

Biodiversity in North-east Scotland

an audit of priority habitats and species

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Summary

Biodiversity is 'the variety of life' - all living creatures and their habitats. In 1994, following on from the 1992 Earth Summit, the government launched its UK Biodiversity Action Plan. A key feature of this is the development of Local Biodiversity Action Plans to aid the conservation of important threatened species and habitats, and to form part of Local Agenda 21 (sustainable development) initiatives. At UK level, 1,250 species and 61 broad and key habitats were identified as priorities for Action Plans.

This report presents the results of an audit of the priority species and habitats which are present in NE Scotland (Aberdeen, Aberdeenshire and Moray). It is not a complete account of the biodiversity of the area, nor does it consider every threatened species present. However, it is a first step towards identifying what can be done in NE Scotland to help achieve national biodiversity targets, and also helps to identify some further local priorities.

Species: Around 398 of the nationally listed species occur in the North-east (c 30%), including 107 of 508 species (21%) on the high priority 'Short' and 'Middle' Lists. Aberdeenshire holds 309 of the listed species, Moray 275, Aberdeen 161 and the sea area 65. For the Short and Middle list species, an analysis of distributions suggests that NW Moray and Deeside have the highest numbers of listed species. Concentrations also occur in Donside, lower Speyside, around Haddo House and Aberdeen itself.

For more than 100 of the listed species present, the North-east can be considered significant in a Scottish or UK context, holding a high proportion of the population or important sites. These include 10 mammals, 30 birds, one amphibian, 2 fish, 23 invertebrates, 11 lichens, 11 bryophytes and 16 flowering plants. Although these are very approximate figures, they point to some priorities towards which NE Scotland can make a very important contribution. A number of other species have been suggested as being locally important.

Habitats: The majority (48 / 61) of the UK listed habitats are found in the area. These include 28 of the priority 'Key' habitats, of which 12 are also 'Broad' habitats, and a further 20 'Broad' habitats. Aberdeenshire holds examples of c 44 of these, Moray c 45 and Aberdeen c 29. Habitats which are well represented in NE Scotland in a UK or Scottish context are: native pine woods, planted coniferous woodlands, acid grassland, upland heathland (moorland), montane habitats, lowland raised bogs, fens, coastal vegetated shingle, sand dunes and open sea. In addition, 6 locally important habitats were identified; of these, birch woodlands and serpentine grassland/heath were considered to be of national significance.

The occurrence of some of the listed species and habitats needs further confirmation, and some additional work is suggested in order to complete the audit.

North-east Scotland is therefore of considerable importance for many UK priority species and habitats. This audit should help as a first step towards developing local action plans to ensure that this range of biodiversity is conserved into the next century.

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1. Introduction

1.1 Background to the project

In 1992, more than 150 countries, including the United Kingdom, signed the Biodiversity Convention at the Earth Summit in Rio de Janeiro. The aim of the Convention was to obtain formal commitment from all governments to act to conserve the world's biodiversity, considered to be under threat as never before.

Biodiversity can be described very simply as 'the variety of life'. A more formal definition, based on that adopted by the Convention, is "the variability among living organisms, including those in terrestrial, marine and other aquatic ecosystems; this includes diversity within species, between species and of ecosystems".

In order to meet the UK's obligations under the Biodiversity Convention to "develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity", the UK Biodiversity Action Plan was launched in 1994. Its overall goal is "to conserve and enhance biological diversity within the UK, and to contribute to the conservation of global biodiversity through all appropriate mechanisms". Through a steering group, it identified a list of species and habitats which were priorities for action.

Another important product of the 1992 Earth Summit was 'Agenda 21' - a comprehensive programme of action needed throughout the world to achieve more sustainable development into the next century. Agenda 21 strategies are also underway locally, and developing a programme for biodiversity conservation is an integral part of the Local Agenda 21 process. Development cannot be considered 'sustainable' if biodiversity is diminishing, and Biodiversity Action Plans provide a structured way of ensuring this does not happen.

To achieve the UK's commitments, action has to be taken at UK, Scottish and local levels. In Scotland, action plans for key species and habitats are being developed, and a steering group has been set up to co-ordinate action at a local level. Four pilot areas were established to begin the process of developing Local Biodiversity Action Plans, and through practical experience, to develop good practice guidance for wider dissemination within Scotland. North-east Scotland (comprising Moray, Aberdeenshire and Aberdeen City) is one of the pilot areas, along with South Lanarkshire, Argyll and Bute, and Orkney. Action Plans are also being developed in other areas, most notably in the present context for the Cairngorms Partnership Board area, which overlaps substantially with North-east Scotland. This provides a good opportunity for the sharing of information and coordination of actions.

Local Biodiversity Action Plans (LBAPs) are seen therefore as the means by which the UK Biodiversity Action Plan will be delivered at the local level, and as a major cornerstone of the Local Agenda 21 process. Targets set nationally for species and habitats of conservation concern will be translated into actions which are achievable in a local context. In addition, LBAPs will provide a focus for the conservation of locally valued species and habitats.

An essential part of the LBAP process is to establish which of the UK priority habitats and species occur in the area, together with information on population size or habitat extent, trends, threats and information sources. Locally important species and habitats can also be included, to produce an audit of the status of priority species and habitats for a given area. This will then feed into the development of local action plans which concentrate on the most threatened elements of biological diversity.

1.2 The scope of this report

In this report we aim to describe the biodiversity resource of North-east Scotland as a basis for the audit stage of a Local Biodiversity Action Plan. However, it is *not* a full account of all habitats and species found in the area, since it concentrates primarily on UK priority habitats and species, previously identified by the UK Biodiversity Steering Group. It is important to stress that the emphasis is laid on these predetermined priorities, but that this in no way devalues the importance of other species. Many rare species are not included, and many 'common' but highly valued species in NE Scotland are also not considered. The report represents a first attempt to address the most threatened species and habitats, but its content will inevitably change through the results of local consultation, as more local information becomes available, and as national priorities are revised and modified.

In summary, the species and habitats considered, both in the database listings in the Appendices, and in the individual accounts, are derived almost entirely from the UK lists contained in the Biodiversity Steering Group report (BSG, 1995 vol. 2) plus the recent revision of the Middle list. In addition, a small number of 'locally important' species are included, proposed by local naturalist or specialists. The UK Habitat lists provide almost complete coverage of habitats present in the country; criteria used for the inclusion of species are summarised in Section 3.1.

During the compilation of the report, only existing information was used; no survey work was carried out. We aimed to identify the main sources of information, and efforts were then made to obtain and summarise them for the various habitat categories and species. Information sources are listed under individual species or habitats, and in summary sections and reference lists. Much use was also made of the personal comments of individuals, whose specialist knowledge of the area or particular tax was invaluable and we are very grateful to them for their help; they are listed in the Acknowledgements. Where we were unable to obtain information in the time available, this has been noted. Information was made available in map form from various land cover databases held in a Geographic Information System at SNH in Aberdeen, and we gratefully acknowledge its provision. We also mapped, where possible, the occurrence of the highest priority species (the 'Short' and 'Middle' list species - see Section 3.1), using a wide range of sources, but particularly the published 'atlases' for various animal and plant groups.

The geographical coverage of this report is the post-1996 local authority areas of Moray, Aberdeenshire and Aberdeen City (the former Grampian Region). The occurrence of habitats and species in each local authority area is recorded in the appendices. An approximately similar area is also covered by five 'Vice Counties'; the long-established recording areas used by naturalists for many decades. These areas, based roughly on late 19th century county boundaries, have not changed since that date (unlike local authority areas), and provide a constant reference for biological recording. The five Vice Counties are:

VC 91, Kincardineshire: VC 92, South Aberdeenshire: VC 93, North Aberdeenshire: VC 94, Banffshire and VC 95, Moray.

Boundaries often do not correspond exactly to present local authority boundaries, and in many cases differ widely. Part of VC 95 (the old county of Moray) also extends into Highland. This has presented some problems, particularly with identifying invertebrate records.

In this report, Aberdeenshire, Moray and Aberdeen refer to current local authority areas, and vice-counties are referred to by number.

1.3 How to use this report

Introductory and summary information is provided in Sections 1 and 4, and references and information sources are listed in Section 7, as well as in the Appendices and under each species and habitat.

The inclusion of habitat types in this report is thought to be reasonably comprehensive; most areas of land, coastal environment or marine in NE Scotland should fall fairly clearly into one of the 'broad' or 'key' habitat types, and can be found using the contents page. The categories used to define habitats are considered in Section 2.1. A listing of all UK habitats (including those not found in NE Scotland) is provided in Appendix 1, together with some summary information on occurrence in the area.

Only a selection of species found in the area is included. The criteria used for selection are given in Section 3.1. Full listings of the 'Short', 'Middle' and 'Long' list species occurring in NE Scotland are provided in Appendix 2, in the order of the UK lists. Each species group in Section 3.3 is divided into 'Short', 'Middle' and 'Long' list species, then locally important species. Within each of these categories, Mammals and Birds are presented in the more familiar standard taxonomic order; other groups are presented in alphabetical order by scientific name.

Copies of the databases listed in the Appendices and word processor disc files of this report have been lodged with RSPB, SNH and other members of the local steering group.

1.4 Changes made to the Second Edition

Following circulation of the first edition of this document during 1997, a number of changes were made in order to produce this revised second edition:

General: Error and spelling correction; general editing and rewriting; incorporation of comments from consultees; additions to reference list.

Habitats: additional information incorporated from the Cairngorms Biodiversity Audit (Leaper 1997). Accounts written for Arable land, locally important habitat Rocks and Scree, and Montane section rewritten.

Species: additional accounts written for species added to Middle List (and maps produced where relevant); species maps updated and corrected; additional information incorporated from Cairngorms Biodiversity Audit.

Spreadsheets: Excel habitat and species files (Appendices 1 and 2) updated and corrected.

1.5 Glossary of terms and abbreviations

10 km square

A 10 x 10 kilometre square of the UK national grid, shown on Ordnance Survey maps, referred to by 2 letters and 2 numbers (e.g. NH96), allowing each 10 km square to be located uniquely in Britain. See OS maps.

Agenda 21

Action plan for sustainable development, endorsed at the Earth Summit.

Ancient woodland

Woods present on General Roy's maps of 1750.

Biodiversity

The 'variety of life'. A more formal definition, based on that adopted by the Biodiversity Convention, is "the variability among living organisms, including those in terrestrial, marine and other aquatic ecosystems; this includes diversity within species, between species and of ecosystems".

Biodiversity Action Plan

A collection of action plans for the conservation of priority habitats and species in a given area.

BSG Biodiversity Steering Group

See UK Biodiversity Steering Group

Broad Habitat

One of 37 broad habitat categories developed by the UK Biodiversity Steering Group to describe the full range of habitat types on the UK land surface and the surrounding seas. See also 'Key Habitat'

Bryophytes

A major group of plants comprising mosses and liverworts.

Countryside Survey 1990

A survey carried out by several bodies including the Institute of Terrestrial Ecology; uses of a sample of 508 1 km squares across Britain, using satellite images and detailed surveys to produce land cover information.

Earth Summit

United Nations Conference on Environment and Development held in Rio de Janeiro in June 1992.

Endemic species

Species that are confined to an area (e.g. the UK), and which, as far as is known, originated there.

Habitat

A place in which a plant or animal lives, but in this report used in its wider context of an assemblage of plants and animals found together, forming a distinct unit such as 'heather moorland' or 'oak woodland'. Roughly equal to 'biotope'.

Key Habitat

Particularly rare, declining or important habitats qualifying under criteria developed by the UK Biodiversity Steering Group, and for which action plans should be developed as a priority. These may sometimes equate directly with a Broad Habitat.

LCS88 (Land Cover of Scotland, 1988)

An analysis of aerial photographs from 1988, undertaken by the Macaulay Land Use Research Institute, which produced land cover maps and cover statistics of a wide range of habitat types over the whole of Scotland.

LBAP Local Biodiversity Action Plan

A plan or plans to ensure the conservation of threatened plants, animals and habitats, dealing with both the national priorities which occur locally and locally important species and habitats. A key feature of such plans is that resources are targeted on priorities, and that they are a local component of a larger scale plan

Local Agenda 21

A local initiative following on from the Earth Summit to address the issue of sustainable development at a local level. Biodiversity conservation forms part of this.

Long list species

Species in the UK (1250 in original list) which qualify for inclusion in the UK Biodiversity Action Plan due to rarity, decline or other importance. See 'Middle' and 'Short' list species.

