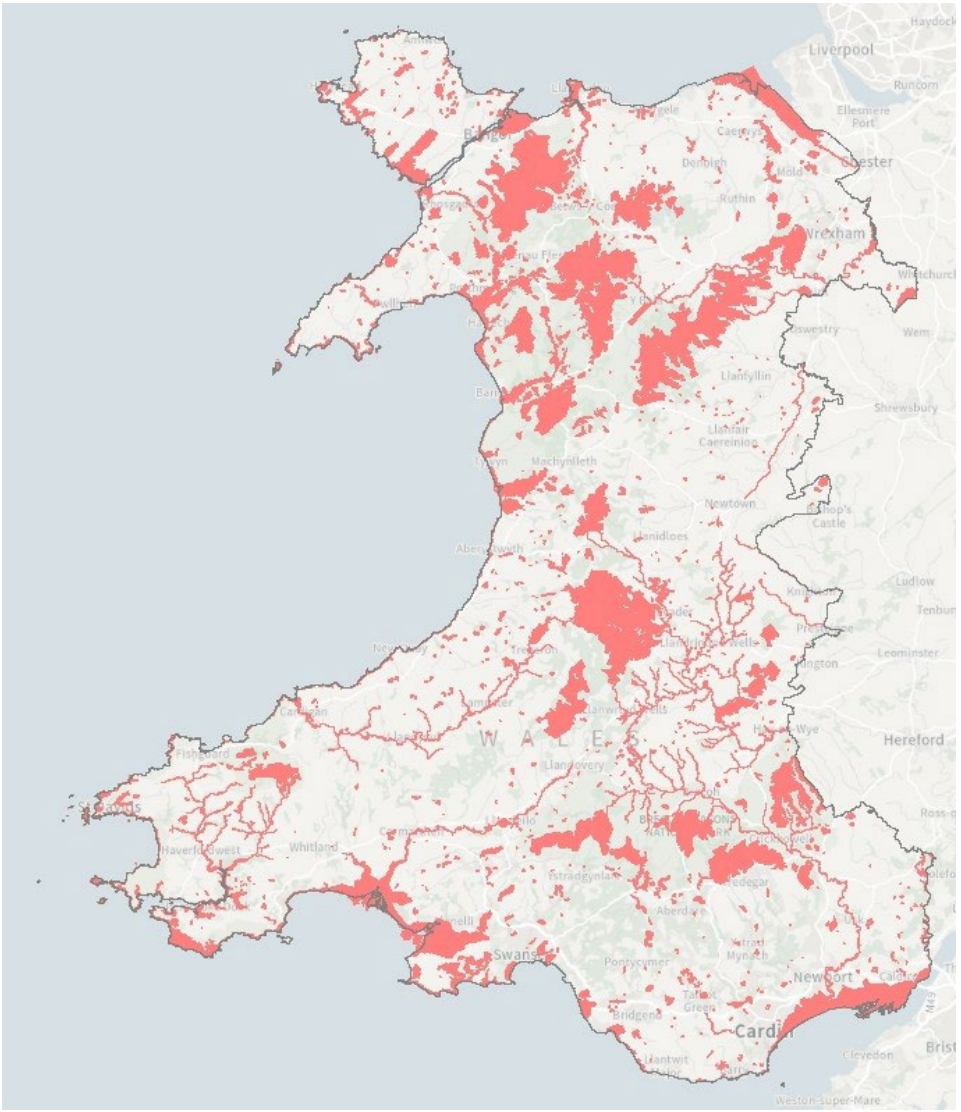
Sites of Special Scientific Interest: a review of the current series in Wales



Sites of Special Scientific Interest (SSSIs) in Wales 2025

NRW Evidence Report No. 878
Christine Edwards, Holly York
Natural Resources Wales

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Contents

List of Figures

List of Tables

List of Acronyms

AONBs	Areas of Outstanding Natural Beauty (National Landscapes)
AoS	Areas of Search
CBD	Convention for Biological Diversity
CCW	Countryside Council for Wales
CRoW	Countryside and Rights of Way Act 2000
CVI	Climate Vulnerability Index
DECCA	Diversity, Extent, Condition, Connectivity, and Adaptability
EGN	Explanatory Geological Note
FCS	Favourable Conservation Status
GCR	Geological Conservation Review
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MCZ	Marine Conservation Zone
MNR	Marine Nature Reserve
MHWM	Mean High Water Mark
MLWM	Mean Low Water Mark
MPA	Marine Protected Area
NCC	Nature Conservancy Council
NNRs	National Nature Reserves
NRW	Natural Resources Wales
OECMs	Other Effective Area-based Conservation Measures
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PEN	Priority Ecological Network
PH	Priority habitat
RDB	Red Data Book
REN	Resilient Ecological Network
SACs	Special Areas of Conservation
SNH	Semi-natural habitat
SoNaRR	State of Natural Resources Report
SPAs	Special Protection Areas
SSSIs	Sites of Special Scientific Interest

Crynodeb Gweithredol

Mae Safle o Ddiddordeb Gwyddonol Arbennig (SoDdGA) yn ddynodiad cadwraeth ym Mhrydain sydd â'r nod o warchod cynefinoedd, rhywogaethau, daeareg a thirffurfiau pwysig. Yn un o gonglfeini cadwraeth, mae SoDdGAau yn gwarchod ein hadnoddau naturiol ar gyfer cenedlaethau'r presennol a'r dyfodol, gan gyfrannu'n sylweddol at amgylchedd iach a ffyniannus. Yng Nghymru, mae SoDdGAau yn cael eu hysbysu gan Cyfoeth Naturiol Cymru (CNC) fel dyletswydd o dan Ddeddf Bywyd Gwyllt a Chefn Gwlad 1981 (fel y'i diwygiwyd). Caiff safleoedd eu nodi a'u hysbysu gan ddefnyddio canllawiau dethol cyhoeddedig ac yna cânt eu rheoli ar gyfer y cynefinoedd, y rhywogaethau a'r gwyddorau daear y maent yn eu cefnogi mewn cydweithrediad â pherchnogion a deiliaid.

Mae'r adroddiad tystiolaeth hwn yn adolygu'r gyfres bresennol o SoDdGAau sydd wedi'u hysbysu yng Nghymru. Mae'n dadansoddi cwmpas, amrywiaeth, cynrychiolaeth a chysylltedd y gyfres o safleoedd a'u nodweddion hysbysedig, gan ganolbwyntio ar gynnig crynodeb ar lefel genedlaethol. Mae'r adroddiad yn rhan allweddol o gyflawni argymhelliad Archwiliad Dwfn Bioamrywiaeth Gweinidogol Llywodraeth Cymru i 'Adolygu'r gyfres o SoDdGAau er mwyn llywio rhaglen hysbysu gyflymach gan ei halinio â'r Rhaglen Rhwydweithiau Natur'. Mae hefyd yn cefnogi'r ymrwymiad yng Nghynllun Corfforaethol Cyfoeth Naturiol Cymru i ymestyn gwarchodaeth a rheolaeth dros o leiaf 30% o'r tir, o ddŵr croyw a'r môr er budd natur drwy nodi cyfleoedd i ehangu a chysylltu'r gyfres o SoDdGAau yn well, a bydd yn cyfrannu at gyflawni ymrwymiad Llywodraeth Cymru i Darged 3 ('30 erbyn 30'): gwarchod 30% o'r tir, o ddŵr croyw a'r môr er budd pobl a byd natur erbyn 2030.

Yn ôl y mesur ehangaf y gellir ei gofnodi, mae SoDdGAau yn gorchuddio tua 12% o arwynebedd rhynglanwol a thir Cymru, sy'n golygu bod eu cyfraniad posib at dargedau bioamrywiaeth yn sylweddol, gan gynnwys Targed 3 ('30 erbyn 30') o Fframwaith Bioamrywiaeth Byd-eang y Confensiwn ar Amrywiaeth Fiolegol.

Mae'r rhaglen hysbysu SoDdGAau o dan Adran 28 o Ddeddf Bywyd Gwyllt a Chefn Gwlad 1981 (fel y'i diwygiwyd) yn un sy'n mynd rhagddi. Fodd bynnag mae tystiolaeth o adroddiadau arolygon ac adroddiadau gwerthuso yn awgrymu bod mwy o ardaloedd o dir yng Nghymru yn cynnal cynefinoedd, rhywogaethau a nodweddion gwyddorau daear o ddiddordeb arbennig nad ydynt wedi'u hysbysu eto. Mae'r adroddiad hwn yn cyflwyno'r data ffeithiol, yr ystadegau a'r wybodaeth sy'n dangos bod llawer o SoDdGAau yn fach, yn dameidiog neu'n ynysig, neu bod eu ffiniau wedi'u tynnu fel eu bod yn agored iawn i bwysau allanol ac yn llai gwydn yn wyneb newid ecolegol negyddol. Nid yw ffiniau a nodweddion dynodedig nifer sylweddol o SoDdGAau wedi cael eu hadolygu'n gynhwysfawr ers eu hysbysiad cychwynnol flynyddoedd lawer yn ôl.

Mae hyn yn amlygu'r angen am ddull mwy strategol ar gyfer gweithgareddau hysbysu safleoedd, gan gynnwys ehangu'r safleoedd presennol, hysbysu safleoedd newydd, ac ychwanegu gwarchodaeth ar gyfer nodweddion ychwanegol o ddiddordeb arbennig trwy amrywio hysbysiadau. Dylai'r dull barhau i gyd-fynd â nodau amgylcheddol ehangach, er enghraifft mynd i'r afael ag effeithiau newid hinsawdd drwy well gwarchodaeth ar gyfer ecosystemau sy'n dal a storio carbon yn well ac sydd hefyd o ddiddordeb arbennig. Gwneir argymhellion i wella cysylltedd cynefinoedd drwy gynnal asesiadau pellach o ynysu a darnio, wedi'u llywio gan y

Map Rhwydweithiau Natur a'u cefnogi gan ddatblygiad offeryn mynegai ynysu, sy'n galluogi nodi ardaloedd yn fwy targedig lle gall hysbysu neu ailhysbysu SoDdGA, neu fesurau cadwraeth effeithiol eraill sy'n seiliedig ar ardal gryfhau cysylltedd ecolegol hirdymor.

Drwy wneud hynny, bydd yn cefnogi CNC yn ei rôl fel yr awdurdod dynodi, gan helpu i lywio'r broses o nodi a blaenoriaethu gweithgareddau hysbysu yn y dyfodol, a gweithio tuag at gyfres o SoDdGAau sy'n well, yn fwy, ac wedi'i chysylltu'n fwy effeithiol.

Er bod yr adroddiad hwn wedi'i gyfyngu i werthuso cwmpas, cysylltedd, amrywiaeth a chynrychiolaeth y gyfres gyfredol o SoDdGAau, mae hefyd yn hanfodol pwysleisio bod mynd i'r afael â'r argyfwng natur a hinsawdd yn effeithiol hefyd yn gofyn rheoli safleoedd yn well, lliniaru pwysau a bygythiadau i nodweddion dynodedig, a hyrwyddo cydnerthedd ecolegol yn weithredol – ochr yn ochr ag ystyriaethau o gwmpas gofodol a chysylltedd. Rhaid i'r rhain gael eu cefnogi gan adborth o ganlyniadau gwaith monitro cyflwr nodweddion dynodedig.

Crynodeb o'r prif argymhellion:

1. Datblygu fframwaith penderfynu gyda meini prawf i gefnogi blaenoriaethu strategol hysbysiadau ac ailhysbysiadau SoDdGAau, wedi'i arwain gan Ganllawiau SoDdGA a'r Datganiad ar y Cyd ar Ardaloedd Gwarchodedig.
2. Cyfrifo cwmpas posibl SoDdGAau a'u cyfraniad at y targed bioamrywiaeth byd-eang 30 erbyn 30.
3. Cynnal adolygiadau treigl ar wydnwch a risg ar gyfer y SoDdGAau sy'n bodoli eisoes, gan ddiweddaru statws nodweddion safleoedd ac effeithiolrwydd dulliau rheoli ar sail tystiolaeth newydd ac effeithiau newid hinsawdd.
4. Asesu cynrychiolaeth nodweddion gan ddefnyddio data arolygon wedi'u cwblhau a nodi anghenion pellach o ran casglu tystiolaeth ar gyfer dynodi SoDdGAau yn y dyfodol.
5. Blaenoriaethu adnabod yn gynnar a gwarchodaeth statudol ar gyfer cynefinoedd sy'n hanfodol ar gyfer dal a storio carbon, er enghraifft mawndiroedd, coetiroedd a morfeydd heli, er mwyn cefnogi ymrwymiadau sero net.
6. Adolygu'r ddeddfwriaeth bresennol a gwella systemau rheoli data i wella prosesau hysbysu SoDdGAau a manteision rheoli cadwraeth.
7. Nodi gofynion uniongyrchol a hirdymor o ran adnoddau ar gyfer arolygu, ymgysylltu, cynllunio gwaith rheoli a monitro i gefnogi rhaglen gyflymach ar gyfer hysbysu SoDdGAau.

Executive Summary

Sites of Special Scientific Interest (SSSIs) are a conservation designation in Great Britain aimed at safeguarding important habitats, species, geology, and landforms. As a cornerstone of conservation, they protect our natural resources for current and future generations, contributing significantly to a healthy and thriving environment. In Wales, SSSIs are notified by Natural Resources Wales (NRW) as a duty under the Wildlife and Countryside Act 1981 (as amended). Sites are identified and notified using published selection guidelines and are subsequently managed for the habitats, species, and Earth science they support in collaboration with owners and occupiers.

This evidence report reviews the current suite of notified SSSIs in Wales. It analyses the extent, diversity, representativeness, and connectivity of the site series and their notified features, with a focus on providing a national-level summary. The report forms a key part of delivering the Welsh Government Ministerial Biodiversity Deep Dive recommendation to 'Review the SSSI series to inform an accelerated notification programme aligning it with the Nature Networks Programme'. It also supports NRW's Corporate Plan commitment to extend the protection and management of at least 30% of land, freshwater, and sea for nature through identifying opportunities to enlarge and better connect the series of SSSIs and will contribute to the delivery of Welsh Government's commitment to Target 3 ('30 by 30'): protecting 30% of land, freshwater, and sea for people and nature by 2030.

At their widest recordable extent, SSSIs cover around 12% of Wales' land and intertidal area, making a significant potential contribution to biodiversity targets, including Target 3 ('30 by 30') of the Convention on Biological Diversity's Global Biodiversity Framework.

The programme of SSSI notification under Section 28 of the Wildlife and Countryside Act 1981 (as amended) is ongoing, however evidence from survey and evaluation reports indicate that more areas of land within Wales support habitats, species, and Earth science features of special interest that have not yet been notified. This report presents the factual data, statistics and information which demonstrates that many SSSIs are small, fragmented or isolated, or have boundaries drawn such that they are very vulnerable to external pressures and less resilient to negative ecological change. The designated boundaries and features of a significant number of SSSIs have not been comprehensively reviewed since their initial notification many years ago.

This highlights the need for a more strategic approach to site notification activities, including expanding existing sites, notifying new sites, and adding protection to additional features of special interest through variation of notifications. The approach should continue to align with broader environmental goals, for example addressing the impacts of climate change through greater protection for ecosystems that sequester and store carbon whilst also being of special interest. Recommendations are made to enhance habitat connectivity by undertaking further assessments of isolation and fragmentation, informed by the Nature Networks Map and supported by the development of an isolation index tool, enabling more targeted identification of areas where SSSI notification, renotification or other effective area-based conservation measures (OECMs) can strengthen long-term ecological connectivity.

By doing so, it will support NRW in its role as the designating authority, helping to inform the identification and prioritisation of future notification activity, and working towards an SSSI series which is better, bigger, and more effectively connected.

Although this report is limited to evaluating the extent, connectivity, diversity and representativity of the current SSSI series, it is also critical to emphasise that effectively addressing the nature and climate emergency also necessitates enhanced site management, mitigation of pressures and threats to designated features, and the active promotion of ecological resilience - alongside considerations of spatial extent and connectivity. These must be supported by feedback from the results of designated feature condition monitoring.

Summary of key recommendations:

1. Develop a decision-making framework with criteria to support the strategic prioritisation of SSSI notifications and renotifications, guided by the SSSI Guidelines and the Joint Statement on Protected Areas.
2. Calculate the potential extent of SSSIs and their contribution to the 30 by 30 global biodiversity target.
3. Conduct rolling resilience and risk reviews of existing SSSIs, updating site feature status and management effectiveness based on new evidence and the effects of climate change.
4. Assess the representativeness of features using completed survey data and identify further evidence-gathering needs for future SSSI designations.
5. Prioritise early identification and statutory protection of habitats crucial for carbon sequestration and storage, such as peatlands, woodlands and saltmarsh, to support net-zero commitments.
6. Review existing legislation and enhance data management systems to improve SSSI notification processes and conservation management benefits.
7. Identify immediate and long-term resource requirements for survey, engagement, management planning, and monitoring to support an accelerated SSSI notification programme.

1. Introduction

Sites of Special Scientific Interest (SSSIs) are a conservation designation established to protect the most important and representative range of habitats, species, and Earth science features. As the cornerstone of conservation, they protect our natural resources for present and future generations, contributing to a healthy and thriving environment.

Established in 1949, the SSSI series in Wales now encompasses over 1,000 sites covering more than 267,500 hectares. These sites protect a diverse range of habitats including woodlands, grasslands, wetlands, rivers, and coastal regions while safeguarding specific species of plants, fungi, and animals alongside a series of geological and geomorphological sites that represent Wales' geoheritage.

1.1 Biodiversity Deep Dive

Following a declaration of the nature emergency by the Senedd in June 2021, the Welsh Government conducted a Ministerial-led Biodiversity Deep Dive to develop a set of collective actions aimed at supporting the delivery of the Convention on Biological Diversity (CBD) Global Biodiversity Framework Target 3, which focuses on conserving 30% of land, waters and seas by 2030. It was undertaken in recognition of Wales' capabilities and in alignment with the duties and approaches set out in the in the Well-being of Future Generations (Wales) Act 2015 and Environment (Wales) Act 2016.

The Biodiversity Deep Dive published a series of recommendations in October 2022, including the overarching recommendation to 'transform the protected sites series so that it is better, bigger, and more effectively managed.' This SSSI review is a step towards delivering one of the associated recommendations to 'review the SSSI series to inform an accelerated notification programme aligning it with the Nature Networks Programme.' It will also inform the longer-term recommendation to 'embark on an ambitious programme of protected site designations with an accelerated notification process to align with and strengthen the nature networks, prioritising those areas where need has already been identified.'

Other Biodiversity Deep Dive recommendations related to SSSIs are also being progressed, including aligning future SSSI notification with the Nature Networks approach through publication of stage one of the Nature Networks Map (Data Map Wales, 2023). This spatial information brings together key datasets and evidence, including habitat and ecological networks, and areas of land and water that are likely to play a functional role in ecosystem interactions, which can inform opportunities to take action towards increasing connectivity for specific habitats and their associated species.

1.2 Natural Resources Wales' Corporate Plan

NRW's Corporate Plan to 2030, under Well-being Objective 1: Nature is Recovering, sets out an ambitious vision to extend the protection and management of at least

30% of land, freshwater and sea for nature through identifying opportunities to enlarge and better connect the series of SSSIs.

To contribute to achieving this well-being objective, the SSSI review fulfils a key deliverable in NRW's 2025-26 Business Plan to increase the understanding of the extent and connectivity of the current SSSI series.

1.3 Development of the SSSI Series in Wales

SSSIs have been integral to environmental protection in the UK since their establishment in 1949 under the National Parks and Access to the Countryside Act 1949 ('1949 Act'). This landmark legislation enabled the protection of areas of ecological or geological importance for the first time, laying the foundation for safeguarding unique habitats and rare species. The Nature Conservancy and successor bodies were tasked with a duty to identify and notify SSSIs across the UK.

Over the subsequent decades, Wales saw the notification of SSSIs to protect its rich biodiversity and geodiversity, from ancient woodlands to wetland habitats to species such as invertebrates and birds. The SSSI system was originally intended to protect a "representative sample" of species and habitats across the country.

While the 1949 Act was pioneering, the early system faced limitations. SSSIs provided recognition but lacked robust legal powers to prevent damaging activities. By the 1970s and 1980s, public concern about environmental degradation grew and high-profile cases of habitat destruction highlighted these vulnerabilities. This led to the Wildlife and Countryside Act of 1981 (as amended) ('1981 Act'), which significantly strengthened the legal framework for SSSIs.

The 1981 Act introduced formal mechanisms to protect these areas more effectively, requiring landowners and occupiers to notify the Nature Conservancy Council (NCC) before undertaking operations likely to damage the special interest. In Wales, this marked a significant advancement in providing a mechanism to engage with owners and land managers over management proposals.

Subsequent legal amendments came in the 1990s, including the Environmental Protection Act 1990 and the Countryside and Rights of Way Act 2000 (CRoW Act), further enhancing protections. These strengthened penalties for damage and expanded the powers of conservation bodies to intervene with enforcement powers. The CRoW Act was especially impactful, introducing more rigorous obligations on public bodies to consider the impacts of their activities on SSSIs, and empowering conservation agencies to enforce compliance through site management schemes and notices.

The European Union's Habitats Directive and Birds Directive established the requirement to identify internationally recognised protected areas to safeguard Europe's most valuable and threatened species and habitats, along with globally important wetlands. In Wales, these areas are designated by the Welsh Government as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), and Ramsar sites and they are underpinned by SSSIs. To meet the milestones set out in the Habitats Directive and the European Commission's habitat and species sufficiency evaluations, there was a marked increase in the extent and pace of SSSI

notifications during the late 1900s and early 2000s, in order to support the designation of new SACs and SPAs.

The devolution of some UK government powers to Wales in 1999 gave Wales further autonomy over its environmental policies. NRW, established in 2013, became responsible for the duties and powers of the statutory nature conservation body in relation to the identification, notification, and regulation of the management of SSSIs and adopted the dual role of protecting and promoting sustainable management of natural resources. This marked a shift toward integrated environmental management, focusing not only on protecting SSSIs but also on ensuring that these sites together with wider environmental management contribute to broader ecosystem services and public well-being, particularly with the introduction of the Well-being of Future Generations (Wales) Act 2015.

The introduction of the Environment (Wales) Act 2016, and more specifically the Section 6 biodiversity and resilience of ecosystems duty, embedded protected sites management into the broader context of sustainable development and climate resilience, recognising that the duty to maintain and enhance biodiversity and to take account of the resilience of ecosystems is essential for achieving Wales' economic, social, environmental and cultural goals.

In 2024, NRW with Natural England, NatureScot, Northern Ireland Environment Agency, and the Joint Nature Conservation Committee (JNCC) considered how protected areas can be more effective in addressing the biodiversity and climate crises. A joint statement was published outlining shared understanding of the principles for an improved protected areas network across the UK. These principles emphasise being forward looking and adaptable, ecologically effective, evidence-based, valued and resourced, collaboration, integration across policy areas, and being globally responsible.

Today, SSSIs in Wales continue to be central to conservation efforts, with over 1,000 sites, and reflects a growing recognition of the need for both statutory protection and active management to safeguard these irreplaceable areas. The focus has gradually shifted from merely restricting harmful activities to proactively enhancing biodiversity, geodiversity, and ecosystem resilience, particularly in the face of climate change.

Looking ahead, Wales remains committed to building the resilience of its SSSI series, with NRW and the Welsh Government exploring new ways to enhance biodiversity and geodiversity, integrate community engagement, and align conservation with the nation's broader environmental objectives. Expanding and effectively managing the SSSI series will play a role in working towards achieving the 30 by 30 target. This evolving approach reflects the enduring importance of SSSIs as foundational elements in conserving and building ecological resilience of Wales' rich natural heritage for future generations.

1.4 Evaluation and Selection of Sites of Special Scientific Interest

NRW has a duty under Section 28 of the Wildlife and Countryside Act 1981 (as amended), to notify any area of land as a SSSI which, in its opinion, is of special interest by reason of any of its floral, fauna, geological or physiographical features.

