001	Steve Chambers	BLS records	Dolmelynlyn Park SH7223
2001	Simon Davey	Survey for Countryside Council for Wales?	Ganllwyd NNR SH7224, Dolmelynlyn Park SH7223, Berth Lwyd SH7223, woodland below Berth Lwyd SH7223
2002	Bryan Edwards	CCW SAC extension survey	Coed Hafod-las SH7124
2002	Steve Chambers;Simon Davey	Monitoring survey for Countryside Council for Wales	Coed Ganllwyd SH7224

2002	Simon Davey	Monitoring survey for Countryside Council for Wales	Ganllwyd - trees on road to reserve SH7224
2004	Steve Chambers	BLS records	Dolmelynlyn Park SH7223
2005	Neil Sanderson	Sanderson 2005	Coed Ganllwyd SH7224
2006	Tracey Lovering	MSc study	Coed Ganllwyd, Ganllwyd SH7224
2010	Dave Lamacraft	BLS records	Coed Ganllwyd NNR SH7224, Berth-lwyd ash plantation SH7223
2011	Alan Orange	Orange 2011	
2012	Neil Sanderson	Sanderson 2012	Dolmelynlyn Park SH7223, Berth-lwyd woods and ffridd SH7223
2013	Tracey Lovering	Lichen Apprentice Scheme Wales visit	Coed Ganllwyd, Ganllwyd SH7224
2013	Dave Lamacraft	Plantlife monitoring	Dolmelynlyn - Berth-lwyd ash plantation SH7223
2013	Neil Sanderson	Sanderson 2013	Coed Berth-lwyd SH7223
2014	Tracey Lovering	BLS records	Coed Ganllwyd, Ganllwyd SH7224
2017	Dave Lamacraft	BLS records	Coed Ganllwyd SH7224
2017	Dave Lamacraft (Plantlife)	Coed y Gamlan glade creation survey	Coed Ganllwyd NNR SH7223
2019	Eric Steer;Mary Steer	BLS records	Coed Ganllwyd NNR, Dolymelynlyn SH7224
2019	Sam Bosanquet	Survey for Natural Resources Wales	Glasdir - car park SH7322
2019	Eric Steer;Mary Steer	BLS records	Coed Ganllwyd NNR, Dolymelynlyn SH7224
2019	Dave Lamacraft	Plantlife site visit	Ganllwyd - Ty Cerrig SH7224
2020	Eric Steer;Mary Steer	BLS records	Coed Ganllwyd NNR SH7224
2020	Sam Bosanquet	Bosanquet 2020	Glasdir Stope SH7422
2020	Dave Lamacraft;Nerys Jones	BLS records	Lanfachreth - Glasdir SH7322
2020	Dave Lamacraft;Nerys Jones	BLS records	Glasdir - Ty'n y buarth - mature oaks by river SH7322

2020	Sam Bosanquet	Survey for Natural Resources Wales	Afon Wen - west of Ty'n-y-buarth SH7322
2020	Dave Lamacraft	Lamacraft 2020	Glasdir car park SH7322
2020	Margaret Crittenden; Peter Crittenden	BLS records	Coed Ganllwyd NNR SH7224
2021	Dave Lamacraft	Plantlife site visit	Coed Ganllwyd SH7224
2021	Nerys Jones	BLS records	Ganllwyd - Dolmelynlyn - Berthlwyd ruins SH7223
2022	Peter Martin	BLS records	Lanfachreth - Glasdir Copperworks Trail SH7322
2023	Dave Lamacraft (Plantlife)	Plantlife 2023	Coed Ganllwyd NNR SH7223
2024	Dave Lamacraft, Peter Jackson	Survey for Natural Resources Wales	Hafod-y-fedw SH7222
2024	Dave Lamacraft	Lamacraft 2024a	Hafod-y-fedw SH7221
2024	Dave Lamacraft	Lamacraft 2024b	Glasdir Stope SH7422
2024	Dave Lamacraft	This report	Dolmelynlyn Park SH7422

6. The lichen interest of Ganllwyd SSSI

A remarkable 400 taxa of lichens and associated fungi are recorded for Ganllwyd SSSI in the British Lichen Society database and as part of this work since the first records in 1920. The taxa list is presented in Appendix 2.

Of these, 146 are notable e.g. red-listed, Nationally Rare or SSSI assemblage species. These are listed in Appendix 3. Nine of these are from rock habitats only, the remainder are epiphytes, although a good number of these are also found on rock here which is not uncommon in rich sites.

