Guidelines for the Selection of Biological SSSIs

Part 1: Rationale, Operational Approach and Criteria for Site Selection

Editors

Ian Bainbridge, Andy Brown, Nichola Burnett, Paul Corbett, Christina Cork,

Richard Ferris, Mike Howe, Ant Maddock, Ed Mountford, Stewart Pritchard

Part 2: Detailed Guidelines for Habitats and Species
available on the JNCC website

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

ISBN 978-1-86107-625-0

Contents 2

The 2011/12 revision of Part 1 of the Guidelines was undertaken by an Editorial team comprising:

Ian Bainbridge: Scottish Natural Heritage – Editor in Chief
Andy Brown: Natural England
Nichola Burnett: Joint Nature Conservation Committee
Paul Corbett: Department of the Environment Northern Ireland
Christina Cork: Natural England
Richard Ferris: Joint Nature Conservation Committee
Mike Howe: Countryside Council for Wales (now Natural Resources Wales)
Ant Maddock: Joint Nature Conservation Committee
Ed Mountford: Joint Nature Conservation Committee
Stewart Pritchard: Scottish Natural Heritage

FOREWORD

It is now over sixty years since the concept of protecting our most valuable species and habitats through the designation of Sites of Special Scientific Interest was established in Great Britain. Since then, legislation has been amended, improved and devolved, but the SSSI series has remained a cornerstone of Britain's biodiversity conservation policy and practice. SSSIs are an important component of the protection of important and threatened habitats and species, of a habitat network approach to conservation, and latterly as part of a wider landscape-scale ecosystem approach to the sustainable management of our environment.

The formal **Guidelines for the Selection of Biological SSSIs** were originally published in 1989, as a means of explaining the scientific rationale underpinning the selection of special sites across Great Britain. Since then, much new European, UK and devolved legislation has been introduced, and nature conservation responsibilities have been devolved, with the formation of the three country nature conservation bodies, and with JNCC providing a co-ordinating function. However, it is important that the Guidelines continue to reflect a common approach to the biology and ecology underpinning site selection in the context of this devolved governance, and continue to recognise their relevance to the parallel process of site selection in Northern Ireland so as to support ensure a coherent approach at UK level.

This revision has updated Part 1 (previously Parts A and B) of the Guidelines for the first time since 1989. The fundamental basis of the evaluation and selection processes remains largely unchanged. This revised guidance has recognised and taken into account the developing ecosystem approach to biodiversity conservation, our European responsibilities, climate change issues and a number of other changes in our knowledge and understanding that have developed in the last twenty-four years.

The Guidelines recognise that Britain is largely a cultural landscape, and that human actions have had a pervasive influence on almost all of our ecosystems, habitats and species. Nature conservationists especially value those habitats that continue to exhibit a high degree of naturalness and diversity among other well-established criteria. The Guidelines place added emphasis on the incorporation of underlying ecological processes in the definition of site interest and boundaries (such as coastal erosion or accretion, and fluvial processes in rivers and floodplains) and emphasise the need for agency staff to think flexibly to take into account likely environmental change.

These Guidelines therefore enable the system to cope with dynamic change. As such, they lay down basic tenets for the evaluation and selection of sites but leave flexibility to deal with ongoing environmental change. We should expect the SSSI series to track changes in our environment. As new areas become of special interest, we should notify them and as the interest of others changes as a result of broader or intrinsic natural environmental change they should be reassessed.

Most importantly, we must all continue to approach the series as a GB-wide network. Biodiversity does not reflect our internal political boundaries, and a common basis of science, a uniform framework and common standards provide strength to the system established to protect our nationally and internationally important wildlife sites.

Peter Bridgewater, Joint Nature Conservation Committee

Poul Christensen CBE, Natural England

Andrew Thin, Scottish Natural Heritage

Morgan Parry, Countryside Council for Wales (now Natural Resources Wales)

Patrick Casement, Council for Nature Conservation and the Countryside, Northern Ireland

PART 1: RATIONALE, OPERATIONAL APPROACH AND CRITERIA FOR SITE SELECTION

1 The purpose of the Guidelines

1.1 The Guidelines for the Selection of Biological SSSIs provide a consistent rationale for the evaluation and selection of biological Sites of Special Scientific Interest (SSSIs) throughout Great Britain. SSSIs are designated in accordance with the duties in law placed upon each of the statutory nature conservation bodies (SNCBs[1]) to notify as a Site of Special Scientific Interest any area of land which in its opinion is of special interest by reason of any of its flora, fauna, geological, geomorphological or physiographical features. The Guidelines are intended primarily to help SNCB staff in the selection of biological SSSIs, but they are also intended as a public statement of the selection principles for all interested parties. The rationale and criteria for the selection of geological and physiographical sites are published separately (Ellis *et al* 1996).

1.2 This first part of the Guidelines sets out the general principles from which the evaluation and selection procedures have been developed. It also explains some of the background issues and concepts surrounding designation, and about which questions are often asked. It deals with the broad operational approach and the criteria for SSSI evaluation and selection as a whole, as the first level of guidance. Part 2 then presents the detailed and specific guidance for each of the main habitat types and species groups.

1.3 The Nature Conservancy Council[2] (NCC) developed the original Guidelines for SSSI selection between 1975 and 1979, for internal use. Ongoing debate about site selection, both within and outside the NCC, led to the formal publication of the guidelines in 1989 (Nature Conservancy Council 1989). This was stimulated in part by the production and publication of the National Vegetation Classification (NVC) (Rodwell 1991 *et seq*), which gave a new and more systematic basis for the selection of habitats according to vegetation types. Since then, groups of specialist ecologists within the SNCBs have revised four sections of the detailed guidance (freshwater habitats; bogs; non-vascular plants; freshwater and estuarine fish), and added four new sections (intertidal marine habitats and saline lagoons; grassland fungi; veteran trees; water voles).

1.4 The 1989 Guidelines have endured for more than twenty years. This period has seen the devolution of NCC into the SNCBs, the introduction and implementation of the EC Habitats Directive, the birth of the Convention on Biological Diversity (CBD), the development of the Ecosystem Approach[3] to biodiversity conservation, and a real recognition of the ongoing effects of climate change on biodiversity. The devolution of Government across the UK in 1999 brought further major changes, with the subsequent development and implementation of devolved legislation for nature conservation. It has become necessary to review and update the Guidelines both to reflect these changes and to provide an up-to-date rationale for the justification, ongoing selection and management of the SSSI network in Great Britain. The responsibility for implementing wildlife legislation and management is devolved, but all three GB SNCBs agree that the Guidelines should retain a uniformity of

1 Natural Resources Wales, Joint Nature Conservation Committee, Natural England and Scottish Natural Heritage.
2 Since 1991, NCC has been superseded by the SNCBs.
3 The Ecosystem Approach is considered one of the most important principles of sustainable environmental management. The Fifth Conference of the Parties to the Convention on Biological Diversity defined the Ecosystem Approach in Decision V/6, Annex A, section 1 as “a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way”.

approach across Great Britain. The wildlife and habitats of Great Britain do not recognise political boundaries, and the Guidelines are rooted in expert judgement of the value of terrestrial, freshwater, intertidal and marine areas for biodiversity conservation, underpinned by (a growing body of) scientific evidence.

1.5 The original Guidelines produced by NCC were for Great Britain and did not include Northern Ireland. There, the Department of the Environment, through the Northern Ireland Environment Agency (NIEA) is responsible for the declaration of Areas of Special Scientific Interest (ASSI). These are declared under broadly equivalent legislation; the Environment (Northern Ireland) Order 2002, which largely superseded the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. In 1999, the Department published the 'Guidelines for the Selection of Biological ASSIs in Northern Ireland' (Environment and Heritage Service 1999). These were based upon the original NCC Guidelines and were designed to explain the underlying rationale behind site selection in Northern Ireland, and to provide information on its practical application. They were intended as an addendum to the SSSI Guidelines, rather than as an alternative. The NIEA considers that the ASSI guidelines are still fit-for-purpose, has played a full role in the 2011 review process, and is supportive of the current revisions.

2 The purpose of SSSIs within biodiversity and nature conservation strategies

2.1 The SSSIs of Great Britain are the fundamental units of our network of protected areas for nature conservation in terrestrial and coastal, but not normally sub-tidal[4] environments. The most important areas for habitat and species conservation, at both national and international levels, lie within them[5], and all are considered to be of national importance for nature conservation. They make the major contribution towards the establishment of an ecologically coherent[6] national network of protected areas, and are where the interest is most highly concentrated or of the highest quality. Each SSSI represents a significant component of the biodiversity resource of Great Britain, and its protection is an important part of Great Britain's biodiversity conservation activity.

2.2 Legislation for the designation of SSSIs emerged as part of the National Parks and Access to the Countryside Act 1949. The areas of special interest were specifically differentiated from nature reserves as "*not being land for the time being managed as a nature reserve",* but which were of sufficient natural heritage interest to warrant formal protection from development and other change. Areas designated were notified to the planning authorities who were required to consult the Nature Conservancy[7] when making development decisions on these sites. The Wildlife and Countryside Act in 1981 extended the protection provided to these special sites, partly to implement the newly-enacted Birds Directive. NCC was additionally required to notify landowners and occupiers of the interest of a site and in

4 Details of the means of defining low-tide boundaries are presented in Section 8.10.

5 A small number of internationally important Special Protection Areas or Special Areas of Conservation, designated under the Birds and Habitats Directives, mostly in Scotland, are not underpinned by SSSI designation.

6 An ecologically coherent network consists of sites designated for the protection of relevant habitats and/or species; it should support habitats and populations of species in favourable conservation status across the whole of their natural range (including the wider countryside beyond Natura 2000 sites); and contribute significantly to the biological diversity of the biogeographic region. At the scale of the whole network, coherence is achieved when: the full range of variation in valued features is represented; replication of specific features occurs at different sites over a wide geographic area; dispersal, migration and genetic exchange of individuals is possible between relevant sites; all critical areas for rare, highly threatened and endemic species are included; and the network is resilient to disturbance or damage caused by natural and anthropogenic factors (Catchpole, 2012).

7 The predecessor body to NCC, which was formed in 1973.

turn they were required to consult NCC before carrying out an operation it listed as being 'likely to damage' the special interests of a site. The majority of SSSIs remain in private ownership, although SSSIs also encompass almost all National Nature Reserves (NNRs) and many non-governmental or private nature reserves. The interest of this site network has therefore been safeguarded under the relevant provisions of the 1981 Act (as amended) and latterly in Scotland, by the provisions of Part 2 of the Nature Conservation (Scotland) Act 2004. Many privately–owned sites are subject to management agreements with the relevant SNCB to safeguard and manage their special interest.

2.3 Today, SSSIs continue to offer safeguard for sites under legislation which can be traced back to 1949. However, they also fulfil a number of roles made necessary by subsequent changes in conservation legislation, philosophy and practice. They provide statutory protection under UK law for the network of terrestrial and freshwater Natura 2000 sites classified under the European Birds and Habitats Directives, and for sites designated under the Ramsar Convention. They help to deliver and underpin the UK's contribution to the Convention on Biological Diversity (especially the 20 Aichi targets) as expressed through the Global Strategy for Plant Conservation, the EU Biodiversity Strategy, UK post-2010 Biodiversity Framework, and the biodiversity strategies of the four countries of the UK. Their relevance to legislation such as the Natural Environment and Rural Communities Act and the Nature Conservation (Scotland) Act, and their contribution to conserving priority habitats and species should be recognised and reflected in the selection and classification of SSSIs.

2.4 Approximately 75% of the area covered by SSSIs is recognised as being of EU importance, and these areas are also designated as Special Protection Areas (SPAs) under the Birds Directive (Council Directive 2009/147/EC on the conservation of wild birds) or Special Areas of Conservation (SACs) under the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora). These sites are also safeguarded by the provisions of the Conservation of Habitats and Species Regulations 2010 (England and Wales) and the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)(Scotland).

2.5 When a habitat or species is considered especially important because Britain holds the entire, or a large proportion of the European or world resource, and there are large proportions of that habitat or species population in some parts of the country, different issues in evaluation and selection arise. Britain's international responsibilities are an important factor in the evaluation and selection of sites. The EU legislation on nature conservation consists of two main Directives:

i. Directive 2009/147/EC on the protection of wild birds (originally 79/409/EEC) (*The Birds Directive*),

ii. Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (*The Habitats Directive*).

The areas protected under the Birds and Habitats Directives form a network of European sites known as the Natura 2000 network. The main purpose of this network is to maintain the protected species and habitats at, or restore them to, 'favourable conservation status' in their natural range. The protected areas comprise:

i. Special Protection Areas (SPAs) – sites classified under the Birds Directive. The species protected are those listed in Annex I of the Birds Directive, and all regularly occurring migratory species;

ii. Special Areas of Conservation (SACs) – sites designated under the Habitats Directive. The habitat types and species concerned are listed in Annexes I and II of the Habitats Directive.

The lists in the Annexes of both Directives concern habitat types and species considered to be most in need of conservation at the European level.

2.6 In 1984, NCC stated that: *"The primary objective of nature conservation is to ensure that the national heritage of wild flora and fauna and geological and physiographic features remains as large and diverse as possible, so that society may use and appreciate its value to the fullest extent."* The 1989 Guidelines Review added that "*Site safeguard, that is the protection and management of the most important areas for wild flora and fauna and their habitat, is regarded as the cornerstone of conservation practice and, within this, SSSI notification is now the principal statutory means of achieving this goal"*. Those sentiments may not be expressed in quite the same way today, but SSSIs remain a cornerstone of the broader biodiversity and environmental policies across Great Britain.

2.7 The purpose of biological SSSIs is to safeguard the diversity and geographic range of habitats and species throughout Great Britain, within which the viable populations of all our threatened native species will be represented; as well as the full range of natural, near-natural and semi-natural ecosystems. To do this effectively, the principle behind the designation must be to protect all the component parts of the habitat within an SSSI, and all the species within those habitats in the SSSI. The SSSI series should therefore include our most important natural heritage sites.

2.8 Over the last twenty years, there has been increasing recognition of the need for and legitimacy of biodiversity conservation in the wider environment. The much larger area of land outside SSSIs contains a far greater proportion of the widespread, commoner habitats and species than the special sites, and has an important role in maintaining the interests of the SSSIs. Biodiversity conservation is no less essential in the wider countryside than in SSSIs, but it is generally achieved by non-statutory and less direct approaches involving advice, education, advocacy and financial incentives. Species protection legislation and measures for safeguarding landscapes also complement SSSIs. The ecological interdependence of the SSSIs and this wider environment is crucial and, while designation necessitates drawing clear boundaries, it is important to integrate, as far as possible, the conservation measures for both protected sites and wider countryside in an ecosystem-based approach[8].