SSSIs are notified in the terrestrial, freshwater, coastal and intertidal environments, and sometimes in sub-tidal areas. The lower or seaward boundaries of SSSIs normally extend to the extent of the local authority planning area. This varies between countries, and for Wales it is the Lowest Astronomical Tide (LAT) line. The Marine and Coastal Access Act 2009 sets out the circumstances in which SSSIs can extend below the Mean Low Water Mark and introduces procedures for notification of sites in the sub-tidal area.

In common with other protected sites, SSSIs are notified using a system of features. These refer to the specific habitat, species, assemblage of species, geological, or geomorphological element that are considered of special scientific interest and is the reason the site is notified. When a site is notified as a SSSI, NRW must describe the site's features of special interest in a citation (statement of the site). These are called notified features. A site can be notified for one or more features, including biological and geological features, see examples in Fig. 1. The features of a particular SSSI are the basis and rationale for its subsequent management and monitoring objectives.

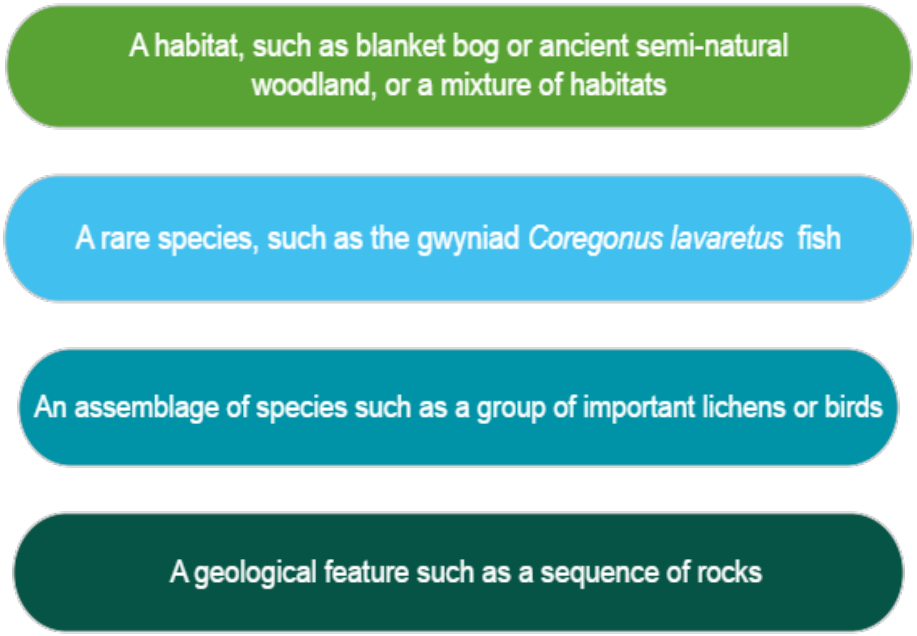


Figure 1: Types of features with examples

In determining sites and their features of special interest, NRW uses the Guidelines for the Selection of Biological SSSIs and the Selection of Earth science SSSIs, (respective SSSI Guidelines) as published by JNCC.

1.4.1 Evaluation and selection of Biological sites

The SSSI Guidelines provide a consistent rationale for the evaluation and selection of biological SSSIs. They support and guide NRW in the selection of biological SSSIs and also provide a public statement of the selection principles for all interested parties. This ensures a consistency of approach and that SSSIs are selected based on a clear conservation need.

Part 1 of the Biological SSSI Guidelines sets out the general principles from which the evaluation and selection procedures have been developed and explains background issues and concepts. It looks at the broad operational approach and criteria for evaluation and selection. It outlines the principles for site evaluation and selection focused on typicalness, fragility, size, diversity, naturalness, and rarity.

Part 2 presents detailed and specific guidance chapters for each of the main habitat types and species groups. It provides details on the biological features for which a site may be selected as a SSSI. For habitat types, this includes those in terrestrial, freshwater, intertidal and coastal environments. Some sites may be notified for features using the SSSI Guidelines from several chapters, and alongside the Earth science SSSI Guidelines.

The attributes of ecosystem resilience - Diversity, Extent, Condition, Connectivity, and Adaptability (DECCA) - are embedded within the SSSI Guidelines and reflected in the core principles that underpin site identification and notification. These principles are expressed as diversity, size, ecological coherence, and potential value.

The selection criteria can vary depending on the habitat, species, or assemblage. In some situations, sites can be selected for all that remains of rare and endangered habitats and species or representative samples of widespread and more common types. For some, the size of the species population or the size of the habitat can be an important factor, as can providing a good representation of the range and diversity of ‘best example’ sites. To help with this, Wales is divided into a number of geographical units called Areas of Search (AoS) (see Appendix 1).

Originally published in 1989, the SSSI Guidelines are undergoing a revision on a phased basis, with Part 1 published in 2014. To date, revisions for nineteen of the Part 2 chapters have been published, with revisions underway for the remaining chapters; non-montane rock habitats, fens, bogs, and artificial habitats. Revisions have been undertaken by staff in the country nature conservation bodies, with approval by the inter-agency Chief Scientist Group and JNCC’s Joint Committee.

1.4.2 Evaluation and selection of Earth science sites

The Geological Conservation Review (GCR) provides the survey and evaluation of Earth science features, providing a consistent rationale for the selection of Earth science SSSIs. The terms ‘Earth sciences’ or ‘geodiversity’ used in this report, encompass both geology and geomorphology.

The Guidelines for the Selection of Earth Science SSSIs make use of the GCR to provide a systematic approach to site selection with the objective of identifying those sites needed to show the key scientific elements of our Earth heritage. The key

rationale for selection is representativeness, exceptional features, and international importance.

Nationally important, in the context of GCR site selection, refers to the importance to Great Britain as a whole. Any site chosen for the GCR has been assessed, wherever possible, against comparable features across the whole of Great Britain.

2. Scope of the review

This review is an assessment of the extent, diversity, representativeness, and connectivity of the SSSI series in Wales, with a focus on providing a national-level summary. It covers the current suite of notified SSSIs and their notified features. The scope was agreed by a steering group of specialists from key areas across NRW and was shaped to reflect the time and resources available, adopting a light-touch approach.

The review focuses on the following aspects of the SSSI series:

- Extent of SSSIs

The precise area of land notified as SSSI plays a crucial role in its ability to adapt, recover, and resist disturbance. There are no specific extent targets in the SSSI Guidelines, which recognises that boundary decisions are related to the individual assessment of the ecological requirements of different habitats, species, and geodiversity.

This report examines the extent of the current SSSI series, including habitat coverage and size variation.

- Diversity and Representativeness

Diversity is essential at every level, from genetic variation to species richness and from habitats to entire landscapes. It supports the complexity of ecosystem functions and the web of interactions that sustain ecological processes, ultimately enhancing the ability to adapt to change.

Representativeness, conversely, considers how well the SSSI series captures the full range of habitats, species, and Earth science features of special interest in Wales. These range from the need to select all that remains in the case of rare and endangered habitats and species, and the most representative examples for widespread and common types.

This report explores the diversity of SSSIs, and examines the presence of characteristic, rare, and threatened habitats, species, and Earth science features.

- Connectivity

Connectivity refers to the ecological links between and within habitats, which can take the form of physical corridors, stepping-stones, or patches of similar habitat that together form networks facilitating the movement of species, genes and natural resources. In addition to structural connectivity, functional connectivity, the actual movement and flow of organisms and ecological processes across the landscape, is critical to ensuring that these networks operate effectively. A well-connected SSSI series should support healthier ecosystems by enabling species to move between sites, maintain genetic diversity, reduce species vulnerability to unpredictable events, strengthen ecosystem stability, and adaptability to change. Section 5 explains the

context of SSSIs in building resilient ecological networks and the tools used, namely Resilient Ecological Networks, Priority Ecological Networks, and the Nature Networks Map.

The SSSI Guidelines encourage selecting sites that support ecological coherence, ensuring that features are considered in the context of the abundance, distance and quality of existing sites in the surrounding landscape and the permeability of these (linear linkages and large areas of permeable habitat). This approach ensures that sites contain the range and area of habitats that species require, while ensuring that ecological connections exist to support dispersal, gene flow and migration between sites.

This report examines the connectivity of the SSSI series with a focus on habitat fragmentation and edge effects. Further analysis, beyond the scope of this review, could explore site shape, isolation, and nearby habitat permeability. Such work would provide deeper insight and complement the development of resilient ecological networks and the future priorities for improving the coherence of the SSSI series in Wales.

Considerations

The review examines the existing suite of notified SSSIs and their notified features. The following considerations should be taken into account:

Notified features are identified using the SSSI Guidelines in place at the time of notification. Consequently, the analysis reflects the criteria and standards applied at that time, which for many sites may date back several decades - 97% of SSSIs (1050 sites) were notified before the 2013 revision of SSSI Guidelines Part 1.

Changes to the criteria for selection, particularly for species, will result in additional species that meet the revised SSSI Guidelines but are not legally recognised through the notification process. For these to be considered as legally notified species in existing sites, the SSSI must undergo a variation of notification (renotification) under Section 28 of the Wildlife and Countryside Act 1981 (as amended), and the relevant species included in the descriptive citation.

The criteria for defining site boundaries have also developed further in the revised SSSI Guidelines, for example, through the inclusion of key bat foraging and commuting areas, greater consideration of the ecological influence of adjacent activities, and taking account of likely future changes for coastal processes. The boundary of existing SSSIs can be changed through notification of additional land (also known as renotification) under Section 28 of the Wildlife and Countryside Act 1981 (as amended).

The revisions to the SSSI Guidelines has also resulted in changes to the descriptions of assemblages, and as such the species assemblages detailed in this report refer to the old and new definitions, dependent on when the SSSI was notified. Vascular plants guidance, for example, have changed the emphasis in favour of species-by-species focus versus an assemblage focus.

Recognition of features within land notified as SSSI, through renotification, is required on many sites, to account for changes in species and habitat status since

first notification, to reflect the growing impact of climate change, as well as recent updates to the SSSI Guidelines and International Union for Conservation of Nature (IUCN) Red Lists and country assessments.

This review provides a holistic view of the current SSSI series, it was not intended to seek to assess the alignment of existing notified features with the revised SSSI Guidelines, nor include features which may now warrant formal recognition. It also did not seek to undertake a review of the needs of the SSSI series, such as identifying gaps in the representativeness of specific habitats, species or Earth science features. It focuses on a high level national view, rather than assessing individual SSSIs. These gaps are discussed further in the conclusions and recommendations. The management, monitoring, and regulation of SSSIs is outside the scope of the review.

2.1 Evidence sources and analytical methods

The primary evidence for the site series analysis was drawn from data held on NRW's Protected Sites Database and NRW GIS layers. Supplementary information was sourced from relevant reports, including SoNaRR 2016 and 2020, with references provided where used. A list of GIS layers used is available in the Data Archive. Details on individual SSSIs (such as boundary map, citation, list of operations requiring consultation with NRW, and site management statement) can be viewed on NRW's protected areas web facility ('Find protected areas of land and sea'). All datasets and reports were accessed in January and February 2025.

The outputs of the analysis were subject to internal peer review and quality assurance by a task and finish group comprising subject matter experts.

When calculating the extent and distribution of SSSIs, the following principles and methods were applied:

The extent (hectares) of notified terrestrial habitat features within a SSSI is based on the figure recorded at the point of notification. These areas may have changed over time and in some cases, no extent figure was recorded. The reported extent should be considered as indicative, as with these missing extent figures they are likely to be an underestimate.

The extent (hectares) of notified Earth science features is based on the overlap between SSSIs and GCR sites.

For the count and extent of SSSIs within specific areas, SSSIs which straddle two or more areas, such as multiple AoS, are counted in all relevant areas. A SSSI is considered partially within an area if it covers more than 0.1 ha, except for those sites with a total extent of less than 0.1 ha. Only the area of notified land within each specific area, such as AoS, is included in the extent figures.

The standard tidal reference levels (Mean High Water Mark, Mean Low Water Mark, and Lowest Astronomical Tide) are subject to change over time, and as such the amount of the SSSI series classified within the different levels may vary over time. The calculations of the extent and percentage of the SSSI series to the standard tidal

reference levels (table 1) are calculated using the GIS layers available in February 2025. The extent of the SSSI series is slightly higher than the furthest tidal reference level (lowest astronomical tide), likely due to changes over time of its position. All extent figures in this review are based on the total extent of the series, unless specified otherwise or where calculations are determined by the boundaries of other aspects, such as Areas of Search.

Most figures have been rounded to the nearest whole number.

3. Extent and Distribution of SSSIs

3.1 Total extent of SSSIs in Wales

As of February 2025, there are 1,083 SSSIs, covering an area of 267,554 hectares (ha) to its total extent.

In Wales, SSSIs cover around 12% of the country's land surface. The percentage of SSSI coverage varies depending on the tidal datums or reference levels used i.e. the water mark used for measurement, as shown in Table 1. Percentage coverage can be calculated in a number of ways using the total area of Wales to Mean High Water Mark (2,078,680 ha), Mean Low Water Mark (2,118,869 ha) or Lowest Astronomical Tide (2,132,577 ha). The total extent of the SSSI series (267,554 ha) is slightly higher than the total extent of SSSIs to the Lowest Astronomical Tide (LAT) line (265,540 ha), reflecting the changes over time in the LAT line position.

Total extent of SSSIs to standard tidal reference levels	Total area of SSSI (ha)	Percentage of Wales notified as SSSI
Total extent of SSSIs to Mean High Water Mark (MHWM)	225,778	10.86%
Total extent of SSSIs to Mean Low Water Mark (MLWM)	258,440	12.20%
Total extent of SSSIs to Lowest Astronomical Tide (LAT)	265,540	12.45%

Table 1: Extent and percentage of the SSSI series to the standard tidal reference levels (MHWM, MLWM, and LAT).

3.2 Extent of SSSIs on land and coast

3.2.1 Extent of upland and lowland SSSI area

The Welsh uplands account for 59% of the total area of SSSI, concentrated within just 191 SSSIs (17% of the SSSI series). This reflects the greater area of many upland SSSIs and their significance in representing Wales' upland environments. The largest of these – Eryri SSSI, Elenydd SSSI, and Berwyn SSSI – each exceed 20,000 ha in size. In contrast, terrestrial lowland SSSIs tend to be more fragmented, resulting in a greater number of smaller sites. Along with coastal areas, these smaller sites account for the remaining 41% of the total SSSI series extent.

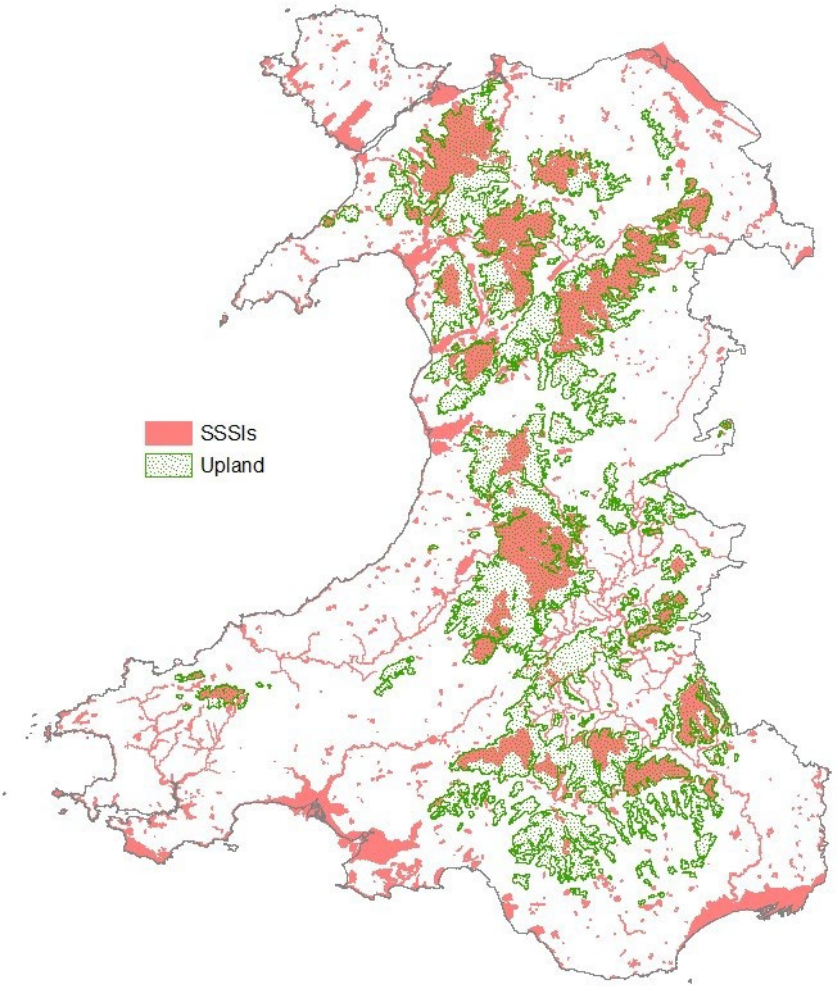


Figure 2: SSSI and upland boundaries, with Mean Low Water Mark boundary. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

Fig. 2 and 3 illustrate the extent of upland area in Wales, and the amount notified as SSSI. The upland boundary used in Fig. 2 defines the upper limit of enclosure (200 m above sea level in altitude) distinguishing upland and lowland habitats. This is derived from Phase 1 Survey and the Wales Field Unit upland vegetation survey of Wales in 1979-1999, with the boundary verified and digitised in 2000. The extent figures have been calculated using the extent of each SSSI within the upland or lowland area. It does not take into account some small overlap between SSSI boundaries (usually due to improvements in mapping over time) and as such the combined figure is a small amount above the maximum extent of SSSIs.

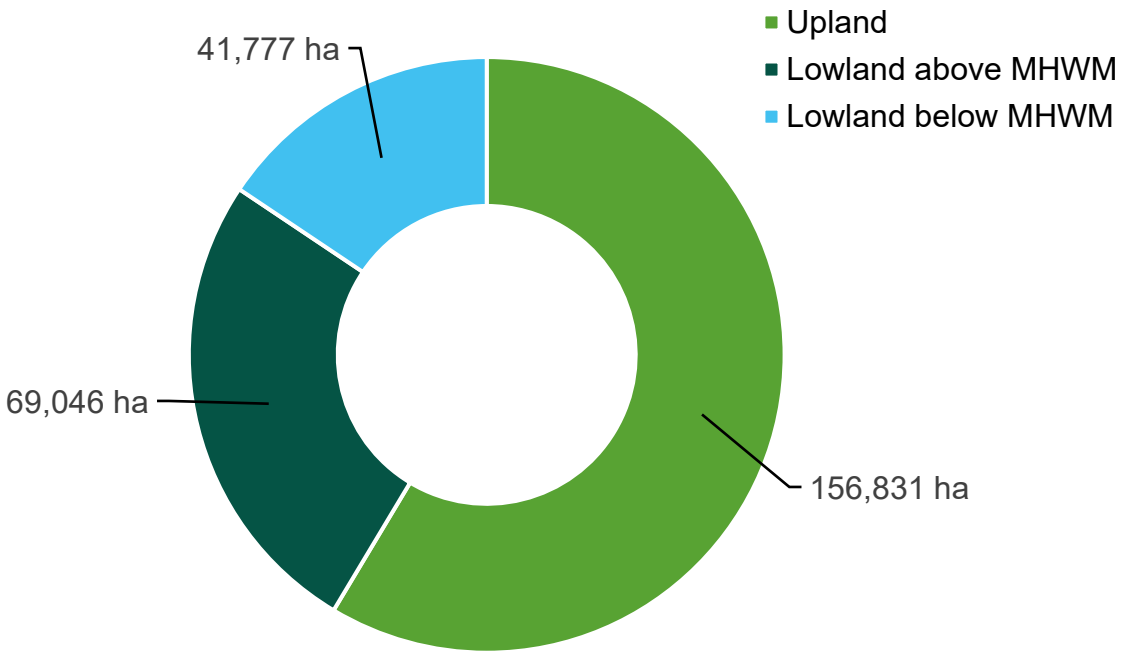


Figure 3: Extent of upland and lowland area notified as SSSI, with lowland split by land above and below MHWM.

3.2.2 Extent of coastal SSSI area

Wales has over 2,700 km of coastline (SoNaRR 2016), with a substantial portion of its intertidal zone – the area exposed by the tide between mean high water and mean low water, and which can extend as far as the LAT line - protected as SSSI. This includes key coastal habitats and geodiversity features such as estuaries, inlets, and bays.

Of the total intertidal area between MHWM and LAT, 74% is notified as SSSI, increasing to 81% between the mean high and low water marks. The total SSSI coverage within MHWM and LAT amounts to 39,763 ha, representing 18% of the entire SSSI series. SSSIs typically do not extend beyond the LAT into marine waters, except in subtidal channels within estuaries.

3.2.3 Extent of priority habitat, semi-natural habitats and SSSI area

Semi-natural habitat (31% of Wales, equating to 640,827 ha, NRW 2025) and priority habitat (17% of Wales, equating to 354,827 ha, Countryside Council for Wales (CCW) Priority Habitats of Wales 2003) form a significant part of the Welsh landscape, as shown in Fig. 4. Semi-natural habitat varies across Wales, with 74% of the upland area being semi-natural and only 9% in the lowlands (Wellbeing of Wales Indicator 43). A significant proportion of semi-natural habitat and priority habitat in Wales are notified as SSSIs. Note that some small areas within SSSIs include improved land for practical boundary reasons, artificial habitat and structures intrinsically linked with the semi-natural, and built structures such as breeding roosts for bats. Therefore, less than 100% of SSSI area is classified as semi-natural or priority habitat.

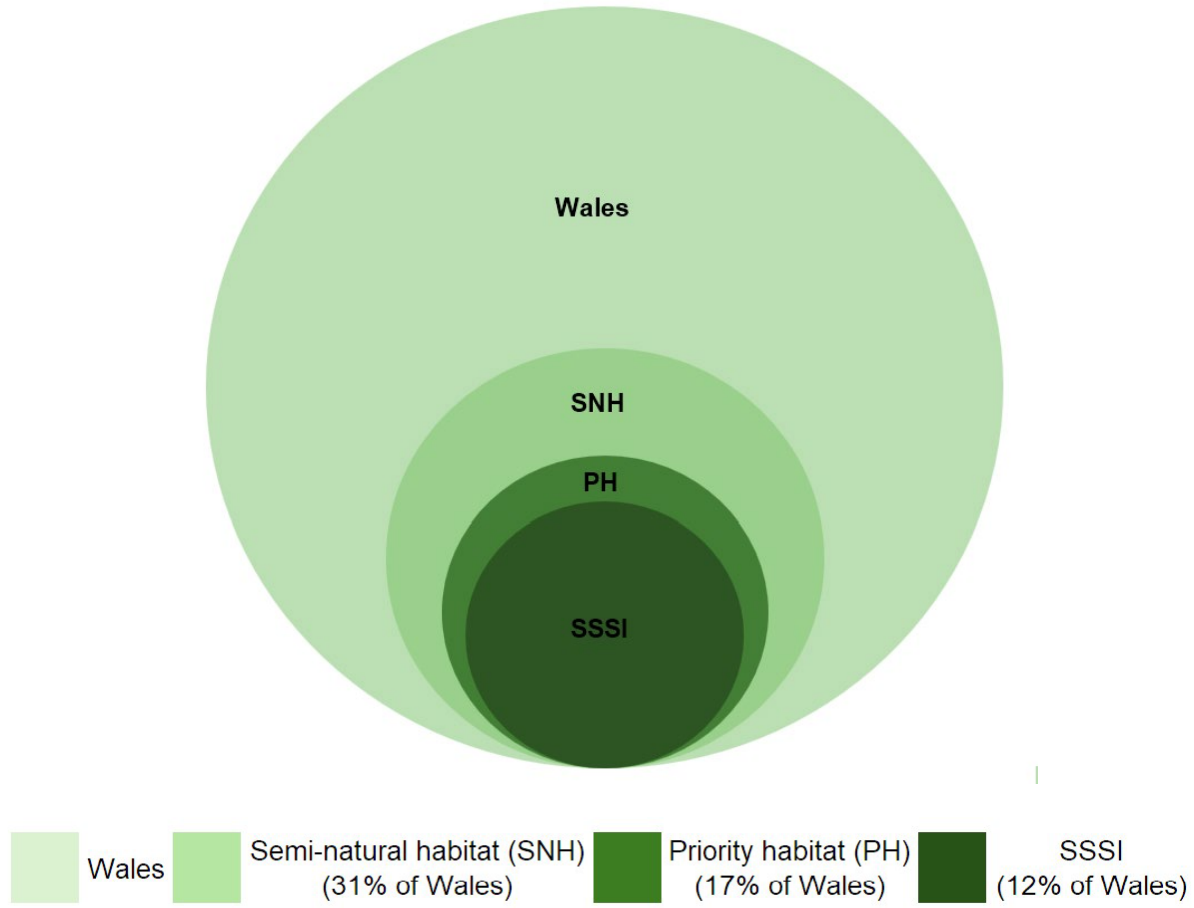


Figure 4: Proportional area chart of the extent of SSSI, priority habitat, and semi-natural habitat relative to the total area of Wales.