Middle list species

400 of the 1250 'Long' list species were selected by the UK Biodiversity Steering Group as being particularly rare globally or declining very quickly; of these 400, 121 became 'Short' list species - action plan already drawn up, and the others 'Middle' list - awaiting an action plan. The Middle list was revised in 1997 and now numbers 387 species.

NCMS (National Countryside Monitoring Scheme)

A survey which compared the cover of different land types or habitats on aerial photographs of much of Scotland dating from the 1940s, the 1970s and the 1980s. This allows the assessment of landscape change.

NHS (Natural Habitat Survey)

A survey of semi-natural habitats in Grampian Region in 1983-85, undertaken by Grampian Regional Council.

North-east Scotland

The local authority areas of Moray, Aberdeenshire and Aberdeen City (the former Grampian Region)

NVC (National Vegetation Classification)

A classification of UK habitats according to the plant communities present.

Red Data Books

Catalogues published by International or National Authorities listing species which are rare or in danger of becoming extinct globally or nationally.

Semi-natural habitats

Habitats or communities that have been modified to a limited extent by man, but still consist of species naturally occurring in the area.

Short list species

121 particularly rare or threatened species which already have national action plans. See also 'Middle' list species.

Species

A group of animals or plants which have common and permanent characteristics which clearly distinguish them from other groups; the basic unit of biological classification.

UK Biodiversity Steering Group

An advisory group set up by the government in 1994, with representatives from key sectors, to develop the UK Biodiversity Action Plan.

Vascular plants

Plants with a vascular system (containing vessels for conducting liquids), Includes all flowering plants, conifers, ferns.

Vice County

Recording areas covering the whole country, based loosely on late 19th century counties. The boundaries have remained the same since then, and they are used widely for biological recording, particularly for plants and invertebrates. There are five in NE Scotland.

1.6 North-east Scotland - a brief introduction

North-east Scotland (Map 1) comprises the local authority areas of Moray, Aberdeenshire and Aberdeen City, and covers around 8,700 square kilometres, or c.11% of the land area of Scotland and 3.6% of the UK land area. In this report, we also consider the adjacent sea areas of the Moray Firth and the North Sea, eastwards to the boundary with Norwegian waters. Indeed the marine habitats cover a greater area than the terrestrial habitats.

Moray (2,247 sq.km) forms the north-western local authority area, and stretches from the Cairngorm plateau and Ben Macdui at 1309m to sea level at the Moray Firth. The River Spey flows to the sea through its centre, and the River Findhorn enters the sea at Findhorn Bay. Moray holds large blocks of upland moorland and montane habitat (24% cover), around 26% plantation forest cover, and some rich agricultural land (34% cover) particularly on the coastal fringe. The Moray Firth offshore is relatively sheltered, and forms an important habitat for marine organisms. The Moray coast is mostly quite low-lying, but there are some important shingle bars and shorelines.

Aberdeenshire (6,320 sq.km) occupies the bulk of North-east Scotland. The south-western and southern fringes are formed by the Cairngorms (Ben Macdui is also shared as the highest point) and Lochnagar and the Mounth. This montane habitat grades downwards into large moorland blocks, with some important native pinewood remnants as well as large plantations. Central and south-eastern Aberdeenshire is a mosaic of improved agricultural land, forestry, woodland and moorland, with particularly productive land in the Mearns. In north-east Aberdeenshire lies Buchan, a low-lying agricultural area, with few plantations, some large remnants of raised bogs (mosses) but little other semi-natural habitat. The Aberdeenshire coast is very varied, composed mainly of hard rock cliffs, but with large sand dune complexes and coastal heath. The rivers Dee, Don, Ythan and Deveron are the main watercourses, but there are rather few standing freshwater bodies. The North Sea off both Aberdeenshire and Aberdeen is quite exposed, with low sea temperatures for much of the year. Farmland occupies 54% of the land, forestry 14% and moorland, peatland and montane land around 17%.

Aberdeen City (188 sq.km) lies at the mouth of both Don and Dee. The city area has a large area of countryside within its boundary and many scattered remnants of semi-natural habitat within the built-up area. It is Scotland's third largest city, and is growing rapidly, with new housing particularly around the fringes. Predominant land cover includes around 28% urban area, 48% farmland and 9% woodland.

Other larger towns in North-east Scotland are Forres, Elgin, Fraserburgh, Peterhead and Inverurie, but the remaining settlements are relatively small. The total population of North-east Scotland is c.504,000.

2. Habitats

2.1 Introduction and definitions

The habitat accounts presented here describe the occurrence in the North-east of any relevant habitat listed in the UK Biodiversity Steering Group (BSG) report (1995). We have attempted to use the BSG categories in order to conform with the national action plan; therefore some definitions may be not be familiar to those used to previous habitat classification systems.

The Biodiversity Steering Group developed a classification of habitat types which cover the entire land surface of the UK and the surrounding sea to the edge of the continental shelf. There are 37 of these Broad Habitats. Habitats are defined as ecologically integrated units at a landscape scale.

From the Broad Habitats 38 Key Habitats were selected. These may be exactly equivalent to a Broad Habitat or a sub-division of a Broad Habitat. The selection was based on the following criteria:-

- habitats for which the UK has international obligations
- habitats at risk, e.g. those with a high rate of decline (especially in last 20 years), or which are rare
- areas (particularly marine) which may be functionally critical
- areas important for key species

Action plans have been written for 14 Key habitats; a number of others are currently in preparation.

In 2.3 below, information for each habitat is derived from details in the BSG accounts, general habitat surveys relevant to NE Scotland and some detailed surveys of specific habitat types. Dealing with habitat information has presented more difficulties than for species. In particular, marrying classification systems of different surveys to that of the BSG has been problematic, notably for grassland categories. A further problem is that for those Key habitats without published action plans at present, no description of the habitat was given in the BSG report, leaving the precise definition of the habitat open to interpretation; for example the distinction between 'upland' and 'lowland' categories of heathland and grassland. Some of the habitat accounts presented here may therefore need to be reviewed when the relevant action plans are published.

The main sources of data in the North-east are the Land Cover of Scotland dataset (LCS88) and National Countryside Monitoring Scheme (NCMS) surveys, the former for distribution and mapping and the latter for trends from the 1940s to the 1980s. We have also utilised the Grampian Natural Habitat Survey of 1983-85 for much supplementary information. The categories and criteria of all of these surveys do not always match those of the BSG. The BSG does list the NVC communities associated with each habitat and in some cases reference has also been made to NVC surveys.

Comparing habitat classifications: examples for grassland categories.

BSG Improved Grassland compares well to LCS88 Improved Grassland. However, the LCS88 Improved/Rough grassland mosaic includes some areas which would fall into the BSG Improved Grassland class, as well as areas which fall into another BSG class. It is not possible to split the area of the mosaic to give separate totals for the two BSG classes, therefore we have to give the area of BSG Improved Grassland as the area of LCS88 Improved Grassland category plus a proportion of the mosaic. For the purpose of mapping the same BSG class, the map will show the total extent of both the single feature and the mosaic.

*A second example, also for grassland, involves the merging of the BSG classes: Unimproved Neutral Grassland, Calcareous Grassland, and some Acid Grassland. This combination of categories together match the LCS88 Good Rough Grassland, grouped with four related (ie., Good Rough Grassland/**) mosaics. The remainder of BSG Acid Grassland is treated independently as it matches a combination of LCS Poor Rough Grassland and related mosaics.*

In order to use this very valuable information, we consulted previous studies comparing habitat survey methods (e.g. Habitat Surveys 1987; Cox *et al.* 1996), and, following discussions with RSPB Research Biologists we then split or joined some of the BSG categories. This resulted in some cases in categories which are not exactly as the BSG have laid out, but suits the survey data available for NE Scotland and gives more accurate information on habitat classes which are more pertinent to area. The translation of the BSG's habitats to those of LCS88 are detailed in Table 1, and an example is given in the box above.

Table 1. The LCS88 habitat classes used in this report for describing BSG habitat classes

BSG HABITAT	LCS CLASS
Broadleaved and Yew Woodland	Broadleaved Woodland
Lowland Wood Pasture and Parkland	N/A
Native Pine Woodland	Semi Natural Coniferous Woodland
Planted Coniferous Woodland	Coniferous Plantation
Some Acid Grassland (<i>Nardus/Molinia</i>)	Poor Rough Grassland
Some Acid Grassland	Good Rough Grassland
Unimproved Neutral Grasslands	" "
Calcareous Grassland	" "
Improved Grassland	Improved Grassland
Grazing Marsh	Marsh
Upland Heathland	Heather Moorland
Lowland Heathland	Lumped with Heather Moorland
Montane	Montane
Blanket Bog	Peatland
Lowland Raised Bog	"
Fens/Carr/Marsh/Swamp and Reedbed	Marsh
Standing Open Water	Freshwaters
Rivers and Streams	N/A
Estuaries	Tidal Waters
Saltmarsh	Saltmarsh
Shingle above High Tide Mark	N/A
Boulders and Rock above the High Tide Mark	N/A
Coastal Strandline	N/A
Sand Dune	Dunes
Saline Lagoon	N/A
Maritime Cliff and Slope	Maritime Grasslands and Heath
Arable	Arable
Cereal Field Margins	Arable
Boundary Features	N/A
Urban	Urban Rural Development
Open Coast	N/A
Open Seawater Column	N/A
Shelf Break	N/A
Offshore Seabed	N/A

Mapping

Many habitats have been mapped at a 1 km square level, using SNH's Geographic Information System. This level of detail was chosen specifically to show more accurately the distributions of the more scarce habitats. Maps were derived primarily from LCS88 data, but some were produced using the GRC's Natural Habitat Survey. The choice of habitats to map was governed by information availability and whether it was possible to produce a meaningful map using pre-existing categories. On some maps, obvious errors have been deleted.

The habitats are presented in the familiar 'Phase 1' order (Nature Conservancy Council 1987), since this allows a more convenient separation of habitat types. We have modified this to present firstly the terrestrial and freshwater habitats, then coastal and marine habitats.

2.2 Summary of significant habitats in North-east Scotland

Although there are some problems in relation to the precise definitions of habitat types, and therefore determining to what extent they occur in the area, around 48 broad and key habitats are found in NE Scotland, including 28 key habitats, of which 12 are also broad habitats, and a further 20 broad habitats. Of these, some are common and widespread across the whole of the UK, and not at all threatened. Others are of more importance in terms of their occurrence in the North-east. NE Scotland accounts for just under 4% of the land surface of the UK and could be said to be significant in UK terms for any habitat for which more than 4% of its national extent occurs in the area. The equivalent figure for Scotland is 11%. These are not straightforward criteria, however, as for some upland types, one might expect a higher proportion, especially in a UK context.

Nevertheless, as an initial way of evaluating the information, all habitat types which appear to be concentrated in NE Scotland in this way are listed below (with percentage figure if available), if information is sufficient to make an assessment. In some cases, the comparison is made with Britain, not the UK. Two locally important habitats are also included.

Habitats disproportionately represented in NE Scotland

B = broad habitat K = key habitat L = locally important habitat

Native pine woodlands (BK): perhaps 23% of the Scottish/UK total area.

Planted coniferous woodland (B): around 8% of the British total area.

Birch woodland (L): probably disproportionately represented.

Acid grassland (B): possibly disproportionately represented.

Upland heath (moorland) (BK): representation in the area is around 4% of UK.

Serpentine grassland and heath (L): very good representation in the area.

Montane (B): disproportionately present in NE Scotland.

Lowland raised bog (BK): c.19% of former Scottish extent and 8% of British.

Fens (K): probably important in a Scottish context.

Coastal vegetated shingle (K): 19% of Scottish; though only 2.5% of British, NE Scotland holds two of the best examples in the country.

Sand dunes (BK): 22% of Scottish and 14% of British.

Open sea-water (B): a considerable proportion of the British North Sea.

2.3 Habitat accounts: terrestrial & freshwater

2.3.1 Broad habitat: **Broad-leaved woodland**

Status, Distribution & Significance

There was approximately 752,000 ha of broad-leaved woodland in Britain in 1985 and the area has now increased to an estimated 800,000 ha¹. This total includes introduced as well as native tree species. Ancient semi-natural broadleaved and yew woodland accounts for less than half of this, 302,000 ha, about 1% of the land area. The remaining area consists of ancient plantations, recent semi-natural woodlands and recent plantations. The BSG includes yew woodland with broadleaved woodland but this restricted to southern England, although the species *Taxus baccata* occurs in Scotland, including the North-east, probably as an introduction.