2.9 Many SSSIs also have a supplementary role in the provision of ecosystem services. By contributing to the maintenance of healthy ecosystems, SSSIs deliver a variety of provisioning, regulating and cultural services to society. SSSIs contribute to a range of provisioning services, such as production of food and timber and provision of fresh water. SSSIs contribute to the conservation of genetic resources by conserving wild crop relatives and by being grazed by rare livestock breeds. SSSIs support recreation and tourism, provide a resource for scientific research and education on biodiversity, and contribute to cultural landscapes by providing a sense of place and a connection with nature. They deliver regulating services such as water purification, and the regulation of climate, water and natural hazards by protecting ecosystems and enhancing their function. The value of the services delivered by SSSIs in England and Wales has recently been assessed under the Defra-funded 'Benefit of SSSIs' research project[9], which concluded that targeted action and investment in bringing SSSIs back into favourable condition delivers benefits far in excess of the associated costs.

8 An ecosystem-based approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (CBD, 2000)

9 Benefits of Sites of Special Scientific Interest: Report to Defra, 2011. http://randd.defra.gov.uk/Document.aspx?Document=finalreportsssis-benefits.pdf

2.10 It is not appropriate to prescribe a definite limit to the total number and area of sites which should be designated as SSSIs. The total extent of SSSI land should reflect the consistent application of these principles, selection procedures and standards across Great Britain. In 2011, the total area of SSSIs designated is 2,371,775 ha, i.e. just over 10% of the area of Britain. The extent of SSSI land varies geographically, according to the wide regional differences in extent of natural and semi-natural habitats. Broadly, regions with large amounts of upland or coastal habitats are likely to support larger areas of SSSIs.

2.11 The 'special interest' of biodiversity features is not necessarily fixed in time. Some species or habitats may become more widespread and numerous and thus less threatened, whilst others may decline, so the remaining populations and areas will assume increased value and may require greater protection and/or better management. One of the manifestations of climate change is altered distribution patterns of some species, particularly those that are highly mobile such as migratory birds. A number of sites which are important for populations of wintering wildfowl now support lower numbers of some species and higher numbers of others than at the time they were first notified. Some have lost much of their notified interest (but may still be important during extreme weather) and other sites are becoming increasingly important for a range of species for which they were not originally notified. Habitats are also subject to change; highly dynamic processes can dramatically alter estuarine habitats, coastal slopes, cliff-top grasslands and flood plains, and managed realignment or inundation in coastal areas can create new wetlands and destroy others.

2.12 It is also important to appreciate that the scientific understanding and British or international concepts of special interest may change. Changes in taxonomy, and in our attitudes to genetic conservation may mean we view certain species or habitats as more or less valuable than before. The context for any consideration of scientific importance is crucial in determining what is and is not important, and there have been some significant changes in this context since the guidelines were written. Locally common habitats and species which may not have been chosen as notified features of an SSSI in a GB context, may assume a much greater significance in a wider, EU context and may actually be priorities for inclusion within the national series as a consequence. The EC Directives require us to adopt just such a perspective. The Convention on Biological Diversity and Country Strategies place an emphasis on an ecosystems approach, delivering multiple benefits including protection of threatened species, restoration of habitats and delivery of ecosystem services. The increasing value we now place on safeguarding and promoting ecological processes may result in us recognising additional values for some sites. New thinking on how we adapt to climate change may require us to examine the potential of some areas for species and habitat conservation. All of these factors mean that SNCBs are likely to keep the SSSI series under review to reflect our dynamic environment, changing natural heritage values and circumstances and changes in the context within which our site conservation work is conducted.

3 The concept of Special Scientific Interest

3.1 The concept of *"sites of special scientific importance"* first appears in the report to Parliament of the Wild Life Conservation Special Committee (England and Wales), (Cmd. 7122, 1947). In the National Parks and Access to the Countryside Act 1949, the word "*importance*" was replaced by "*interest*", but the two terms have been regarded as synonymous since then.

3.2 The 1949, 1981 and 2004 Acts speak of designating *"any area of land ... of special interest by reason of [any of] its flora, fauna, or geological or physiographical / geomorphological*

features". The term "Site of Special Scientific Interest" or SSSI has become the understood and accepted term covering the legal formulation. The SNCBs are required to exercise their "*opinion*" on the selection of sites for notification, and this recognises that special scientific interest is a matter of informed expert judgement rather than simply the rigid application of objective rules.

3.3 The SNCBs have therefore developed this conceptual framework and criteria for the determination of special scientific interest and the choice of sites. Given that the nature conservation interest of species and habitats varies greatly from place to place, special interest must refer to the highest quality part of the variation found across Great Britain. The determination of this upper segment depends on the views of those with specialist knowledge of the species and habitat features: conservationists and ecologists, both inside and outside the SNCBs.

3.4 The determination of special interest requires two steps. First, the descriptive recording of the biological attributes and controlling physical environmental features of an area, and second the evaluation of this information using established criteria, to determine the nature conservation value of a site. The descriptive part of this process, within the limitations of resources and expertise, can be made reasonably objective and standardised. The development of the evaluation criteria involves the integration of the views of a range of experts in the relevant species and habitats.

3.5 Very little of Britain's land surface is unmodified by human influence, and the remaining near-natural (essentially unmodified) habitats, are confined to some high mountain tops in the uplands, cliffs, limestone pavements, peat bogs, mountain lakes and rivers (and their islands), sea cliffs and many intertidal areas. Even here, the pervasive effects of climate change and atmospheric pollution have caused some modification of habitats otherwise unaltered by human intervention. However, around 30% of the land surface is considered to comprise near-natural or semi-natural habitats, which retain a high degree of naturalness and typically support diverse native animal and plant communities. There is a wide variation in the distribution and abundance of these habitats across Britain, from 5-15% in many lowland English counties to between 50 and 95% in upland districts of Wales, northern England and Scotland. In the lowlands, these habitats mostly comprise fragments of ancient woodland, heath, grassland and scrub, bog and fen, lake and river, saltmarsh, dune and machair, and some substantial intertidal areas. The greater area however, is in the uplands: mainly in montane and upland grassland, heath and bog. Most near- and semi-natural habitats are subject to low-intensity use, upon which their continued existence depends; for example they may be important for extensive grazing or for recreation, and some are virtually unused.

3.6 The remaining 70% of our land is more intensively used, mainly for agriculture and commercial forestry and for urban, industrial and transport purposes. These modified habitats are for the most part artificial in structure, and are characterised by introduced, cultivated plant species. Whilst this modified and developed land has some wildlife interest, much of this interest is common and widespread, widely dispersed or fragmented into a large number of small parcels of less-modified habitat within the modified systems. Conservation of this wildlife interest, with notable exceptions for particular species[10], is not generally well-served by a site-based conservation approach.

3.7 Conservation by the protection of special sites is appropriate in places where the wildlife interest is especially high or valued species are concentrated. In practice, this means that SSSIs are designated largely within the areas of near-natural and semi-natural habitats,

10 Such as arable-nesting birds (stone curlews, woodlarks) bats in buildings, some specialist invertebrates, rare arable plants, saxicolous lichens

although they amount to only about one third of the total area of those habitats. The reason that high wildlife value is accorded to the less-modified habitats is primarily related to the intrinsic interest of the habitats, plant and animal communities and species found there. It also relates to their scarcity and vulnerability, and to the difficulty of restoring them in the event of damage or loss. In general, the more that a natural habitat has been modified, the greater is the difficulty, time and cost of the complete re-creation of its original structural and species composition. The complete restoration of high-quality, semi-natural habitats remains a challenging prospect. This means that in-situ retention of such habitats remains a key guiding principle.

3.8 The areas of near- and semi-natural habitat which are considered to be of high conservation value are dominated by native species and typically retain a high species-richness of those species closely or obligately associated with those habitats. In the uplands and peatlands, these habitats may be relatively species-poor, but this reflects that their natural precursor habitats were often limited in species richness. In these habitats, low diversity is not a valid reason for regarding them as having a low nature conservation value. The key is to continue to select those sites retaining the highest or best complement of species and plant communities naturally associated with that habitat.

3.9 Designation as SSSI is normally inappropriate to most sites of highly artificial character, including most of the urban environment and intensively-managed farmland. However, there are certain situations where sites are of SSSI quality given their species complement (e.g. rare bats or rare lichen assemblages on or in buildings). These sites may include artificial waterbodies, mining features, old buildings, and also certain coastal and floodplain pastures, plantations, arable fields, and areas of previously-developed land.

4 The rationale for the evaluation and selection of a national series of biological SSSIs

4.1 Great Britain, although relatively small, is an ecologically diverse area. The coasts are biologically diverse as Britain lies on the boundary between two marine ecozones, and three oceanic / climate zones, emphasised by the contrast between the exposed western Atlantic shores and hard cliffs and the eastern soft coasts and shallow, large bays. On land, the broad geographical division between low-lying, flat and fertile land to the south and east, and mountainous, steep and infertile terrain to the north and west provides the most conspicuous contrast across the country. Superimposed upon and magnified by these geological and topographic differences are major gradients of climate. Mean temperatures fall with increasing latitude and altitude, and there is an increase in rainfall, wind and cloud cover with increasing distance west and with altitude. The temperature range is also smaller in the west and with proximity to the sea. These environmental gradients have produced geographical differences in agricultural, urban and industrial development and a converse pattern in the extent of near-natural and semi-natural habitats. Within these habitats, they have also produced wide diversity in both physical and biological character, and this diversity sets challenges for the consistent evaluation and selection of SSSIs across Great Britain.

4.2 The criteria for evaluating important nature conservation sites in Britain have evolved over the last 150 years. In Victorian times, the study of natural history became a leading interest in scientific, intellectual, and recreational circles. County floras, journals on natural history, and the writings of amateur and professional biologists provided information about important localities for wildlife. An understanding of the best places to find rare and local species became a common fund of knowledge. Many of these places are repeatedly referred to in the literature and became well-known over a long period.

4.3 Drawing on this information, in 1915 the Rothschild Nature Reserves Investigation Committee compiled a list of desirable places for the establishment of nature reserves for the Society for the Promotion of Nature Reserves. In 1947, this list was adopted, amended and published by the Government's Wild Life Conservation Special Committee. This provided a list of areas identified as potential National Nature Reserves and other special sites. A similar compilation was undertaken to develop a list of SSSIs when these became a statutory designation, and, as if to emphasise the need for a strong system of site protection, many of the sites which appeared on the original list were destroyed before any protection could be conferred upon them (Rothschild and Marren 1997, Marren 2002). Additions to this latter list have been mainly of sites newly discovered (many new sites were found during surveys in 1980s and 1990s), whilst deletions have resulted from deterioration in quality or complete loss of sites rather than from the re-evaluation of intrinsic attributes. There has been a remarkable degree of agreement over the value of sites on these lists. This stems from a common understanding of the background concepts. Much of the earlier interest was in rare and local species, so that the sites selected were those with the best aggregations of uncommon wildlife. Later, with the growth of ecological science, sites with classic examples of vegetation types, communities, and dynamic processes, and a few subjected to intensive ecological studies, were added to the lists. The standards of nature conservation evaluation therefore became established through practice and precedent, with emphasis placed on the soundness of judgement and expertise of those concerned.

4.4 The Wild Life Conservation Special Committee report contains virtually no reference to criteria for site selection. A detailed rationale for site selection was developed in the 1970s, when it became clear that increased resource competition with other interests would lead to an increase in the questioning of the process. ***'A Nature Conservation Review'*** (Ratcliffe 1977) explained the thought processes which had gone into the choice of nationally important sites. This presented a rationale based on all the major factors which were consistently detectable in the sites themselves.

4.5 In the site selection process, there must be a clear framework of judgements within which evaluation takes place. The evaluation of quality depends on the prior definition of qualifying requirements, which will vary according to the type of interest feature. This leads to decisions as to which and how many of the known sites should be selected for notification. Selection is the crucial, first scientific step towards meeting the legislative requirements and allocating resources for protected sites, and this is the stage which requires clear guiding principles derived from basic conservation objectives.

4.6 The Wild Life Conservation Special Committee report gave an authoritative analysis of the purposes of safeguarding the most important biological sites for nature conservation as a series of National Nature Reserves. Within this rationale was enunciated the first basic principle for site selection. By 1970, a second principle was established to select certain types of site. The two fundamental **guiding principles, which remain the basis of site selection, are:**

- ***the exemplary site principle* – that the series of sites should contain adequate representation, in the form of the best examples, of the countrywide range of variation in near-natural and semi-natural habitat types, with their associated assemblages of plants, fungi and animals, considered both as communities and as individual species.**
- ***the critical standard principle* – that the identification of a critical standard of nature conservation importance can be developed and applied, above which all examples should qualify for key site status.**

In selecting key sites of national biological importance, *A Nature Conservation Review* applied the exemplary site principle to the assessment of most habitats, but used the critical

standard principle, either in population size or percentage for some species assessments, such as wintering wildfowl populations and colonial breeding bird assemblages. For many important habitats one or two of the best examples were chosen in each local area (exemplary site principle), and for some rare and fragmented habitats (e.g. the Breckland and Lizard heaths) all remaining areas of good quality were chosen (critical standard principle).

4.7 In 1975, NCC began to develop formal guidelines to establish consistent criteria and standards throughout Great Britain for the selection of biological SSSIs. The criteria were based on those used in *A Nature Conservation Review* for habitats (principally naturalness, diversity, typicalness and size), supplemented by provisions for rare species and important assemblages of animals, plants or fungi. The concept of 'Areas of Search' was also developed to ensure that for each habitat type there was both an adequate total area and a good geographical spread of SSSIs across Great Britain (see 4.13). The Guidelines related the number of sites selected to the scarcity and vulnerability of the biodiversity occurring within them. Criteria were also developed for the selection of 'buffer land' around wetland and other SSSIs that required such protection. In 1979, NCC formally accepted these criteria, and these have formed the basis of the Guidelines used since then. The Guidelines proved particularly timely with the passing of the Wildlife and Countryside Act 1981, which afforded much greater protection to SSSIs.