3.3 Variation in SSSI size

The boundaries, and therefore the extent, of SSSIs in Wales are determined for the most part by the occurrence of and ecological needs of the features they support. As a result, SSSIs in Wales vary greatly in size, reflecting the diversity of habitats, species, and geodiversity they protect.

The majority of SSSIs (74%) are between 1 and 100 ha in size, with four upland sites exceeding 10,000 ha (see Fig. 5). Smaller sites are particularly common: 41% of all SSSIs are under 10 ha, and 9% of all SSSIs are under 1 ha. The median site size is 14.3 ha, for example, Gwenaffel Dingle SSSI, notified for its semi-natural woodland habitat, covers 14 ha.

At the smallest scale, a bat nursery roost in a Pembrokeshire cottage is just 0.004 ha in size. In contrast the largest SSSI is the Berwyn SSSI, a vast moorland spanning 24,271 ha which supports heath, blanket mire, and upland bird populations.

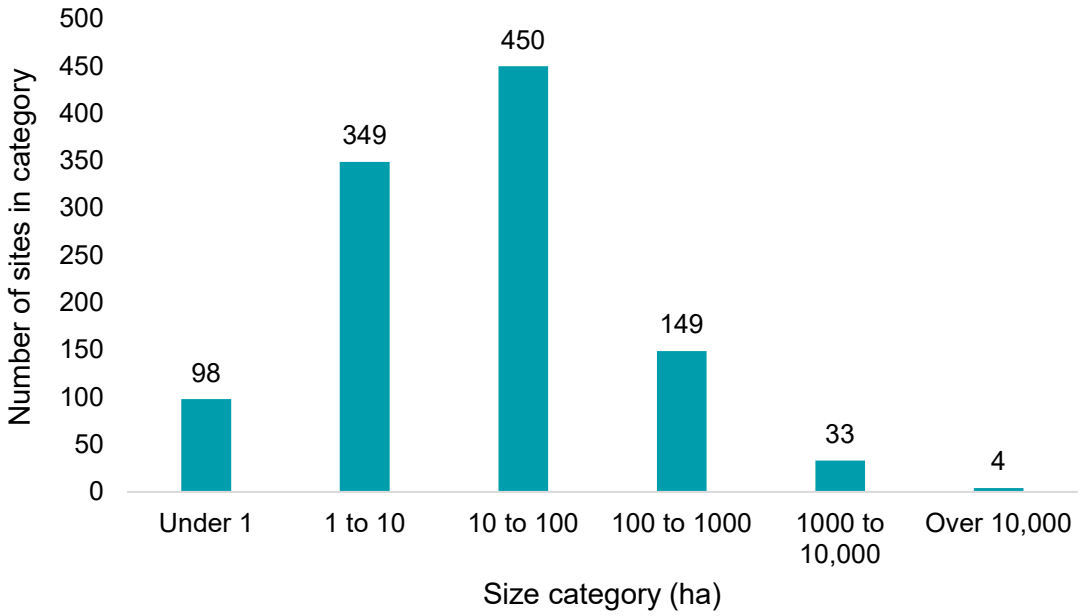


Figure 5: Size distribution of SSSIs.

3.4 Cross-border SSSIs

Consideration of the extent of SSSIs on land and coast and the size distribution data (Fig. 5) includes land notified as SSSI within Wales, up to the Wales-England border. However, there are thirteen cross-border SSSIs that extend across both Wales and England. Due to devolved notification and management responsibilities, these sites are administratively divided into separate SSSIs with the same names on either side of the border.

An example is The Dee Estuary/Aber Afon Dyfrdwy SSSI (as shown in Fig. 6) and the Severn Estuary SSSI which extend over the Wales-England border forming Wales's largest intertidal SSSIs, covering around 13,679 ha and 15,950 ha, respectively.

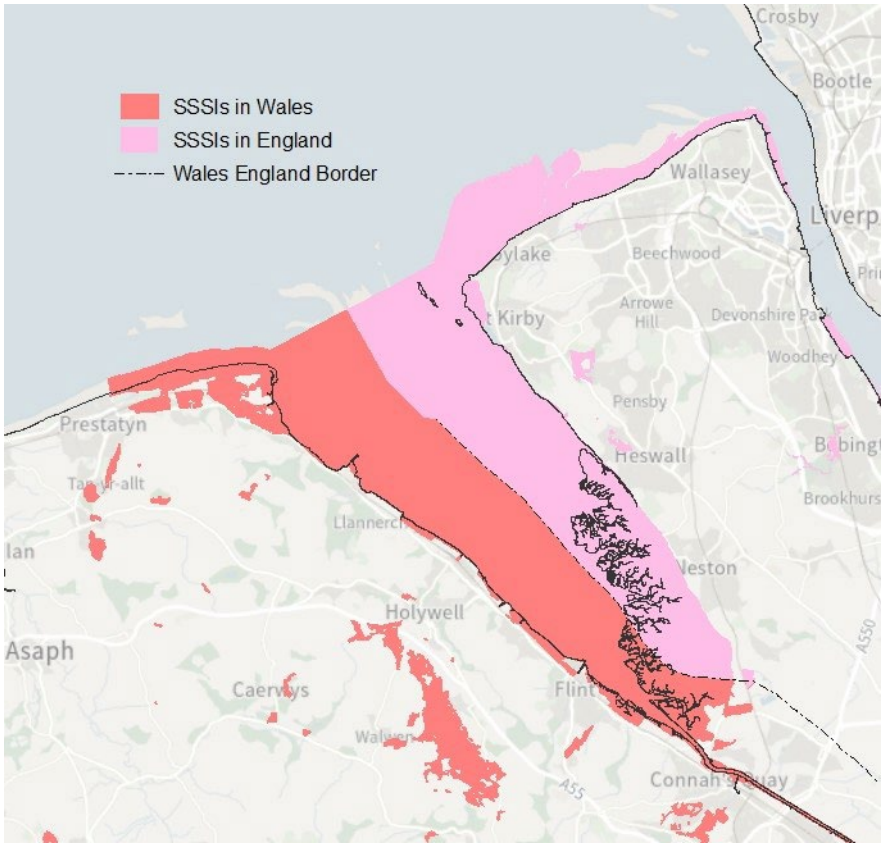


Figure 6: Map of the Dee Estuary SSSI, showing its cross-border coverage. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

Other cross-border SSSIs include the Afon Dyfrdwy (River Dee) SSSI, Black Mountains SSSI, Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses SSSI, Inner Marsh Farm SSSI, Llanymynech and Llynclys Hills SSSI, River Lugg SSSI, River Teme SSSI, River Wye (Lower Wye)/Afon Gwy (Gwy Isaf) SSSI, Spy Wood and Aldress Dingle SSSI, Trewern Brook SSSI, and Upper Wye Gorge SSSI.

3.5 Increasing SSSI extent through notification activity

Since 2010, 71 new SSSIs have been notified and six existing SSSIs have been extended through renotifications. This activity has increased the total extent of the SSSI series by 8,256 ha. Notifications before 2013 were undertaken by the NRW predecessor body CCW.

Fig. 7 illustrates the number of notifications and renotifications of SSSIs per year since 2010, with the annual increase in total notified area (ha) indicated above each column. For example, in 2016, there were two new notifications and one renotification, resulting in a total increase of 34 ha to the SSSI series. The figures of extent for 2025 are subject to change, with two SSSIs in their consultation period.

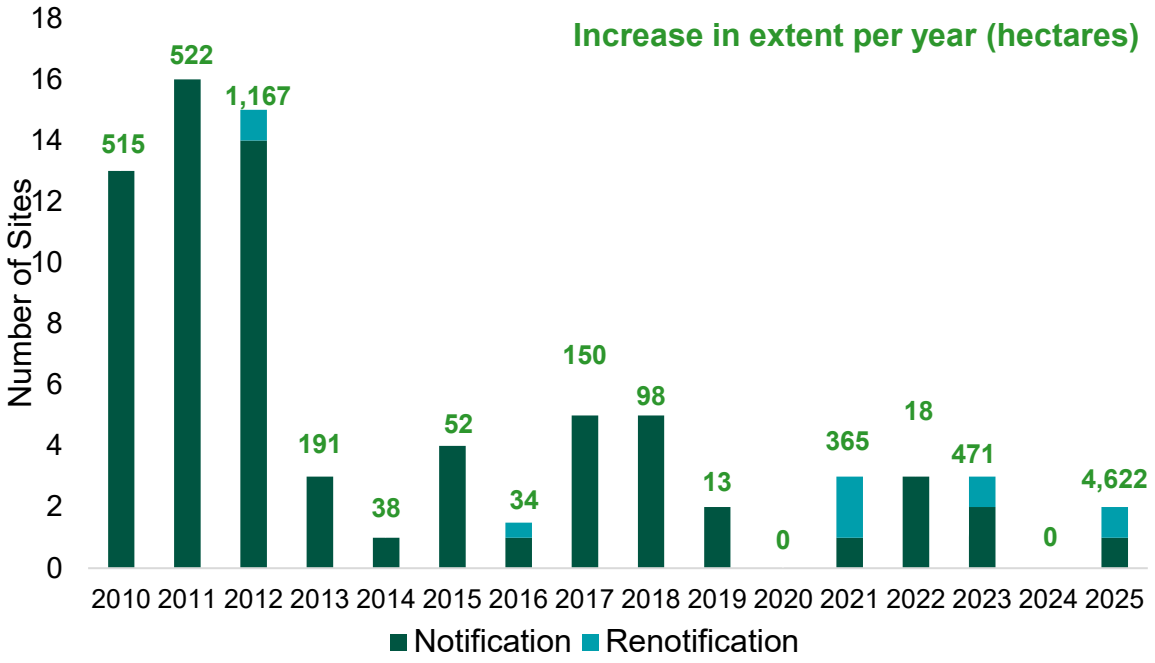


Figure 7: The number of sites and area of land notified between 2010 and 2025.

3.6 Extent of SSSIs within Areas of Search

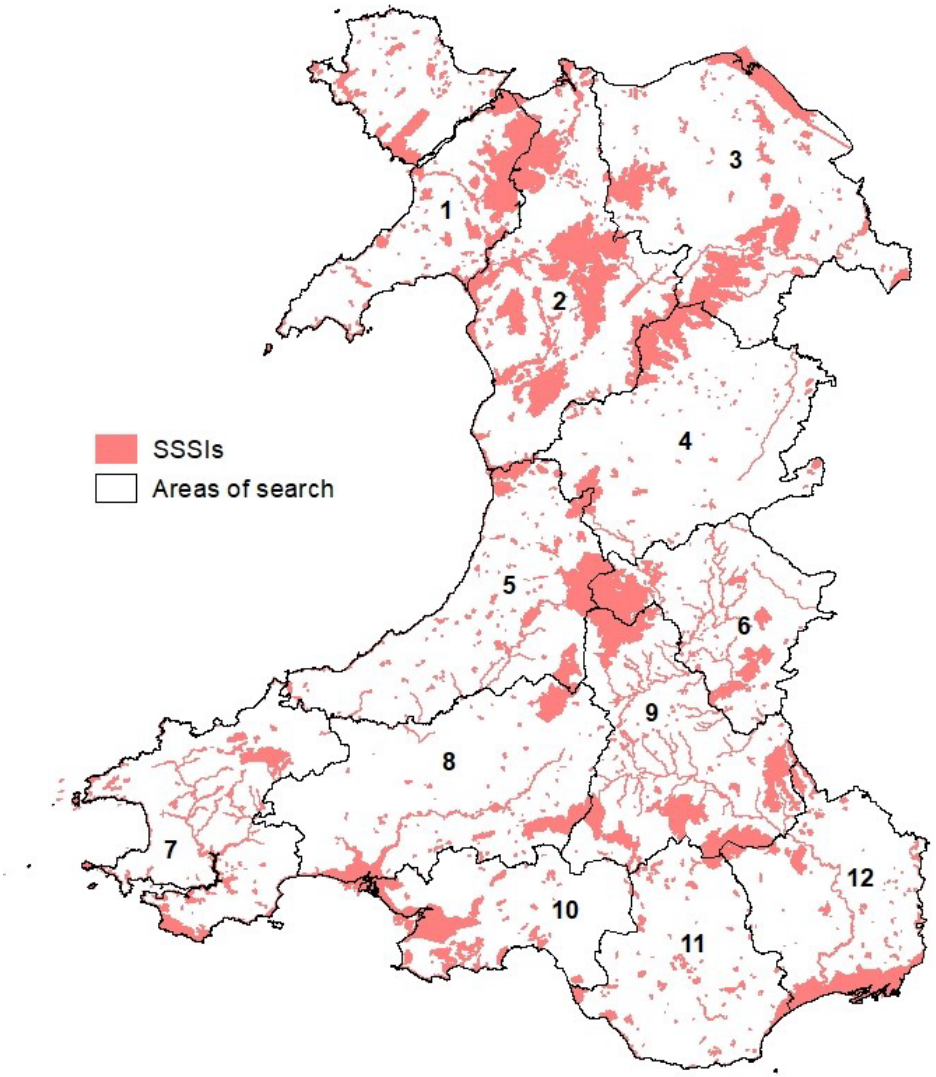
3.6.1 Terrestrial Areas of Search

For biological terrestrial sites, Wales is divided into twelve terrestrial AoS, which are used to support the selection of SSSIs (see Appendix 1). Each terrestrial AoS varies in terms of the number, size, and percentage coverage of SSSIs within its boundaries (Table 2 and Fig. 8).

Table 2: Number, total extent, and percentage coverage of SSSIs in terrestrial Areas of Search.

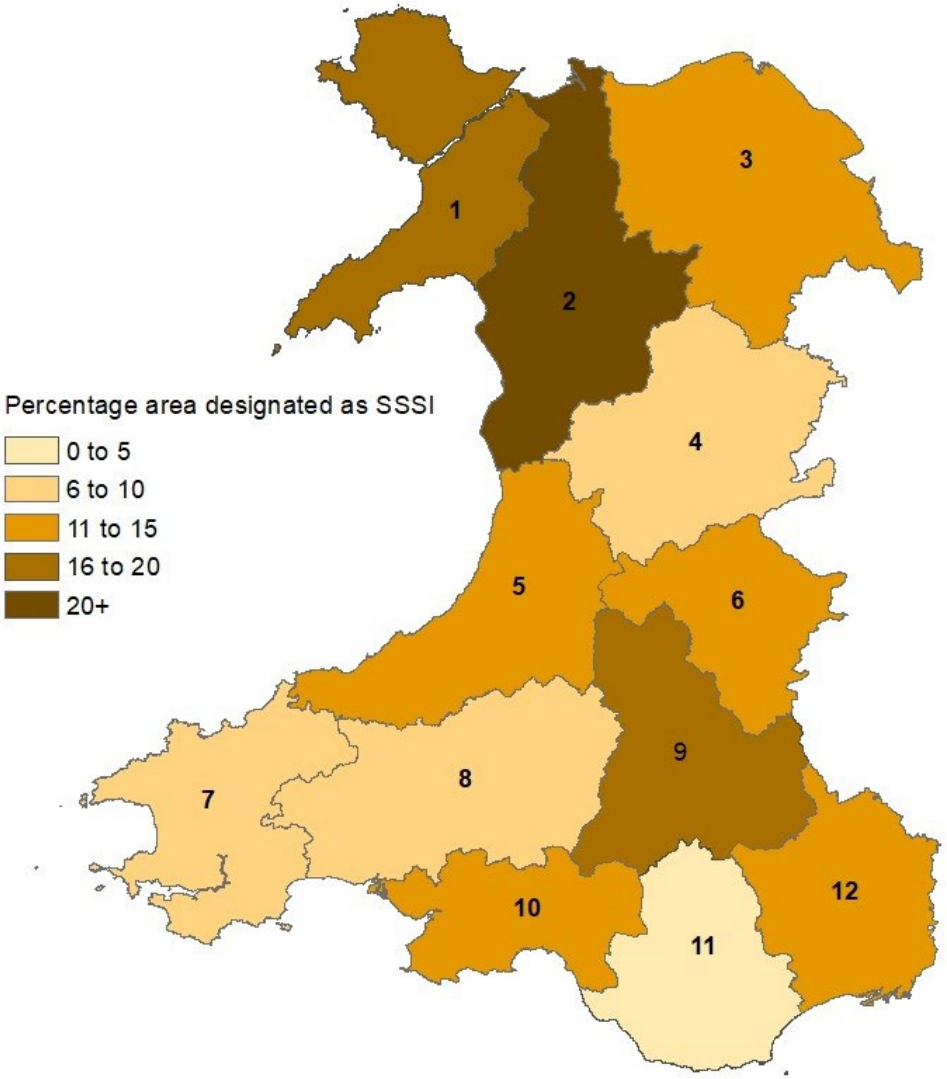
Areas of Search	Number of SSSI	Total extent of SSSI (ha)	Percentage of AoS area notified as SSSI
Brecknock	87	29,172	16%
Carmarthen and Dinefwr	94	14,647	7%
Ceredigion	101	19,546	11%
Clwyd	91	33,460	13%
East Gwynedd	120	53,585	25%
Gwent	84	17,642	12%
Mid and South Glamorgan	92	6,636	5%
Montgomeryshire	93	14,215	7%
Preseli and South Pembrokeshire	84	13,185	8%
Radnor	99	15,748	13%
West Glamorgan and Llanelli	66	15,181	13%
West Gwynedd	141	29,679	16%

Fig. 8 shows the distribution of SSSIs across each AoS and Fig. 9 illustrates the percentage area notified as SSSIs within each AoS. Some AoS have a high proportion of their land notified as SSSI, such as East Gwynedd (25%) and Clwyd (14%). In contrast, areas such as Mid and South Glamorgan have a lower percentage of notified land (5%), likely due to more urban development and land use pressures.



1. West Gwynedd, 2. East Gwynedd, 3. Clwyd, 4. Montgomeryshire, 5. Ceredigion, 6. Radnor, 7. Preseli and Pembrokeshire, 8. Carmarthen and Dinefwr, 9. Brecknock, 10. West Glamorgan and Llanelli, 11. Mid and South Glamorgan, 12. Gwent.

Figure 8: SSSI and terrestrial Areas of Search boundaries.



1. West Gwynedd, 2. East Gwynedd, 3. Clwyd, 4. Montgomeryshire, 5. Ceredigion, 6. Radnor, 7. Preseli and Pembrokeshire, 8. Carmarthen and Dinefwr, 9. Brecknock, 10. West Glamorgan and Llanelli, 11. Mid and South Glamorgan, 12. Gwent.

Figure 9: Percentage area of Areas of Search notified as SSSI. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

3.6.2 Intertidal Areas of Search

The AoS for intertidal habitats is based on a series of coastal cells around the British Isles, which are used to support the selection of SSSIs. There are four which cover the Welsh intertidal area (Fig. 10).

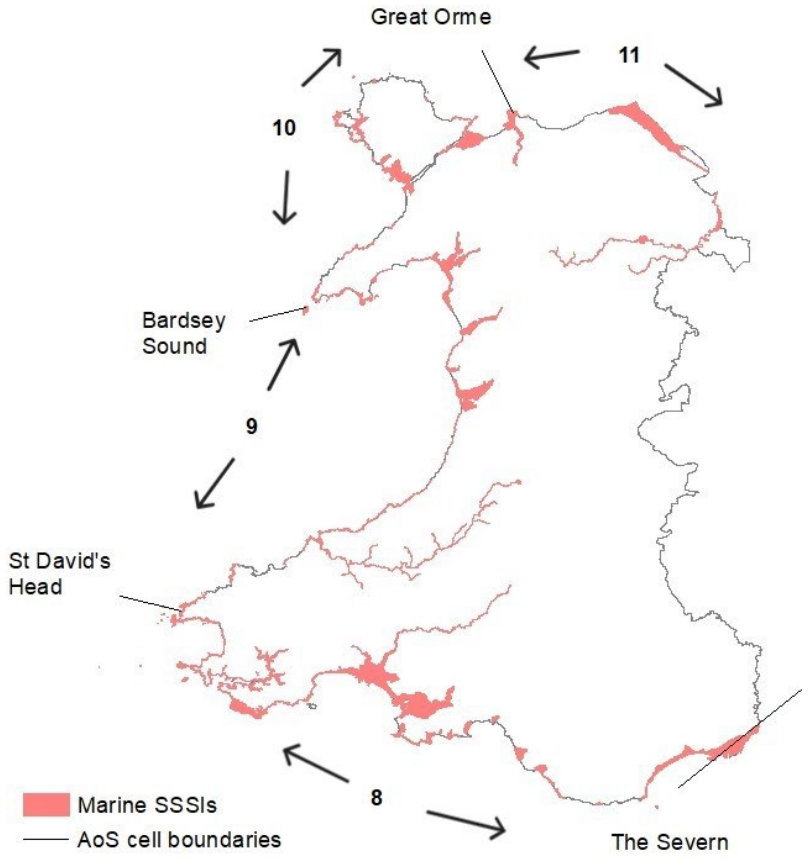
The number and extent of SSSIs (ha) in the intertidal AoS varies but all AoS have a high proportion (62% to 81%) of land notified as SSSI (Table 3).

Table 3: Number, total extent, and percentage coverage of SSSIs with marine features in intertidal Areas of Search.

Areas of Search	Number of SSSI	Total extent of SSSI (ha)	Percentage of AoS area notified as SSSI
Afon Hafren i Benmaendewi/River Severn to St. Davids Head	49	22,780	73%
Penmaendewi i Ynys Enlli/St. Davids Head to Bardsey Island	28	6,203	81%
Ynys Enlli i Ben y Gogarth/Bardsey Island to Great Ormes Head	27	6,251	62%
Pen y Gogarth i Ferin Rheged/Great Ormes Head to Solway Firth	5	5,835	73%

The number of SSSIs and the total extent (Table 3) are calculated from sites determined to be ‘marine SSSIs’ based on having either or both habitats and species which exclusively use, or make significant use, of the marine environment such as wading birds and marine fish. These sites form a marine SSSI series (illustrated in Fig. 10) that are included in the Marine Protected Area (MPA) network. A list of the marine SSSIs is provided in the data archive.

The percentage of intertidal AoS notified as SSSI is based on the overlap of these marine SSSIs with the intertidal area mapped by the NRW Phase 1 intertidal survey (2005) and excludes landward areas. As SSSI boundaries can extend beyond this dataset, such as into subtidal channels in estuaries or due to shifting low water marks, these figures should be treated as indicative.