In NE Scotland there is a total of around 24,000 ha of broad-leaved woodland (excluding 10,170 ha of mixed woodlands), according to the Forestry Authority in 1992², representing around 3% of the British total. The LCS88 recorded rather less, 10,564 ha, 10% of the Scottish total. As shown from the LCS88 survey³ (Map 2a) these woodlands are distributed all over the North-east, but particularly in lower areas. This is emphasised more in Map 2b, showing the distribution according to the Grampian NHS (1983-85)⁴. The contrasts in these two maps illustrate the problems of comparing different surveys. Where broad-leaved woodlands do penetrate into higher areas in the west, this is generally along the main straths, such as the Dee and the Avon, where the soils are better and there is more shelter.

The commonest type is birch woodland, which is considered further below as a locally important habitat (2.3.9), along with key habitats Upland oakwood (2.3.2), Upland mixed ash woodland (2.3.4), Lowland beech wood (2.3.3) and Wet woodlands (2.3.5). Occasionally other species, such as alder *Alnus glutinosa*, aspen *Populus tremula* or rowan *Sorbus aucuparia* may predominate. Most woodlands contain a variety of species; bird cherry *Prunus padus*, gean *P. avium*, elder *Sambucus nigra*, wych elm *Ulmus glabra*, hawthorn *Crataegus monogyna*, holly *Ilex aquifolium*, hazel *Corylus avellana* and a number of species of willow *Salix* spp. are native, while beech *Fagus sylvatica* and sycamore *Acer pseudoplatanus* are the commonest non-native species.

A survey of Upper Deeside found that about 18% of the area was wooded, but the majority was coniferous⁵. Broadleaved woodland accounted for 1.5% of the 23,757 ha of woodland on Deeside. . An earlier survey of a smaller area of the Dee valley⁶ recorded 1081ha of broadleaved woodland between Banchory and Linn of Dee, mainly birch, also oak (59ha), alder (62ha), mixed (67ha; dominated by ash, wych elm, sycamore or beech), aspen (9ha), willow (6ha) and hazel (2ha). Hazel was more abundant on south facing slopes between Ballater and Crathie outside the study area. In the Dee valley, aspen is found mainly between Ballater and Crathie, with the largest aspen wood in the North-east at Crathie⁷, also on Crannach Hill (NO39)⁵.

Montane willow scrub (W20) is included by the BSG in Montane habitat (see 2.3.24). However, juniper scrub (W19) is included in Broadleaved woodland, (although juniper is coniferous), presumably because this community sometimes has an open over-canopy of birch. *Juniperus communis* - *Oxalis acetosella* woodland is found mainly at high altitudes in the east-central highlands and NE Scotland holds a large proportion of this habitat⁸ (see also Species Middle List).

Broadleaved woodland in the UK holds a greater number of species of conservation concern (232) than any other broad habitat, including 78 globally threatened and rapidly declining species, while a further 46 have become extinct in the past 100 years⁹. This probably reflects the structural complexity of broadleaved woodlands and their predominance in the landscape before clearance for agriculture.

Species particularly associated with oak, ash or birch woodlands are listed under the key habitat. There are also several species associated with aspen, including the dark bordered beauty moth *Epione paralellaria* (Middle list), the hoverfly *Hammerschmidia ferruginea* (Middle list) and the epiphytic moss *Orthotrichum gymnostomum* (Middle list). Other mosses of this genus, *O. obtusifolium* and *O. pallens* (M) grow on a variety of deciduous trees. Many birds e.g. song thrush (Short list), bullfinch (Middle list), are associated with broadleaved woodland generally and the hoverfly *Parasyrphus nigratarsis* (Long list) is usually found in riverside woodlands.

Trends & Influential Factors

Britain is one of the least naturally wooded countries in Europe. Around three quarters of Scotland was once forested but both broadleaved and pine woodlands have been reduced to a tiny fraction of their former extent. Much of the lowland woodlands had been cleared by mediaeval times and there was considerable timber extraction from the highlands in the 18th century, but there have also been significant losses this century.

From the 1940s to 1970s, around 28% of broadleaved woodland was lost in NE Scotland, much to coniferous plantations¹⁰. More recently, the area of broad-leaved woodland has increased from around 12,000 ha in 1979, as a result of natural regeneration (particularly birch) and replanting². Apart from birch, there was about 8000 ha of broad-leaved woodland in 1979 and 13,000 ha in 1992, with the main increase in mixed broadleaved woodland. New grant-aid schemes play a key role in influencing the amount of replanted woodland¹¹.

However, losses of woodland still occur. Current threats include clearance for roads and other developments, inappropriate woodland management, overgrazing by deer and sheep which prevents regeneration, planting of non-native species and invasion by non-native species such as rhododendron¹.

Information sources

1. BSG, 1995b
2. Forestry Commission census information, 1979 and 1992
3. LCS88
4. Grampian Natural Habitat Survey, 1983 - 85
5. Bayfield & Conroy, 1996
6. Forster & Green, 1985
7. Adam Watson, pers.comm.
8. Rodwell, 1991a
9. BSG, 1995a
10. NCMS
11. Graham Cullen (FA), pers.comm.

2.3.2 Key habitat: Upland oakwood

Current Status, Extent and Distribution

In upland oakwoods, sessile oak *Quercus petraea* usually predominates, sometimes with pedunculate oak *Quercus robur*. Birch is generally present with varying amounts of other broad-leaved tree species, such as rowan, alder and holly¹. British and Irish oakwoods are of international importance due to their rich animal and plant communities, especially those of bryophytes.

Oakwoods are quite scarce in the North-east, forming a small proportion of the broadleaved woodlands (see above), with a total of around 659 ha in 1992². The majority of stands were probably planted. A survey of the Dee valley from Banchory to Whitebridge recorded 59 ha of oakwood, mostly above Ballater, with the main stands at Craigendarroch, Dinnet and Aboyne³.

The oakwood at Craigendarroch stands on a south facing slope at 200 - 300m and is probably close to the climatic limit of natural oak woodland⁴. It was previously coppiced, but stated in 1843 to be natural⁵. The oakwood at Dinnet was planted, probably in the late 18th or early 19th century, but has much of the character of a semi-natural wood and has both *Quercus petraea* and *Q. robur*⁵. Together these two woods total around 55 ha⁶. Other notable North-east oak woods include Laithers, on the Deveron upstream of Turriff, Old Wood of Drum on lower Deeside, Paradise Wood by the River Don

(NJ61) and Gight, a Scottish Wildlife Trust reserve. The latter is quite a mixed woodland, with the best concentration of oaks further upstream by the Ythan at Fetterletter⁷. These are all in more lowland areas but there is no clear distinction between 'upland' and lowland oakwoods.

Scottish / UK Significance

There is thought to be between 70,000 and 100,000 ha of upland oakwood in the UK, mostly in the north and west. The main concentrations in Scotland are found in Argyll and Lochaber¹. North-east Scotland holds only a very small proportion - between 0.7 - 0.9% - of the UK total.

Associated Species & Example Key Sites

The range of ground vegetation in oakwoods varies with soil type and grazing pressure. In the examples found in the North-east, the ground layer is usually of grasses or heath, sometimes with bluebells *Hyacinthoides non-scripta* (Long list) and brambles *Rubus* in less-grazed areas. Important plant species include the three-veined sandwort *Moehringia trinervia*, and moschatel *Adoxa moschatellina*, and also frequently northern species such as chickweed wintergreen *Trientalis europaea* (not listed).

The spotted flycatcher (Middle list) breeds at higher densities in Dinnet oakwood than other woodlands on Deeside⁴, and also breeds at Craigendarroch. Other breeding birds include song thrush (Short list), redstart and wood warbler (Long list). Many mammals are found in oakwoods, including badger, roe deer and Daubenton's bat (Long list). The slug *Limax tenellus* (Long list) is found in old woodlands, including several oakwoods in the area⁷.

Area / Quality Trends

There has been a decline of about 30 - 40% in the extent of British upland oakwoods over the last 60 years¹. In Scotland, there was large-scale planting of oaks on many estates between 1780 and 1830 and regular coppicing in many oakwoods. Later in the 19th century, with the reduced demand for timber, many oak coppices were felled and replaced with conifers⁴.

In the North-east there appears to have been a decline over the past two decades, with the extent of oak woodland falling from 2125 ha in 1979 to 659 ha in 1992, a loss of 69%². These figures may be influenced to some degree by changes in methodology between the surveys, the earlier survey being more likely to classify mixed woodland with a high proportion of oaks as oak woodland.

Factors Influencing Trend

Current factors affecting British oakwoods include over-grazing by sheep and deer, invasion by non-native species such as rhododendron and unsympathetic forest management¹. Decreases in the past are likely to have been due to the factors affecting broadleaved woodlands generally, e.g. losses to conifer plantations (see above).

Information Sources

1. BSG, 1995b
2. Forestry Commission National Inventory of Woodlands, 1994
3. Forster & Green, 1985
4. Buckland *et al.*, 1990
5. Ratcliffe, 1981
6. NHS 1983-85
7. Richard Marriott, pers. comm.

2.3.3 Key habitat: Lowland beech woodland

Current Status, Extent & Distribution

Beech *Fagus sylvatica* is native in southern England but not in Scotland, although widely planted throughout the UK, including NE Scotland¹. It is commonly planted along roadsides, on farmland and in forestry plantations. It also occurs as a component of mixed broadleaved woodlands, sometimes regenerating naturally, but is rarely the dominant species.

Forestry Commission figures give the total area of beech woodland in the North-east as 1,289 ha in 1992². In a survey of 7183 ha of the Dee valley between Banchory and Whitebridge, 67 ha was recorded as 'mixed broadleaved' woodland, mostly below Aboyne³. This included all woods in which ash, wych elm, sycamore or beech were dominant. Beech woods are particularly scarce in Moray (44 ha)⁴.

Scottish / UK Significance

The native beechwoods of southern England, for example on the chalk downlands, are clearly of much greater importance, and likely to be the priority in the national action plan. It seems inappropriate to consider beech woodland as a key habitat in NE Scotland, as it consists entirely of planted woodland of a non-native species.

Associated Species & Example Key Sites

Little ground vegetation grows under beech trees because their foliage allows little light penetration.

Area / Quality Trends

In the North-east the NHS put the total area of beech in 1983-5 at 871 ha⁴. Forestry Commission surveys indicate a higher figure for 1979 of 2,107 ha, and a subsequent decrease to 1,289 ha in 1992, a drop of 38%². The decline seen from the FC survey may reflect slight changes in methodology, but the trend is probably real and is composed of both loss of old trees and a decline in the planting of new areas of beech. At present there are no figures available for the proportion of trees planted which are beech.

Factors Influencing Trend

New planting of both beech and native broad-leaved trees has increased markedly in the past two years. Planting is greatly influenced by grants available, and the decline and subsequent resurgence reflects differing Woodland Grant Schemes.

Information sources

1. Stace, 1991
2. Forestry Commission National Inventory of Woodlands, 1994
3. Forster & Green, 1985
4. NHS 1983-85
5. Graham Cullen (FA), pers.comm.

2.3.4 Key habitat: Upland mixed ash woodland

Current Status, Extent & Distribution

Ash *Fraxinus excelsior* is a common and widespread native tree. It can survive on soils too poor for most tree species and is quite often dominant on base-rich soils. Ash is a common component of riparian woodlands and can be found at 500m or higher in northern and western Britain¹.

Although frequently found in mixed broadleaved woodland (see 2.3.1) and widely planted in the lowlands, ash is rarely the dominant tree species in woodlands of the North-east. Broadleaved woodland, other than birch, is quite limited in extent, so the area of ash woodland is likely to be very small. Forestry Commission figures put the area at 169 ha in 1992². There is a small stand of ash at Dinnet, about a mile upstream of the bridge on the south side of the river³. Quithel Wood at Ballogie, one of the few remaining examples of mixed broadleaved woodland on Deeside, contains ash, hazel, cherry and wych elm⁴. The wood at Gight, an SWT reserve, contains many ash trees³.

Scottish / UK Significance

Data was not available on the extent of ash woodlands in Britain, but NE Scotland is unlikely to hold a significant proportion. Ash woodlands are scarce in central and eastern Scotland, although widespread

elsewhere in Britain⁵. NVC community W8 (*F. excelsior* - *Acer campestre* - *Mercurialis perennis* woodland) is found mainly in England & Wales, while W9 (*F. excelsior* - *Sorbus aucuparia* - *M. perennis* woodland) has a generally western distribution, including western Scotland.

Associated Species & Example Key Sites

The bird species are similar to those of birch woodlands. The lichen *Pannaria ignobilis* (Long list) grows on a variety of deciduous trees, but especially ash.