4.8 The ***exemplary site principle*** and the ***critical standard principle*** have both been applied to the selection of the SSSI series, but the emphasis on one or the other varies according to circumstances. For some habitats and species, a large part of the remaining areas and populations can be deemed to have special interest, but there will be geographical variation in the value according to the size of the remaining resource. In the lowlands of Cambridgeshire, for example, only a small proportion of the land is now semi-natural, and much of this is in SSSIs. In the extensive near- and semi-natural habitats of intertidal areas, or the uplands of Sutherland, a much larger proportion of land qualifies for selection. The SSSI series therefore shows a gradient: in the lowlands, there is generally a larger number of small sites, perhaps comprising all the remaining good-quality examples of a particular habitat, compared with fewer but larger sites within the more continuous expanses of semi-natural habitats in the uplands and coastlands. It is important to apply minimum standards of quality to the selection of all SSSIs, but the principle of choosing only the best examples is appropriate only to the extensive and continuous types of habitat, notably rivers, northern lakes, cliff coasts and a number of upland habitats. For many habitats, it is appropriate to select several of the best remaining examples in each area. This changes the emphasis from (1) choosing only the best examples in an area (the exemplary site principle); to (2) choosing most or all remaining examples (the critical standard principle), depending on how much habitat/how many sites remain. If many sites remain then tend towards (1), if plenty of sites remain then tend towards (2). However, it is not possible to quantify this. Proportionally larger areas of habitats recognised as being of international importance also need to be selected (e.g. estuaries, some woodlands, heathlands and blanket bogs).

4.9 In many cases SSSIs comprise a single parcel of land and a single habitat. However, some habitats have been particularly prone to fragmentation. For example, there may be a group of individual fields of semi-natural grassland within a matrix of improved farmland within a valley. In such a case it is appropriate to consider these as component parcels of land within one SSSI, which we term **a compound site**[11]. In Scotland, for example, 33% of SSSIs comprise more than one parcel of land, and in Wales, 31%. Mobile animals are likely to use the components as a single unit, possibly forming a metapopulation, so that the

11 As opposed to **composite sites** (see Section 9.3). Compound sites are a means of adopting the critical standard principle (see section 4.6)

site will therefore help to conserve larger populations of those species. This approach may become increasingly important, given the development of the concept of ecological networks, which are intended to increase the resilience of isolated sites to pressures including climate change and fragmentation. In future, 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 (see 5.16). This approach is already being adopted for sites to protect species such as the marsh fritillary butterfly (*Euphydryas aurinia*).

4.10 The definition of standards and the identification of best examples depend on an evaluation system in which criteria of nature conservation importance are applied to survey information. Each criterion assesses attributes or features whose value increases as, for example, size, diversity or naturalness increase. These values derive from the range of interests in the features themselves. The procedure therefore depends on a background classification of the countrywide variation in habitats and communities to provide a framework of reference. The criteria used are based on those defined in Volume 1 of *A Nature Conservation Review* (Ratcliffe 1977), which are discussed in more detail below.

4.11 The biological attributes for site selection can be divided into habitat types, individual species of plants, fungi or animals, and species assemblages. Terrestrial habitat type assessments are based mainly on vegetation categories (plant communities), with an appreciation of abiotic features (e.g. soil condition) and sometimes individual plant species and associated animal communities. Habitats are valued in their own right and not simply as the providers of ecological niches for species. The primary division into ten major habitats (Part 2, Chapters 1-10) is based on the detail in *A Nature Conservation Review* (Ratcliffe 1977). Most of these are subdivided primarily according to the plant communities and sub-communities in the National Vegetation Classification (Rodwell 1991 *et seq*) or their equivalents (e.g. for vegetated shingle, Sneddon and Randall 1994). The exceptions are woodlands (where vegetation structure plays a far larger part), freshwater habitats (with their own classification) and intertidal coastal habitats (where a biotope classification is used – see Connor *et al*. 2004). The NVC classification provides the most comprehensive and precise classification of the terrestrial habitats found across Great Britain. These are detailed in the annexes to the chapters of Part 2. Individual plant, fungus and animal species, and species assemblages are assessed within broad taxonomic groups (Chapters 11– 20). However, other types of classification may be used to highlight other important elements of variation in particular circumstances.

4.12 The chapters on habitats and species groups in Part 2 describe the information on which the evaluation depends. This information should, as far as possible, be presented as a quantitative assessment. The primary habitat information required is the extent and quality of habitats and vegetation communities within a site. Information on the abundance and population size of the species under consideration is also vital. Knowledge of the total extent, abundance and status of both habitats and species over the whole country provides the background in judging the value of their occurrence on any one site.

4.13 *Areas of Search*

To provide a good representation of the range and diversity of 'best example' sites across Great Britain, 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 sq. km, averaging around 2,500 sq. km. These correspond roughly in size to a Watsonian vice-county (Dandy 1969), which were considered to be of an appropriate size on which to base selection of sites to represent a national network.

4.14 The subdivision of Britain into biogeographical areas has long been proposed as the best basis for site selection, but no common system has been agreed. Whilst the original Areas of Search continue to be used in Scotland and Wales, Natural England is in the process of adopting AoS based on biogeographical units, derived from the English National Character Areas (NCA)[12]. Scotland and Wales continue to use Areas of Search based on the 1979 local government boundaries. The Areas of Search in use in each country are shown in Figures 1.1 – 1.3. In essence, either administrative or biogeographical boundaries give a practical geographical framework for selection across the national range of variation in both habitats and species assemblages resulting from differences in environmental factors, such as climate, topography, geology, soils and land-use history.

4.15 The Areas of Search for intertidal habitats have been developed separately from those for terrestrial habitats. The AoS for intertidal habitats, which are based on a series of coastal cells around the British coast, are shown in Part 2, Chapter 1a of the Guidelines.

4.16 Devolution has brought about new arrangements for the treatment and management of cross-border SSSIs. When the Environment Act 1990 created the Country Agencies it also devolved the responsibilities for SSSIs. The few cross-border SSSIs were divided into pairs of SSSIs with the same names. However, where a biological feature crosses an administrative boundary, it must be the value of the biological whole that is assessed, regardless of whether the site lies in one AoS or two, or whether it is covered by one jurisdiction or two.

4.17 A number of ecological principles and considerations may influence the size, number and spacing of sites within any area. For many species the effects of ecological isolation can be minimised by providing protection to a number of sites in an area. This will undoubtedly become more important as strategies for adaptation to climate change are developed. It is also considered important to maintain robust populations of species within SSSIs which can help to support populations occurring in the wider countryside. The aim of maintaining viable populations of species needs to encompass both the survival of rare and vulnerable species, and the best examples and populations of widespread species across their range in Great Britain. Populations in protected areas should be large enough to avoid genetic problems, such as inbreeding depression, although there is often little knowledge or guidance in these matters. Selection of SSSIs is therefore based on expert judgement, underpinned by a firm evidence base (helped by our growing ecological knowledge and understanding), combined with a realistic perception of the values society places on these biodiversity features.

4.18 Although these Guidelines seek consistency in standards of SSSI selection, it is not possible to specify the uniform application of criteria to any species or habitat across Great Britain. The network must allow for and reflect geographical variation in habitats, plant and animal communities, species morphology and genetic variability. It must also reflect the extent, distribution and abundance of features. This can cause a different value to be placed on a site according to its location. For example, habitats and species can be of particular interest at the limits of their ranges. They are often less common or under greater stress, their ecological requirements may be more demanding and their numbers may be more responsive to environmental change. They may also contain important genetic variation. Studies of habitats and species at their natural geographical limits may thus give scientific insight into both population change and the nature of controlling

12 NCAs are distinct biogeographical areas that cover the whole terrestrial area of England. The 159 NCAs have been identified by analysing geology, soils, landform and land-use across England. NCAs are the main framework used to describe landscapes and habitats, target action, and set priorities for habitats and species in map form in England. They provide a common framework that can be used to compare social, economic and biodiversity information. http://www.naturalengland.org.uk/ourwork/landscape/englands/character/areas/default.aspx

pressures or processes, which has increasing relevance at a time of significant environmental change.