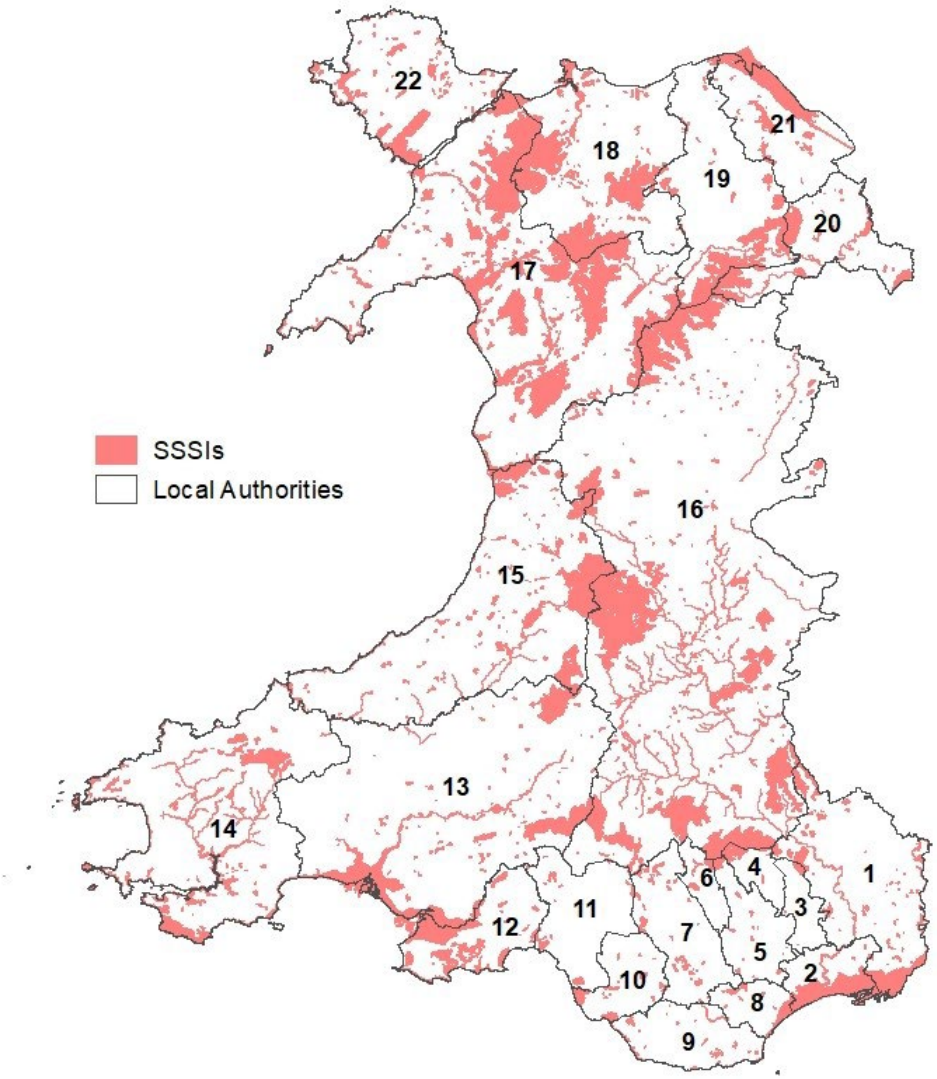


No. 8. Afon Hafren i Benmaendewi/River Severn to St. Davids Head, No. 9. Penmaendewi i Ynys Enlli/St. Davids Head to Bardsey Island, No. 10. Ynys Enlli i Ben y Gogarth/Bardsey Island to Great Ormes Head, No. 11. Pen y Gogarth i Ferin Rheged/Great Ormes Head to Solway Firth.

Figure 10: Marine SSSI and intertidal Areas of Search boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

3.7 Extent of SSSIs within Local Authorities

The number and total extent of SSSIs varies across the twenty-two local authorities in Wales. Larger local authorities tend to contain more SSSIs and a greater total SSSI extent, as seen in Powys (266 SSSIs covering 60,392 ha) and Gwynedd (156 SSSIs covering 57,961 ha). While large authorities generally have more individual SSSIs, this does not necessarily mean they have a higher proportion of land notified as SSSI. Some may have smaller fragmented sites, while others have fewer but larger SSSIs, reflecting the presence of more or less lowland and upland area. Some SSSIs, for example, the river and large upland sites, cross over multiple local authorities. Fig. 11 shows the distribution of SSSIs within local authority boundaries.



1. Monmouthshire, 2. Newport, 3. Torfaen, 4. Blaenau Gwent, 5. Caerphilly, 6. Merthyr Tydfil, 7. Rhondda Cynon Taf, 8. Cardiff, 9. Vale of Glamorgan, 10. Bridgend, 11. Neath Port Talbot, 12. Swansea, 13. Carmarthenshire, 14. Pembrokeshire, 15. Ceredigion, 16. Powys, 17. Gwynedd, 18. Conwy, 19. Denbighshire, 20. Wrexham, 21. Flintshire. 22. Isle of Anglesey.

Figure 11: SSSI and Local Authority boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

Table 4 provides a breakdown of the number of SSSIs, total SSSI area and percentage coverage in each local authority. The proportion (percentage coverage) of local authority land notified as SSSI ranges from 2% in Castell-nedd Port Talbot/ Neath Port Talbot to 35% in Casnewydd/ Newport reflecting a number of large SSSIs on the Gwent Levels and the Severn Estuary.

SSSIs are selected based on their AoS not local authority boundaries, which should be considered for reference and context when reading Table 4.

Table 4: Number, total extent, and percentage coverage of SSSIs in Local Authorities.

Local authority	Number of SSSI	Total extent of SSSI (ha)	Percentage of Local Authority areas notified as SSSI
Abertawe – Swansea	36	8,819	21%
Blaenau Gwent	4	1,322	12%
Bro Morgannwg - Vale of Glamorgan	27	941	3%
Caerdydd – Cardiff	18	1,508	10%
Caerffili – Caerphilly	16	735	3%
Casnewydd – Newport	13	7,572	35%
Castell-nedd Port Talbot - Neath Port Talbot	21	953	2%
Ceredigion	101	19,59	11%
Conwy	55	23,396	20%
Fynwy – Monmouthshire	68	8,482	10%
Gaerfyrddin – Carmarthenshire	101	20,044	8%
Gwynedd	156	57,962	22%
Merthyr Tudful - Merthyr Tydfil	8	550	5%
Pen-y-bont ar Ogwr – Bridgend	15	1,565	6%
Powys	266	60,397	12%
Rhondda Cynon Taf	21	1,330	3%
Sir Benfro – Pembrokeshire	84	13,328	8%
Sir Ddinbych – Denbighshire	35	11,235	13%
Sir y Fflint – Flintshire	28	7,695	16%
Torfaen	4	423	3%
Wrecsam – Wrexham	20	7,047	14%
Ynys Môn - Isle of Anglesey	65	7,756	10%

3.8 Extent of SSSIs within Area Statements regions

Area Statements outline the key challenges facing natural resources in a defined region, what we can all do to meet those challenges, and how we can better manage the natural resources for the benefit of future generations.

They comprise seven regions: Mid Wales, North East Wales, North West Wales, South East Wales, South Wales Central, South West Wales, and Marine. Viewed together, the Area Statements can be seen as a collaborative response to the Natural Resources Policy which sets out the key challenges and opportunities in Wales for the sustainable management of natural resources. Fig. 12 shows the distribution of SSSIs within the Area Statement region boundaries. Table 5 provides a breakdown of the number of SSSIs, total SSSI area and percentage coverage in each Area Statement region. The Mid Wales Area Statement has the highest number of SSSIs (361 SSSIs), while the North West Area Statement has the greatest proportion of land notified as SSSI (20%). The size of Area Statement regions themselves vary in size, in order the smallest is South Wales Central (128,060 ha), followed by South East, North East, North West, South West and the largest being Mid Wales (700,129 ha).

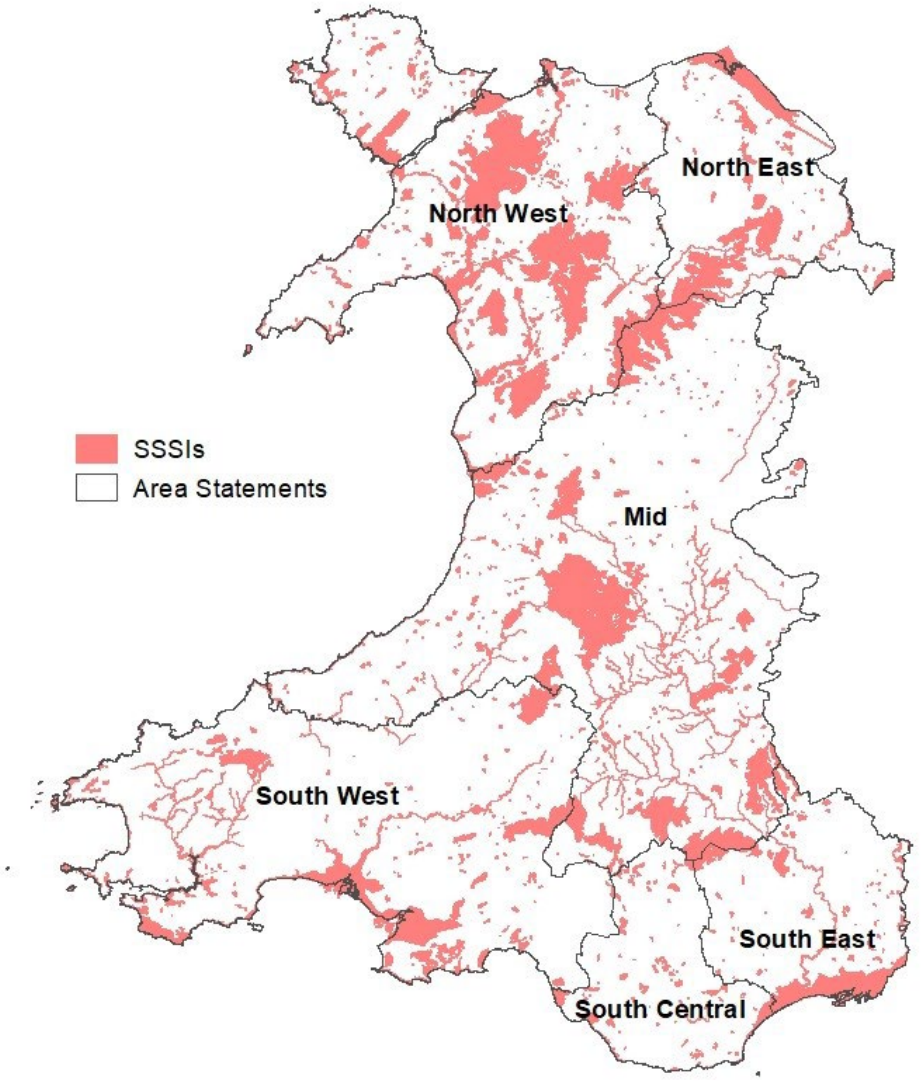


Figure 12: SSSI and Area Statement region boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

SSSIs are selected based on their AoS not Area Statement boundaries, which should be considered for reference and context when reading Table 5.

Table 5: Number, total extent, and percentage coverage of SSSIs in Area Statements.

Area Statement	Number of SSSI	Total extent of SSSI (ha)	Percentage of Area Statement region notified as SSSI
North West Wales	272	89,503	20%
North East Wales	71	25,968	14%
Mid Wales	361	79,898	11%
South East Wales	95	18,566	11%
South West Wales	236	43,091	9%
South Wales Central	83	5,920	5%

3.9 Relationship with other designations

3.9.1 Special Areas of Conservation, Special Protection Areas and Ramsar sites

Many SSSIs in Wales are also recognised as being of international importance and are additionally designated as Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and or Ramsar sites. SACs are designated to safeguard the best examples of habitats and species considered rare or threatened in Europe as a whole. Originally designated under the EU Habitats Directive, they are now protected under the Conservation of Habitats and Species Regulations 2017 (as amended). SPAs protect important habitats for rare, vulnerable, and migratory bird species, and were originally classified under EU Birds Directive. Ramsar sites are wetlands of global importance, recognised under the Convention on Wetlands, known as the Ramsar Convention, for their role in supporting biodiversity, water regulation, and climate resilience.

In Wales, there are 95 SACs, 21 SPAs, and 10 Ramsar sites designated within the marine, terrestrial and freshwater environment. Almost all of the terrestrial and intertidal based sites are underpinned by SSSIs.

A significant proportion of the SSSI series (71% by area*) is recognised as having international importance through these overlapping designations (Fig. 13). The extent of this overlap is as follows:

- 288 SSSIs, covering a total of 166,918 ha, underpin SACs
- 79 SSSIs, covering a total of 107,470 ha, underpin SPAs
- 26 SSSIs, covering a total of 26,970 ha, underpin Ramsar sites

Some of these international sites are underpinned by multiple SSSIs. For example, the Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC is underpinned by twenty-two individual SSSIs. Some sites have more than one protected site designation, for example, The Dee Estuary / Aber Afon Dyfrdwy SSSI and Severn Estuary SSSI are notified as SSSI, SAC, SPA and Ramsar.

*calculated in 2021, as no recent boundary changes have affected the proportions. More detailed figures on the number and amount of SSSIs underpinning these designations were produced in February 2025.

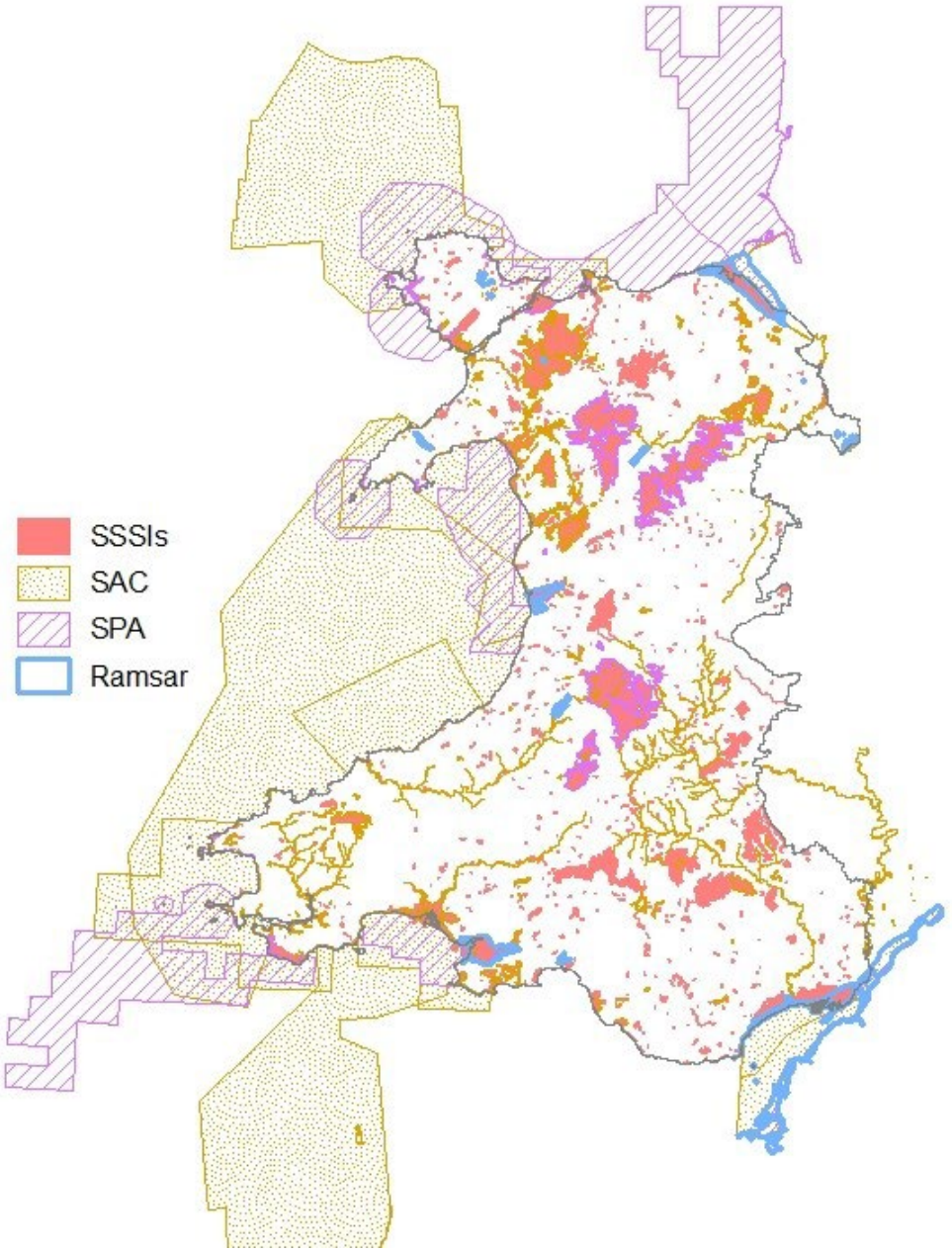


Figure 13: SSSI, SAC, SPA and Ramsar boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

3.9.2 National Nature Reserves

National Nature Reserves (NNRs) recognise some of Wales' most important natural habitats, wildlife, and Earth science features. NNRs are managed primarily for nature conservation and scientific study, while also providing opportunities for public enjoyment and education. NRW selects and declares NNRs in Wales under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended).

There are 76 NNRs in Wales, covering a total extent of 26,418 ha. They range in size from the smallest, Dan-Yr-Ogof NNR at 0.51 ha to Y Berwyn NNR at 7,920 ha. The Fenn's, Whixall and Bettisfield Mosses NNR is cross-border with England.

Of the land recognised as NNRs, 96.5% is also notified as SSSI, with all but one NNR being fully or partially covered by SSSI notification (Fig. 14).

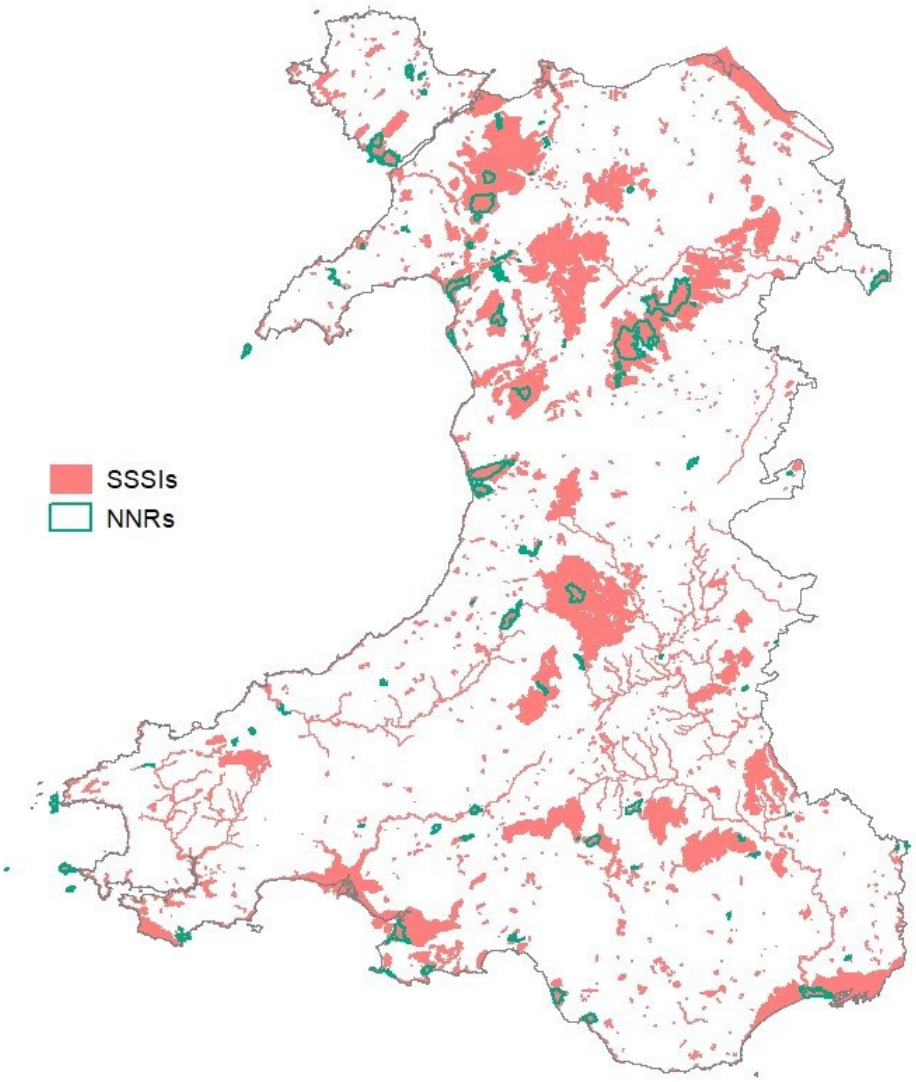


Figure 14: SSSI and NNR boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

3.9.3 Marine Conservation Zones

Marine Nature Reserves (MNR) were established under the Wildlife and Countryside Act 1981 (as amended). Upon implementation of the Marine and Coastal Access Act 2009, all existing MNRs in the UK were converted to Marine Conservation Zones (MCZ).

In Wales, Skomer MCZ, designated in 2014, is currently the only MCZ. Before this, Skomer had been Wales' sole MNR for 24 years.

Skomer MCZ protects the seas around Skomer Island and the Marloes Peninsula in Pembrokeshire, safeguarding species and habitats of natural and international importance. Its intertidal area is underpinned by Skomer Island and Middleholm SSSI

(all land above LAT, liable to change), as well as De Porth Sain Ffraid / St Bride's Bay South SSSI and Dale and South Marloes Coast SSSI along the coastline (Fig. 15).

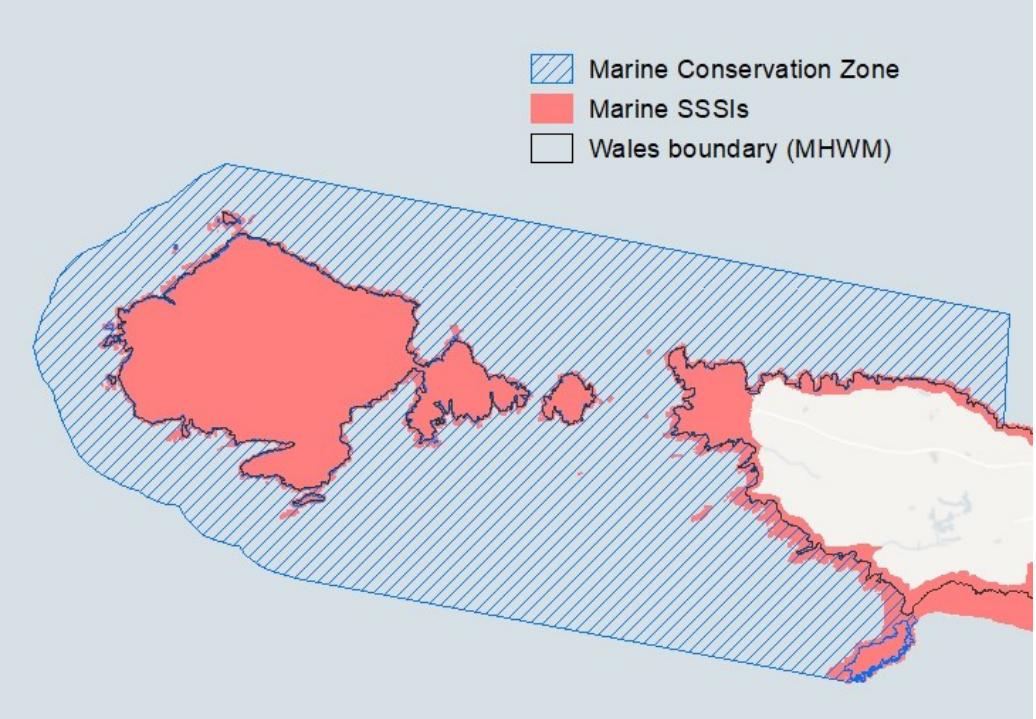


Figure 15: Marine SSSIs and Skomer MCZ. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

3.9.4 National Parks and National Landscapes

National Parks, and National Landscapes (also known as Areas of Outstanding Natural Beauty), are designated landscapes Category V Protected Areas. National Parks are large, protected areas designated for the conservation and enhancement of natural beauty, wildlife and cultural heritage, and opportunities for public enjoyment, while National Landscapes are designated primarily to conserve and enhance natural beauty. National Parks are designated under the National Parks and Access to the Countryside Act 1949. National Landscapes are designated under the Countryside and Rights of Way Act 2000.