Some records are considered erroneous:

- *Bryobilimbia hypnorum*; a species of that grows over bryophytes and plant debris over limestones and calcareous schists, acid debris on the Cairngorm plateau and very rarely on old tree trunks (Smith et al 2009). Old records of this species, as *Lecidia hypnorum*, are now considered mostly to be the similar *Bryobilimbia sanguineoatra*. Recorded several times in the SSSI, those from 1967 and 1986 have a note in the BLS database from Steve Chambers that they are probably errors for *B. sanguineoatra* which seems likely especially for the latter given it was on an oak, and one record from 2013 which has no substrate noted in the BLS database but again seems an unlikely record.
- *Parmotrema robustum*; a record made by Francis Rose in October 1999 in the grove of trees near Ty'n-y-groes Bach is considered likely to be erroneous (<https://wales-lichens.org.uk/species-account/parmotrema-robustum>). Given this area has had good survey coverage since e.g. Sanderson 2012 and this species has not been recorded again, this seems likely.
- *Phaeographis lyellii*; easily confused with *P. inusta*, and the record from a rowan by Simon Davey and Steve Chambers in Coed Ganllwyd NNR in 2002 was probably *P. inusta* (S P Chambers, pers comm 2024). This record was also considered incorrect by Sanderson (2012).
- *Sticta canariensis*; a record from 2019 is considered to have been the cyanobacterial *dufourii* morph after consultation with the recorder.

Omitting these records reduces the taxa list to 396 in total, and 142 notable taxa.

Most of these have been recorded since 2000, perhaps unsurprising given most recording has taken place this century; 131 notable taxa have been recorded since 2000, with 84 recorded before. Of these, 9 were recorded in pre-2000 years but not since:

- *Gyalecta derivata*; recorded by Humphrey Bowen on ash near the Ty'n-y-groes bridge/ car park in 1984, determined by B J Coppins.
- *Gyroglypha saxigena*, recorded in 1980, but with no further details available. Typically a species of shaded siliceous rock, but also known rarely from smooth bark e.g. of *Ilex*.

- *Lepra monogona*; one record in 1980, but with no further details available e.g. recorder or substrate. This taxon is considered possibly the fertile form of *Lepra excludens* and is rare in GB with a mostly coastal distribution.
- *Pectenien atlantica*; recorded in 1967 by B.E. Pilcher Blanchard at SH723243 (just east of the bridge over the Afon Gamlan, south of the river but this is likely a centralised grid reference), in 1968 by Francis Rose and in 1984 by Humphrey Bowen from SH7224 but no other details are available.
- *Peltigera collina*; recorded three times, in 1967 by B.E. Pilcher Blanchard at SH723243 (just east of the bridge over the Afon Gamlan, south of the river but this is likely a centralised grid reference), in 1968 by Francis Rose from 'oaks below the road' in SH7224, and in 1997 by A N Graham and J E Graham from sycamore and oak near the old Berth-lwyd farmhouse.
- *Sphinctrina turbinata*, just the one record made by William Travis in 1920, determined by B J Coppins.
- *Stereocaulon nanodes*; one record in 1980, but with no further details available e.g. recorder or substrate.
- *Stereocaulon pileatum*; one record in 1980, but with no further details available e.g. recorder or substrate.
- *Usnea ceratina*; just the one record, by Francis Rose in 1999 from beside the river below the Glasdir car park.

Of these it seems likely that some persist but have been overlooked e.g. *Gyalecta derivata*, whereas others e.g. *Stereocaulon* are rock species, presumably recorded from a survey of walls by Ivan Pedley referenced in Sanderson 2012 and unlikely to have been surveyed since efforts tend to focus on the epiphytes. The lack of post 2000 records of *Pectenien atlantica* and *Peltigera collina* is interesting given they were recorded over a span almost 20 and 30 years respectively prior to 2000. Whilst they may well have been lost, they could easily still survive and may just await refinding.

6.1. Assessment against SSSI criteria

The relevant SSSI assemblages for the epiphytic lichen interest are the Southern Oceanic Woodland Assemblage (SOWI) and Upland Rainforest Index (URI) (Sanderson et al 2018). Applying the criteria for these assemblages to Ganllwyd SSSI the sites scores:

- 63 on the SOWI, using records from all years;
- 60 on the SOWI, applying the 25-year cut-off (Sanderson et al 2018) and using records from post-2000 only (*Pectenien atlantica*, *Peltigera collina* and *Usnea ceratina* being the 'missing' species);
- 28 on the URI, using records from all years;
- 28 on the URI, applying the 25-year cut-off (Sanderson et al 2018) and using records from post-2000 only.

These all exceed the thresholds for SSSI consideration – 30 and 15 respectively – by some margin. The taxa lists and scores are in Appendix 4. With reference to Bosanquet (2022) these scores place the SSSI equal top in a ranking of Welsh SSSIs for the SOWI assemblages and top on the URI.