Figure 1.1. Areas of Search: England

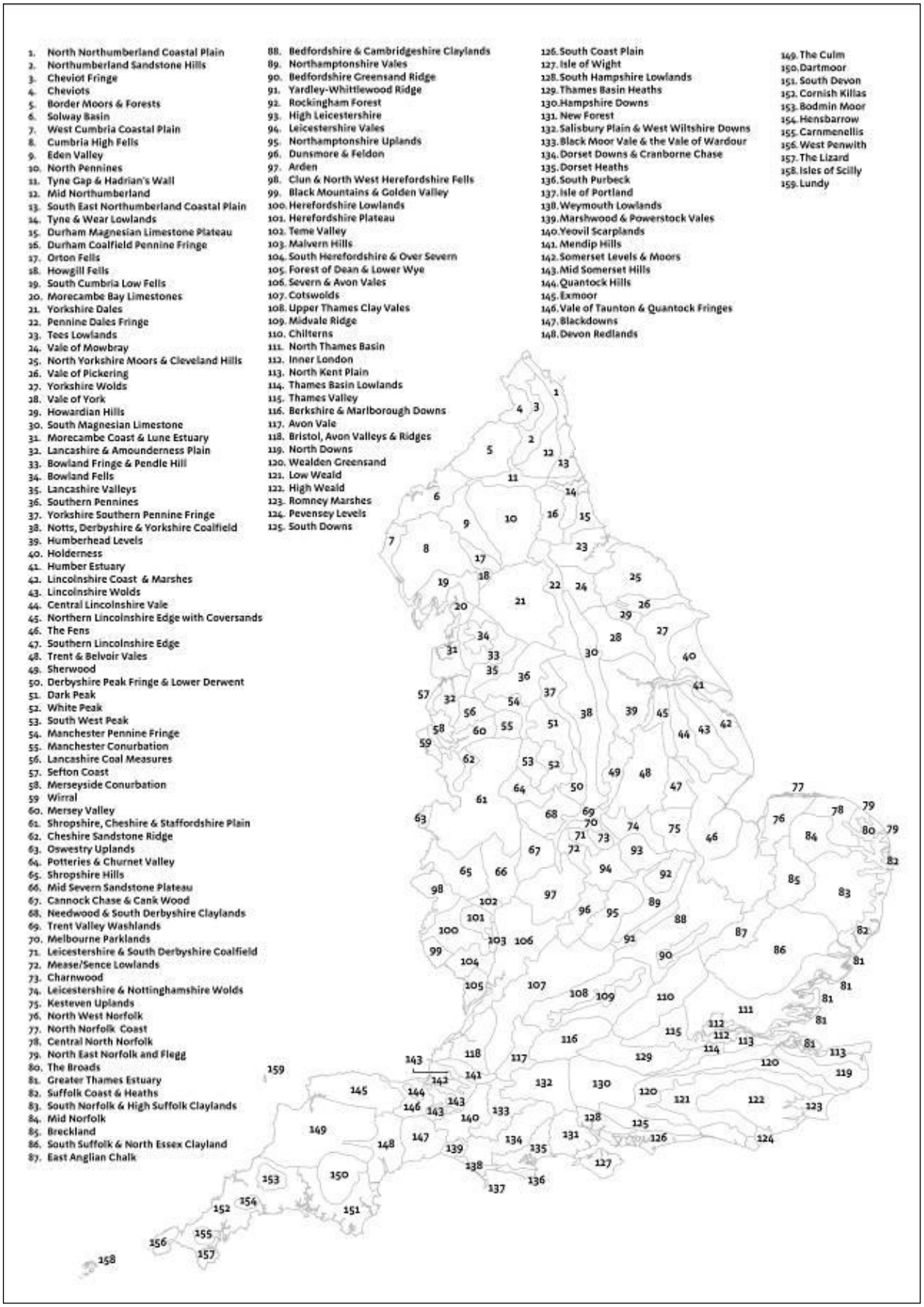


Figure 1.2. Areas of Search: Scotland

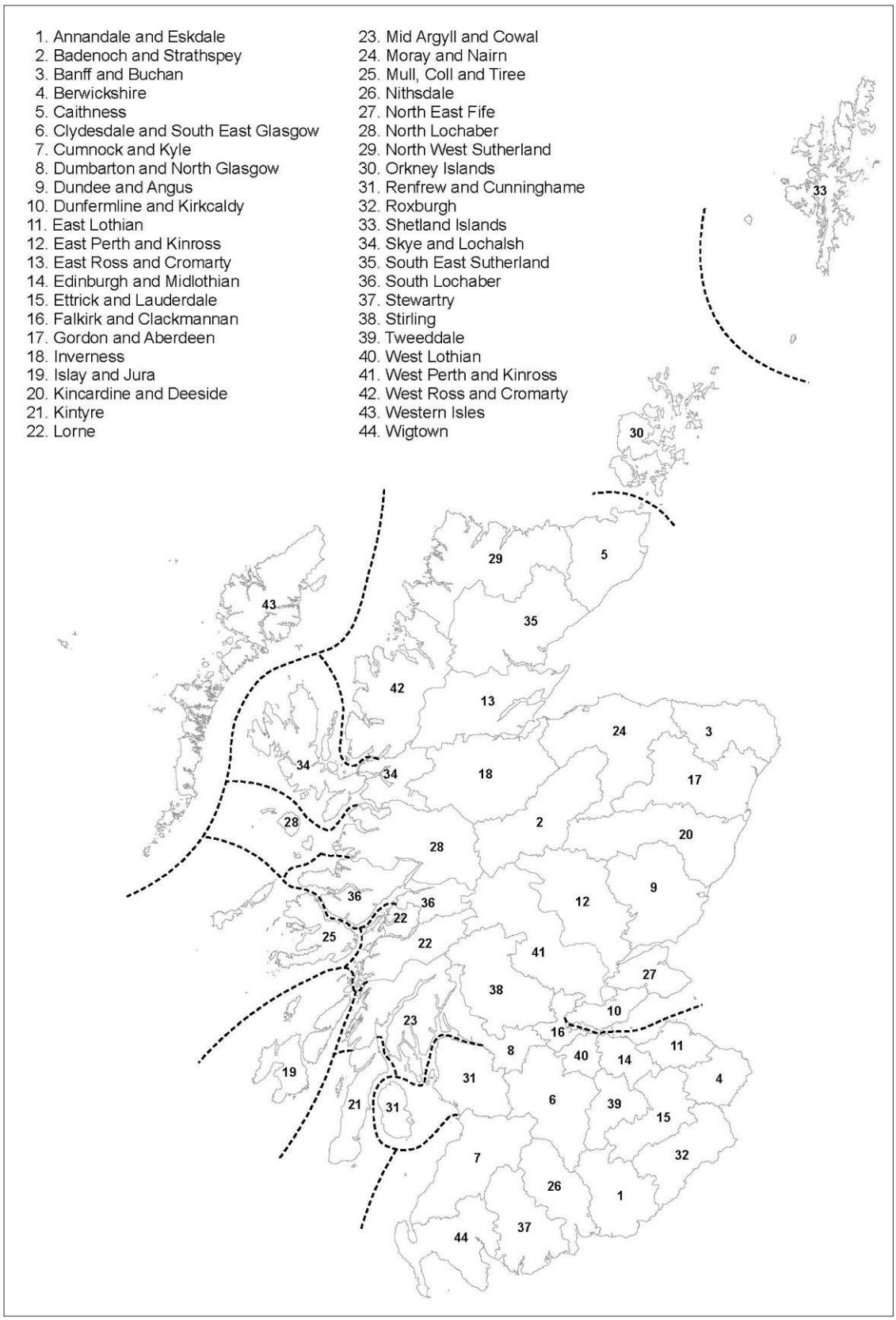
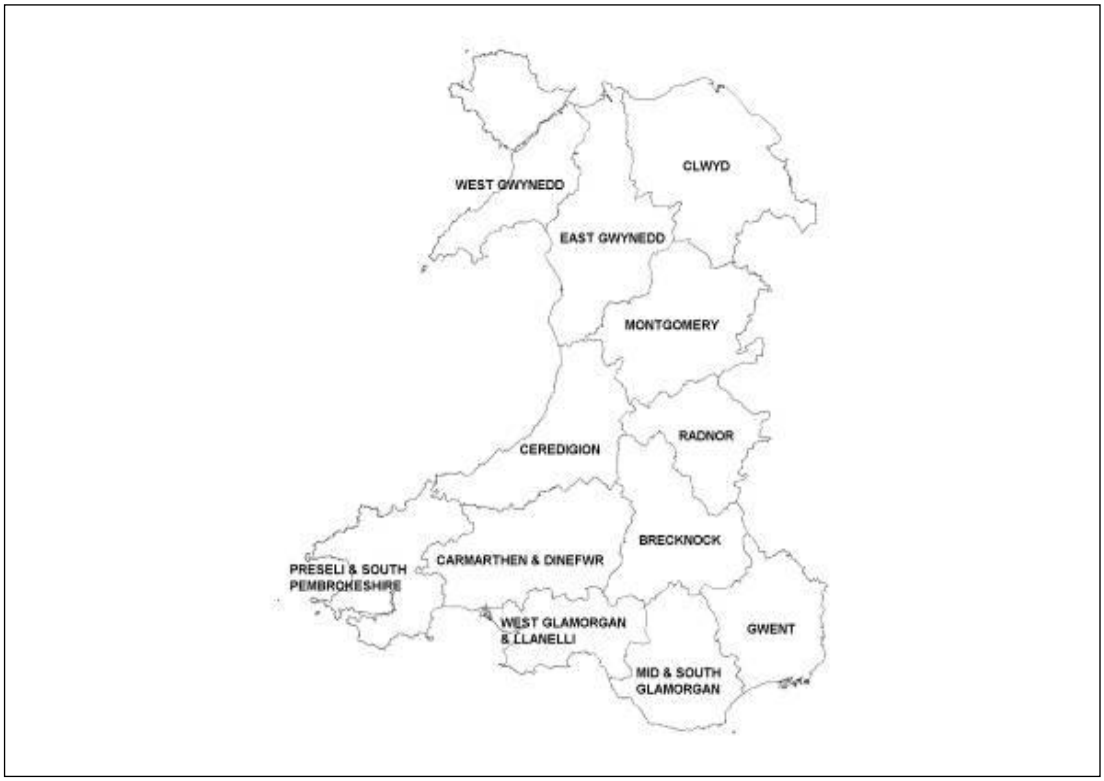


Figure 1.3 Areas of Search : Wales



4.19 The legislation has never set limits to the size of individual areas regarded as having special interest. While upland sites tend to be large compared with most lowland sites, it has been the practice to determine the area of an SSSI as that considered necessary to encompass the special interests and to ensure their long-term viability. The largest single SSSI in Britain is the Wash, covering 63,135 ha of intertidal mud, sandflats, saltmarsh and estuarine habitats, one of the most important coastal wetlands in Europe. Areas such as the Cairngorms and the Caithness and Sutherland Peatlands (the Flow Country) are also of outstanding national and international importance and to reflect this, a large proportion of the resource has been notified.

4.20 It is not always possible to provide rigid rules for SSSI selection which require only the measurement of attributes to determine whether sites pass a critical total 'score' or value. The nature of the evaluation process means that scores themselves will be subjective. In practice, a mixture of attributes has to be evaluated, which requires expert judgement stemming from a wide experience of the ecosystems, habitats and species in question. When a scoring procedure is recommended (e.g. for certain species groups), these limitations must be borne in mind. When threshold values (such as minimum area or population size) are provided, they must be regarded as guidance, subject to the judgement of those concerned, and not used uncritically to accept or reject sites. The decision to select (or not) a site for SSSI notification must be transparent, objective and explicable. This must be based on the rationale in this document, and an explanation of how evaluation decisions are reached must be available for any particular case. If discretion has been exercised with regard to specific guidelines, it must be capable of reasoned explanation.

5 The principles of site evaluation and selection

5.1 The criteria for site evaluation detailed below continue largely to be those defined in *A Nature Conservation Review* (Ratcliffe 1977). The primary criteria defined were:

- typicalness
- fragility
- size
- diversity
- naturalness
- rarity.

The secondary criteria were:

- recorded history
- position in an ecological / geographical unit (ecological coherence)
- potential value
- intrinsic appeal.

The application of these criteria is complex, and different criteria, combinations or emphases are needed for evaluation and selection between:

- the use of the exemplary site and critical standard principles
- habitats and taxonomic groups

and within

- individual habitats
- taxonomic groups.

5.2 Since the publication of *A Nature Conservation Review* (Ratcliffe 1977), the appreciation of the original primary criteria has not changed substantially, and these continue to form the basis for site selection of SSSIs in Great Britain. However, the value and relevance of the secondary criteria has changed more substantially, **and we no longer advocate the distinction between primary and secondary criteria**. The effects of a range of environmental pressures, particularly climate change, and of the ways in which we can mitigate for these effects, demands that ecological coherence[13] and potential value are now given greater attention in the site evaluation and selection process. **Consideration of:**

- **ecological coherence and**
- **potential value**

should form an intrinsic part of the assessment of criteria in the selection of new sites, and these are treated as such in the detailed guidance below. The value of recorded history as an evaluation criterion is little changed, and we continue to advocate the use of this as a criterion, with the caveat that SSSIs should not be chosen on the grounds of recorded history alone. Finally, the criterion of intrinsic appeal has never been developed in any way, and now appears anachronistic and inappropriate as part of a scientific evaluation of a site's biodiversity or nature conservation value, and intrinsic appeal should no longer be considered in the site selection process.

5.3 An explanation of the general principles which apply to the typicalness and fragility criteria is provided in sections 5.4 and 5.5 below, and specific guidance on the remaining primary

13 The concept of ecological coherence can be applied at the network level (equating broadly to landscape) or at the site level, where 'integrity' may be an appropriate term.

criteria is given in sections 5.7 to 5.12, separated for habitats and species where appropriate. In most habitats, little use has been made of scoring systems because of these complexities of treatment and hence the difficulty of finding a standard approach which can be applied over the whole of Great Britain. Where these are available (e.g. for intertidal habitats), detailed guidance is provided in the individual chapters of Part 2. However, the attributes which are to be assessed are quantified, whenever possible, through the standardised recording of survey information.

5.4 *Typicalness*

5.4.1 The criterion of typicalness may often be used in a more general way than the other criteria. The selection process aims to choose sites with examples of habitats and species which are not only typical (or characteristic) of that ecosystem in the AoS, but are also the best examples available. This process may result in a tendency to select the unusual, so that, while most typical features are nearly always present, some may be under-represented or not represented at all. It is necessary to be aware of this and, when appropriate, to select sites both for their unusual features, and as good examples of typical features which also have special interest.

5.4.2 Some evaluation systems adopt a criterion of representativeness, but the SSSI guidelines have never followed this approach. Representativeness is sometimes equated with typicalness, but the guidelines have always taken the position that representativeness subsumes the separate criteria of diversity and typicalness, and also size and rarity to some extent. These guidelines regard representativeness as the overall principle which the selection process aims to satisfy.

5.4.3 Criteria must be evaluated against a reference framework (classification) describing the range of variation in ecosystems, communities and species which the SSSI series is intended to represent. For most terrestrial habitats, the National Vegetation Classification is used as the main reference framework to determine which specific types of habitats should be selected, i.e. which should be considered 'typical'. The exceptions to this are woodlands (where vegetation structure plays a far larger role in site evaluation), freshwaters and intertidal habitats. The NVC provides:

- a standardised GB-wide description of the range of variation and distribution of most types of semi-natural vegetation;
- a reference system classification of vegetation communities and sub-communities;
- data on the floristic composition of each community and sub-community, against which elements of diversity, naturalness and richness, as well as artificiality (e.g. presence of exotic species) can be measured.
- a tool for the standardised recording of vegetation composition within surveyed areas, including the representation of vegetation patterns by mapping.
- a 'language' for describing vegetation in a systematic way, which promotes ecological understanding when correlated with environmental parameters and species traits
- an indication of the role of management in maintaining communities.

5.4.4 Because variation in plant communities in the field tends to be continuous, the floristics of many vegetation stands will be intermediate between the nodal types. The nodes represent statistically significant associations in the original data set, but not all variations will be described in the NVC as it is based on samples. The intermediates are usually of equal nature conservation value to the type examples and so merit similar representation. Only when an intermediate stand results from the presence of introduced species or those

associated with recent undesirable disturbance may the nature conservation value fall below a qualifying level.

5.4.5 The NVC can be used as a tool to identify some features of conservation priority (e.g. distinguishing between unimproved (near natural), semi-improved and improved, intensively-managed grasslands), and some levels of modification of vegetation communities. However, for other habitats (e.g. woodlands), there is no simple relationship between NVC communities and conservation importance based on community composition. For certain classes of vegetation, further refinement of the NVC has been proposed (Rodwell *et al*. 2000; Dargie 2000, JNCC 2011), and the need to represent additional communities, sub-communities or variants should be considered where there is a justifiable argument for so doing.

5.4.6 The Marine Habitat Classification (MHC) for Britain and Ireland (Connor *et al* 2004) provides a similar standardised description of intertidal flora and fauna (biotopes), their environmental tolerances and geographical distribution.

5.5 *Fragility*

5.5.1 The criterion of fragility is also applied generally, as a measure of the intrinsic sensitivity of habitats and species to natural process change or human impact, combined with the probability of such impact arising. The greater the fragility of a feature, the higher its value, and those which cannot be re-created should be regarded as irreplaceable and accorded particular importance in site selection. However, within many habitats, similar sites usually have an equal fragility, so that the criterion has less value than others in the evaluation between sites. Fragility may also change over time, as a consequence of environmental change itself.

5.5.2 The capacity to restore a habitat may be a better measure of fragility than any other single factor or criterion. In general, the more complex an ecosystem is, the greater is the difficulty of restoring it to its original richness and complexity. It is sometimes possible to restore the physical conditions of former habitats, but it is generally more difficult to restore the full range of processes, functions and species over meaningful timescales. This is especially true of our more complex natural habitat types. A strong emphasis therefore has to be placed on the selection of the most fragile habitat types, which in practice are likely to those that are particularly difficult to restore. This is also the most cost-effective strategy, because at best, the re-creation of destroyed habitats is technically very difficult and therefore far more expensive than retaining them in the first place (and for some habitats it is impossible on any realistic time-scale, if at all).

5.6 *Assessments to identify habitats and species which meet critical standards*

The main intent of section 5.7 to 5.10 is to set standards, by defining qualifying levels of quality in the nature conservation interest of a habitat or site. The main criteria which apply to habitats are size, diversity, naturalness, rarity, ecological coherence and potential value. In the evaluation of species groups the emphasis is especially on (population) size, diversity and rarity, with typicalness especially valuable in the case of invertebrate species assemblages.

5.7 *Size*

5.7.1 *Habitats*

The size (extent) of a site is important because larger sites tend to be more species rich, have more viable species populations (because the populations are larger), contain more types of habitat, more subsidiary habitats and greater structural diversity. They are also less susceptible to edge effects, may be easier to manage, and give more opportunities for

natural dynamics to take place. **The guiding principle is that:**

- **a site must be large enough for it to be viable, to provide adequate suitable habitat, be resistant to internal changes in the vegetation composition and structure, be robust to adverse edge effects, to loss of species and to colonisation by invasive species.**

The significance of this depends on the nature of the habitats and associated species. However, there is no generic lower threshold as regards the size of an SSSI. Sites that are very small or fragmentary can be designated if they are able to protect the special interest concerned and maintain its viability. It is impossible to generalise about size limits to viability, because of the great variation between habitats and species. What is big for a meadow or ground beetle may be small for a montane massif or a bird of prey. Much depends on the environmental context within which the site exists. A small fen may continue to dry out if it is surrounded by farmland which is heavily drained, but meadows of as little as 1 ha may retain their floristic composition indefinitely if they are managed appropriately. Size is not entirely separable from naturalness, since a reduction in size of a habitat is a potent factor for species loss, to the point at which habitats no longer retain their expected complement of characteristic species. In some heavily-developed parts of Great Britain, the best remaining examples of some grassland communities and the surviving localities for some rare species are on road verges and railway cuttings. If they are to be represented within the particular AoS, their small size and artificially linear form has to be accepted.

5.7.2 *Species*

For some species (birds, some other vertebrates and a few invertebrates) there are good data on population sizes and the range of fluctuations in these populations. Where these data are available, the size of a species' population on a site can be a useful measure of importance, especially for species which are colonial or show some degree of aggregation either for breeding or at other times of year. In international and UK bird conservation, it has become a well-established practice to regard 1% of a species' total population in the range under consideration (e.g. national, international, flyway, global) as a significant threshold when assessing whether sites should be designated. The application of this principle to evaluation of sites for ornithological interest is set out in the chapter on Birds (Part 2, Ch.17) and provides prescribed size criteria for some bird groups. Combinations of species, as well as individual species, have to be taken into account. For other animal groups, population size cannot be used in any consistent way, because of the lack of comprehensive data, but where available it is a useful guide.

5.7.3 Amongst vascular plants, populations of many rarer species can be counted or estimated, and size differences in these populations should be taken into account in site evaluation, though above a certain level of rarity, presence or absence becomes the main criterion. Large population size is especially relevant to localised species, including those at the edge of their range. Sites with populations of Schedule 8 and Red Data Book plant species should be evaluated for inclusion within SSSIs, and sites holding populations of nationally rare and scarce plant species should be assessed using the criteria in Part 2, Ch 11.