Wales currently has three National Parks, each distinct in character, covering an area of 4,141 km^2 and representing approximately 20% of the land area. Eryri National Park was first designated in 1951, followed by Pembrokeshire Coast National Park in 1952 and Bannau Brycheiniog National Park in 1957 (Valuing Wales National Parks 2013).

There are five National Landscapes in Wales, collectively covering approximately 5% of the country's land area (National Landscapes 2025). These are geographically distributed across Wales, with no overlap with National Parks. The Gower National Landscape, designated in 1956, was the first National Landscape to be designated and the Wye Valley National Landscape is transboundary with a third in Wales and two-thirds in England.

Thirty-eight percent of the total extent of the SSSI series is within National Parks, and 9% is within National Landscapes (Fig. 16). A quarter (25%) of the extent of the National Parks in Wales is notified as SSSI. Table 6 provides a breakdown of the number, total extent, and percentage coverage of SSSIs in each National Landscape and National Park.

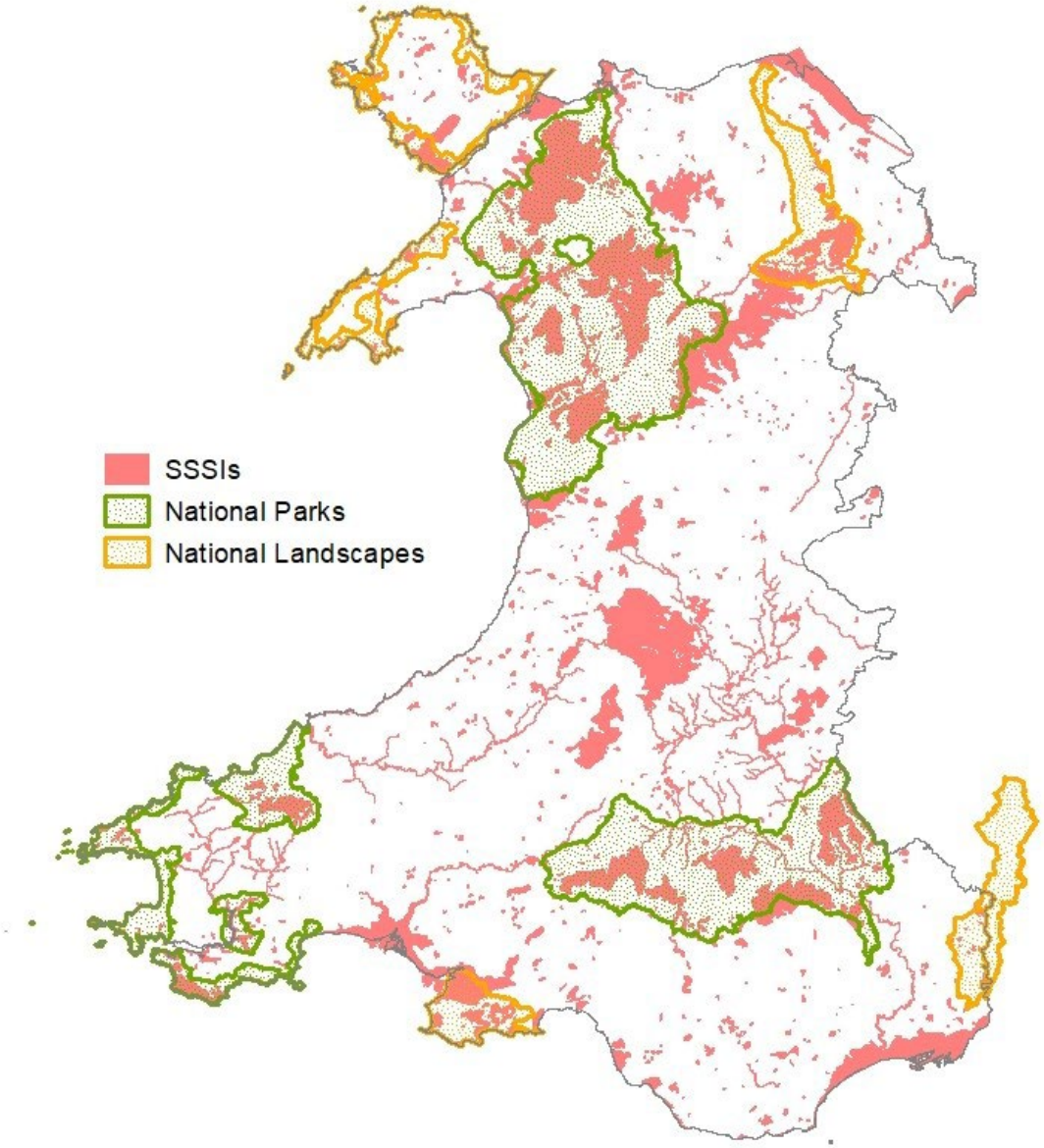


Figure 16: SSSI, National Park, and National Landscape boundaries. © Crown copyright and database rights 2025 Ordnance Survey AC0000849444.

Table 6: Number, total extent, and percentage coverage of SSSI in National Landscapes and National Parks.

National Landscapes and National Parks	Number of SSSIs	Total extent of SSSI (ha)	Percentage of National Landscapes and National Parks sites notified as SSSI
Arfordir Penfro / Pembrokeshire Coast National Park	62	11,370	19%
Bannau Brycheiniog / Brecon Beacons National Park	81	28,506	21%
Eryri / Snowdonia National Park	116	62,618	29%
Clwydian Range and Dee Valley National Landscape	24	9,251	24%
Gower National Landscape	27	7,475	40%
Llŷn AONB	22	2,183	14%
Wye Valley (Wales part) National Landscape	22	651	6%
Ynys Mon/Anglesey National Landscape	32	4,865	22%
Total National Landscapes	127	24,425	19%
Total National Parks	259	102,494	25%

4. Diversity and Representativeness

4.1 Site type

SSSIs are notified based on their special interest and fall into three categories: biological, geological, or mixed. Fig. 17 provides the percentage of each site type in the SSSI series.

- Biological SSSIs, notified for their habitat and species interest, account for 787 SSSIs.
- Geological SSSIs, notified for their geological or geomorphological (Earth science) interest, account for 179 SSSIs.
- Mixed SSSIs, notified for both biological and Earth science features of interest, account for 117 SSSIs.

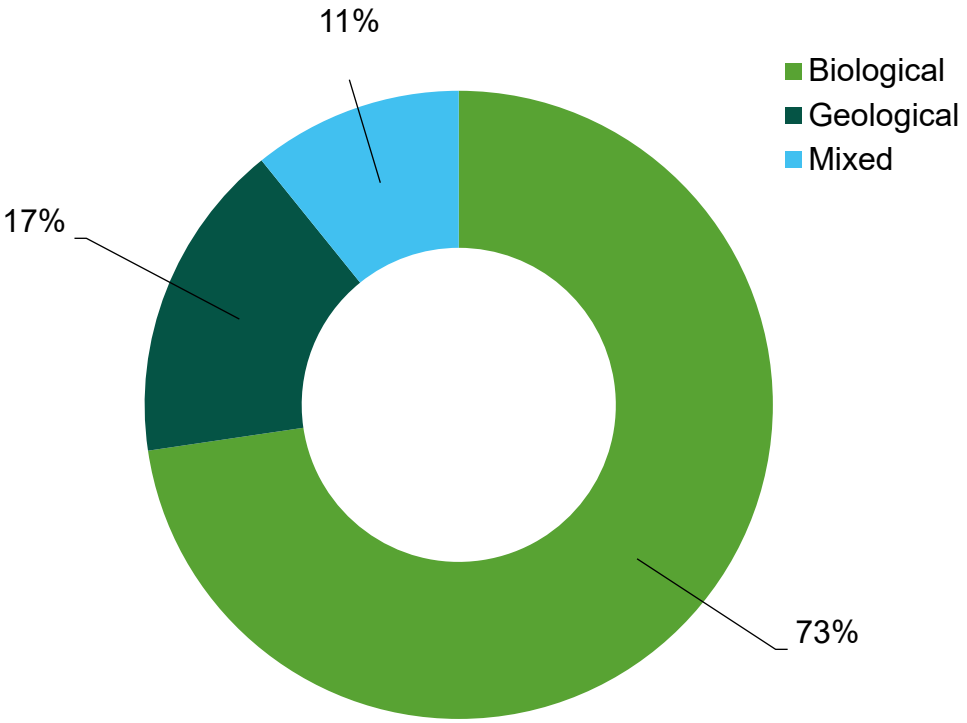


Figure 17: Percentage of SSSIs by site type.

4.2 Feature representativeness overview

Wales has a wide representativeness of species across a broad range of taxonomic groups with estimates varying from 25,000 to 50,000 different species of animals, plants, and other organisms (SoNaRR 2016). Within SSSIs in Wales, a total of 649 different features are notified, including species (breeding, non-breeding, and hibernating counted separately), species assemblages, habitats, and Earth science features. The reason for the selection of these features range from the need to select

rare and endangered habitats and species to representative samples of widespread and common types. A complete list of these features is provided in the data archive.

Across Wales, 4,134 notified feature occurrences exist within notified SSSIs, reflecting the wide variety and presence of habitats, species, and Earth science interests.

Feature classification

NRW categorises features into six broad feature types:

- terrestrial and freshwater habitats
- plant (alga, fungi, liverworts, mosses, stoneworts, and vascular plants) species
- animal species
- species assemblages (a group of plants or animals that occur together at a site. Individually they may not meet the SSSI Guidelines but together they form a feature of special interest)
- marine intertidal habitats (some marine features are categorised under other feature type groups, such as saltmarsh under terrestrial habitats and seagrass under plant species – due to variations in recording practices)
- Earth science (geology and geomorphology)

Fig. 18 illustrates the range of notified features by feature type group across all SSSIs, as well as the percentage of SSSIs with features from each group. Terrestrial and freshwater habitats represent the most frequently notified features, present in 793 SSSIs, which accounts for 73% of all SSSIs and 88% of biological and mixed-type SSSIs. In comparison, animal species features are notified in 27% of biological and mixed-type SSSIs, plant species in 29%, and species assemblages in 23%.

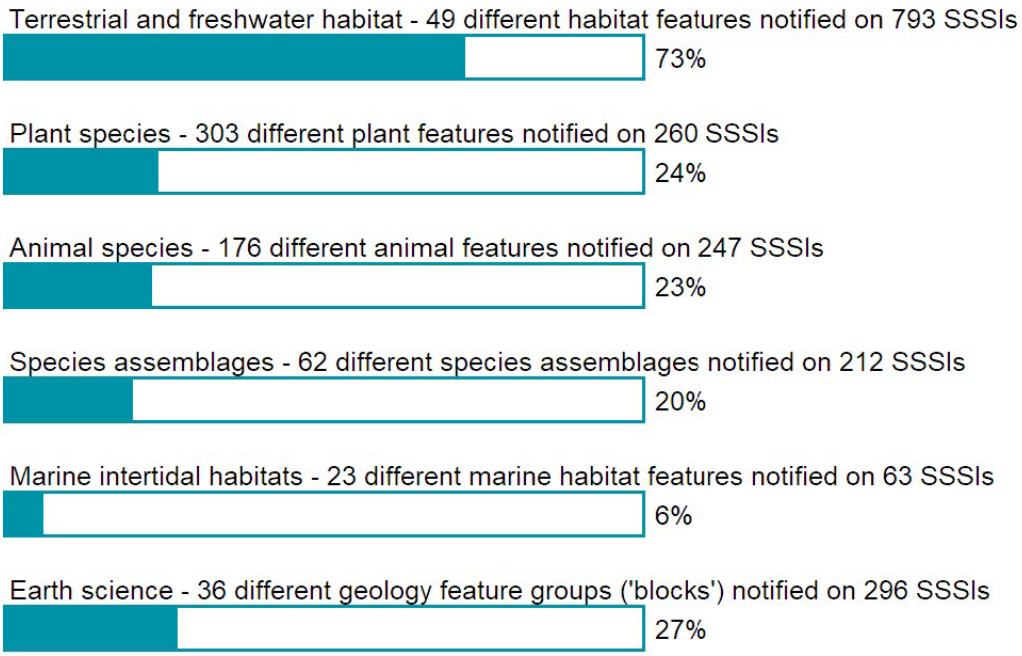


Figure 18: Percentage of SSSIs with broad feature type grouping, and the number of different features and occurrences on SSSIs.

4.3 Species feature representativeness

4.3.1 Flora

Three-hundred and three distinct flora features have been notified across 260 SSSIs, with 556 occurrences. These features represent alga, fungi, lichen, liverworts, mosses, stoneworts, and vascular plants.

Selection criteria for flora

SSSIs were selected based on the SSSI Guidelines that applied at the time of notification or subsequent renotification. The current SSSI Guideline chapters in use for flora are:

- vascular plants (chapter 11 2021)
- bryophytes (mosses and liverworts) (chapter 12 2018)
- lichens and associated microfungi (chapter 13 2018)
- fungi (non-lichenised) (chapter 14 2018)
- charophytes (stonewort) (chapter 15 2020)

Some marine flora features (mostly algae) are selected using the marine intertidal and shallow subtidal habitats (chapter 1b 2019). Other marine flora features have been classified under marine 'habitats' and as such are reported in section 4.4.2.

Selection is often driven by the threat status and rarity of species, using Great Britain and country-level Red Lists to identify priority taxa for SSSI protection.

Representation and distribution

A significant proportion of SSSIs are notified, either wholly or in part, for their vascular plant interest (228 SSSIs, 21%), which includes clubmoss, ferns, quillwort, and all vascular plants (see Table 7). The most frequently notified plant species is floating water-plantain *Luronium natans* (on 15 SSSIs). Some notified vascular plants are extremely rare, such as the Snowdon lily *Gagea serotina*, which only occurs in Wales in the British Isles, and the Llangattock hawkweed *Hieracium asteridiophyllum* and Ley's whitebeam *Sorbus leyana*, rare endemic species confined to the cliffs in the Bannau Brycheiniog.

Lichens are notified on 27 SSSIs (2.5%), with golden hair-lichen *Teloschistes flavicans* being the most frequent (nine SSSIs). This species is particularly sensitive to sulphur dioxide, which was formerly widespread in the UK and is now mainly found only in south west England and Wales. Coedwig Dyfi SSSI contains the richest concentration of notified lichen species on a SSSI, with thirteen distinct lichen species along with two lichen assemblages.

Mosses are notified on 19 SSSIs (1.8%) and liverworts (notified in 18 SSSIs, 1.7%). For example, the recently notified Gweunydd Nant y Twyn SSSI is the only site notified for important populations of the rare and declining liverworts, bog pawwort *Barbilophozia kunzeana* and marsh flapwort *Biantheridion undulifolium*.

Fungi, stoneworts, and other algae are recognised as notified features on only a few SSSIs (Table 7). For example, a diverse assemblage of grassland fungi, including at least 37 species of waxcaps and important populations of five species of globally threatened grassland fungi are notified at Mynydd Epynt SSSI.

Table 7. Breakdown of flora feature groups, showing the number of features, their occurrence across SSSIs, and overall percentage of sites supporting them.

Broad species groups	No. of unique features in group	No. of SSSIs where these features occur	Percentage of SSSIs with notified features
Alga	1	1	0.1%
Fungi	10	6	0.6%
Lichen	41	27	2.5%
Liverwort	9	18	1.7%
Moss	13	19	1.8%
Stonewort	2	2	0.2%
Vascular plant	227	228	21.1%

The AoS is recorded for all flora species and provides an insight into the geographical distribution of notified features across Wales (Table 8). Some SSSIs, such as rivers and large upland sites span multiple AoS, in these instances the features are counted in each AoS.

AoS are used to support the selection of sites for vascular plants, bryophytes, lichens, and non-lichenised fungi. For example, a Red Listed moss species may be notified within an AoS if it is the only viable population of the species in the particular AoS (chapter 12 Bryophytes, section 3.3.1.4).

Notified vascular plant features are present across all AoS, with the highest representation in East Gwynedd (86 features), Brecknock (48) and West Gwynedd (57). Notified lichen features show significant regional variation, with Montgomeryshire (21 features) and Preseli and South Pembrokeshire (10) supporting the most occurrences. Notified moss and liverwort features are most prominent in East Gwynedd and Ceredigion. Fungi have limited representation as notified SSSI features, with only a handful of occurrences, primarily in Brecknock (6 features) and Mid and South Glamorgan (3).

There are only two notified stonewort species features, Starry Stonewort *Nitellopsis obtusa*, within Llynnoedd Cosmeston / Cosmeston Lakes SSSI, Mid and South Glamorgan and in Eryri SSSI slender stonewort *Nitella gracilis* across two AoS, East Gwynedd and West Gwynedd.

Table 8: Number of notified flora features by broad species group recorded across terrestrial Areas of Search.

Areas of Search	Alga	Fungi	Lichen	Liverwort	Moss	Stonewort	Vascular plant
Brecknock	0	11	8	0	5	0	69
Carmarthen and Dinefwr	0	1	0	2	3	0	26
Ceredigion	0	0	5	2	6	0	37
Clwyd	0	0	0	1	0	0	33
East Gwynedd	0	1	5	4	9	1	100
Gwent	0	6	1	0	2	0	43
Mid and South Glamorgan	0	10	0	5	1	1	52
Montgomeryshire	0	0	21	0	2	0	36
Preseli and South Pembrokeshire	1	0	10	3	2	0	32
Radnor	0	0	6	0	2	0	25
West Glamorgan and Llanelli	0	2	0	1	0	0	12
West Gwynedd	0	2	5	2	4	1	71

4.3.2 Fauna

One-hundred and seventy-six distinct animal features have been notified across 247 SSSIs, with 627 occurrences. These features represent birds, fish, invertebrates, mammals, reptiles, and amphibians.

Selection criteria for fauna

SSSIs were selected based on the SSSI Guidelines that applied at the time of notification or subsequent renotification. The current SSSI Guideline chapters in use for fauna are:

- mammals (chapter 16 2019)
- birds (chapter 17 2020)
- reptiles and amphibians (chapter 18 2022)
- freshwater fish (chapter 19 2018)
- estuarine fish (chapter 19a 2022)
- invertebrates (chapter 20 2019)

Some marine animal features (such as invertebrates and fish) are selected using the marine intertidal and shallow subtidal habitats (chapter 1b 2019). Other marine animal features have been classified under marine 'habitats' and as such are reported in section 4.4.2.

Selection is typically influenced by factors such as the rarity of the species, its population size, and key habitats, including important breeding areas (e.g., significant bird colonies, bat breeding roosts and hibernation sites, and fish spawning grounds).

Representation and distribution

Table 9 provides an overview of the broad species groups, with the number of unique features within each group, and the number of occurrences and percentage of SSSIs with the notified animal species. Some bird and bat features are recorded separately as breeding or non-breeding such as curlew, chough, and redshank or hibernating and breeding roosts for bats.

Invertebrates are notified on 113 SSSIs (10.4%). The main contributions are Lepidoptera, Coleoptera and Odonata, and to a lesser extent Mollusca, Diptera and Hymenoptera. Marsh fritillary *Euphydryas aurinia*, a butterfly of lowland rhos pastures, is the most frequently notified invertebrate feature, on 33 SSSIs, notifications to date recognising the urgency to protect the habitat of this fast-declining species.

Of the notified marine invertebrate species categorised under animal feature type, many are only found in a few sites, for example the amphipods *Echinogammarus incertae sedis planicruru* (on one SSSI), *Gammarus chevreuxi* (two SSSIs), the polychaetes *Ophelia bicornis* (one SSSI). The Severn Estuary SSSI is the only location for two species, the amphipod *Gammarus insensibiliis* and the lagoon sea slug *Tenellia adspersa*. Ramsey / Ynys Dewi SSSI is the only location for the sponge *Thymosia guernei.*

Mammals are notified on 105 SSSIs (9.7%). Of those SSSIs, 59 are selected for bats, with most accommodating significant breeding roosts and hibernacula of two rare species, the greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros*. Thirty-nine SSSIs, mostly rivers, are notified for otter *Lutra lutra*. Other mammals, including water vole *Arvicola amphibius,* Skomer vole *Clethrionomys glareolus skomerensis*, dormouse *Muscardinus avellanarius*, harvest mouse *Micromys minutus,* and grey seal *Halichoerus grypus,* are notified as features in relatively low numbers.

Birds are notified on 74 SSSIs (6.8%), most of which support important breeding and wintering populations. Many of the largest SSSIs in Wales are selected for bird interest (as well as habitat and other features) and are also classified as SPAs. Prominent amongst these on the coast are estuaries, including Dee Estuary / Aber Afon Dyfrdwy SSSI, Burry Inlet and Loughor Estuary SSSI, and Severn Estuary SSSI which provide significant habitat for wildfowl and waders. Several of the islands such as Skokholm SSSI, Grassholm / Ynys Gwales SSSI, and Skomer Island and Middleholm SSSI hold important sea-bird colonies with strong breeding populations of one or more species for example gannet *Morus bassanus* and Manx shearwater *Puffinus puffinus*. Several lowland lakes and wetlands are notified for their bird interest such as Gwlyptiroedd Casnewydd / Newport Wetlands SSSI, as well as upland areas and woodland habitats.

Fish species are notified in 3% of SSSIs (32 sites). One species, Gwyniad *Coregonus lavaretus*, is an extremely rare species found on one lake SSSI.

Only sand lizard *Lacerta agilis* and great crested newt *Triturus cristatus* are independently notified reptile and amphibian features on nine SSSIs. However, other reptile and amphibian species are notified under reptile and amphibian assemblages.

Table 9: Breakdown of animal feature groups, showing the number of features, their occurrence across SSSIs, and overall percentage of sites supporting them. The count in brackets provides the number of individual species.

Broad species group	No. of unique features in the group	No. of SSSIs where these features occur	% of SSSIs with notified features in this group
Birds	60 (55)	74	6.8%
Fish	10	32	2%
Invertebrates	90	113	10.4%
Mammals	14 (10)	105	9.7%
Reptiles and amphibians	2	9	0.8%

The AoS is recorded for all animal species and provides an insight into the geographical distribution of notified species features across Wales (Table 10). Some SSSIs, such as rivers and large upland sites span across multiple AoS, in these instances the features are counted in each AoS.

AoS are used to support the selection of sites for birds, mammals, and reptiles and amphibians. For example, up to two sites per AoS should be considered for notification for water voles (chapter 16 Mammals, section 4.4.3).

Birds are recognised as notified features on SSSIs across all AoS, with the highest representation in Preseli and South Pembrokeshire (36 features) and West Gwynedd (32), as well as other coastal AoS. Fish are most common as notified features on SSSI in Brecknock, Gwent and Radnor, and have no notified features in Mid & South Glamorgan and West Glamorgan and Llanelli. Mammals are also present as notified features in every AoS, with the highest concentrations in Preseli and South Pembrokeshire (34 features) and East Gwynedd (24). Reptiles and amphibians have fewer occurrences as notified features, only occurring on nine SSSIs across four AoS (excluding assemblages).

Table 10: Number of notified animal features by broad species group recorded across each terrestrial Areas of Search.

Areas of Search	Birds	Fish	Invertebrates	Mammals	Reptiles and amphibians
Brecknock	2	35	9	13	0
Carmarthen and Dinefwr	9	11	16	5	0
Ceredigion	17	12	34	8	0
Clwyd	26	5	16	11	5
East Gwynedd	20	3	23	24	2
Gwent	20	30	41	11	0
Mid and South Glamorgan	8	0	22	3	0
Montgomeryshire	1	11	3	11	1
Preseli and South Pembrokeshire	37	19	24	36	0
Radnor	2	29	13	14	0
West Glamorgan and Llanelli	20	0	15	3	0
West Gwynedd	33	4	21	5	1

4.3.3 Species assemblages

Sixty-two distinct species assemblages have been notified across 212 SSSIs, with 399 occurrences. Species assemblage features are present in the following groups: birds, bryophytes, stonewort, fungi, invertebrates, lichens and associated microfungi, mammals, reptiles and amphibians, slime moulds and vascular plants.