The SSSI would also qualify for its populations under criterion 3.3 in the guidelines (Sanderson et al 2018) of Threatened lichens in Britain:

- *Leptogium brebissonii*, Vulnerable (Wales red list), Near Threatened (GB red list) and an International Responsibility species which has its largest known population in Wales and in the Area of the Search here at Ganllwyd SSSI.
- *Nevesia sampaiana* Endangered (Wales red list), Near Threatened (GB red list) and an International Responsibility species which has its largest known population in Wales and in the Area of the Search here. Ganllwyd SSSI.
- *Parmeliella testacea* Critically Endangered (Wales red list), Near Threatened (GB red list) and an International Responsibility species which has its largest known population in Wales and in the Area of the Search here at Ganllwyd SSSI.

6.2. Summary of interest

Ganllwyd SSSI is an incredibly rich, diverse and important site for lichens. This includes good saxicolous interest but it is for the epiphytic interest that it is most significant; it is one of the richest and most important sites for oceanic lichens associated with old-growth woodland in Wales and England.

This richness is represented by the scores on the SSSI assemblages which place the SSSI equal top of Welsh SSSIs with scores of 60 and 28 on the SOWI and URI respectively using data from the last 25 years exclusively.

The main lichen communities are:

- The *Lobarion*, or Lungwort, community of base-rich bark; here this includes species typical of lowland rainforest e.g. *Leptogium brebissonii* and *Parmeliella testacea* that are incredibly rare outside of the Scottish Highlands, and southern oceanic species that are rare in northern Britain but commoner in the slightly drier and sunnier oceanic areas of southern Britain e.g. *Agonimia octospora*, *Porina hibernica* and *Varicellaria velata*. This community is typified by the leafy *Lobaria* species such as *L. pulmonaria* which is frequent in the SSSI, and the abundance of this and associated large leafy *Lobarion* species is unrivalled in Britain outside of the Scottish Highlands. Ganllwyd SSSI is one of the most important sites in Wales and England for this community, as indicated by its SOWI score of 60 (or 63 with all data) placing it 3rd (or top) site in Wales for this assemblage. Interestingly it would also qualify under the Lowland Rainforest Index, which is used in NW Scotland, if that were applicable in Wales.
- The *Parmelion*, or upland rainforest, community of leached acid bark in high rainfall areas. Ganllwyd SSSI is one of the most important sites in Wales for this community which here includes species that are rare outside of Scotland e.g. *Lepra ophthalmiza*. It's richness for this community is reflected in the score of 28 on the URI, the richest

site in Wales, surpassing the score of 27 for Coed y Rhygen and Dyffryn Maentwrog (scores for the latter sites in Bosanquet 2022).

- The *Graphidion* community of smooth bark of trees such as hazel, rowan and holly. Although most examples of this community in the SSSI are of the commoner species, there are some notable exceptions e.g. *Mycoporum lacteum* (one of only two Welsh sites), *Pyrenula acutispora* and *P. laevigata*.
- Bare wood communities on acidic exposed wood and stumps; limited but significant communities on dry or damp exposed wood with species such as the rare *Xerotrema quercicola*, endemic to Britain and Ireland, and *Cladonia incrassata* amongst others.

Some of the most significant species in the SSSI are:

- *Lecanora strobilina* VU (GB) VU (Wales) NR; found new to the SSSI in 2024 on a flake of bark on a Scots Pine adjacent to the Glasdir Stope.
- *Varicellaria velata* VU (GB) NR IR SOWI, just one known location, on Sycamore near Berth-lwyd, first recorded in 2012 by Sanderson (2012) and recorded in subsequent years by the author but not in recent years (including as part of this project) and it seems like it has been lost from this location, probably due to flaking of the bark.
- *Agonimia octospora* NT (GB) VU (Wales) NS IR SOWI; a southern-oceanic species, mostly recorded from the parkland areas, and mostly by Sanderson in his 2012 survey.
- *Leptogium brebissonii* NT (GB) VU (Wales) NS IR; a lowland rainforest species, here at one of its few British sites south of the Scottish Highlands. Found in and around the old Berth-lwyd farmstead, near the hotel and at Hafod-y-fedw. Also in the old walled garden beside Dolmelynlyn Hotel which is not included in the SSSI. Ganllwyd SSSI is the main site for this species in Wales.
- *Megalospora tuberculosa* NT (GB) VU (Wales) NS IR SOWI; recorded in several locations since 1986, but only from one tree in recent years, on the edge of the parkland near the hotel.
- *Heterodermia obscurata* NT (GB) VU (Wales) NS SOWI; recorded new to the SSSI in March 2024 on three young ash trees in the parkland east of the A470.
- *Melaspilea amota* NT (GB) NR; a rarely recorded oceanic bark fungus that has only ever been recorded by Neil Sanderson at Ganllwyd SSSI, in 2005 and 2012 from the Parkland and from Coed Ganllwyd NNR.
- *Mycoporum lacteum* NT (GB) NS; recorded once, in 2012 by Neil Sanderson, above the NT workshop at Ty'n y groes.
- *Nevesia sampaiana* NT (GB) EN (Wales) NS IR; another lowland rainforest species, as with *L. brebissonii* it is at one of its few British sites south of the Scottish Highlands here. Found near the old Berth-lwyd farmstead, and in the parkland. Ganllwyd SSSI is the main site for this species in Wales.