5.7.4 Population size is relevant to issues of population viability. Provided that the site is appropriately managed, questions of population viability arise less often for plants or fungi than for animals, especially the larger and more mobile species. Ideally, an SSSI should contain viable populations of all the species it supports, but for some this is not a practical proposition. There is also the difficulty that for many species we simply do not know what a viable population might be: size is only one factor, and so much depends on genetic variability, the intrinsic population behaviour of a species and on the human influences, including deliberate management, to which it is subjected.

5.7.5 Sites to protect populations of some of the larger, less numerous vertebrate species which occur at low population densities will need to be large to include a viable population. For example, an upland SSSI for golden eagles should be large enough to include the home ranges of several breeding pairs and might cover several thousand hectares. In very small populations, stochastic effects, low reproductive rate and genetic problems caused by inbreeding may weigh heavily against survival, which may depend on there being a supply of new recruits from other areas. Some more numerous and fecund species, such as some butterflies, are vulnerable to unfavourable events and have a propensity to die out in an individual locality. They are greatly at risk if restricted to only one SSSI, and also need opportunities for population replenishment. In such cases, all inter-dependent populations should be considered for inclusion within a single SSSI, to promote population viability through the establishment of ecological networks. The argument that protected sites form an interdependent network assisting with such exchange is a key part of the case for establishing a GB-wide system of SSSIs. The spacing of related habitats should therefore be on a scale that gives realistic opportunities for such interchange by natural movement. However, precision about the appropriate size and connectivity of protected sites is unrealistic. Plant and animal species differ enormously in the size of their home-ranges, dispersal distances, population densities, and ability to cross hostile landscapes (Lawton *et al* 2010). The SSSI series as a whole should contain sufficient sites to be able to support viable populations of our most threatened species across their national range.

5.8 ***Diversity***

5.8.1 *Habitats*

Diversity tends to be valued positively as it increases, but it has to be considered in relation to scale, which can be on at least three levels. At the plant community level, some examples of habitats are more naturally species-rich, spatially or structurally diverse than others and so have higher value, unless the greater richness involves non-native species or the structural diversity is a result of recent unnatural and undesirable disturbance. Some plant and animal communities are intrinsically more species-rich than others; and some habitats and communities of national and international importance have naturally lower diversity than other habitats, due to their inherent and sometimes unique physical and biological characteristics (e.g. hypertidal estuaries and active blanket bog). Comparisons on this criterion are therefore valid only between examples within the same community and not between different communities. Within a habitat, diversity in terms of the number of different communities will influence the value of a site. Diversity of different habitats on a site often involves the issue of 'habitat mosaics' (or habitat mixtures), which are considered separately below: clearly, the number of different elements will affect the site value, but this assessment is complex. Diversity tends to have greater importance as a criterion of value in the comparative assessment of different sites to choose the best examples.

5.8.2 *Species*

The evaluation of plant communities takes account of the more widespread vascular plant species on a site as a matter of course, but it may neglect the interest of assemblages from different elements within a site, especially where these occur over a range of different communities. It may also ignore species refugia in which one element (e.g. Boreal-Montane, or Mediterranean-Atlantic) (Preston and Hill 1997) is especially well-represented. These species assemblages tend to include rarer species, but their interest derives from species variety within the phytogeographical groupings. Assessment of non-vascular plants (mosses, liverworts, lichens and algae) and fungi is based on both species aggregations and distinct communities. Specific guidance on minimum qualification levels of phytogeographical interest has not yet been developed.

5.8.3 Diversity of animal or plant species within each main taxonomic group is an important criterion, but when they are used, qualifying totals may have to be graded geographically

where there are marked differences in occurrence of the group as a whole across the country. For example, butterflies or dragonflies decrease greatly in species diversity from south to north. Diversity over a range of animal species groups is also important, but it is difficult to prescribe significant combinations, and this has to be judged by examining the criteria for the separate groups concerned. Zoogeographical considerations also apply, in a similar manner to the phytogeographical ones for plants.

5.9 *Naturalness*

5.9.1 *Habitats*

Near-natural habitats (i.e. those essentially unmodified by human activities) are highly valued, and are now very rare in Britain, being confined to some high mountain summits, bogs, coastal cliffs and ledges, and shores and intertidal areas. In a strongly cultural landscape such as that across most of Britain, and with environmental pressures such as climate change influencing species distribution patterns[14], the concept of naturalness is a difficult criterion to apply. Site selection has to deal principally with a wide range of semi-natural types. Within these, three key aspects of naturalness are habitat continuity, similarity to the original natural habitats, and the capacity for natural processes to occur. Sites with long histories and little modification should be valued highly. Some habitats (bogs, montane areas, some woodlands, coastlands) should generally be characterised by a lack of gross and/or recent human modification. In some habitats, sites where natural dynamic processes (such as erosion, accretion, dynamic river channel activity) occur should be valued more highly than locations where such processes are constrained. In other habitats, physical management or modifications vary greatly in their impact. Some may be an essential or desirable part of conservation management (excavation of choked water bodies, grassland or heathland management). Others, such as ploughing, drainage works and intrusive buildings are normally highly damaging in their effects. Chemical modification by fertilisers, pesticides or pollution is nearly always undesirable. Specific guidance is extremely difficult, since so much depends on particular circumstances, but **the guiding principle is:**

- **the presumption against the site meeting the qualifying standard for naturalness increases as signs of artificiality increase.**

Those habitats which show continuous variation from natural or semi-natural to artificial give the greatest problems. Examples might be woodlands with stands of, or inter-planted with, exotic species, or grasslands variably modified by agricultural intensification. Judgement on naturalness may also be influenced by the prospects for reversing the damage or loss of quality. Adaptation to climate change means that a flexible approach is needed more than ever before, accepting that some change will be irreversible.

5.9.2 Species

Native species are generally considered to be the valuable elements of the plant or animal community on a site. Species which are not native, and have been introduced accidentally or deliberately to a site or to its biotic communities should generally be regarded as undesirable and negative features. There are some exceptions, where planned reintroductions have taken place and populations have become self-sustaining.[15] These terms have been defined by MacPherson *et al* (1996), and Preston, Pearman and Dines (2002) provide detailed information to differentiate between native, archaeophyte (introduced before 1500) and neophyte (introduced after 1500) vascular plants. Archaeophyte plant species may be viewed neutrally as regards site selection, as may very

14 One of the primary observed impacts of climate change upon species within the UK has been a northerly movement of many warmth-loving species, and some retreat of northerly-distributed species. There have also been concomitant changes in abundance observed in some cases (IACCF, 2010)

15 For example, NRW considers (re)introduced populations of sand lizard and natterjack toad as features on SSSIs if these are self-sustaining. This is the case for 2 populations of sand lizard, and one of natterjack toad.

long-established animals; as they have often reached an equilibrium with native species within a community or habitat. Some arable-associated archaeophytes may even be viewed as positive features. One effect of climate change is the increased likelihood of new natural arrivals, especially from across the English Channel (eg. little egret *Egretta garzetta*) and of range increases within the UK (eg. Dartford warbler *Sylvia undata*, wall brown butterfly *Lasiommata megera*). We should welcome this, and be prepared to consider the selection of new sites to reflect the new range, once the species is sufficiently well-established to enable the identification of new long-term key sites for those species.

5.9.3 In contrast, some recently-introduced invasive non-native species, such as Japanese knotweed (*Fallopia japonica*) or grey squirrel (*Sciurus carolinensis*), have a distinctly negative effect on site quality, because of the adverse effects they have on native flora and fauna, and potentially on ecosystem function and services. The presence of recently introduced non-native species, especially those known to be invasive or known to have been deliberately introduced, is a negative indicator, but much depends on their relative abundance and their effect on the species community, habitat or ecosystem. Loss of quality can be indicated by the number and abundance of recent non-native, invasive and disturbance-indicator species.

5.10 ***Rarity***

5.10.1 *Habitats*

A critical part of the selection process is to evaluate and understand the relative rarity of habitats in the landscape, regardless of quality. Habitats that are rarer are given higher priority, simply because options and opportunities for conserving them are more limited and if all such habitats are lost, so too are the species and processes associated with them. Hence, the rarity of a habitat has an important effect on an assessment and can make selection against uniform minimum standards inappropriate. There is therefore a differential standard according to geographical variations in the extent of the habitat. The Habitats Directive (92/43/EEC) Annex I identifies a number of threatened habitats at a European scale, the conservation of which requires site designation. The continuing loss and increasing scarcity of near- and semi-natural habitats over much of lowland Britain has led to the view that, for some habitats, all remaining examples above a certain quality should be protected. The scarcer the habitat, the stronger is the case that the qualifying standards should be more flexible. Flower-rich grasslands are now so localised that individual fields are often all that is left in an AoS, and the minimum acceptable area has to be very small if some types are to be represented in the SSSI series at all. On the other hand, many types of upland grasslands and heaths are so extensive that only example areas of high quality can be justified for inclusion, unless they are designated for other (species-based) reasons. In general, the rarer the habitat, the larger is the proportion of the total area which should be protected. This may be 100%, as in the case of the Lizard serpentine heaths and the greatly fragmented Breckland heaths. Any terrestrial habitat with a total area in Britain of less than 10,000 ha (the area of one 10 km grid square) can be regarded as rare, and for these there should be a general presumption in favour of selecting all remaining areas. This does not apply to intertidal habitats because of the linear nature of many intertidal areas. Even common habitats such as moderately exposed fucoid shores only cover a few thousand hectares in Britain.

5.10.2 *Species*

The criterion of rarity has always included the assessment of two factors; the rarity of, and the threat to, a species (or habitat). This has caused a degree of confusion in some quarters and it is important to distinguish between the two. Some species will be naturally rarer than others (top predators are invariably rarer than their prey, for example). Some species may be at the edge of their ranges in the UK, and therefore found in only a few locations. These species are not necessarily at risk of extinction however, and the

assessment of the threat of the local, national or global loss of a species should be a separate assessment under these guidelines.

5.10.3 The rarity of a species has long been used as one of the factors influencing the decision-making on site designation. For many taxonomic groups 'Nationally Rare' species are defined as those occurring in 15 or fewer 10 km squares in Great Britain. For marine species this is defined as those occurring in eight or fewer 10 km squares containing sea, within the three mile territorial limit for the UK (Sanderson 1996). 'Nationally Scarce' species are defined as those occurring in 16-100 10 km squares in GB. For vascular plants, the integration of the evaluation of several nationally rare and scarce species within a site is achieved by a simple scoring procedure (Part 2, Ch.11). It is also important that regionally rare species are also taken into account. National legislation also identifies a number of nationally rare species which require special protection (Schedules 5 and 8 of the Wildlife and Countryside Act 1981 as amended) and Schedules 2, 3 and 4 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

5.10.4 The threat to a species is also regarded a factor which can influence the need for site selection and designation, and a number of means have been developed to identify species considered at risk in this way. The IUCN guidelines[16] explain the standard means of identifying Threatened (Extinct in the Wild, Critically Endangered, Endangered, Vulnerable), Near-threatened and 'Data Deficient' species and those of 'Least Concern' at global, regional or national scales. The Birds Directive (2009/147/EC) Annex I and Habitats Directive (92/43/EEC) Annex II have also identified a number of threatened species at a European scale, the conservation of which requires site designation. In general terms, these are called threatened species, but note that some of these are not rare, but are experiencing rapid or prolonged population declines which give rise to concern for their conservation.

5.10.5 The IUCN website provides interactive listings for taxonomic groups which have been assessed at a Global scale, as well as European threat assessments for a number of taxa. Some details are provided in Box 5.1 below. Lists of nationally-threatened species are also periodically published for individual taxa. The JNCC website aims to maintain a complete listing on its species status pages. However, some of the assessments pre-date the latest IUCN guidelines, so the terminology and categories are not necessarily equivalent to those in the most recent global assessments. Some examples of national assessments are listed in Box 5.2 below. Staff should refer to these websites for the most up-to-date information relating to particular taxa, and should refer to the appropriate Part 2 Chapter and to specialist staff for further guidance on the interpretation and use of these lists.

5.10.6 In considering site selection for species, both the rarity of the species and the level of threat it is facing should be taken into account. As with habitats, **the guiding principle is that:**

- **the rarer and more threatened the species, the larger is the proportion of the population which qualifies for selection**.

Box 5.1 International Red List Information Sources

***For up-to date information on global and European red lists refer to* www.iucnredlist.org**

At 2012 the International Red Lists include:

Terrestrial Vascular Plants	Aquatic Plants
Plants of Medical Interest	Mammals

16 www.iucnredlist.org

Birds	Reptiles
Amphibians	Freshwater Fish
Land and Freshwater Molluscs	Butterflies
Dragonflies	Saproxylic Beetles.

Box 5.2 National Red List Information Sources

***For up-to date information on national red lists refer to* http://jncc.defra.gov.uk/page-3352**

Examples of UK and GB red list and equivalent publications.

Foster, G. N. 2010. A review of the scarce and threatened Coleoptera of Great Britain. Part 3: Water beetles

Fox, R., Warren, M. S. and Brereton, T. 2010 The Butterfly Red List for Great Britain

Daguet, C., French, G. and Taylor, P. (Eds). 2008. The Odonata Red Data List for Great Britain

Cheffings, C. and Farrell, L. (Eds). 2005. The Vascular Plant Red Data List for Great Britain

Falk, S.J. and Crossley, R. 2005. A Review of the scarce and threatened flies of Great Britain: Superfamily Empidoidea.

Falk, S.J. and Chandler, P. 2005. A review of the scarce and threatened flies of Great Britain: Nematocera and Aschiza

Church, J.M., Hodgetts, N.G., Preston, C.D. and Stewart, N.F. 2004. British Red Data Books: mosses and liverworts.

Church, J.M., Coppins, B.J., Gilbert, O.L. James, P.W. and Stewart, N.F. *1996.* Red Data books of Britain and Ireland: lichens. Volume 1: Britain.

Stewart, N.F. and Church, J.M. 1992. Red Data Books of Britain & Ireland: stoneworts.

Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. 2009. Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. *British Birds* 102: 296–341.

5.10.7 Mapping by 10 km squares, whilst a useful tool, gives no information on the numbers of the species concerned. For most rare vascular plants additional data on population size also need to be collected. For birds, where reliable population data exist for almost all species, the grid square method is not used, and size classes in orders of magnitude are used as the principal basis for deriving threshold scores for various habitats (Ch.14, Appendix C). It is important that data on the population sizes of well-established (not ephemeral) resident species and regularly occurring migrants are kept up to date by regular monitoring. Up to date knowledge of the status of species is needed to take account of significant changes and trends. For many species, information on their national distribution can now be provided by the data presented in the National Biodiversity Network Gateway at a 10 km square level or finer (down to 1 km square). Also, many county recording schemes for flora and fauna are now based on 'tetrads' of the National Grid (i.e. blocks of 2x2 km squares) and, where detailed information is available; it should be used to assess regional or local distribution and rarity.