Selection criteria for assemblages

SSSIs were selected based on the SSSI Guidelines that applied at the time of notification or subsequent renotification. The current SSSI Guideline chapters in use for selecting species assemblages are:

- vascular plants (chapter 11 2021) – the revised chapter shifts the selection emphasis from an assemblage-based approach to a species-by-species focus. However, it recognises that there are some instances where biogeographical significant assemblages occur, vascular plants can be selected as features in their own right.
- bryophytes – mosses and liverworts (chapter 12 2018)
- lichens and associated microfungi (chapter 13 2018)
- fungi (non-lichenised) (chapter 14 2018)
- charophytes (stoneworts) (chapter 15 2020)
- mammals (chapter 16 2019)
- birds (chapter 17 2020)
- reptiles and amphibians (chapter 18 2022)
- invertebrates (chapter 20 2019)

Selection is often driven by the total number or score of individual specified species (components) comprising an assemblage. They can be linked to specific habitats for example coastal invertebrate assemblage, breeding bird assemblage of scrub-heath of upland fringe or ffridd in Wales or a group of species for example assemblage of clavarioid fungi.

Species assemblages can simplify the feature list of a site but may present challenges in associating the feature assemblage components with coherent ecological entities. This can make their management including regulation, monitoring and conservation challenging. Assemblages are most effective when they are closely tied to a specific ecological niche, such as invertebrates of exposed riverine shingle.

Representation and Distribution

Vascular plant assemblages are the most frequently notified species assemblages on SSSIs, occurring on 78 sites (7%). Lichens and associated fungi (74 SSSIs) and invertebrate assemblages (72 SSSIs) (Table 11) closely follow these.

Among the 212 SSSIs with notified species assemblages, 85 SSSIs support two or more assemblages. For example, Castlemartin Range SSSI has eight distinct assemblages including invertebrates (coastal invertebrate assemblage, grassland invertebrate assemblage), bryophytes (assemblage of RDB and/or Nationally Scarce and/or Atlantic-Western British bryophytes), plants (assemblage of RDB and/or Nationally Scarce vascular plants), reptiles (reptile assemblage), birds (breeding seabird colony) and lichens (lichen assemblage: lowland rocks, and lichen assemblage: lowland calcareous and fixed dune grassland).

Table 11: Breakdown of species assemblage groups, showing the number of features, their occurrence across SSSIs, and overall percentage of sites supporting them.

Broad assemblage groups	No. of unique features in the taxonomic group	No. of SSSIs where these features occur	Percentage of SSSIs with notified features in this group
Birds	9	33	3.1%
Bryophytes	3	55	5.1%
Stoneworts	1	1	0.1%
Fungi	7	11	1.0 %
Invertebrates	20	72	6.7%
Lichens and associated microfungi	14	74	6.8%
Mammals	1	8	0.7%
Reptiles and amphibians	2	7	0.7%
Slime mould	1	5	0.5%
Vascular plants	4	78	7.2%

A detailed assessment of individual species and the composition of assemblages is beyond the scope of this review. The criteria for assemblages have been significantly

revised in the updated SSSI Guidelines. This analysis is based on the assemblages present at the time of notification. The AoS for species assemblages is not available.

4.4 Habitat feature representativeness

4.4.1 Terrestrial habitats

Forty-nine distinct habitat features have been notified across 793 SSSIs, with 1,909 occurrences. Their features represent coastland (for example coastal grassland, heathland, saltmarsh, sand dunes), grassland (for example acid, calcareous and neutral grasslands) and marsh, heathland (for example dry and wet heath), mire/peatland (for example bog, fen and mire), open water (for example rivers and lakes), rock exposure, swamp, mire and inundation, tall herb and fen, and woodland and scrub (for example semi-natural woodland).

Selection criteria for habitats

SSSIs were selected based on the SSSI Guidelines that applied at the time of notification or subsequent renotification. The current SSSI Guideline chapters in use for habitats are:

- coastlands (chapter 1a 2019)
- marine intertidal and shallow subtidal (chapter 1b 2019)
- saline lagoons (chapter 1c 2022)
- woodland (chapter 2 2018)
- lowland grasslands (chapter 3 2014)
- lowland heathland (chapter 4 2018)
- non-montane rock habitats (Chapter 5 1989)
- freshwater habitats (chapter 6 2018)
- fens (chapter 7 1989)
- bogs (chapter 8 1994)
- upland habitats (chapter 9 2024)
- artificial habitats (chapter 10 1989)

Selection is driven by the type of habitat present and its rarity, the species composition, the quality of the habitat, how exemplar the site is in the AoS, and the size of the site. For example, the largest areas available for all major types of woodland in an AoS (chapter 2 woodlands, section 3.4.2). The National Vegetation Classification system is often utilised.

Representation and distribution

A significant proportion of SSSIs are notified for their grassland and marsh features (660 sites, 61% of all SSSIs, 73% of biological and mixed type SSSIs). Woodland and scrub features are found on 370 sites (34% of all SSSIs, 41% of biological and mixed SSSIs). Fig. 19 provides the number of SSSIs notified for habitat feature groups. Some sites often contain more than one notified habitat; this is explored in section 4.6.

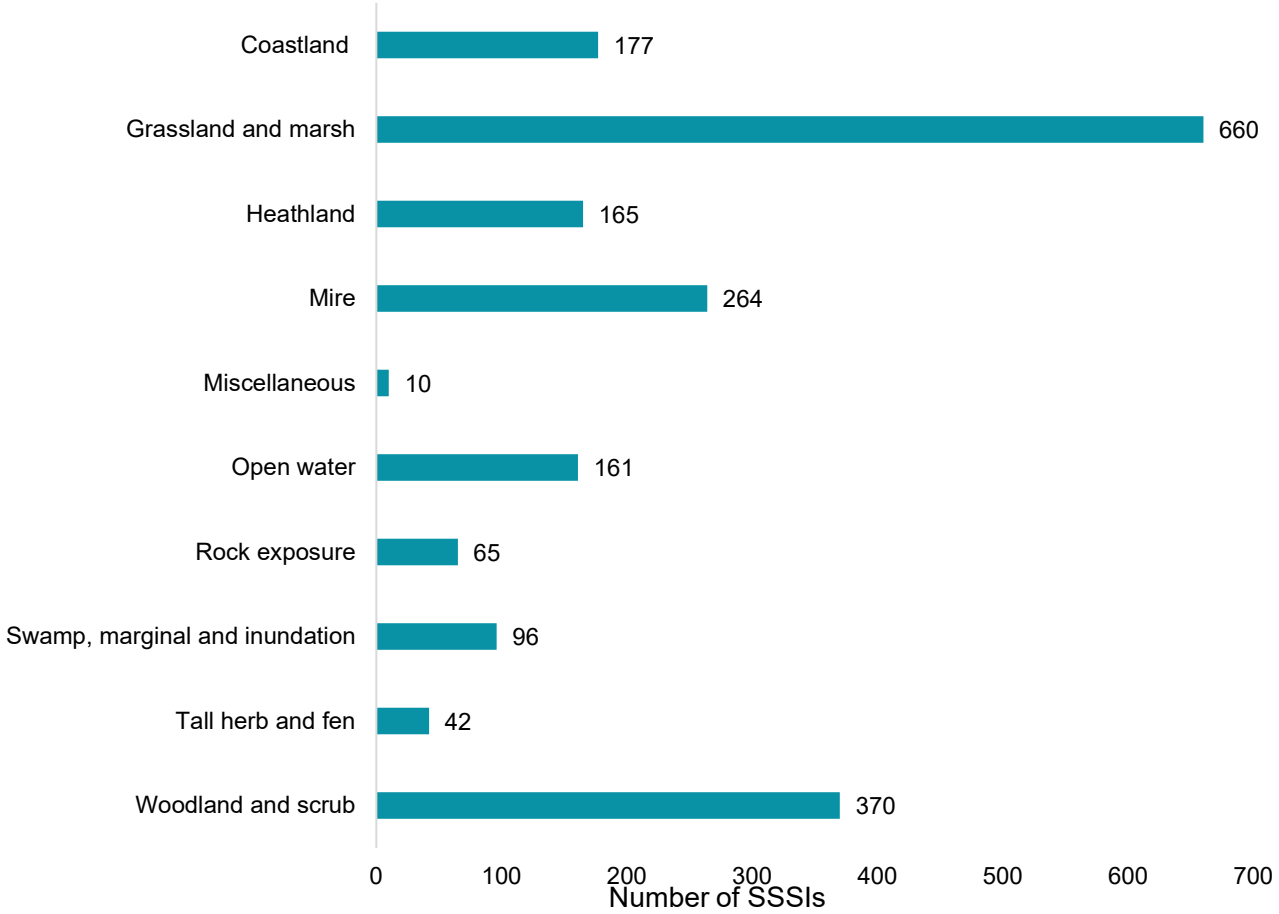


Figure 19: Number of SSSIs with terrestrial and freshwater habitat features.

Tables 12 and 13 provide an indicative habitat extent (ha) based on feature group (such as grassland and marsh) and feature type (such as neutral grassland). Extent figures are based on the quantity of the feature at the point of notification. For some features, there is no recorded area in the NRW's Protected Sites Database beyond the extent of the SSSI itself. Therefore, as the extent is unknown in some cases, and where known feature quantity may have been calculated some time ago, the figures and analysis in this section are an underestimation and should be taken as indicative. Habitat feature definitions are based on NRW's Protected Sites Database features dictionary and originally derive from the Handbook for Phase 1 Habitat Survey (NCC 1990).

In respect of extent, heathland covers the largest area, exceeding at least 37,000 ha, closely followed by mire, which spans over 32,000 ha. Arable field margins have the least notified extent, on two SSSIs, comprising of 20 ha.

Table 12: Extent of notified terrestrial features on SSSI.

Feature group	Total area of notified habitat on SSSI (ha)
Heathland	37,187
Mire	32,647
Grassland and marsh	15,113
Coastland	14,306
Woodland and scrub	9,877
Open water	5,240
Rock exposure	3,411
Tall herb and fen	1,872
Swamp, marginal and inundation	681
Miscellaneous (arable, hedgerows)	20

Table 12 delineates the extent of notified habitat group further by feature such as neutral grassland and details the number and percentage of SSSIs with the feature.

Semi-natural broadleaved woodland occurs on 289 SSSIs (27%) making it the most frequently notified habitat feature. The extent of all woodland in Wales is 309,312 ha, of which 41,790 ha is classed as ancient semi-natural woodland (SoNaRR 2020). 9,152 ha of semi-natural woodland is notified on SSSIs, equating to around 22% of the extent of semi-natural woodland in Wales.

Marshy grassland (243 SSSIs, 22%), neutral grassland (230 SSSIs, 21%) and acid grassland (125 SSSIs, 12%) are also prevalent. Neutral grasslands (1766 ha, 230 SSSIs) are prevalent but have a smaller total area suggesting it exists in smaller patches. Only around 10% of priority grassland habitat is within SSSIs as calculated by GIS overlay of grassland priority habitat areas against SSSI boundaries in 2012, (SoNaRR 2020).

Dry heath has the largest indicative total habitat area (over 33,000 ha) highlighting its importance in upland sites.

Raised bog and fen are the predominant lowland peatland types, and blanket bog in the uplands in Wales. The extent of blanket bog within SSSIs is also notable, covering over 25,000 ha, and the protection given by SSSIs plays a crucial role in supporting their contribution to carbon sequestration and climate regulation. The total area of deep peat soils in Wales is more than 90,000 ha (SoNaRR 2020). Fen is notified on 106 SSSIs, nearly 1,000 ha and raised bog is notified on 26 SSSIs, nearly 1,700 ha.

Saltmarsh (6,621 ha, 28 SSSIs) and sand dunes (3,557 ha) are amongst the largest coastal habitats. There are several large examples of notified sand dunes on the Welsh coast, notably Newborough Warren - Ynys Llanddwyn SSSI, Tywyn Aberffraw SSSI, Morfa Dyffryn SSSI and Morfa Harlech SSSI in north Wales, and Chwitffordd, Morfa Landimor a Bae Brychdwn / Whiteford Burrows, Landimore Marsh and Broughton Bay SSSI, Cynffig / Kenfig SSSI and Merthyr Mawr SSSI in south Wales. Over 75% of mapped sand dunes and saltmarsh are notified as SSSIs, along with 56% of sea cliff and 50% of shingle (SoNaRR 2016).

Lakes and other water bodies like reen and ditch networks, such as in the Gwent Levels suite of SSSIs, are included in the standing water category (notified on 107 SSSIs). The largest natural lakes notified in the lowlands are Llyn Tegid SSSI and Llyn Syfaddan SSSI, and there are notable concentrations of lake SSSIs in Anglesey and Snowdonia.

All major rivers have been notified in Wales. Wales has approximately 24,000 km of rivers and streams (SoNaRR 2016), of which main rivers total around 6,494 km (CCW Current state of knowledge report 2005/6). The total length of SSSIs notified for rivers or river features is 3,003 km.

Table 13: Number and percentage of SSSIs where habitat feature occurs and the total area on SSSIs, broken down by feature type.

Feature group	Feature	No. of SSSIs where habitat feature occurs	Percentage of SSSIs with habitat feature	Total area of habitat feature on SSSI (ha)
Coastland	Coastal grassland	34	3%	554
Coastland	Coastal heathland	26	2%	412
Coastland	Inter-tidal	7	0.7%	2,370
Coastland	Maritime cliff, associated ledges, and crevices	36	3%	736
Coastland	Saltmarsh	28	3%	6,621
Coastland	Sand dune	30	3%	3,557
Coastland	Strandline vegetation	5	0.5%	12
Coastland	Shingle/boulders above high water mark	11	1%	43
Grassland and marsh	Acid grassland	125	12%	9,251
Grassland and marsh	Calcareous grassland	53	5%	1,027
Grassland and marsh	Marshy grassland	243	22%	3,069
Grassland and marsh	Neutral grassland	230	21%	1,766
Heathland	Dry heath	91	9%	33,155
Heathland	Montane heath	2	0.2%	151
Heathland	Wet heath	72	7%	3,881
Mire / peatland	Blanket bog -other ombrogenous mire-	36	3%	25,049
Mire / peatland	Raised bog -ombrogenous-	26	2%	1,700
Mire / peatland	Fen -topogenous mires in valleys, basins, and flood plains	106	10%	969
Mire / peatland	Flush and spring -soligenous mire	88	8%	3,922
Mire / peatland	Montane flush and spring	8	0.7%	1,008
Misc	Arable	2	0.2%	20

Feature group	Feature	No. of SSSIs where habitat feature occurs	Percentage of SSSIs with habitat feature	Total area of habitat feature on SSSI (ha)
Open water	Running water (for example rivers, streams)	54	5%	2,893
Open water	Standing water (for example lakes)	107	10%	2,347
Rock exposure	Natural inland rock exposures, and other rock exposures	65	6%	3,411
Swamp, marginal, and inundation	Marginal and inundation vegetation	17	2%	40
Swamp, marginal, and inundation	Swamp	79	7%	641
Tall herb and fen	Continuous bracken	30	3%	1,791
Tall herb and fen	Tall herb and other fen	12	1%	81
Woodland and scrub	Other plantation (broadleaved, coniferous, mixed)	14	1%	102
Woodland and scrub	Parkland / scattered trees	4	0.4%	50
Woodland and scrub	Scrub	63	6%	573
Woodland and scrub	Semi-natural broadleaved woodland	289	27%	9,152

The AoS is recorded for all terrestrial habitats and provides an insight into the geographical distribution of notified features across Wales (Table 13). Some SSSIs with habitats such as open water span multiple AoS, in these instances the features are counted in each AoS.

AoS are used to support the selection of sites for coastlands, marine intertidal and shallow subtidal, saline lagoons, woodlands, lowland grasslands, lowland heathland, fens, and upland habitats. For example, the selection of the largest areas available of all the major types of woodland in an AoS (chapter 2 woodlands, section 3.4.2).

Grassland and marsh habitats are most prominent in Ceredigion (107 SSSIs), Clwyd (76) and Radnor (36). Heathland is most prominent in West Gwynedd (28), Ceredigion (30), and Preseli and South Pembrokeshire (26), where upland SSSIs are prominent.

Open water features are well represented in Ceredigion (20), East Gwynedd (20), and Clwyd (18), likely due to the higher presence of lakes, rivers, and reservoirs. Woodland and scrub are most abundant in Clwyd (62), Ceredigion (48), and East Gwynedd (46), suggesting these areas have significant semi-natural woodland cover.

Table 14: Number of notified habitat features by species groups recorded across each terrestrial Areas of Search.

Areas of Search	Coastland	Grassland and marsh	Heathland	Mire/peatland	Open water	Rock exposure	Swamp, marginal, and inundation	Tall herb and fen	Woodland and scrub
Brecknock	0	52	9	19	14	6	1	0	21
Carmarthen and Dinefwr	10	55	8	15	14	2	10	0	25
Ceredigion	14	109	31	57	22	14	15	8	51
Clwyd	15	76	13	26	18	14	19	13	62
East Gwynedd	18	43	18	19	21	11	9	6	47
Gwent	1	22	4	6	12	2	3	0	30
Mid and South Glamorgan	7	61	8	10	4	2	1	1	21
Montgomeryshire	0	41	3	13	5	2	3	1	21
Preseli and South Pembrokeshire	57	54	27	23	18	6	23	12	41
Radnor	0	63	8	18	15	3	2	0	23
West Glamorgan and Llanelli	16	32	9	9	5	0	5	0	14
West Gwynedd	41	29	32	45	20	3	10	2	22

4.4.2 Marine habitats

Twenty-three distinct features have been notified across 63 SSSIs, with 202 occurrences. These features are a mixture of shore types, similar to ‘feature groups’ for terrestrial habitat, such as exposed rock, sheltered mud and other more specific habitats and community types, such as caves and overhangs, rockpools, soft piddock bored substrata, and tide-swept algae.

Selection criteria for marine habitats

The current SSSI Guideline chapters for marine habitats are:

- coastlands (chapter 1a 2019)
- marine intertidal and shallow subtidal (chapter 1b 2019)
- saline lagoons (chapter 1c 2022)

Some marine features, such as saltmarsh communities and species, and seagrass beds and species, have been selected under other SSSI Guidelines such as vascular plants (chapter 11).

Some notified features associated with the marine environment have been classed under other feature types, such as flora and fauna, rather than consistently tagged as ‘marine habitat’ in NRW’s Protected Sites Database. For example, red seaweed *Gigartina pistillata* is notified on three SSSIs but is listed as ‘vascular plant’ on Castlemartin Range SSSI and as a ‘marine habitat’ on Arfordir Penrhyn Angle / Angle Peninsula Coast SSSI and Dale and South Marloes Coast SSSI. This variation does not affect the management of the feature. However, it has shown inconsistencies in data management and quality assurance meaning the analysis for this report should be treated as indicative.

Representation and distribution

The most frequently occurring features are rockpools, notified at 36 SSSIs, followed by caves and overhangs, at 29 SSSIs (see Fig. 20).

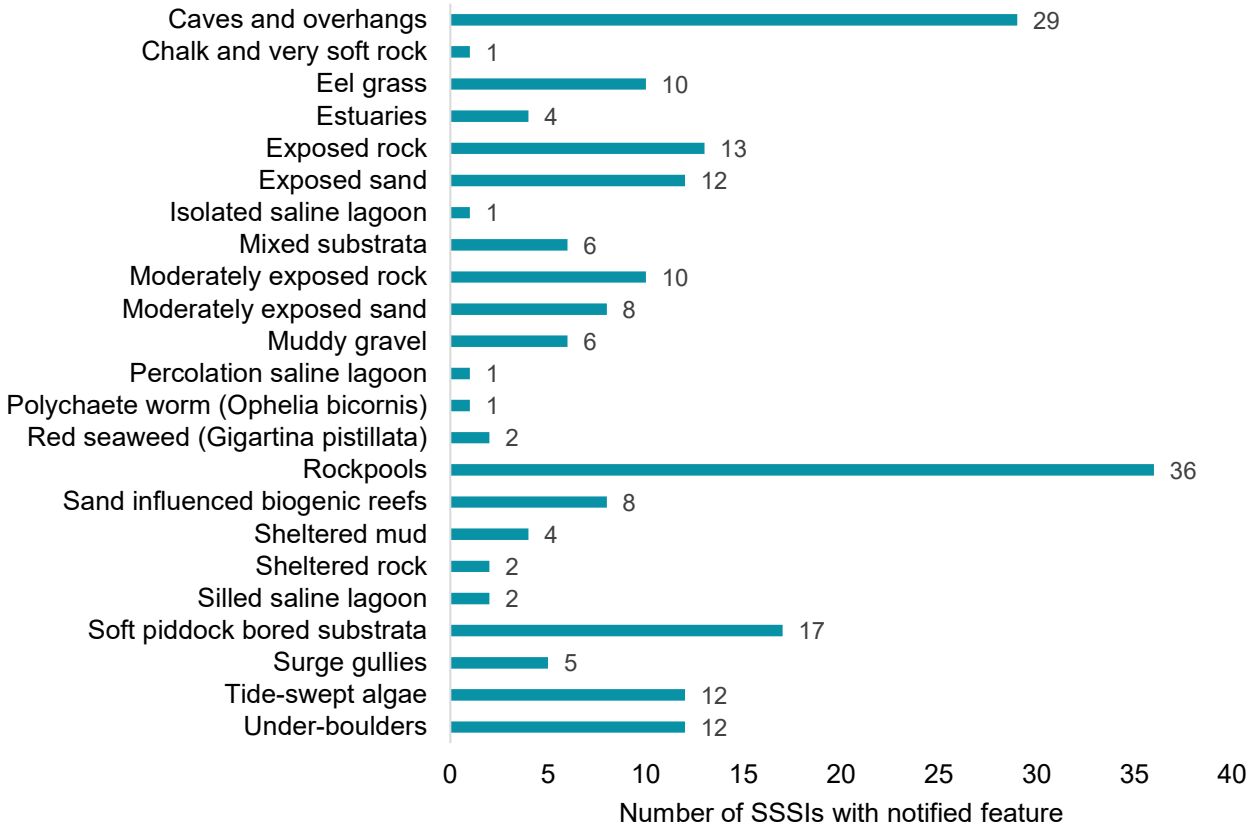


Figure 20: Number of SSSIs with marine habitat features.

At this stage, it has not been possible to calculate the exact extent of these marine habitat features. However, it is likely that estuaries represent the largest area (notably the Severn Estuary SSSI and the Dee Estuary / Aber Afon Dyfrdwy SSSI), followed by exposed sands. Much of the notified intertidal mudflat, sandflat and saltmarsh habitat occurs in close association (see also Coastland habitat in 4.4.1).

Notified marine habitats are most prominent in the Afon Hafren i Benmaendewi/ River Severn to St. Davids Head AoS.

Table 15: Number of notified features classed as marine habitats across each Areas of Search.

Areas of Search	Total occurrence of marine habitats in AoS
Afon Hafren i Benmaendewi/River Severn to St. Davids Head	102
Penmaendewi i Ynys Enlli/St. Davids Head to Bardsey Island	54
Ynys Enlli i Ben y Gogarth/Bardsey Island to Great Ormes Head	38
Pen y Gogarth i Ferin Rheged/Great Ormes Head to Solway Firth	13

4.5 Earth science feature representativeness

The rocks and landforms of Wales are of great scientific, cultural, and educational importance and provide evidence from Earth's early history, through the last Ice Age to the present day – covering nearly a billion years. This geodiversity enables us not only to study and understand the history of environmental change, but also how changing climate and sea-level, coastal erosion and soil formation continue to shape the landscape of Wales.

Wales has attracted geologists since the pioneering work of Victorian times when they named some of the divisions that define the international geological timescale – for example, the Cambrian, named after the Latin name for Wales, and the Ordovician and Silurian periods, which are named after Celtic tribes. These standard geological terms are used globally, and this rich legacy continues to attract geologists from all over the world to study the geology and globally recognised reference sites. This geodiversity is reflected in the SSSI series.