- *Parmeliella testacea* NT (GB) CR (Wales) NS IR SOWI; another lowland rainforest species, as with *L. brebissonii* and *N. sampaiana* it is at one of its few British sites south of the Scottish Highlands here. Found on three trees at Coed Ty-cerrig near the village hall. Ganllwyd SSSI is the main site for this species in Wales, with the majority of the Welsh population on one ash tree.
- *Porina hibernica* NT (GB) CR (Wales) NS IR SOWI; a southern oceanic species of base rich bark, with its British headquarters in the New Forest and rare beyond. Known from one tree, an ash near the village hall, which has had its crown reduced due to ash dieback.
- *Lobarina scrobiculata* CR (Wales) IR SOWI; a 'lungwort' lichen that seems to be becoming increasingly rare in Wales, probably highly sensitive to air pollution including ammonia. Although it has declined and seems in poor condition in some locations in the SSSI it is still known from about 13 trees, increasing on some.
- *Pannaria rubiginosa* CR (Wales) IR SOWI; a small squamulose species which is intriguingly rare in Wales given it is common and a rapid coloniser in western Ireland and Scotland. A record from an Ash here from 2012 was the first Welsh record for some decades, and it has since been found in small quantity in other sites but not within the SSSI.

Species distribution maps for the SSSI assemblages and all notable species are presented in Appendix 7.

6.3. Population size of notable species

Bergamini (2019) presents a method of measuring population size based on the concept of 'individual equivalents' e.g. an occupied tree. This can be applied here to get an idea of population size, although it is difficult to ascertain using the complete dataset and only really works with discrete surveys e.g. Sanderson 2012. Population sizes of notable taxa have been estimated using some of the larger discrete surveys and are presented in Appendix 6. Population sizes of the commonest are presented in Table 2 and the rarest in Table 3.

Table 2. Population sizes (individual equivalents) of the commonest notable species. Different areas were surveyed in different years, so the total reflects full coverage of the site over six surveys.

Taxon name	Sanderson 2005	Sanderson 2012	Sanderson 2013	Lamacraft 2024a	Lamacraft 2024b	Other surveys	Total
<i>Sticta sylvatica</i>	3	81	27	1	0	0	112
<i>Lobaria pulmonaria</i>	1	77	4	0	0	0	82
<i>Parmeliella triptophylla</i>	5	55	14	1	0	0	75
<i>Hypotrachyna taylorensis</i>	5	6	0	47	1	0	59
<i>Sticta limbata</i>	2	43	6	4	0	0	55
<i>Parmelinopsis horrescens</i>	7	8	5	13	3	0	36
<i>Pannaria conoplea</i>	4	23	3	3	0	0	33
<i>Ricasolia amplissima</i>	0	33	0	0	0	0	33
<i>Mycobilimbia epixanthoides</i>	2	10	16	1	0	1	30
<i>Thelotrema lepadinum</i>	0	0	12	8	8	0	28
<i>Hypotrachyna laevigata</i>	7	0	2	11	5	0	25
<i>Megalaria pulverea</i>	0	0	3	14	5	0	22
<i>Collema subflaccidum</i>	0	16	5	0	0	0	21

Table 3. Population sizes (individual equivalents) of the rarest notable species

Taxon name	Sanderson 2005	Sanderson 2012	Sanderson 2013	Lamacraft 2024a	Lamacraft 2024b	Other surveys	Total
<i>Anisomeridium viridescens</i>	0	0	0	1	0	0	1
<i>Bryobilimbia sanguineoatra</i>	0	0	0	1	0	0	1
<i>Bunodophoron melanocarpum</i>	1	0	0	0	0	0	1
<i>Chaenothecopsis nigra</i>	1	0	0	0	0	0	1
<i>Cladonia incrassata</i>	1	0	0	0	0	0	1
<i>Cladonia parasitica</i>	1	0	0	0	0	0	1
<i>Hypotrachyna endochlora</i> (potentially lost)	1	0	0	0	0	0	1
<i>Lecanora strobilina</i>	0	0	0	1	0	0	1
<i>Megalospra tuberculosa</i>	0	1	0	0	0	0	1
<i>Mycoporum lacteum</i>	0	1	0	0	0	0	1
<i>Porina coralloidea</i>	0	1	0	0	0	0	1
<i>Porina hibernica</i>	0	0	0	0	0	1	1
<i>Porina rosei s. lat.</i>	0	0	0	0	0	1	1
<i>Ramonia chrysophaea</i>	0	1	0	0	0	0	1
<i>Usnea glabrescens</i>	0	0	0	0	1	0	1
<i>Varicellaria velata</i> (potentially lost)	0	1	0	0	0	0	1