Area / Quality Trends

According to FC surveys the area of ash woodland declined from 225 ha in 1979 to 169 ha in 1992, a loss of 25%².

Factors Influencing Trend

Ash woodlands are likely to be affected by the factors influencing broadleaved woodlands generally (see 2.3.1).

Information sources

1. Milner, 1992
2. Forestry Commission National Inventory of Woodlands, 1994
3. David Welch, pers.comm.
4. Buckland *et al.*, 1990
5. Rodwell, 1991a

2.3.5 Key habitat: Wet woodlands

Current Status, Extent and Distribution

The national Action Plan for this habitat is not yet available and the Biodiversity Steering Group does not give a definition. Seven types of wet woodland - where the wetness of the ground is the overriding element in the environment - are listed in the NVC communities¹. Of these, W1 - 6 are included by the Biodiversity Steering Group in the broad habitat 'Fens, carr, marsh, swamp and reedbeds', while W7 is included in the broad habitat Broadleaved woodland². Thus this key habitat should possibly be considered as a sub-division of the former broad habitat rather than with the woodland habitats.

Wet woodlands are generally dominated by alder, willows or downy birch. The most common willows are common sallow or grey willow *Salix cinerea*, goat willow *S. caprea* and eared sallow or eared willow *S. aurita*.

The following NVC communities occur in NE Scotland¹:

Salix pentandra - *Carex rostrata* woodland (W3) - found mainly in northern Britain in very wet poor-fen systems.

Betula pubescens - *Molinia caerulea* woodland (W4) - on raised areas within floodplain and basin mires, and along the drier fringes of blanket bogs.

Alnus glutinosa - *Fraxinus excelsior* - *Lysimachia nemorum* woodland (W7) - flushes on slopes around upland fringe.

There are scattered small spring line alder / ash woods e.g. near Midmar and Alford and larger examples below Ballater and northeast of Crathie, the latter thought to be the best site in Aberdeenshire³. There are also numerous willow carr areas which grade into fen/carr habitats (see 2.3.26). A small patch of wet woodland has developed along an old mill lade at the foot of Scolty Hill, Banchory⁴. The Lower River Spey SSSI holds a large extent of alder woodland developed on braided river channels. In the Dee valley, alder and willow woodland were recorded mainly below Ballater, with 61.5 ha of alder and 5.9 ha of willow (most commonly *S. caprea* and *S. cinerea*)⁵. Alder was found on parts of the floodplain with a permanently high water table, willow on wetter soils along abandoned channels, on islands and banks of main river. There are also important stands of alder along

the River Gairn and smaller stands around the Dinnet lochs. Some of the Deeside birch woodland (total 876 ha) was classified as 'moist birchwood'⁵.

Little information was available for other parts of the area but there may be small areas of alder and willow woodland in other river valleys and birch-mire woodland could be widespread. A further type of wet woodland is bog woodland, or wooded bog, a rare and poorly understood habitat⁶. Although not considered by most British habitat classifications, it is a priority Annex 1 type of the EC Habitats Directive. The NVC wet woodland types considered above tend to occur on poorly drained or seasonally flushed soils but are at least partly minerotrophic. Birch is not thought to be able to grow on purely ombrotrophic bogs and Scotland's wooded bogs are composed of Scots pine (W18), associated with mire communities (e.g. M18). There is a wooded bog at Ballochbuie on Deeside but larger examples in Strathspey e.g. at Abernethy, just outside the area.

Scottish / UK Significance

No estimates were available for the extent of wet woodlands within NE Scotland, or the UK total. It seems unlikely, however, that the area holds more than a very small proportion of the total.

Associated Species

Reed bunting (Middle list) and sedge warbler (Long list) nest in willow scrub.

Area / Quality Trends & Factors Influencing Trend

Many wet woodlands along river floodplains have probably been lost through drainage. It was noted in the Dee valley that most of the alluvial flats where alder might grow are now farmed and the largest stands now occur on islands or flats below steep cliffs which restrict access⁵.

Information Sources

1. Rodwell, 1991a
2. Biodiversity Steering Group, 1995b
3. Adam Watson, pers.comm.
4. David Welch, pers. comm.
5. Forster & Green, 1985
6. MacKenzie & Worrell, 1995

2.3.6 Broad and Key habitat: Lowland wood pastures and parklands

Current Status, Extent and Distribution

Lowland wood pastures are grasslands with scattered large trees. The prime type of this habitat considered by the Biodiversity Steering Group is where grazing still occurs at a level which maintains the special features of the open ground. However, a much greater extent of relict wood pasture and parkland exists, either unmanaged or with the grassland component converted to arable or improved pasture¹. This habitat is important for archaeological remains as well as for mature deciduous trees such as oak and beech and associated invertebrates, lichens and fungi. The grassland component of this habitat is often acid or neutral and is also an important feature.

There is little information on the extent or distribution of this habitat in NE Scotland, but it is certainly scarce. The LCS did not consider it as a habitat class, although the presence of trees was recorded for grassland categories. The NCMS used tree spacing as the criterion to define 'parkland' as a habitat class, which includes this Key Habitat type, but it also includes a great deal of land which is not traditional 'wood pasture', such as modern parkland. The total area recorded for 'parkland' by the NCMS in the late 1980s was 2200 ha², so the area of true wood pasture is likely to be rather less. Similarly, the 'park and ornamental grounds' shown on the Ordnance Survey maps probably include a much wider variety of habitats than parkland as defined by the BSG.

Examples of this habitat include the grounds of Haddo House, north of Oldmeldrum and The Burn House, Edzell. Both of these sites have mature deciduous trees, including elm. Other old parkland sites

include the policies around Leith Hall, Fyvie Castle, Crathes Castle, Dunecht House and Fasque House. A survey of lowland wood pasture and old parkland habitat would therefore be valuable in assessing its current state in NE Scotland.

It has been suggested that mature wayside trees should be included in this habitat category. In some cases, such trees may be relics of former wood pasture or parkland, and they are of considerable importance for epiphytic lichens and bryophytes³. However, data were not available on the distribution of mature wayside trees in the area.

Scottish / UK Significance

In Mediaeval times, wood pasture and parkland are believed to have been widespread in lowland areas, but they are now found mainly in southern England. There is an estimated total of 10,000 - 20,000 ha of working wood pastures and parkland, with much more in a relict state¹. It seems unlikely that this habitat was ever very extensive in NE Scotland. The small areas found on the estate policies are often planted with non-native species, in contrast to the ancient native oaks and beeches of southern Britain, and not likely to be of any national importance. A list of 68 of the most important pasture-woodlands included only 6 sites in Scotland, all in the south⁴.

Associated Species

The lichens *Caloplaca luteoalba* (Short List) and *Bacidia incompta* (Middle List) are found on elm trees at Haddo House and a walnut tree in parkland at the Burn House, Edzell is the only known site of the lichen *Parmelia subargentifera* (Long list). The moss *Orthotrichum obtusifolium* (Middle list) grows on elms and sycamores at Leith Hall, now it's only known site in the UK.

The lichen *Leptogium saturninum* (not listed: RDB - Vulnerable) was recently discovered on roadside ash trees at Monymusk³.

Area / Quality Trends & Factors Influencing Trend

In the UK as a whole, declines have been due principally to reduction in grazing, leading to succession to secondary woodland, and conversion for intensive agriculture or forestry¹.

Information sources

1. Biodiversity Steering Group, 1995b
2. NCMS
3. Brian Coppins (RBGE), pers. comm.
4. Harding & Rose, 1986

2.3.7 Broad and key habitat: Native pine woodland

Current Status, Extent & Distribution

Native pinewoods, of self-sown Scots pine, *Pinus sylvestris*, are relicts of the Caledonian Forest or Old Wood of Caledon, which once covered much of the Scottish Highlands¹. Pine is able to grow on very poor, podsolised soils. While pine is dominant, pinewoods usually contain varying amounts of birch and other broadleaved trees, with juniper often an important element in the understorey². The NVC divides pine woodland (W18) into 5 sub-communities, of which the *Erica - Goodyera*, *Vaccinium* and *Luzula* sub-communities (W18a,b,c) are characteristic of drier eastern areas including NE Scotland. The *Sphagnum - Erica* subcommunity (W18d) is found mainly in the wetter west, but also at higher altitudes in Deeside³. There are also thought to be distinct genotypes within the Scottish pine populations and the remaining woodlands have been classified by biochemical region, most woodlands in NE Scotland falling into the North East region⁴. Pinewoods in eastern highlands may be of different origins to those in the north and west highlands. It is thought that those in the west originated from the native stock prior to the last glaciation, while the eastern genotype arrived here from northern Europe after this time. The eastern type is found almost exclusively in Strathspey and Deeside.

The LCS88 recorded 2540 ha of semi-natural coniferous (i.e. pine) woodland⁵, which seems likely to be an under-estimate as the woods listed in the Caledonian Pine Inventory (see table) total 3670 ha. The discrepancy could be that the LCS recorded pinewoods with a high proportion of birch as mixed woodlands. Except for a few small sites, the native pinewoods in NE Scotland are all located in Deeside (Map 3). Besides the sites listed below, there is a possibility that pinewoods at Windyhills (NJ84) are natural⁶.

Native Pinewoods in NE Scotland

Site	Central Grid Ref.	Area of pine (ha)
Glen Derry	NO040945	246
Glen Lui	NO075905	164
Glen Quoich	NO095952	426
Glen Avon	NJ176072	4
Ballochbuie	NO210900	647
Crathie	NO270955	135
Creag Ghiubhais	NO315955	40
Torphantrick	NO410973	32
Glen Tanar	NO408920	1578
Glen Ferrick	NO570915	390
Breda	NJ527157	8
Total		3670

from Caledonian Pine Inventory

Scottish / UK Significance

Native pinewoods are found only in Scotland and the total area is around 16,000 ha⁴. Although pinewoods on Deeside are more fragmented than in Strathspey, NE Scotland is very important for this habitat, holding somewhere around 23% of the total^{4,5}, including a substantial proportion of the eastern genotype.

Associated Species & Example Key Sites

Native pinewoods hold 37 species of conservation concern, listed by the UK Steering Group⁷. Animals associated with pinewoods include birds, such as capercaillie, Scottish crossbill (Short list) and crested tit (Long list), mammals e.g. red squirrel (Short list) and pine marten (Long list), wood ants *Formica aquilonia* and *F. lugubris* (Middle list), cousin German moth *Paradiarsia sobrina*, hoverflies *Metasyrphus lapponicus* and *Blera fallax* (Middle list), robber fly *Laphria flava* (Long list) and spider *Dipoena torva* (Long list).

Associated plants include twinflower *Linnaea borealis* (Middle list), one-flowered wintergreen *Moneses uniflora* (Long list), the lichen *Cladonia botrytes* (Middle list) and the moss *Buxbaumia viridis* (Short list).

Good examples of Caledonian Forest remnants in the North-east are found in Glen Tanar, Ballochbuie in Balmoral Estate and Glen Quoich in upper Deeside.

Area / Quality Trends

Four thousand years ago, pine-dominated native mixed forests are estimated to have covered around 1.5 million ha of the Scottish highlands. The remaining fragments represent about 1% of the former range¹. Over the centuries, large areas of pine wood have been cleared and, earlier this century, under-planting with non-native conifers occurred frequently. The NCMS surveys showed a reduction in area of nearly

50% in Grampian region from the 1940s to 1970s, with the main losses to 'young plantation'⁸. The fragmentation and isolation of individual woods has reduced the wildlife value and may have led to loss of genetic variation¹. More recently, action has been taken to expand the area of native pinewoods, by encouraging natural regeneration and planting new woods of natural character.

Factors Influencing Trend

One of the main factors currently affecting the habitat is heavy grazing by deer (and in other parts of Scotland, also sheep), which prevents regeneration and reduces diversity¹. Sheep and Deer exclosures protect some areas of pinewood but the better long term solution is a reduction in deer numbers².

Information sources

1. BSG, 1995b
2. Bayfield & Conroy, 1996
3. Rodwell, 1991a
4. Caledonian Pinewood Inventory, Forestry Authority, 1994
5. LCS88
6. David Welch, pers. comm.
7. BSG, 1995a
8. NCMS

2.3.8 Broad habitat: **Planted coniferous woodland**

Status, Distribution & Significance

Coniferous plantations are often composed of even-aged stands of a single species. They are generally low in diversity compared to the habitats which have been replaced, such as broadleaved woodland, heathland and bog. However, some are of conservation value for threatened species. For example, twinflower (Middle list) has declined with the loss of native pinewoods and many of the remaining sites are in the older pine plantations. These may also have a lichen-rich pinefloor, which is a threatened habitat (Adam Watson, pers.comm.). Birds, such as Scottish crossbill, capercaillie (Short list), black grouse (Middle list), goshawk (Long list) occur in plantations, also red squirrels (Short list).