Earth science features within Wales' SSSIs must first be registered as GCR sites, each of which is selected independently within a series of more than 90 'blocks'. These GCR blocks can represent divisions of geological time, fossil groups, mineralogy, igneous petrology, geological structure, or geomorphology (both static and active landforms). In Wales, 36 GCR blocks are represented (Table 16).

There are 485 GCR sites in Wales, 411 of which are notified within 296 mixed (e.g. biological and geological together) and geological only SSSIs. In Wales, 28% of SSSIs are notified for geological and geomorphological features. The majority of geological and mixed SSSIs (75%) contain a single geological feature, while 24% contain multiple geological features. A SSSI may include multiple Earth science features if GCR sites have different blocks present or if different sites within the same block type occur in geographically distinct areas. One example of a geologically diverse site is Arfordir Marros-Pentywyn / Marros-Pendine Coast SSSI which features Coastal geomorphology of Wales (Carmarthen Bay GCR No. 2102), Quaternary of Wales (Marros Sands GCR No.1451), and Namurian of England and Wales (Marros GCR No. 311).

Among the most frequently occurring Earth science features, Quaternary of Wales is the most prevalent, found on 59 SSSIs, followed by Mineralogy of Wales (39 SSSIs)

and Arenig-Llanvirn (24 SSSIs). Conversely, some features are exceptionally rare, with only a single notified occurrence in Wales of Carboniferous-Permian igneous, Mesozoic Mammalia, and Mesozoic palaeobotany.

Spatial extent figures (Table 16) are based on the overlap between SSSIs and GCR sites.

The spatial extent of these features varies significantly depending on their type. The Coastal geomorphology of Wales block includes a number of large coastal intertidal sites selected for their coastal landforms and geomorphology with the block covering ~16,700 ha. Other GCR blocks which contain large landform-scale sites include Quaternary of Wales (~14,454 ha), Ordovician-Silurian igneous (~4,570 ha) and Caves (~2.975 ha).

To support the understanding of geological conservation, NRW produce Explanatory Geological Notes (EGN) for sites of geological interest, providing detailed insights into the features and their significance.

Table 16: GCR blocks and the number and total extent of SSSIs notified.

Earth science feature (GCR block)	No. of SSSIs with notified GCR	Total extent (ha) on SSSIs
Arenig – Llanvirn	24	183
Caledonian structures of Wales	17	278
Cambrian	11	217
Cambrian-Tremadoc	3	29
Caradoc-Ashgill	15	16
Carboniferous-Permian igneous	1	0.3
Caves	9	2,975
Coastal geomorphology of Wales	23	16,753
Dinantian of northern England and North Wales	9	663
Dinantian of southern England and South Wales	16	247
Fluvial geomorphology of Wales	13	821
Hettangian-Pliensbachian	2	90
Karst	4	724
Llandeilo	9	12
Llandovery	12	101
Ludlow	8	22
Mass movement	3	294
Mesozoic Mammalia	1	29
Mesozoic palaeobotany	1	1
Mineralogy of Wales	39	476
Namurian of England and Wales	8	95
Non-marine Devonian	13	188
Ordovician - Silurian igneous	21	4,570

Earth science feature (GCR block)	No. of SSSIs with notified GCR	Total extent (ha) on SSSIs
Palaeozoic palaeobotany	12	44
Permian-Triassic -red beds-	4	85
Permian-Triassic Reptilia	1	28
Pleistocene Vertebrata	7	7
Precambrian of England and Wales	14	215
Quaternary of Wales	59	14,454
Rhaetian	2	32
Silurian-Devonian Chordata	3	5
Tremadoc	5	9
Tufa	3	12
Variscan structures of South Wales and the Mendips	10	290
Wenlock	18	74
Westphalian	15	250

4.6 Diversity

The diversity of notified features across SSSIs varies significantly, ranging from sites notified for a single feature to those with up to 56 features, as seen at Mynyddoedd Llangynidr a Llangatwg, Cefn yr Ystrad a Chomin Merthyr SSSI.

On average, each SSSI supports nearly four (3.82) notified features, though a large proportion (42%) are notified for a single feature. Fig. 21 illustrates the distribution of SSSIs by the number of notified features, categorising sites into one feature, 2 to 5, 5 to 10, 10 to 20, 20 to 30, and 30+ different features. The majority (77% or 836 SSSIs) contain up to six features, while only 8% (90 SSSIs) support more than ten features.

SSSIs with a higher number of notified features are typically large, diverse landscapes, including commons, uplands, rivers, and coastal areas, where multiple habitats, species, and Earth science features coexist.

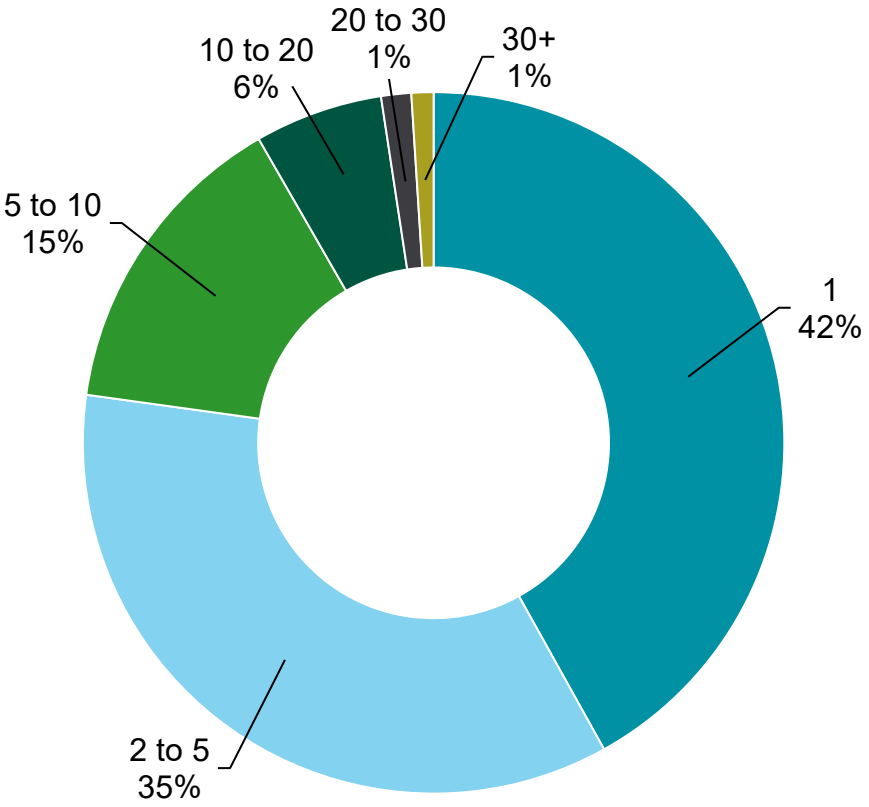


Figure 21: Proportion of the number of features on SSSIs, as percentage of sites with one, 2 to 5, 5 to 10, 10 to 20, 20 to 30, and 30 plus features.

Of the 1083 notified SSSIs, the following notified feature type combinations occur:

Habitats

- 73% (793) of SSSIs contain at least one notified habitat feature
- 36% (392) of SSSIs are notified for terrestrial habitats only
- 37% (399) of SSSIs support multiple terrestrial habitats
- 6% (63) of SSSIs are notified for marine habitats (of those categorised as marine habitats feature type)

Species

- 45% (488) of SSSIs contain at least one notified species feature (animals, plants, and assemblages).
- 8% (85) of SSSIs are notified for species interest only

Habitats and species interaction

- 35% (384) of SSSIs have a combination of terrestrial habitat and species interest.

5. Connectivity

Connectivity in the context of SSSIs refers to how well sites are linked with the broader landscape, and each other. It can be influenced by factors such as proximity to similar habitats and connection to these through corridors, stepping stones and other permeable links. To support building connectivity in Wales, we have Resilient Ecological Networks (RENs), Priority Ecological Networks (PENs) and the Nature Networks Map.

Resilient Ecological Networks (RENs) have been defined in the Nature Recovery Action Plan for Wales, 2020-21 as 'networks of habitat in good ecological condition linking protected sites and other biodiversity hotspots across the wider landscape, providing maximum benefit for biodiversity and well-being. Such nature networks have existing or potential for healthy resilient ecosystems which provide a range of important ecosystem services as well as allowing the movement of species across landscapes in response to climate change.' RENs are the intended outcomes i.e. to develop functionally connected networks with outcomes for ecosystem resilience and the wellbeing of people in Wales. They can be developed at a range of scales and follow methodology as outlined by the Terrestrial and freshwater Resilient Ecological Networks: a guide for practitioners in Wales. RENs development is at varying stages across Wales, for more information see Area Statements on progress of RENs development.

At sea, a network of MPAs has been established which, when measures are in place to bring about good condition, will form the marine REN. The MPA network includes all protected site designations (SAC, SPA, Ramsar, MCZ and SSSIs) with marine features, and follows network principles set by OSPAR and underpinned by the Marine and Coastal Access Act (2009). A marine network will be considered ecologically coherent if it:

- protects the range of marine habitats and species in a proportionate manner, which are representative of UK waters (representativity)
- is resilient to withstand, adapt or recover from impacts including those associated with the climate emergency (resilient)
- connects areas to allow linkages and provide species with protection through different life stages (connectivity)
- is effectively managed

Priority Ecological Networks (PENs) are maps of areas of existing connectivity around and between protected sites. These mapped ecological networks are for some groups of habitats that indicate good areas of connectivity between protected sites and can be used to inform the development of RENs. They provide a strategic framework for designing and targeting activities to build functionally connectivity, with protected sites at their core. A PEN for the marine environment focuses on the condition within the MPA network as a basis for strategically prioritising and targeting action.

The Networks Map is designed to inform the delivery of the Nature Networks Programme, includes modelled habitat networks for All-Wales (providing a comprehensive descriptive overview of habitat connectivity across Wales), PENs for

terrestrial habitats, a PEN for the marine environment, and a generic buffer around terrestrial protected sites. The term ‘Nature Network’ may also be used synonymously with REN, although it will generally refer to large-scale networks that are based around protected sites and funded by the Nature Network Programme.

5.1 Habitat fragmentation

Data on habitat loss and fragmentation is logged against SSSI management units and features on the NRW Protected Sites Database. Habitat fragmentation has been identified as impacting, or likely to impact, 166 habitat and species features across all or part of 200 SSSIs (18% of the SSSI series). Fig. 22 lists the features with the most frequently recorded identification of habitat loss and fragmentation as an issue. A full list of SSSIs and features recorded to be impacted by habitat fragmentation is provided in the data archive.

The most frequently affected habitats are dry heath, blanket bog, and semi-natural woodland, followed by coastal grassland, wet heath, and sand dunes.

Among species, raptors such as peregrine *Falco peregrinus*, merlin *Falco columbarius*, and hen harrier *Circus cyaneus* are most frequently recorded as being affected by habitat fragmentation. Other notable impacted species include chough *Pyrrhocorax pyrrhocorax*, lesser horseshoe bats *Rhinolophus hipposideros*, invertebrate and lichen assemblages, and marsh fritillary *Euphydryas aurinia*.

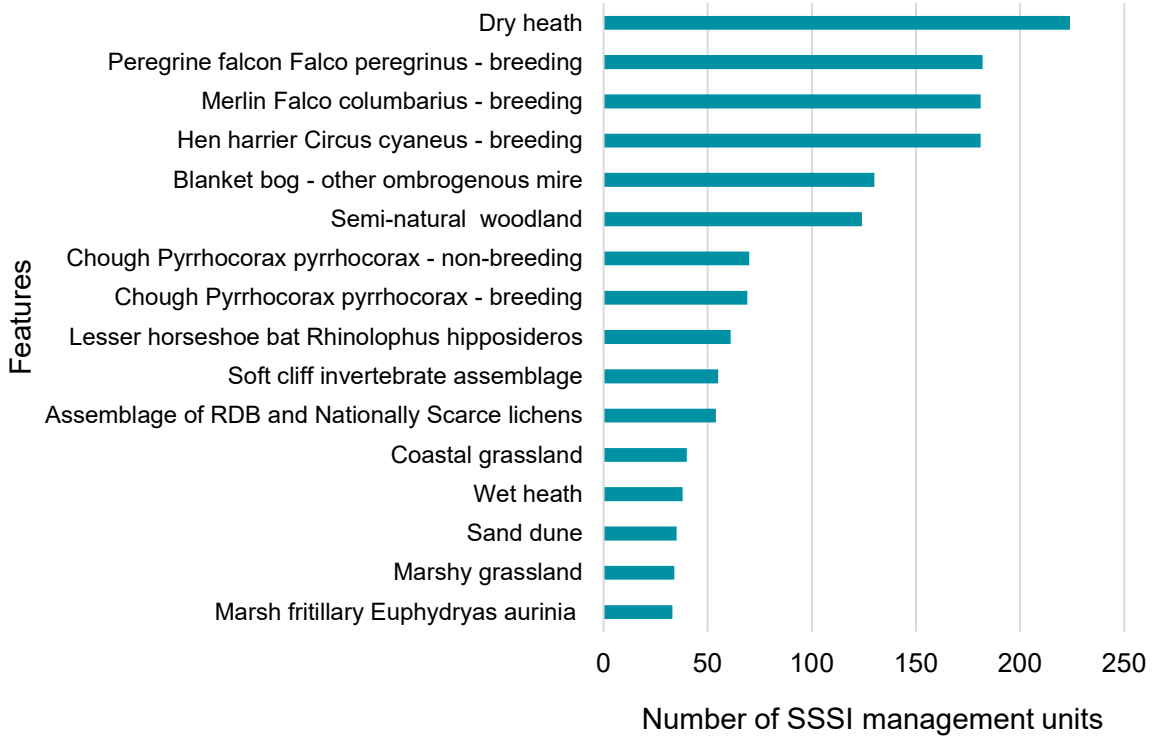


Figure 22: Features with the most frequent recorded identification of habitat loss and fragmentation issues across SSSI management units.

A climate vulnerability assessment of protected sites in Wales (Wilson et al., 2013) provided an initial evaluation of how climate change may impact upon the ability to achieve favourable condition on protected sites (SSSI, SAC, SPA) and sought to identify those sites where adapting to climate change is most important. The overall climate vulnerability of any protected site to climate change impacts is dependent on a number of related factors including the types of species and habitats present and their climate impact risks, the connectivity of those habitats within the context of the surrounding landscape, the condition status of the site and other management challenges. The study estimated the overall vulnerability of the sites by collating data on all these factors using specific methodologies for each and integrating them into an overall vulnerability assessment. To bring together the various components of vulnerability together in a single metric, the study developed the concept of a Climate Vulnerability Index (CVI), which was calculated for each site. Sites were then ranked by their CVI score.

The components of vulnerability, feeding into the CVI, focused on the impact-risk of habitat and species features, the connectivity of habitat features in context of wider countryside, the current state of key species and habitat features, and non-climate threats to resilience. Looking at the connectivity component, the analysis provided a measure of the degree of fragmentation of habitats around a site, and thus their potential for recovery (for habitats) or recolonisation (for species) following an extreme climate-induced event (for example fire or flooding). The metric that was used for this was the proximity of similar habitats within a 5 km radius of the site boundary, for nine broad habitats. An overall proximity metric for all habitat features per site was calculated.

The top ten SSSIs with the highest CVI, with high impact-risk features are:

- Penarth Coast SSSI
- Severn Estuary SSSI
- River Wye (Upper Wye) / Afon Gwy (Gwy Uchaf) SSSI
- Llynnau y Fali - Valley Lakes SSSI
- Dee Estuary / Aber Afon Dyfrdwy SSSI
- Mwyngloddiau a Chreigiau Gwydyr SSSI
- Sluxton Marsh, Whitemoor SSSI
- Cae Llety-yr-efail SSSI
- Caeau Ffos Fach SSSI
- Pen y Gogarth / Great Ormes Head SSSI

A large proportion of the high-ranking CVI sites encompass aquatic habitats. This is a reflection of both the management issues component of the CVI, which is dominated by water management issues, and the habitat feature impact-risk assessment, which identifies a total of 29 high impact-risk habitats, of which 21 are likely to be dependent on hydrology**.** There are a number of smaller sites with high CVI, such as Sluxton Marsh on the Gower, affected by a number of climate-sensitive management issues.

5.2 Edge effects

SSSIs vary greatly in shape, depending on the type of habitat, land use and geographical features. They can be influenced by ecological, geological, and practical considerations. While some are large and continuous, others are fragmented, linear, or irregularly shaped.

SSSIs can consist of a singular continuous area or multiple separate land parcels. For example, several nearby fields of neutral grassland may be notified as a single SSSI. In lowland areas, SSSIs often comprise of semi-natural habitats that stand as 'islands' within a landscape dominated by modified habitats. Some habitats, particularly dry ground types and rivers, may persist indefinitely as isolated or elongated fragments within highly modified surroundings. Additionally, for some species, SSSIs provide essential breeding or roosting areas, while adjacent farmland serves as their primary feeding habitat (SSSI Guidelines Part 1).

Smaller sites and those made up of multiple 'islands' are more vulnerable to 'edge' effects, some of which maybe unforeseen. Edge effects are changes in environmental conditions and ecological processes that occur at the boundary between habitat types, particularly where natural habitats meet disturbed, agriculturally improved, or fragmented areas. Edge effects can influence the resilience and functionality of the sites' ecosystems and features, potentially affecting their ability to adapt to change. SSSIs with a high edge to area ratio (or that are more fragmented in the landscape) are likely to have a higher proportion of the site impacted by negative external influences. For example, microclimate changes (such as wind exposure), increased risk of invasive species and predators, sound and light pollution, and disrupted ecological processes (such as impact on seed dispersal, surface water movement, retention and filtration, nutrient runoff, pollination, and increased threat from spray drift and run off).

SSSI boundaries are typically delineated by hedges, fences, or walls, and in some cases, the presence of infrastructure like roads create separate notified areas. Sixty-eight percent of SSSIs have a single continuous boundary, others consist of multiple fragmented areas (multi-part sites, see Fig. 23). Sites with multiple 'islands' are most prominently in coastal sites, such as Strumble Head - Llechdafad Cliffs SSSI (167 islands), Dale and South Marloes Coast SSSI (179 islands) and St. David's Peninsula Coast SSSI (233 islands). These reflect the nature of coastal environments, where SSSIs often encompass extensive sea cliffs interspersed with rocky outcrops.

The permeability of the surrounding land is also a key factor for species movement. The marsh fritillary *Euphydryas aurinia* butterfly depends on networks of damp grasslands, but habitat fragmentation from agriculture and development has left populations isolated in small patches. Surrounding improved land often acts as a barrier to movement, reducing genetic diversity and the ability to recolonise sites. Semi-natural grasslands, field margins and lightly grazed pastures can function as stepping stones or corridors.

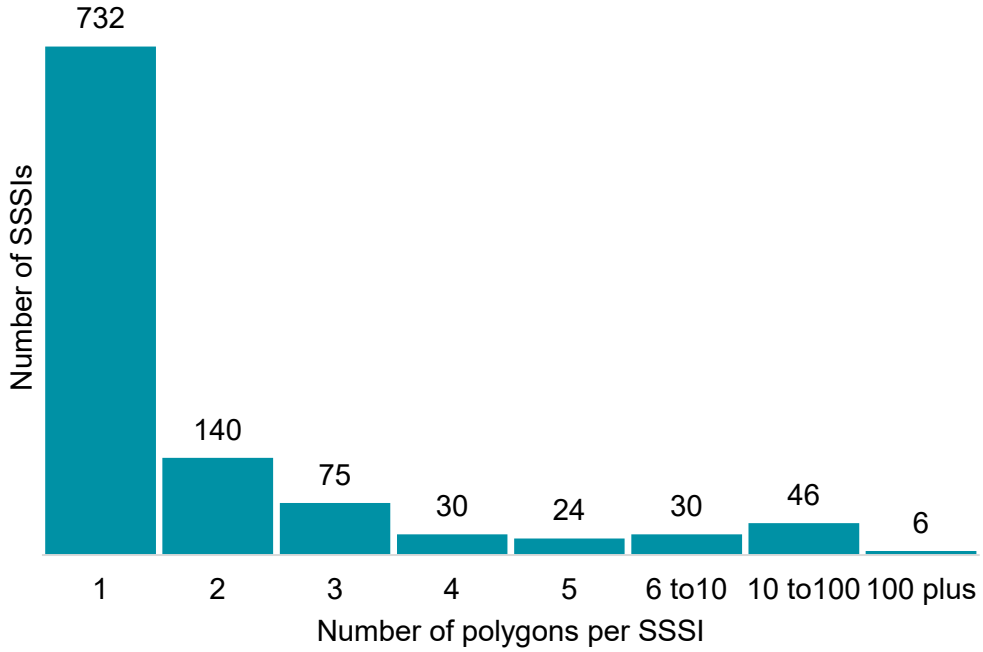


Figure 23: Total number of polygons per SSSI (i.e. multi-polygon or multi-part).

Many SSSIs, especially rivers, coastal cliffs, and geological formations are long and narrow. Rivers SSSIs in particular have boundaries tightly drawn to the river bank. Some SSSIs also have irregular or jagged boundaries which may open them up to more edge effects. These could become more apparent over time with any added pressures, such as land use changes, overexploitation, and climate change.

The perimeter lengths of SSSIs in Wales vary significantly, ranging from just 200 m at bat nursery roost in a Pembrokeshire cottage to 446 km at Afon Teifi SSSI. The longest perimeters are typically found in riverine SSSIs – such as Afon Teifi SSSI, Afon Dyfrdwy (River Dee) SSSI, Afon Wysg (Isafonydd) / River Usk (Tributaries) SSSI, and River Ithon SSSI (all exceeding 200 km) – reflecting their elongated shapes. Similarly, large upland sites such as Berwyn SSSI, Elenydd, Migneint-Arenig-Dduallt SSSI, and Eryri SSSI also have extensive perimeters exceeding 200 km.

In general, larger sites tend to have longer perimeters, while smaller sites typically have more compact boundaries. Nearly all sites smaller than 1 km² have perimeters of less than 1 km (see Fig. 24). However, some sites feature irregular or fragmented boundaries, resulting in disproportionately long perimeters relative to their size. For example, the Glascoed, Meifod SSSI encompasses a bat maternity roost, along with surrounding areas used by the bats when entering and exiting the roost. This includes a linear tree-lined watercourse, hedgerows, and patches of woodland.

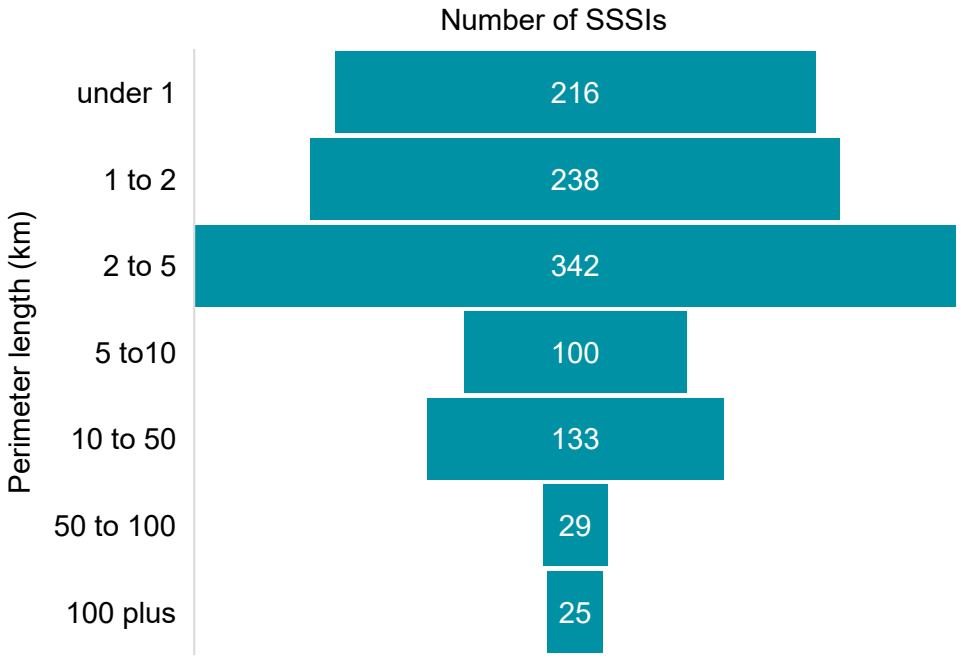


Figure 24: Total perimeter length of SSSIs.