7. Distribution of interest

Almost the whole SSSI supports significant lichen interest: the only parts that do not are those areas that have not had long-standing tree cover e.g. the ffridd at Ffridd Maes-mawr in the south of the SSSI and the open ffridd that extends on to the lower slopes of the Rhinogydd in the west of the SSSI. To a fair extent the distribution of interest will reflect the survey and recording effort, with the most visited parts of the SSSI around the Dolmelynlyn estate e.g. the parkland, Coed Ganllwyd NNR, Coed Berth-lwyd farmstead seemingly supporting the richest interest. There are parts of the SSSI that only had some survey effort in recent years e.g. the Glasdir Stope, and Hafod-y-fedw which was surveyed in 2024 as part of this project (along with a second survey of the Glasdir Stope), or some time ago e.g. Coed Aber Eden. In general terms, survey and recording effort decline to the south and south-east from the core recording area around the Dolmelynlyn estate. There are still some areas that appear to have had little if any effort, especially the western, upslope fringes of the wooded parts of the SSSI and scattered tree cover out onto the ffridd. Based on the results of the survey of Hafod-y-fedw (Lamacraft 2024a), these could well support significant interest and additional survey work is recommended there.

In general terms the acid-bark *Parmelion* interest represented by the URI is scattered throughout but has particularly strong representation in the south at Hafod-y-fedw and Glasdir Stope e.g. the majority of the SSSI population of *Hypotrachyna taylorensis* is at Hafod-y-fedw. The base-rich bark *Lobarion* interest represented by the SOWI is also scattered throughout but is centred on the parkland – where the typically more southern taxa such as *Agonimia octospora* are mostly found – and the woods and ffridd of Coed Ganllwyd and Coed Berth-lwyd, where the area around the old farmstead is particularly rich.

Maps of the distribution of notable taxa are presented in Appendix 7. To give an indication of the distribution of interest, maps of the density of records of SOWI taxa have been produced based on the same surveys used to produce population estimates above, see Figures 2 and 3.

Figure 2. Density of records of SOWI taxa from surveys 2012-2024 (see above)