Around 1.5 million ha of Britain is covered with planted conifers, 40% of which is sitka spruce *Picea sitchensis*¹. Sitka spruce (39,000 ha) and Scots pine (39,000 ha) are the most extensively planted conifers in NE Scotland². The planted area of pine is about ten times the area of the native pinewoods. As well as sitka spruce, plantations of non-native conifers include lodgepole pine *Pinus contorta*, Norway spruce *Picea. abies*, European and Japanese larch *Larix europaea & L. kaempferi*, Douglas Fir *Pseudotsuga menziesii* and smaller quantities of other species.

The total area of coniferous plantations was 116,700 ha in 1992² i.e. covering 13% of the land area of the North-east, about twice the proportion as in Britain as a whole¹. The LCS88 recorded 94,140 ha of coniferous plantation, with a further 21,460 ha of recent planting and 5620 ha of felled woodland³. The latter two categories include broadleaved woodland but are probably mainly coniferous. The plantations in the North-east represented 15% of the Scottish total³.

Trends & Influential Factors

Large scale coniferous plantations are a relatively recent feature of the landscape, with most planted since the first World War. The NCMS showed major increases throughout Grampian and adjacent regions from the 1940s (14,000 ha) to 1970s (34,000 ha)⁴. Forestry Commission censuses show a further increase to 106,000 ha in 1979 and 116,700 ha in 1992, with an average 1210 ha planted each year from 1981 to 1994². The proportion of sitka spruce has increased since 1979.

Information sources

1. BSG, 1995b
2. Forestry Commission National Inventory of Woodlands, Forestry Authority, 1994
3. LCS88
4. NCMS

2.3.9 Locally important habitat: **Birch woodland**

Status, Distribution & Significance

Although not considered as a key habitat by the BSG, birch woodland is of considerable importance in NE Scotland. It is one of the main woodland types in Scotland, and although only a fraction of the former area remains, is still by far the most extensive deciduous woodland in the area.

Both downy birch *Betula pubescens* and silver birch *Betula pendula* are present. The former is more frequently dominant and occurs on wetter soils. Many woodlands contain both species and a variety of other trees, such as rowan, aspen, alder, bird cherry and gean.

Birch grows on soils with a higher range of fertility than pine¹ and is found from valley bottoms up to around 650m². Nearly half (11,200ha) of the 24,000ha of broadleaved woodland in the North-east is birch³. A survey of the Dee valley in 1979 recorded 876 ha of birch, representing 81% of the deciduous woodland and 12% of the area surveyed, it being the dominant habitat between Aboyne and Ballater⁴. The distribution of birch woodlands in the North-east is illustrated in Map 4, taken from the NHS 1983-85⁵. Although there have probably been changes since this survey (which recorded a total area of 7,989 ha), this is the only distribution data available and may be assumed to reflect the general pattern which exists today.

Morrone birchwood, near Braemar, is similar in character to Scandinavian sub-alpine birch forest. Here, downy birch grows on soils derived from calcareous schists, with a dense understorey of juniper and varied flora. The wood extends up to 650m, and the trees here, at the natural altitudinal limit, are generally small¹. Birch also grows on acid soils and can colonise heather moorland, as, for example, at Muir of Dinnet¹.

The cousin German *Paradiarsia sobrina* (Middle list) and Kentish Glory moths *Endromis versicolora* (Long list) are associated with birch woodland, the latter mainly in open woodland. As the most extensive type of deciduous woodland, the birch woodlands are important for many woodland birds, including song thrush (Short list).

Trends & Influential Factors

Forestry Commission survey data show an increase in the area of birch woodland from 4115 ha in 1979 to 11,235 ha in 1992³. This may partly reflect differences in survey criteria but could also be related to the Woodland Grant Schemes; over 97% of birchwoods are in private ownership. There is certainly extensive regeneration in some areas. However, other birch woodlands in the area are moribund and lacking regeneration due to high numbers of deer, for example at Loch Muick and Glen Ey². Heavily grazing by sheep can also prevent regeneration. Selective felling of trees can be damaging to the woodland habitat by destroying much of the understorey and ground flora e.g at Sluie birchwood⁶.

Information sources

1. Ratcliffe, 1981
2. Bayfield & Conroy, 1996
3. Forestry Commission National Inventory of Woodlands, Forestry Authority, 1994
4. Forster & Green, 1985
5. NHS 1983-85
6. Adam Watson, pers.comm.

2.3.10 Locally important habitat: **Riparian woodland**

Status, Distribution & Significance

Riparian woodland (broadleaved woodland composed predominantly of native species, lying along watercourses) is not considered as a separate category by the BSG. However, it is of particular importance for two reasons; firstly, in many areas, the only remaining woodland is along the banks of burns and rivers which are relatively inaccessible to browsing animals and unsuitable for agriculture. Secondly, riparian woodlands are very important to freshwater ecosystems, contributing substantially to their productivity through leaf litter and associated invertebrates. These woodlands may help ameliorate acid runoff by providing a zone with leaf litter of higher pH. Tree roots also stabilise banks, preventing erosion and siltation, and provide suitable areas for otter holts (Short list). Alder, willows and bird cherry are particularly associated with riparian woodlands, some of which may be classified as Wet woodlands (see 2.3.5).

The extent of riparian woodland has declined in many parts of Scotland, including the North-east. There are no figures on the extent of that which remains in the area, but it is scarce and often very sparse where it does occur. A study of the extent of this habitat type would be useful. Measures are available under agricultural schemes to promote regeneration along river banks by excluding livestock.

Information source

Scottish Native Woods, 1996

2.3.11 Locally important habitat: **Scrub**

Status, Distribution & Significance

North-east Scotland holds many areas of dense scrub, composed primarily of broom *Cytisus scoparius* but also gorse or whin *Ulex europaeus*. These range in size from thick hedge banks and small field corners (which would be included in the BSG Broad habitat Boundary features, see 2.3.36) to large expanses often dominating whole hillsides. The Grampian NHS (1983-85) recorded 7,282 ha of scrub dominated by >50% broom or gorse, representing 0.8% of the land area of NE Scotland. The former Gordon District holds a particularly high concentration. A very good example lies on the southeastern edge of Tap o' Noth near Huntly; another covers much of Brimmond Hill near Aberdeen, and there are many others. They are important for a range of declining bird species, including song thrush (Short list), linnet (Middle list), yellowhammer, dunnoek, whinchat, stonechat and whitethroat (Long list), though there have been few studies of this habitat. Larvae of the broom-tip moth *Chesias rufata* feed on broom. Juniper scrub *Juniperus communis* is also widespread in upland areas, but this is rather different ecologically (Charles Gimingham, pers. comm.). Juniper has recently been added to the Middle list and is considered further under Species, 3.6.2).

Expanses of dense broom and gorse scrub seem concentrated in NE Scotland compared with elsewhere, but information is very limited. A study of its extent, composition and importance for breeding birds would be very useful.

Trends & Influential Factors

There is little information available about overall trends in extent in this habitat. Certainly it is frequently cleared and burned on farms, as scrub banks harbour rabbits and may spread orf amongst sheep. However, scrub regenerates fairly quickly, and lack of grazing on moorland areas can allow colonisation.

Information sources

Grampian Natural Habitats Survey

2.3.12 Broad habitat: **Acid grassland**

Status, Distribution & Significance

Acid grassland occurs on acid rocks, such as sandstones and some igneous rocks, and deposits of sands and gravels. It is thought to be one of the most extensive semi-natural habitats in Britain. The total extent is not known but these grasslands are estimated to cover more than 1,200,000 ha in the uplands and around 30,000 ha in the lowlands¹. Acid grasslands include the key habitat Lowland dry acid grassland (2.3.13).

Upland acid grasslands have generally been created by poor management of more biologically rich habitats, particularly by heavy grazing of heather moorland^{1 2}. Although generally species-poor and of little interest for their flora, acid grasslands can be of value as a component part of moorland and for bird populations. Species, such as skylark (Short list) and lapwing (Long list), which have declined on intensively managed farmland, may be present in high densities².

None of the major land cover surveys considered acid grassland as such. The LCS category 'poor rough grassland', primarily *Nardus* and *Molinia*, is thought to be acid grassland. The LCS category 'good rough grassland' includes acid, calcareous and neutral grasslands³. It is not possible to break this down into the different components, but the majority is probably acid grassland as the extent of calcareous rocks and soils is small.

Dry ground is dominated by bent grasses *Agrostis* and fescues *Festuca*, and *Festuca ovina* - *Agrostis capillaris* - *Galium saxatile* grassland (U4) is widespread. Mat grass *Nardus stricta* is predominant on wetter ground and *Nardus stricta* - *Galium saxatile* (U5) is the other common and widespread grassland community of the uplands^{4 5}. Acid grasslands extend into the montane zone, often dominated by tufted hair grass *Deschampsia cespitosa*, but this is considered under the broad habitat Montane (2.3.24).

The LCS recorded a total of 4,438 ha of 'poor rough grass' (map 5a) mainly in the southwest of the area, mostly in mosaics with heather moorland³. 'Good rough grass' is more extensive (44,250 ha), found throughout the area except the highest ground (map 5b). Other surveys from the 1980s recorded 68,800 ha of 'unimproved grassland' (NCMS⁶), and 30,515 ha of 'rough grass' (Grampian NHS).

The LCS combined total of poor and good rough grasslands (48,688 ha) represents nearly 6% of the area of North-east Scotland and 5% of the Scottish total (920,900 ha) for these habitats. If the combined total was entirely acid grassland, this would represent about 4% of UK total, but as mentioned earlier this is probably a slight over-estimate as it includes other grassland types.

Trends & Influential Factors

Unimproved grasslands have increased in area from the 1940s to 1970s, mainly at the expense of heather moorland⁶. For example grasslands are becoming more widespread around Glen Shee and Strathdon².

Overgrazing is frequently a problem in the uplands, leading to further degradation of habitat and lower diversity¹. *Festuca-Agrostis* grasslands are important for grazing animals, but heavy grazing leads to spread of bents and then unpalatable *Nardus*⁸. Livestock moving between improved farmland and the hills may introduce grassland species from the improved grasslands, which replace the natural upland species². Some areas have been converted to semi-improved grassland by liming and re-seeding and other grasslands have been planted with conifers⁶.

Information sources

1. Biodiversity Steering Group, 1995b
2. Bayfield & Conroy, 1996
3. LCS88
4. Rodwell, 1992
5. Fraser Darling & Boyd, 1989
6. NCMS
7. NHS 1983-85
8. Pearsall, 1971

2.3.13 Key habitat: Lowland dry acid grassland**Current Status, Extent & Distribution**

The national action plan for this habitat is not yet available and the BSG does not give a definition. Acid grassland is found in lowland areas of NE Scotland, but as this has generally resulted from heavy grazing of heathland, it is perhaps better categorised with upland acid grasslands and it is possibly not appropriate to consider it as a key habitat.

There is little information available on extent and distribution of lowland acid grassland in the area, although it commonly occurs along the lower edges of heather moorland, where grazing is heavy. The drier acid grasslands are generally dominated by *Deschampsia flexuosa* or *Agrostis* spp¹. Without grazing, acid grassland may revert to heath, scrub or woodland². Patches of this type of grassland can be seen in Donside along the lower fringes of heather moorland, for example on Gallows Hill, near Towie.

Scottish / UK Significance

It seems likely that the BSG key habitat refers to grasslands such as U1 (*Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella*), characteristic of the warm and dry lowlands of southern Britain and not found in Scotland³. Lowland acid grasslands in NE Scotland are not likely to be of any national significance.

Associated Species & Example Key Sites

In NE Scotland, this is not a particularly species-rich habitat, or notable for rare species. However, the pearl-bordered fritillary (Short list) may occur on some sites classified as acid grassland, especially where there is a degree of bracken invasion⁴.

Area / Quality Trends

Drumblair Wood (NJ 640430) was probably woodland originally, more recently heather moorland and has now been converted to acid grassland through heavy grazing by cattle (see picture facing page 18 in Welch, 1993). Conversely an area of acid grassland on Newton Hill, about 5 miles north of Stonehaven, which once held orchids, has now been invaded by gorse. Overall trends are not known

Factors Influencing Trend

In NE Scotland these grasslands have generally been created from areas of lowland heathland which have been overgrazed by sheep or cattle. Elsewhere in Britain, lowland acid grasslands are often lost due to lack of grazing, leading to invasion by scrub.