5.10.8 Most species tend to become increasingly rare at the limits of their geographical range. These limits are often particularly interesting, as they represent the critical zone within

which a species is especially responsive to beneficial or adverse environmental changes causing its further advance or retreat. Ecological and genetic insights about limiting conditions for a species are often best obtained here and are highly relevant to management. Extra weight should therefore be given to the representation of species at their southern or northern geographical limits within Britain. This is particularly important in the context of our understanding of the effects of climate change on threatened species and habitats.

5.11 *Ecological coherence*

5.11.1 The concept of ecological coherence is currently concerned more with the incorporation of ecological network theory into site selection, having evolved from the original criterion described by Ratcliffe (1977). Part of the selection process for SSSIs should therefore be to consider the functional importance of a site within the wider environment, at a range of scales. The effectiveness of site designation, whether it is measured through a species inventory or condition assessment, can usefully be addressed at three different relative spatial extents, described by Gaston *et al* (2006).

- It can be considered for the individual protected area: does the site meet the needs of the qualifying species and habitats found within it?
- It forms part of a portfolio of SSSIs: does the site contribute to the SSSI series for those species and habitats?
- It forms part of an ecological network; does the site contribute to a functional network of semi-natural habitat, with or without interacting protected areas?

By considering sites this way, proper account can be taken of the contribution of the site to national ecological networks, delivering a natural environment where "*compared to the situation in 2000, biodiversity is enhanced and the diversity, functioning and resilience of ecosystems re-established*" (Lawton *et al* 2010).

5.11.2 SSSIs need to be seen within a wider context, as one component of a site-based approach to nature conservation, which is then integrated with and complements the developing wider environment approach, including the use of spatial planning tools such as Green Infrastructure. SSSIs should be seen as forming key, core areas of a planned network.

5.11.3 Ecological coherence should be considered at the individual site and larger geographical scales. At the site scale, ecological integrity is the key consideration. Sites should contain priority species and habitats, and be sufficiently large to maintain their special interest features. At the wider, landscape scale, ecological coherence should be considered in terms of representing the full range of variation in relevant species and habitats; protecting threatened species and habitats; and supporting dispersal, gene flow and migration between sites (Catchpole 2012).

5.11.4 The key objective is therefore to safeguard a suite of high-quality sites which collectively contain the range and area of habitats that species require, while ensuring that the ecological connections exist to allow species to move between them. Whilst there are many knowledge gaps in relation to species' dispersal capabilities, our understanding for selected taxonomic groups continues to improve. There are two elements to this evaluation. First is the need to assess the necessity and ability of a particular species (or the component species of a particular habitat) to move to and from other sites. The second is to assess the surrounding landscape in terms of the abundance, distance and quality of other sites and the permeability of these (through both linear linkages and larger areas of permeable habitat) to the dispersing species.

5.12 *Potential value*

5.12.1 This criterion acknowledges that sites can develop a substantially greater nature conservation value as a result of appropriate management or natural change over time. In theory, almost any area of land is potentially of high nature conservation interest, provided that enough re-creative or restorative effort can be expended upon it. However, potential value should only be applied as a criterion in a few specific circumstances. These might include cases where:

- the habitat has recently deteriorated through adverse use, such as a degraded peat bog where the underlying substrate remains relatively intact and where the complement of characteristic species is still present or can recolonise, and recovery is likely to take place once the adverse pressure is lifted.
- vegetation succession can be fairly readily encouraged, reversed or deflected by suitable management.
- there is a need to reinstate key ecological processes or to support ecological resilience, such as improved land in floodplains, or lake or wetland catchments that can be restored to support the key interest feature and provide additional habitat.
- the evolution of the coastal system, as a result of natural processes, may lead to areas of land without current interest becoming inundated by tidal water or sedimentary systems migrating landward, or cliff recession forming new areas for colonisation.

It is perhaps most appropriate to apply this criterion where part of a site, sometimes consisting of a different habitat, is in a poorer condition than the rest but its inclusion contributes strongly to the overall interest. One example is where the inclusion of a degraded area occurs between two high-quality parts of a compound site and where its restoration might benefit all three elements of the site.

5.12.2 It is also important to recognise the need to create integrated national and regional networks which provide for the persistence of species now, but which also anticipate and provide for their persistence under different climate change scenarios (Ervin et al, 2010). With predicted changes in climate, an approach should be developed within which a network of protected sites (of which SSSIs will be a major component) forms part of a large-scale strategy to integrate the needs of nature conservation into wider spatial planning and development (Opdam and Wascher 2004; Lawton *et al*. 2010). The detailed development of this approach is not a subject for these guidelines, but it serves as a reminder of the need for agencies to consider, as part of the assessment process, the roles of sites within functional units which may change over time.

5.13 *Recorded history*

5.13.1 The recorded history of a site is a criterion used mostly comparatively, where a site with a better ecological data record or known and recorded management history may be seen as more valuable than one with no historical information. It may on occasion justify the selection of a site with a long history of valuable ecological research and substantial habitat or species datasets, which would otherwise be of lesser interest according to its intrinsic biological features. Similarly, a site with a well-documented long land-use history may be recognised as more valuable than one whose history is unknown or unrecorded. In the case of mediaeval deer parks and ancient woodland it may be possible to trace past land use through maps and documents. Such long-term continuity of habitat management should be taken into account in SSSI evaluations.

5.14 *Assessment to identify the best examples of sites to represent habitats and species*

5.14.1 For this criterion, habitats and species groups can be considered together, since similar assessments have to be made about both. The exemplary site principle differs from the critical standard principle, in that it involves:

- the comparison of two or more similar sites, to arrange them in order of merit,;
- a decision on the number and extent of sites required to represent adequately a given field of ecological variation.

5.14.2 The essence of the exemplary site principle procedure is that all of the examples of habitats and species assemblages within an AoS are compared, to identify the best, and it is only these which are selected. If all similar sites can be arranged in order of merit, selection of the 'best' can vary from one to whatever number of examples is judged appropriate by the responsible SNCB. While minimum standards of quality have still to be observed, the main point is that not all sites above this standard have to be selected. In assessing the more extensive and continuous semi-natural habitats, this approach also often involves a more difficult decision on the definition of site boundaries. Because of the complex nature of the communities and habitats to which this rationale is applied, it is usually combinations of features which are assessed, so that diversity across and between broad groups tends to be more important than it does in simply determining whether a site merits selection as an SSSI. In an upland massif, for example, it is the diversity of plant communities and species groups, and also the variety of main habitats, that is particularly important.

5.14.3 The extent of the relevant habitat is usually one of the less important factors, except for the rarer, more fragmented habitat types. However, size and density of species populations are often important in judging which of two similar sites is more valuable. Naturalness or condition often give a valuable basis for comparison of quality, for example when one of two otherwise similar areas of montane heath has been more heavily burned and grazed or drained, with loss of dwarf shrub cover. The occurrence of a greater number of rare communities or species will place one site ahead of another, other conditions being similar.

5.14.4 The most difficult aspect of selection according to best examples is not the comparative evaluation of sites, but the determination of how many examples to represent. This requires a decision on when two or more sites are sufficiently different in character to require separate representation in the SSSI series or when a particular type is so important that it should be represented by more than one site. Guidance on these points is developed in the relevant chapters of Part 2. Scoring systems can be useful in providing a consistent method for ranking sites of similar habitat type for their evaluation for nature conservation, but they have inherent pitfalls and should be used with caution. Their validity to decision-making in SSSI selection is limited by the partly-arbitrary nature of any scoring method, the choice of threshold scores or other underlying instructions. Only limited use of scoring methods has so far been used, and much more development would be needed before they could be regarded as appropriate for site selection generally.

6 International Importance

6.1 The recognition of the international importance of a site requires similar procedures and criteria to the evaluation of nationally important sites. However, the background reference framework is an international (European, flyway or theoretically even global) assessment of ecosystems and species. Rarity is the most important criterion on this larger geographical scale. This identifies the habitats and species which are rare or highly localised internationally, but which are well represented, and therefore qualify as especially important in Great Britain. We have an international conservation obligation, especially for migratory species, for which British sites and habitats are important in many species' annual cycle of

movements between countries. In Europe, the major drivers behind the protection of these internationally-important sites are the EU Birds and Habitats Directives, and for wetlands, the Ramsar Convention. A number of examples of internationally important habitats and species are listed below.

- Blanket bog, a peatland formation which is confined to a few cool humid regions of the world, and of which Great Britain holds the largest area.
- Plant communities and species with markedly Atlantic or Lusitanian distribution, restricted to the extreme western seaboard of Europe. These include ericaceous dwarf shrub heath, machair grasslands, a number of vascular plant species, many oceanic ferns and bryophytes found in western woods, oceanic woodland lichen assemblages and hyper-oceanic montane lichen assemblages.
- Maritime communities generally are important for their variety and extent, including sand dunes, saltmarsh, shingle, cliffs, and machair.
- Outlying and fringe occurrences of communities and species with distinctive ecological and biogeographical distributions, such as Scots pine forest, montane and tundra vegetation characteristic of Arctic and alpine areas, Mediterranean communities, and continental types of woodland and grassland.
- Unusual biogeographical combinations, such as the juxtaposition of Arctic-Alpine and Atlantic-Mediterranean species.
- Unusual survivals of wood-pastures or traditionally grazed old-growth woodlands, with abundant veteran trees.
- Migratory bird populations, particularly waders and wildfowl, wintering in Britain or having important migration stopovers. Their habitats are typically estuarine flats and saltmarshes, and wetlands away from the coast.
- Other migratory groups such as fish and marine mammals.
- Large concentrations of breeding seabirds, most of which have a highly restricted north Atlantic distribution.
- Endemic and near endemic species, subspecies and island races. The British endemic species are of particular importance. These include the apomictic micro-species of endemic hawkweeds (*Hieracium* spp.) eyebrights (*Euphrasia* spp.) and whitebeams (*Sorbus* spp.) A number of species have evolved distinctive British subspecies and races, both on the mainland and on individual offshore islands.
- Other globally rare species of animals, plants or fungi, e.g., white-clawed crayfish (*Austropotamobius pallipes),* vendace (*Coregonus albula)* and freshwater pearl mussel (*Margaritifera margaritifera).* A full list is in the JNCC '*Conservation Designations for UK Taxa'* spreadsheet, http://jncc.defra.gov.uk/page-3408

6.2 The international obligation to nature conservation in terms of site protection is formalised and defined under a number of directives, conventions and treaties entered into by the UK Government, and these are listed below. These, and any UK-developed guidance associated with them, should be consulted as necessary when evaluating the international importance of features or sites.

- ***Habitats and Species Directive*** (Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna). This sets out rules of a general nature concerning the conservation of listed species and their habitats, and other special habitats listed separately.
- ***Birds Directive*** (now Directive 2009/147/EC on the Conservation of Wild Birds). This sets out rules of a general nature concerning habitat conservation for listed species, and an accompanying resolution requires Member States to take certain steps towards preserving bird habitats.

- ***Ramsar Convention*** on Wetlands of International Importance especially as Waterfowl Habitat. This includes coastal as well as inland wetlands, and also peatlands of importance to plant ecology.
- ***Bonn Convention*** on the Conservation of Migratory Species of Wild Fauna. This requires appropriate national action, including site safeguard, for conservation of certain listed species, especially migratory birds.
- ***Bern Convention*** on the Conservation of European Wildlife and Natural Habitats. This includes protection of habitats and certain listed species of plants and animals, especially migratory species.
- ***World Heritage Convention*** concerning the Protection of the World Cultural and Natural Heritage. This requires each State / Party to nominate a list of "cultural and natural properties" that it considers to be of "outstanding universal value" against a set of carefully defined criteria. Major natural and semi-natural ecosystems of international wildlife importance merit consideration under the "natural property" category.
- ***The OSPAR Convention*** for the protection of the marine environment of the north-east Atlantic. This is an agreement by relevant governments and the European Community to co-operate to protect the marine environment. http://www/ospar.org

- ***Other site conservation designations.*** The UNESCO "Man and the Biosphere" programme[17] proposed a global system of Biosphere Reserves for conservation and monitoring of major ecosystems. Seven such reserves exist in Great Britain, with designated sites in their core areas. The World Conservation Strategy (IUCN 1980) made general recommendations about the importance of reserves, and identified the Scottish Highlands as one of the prime biogeographic provinces for the establishment of protected areas.

6.3 **If an area, habitat or species is identified as being of international importance, it must be of special interest in its national occurrence within Great Britain** (as long as it occurs naturally). In these cases, it may be necessary not to rely on choosing only a minimum number of exemplary areas, but to select more or all sites above a critical international standard, in order to meet international conservation obligations. Where international designations are compound sites (ie contain several parcels of land), all of those parcels of land should be considered to be of special interest, and all of the internationally-recognised features should be reflected in the SSSI designation. This can apply to habitats which are extensive (e.g. blanket bog) or fragmented (e.g. woodland). This principle also applies to species which are locally numerous and may even be regarded as a nuisance by some interests (e.g. grey seal and great skua) as well as to habitats and species which are localised or rare.

7 Assessment of site value

7.1 These Guidelines were developed on the basis that each habitat type or species group is assessed independently in its own right. A site has to reach the qualifying standard for only one habitat or species to be eligible for selection as SSSI when the critical standard principle is being applied. In practice, there are often both habitat and species qualifying interests on a single site; for example, invertebrates, amphibians and wetland habitats. Thus, while the evaluation process is dealt with in a sectional way, it is necessary to take account of the combined value of habitats and species groups. It is the fragmented nature of semi-natural habitats in much of the developed British lowlands that can cause a single habitat or species category to occur in isolation, and in the uplands and on coasts combinations of features usually have to be assessed. The practical result is that a site

17 http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/man-and-biosphere-programme/

chosen for one interest will often meet other interests as well. Some sites, such as bat breeding and hibernation sites and some grasslands and woodlands, have a single interest feature; in Scotland, this applies to 31% of sites, and in Wales 28%.

7.2 Most sites qualify for selection on the basis of more than one interest, and many have multiple interests. For example, intertidal sites are often highly complex, biodiverse and natural compared with terrestrial sites and many of them qualify for multiple habitat and species features. It can be difficult to assess the qualifying value of a site when integrating different criteria. For instance, a grassland which is marginal in terms of its floristic quality may pass the overall threshold value because of its large size; or it may fail because it is too small. A more complex habitat, such as a fen system, may be borderline for the floristic quality of its main plant community and also for size, but it may qualify overall because of the diversity or clear successional pattern of the total range of communities. In either example, the total botanical value may still be marginal, but, when faunal interest is assessed, the combined value may be judged as meeting the required standard. Woodlands are perhaps the most difficult habitat to evaluate, because of their structural complexity and because each of the structural 'layers' may have a separate community, with plant and animal species of special value.