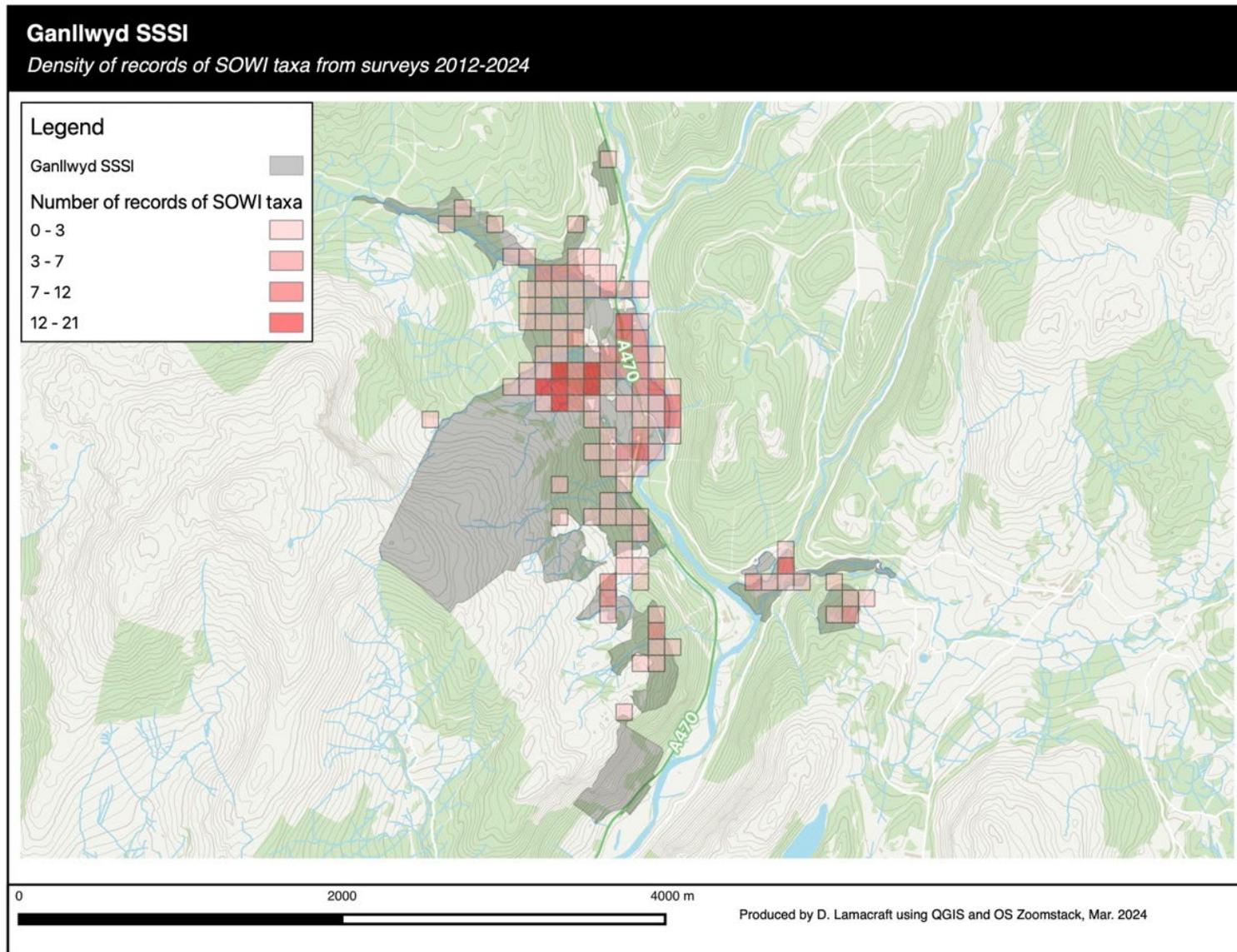
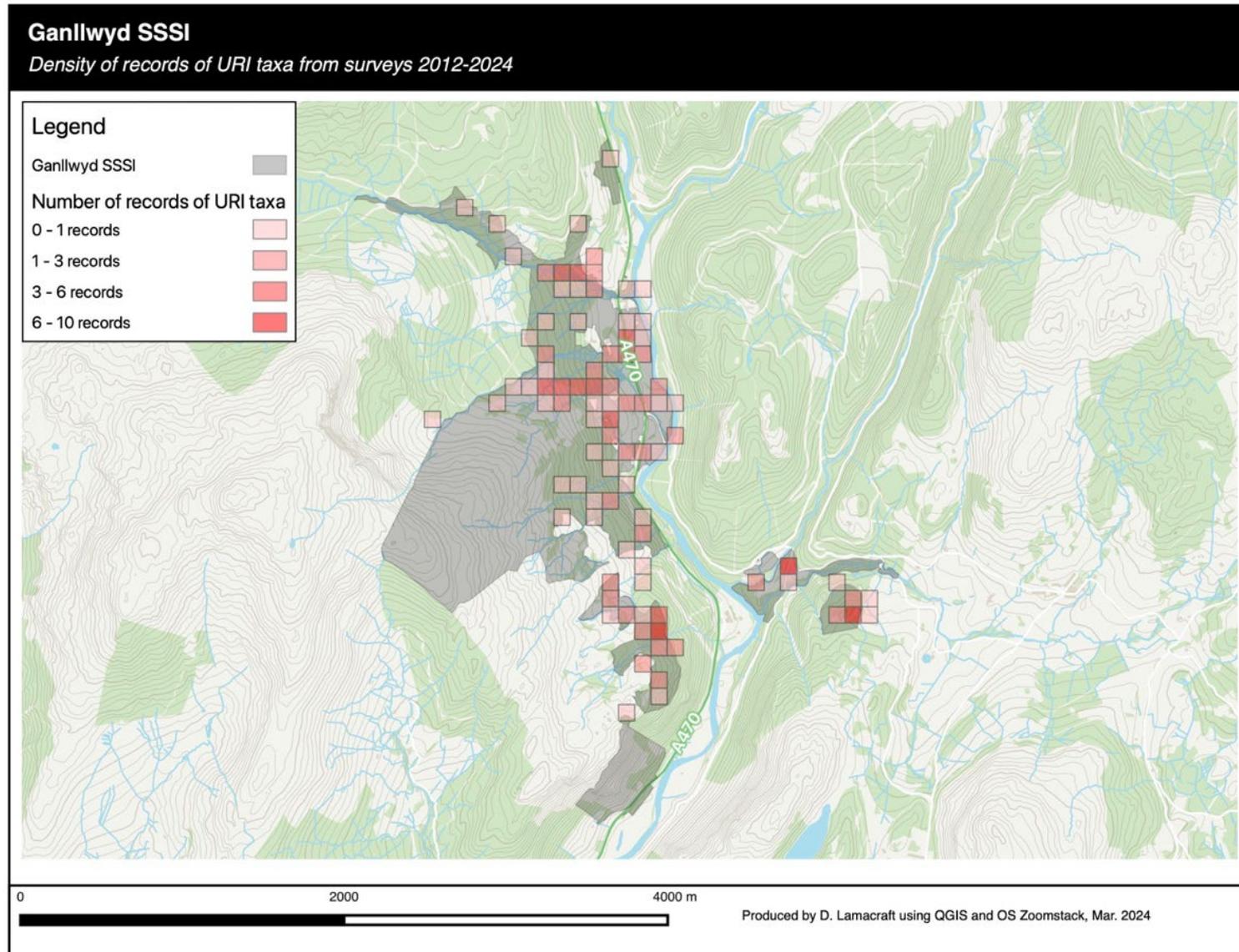