Information sources

1. Charles Gimingham, pers. comm.
2. David Welch, pers.comm.
3. Rodwell, 1992
4. Paul Kirkland, pers. comm.

2.3.14 Broad habitat: Unimproved neutral grassland**Status, Distribution & Significance**

Species-rich neutral grasslands, unaffected by agricultural improvements, such as fertilisers and re-seeding, are now rare. This habitat (which can also be described as mesotrophic grasslands) is found mainly in England¹ ², which has less than 10,000 ha, and the UK total is estimated to be less than

15,000 ha¹. This type of grassland is probably covered by the LCS category 'good rough grassland' (map 5b)³, but only constitutes a very small proportion of this, so the LCS data cannot be used to estimate extent or distribution of unimproved grasslands. Various surveys have identified a few small sites of species-rich grassland (not necessarily all neutral) in the area. There may be others, but the total area is likely to be small.

The Grampian Natural Habitat Survey recorded 154.5 ha of herb-rich grassland in 1983-85⁴. This was all concentrated in just three sites and the largest, behind the sand dunes of St Cyrus NNR, is calcareous (see 2.3.16). The other two sites were in Moray, including one alongside the River Avon. A number of small sites have been located by other surveys, for example along the River Dee⁵.

Unimproved neutral grasslands are mostly managed as traditional hay meadows or pastures and include the key habitats: Lowland hay meadows and Upland hay meadows (see 2.3.15).

Trends & Influential Factors

With the intensification of agriculture, many grasslands have now been 'improved' e.g. by use of fertiliser, and are no longer floristically diverse. The change from hay to silage is also detrimental as it involves more frequent cutting, reducing seeding opportunities for plants and breeding success of ground nesting birds.

Of the grassland sites surveyed on Deeside, the main threats were found to be scrub encroachment (often due to lack of cutting), riverbank management and agricultural improvement. Many of the sites remain only because they are either inaccessible, of no use for agriculture in their present condition or are regularly but infrequently cut for access to fishermen.

Information sources

1. Biodiversity Steering Group, 1995b
2. Rodwell, 1992
3. LCS 88
4. NHS, 1983-85
5. Court, 1986

2.3.15 Key habitats: Lowland and upland hay meadows

These 2 habitats are considered together as precise definitions are not available.

Current Status, Extent & Distribution

There are probably very few traditionally managed hay meadows in NE Scotland. There are a few species-rich hay meadows in the Glenlivet area¹ and *Cynosurus cristatus* - *Centaurea nigra* grassland (MG5) has been recorded in Strath Avon (NJ11)².

The largest areas of 'hay meadow' type habitat are probably where riverbanks are mowed regularly for the benefit of fishermen. A 1979 survey of the Dee valley identified 14.6 ha of tall-herb meadow grassland on drier sites along the riverbanks below 250m. These sites were mowed regularly, but rarely grazed, and had communities similar to the hay meadows of northern England and southern Scotland. The best sites were upstream from the bridge at Banchory, at Potarch, and near Abergeldie Castle³.

Another survey of grasslands along the River Dee, from Linn o' Dee to Aberdeen, found 16 sites which contained NVC communities included in the unimproved neutral grassland class by the BSG⁴. All of these sites were small, averaging only 2.8 ha with a maximum of 12.6 ha and mainly found along the riverbank. Only two of these sites were regularly cut for fishermen's access. A site at Ballater held the greatest diversity of plant species (117 spp.).

Riverbank maintenance is most extensive along the River Dee, but also carried out on other rivers, such as the Deveron and Spey. Among the stretches of bank regularly cut, only a proportion are classed as species-rich. A small area (5ha) of herb-rich grassland was recorded by the River Avon by the Natural Habitat Survey of Grampian⁵.

Scottish / UK Significance

The area of hay meadows is unlikely to be of significance in a national context, although the few remaining sites are of local importance.

Associated Species & Example Key Sites

Hay meadows hold a high diversity of vascular plants.

Area / Quality Trends

This habitat is now very rare in the area but no information was available on how extensive hay meadows were in the past. There is thought to have been less cutting of riverbanks in extent in recent years⁶.

Factors Influencing Trend

The factors affecting hay meadows are listed under the Broad habitat above.

Information sources

1. Nicky Penford (FWAG), pers. comm.
2. Rodwell, 1992
3. Forster & Green, 1985
4. Court, 1986
5. NHS Grampian, 1983-85
6. David Welch, pers.comm.

2.3.16 Broad habitat: Calcareous grassland

Status, Distribution & Significance

Calcareous grasslands are found on shallow lime-rich soils, most frequently derived from chalk and limestone rocks. There is an estimated 40,000 - 50,000 ha of calcareous grassland in the UK, widely but unevenly distributed¹. Most of the chalk grasslands are found in southern England while northern England (North Yorkshire and Cumbria) holds the majority of limestone grasslands. Some igneous and metamorphic rocks are basic, and calcareous grasslands also occur over the basic lavas of eastern Scotland and Dalradian schists of the southern highlands². Chalk is not present in Scotland, but there are small areas of limestone in Deeside, Strath Avon and Speyside. There are also other basic rocks, such as epidiorite and mica-schist, the latter extensive in the east of the area³.

The BSG defines calcareous grasslands as NVC communities CG1-11, of which only *Festuca ovina* - *Agrostis capillaris* - *Thymus praecox* grassland (CG10) and *Festuca ovina* - *Agrostis capillaris* - *Alchemilla alpina* grass-heath (CG11) have been recorded in Scotland⁴. Both occur in NE Scotland.

Calcareous grasslands are included in the LCS category 'good rough grassland' (map 5b), but certainly represent only a small proportion of this category, so the LCS data cannot be used to assess distribution or area of this habitat. The NHS used a narrower category of herb-rich grassland, but even this includes grasslands on both base-rich, neutral and acid soils.

Calcareous grassland holds a large number of species of conservation concern and comprises the Key habitats Upland calcareous grassland and Lowland calcareous grassland, considered in more detail below (2.3.17).

Information sources

1. Biodiversity Steering Group, 1995b
2. Keymer & Leach, 1990
3. British Geological Survey maps
4. Rodwell, 1992

2.3.17 Key habitats: **Lowland and upland calcareous grassland**

Current Status, Extent & Distribution

The relative extents of lowland and upland types of calcareous grassland are not known, but there are certainly examples of both types in NE Scotland. The total area is also unknown. Only a small proportion of the region overlies calcareous rock (see above) and in many such areas high rainfall leaches the soil, maintaining soil pH too low for calcicolous plants¹.

Inchrory SSSI (1,093 ha) in Glen Avon has a large extent of base-rich rocks and base-rich grasslands with a rich submontane flora². Some grassy riverbanks along the Dee are calcareous³ and lowland calcareous grassland is found at St Cyrus NNR.

Scottish / UK Significance

Not known, but probably low.

Associated Species & Example Key Sites

As well as an unusual and rich lime-loving plant community⁴, Inchrory SSSI is important for invertebrates such as the northern brown argus butterfly *Aricia artaxerxes* (Middle list) and the rare snail *Vertigo alpestris* (suggested as locally important species). The small blue butterfly occurs on calcareous coastal grassland, and was formerly found at St Cyrus.

Area / Quality Trends

No information.

Factors Influencing Trend

The extent of calcareous grasslands depends largely on the distribution of basic rocks, but the condition of the habitat can be affected by factors such as grazing. In the uplands, overgrazing is probably the main threat, reducing species diversity, especially of tall herbs and shrubs, also of invertebrates.

Conversely, in the lowlands of Britain, lack of grazing is more frequently a problem, allowing succession to rank grassland, scrub and woodland⁵. In the lowlands, and on the lower slopes of the uplands, grasslands may be degraded by agricultural improvement with fertilisers, herbicides, ploughing and re-seeding.

Information sources

1. David Welch, pers.comm.
2. Bayfield & Conroy, 1996
3. Court, 1986
4. SNH SSSI files
5. Biodiversity Steering Group, 1995b

2.3.18 Broad habitat: **Improved grassland**

Status, Distribution & Significance

Improved grasslands are those which have been established by re-seeding or by modification of unimproved grassland through use of fertilisers, lime and selective herbicides¹. Such grasslands are usually grass-dominated swards, with low species diversity and characterised by an abundance of rye grass *Lolium* spp. and clover *Trifolium repens* (NVC communities MG6, MG7). For this habitat, the LCS category 'improved grasslands' corresponds with the BSG definition.

The total extent of improved grassland is not known, but it accounts for the great majority of grasslands in the UK¹. These grasslands are mainly agricultural, used for pasture or mown for silage /

hay. Recreational and amenity grasslands are also mown regularly. Some are temporary grasslands in rotation with arable crops.

Improved grasslands are widespread in the lowlands of NE Scotland (Map 6), and the second most extensive habitat after arable. There was 192,197 ha of improved grassland in June 1995², accounting for 13% of the land area. The LCS recorded a rather lower figure of 112,676 ha in 1988 representing about 10% of the total in Scotland (11,024km²)³.

Although generally low in diversity, improved grasslands can be of value for ground-nesting birds, such as skylark and waders, provided stocking densities are low, and machines are not used too frequently. These grasslands can also be as important as grazing for wintering wildfowl, such as geese and wigeon

Trends & Influential Factors

The area of improved grasslands in Britain has increased by 90% over the past 50 years, mainly through conversion of other habitats of greater wildlife value, such as unimproved grassland and moorland¹. In NE Scotland however the trend has been the opposite, with improved grasslands decreasing, primarily through conversion to arable land, from 246,800 ha in the 1940's to 230,800 ha in the 1970s and 196,200 ha in the 1980s (includes improved and semi-improved classes)⁴. Other causal factors have been conversion to unimproved grassland and building development.

In Britain there has been a trend from hay to silage making over the past twenty years, and the associated increase in use of chemicals has further reduced the biodiversity of improved grasslands¹.

Information sources

1. Biodiversity Steering Group, 1995b 2. SOAFD data 3. LCS88 4. NCMS

2.3.19 Broad and Key habitat: Coastal and floodplain grazing marsh

Current Status, Extent & Distribution

The BSG defines grazing marsh as periodically inundated pasture or meadow water levels maintained by ditches containing standing brackish or fresh water¹. This habitat is usually grazed and occasionally cut for hay or silage. Sites with extensive areas of tall fen vegetation are not considered included in this habitat type, although grazing marsh often abuts areas of fen and reed swamp. The NVC communities listed for this habitat by the BSG (MG8-13) are mainly found in England².

There is only one coastal grazing marsh in the area at Loch of Strathbeg (NK070602). Much of this has now been converted to improved pasture³.

There are also areas of grazing land alongside watercourses which are periodically flooded. Sites which may be regarded as examples of this habitat type include Auchlossan near Aboyne, alongside the Spynie canal at Elgin and alongside the Ugie near Mintlaw⁴. Flooding in some years leaves alluvial deposits which are suitable for mud-dwelling plant species such as water pepper *Polygonum hydropiper*. On Deeside, *Festuca rubra* - *Agrostis stolonifera* - *Potentilla anserina* grassland (MG11) has been recorded near Ballater (NO39)².

Scottish / UK Significance

There is an estimated 200,000 ha of grazing marsh in England and possibly a total of around 300,000 ha in the UK¹. Species-rich semi-natural grassland comprises only a small proportion of this area, with a total of about 10,000 ha, of which half is in England. Although the total extent of this habitat in NE Scotland is not known, it is certainly only a very small proportion of the UK total.

There has been no national survey of coastal grazing marsh or lowland wet grassland. Grazing marsh is considered a rare habitat in Scotland but there are many more sites around the inner firths of the Moray Firth³.

Associated Species & Example Key Sites

These wet grassland habitats may be locally important sites for breeding wading birds such as lapwing and redshank (Long list). The coastal grassland at Loch of Strathbeg is important for wintering pink-footed geese *A. brachyrhynchus* (Long list)³.

Area / Quality Trends

No information

Factors Influencing Trend

Threats to grazing marshes include flood defence works, agricultural intensification and decline in traditional management, and eutrophication of the catchment waters¹. Other water pollution could also affect this habitat. Much of the grazing marsh at Loch of Strathbeg has been converted to improved pasture.