However, the number of parts (sometimes also called polygons or parcels) and the total perimeter length of SSSIs can be arbitrary, as historical notification practices have varied. For example, in some cases, multiple woodland parcels have been notified as separate SSSIs, while in others, similar areas have been grouped into a single SSSI.

6. Conclusions and Recommendations

6.1 Conclusions

This review of the current suite of notified SSSIs in Wales demonstrates the broad diversity of habitats, species, and Earth science features that benefit from the protective regulatory mechanisms and positive management incentives afforded by SSSI notification. With around 12% of Wales notified as SSSI (see Fig. 1), the series plays a vital role in contributing to the 30 by 30 target commitment.

However, there remain significant challenges and barriers towards achieving the effective management element across all SSSIs; many SSSIs are relatively small, consist of isolated habitat patches, or lie outside functional ecological networks, making them more vulnerable to external negative factors and less resilient to change. This highlights the need for a more strategic approach to future notification and renotification identifying opportunities available to strengthen the series resilience through expanding existing sites, adding new features, and evaluating new areas for notification. Further notification activity is required to facilitate effective protection, positive management, and to develop a more resilient ecological network.

To effectively assess what an optimal protected sites network would look like, it is essential to first understand the characteristics of a resilient Wales. This understanding enables us to define the contribution the SSSI series can make toward this overarching goal in combination with other measures. National and international targets are best informed by the concept of Favourable Conservation Status (FCS) (as defined in the UK Statutory Nature Conservation Bodies Common Statement) and are most easily envisioned in relation to specific habitats and species.

For some habitats and species, the current SSSI series may already be sufficient to support them at FCS, provided they are managed appropriately. For others, a larger portion of the remaining habitat or range may need to be included in an expanded SSSI series to ensure more targeted management, maintain or restore populations, and preserve habitat quality. This approach also helps to ensure that these areas are sufficiently large with external pressures and threats minimised to remain viable in the long term. In some cases, the existing SSSI series may already capture the most important remaining areas in a well-connected and relatively robust network, but the habitat or species still falls short of FCS. In such cases, achieving restoration to favourable status may rely more on other measures undertaken on non-notified land.

6.1.1 SSSI Extent

There is currently no target for the number or total extent of SSSIs in Wales. Neither the legislation, nor the SSSI Guidelines set any limits. Likewise, there is no legislative or policy limit to the size of individual sites deemed to be of special interest. SSSIs play a critical role in contributing towards the protection and effective management of 30% of our land, waters and seas, significantly contributing towards achieving the 30 by 30 target. Further analysis is needed to assess areas of land that support habitats, species, and Earth science features of special scientific interest, in

order to determine their current and potential contribution to protected area coverage and effective management under the 30 by 30 target.

When considering the development of the SSSI series, it is important to recognise that only 31% of Wales' land is classified as semi-natural habitat. Parts 1 and 2 of the SSSI Guidelines outline the scientific criteria and attributes that habitats, species, and Earth science features must meet to qualify for special interest status and, therefore, SSSI notification. Currently, with approximately 12% of Wales' land area notified as SSSIs, these sites form the core of the country's richest natural heritage, making a vital contribution to the 30 by 30 target. There is clear evidence to support the need for further notification and protection and that it is crucial to provide additional safeguards and address the ongoing nature emergency.

Many SSSIs are relatively small, consisting of multiple land parcels or being isolated from broader habitat networks, which makes them more susceptible to external pressures. Building on this report, an assessment of whether each SSSI is ecologically and functionally adequate to support its notified features in the context of the surrounding landscape would help identify sites where boundary enlargement would be beneficial, thereby supporting the principle of creating 'bigger', more connected conservation areas.

Improvements to the SSSI Guidelines, such as added emphasis on incorporating underlying ecological processes in the definition of site interest and boundaries (such as coastal erosion or accretion, and fluvial processes in rivers and flood plains) and an emphasis on the need to think flexibly to take into account likely environmental change, means that existing SSSIs may benefit from boundary extensions to improve resilience to issues such as edge effects and climate change. The guidelines propose that a compound SSSI might include all the key sites of a particular semi-natural habitat in a local area, as well as buffer land, linking land and restoration areas which will help to ensure ecological coherence.

Assessing the current condition of features, which was not in scope of this report, is critical to understand the effectiveness of the SSSI series and whether further notification, such as boundary extensions would help support improved management. Available condition data, particularly the 2020 Baseline Evaluation, provides insight into the state of some SSSI features across Wales. It provides indicative condition assessments to inform management strategies for features and guides future evidence collection. Findings from the 2020 Baseline Evaluation indicated that only 20% of the assessed features were in favourable condition.

All new SSSIs should be notified with boundaries that protect their long-term viability, enabling them to adapt, recover, and withstand disturbances. When identifying new sites or considering expansions of existing ones, proposed boundaries should, whenever possible, include the land required for the ecosystem to function effectively over the long term.

6.1.2 Diversity and Representativeness

Protecting biological and geological diversity is the core purpose of notifying SSSIs. The SSSI Guidelines aim to ensure that the sites represent a wide and representative range of habitats, species, geodiversity and their variations at both a

national and local (AoS) level. Currently, the SSSI series in Wales protects over 4,000 notified feature occurrences, covering 649 different notified features including habitats, species, assemblages, and Earth science features.

The SSSI series, as a whole, should contain sufficient sites to be able to support a wide and representative range of features and viable populations of the most threatened species across their natural range. Thus, helping to mitigate the likely changes of climate change, and moving towards a network approach rather than a 'series'. Evidence (examples below) suggests that the SSSI series is not yet complete and there remains a significant opportunity for more SSSI notification (both new sites and amendments to existing sites) to further protect the wide and representative suite of habitats, species, and Earth science features deemed to be of special interest.

Information from completed habitat and survey programmes provide evidence of additional areas that can be explored for notification. For example, the National Peatland Action Programme, NRW's Lowland Peatland Survey Programme, NRW's assessment of intertidal sites (Brazier et al. 2002 unpublished; Lush and Ashmead CCW 2010), and the NRW Evidence Report 699 Programme of work for semi-natural grasslands in Wales.

The NRW Evidence Report 818 Terrestrial and Freshwater Species in Peril in Wales (Bosanquet *et al* 2025, in preparation) identifies terrestrial and freshwater species most at risk of extinction in Wales and their key locations. Rare species are defined as those species occurring at five or fewer locations in Wales. Analysis of species data collected over many decades shows that there are 2,955 Species in Peril in Wales, with 1,262 known at just one location each. These species are exceptionally vulnerable to stochastic events as well as climate change. The notification of land as SSSIs are crucial to the protection and effective management of the rarest Welsh species. In Wales, 75% of Species in Peril occur on at least one SSSI, and 47% are found only on SSSIs. These figures show just how critical SSSI protection is for our rarest Welsh species, as is managing those SSSI to conserve the plethora of rare species which live on them. The report found 733 species which are not found on protected sites and identifies key unprotected sites that should be explored for future SSSI notification.

The Third UK SPA Review Phase 2 report (Grady *et al*, 2025) adds evidence on protected sites designation requirements for birds. It addresses the identified insufficiencies for each species or population in terms of their population numbers, range coverage and ecological requirements, and sets out the required work on changes to the UK SPA network through the provision of advice and options. SPAs on land are underpinned by notified SSSIs and the associated regulatory legislation therefore this advice is relevant to the planning of future SSSI notification programmes.

With regard to Earth science features, the GCR Programme undergoes periodic reviews in light of scientific advances ensuring that the GCR remains credible and robust. Any additions to the GCR network follow a robust registration process with agreement to new GCRs being made by the JNCC's Chief Scientist Group. As GCR selection, in itself, affords no legal protection against damage or complete destruction through activities such as quarrying, inappropriate development, theft of

fossils, or simply through neglect, it is important to consider all remaining GCRs which are not notified as SSSIs as a priority for notification.

In addition, the suite of notified features listed on the citations of our current SSSIs have not been comprehensively reviewed since the mid-2000s, as these notifications were based on the SSSI Guideline versions in use at that time. In some cases, species rely on suitable available habitat that may have not been classed as a notified feature at notification but nevertheless is necessary for the species' life cycles and so its condition and resilience is crucial. Of all SSSIs, 97% of the series (1050 sites) were notified before the commencement of the SSSI Guideline revisions and publication of Part 1 of the Guidelines in 2013.

Following the publication of the revised chapters, NRW subject matter experts are making progress on identifying features that align with the updated SSSI Guidelines for existing sites, as well as identifying new sites and features which will be under consideration for notification. An indicative view is that there is a significant number of changes, which for existing sites would require a renotification under the 1981 Act. This would ensure that all features which meet the current SSSI Guidelines are legally notified to all owners, occupiers, and relevant statutory bodies, providing stronger safeguards against potential harm, enhancing opportunities for appropriate management, and ensuring these features are duly considered as material factors in consenting process such as town and country planning.

If all the features for which a SSSI was originally notified are no longer of special interest, and lack a reasonable prospect of recovery or restoration within the next 10 years, partial or full denotification may be considered. This process, a power under Section 28D of the Wildlife and Countryside Act 1981 (as amended), ensures that the SSSI series remains scientifically robust.

Section 4 of this report provides summaries of the notified features but should not be taken as a full assessment of representativeness. Further analysis is required to determine what constitutes sufficient representativeness of those habitats, species, and Earth science features across the AoS (where applicable), and as a whole in Wales.

6.1.3 Connectivity

The connectivity of habitats within SSSIs varies across Wales, largely reflecting the large-scale patterns in the extent of semi-natural habitats. The SSSI Guidelines and SoNaRR 2020 tell us that in upland areas, larger SSSIs are often well-connected, already supported by extensive ecological networks. Here connectivity challenges are more likely to result from habitat condition rather than extent. In contrast, lowland SSSIs tend to be smaller, more fragmented, and often poorly connected. Some sites are very isolated in the landscape and are disconnected from any PENs. The coastal fringe has formed extensive networks, but these are often narrow and vulnerable to external pressure. Rivers provide a natural connective attribute, often from the uplands to the sea. However, typically the lengthy river SSSIs tend to be bordered by relatively low proportions of semi-natural habitats.

Enhancing connectivity between sites, and their habitats, through expanding protected site extent, for example, enlarging existing SSSIs would improve the

resilience of the SSSI series. The recognition of Other Effective Area-based Conservation Measures (OECMs) presents an opportunity to support biodiversity conservation outside of protected sites, as called for under the 30 by 30 target. OECMs are a new mechanism to the UK which recognise areas that are achieving long term and effective in-situ conservation of biodiversity. Their role in Wales in supporting achievement of the 30 by 30 target is currently being explored (OECM Expert Group for Wales Report). OECMs have the potential to complement SSSIs by recognising areas outside of the SSSI notification criteria that contribute to biodiversity conservation.

In the terrestrial environment, the Nature Networks map offers a strategic tool to help identify nearby networks that could be strengthened or expanded to connect more isolated sites. It highlights potential connections by measuring proximity: up to 300 m for non-riverine biological SSSIs and up to 100 m for riverine biological SSSIs (see Data Map Wales). These aid practitioners in identifying opportunities for local nature restoration.

In the marine environment, network coherence can be assessed using the Charting Progress 2 (CP2) Reporting Regions, determined at a UK scale. Representativity is evaluated at a broad habitat level of different sediments and exposures and depths of rock habitats and also at a habitat specific level (such as horse mussel beds). There are clear requirements for at least 10% of a broad habitat type to be protected within an MPA, with connectivity stipulating a maximum of 80 km between sites of similar habitats. Overall, connectivity within the MPA network is considered to be inherently good.

Spatial approaches such as the RENs, PENs, the Nature Networks Maps and species modelling can help identify strategic opportunities for strengthening the connectivity between SSSIs, OECMs and the surrounding habitats to build more resilient networks. Assessing the SSSI series, including their habitats, species, and Earth science features, using an isolation index tool would provide further valuable insight into fragmentation, edge effects, and the permeability or otherwise of surrounding geodiversity and landscapes to the expansion of habitat or species. This could identify opportunities for improving connectivity through notification activity and support the ‘effectively connected’ principle. This overall approach could help develop a more extensive and functionally connected network across Wales.

6.2 Recommendations for next steps to inform the SSSI notification programme 2025-30

The recommendations are framed around two key areas, preparing for future notification activity and renotification to enable improved future management of existing sites. The SSSI Guidelines and the Joint Statement on Improving the Approach to Protected Areas in the UK should remain key guiding documents for the selection process of sites for notification and renotification.

1. Develop a decision making framework

- Establish clear criteria to support the strategic prioritisation of site notifications, denotifications, and renotifications across the programme to 2030 and beyond.

These criteria could reflect key ecological and geological principles—such as extent, diversity, representativity, resilience, connectivity, and adaptive capacity to environmental change - and will underpin delivery of Welsh Government's commitment to a 30 by 30 framework for Wales.

2. Calculate potential 30 by 30 target delivery

- Using evidence from data on areas of land which host habitats, species and Earth science features of special scientific interest to calculate the existing and potential protected area extent and effective management contribution towards the 30 by 30 target.

3. Conduct resilience and risk reviews of existing sites

In order to make the current series bigger, more resilient, and better connected, conduct a rolling programme of resilience and risk reviews of existing SSSIs, weighting criteria derived from evidence to identify highest priority SSSIs requiring renotification (enlargement, variation, or addition):

- following the publication of revised SSSI Guidelines, and in light of new evidence, continue a programme of feature reviews to identify all features that the SSSI Guidelines now indicate qualify for notification. Update site feature status on the NRW protected sites database.
- review current management effectiveness by utilising available feature condition monitoring data and evidence of vulnerability to climate change impacts. Assess factors that negatively affect the achievement of conservation objectives and explore potential solutions, such as extending the notified area or considering other measures to minimise and adapt from negative external factors.
- explore opportunities for improving habitat connectivity, carrying out further assessment of isolation and fragmentation, using the Nature Networks Map and through development of an isolation index tool to better direct where SSSI notification or OECMs can improve long term connectivity.

4. Evaluate & collate emerging evidence

- use evidence from completed surveys and evaluation programmes, such as the SPA Review, Species in Peril and other notable habitat and species evidence reports and data, to assess the sufficiency of feature representativeness, to evaluate the extent of additional protected land needed to contribute to FCS and to combat biodiversity decline, using the SSSI Guidelines.
- identify and prioritise further survey and evidence gathering requirements needed for informing notification, denotification and renotification activity. Feed into the resource planning for a costed delivery programme.
- ensure that all data sources pertaining to habitat, species, and Earth science evidence to support notification decisions are catalogued and accessible.

5. Prioritise Climate action

- to contribute to the UK's net zero commitments, prioritise the early identification and statutory protection of habitat types that meet SSSI Guidelines and are crucial for carbon sequestration and storage - principally peatlands, woodlands, saltmarshes, and permanent grasslands. This approach is consistent with the

Welsh Government's National Peatland Action Programme, Woodlands for Wales: strategy and Climate Adaptation Strategy for Wales.

- to capitalise on the investment and climate change mitigation opportunities of the restoration of peatland through the National Peatland Action Programme and also the work of NRW's Lowland Peatland Survey Programme in characterising peatland sites potentially of SSSI quality, emphasis should be given to consideration of early notification of peatland sites which meet the SSSI Guidelines.

6. Continuous improvement towards a more efficient SSSI notification delivery programme

- review existing legislation to identify opportunities for improvement, aiming to enhance the conservation management benefits of the SSSI notification, such as increasing its adaptability to ecological changes and climate impacts. For example, develop administratively less burdensome and cost effective legislative mechanisms to legally protect qualifying (but not previously notified) species on existing SSSIs.
- further develop data management systems to capture evidence, in particular from monitoring and effective management evaluation, and to ensure both NRW and stakeholders can maximise potential biodiversity and geodiversity opportunities and outcomes.
- update guidance, provide training, and refresher training material on SSSI notification and delivery. To encompass soft skills, negotiating and communication, legislation and regulation, incentives, and financial support for stakeholders.

7. Determine immediate and long-term resource needs

- identify the immediate resource requirements of survey and notification activity required to deliver an accelerated SSSI notification delivery programme.
- model the costs of ongoing engagement with owners, occupiers and stakeholders, communications, management planning, financing positive management through incentives (such as grants and land management agreements), regulation and monitoring.
- estimate long term requirements for the necessary elements to achieve effective management and favourable condition. Factor into the delivery programme for corporate plan to 2030 and long-term strategic planning.

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8. Appendices

Appendix 1: Areas of Search

The Guidelines for the Selection of Biological SSSIs, Part 1: Rationale, Operational Approach and Criteria for Site Selection explains the establishment and use of Areas of Search (AoS) across Great Britain:

“To provide a good representation of the range and diversity of ‘best example’ sites across Great Britain, a SSSI selection has been carried out since 1979 on a basis which subdivides Britain into a number of geographical units. These are called ‘Areas of Search’ (AoS). For administrative convenience, NCC originally adopted a subdivision based mainly on counties in England and districts in Scotland and Wales. This gave areas which vary between 400 and 4,000 square kilometre, averaging around 2,500 square kilometre. These correspond roughly in size to a Watsonian vice-county, which were considered to be of an appropriate size on which to base selection of sites to represent a national network.”

AoS (Fig. 25), are not designed to artificially cut off site boundaries. Where a biological feature straddles an AoS boundary, it must be the value of the feature as a whole that is assessed. They very roughly correspond to Watsonian vice-county boundaries.

1. West Gwynedd
2. East Gwynedd
3. Clwyd
4. Montgomeryshire
5. Ceredigion
6. Radnor
7. Preseli and Pembrokeshire
8. Carmarthen and Dinefwr
9. Brecknock
10. West Glamorgan and Llanelli
11. Mid and South Glamorgan
12. Gwent

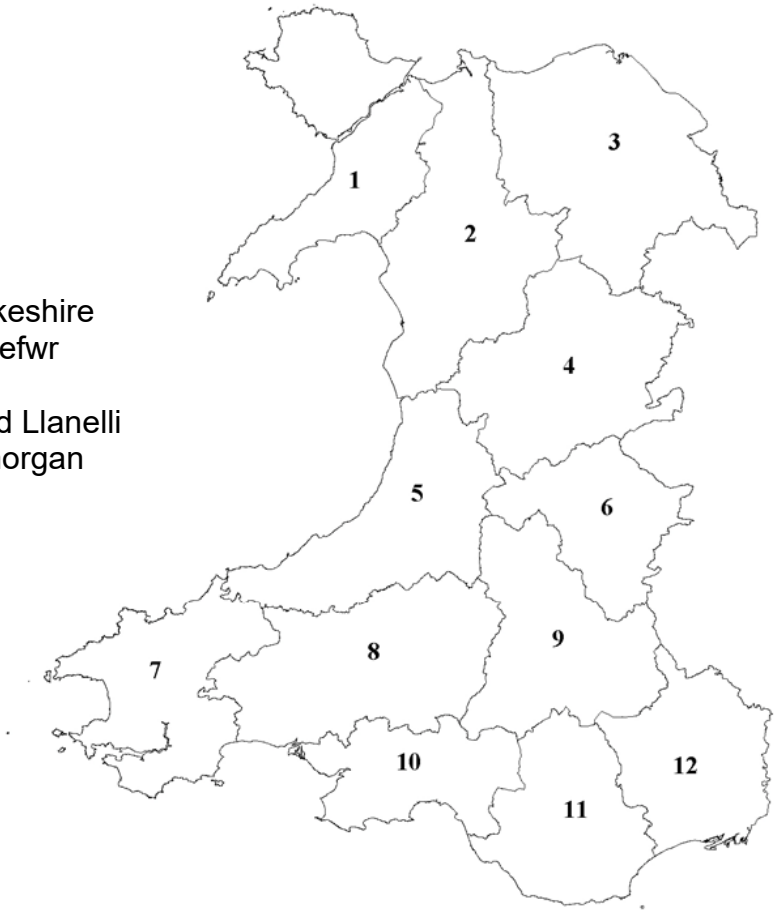

Figure 25: Terrestrial Areas of Search for Wales.

The AoS for intertidal habitats were developed separately from the terrestrial habitats (Fig. 25). They are based on a series of coastal cells around the British coast (Fig. 26). In Wales, these are Afon Hafren i Benmaendewi/River Severn to St. Davids Head (No. 8), Penmaendewi i Ynys Enlli/St. Davids Head to Bardsey Island (No. 9), Ynys Enlli i Ben y Gogarth/Bardsey Island to Great Ormes Head (No. 10), and Pen y Gogarth i Ferin Rheged/Great Ormes Head to Solway Firth (No. 11).

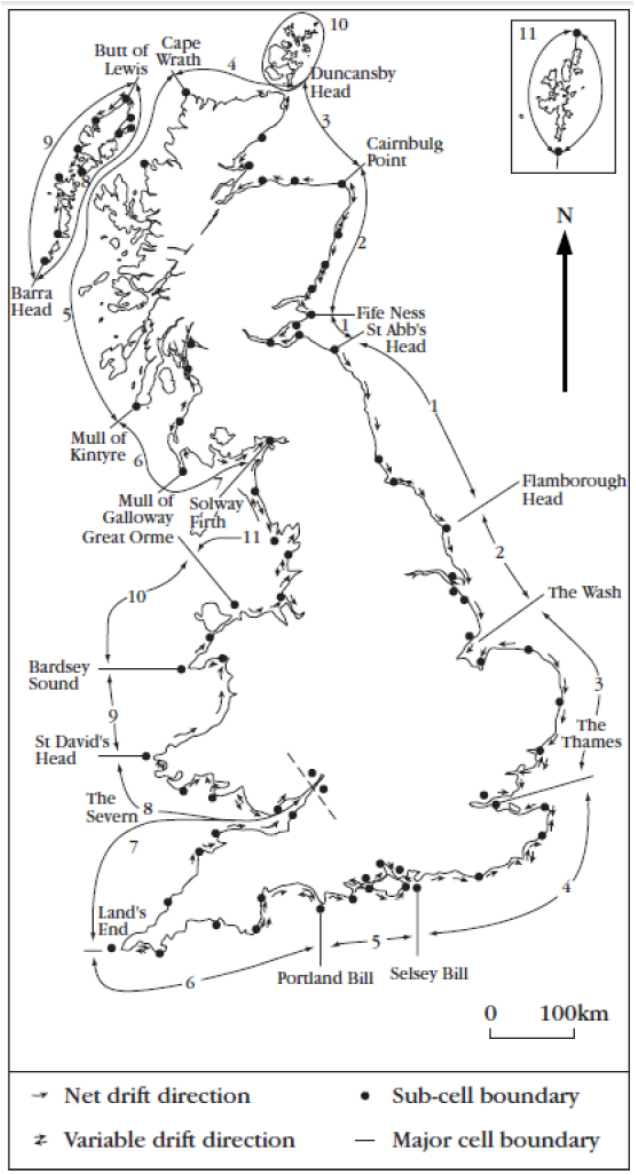

Figure 26: Areas of Search for selection of SSSI for marine features, based on the major coastal cell boundaries for inshore areas of Wales.

9. Data Archive Appendix

Data outputs associated with this project are archived 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 SSSI data in Microsoft Excel format.

Metadata for this project is publicly accessible through Natural Resources Wales' Data Discovery Service https://metadata.naturalresources.wales/geonetwork/srv (English version) and https://metadata.cyfoethnaturiol.cymru/geonetwork/cym/ (Welsh Version). The metadata is held as record no NRW_DS161393.