Figure 3. Density of records of URI taxa from surveys 2012-2024 (see above)



8. Monitoring of the lichen interest

Plantlife undertook some monitoring of past-recorded and monitored trees in 2023 as part of a contract to the National Trust as part of a management plan review (Plantlife 2023) summarising that in general terms:

- Populations appear to be doing well, although they do face developing threats. In most cases species were present to similar or greater abundance than in previous surveys.
- There are clear signs of growth and colonisation of some important species, such that populations on the whole appear healthy and viable. Examples include the *Lobarion* species in the walled garden (outside the SSSI), *Pectenaria plumbea* on Tree 044a and on the ash near the walled garden (inside the SSSI), and *Leptogium brebissonii* which appears to be quite mobile on the site.
- There are exceptions though e.g. the reduction or loss of some species in Coed Berthlwyd (compartment 5b) and of *Hypotrachyna endochlora* at Ty Cerrig (compartment 4d).'

It was noted that this work was a rather limited check of previously recorded lichens and not a substitute for full monitoring, albeit one that gave a general impression of what is happening with some species across parts of the site.

Monitoring as part of this project focussed mainly on the southern and eastern parkland areas and is detailed in Appendix 6. The intention was to cover areas not looked at by the Plantlife monitoring in 2023 and specifically to focus on areas where Sanderson (2012) had recorded the greatest losses e.g. the northern field on the eastern parkland. In summary this has shown:

- Some losses to fallen trees.
- Little loss in the far south with *Nevesia sampaiana* still present and *Lobarina scrobiculata* increasing on an Ash recently monolithed due to Ash Dieback infection.
- A general trend of continuing decline and loss in the eastern park, especially notable closest to the farm to the north. These are most obvious in the leafy *Lobarion* species, less so with crustose *Lobarion* e.g. *Agonimia octospora* which seem to be doing ok, *Lobaria pulmonaria*, *Lobarina scrobiculata*, *Nevesia sampaiana*, *Parmeliella triptophylla*, *Ricasolia virens* and *Sticta* species have all declined and or been lost from many trees where they were present in the 1990s in this part of the site.
- There are some exceptions e.g. tree 038 which has seen both colonisation and growth of leafy *Lobarion* species e.g. *Nephroma parile*, and which seems to have seen an increase in *Ricasolia virens* on tree 026 which has become increasingly shaded, this species being the more tolerant of shade than the other '*Lobaria*' species.
- Declines and loss of leafy *Lobarion* has also occurred in the south of the western parkland between the lodge and Ty'n y Groes cottages.

- In some cases losses/declines can be attributed to increasing shade and or ivy increase, and sheep rubbing against the bases of trees.
- In most other cases there is little obvious physical cause, but apparent poor health of a lot of the leafy *Lobarion* lichens, and general decline in this group, perhaps points towards an air quality issue. This seems most likely to be the impact of ammonia associated with the intensive management of the eastern parkland, and the proximity of likely sources such as the farmyard and sewage plant to the north. It is possible traffic emissions on the busy A470 which runs through the site are having an impact.

9. Threats and habitat management issues

The main threats and issues are:

Rhododendron ponticum; efforts over recent decades have eradicated this plant from much of the SSSI, but a small amount persists in Hafod-y-fedw (Figure 4) and it is most extensive in the NRW owned section at Glasdir Stope (Figure 5). This will remain a threat to these areas and more widely unless dealt with.

Ash Dieback: given the importance of Ash for the lichen interest here, Ash Dieback has the potential to have a significant impact on the interest. The current approach of minimal intervention, appreciating the importance of tree species such as Sycamore and managing the site favourably to create and maintain optimum conditions, is a good example of how to tackle the issue (Figure 6). Translocation has taken place from fallen ash, and a wider programme of translocation needs to be considered. It may be worth keeping an eye out for resistant trees on the site and growing stock on from seed for subsequent planting if the resistance seems real.