Information sources

1. BSG, 1995b 2. Rodwell, 1992 3. Barne *et al.*, 1996 4. David Welch, pers. comm.

2.3.20 Broad and key habitat: Upland heathland

Current Status, Extent & Distribution

Upland heathland includes dry and wet heather moorlands and other dwarf shrub heathland. This habitat is generally found between the upper edge of enclosed agricultural land (300 - 400m) and the montane zone above the potential tree line at around 600 - 750m¹. Dwarf shrub heaths also occur in the montane zone (see 2.3.24) and the LCS88 figures below include considerable areas above 600m and even small areas above 850m². The LCS88 category 'heather moorland' otherwise corresponds well to the BSG definition.

Upland heathland is one of the most extensive habitat types in NE Scotland, covering 16% of the area (139,460 ha). It is found mainly in the west and south of the area (Map 7), namely the upper parts of Deeside, Donside, Strathbogie and lower Speyside. Heather moorland extends northward and eastward from the main hill areas between the Deveron and Spey rivers and over Bennachie, the Hill of Fare and beyond the Cairn o' Mount towards Stonehaven. It frequently occurs in mosaics with peatland and grasslands². There is a small area (134 ha) of heathland in Aberdeen City. These figures includes areas of lowland heathland which have not been surveyed separately (see 2.3.21).

Heathland is generally found on nutrient-poor acid soils with annual precipitation of more than 100cm¹, and is derived from former woodlands or scrub. Dry heather moorland is now the most widespread community on the deforested lower slopes of the Cairngorms³. Heather *Calluna vulgaris* is usually dominant and NVC community *Calluna vulgaris* - *Vaccinium myrtillus* (H12) is widespread throughout the area. Other dwarf shrubs such as blaeberry (or bilberry) *Vaccinium myrtillus*, crowberry *Empetrum nigrum* and bell heather *Erica cinerea* can be abundant. *Vaccinium myrtillus* - *Deschampsia flexuosa* (H18) heath is found mainly in the southwest of the area. On wetter ground, cross-leaved heath *Erica tetralix* may predominate (M15, M16)⁴.

Heathland where bearberry is abundant (H16 *Calluna vulgaris* - *Arctostaphylos uva-ursi*) is a relatively rare habitat, found only in the Central and Eastern Highlands, including Speyside and Deeside where there are good areas of *Arctostaphylos* heath between Crathie and Dinnet³. This

community occurs on acid to neutral soils with the species-rich *Pyrola - Lathyrus* sub-community on the more neutral soils³. There are a few examples of this sub-community in the area e.g. near Strathdon⁴.

Scottish / UK Significance

The LCS88 recorded a total of 1395 km², representing 8% of the Scottish total (16,922 km²) of heather moorland². The estimated UK total of 37,110km² of upland heathland, includes 25,140km² in Scotland¹, about 1.5 x the LCS estimate. This habitat is of international conservation significance, being largely confined to the UK and the western seaboard of Europe¹.

The LCS total includes a small proportion at lower elevations which may be classed as lowland heathland.

Associated Species & Example Key Sites

Birds of heather moorland include twite *Carduelis flavirostris*, golden plover *Pluvialis apricaria*, golden eagle *Aquila chrysaetos*, hen harrier *Circus cyaneus* and merlin *Falco columbarius* (Long list), and red grouse *Lagopus lagopus* (not listed), which is of economic importance in the area. The mountain hare *Lepus timidus* (Long list) is most abundant on heather moorland and red deer are also numerous (Long list).

A number of rare or threatened insects are associated with heathland. The Scottish burnet moth *Zygaena exulans* is an upland heath species and the butterflies *Boloria selene* and *Coenonympha tullia* (Long list) are found on damp moorland. *Arctostaphylos* heath is also important for Lepidoptera, such as *Semiothisa carbonaria* (Middle list), *Anarta melanopa* and *A. cordigera* (Long list).

Many examples of this type of heathland are to be found in the North-east, including The Cabrach, Correen Hills, Ladder Hills, Bennachie, Lochnagar, Morven, the upper parts of Glen Tanar and the Forest of Birse and the slopes of the Cairn o' Mount. An excellent example of species-rich heath occurs at Muir of Dinnet NNR. This community is rich in lichen species and includes the rare moss *Dicranum spurium* (suggested as locally important species).

Area / Quality Trends

Heather moorland cover in the North-east (including both lowland and upland heathland) in the mid 1980s was estimated to be less than 64% of that in the 1940s⁵.

Factors Influencing Trend

The vegetation is strongly influenced by grazing pressure. Heavy grazing can damage heather and lead to a gradual conversion to grassland¹, while in the absence of any grazing, natural succession to scrub and woodland would occur in many areas. A high proportion of heather moorland in area is managed for grouse with regular rotational burning². Burning generally favours the maintenance of heather moor and prevents woodland regeneration. Badly managed muirburn, however, causes degradation of the heathland habitat¹. For example, burning on steep, rocky ground can lead to erosion of thin soils³.

The main losses of heathland area from the 1940s to 1980s were to coniferous plantations and unimproved grassland⁵.

Information sources

1. Biodiversity Steering Group 1995b 2. LCS88 3. Ratcliffe, 1981 4. Rodwell, 1991b 5. NCMS

2.3.21 Broad and Key habitat: **Lowland heathland**

Current Status, Extent & Distribution

Lowland heathland is characterised by its low altitude (below 300m)¹ and the presence of plants such as heather *Calluna vulgaris*, gorse *Ulex* spp., bell heather *Erica cinerea* and wavy hair-grass *Deschampsia flexuosa*. With increasing wetness and peat depth, the community grades into wet heath with cross-leaved heath *Erica tetralix* and peat bog.

The extent of this habitat in NE Scotland is difficult to assess at the present time because it is not treated as a distinct class in the habitat surveys which have been carried out in this area (LCS88, NCMS, NHS). The distinction between upland and lowland heathland is also by no means clear cut.

Lowland heathland in Scotland differs from that in the south of England in both species composition and richness^{2 3}. None of the most of the plant communities listed exclusively in this class by the BSG (H1-6) are present in Scotland, although several communities found on both lowland and upland heaths do occur in the North-east (M15, M16, H10, H12, H16)⁴. One of these is found only in Scotland (H16 *Calluna vulgaris* - *Arctostaphylos uva-ursi*), generally at altitudes of 250 - 600m.

There is also less floristic difference between lowland and upland heath in Scotland, with species typical of upland communities appearing in heather vegetation almost down to sea level in some places. Heaths at the lower altitudes are generally lacking in or have reduced representation of plants such as blaeberry, crowberry and cowberry *Vaccinium vitis-idaea* which are more characteristic of upland heaths. Conversely, some species which are more abundant in the lowland heaths, such as tormentil *Potentilla erecta* and thyme-leaved milkwort *Polygala serpyllifolia*, also occur in upland heaths.

It has not been found possible to estimate the extent of 'lowland heathland' habitat in NE Scotland. Possibly it is not appropriate to separate upland and lowland heathland in the area, as the BSG definition of upland heathland can include areas down to near sea-level in northern Scotland. However, one distinctive type of lowland heath - coastal heath - is considered separately as a locally important habitat (see 2.3.22 below).

Distribution

Lowland heathland has a very restricted distribution in NE Scotland because of the relatively small proportion of land at this elevation which does not have a history of agricultural use. There are scattered examples in the coastal lowlands of Aberdeenshire and Moray, but there is no information on the extent or records of the number of sites.

Lowland heathland is included with the upland heathland class in Map 7, derived from LCS88 data for 'heather moorland'. Those parts of the distribution which are lowland heathland lie mainly in the scattered patches closer to the coast and away from the more expansive upland heathland areas.

Scottish / UK Significance

Lowland heathland is a rare and threatened habitat, with only around 58,000 ha remaining, 55% of this in England, mainly in the southern counties. The British total represents about 20% of the international total¹. The small areas in NE Scotland are unlikely to be important nationally.

Associated Species & Example Key Sites

Examples of lowland heath may be found close to the B979 road near Netherley, at Garlogie, Maryculter (now mostly lost), inland from Portlethen and at Rosehearty. Patches of lowland heath on dried-out peat bogs can be seen at Red Moss of Netherley, New Pitsligo, Rora Moss, St Fergus Moss and Cruden Moss, though these may be more correctly classed as degraded raised bog (see 2.3.26).

Area / Quality Trends

Trends for the North-east cannot be quantified, but are likely to be downward, since heathland generally has declined in extent in past decades and dry lowland heaths provide relatively good land for other uses. The habitat in the UK has now been reduced to around one sixth of its extent in 1800¹.

Factors Influencing Trend

Present day factors which influence lowland heathlands include tree and scrub encroachment due to lack of grazing, burning and cutting, nutrient enrichment from agriculture and atmospheric sources, and conversion of land for other uses such as grazing and tree plantations.

Information sources

1. BSG, 1995b, 2. David Welch, pers.comm 3. Charles Gimingham, pers.comm. 4. Rodwell, 1991b NCS, LCS88, Grampian NHS 1983-85.

2.3.22 Locally important habitat: Coastal heath**Status, Distribution & Significance**

Maritime heath is a distinctive type of heathland community occurring near the coast (e.g. on cliff tops), where salty winds influence the species composition, which may include plants like sea plantain *Plantago maritima*¹. Another variant - dune heath - occurs behind sand dunes, either on silica sand or on older dunes from which the lime has been leached out², and may include marram grass *Ammophila arenaria* and sand sedge *Carex arenaria* along with heaths and crowberry³. These types of heath community are included by the BSG under Maritime cliff & slope (2.4.11) and Sand dunes (2.4.8)⁴.

The only estimate of the extent of coastal heathland in the North-east (including cliff-top and sand dune types) is a total area of about 355 ha, found by the NHS in 1983-85 (331.5 ha in Aberdeenshire and 24 ha in Moray)². Maritime heath (H7 *Calluna vulgaris* - *Scilla verna* heath)⁵ is quite well represented on the cliffs of Moray and the former Gordon district of Aberdeenshire, for example at Longhaven, near Peterhead. Dune heaths (H11 *Calluna vulgaris* - *Carex arenaria* heath)⁵ have a scattered distribution on sand dunes from Aberdeen round to the Moray Firth, e.g. at the Sands of Forvie.

Trends & Influential Factors

In some parts of the North-east maritime heath is being invaded by scrub; some has been overgrazed and other areas have been improved. However, little is known specifically about trends in extent. Lowland heathland in general has been much reduced in the UK during this century

Information sources

1. David Welch pers.comm 2. NHS 1983-85 3. Charles Gimingham, pers.comm. 4. BSG 1995b 5. Rodwell, 1991b

2.3.23 Locally important habitat: Serpentine grassland and heath**Status, Distribution & Significance**

Several sites in NE Scotland hold extensive areas of serpentine rich grassland and heath. Such areas have thin soils derived from the underlying rock rich in the mineral serpentine. Such rock outcrops are rare in Britain. The rock breaks down into unstable debris, rich in calcium, iron and magnesium, and the substrate is toxic to many plants. This leads to a distinctive plant community composed of those species which can tolerate high levels of these metals, including spring sandwort *Minuartia verna*,

mossy saxifrage *Saxifraga hypnoides*, thrift *Armeria maritima* and several rare bryophytes. Key sites in the area are the Green Hill of Strathdon, the Hill of Towanreef and the Coyles of Muick, all of which are protected as SSSIs.

Trends & Influential Factors

No information.

Information sources

SNH SSSI citations

2.3.24 Broad habitat: Montane (alpine and subalpine types)

Current Status, Extent & Distribution

Definitions of the montane zone vary. The BSG defines this broad habitat as areas above the potential tree-line, this being above 611m (2000') throughout much of the uplands, but lower, even down to sea-level, in exposed parts of the north and west¹. The LCS, on the other hand, used a vegetational classification². 'Montane' habitat was characterised by a range of (unspecified) montane plant communities. Much of the land area above 600m was classified as other habitats, mainly heather moorland (see 2.3.20 Upland heathland) and peatland (see 2.3.25 Blanket bog), also some poor rough grass (see 2.3.12 Acid grassland)³.

Thus the LCS area of 21,520 ha of montane habitat (map 8) is probably rather less than would be included in the BSG definition. The area of land above 611m has not been calculated. The NHS 1983-85 reported a smaller area (15,279 ha), but this excludes a zone of heather above the tree line.

Four of the five highest mountains in the UK are found in the Cairngorms, and the area holds many 'Munros' over 914m (3000'). The main Cairngorms massif lies across the border of NE Scotland, with the summits of Cairn Gorm, Braeriach and Cairn Toul on the boundary. Thus for montane habitats and species the NE Scotland border is rather artificial and there is clearly a need to consider the mountain area as a whole, but this should be addressed by the Cairngorms Partnership LBAP. As well as the main Cairngorms range, there are large tracts of high ground around Lochnagar and the Mounth on the southern border and the Ladder Hills to the northeast of the Cairngorms.