7.3 Some of the most difficult cases of all are those involving the conjunction of different major habitats. A site may be of uncertain value when its grassland is assessed alone, but, when considered with its ecotones into associated woodland, marsh and stream habitats (none of any greater value alone), it may easily pass the qualifying standard for overall diversity of communities and species. In theory, a scoring system should achieve the consistency of assessment necessary to deal with these problems of combining values, but in practice the complexities of evaluation across the whole range of attributes have made such an approach impossible. **The guiding principle is that:**

- **for sites which are considered to be important but which do not clearly qualify on a single feature interest, specialist advice should be sought and the combined value of all biological components should be taken into account, as long as the decision-making is transparent and explicable.**

Different evaluation systems have been used for the various habitat groupings, and the issue of selecting habitat mosaics in which only the collective interest of different habitat elements meets the standard for SSSI selection is considered in section 9 below. The issues of combining values for different species groups within a single site are discussed at section 10.

7.4 A related issue is the incidental representation of features, and its bearing on the need for further deliberate selection of these features. A grassland site selected on botanical grounds, or a saltmarsh selected for its birds will almost invariably support a range of invertebrates, while a woodland which is selected for a rare orchid will include at least one community and a range of other plant species. In this way, most of the common and widespread species within an AoS will be represented by chance in at least one SSSI, and many species will have a multiple representation. For these latter species there should be no need to specifically select further sites. The same is likely to apply to widespread plant communities and animal assemblages. With decreasing abundance, there will be an increasing chance that species and habitats will not be represented unless sites are deliberately chosen for them. When this is the case, it remains important to choose sites with the largest or most important populations, or the best stands. For these scarcer and rarer species, there may be good reason to select more than one site per AoS rather than rely on occurrences (especially small populations) that may be represented by chance on other sites

.

8 Boundary definition, size and site integrity

8.1 When designating or reviewing SSSIs, the boundaries and integrity of a site should be determined in a way that enables the SNCB to explain the boundary selected, and the site's overall integrity. In practice, this means that site boundaries must be defined in accordance with a number of requirements and conditions, which are considered in the paragraphs below. Whatever variations in importance may be found within a site, all parts must function to protect the standard of special interest, so that loss of or damage to any part of the site would detract significantly from the value of the whole. The loss or damage to any part of a site cannot be justified by the survival of the larger fraction of the site, since, once the process of fragmentation has begun, there are no logical stopping points short of total loss of the site. We will not set arbitrary limits of acceptable loss as this would fundamentally undermine the consistency of approach which is the credible basis for SSSI selection. Small incursions into protected sites are often disproportionately large in their direct ecological effects. The concept of site integrity may seem far-fetched when the defining boundaries are artificial, but any further intrusions make an already unsatisfactory situation worse. The smaller and more fragmented a site, the more important it is to ensure that still further reduction does not occur.

8.2 SSSI boundaries should be drawn to encompass the special features of the site and all land necessary to ensure the sustainability of those features. Consideration should be given to the inclusion of whole management units, entire ecological units and supporting processes (such as hydrology or sediment supply). Boundaries should take account of dynamic processes (such as active coastal and floodplain geomorphology). Where part of a site does not hold the special features at the time of selection, **the guiding principle is that:**

- **there must be good evidence that this part of the site could support the special features for which others parts of the site are notified.**

For example, this could be as a result of natural processes (such as coastal erosion or accretion), predictable rotational management (such as that associated with forestry and agriculture) or the known ecological requirements of a species which uses a series of habitat patches but where not all patches are occupied at one time.

8.3 ***Fragmented habitats***

The boundaries of important sites are rarely wholly defined by clear-cut natural features. Sudden discontinuities between land of high wildlife interest and that which is unimportant are usually the result of human activities, and separate individual near- or semi-natural habitats and artificial habitats such as enclosed farmland, plantation forest or urban or industrial land. Most of these boundaries are precisely delineated by hedges, fences or walls. While these clear-cut edges are usually unnatural, they are usually accepted as practical boundaries in the selection of sites, unless there are clear reasons to include a wider area (eg to take account of predicted coastal change). In the lowlands, the important sites, consisting of near- and semi-natural habitats, are often thus delimited as 'islands' within a 'sea' of man-made habitats.

8.4 For most lowland habitats, the important sites are usually so small that it is normal to include the whole area as being of special interest. Many sites are perhaps too small to be entirely adequate as conservation areas, and they are selected as the best of what remains. The question about these is whether there is a lower acceptable size limit. Flower-rich grasslands are nearly all small, most being isolated fields of no more than a few hectares, but they are usually viable if managed sympathetically. The probability of any

species surviving in an area tends to decline in line with the declining extent of suitable habitat. The critical lower size limits for viability, below which the habitat or its constituent species may not be viable in the long term, are seldom known and vary widely. However, this ecological principle is relevant to site selection and points to a need for further study. For animal species associated with fragmented habitats or which have small, fragmented populations, it may be essential to have a number of dispersed SSSIs to allow interchange between them. However, we know relatively little about the dispersal abilities of most species, and it is therefore difficult to offer detailed advice about how closely-spaced SSSIs might need to be to cater for any individual species' needs.

8.5 *Buffer land*

Some habitats, especially dry ground types, may survive indefinitely as tiny islands within a highly modified surrounding environment. These small sites are, however, always vulnerable to 'edge' and 'overspill' effects, which are sometimes unforeseen. Spray drift of pesticides or wind-blow of fertilisers or atmospheric ammonia from surrounding farmland may affect plants and invertebrates, or predators from adjoining forests may have an influence on ground-nesting birds. Wet ground habitats are often influenced by the hydrology of a much larger area than the site itself, and drainage operations on the surrounding land can cause drying, or inflow of fertiliser from the catchment can result in eutrophication. For some animals, the semi-natural habitat may be the breeding or roosting area, but surrounding farmland may provide the principal feeding areas.

8.6 These overspill or peripheral effects have led to the concept of 'buffer land' surrounding an SSSI, over which some degree of management control is required to ensure full protection for an important site. Buffering takes on particular importance for small, isolated sites and linear sites with a large proportion of edge habitat. It involves managing the area surrounding a protected site in ways that reduce adverse effects on the site, and maintain the positive interactions (Jongman and Pungetti 2004). As regards SSSI designation, there is no other category of legally-protected land and, through its ecological or functional relationship with the main area, the surrounding land should be regarded either as sufficiently important to the special interest to be included within the site, or not designated. The key question is whether foreseeable human impact on this surrounding land is likely to damage or destroy the special interest of the 'core' area. Decisions on this must be influenced by the ability to draw a boundary which defines the limits of this ecological or process influence. For hydrological effects this may be possible, but for mobile animals which feed over a variable surrounding area it may not be. In some situations detailed research would be needed before well-informed judgements could be made. There will also be cases where the ecological influence of adjacent activities declines slowly across a wide gradient, so that any decision on a boundary has to be made on best judgement. One example may be where intensive farmland is used by waterfowl for almost all of their feeding activity: impacts here will affect the interest of the designated wildfowl roost nearby, but much of the farmland may not be used in any one year, and there will probably be a decreasing gradient of activity with increasing distance away from the SSSI. Difficult cases where generalised guidance offers little help will continue to arise, and decisions on buffer zone inclusions within boundaries will have to be made according to the particular circumstances of each situation. Ecotone habitats are often eroded as land management hardens the boundaries between habitats. Intervention may be required to soften these boundaries to allow a more gradual transition between habitats or land uses. This can provide the buffering required against environmental pressures from the wider countryside.

8.7 *Dynamic habitats*

In a small number of cases, a feature of interest will be part of a dynamic habitat, where the physical landscape will change over time. These include seacliffs and sandy shores experiencing erosion or accretion, mobile dune systems, estuarine sites where managed

realignment may be under consideration, and river systems where the river channel may change its course. In each of these cases consideration should be given to including an element of adjacent land to allow for these processes to occur naturally. In some such sites the boundary is defined relative to the mobile feature eg a number of metres from the top of the bank, or the edge of the cliff; or it follows the low water mark (eg MLWS). How much land to include will be based on case by case judgements, for example influenced by known rates of erosion or accretion.

8.8 *Extensive habitats*

Some coastlands and intertidal habitats, upland grasslands, bogs and heaths, and their mosaics are still present in Great Britain as extensive areas of near- or semi-natural habitat, sometimes covering large continuous areas. For these habitats, the judgement associated with protected areas policy has been that it is appropriate to select only the better sites, ecological units or areas within the total extent, and the definition of boundaries can become a more difficult and judgemental matter. **The guiding principles for these habitats and cases are that:**

- **the diversity characteristic of the habitat in question in the AoS must be fully represented in the selected site(s),**
- **the extent of sites designated must ensure the safeguarding of an adequate amount of all the features concerned,**
- **ecological units should not be fragmented by designation or administrative boundaries,**
- **the areas must be sufficient to meet international obligations for habitat and species conservation.**

Discontinuities between the semi-natural habitat and developed land still usually occur in some places and provide obvious boundaries. However, it is often necessary to draw at least some of the boundaries through semi-natural areas, sometimes with few helpful features on the ground. Where there are distinctive physical features, such as fences, walls, streams, or even tracks or roads, these should be used as appropriate. Where there are no physical features, the use of GPS co-ordinates for boundary mapping, facilitating the setting and relocation of less well defined on-the-ground boundaries, should be considered. Boundary decisions must, however, always be compatible with the selection guidelines and must not take precedence over them.

8.9 Intertidal areas

Intertidal areas, saltmarshes and sand dunes usually present relatively few problems in boundary definition. Both show a characteristic structural diversity and zonation, and most of them are highly localised, with sharply defined landward boundaries where the near-natural meets the agricultural. Ornithological requirements usually reinforce the need to select the whole of major systems, and the boundary problems which do arise are whether to exclude small, detached areas or, in the case of saltmarshes, whether to include desirable areas of grazing marsh behind sea-walls. Potential future coastal realignment may also be taken into consideration. It may be appropriate to include artificial structures, such as piers or islands which are used by many thousands of birds for foraging or roosting at high water, and for which the site is notified. Rocky coasts are more difficult to select when there are long lengths of more or less continuous cliff. Natural breaks may give convenient boundaries, but the desirable length of cliff-line will depend on biological features notified, or the biological or geological diversity.

8.10 Sub-tidal areas

The lower or seaward boundaries of SSSIs should normally extend to the extent of the local authority planning area. This varies between countries. In England it is normally to Mean Low Water Mark (MLWM); in Wales it is similar, or more recently to the Lowest Astronomical Tide (LAT); and in Scotland it is to Mean Low Water of Spring Tides (MLWST). However, these boundaries can, and should where appropriate, include estuarine channels or lagoons whose beds are below low water, and enclosed subtidal parts of river mouths. In England and Wales, clarity on boundary setting has been provided by the Marine and Coastal Access Act 2009[18]. This sets out the circumstances in which SSSIs can extend below MLWM, and introduces new procedures in relation to the notification of SSSIs in the sub-tidal zone. If it is desirable to notify, extend or enlarge an SSSI to include areas below MLWM (sub-tidal areas), or beyond the limit of estuarial waters, this amends the 1981 Act to allow the SNCB to recommend this approach, provided one or more conditions are met (set out in subsections 28(1C), 28B (2C) and 28C (2C) of the 1981 Act). Responsibility for the notification of sub-tidal land lies with the appropriate Minister (unlike terrestrial or intertidal SSSI notifications, which remain the responsibility of the SNCB). This approach might be taken to ensure the ecological coherence of the site, or for other practical reasons, such as drawing simple boundaries across estuary mouths. This provides a clear, flexible mechanism which dovetails with the Marine Conservation Zone (MCZ) approach.

8.11 Globally rare habitats and species assemblages

Adequate representation of globally rare habitats and species assemblages may require the selection of especially large areas, as in the case of some blanket bogs. Uplands tend to be the most difficult cases to determine, with blanket bogs the most problematical of all, because they usually lack conspicuous edge features along which to draw boundaries. There are five **guiding principles which help to reach decisions on these complex and extensive habitats, though they also apply more generally to site selection. These are:**

- **Every feature of interest present in the area should have at least one example within the site.** This should include habitats, vegetation types and plant and animal species. Special consideration should be given to the inclusion of rare habitats and species, but the common and widespread need to be represented in proportion to their relative extent and abundance. The entire animal and plant community should be represented, from top predators to the lower trophic levels.
- **The full complement of abiotic features should also be included, over as complete as possible a range of the variation present.** This should include the underlying geology, soil type, slope, aspect, elevation, macro- and micro-topography and hydrology. The amount of each should be sufficient to ensure the viability of any other feature which is functionally dependent on it. There is usually a correspondence between biotic and abiotic diversity, but this is not always fully understood and sometimes the abiotic features are more readily identified and mapped.
- **Where an important habitat or species depends on a functional relationship with an adjacent area enough of the latter must be included to satisfy the needs of the former.** Examples of this approach include designating areas to safeguard the hydrology of important peatlands, the inclusion of a whole water body for rare birds nesting at one end of it, and inclusion of feeding habitats for some animals (see also 8.5).

[18] http://archive.defra.gov.uk/environment/biodiversity/marine/documents/guidance-note4.pdf

- **Ecotones between components should be treated as further components in their own right.** These ecotones reflect varied biotic and abiotic interactions. For instance, where plant community X adjoins communities Y and Z at one place but adjoins communities A and B at another place, the two groups XYZ and XAB should be treated as separate entities and both included within the site boundary.
- **The total area of the habitats concerned, within SSSIs representing that habitat type, must be sufficient to ensure the safeguarding of all the component communities and species of that habitat type.** This is a matter both of size and of spacing between sites, to enhance the probability of exchange of mobile species between them. They must also be sufficient to satisfy both national and international conservation needs.