Nitrogen/ammonia; it does seem likely that this is having an impact in the central parts of the SSSI (Figures 7, 8), and the most likely source is the agricultural management of the parkland, proximity of the farm buildings and sewage treatment plant. The A470 also runs through the middle of the site and may be contributing to the issue. It would be worth undertaking some air quality monitoring in the SSSI to try to establish levels of pollutants. Ideally the parkland would be managed with low inputs and low intensity e.g. restored to flower-rich hay-meadow or pasture alongside a programme of tree planting to create wood-pasture or wood-meadow.

Agricultural management: the eastern part of the parkland in particular seems to be quite intensively managed, with compacted soils, manure applications including manure which was found splattered on a trunk in the northern field of the eastern parkland (Figure 9) and frequent evidence of stock rubbing on tree bases (Figure 10). Ideally the parkland would be managed with low inputs and low intensity e.g. restored to flower-rich hay-meadow or pasture alongside a programme of tree planting to create wood-pasture or wood-meadow.

Grazing and browsing management; this is going to be the most effective long-term management of the woodland and ffridd and has been underway here since conservation grazing was first funded by Plantlife in c.2013. This is going well, but some issues were identified by the Plantlife monitoring in 2023. There do not appear to be any problems with deer grazing at present.

Parkland fencing: part of the western edge of the central field in the eastern parkland has been fenced, this continues to threaten the lichen interest with declines recorded on all trees due to shade and ivy. Only the more shade tolerant *Ricasolia virens* seems to be coping and only on one tree. This should be opened up to grazing again, and the Oak to the north needs to be halo-thinned, especially as this is an old tree and adjacent to rich ash trees (hence a good candidate for colonisation or translocation).

Lack of successive generations of trees; this is a major issue in more open areas e.g. in the parkland and the ffridd (inc the Berth-lwyd farmstead area) and sadly from the perspective of securing future habitat for the lichen interest it may well be getting too late in many cases. Planting that has occurred has mostly been too close to existing trees, such that they will threaten the lichen interest through shade impacts and compete with the older tree for light etc. There are some encouraging signs though, such as the colonisation of young ash by *Lobarion* in the 'ash plantation' and in the parkland, albeit slightly ironic that this is on Ash which are infected with Ash Dieback.

Planting needs to happen, but needs to take a two-pronged approach – of providing future large veteran trees, and of providing faster growing alternatives. The former needs to focus on Oak and perhaps Sycamore given the likely loss of Ash, the latter on Rowan, Willow and Hazel. If ADB-resistant Ash become available (ideally from growing on local resistant stock) these should feature significantly. In all cases, planting needs to be close enough to allow colonisation but not so close as to threaten interest on or compete with existing mature trees. In the parkland and ffridd especially this needs to focus on new large open-crowned trees (for Oak and Sycamore, and perhaps ADB-resistant Ash if possible) and planting should be beyond the canopy of existing trees and planned to allow for a large open canopy on the newly planted trees. There may be scope for planting of small groups of the faster growing species nearby. This will clearly need a different approach to the management of the parkland than is happening currently. In addition, planting flowering shrubs such as blackthorn and hawthorn is recommended to benefit saproxylic invertebrates, although care must be taken to avoid them shading the trunks of lichen-rich trees.

There is also enormous potential to facilitate woodland/wood-pasture expansion on the ffridd around the Berth-lwyd farmstead.

Figure 4. *Rhododendron ponticum* at Hafod-y-fedw.



Figure 5. *Rhododendron ponticum* at Glasdir Stope.



Figure 6. Ash Dieback management; a monolithed tree with a healthy increasing population of *Lobarina scrobiculata*.



Figure 7. Unhealthy looking *Lobarina scrobiculata* in the eastern park, possibly the product of exposure to poor air quality



Figure 8. Unhealthy looking necrotic *Lobaria pulmonaria* in the eastern park, possibly the product of exposure to poor air quality



Figure 9. Manure on trunk of Oak in the eastern parkland northern field



Figure 10. Sheep rub on base of Ash in eastern park, this is a favoured niche for SOWI lichens such as *Collema subflaccidum*, *Scytinium lichenoides* and *Sticta* species



Figure 11. A large oak within the fenced area of the central field, eastern park, which had *Lobaria pulmonaria* in the 1990s (not recorded since, possibly overlooked) and needs halo-thinning.



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Appendices

It is not possible to make the data tables and photos in the appendices comply with Accessibility legislation, so they have been removed from this web version of the report. They are available in full from the Natural Resources Wales library and the National Library of Wales.

Data Archive Appendix

Data outputs associated with this project are archived in DMS on server-based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A spreadsheet of records in Microsoft Excel format.

Metadata for this project is publicly accessible through Natural Resources Wales' Library Catalogue <https://libcat.naturalresources.wales> (English Version) and <https://catllyfr.cyfoethnaturiol.cymru> (Welsh Version) by searching 'Dataset Titles'. The metadata is held as record no ??

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