8.12 *Artificial Habitats and structures*

Some protected sites contain areas of artificial habitats that are neither of special interest nor support any special interest, and which are not in need of restoration to bring the site into favourable condition. Whether these areas should be excluded from the SSSI, thereby leaving 'holes' within the site, has to be decided in each case on its merits. Cases arise where areas of artificial habitat are so intermixed with the semi-natural, or the management of areas is so intrinsically linked, that separation of the two becomes impracticable. One example was the then largely coniferised woodland of Bernwood Forest (now widely restored to broadleaves), where the network of rides retains high entomological interest, and broadleaved clumps or edges to the conifer blocks remain important. To exclude every conifer block from the SSSI would be absurdly complex and unnecessary. Arguably, the conifers helped to provide shelter which enhances the importance of the rides for butterflies. The exclusion of coniferous shelter-belts within an upland site might also be an unnecessary exercise, but relevance to the listing of notifiable operations must be borne in mind. If the Country Agency is likely to object to the creation of more of the artificial habitat within the SSSI, it may be inconsistent to notify existing areas. In general, large conifer plantations will normally be excluded from SSSIs, because they are artificial habitats, unless they support particular species features, such as rare breeding raptors. A similar approach would normally be taken for areas of arable fields; unless they support particular species features, such as rare vascular plants or wintering wildfowl that justify their notification as SSSI. This is reflected in the approach to designation in Breckland, which has changed over the years. Here, there are many individual SSSIs, most notified as the remaining fragments of semi-natural habitat. More recently, the Breckland Farmland SSSI has notified intensively managed farmland of interest for stone curlews (*Burhinus oedicnemus*) and other species. The current approach suggests that in this case it would have been better to notify the whole area as one site for its range of interests.

8.13 Recent and intrusive artificial features can be a contributing factor for rejecting a site in preference to another similar one, and the creation of new artificial features should be regarded as a potentially damaging operation. These activities have a directly damaging effect on site quality, and their indirect effects can extend over a larger area. The presence of constructions, including hill roads, pipes, dams, wind turbines, pylons, ski-tows, snow fences and buildings, can also seriously affect the naturalness which is an integral quality of important wildlife areas, by increasing pollution, hydrological impacts, disturbance and fragmentation. Most near- and semi-natural habitats share the common quality of appearing to be in a wild state, with little obvious evidence of human activity, even though they may have been much modified from their original state.

9 Evaluation of habitat mosaics

9.1 The classification of habitats into major types (e.g. woodland, grassland), followed by their selection according to these types is a useful procedure, especially where human activities have tended to define these types clearly from each other. However, there are a great many situations where different habitats are contiguous or associated in various combinations. Many organisms depend on more than one, often quite different habitats, and some live in the transition zones (ecotones) between habitats. A butterfly whose adults feed on flowers in a grassland may have larvae feeding within an adjoining woodland or along its edge, and beetles and bumblebees which live in the meadow in summer may hibernate within the wood. Dragonflies and amphibians which breed in ponds and streams will disperse to feed or find shelter in adjacent habitats, especially woodland edge. Bats and some birds and dragonflies range over very different habitats for feeding, away from those in which they breed or roost. In these circumstances, site selection based on the major habitat types can lead to difficulties, and these multiple needs should be taken into account in site selection and boundary definition.

9.2 Sometimes the juxtaposition of habitats is a matter of chance, as in the case of an old meadow adjoining an ancient woodland. Glacial deposition features often give rise to a combination of open water and peatland habitats with dry ground types such as grassland, heathland and woodland. In some ecosystems there is a topographic sequence; from hill slope to valley floor, or stretching inland from the shore. Sometimes habitats occur in complex mosaics. Breckland and The New Forest are good examples of areas where grassland, heath and wetland habitats exist in complex spatial relationships with each other. These are best treated as continuous areas of diverse, semi-natural habitat. Mosaics frequently give rise to interesting and valuable transitions and intermediates between vegetation types, often called ecotones. One example would be on chalk downland with slightly acidic grassland on top, classic calcicolous grassland on the slope and mesotrophic grassland towards the bottom. Mosaics can also be both spatial and temporal; some ecotones are unstable and will quickly change into later stages of vegetation succession; for example a woodland clearing or an area of scrub in ungrazed grassland. Persistence of these features will depend on an appropriate management regime, and also on a site being large enough to contain the different successional stages in a changing spatial pattern. Some mosaics arising through natural succession are relatively recent, such as the post-myxomatosis invasion of chalk grassland by scrub. In general, the greater the age of all the components, and the greater the structural heterogeneity of a mosaic or edge, the greater is their overall value.

9.3 These mosaics are examples of ecological diversity, which can have a synergistic effect. Two habitats in juxtaposition will often be more valuable than the same habitats in isolation. As a general rule, the greater the number of additional habitats, the greater the overall importance of the area as a whole is likely to be. There should be a presumption in favour of selecting sites with habitat combinations. The boundaries should be chosen to delineate the combination as a single geographical and ecological entity. These combinations of habitats within a single area were termed **composite sites** in *A Nature Conservation Review*.

9.4 The cases which are most difficult to evaluate are combinations of different habitats (and species) where no one component type clearly exceeds the SSSI standards but their combined value appears to merit selection. In addition to mosaics already represented because at least one component habitat is clearly of SSSI quality, the best example of each combination in the AoS may be considered for selection. A combination which is rare or appreciably different in detailed community or species composition from those already

chosen may also be selected. In addition, any mosaic should be selected which contains two or more habitat types with a combined rare or scarce species score exceeding that qualifying for SSSI selection. The advice of species and habitat specialists should be sought in these difficult cases. In assessing habitat representation within the SSSI series, the occurrence of all the different main habitat types within all sites should be counted, and all the selected habitats should be identified as mosaic features in the SSSI description and in site condition monitoring assessments.

10 *Evaluation of species group combinations*

10.1 Where procedures and adequate data are available, scoring systems have been applied to the assessment of some species group combinations: vascular plants, birds, amphibians and dragonflies, and different (non-scoring) criteria have been used for mammals, reptiles, fish, and various invertebrate groups. Combinations of different species groups often cannot be evaluated by combining scores for each because scoring systems for different species groups have not been normalised. Thus, while the collective interest of different species groups should be taken into account, it is difficult to provide specific guidance on procedure. Any site which narrowly fails to qualify for selection under one species group (and does not qualify on habitat criteria) should be examined for additional significant interest under other groups. Aggregations of regionally or locally rare species also need to be considered for site selection.

11 *Total extent of SSSIs*

11.1 An important question which arises regularly is “what is the total extent of land needed to conserve the special interest of habitats and species in Great Britain?” There are no arbitrary targets in this respect, and the total area of SSSI land arises as a consequence of the decisions related to the separate assessments of the different habitats and species groups. These range from the need to select all that remains in the case of rare and endangered habitats and species to the choice of representative samples of widespread and common types. The total extent of near-natural and semi-natural habitat will particularly affect the extent of SSSI land within any AoS and so will account for the large geographical differences in representation between upland and lowland areas.

11.2 The areas required for adequate representation of the full range of interest features of vegetation, flora and fauna will be influenced by the following factors:

- The amount of diversity within these features. For example, representation of the complex variation within woodlands would require selection of a large number of different sites.
- The degree of geographical coincidence between different features. When a wide range of interest features are well-represented on the same site, this will tend to reduce the need for further sites. Conversely, when sites are predominantly notified for single or very few features, this will increase the need for a larger number of sites.
- The geographical concentration or localisation of categories. When a particular interest feature occurs mainly in a restricted area of the country or when it is rare everywhere, there is a case for a greater representation in the AoS where it occurs.
- The vulnerability of features to decline through continuing adverse environmental influences. As some habitats and species groups become rarer, their conservation value is likely to increase, particularly where the special interest is not afforded strict protection by the SSSI network. For instance, if atmospheric pollution does not improve appreciably, the important *Lobarion* lichen community is likely to decline further in many

areas; which points to the need to increase its representation in those AoS where it still flourishes.

- The international importance of the special interest. This will also tend to indicate a need for greater representation.

11.3 The specific chapters of Part 2 offer guidance on the minimum areas of individual habitats and the minimum numbers of species regarded as having special interest. For the reasons given above, these should not be applied rigidly but used with regard to significant qualifying factors.

12 *Summary*

12.1 Part 1 of this document describes the selection process for biological SSSIs. It explains the history and purpose of SSSIs, and the concept of special interest. It outlines the rationale for the evaluation and selection of sites and details the principles which provide a fundamental base for this process for all habitats and species. Detailed guidance for the selection of sites for particular habitats and species are contained in the Chapters of Part 2.

12.2 Using this guidance, country agency staff should be able to determine and explain any selection case in the most objective manner possible. However, in the last analysis, each case rests on expert judgement, based on an assessment of the available data. It is not intended that the Guidelines should be applied as a rule-book. They do not provide final or exact criteria, but assist the decisions for or against selection. On many issues there is a substantial element of expert judgement, and it will be for those concerned to make this with the maximum rigour possible, and to consult as necessary with others, so that common standards are built into the process. Within the Country Agencies, scientific specialists are a focus for advice and a means of achieving consistency throughout Great Britain, but the wide expertise available outside the agencies should also be used as necessary. In many instances, decisions are reached by an incremental process, involving not only the collection and analysis of all the available data, and the cumulative assessment of different features, but also the balancing of different views.

13 References (for Part 1)

Catchpole, R. 2012. Ecological Coherence Definitions in Policy and Practice. *Contract Report to Scottish Natural Heritage*, No.41102. Aspen International, Leeds.

Connor, D.W., Allen, J.H., Golding, N., Howell, K.L., Lieberknecht, L.M., Northen, K.O. and Reker, J.B. 2004. *The Marine Habitat Classification for Britain and Ireland. Version 04.05.* JNCC, Peterborough. jncc.defra.gov.uk/MarineHabitatClassification.

Dandy, J.E. 1969. *Watsonian vice-counties of Great Britain*. London, Ray Society. Publication No. 146.

Dargie, T. 2000. *Sand Dune Vegetation Survey of Scotland*. Scottish Natural Heritage.

Ellis, N.V. (Ed), Bowen, D.Q., Campbell, S., Knill, J.L., McKirdy, A.P., Prosser, C.D., Vincent, M.A. and Wilson, R.C.L. 1996. An Introduction to the Geological Conservation Review. *GCR Series* No.1. JNCC, Peterborough.

Environment and Heritage Service. 1999. *Guidelines for the Selection of Biological ASSIs in Northern Ireland*. EHS, Belfast.

Ervin, J., Mulongoy, K.J., Lawrence, K., Game, E., Sheppard, D., Bridgewater, P., Bennett, G., Gidda S.B., and Bos, P. 2010. Making Protected Areas Relevant: a guide to integrating protected areas into wider landscapes, seascapes and sectoral plans and strategies. *CBD Technical Series* No.44. Montreal, Canada: Convention on Biological Diversity.

Gaston, K.J., Charman, K., Jackson, S.F., Armsworth, P.R., Bonn, A., Briers, R.A., Callaghan, C.S.Q., Catchpole, R., Hopkins, J., Kunin, W.E., Latham, J., Opdam, P., Stoneman, R., Stroud, D.A. and Tratt. R. 2006. The ecological effectiveness of protected areas: The United Kingdom. *Biological Conservation* 132: 76-87.

IACCF. 2010. *Biodiversity and Climate Change in the UK.* (Eds. Procter, D.A., Baxter, J.M., Crick, H.P.Q., Mortimer, D., Mulholland, F. and Walmsley, C.A.). JNCC, Peterborough.

International Union for Conservation of Nature and Natural Resources. 1980. *World Conservation Strategy. Living resource conservation for sustainable development.* Gland, Switzerland.

IUCN Species Survival Commission. 2001. *IUCN Red List Categories and Criteria. Version 3.1.* IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

JNCC. 2011. *A compilation of proposed additions and revisions to vegetation types in the National Vegetation Classification*. Joint Nature Conservation Committee. http://jncc.defra.gov.uk/page-4269

Jongman, R. and Pungetti, G. (Eds). 2004. *Ecological Networks and Greenways: Concept, Design, Implementation*. Cambridge University Press.

Lawton, J.H., Brotherton, P.N.M., Brown, V.K., Elphick, C., Fitter, A.H., Forshaw, J., Haddow, R.W., Hilborne, S., Leafe, R.N., Mace, G.M., Southgate, M.P., Sutherland, W.J., Tew, T.E., Varley, J., and Wynne, G.R. (2010). *Making Space for Nature: a review of England's wildlife sites and ecological network*. Report to Defra.

Macpherson, P., Dickson, J.H., Ellis, R.G., Kent, D.H. and Stace, C.A. 1996. Plant status nomenclature. *BSBI News* 72: 13-16.

Marren, P. 2002. *Nature Conservation*. New Naturalist 91. Collins, London.

Nature Conservancy Council. 1984. *Nature conservation in Great Britain*. Shrewsbury.

Nature Conservancy Council. 1989. *Guidelines for selection of biological SSSIs*. Peterborough.

Opdam, P. and Wascher, D. 2004. Climate change meets habitat fragmentation: linking landscape and biogeographical scale level in research and conservation. *Biological Conservation* 117: 303-309.

Preston, C.D. and Hill, M.O. 1997. The geographical relationships of British and Irish vascular plants. *Bot. J. Linn. Soc.* 124**:** 1-120.

Preston, C.D., Pearman, D.A. and Dines, T.D. 2002. *New Atlas of the British and Irish Flora*. Oxford University Press.

Ratcliffe, D.A. (Ed). 1977. *A Nature Conservation Review.* 2 vols. Cambridge University Press.

Rodwell, J.S. (Ed). 1991. *British Plant Communities. Volume 1. Woodlands and scrub*. Cambridge University Press.

Rodwell, J.S. (Ed). 1991. *British Plant Communities. Volume 2. Mires and heath.* Cambridge University Press.

Rodwell, J. S. (Ed). 1992*. British Plant Communities. Volume 3. Grassland and montane communities*. Cambridge University Press.

Rodwell, J.S. (Ed). 1995. *British Plant Communities. Volume 4. Aquatic communities, swamps and tall-herb fens*. Cambridge University Press.

Rodwell, J.S. (Ed). 2000. *British plant communities. Volume 5. Maritime communities and vegetation of open habitats*. Cambridge University Press

Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminée, J.N.J., and Dargie T.C.D. 2000. Review of coverage of the National Vegetation Classification. *JNCC Report 302*. JNCC, Peterborough.

Rothschild, M. and Marren, P. 1997. *Rothschild's Reserves: Time and Fragile Nature*. Harley Books.

Sanderson, W. 1996. Rarity of marine benthic species in Great Britain: development and application of assessment criteria. *Aquatic Conservation* 6: 245-256.

Sneddon, P.E. and Randall, R.E. 1993. *Coastal vegetated shingle structures of Great Britain*. JNCC, Peterborough. http://jncc.defra.gov.uk/page-2509.

Wild Life Conservation Special Committee (England and Wales). 1947. *Conservation of nature in England and Wales.* (Cmd. 7122). London, HMSO.