The montane zone consists mainly of high plateaux, with steep-sided corries, rocky cliffs and crags, boulder fields and scree slopes^{3 4}. The vegetation is influenced by factors such as exposure, snow cover and soil type. This broad habitat comprises a variety of habitats, including moss-heaths, grasslands, dwarf-shrub heaths, late snow patches, rock ledges and montane willow scrub.

Moss-heath

Woolly fringe moss (*Rhacomitrium lanuginosum*) is one of the first colonisers of mountain-top debris and moss-heath (U10 *Carex bigelowii* - *Rhacomitrium lanuginosum*) is one of the most extensive types of montane vegetation in Britain⁵. It is characteristic of areas that are still unstable and found mainly on level or gently sloping ground^{4 5}. Moss-heath is widespread in the Cairngorms and Lochnagar⁶.

Grassland

Montane grasslands (including those dominated by sedges and rushes, as well as grass-heaths) are also widespread. Three-pointed rush *Juncus trifidus* is the most characteristic mountain-top vegetation of the Cairngorms, sometimes with *Rhacomitrium*⁴, (U9 *Juncus* - *Rhacomitrium* rush-heath)⁶. Grass-heath (U7 *Nardus stricta* - *Carex bigelowii*) and sedge-heath (U8 *Carex bigelowii* - *Polytrichum alpinum*) are associated with areas of late snow lie^{4 6}. Apart from the mat-grass *Nardus* communities, grass-dominated communities are relatively scarce in the Cairngorms, although tufted hair-grass

Deschampsia cespitosa grows in many of the high corries⁴. *Deschampsia cespitosa* - *Galium saxatile* grassland (U13) is concentrated in the more oceanic western highlands, but is also found in the south of the area⁶. The richest grasslands are found where the water drains from more calcareous rocks, such as schists and limestone, for example on the upper slopes of Creag an Dail Bheag, near Invercauld⁴.

Dwarf-shrub heaths

Natural dwarf-shrub heaths, as opposed to man-made heather moor, are found at altitudes from around 700 to 1100m in the Cairngorms. Heather usually dominates in the low-alpine zone and blaeberry at higher altitudes. Other dwarf shrubs are generally present, including cowberry *Vaccinium vitis-idaea*, which is sometimes frequent, and crowberry *Empetrum nigrum*. Lichens or mosses make a major contribution to some communities e.g. *Vaccinium myrtillus* - *Cladonia arbuscula* heath (H19), and can be dominant⁶.

Snow-beds

The vegetation is strongly influenced by the length of snow lie. As snow cover increases, blaeberry heaths are replaced by mat-grass communities and the longest lying snowbeds are characterised by mosses and liverworts. The north and east facing corries of Braeriach, Ben Macdui and Cairn Gorm have semi-permanent snow beds which rarely melt⁴.

Rock ledges

Rock ledges often have a flushed soil and have a very varied vegetation⁵, including tall herb communities. Several rare alpine plants e.g. *Cicerbita alpina* (Long list) are restricted to crags and ledges which are inaccessible to grazing animals. The richest flora is again found on the calcareous limestones and schists (ledge community CG14). A rich flora is found on the cliffs of Coire Kander in Glen Callater as well as in the Angus glens just to the south of the area^{4 6}.

Serpentine grassland & heath

Granite is the main rock of the Cairngorms and calcareous rocks are of limited extent in the area. The area of serpentine outcrops is also very small, but of interest as this rock is rare in Britain. Serpentine debris is rich in magnesium and toxic to many plants, resulting in a distinctive flora. There is a serpentine outcrop at the Coyles of Muick (NO28) but the other examples in the area are below the montane zone, so this habitat is considered further in section 2.2.23.

Montane scrub

At one time, scrub woodland of willows and dwarf birch *Betula nana* may have been extensive in the lower part of the montane zone above the natural forest zone⁴. Sub-alpine willow scrub (W20) is now rare, confined to ungrazed ledges. Downy willow *Salix lapponum* is generally dominant, often accompanied by woolly willow *S. lanata* (Middle list) or whortle willow *S. myrsinites*⁶. In Glen Muick, there is possibly one of the largest areas of dwarf birch in Scotland⁹.

Scottish / UK Significance

The differences in defining the montane habitat make it difficult to calculate the proportion in NE Scotland. However, the area contains 9% of the Scottish total, as defined by the LCS. The BSG estimates there to be around 600,000 ha of montane habitat in Britain, 90% of this in Scotland¹. The montane habitat in NE Scotland, although not particularly extensive, is important as a part of the highest and largest area of montane habitat in Britain. Although the BSG regarded montane as a broad habitat (with no sub-divisions), it should, perhaps, be regarded as a key habitat in the Cairngorms for the number of rare species which are found here. The EC Habitats Directive includes alpine and sub-alpine heaths, sub-arctic willow scrub and eutrophic tall herb communities as Annex 1 types⁸. The Cairngorms NNR has been recognised as the most natural area in the country³.

Associated Species

Dotterel *Charadrius morinellus*, snow bunting *Plectrophenax nivalis*, purple sandpiper *Calidris maritima* (Long list) and ptarmigan *Lagopus mutus* (not listed) are confined to the montane zone for nesting. Other birds, such as golden eagle *Aquila chrysaetos* (Long list), and mammals, such as mountain hare (Long list), frequent the montane zone, but are also found at lower altitudes. Invertebrates include northern dart moth *Xestia alpicola* (Middle list), Scotch burnet moth *Zygaena exulans* and mountain ringlet butterfly *Erebia epiphron* (Long list).

Many rare alpine plants are found in the area, including (besides those already mentioned) mountain scurvy grass *Cochlearia micacea*, Newman's lady fern *Athyrium flexile* (Short list), Alpine fleabane *Erigeron borealis*, Alpine pearlwort *Sagina saginoides*, and tufted saxifrage *Saxifraga cespitosa* (Long list).

Nearly one third of the Red list lichens are montane species, and several of these are present, including *Alectoria ochroleuca*, *Bellemeria alpina*, *Hypogymnia intestiniformis* (Middle list). Bryophytes are also well represented, for example the liverwort *Marsupella stableri* (Middle list) and moss *Andreaea frigida* (Middle list).

Trends & Influential Factors

Of all British habitats, the montane zone is probably the least modified by man and large areas remain in a near-natural condition³.

Overgrazing by red deer and sheep can change the composition of vegetation and threaten rare species. Poorly controlled muirburn spreading from the sub-montane zone, can also damage montane vegetation and soils^{1 3}. Hill-walkers can cause erosion of fragile soils, trampling of rare plants and disturbance to wildlife¹. Numbers of people are increasing but the effects are localised; the Cairn Gorm - Ben Macdui area is thought to be the most affected by hill-walking, ski-ing and other human activities³. Air pollution leading to acidification, and global warming are potential long term threats^{1 3}.

Information sources

1. Biodiversity Steering Group, 1995b
2. LCS88
3. Bayfield & Conroy, 1996
4. Ratcliffe, 1981
5. Pearsall, 1971
6. Rodwell, 1992
7. Fraser-Darling Boyd, 1989
8. Biodiversity Steering Group, 1995a
9. Richard Marriott, pers. comm.

2.3.25 Broad and Key habitat: **Blanket bog**

Current Status, Extent & Distribution

Blanket bog is by far the most extensive type of peatland in Britain. It is a type of ombrotrophic mire i.e. a wetland which is fed exclusively by precipitation¹. Unlike raised bog (see 2.3.26), the other type of ombrotrophic mire, development of blanket bogs is not confined to flat ground and basins, but can occur on slopes of up to about 30°.

In NE Scotland, blanket bog is found mainly in the uplands in the south and west of the area. Estimates of the total area of blanket bog vary from a minimum estimate of 208 km² (NHS, 1983-85)² to 568 km² (LCS88)³. The discrepancy is probably mainly due to slightly different classification of habitats; blanket bog grades into wet heathland and if these two habitat categories are combined, the estimates from the two surveys are similar (529, 599km², respectively). Map 9 shows the general distribution of peatlands in NE Scotland, most of which is blanket bog.

Scottish / UK Significance

The LCS estimate of 568 km² represents 6.5% of the land area of NE Scotland and 4.3% of the total area (13,300 km²) of blanket bog in Scotland. Blanket bogs are rather more extensive in some areas of west and north Scotland and also found in the southern uplands. Small areas are present in northern England, Wales and Northern Ireland but more than 95% of UK peatland soils derived from blanket bog are found in Scotland⁴.

Associated Species & Example Key Sites

The rare Baltic bog moss *Sphagnum balticum* (Middle list) is usually found on raised bogs, but in NE Scotland occurs on a blanket bog above Loch Muick. Breeding birds of the bogs include golden plover *Pluvialis apricaria*, dunlin *Calidris alpina* and snipe *Gallinago gallinago* (Long list). The large heath butterfly *Coenonympha tullia* is found on blanket bog as well as wet heathland.

Area / Quality Trend

The NCMS⁵ recorded 406 km² of blanket bog in the 1940s and 355 km² in the 1980s, a decrease of 51 km² or 13%, most of which occurred from the 1970s. Almost all of this was due to change to heather moorland, presumably through drainage or drying out of the bog habitat - if the change was genuine and not due to errors of classification.

It has been estimated that, of the total area of peatland soils derived from blanket bog in Britain, no more than 10% survives as primary blanket bog¹.

Factors Influencing Trend

In Scotland as a whole, large areas of blanket bog have been lost to commercial forestry. Overgrazing, burning and moorland drainage are also significant causes of degradation. In NE Scotland, 42% of the area of blanket bog showed signs of erosion and peat working took place in 4% of the area³.

Information sources

1. Lindsay, 1995
2. NHS 1983-85
3. LCS88 (NB LCS estimates for peatlands include raised bog but area of raised bog negligible)
4. Lindsay & Immirzi, 1996
5. National Countryside Monitoring Scheme.

2.3.26 Broad and Key habitat: Raised bog**Current Status & Extent**

Raised bog is a type of ombrotrophic mire, i.e. a peatland which is fed exclusively by precipitation, generally found in lowland areas, such as valleys or floodplains¹. In its pristine state, a raised bog consists of a dome of peat, which is produced entirely by peat growth. This type of bog is known locally as a 'moss', although the term is also applied to some blanket bogs and fens.

Primary bogs are those where the peat dome is intact and uncut, while secondary bogs have been damaged by peat extraction or other activity, but the water table has stabilised. Secondary re-vegetated bog is considered to be of conservation importance as well as primary bog. The majority of raised bogs in Aberdeenshire (excluding those completely afforested or archaic) were surveyed in 1995 / 96 by SWT². An area of 2125 ha was found to be primary bog or secondary re-vegetated bog, and thus considered of conservation interest (see table). There is a further 1004 ha of secondary bog, 827 ha being covered in woodland or scrub and 177 ha bare peat.

Raised Bogs in Aberdeenshire²

Condition	Area (ha)	
Primary (uncut)	- open	591
	- woodland	189
	- scrub	45
Secondary (cut-over)	re-vegetated	1300
Total of conservation interest		2125
Total area		4425

There has been no recent survey in Moray, although the area of raised bog was never large. Apart from the Moss of Crombie, which lies about half in Moray and half in Aberdeenshire (see table), there are two active bogs recorded in the National Peatlands Resource Inventory (NPRI)³: 7 ha of primary bog at Moss of Rothiemay (NJ553511) and 36 ha of mainly secondary re-vegetated bog at Foggy Moss (NJ466540). Within the Aberdeen City area, Grandhome Moss (NJ913124) was recorded by the NPRI as 35 ha of primary bog, mainly with scrub / woodland but also including 2 ha of degraded open bog³. However, this site was probably mis-classified as it is now fen with birch and willow carr, and only limited areas of more acidic bog (Charles Gimingham, pers. comm.)

Distribution

See Map 10. There are 45 sites in Aberdeenshire with primary (uncut) open bog². The larger sites are listed below; there are a further 14 sites of less than 1.5 ha. The status of Lochlundie Moss is uncertain, as it was not surveyed in 1995/96, access being denied to the site. There are also many other small areas of remnant secondary bog.

Raised bogs in Aberdeenshire

Site	Grid Ref	Area (ha)
Lochlundie Moss	NK042335	141.5
Greens of Auchmedden	NJ853579	58.7
Moss of Crombie*	NJ573523	27.6
Red Moss	NJ915175	24.0
Rora Moss	NK040514	22.7
Reidside Moss	NJ602569	22.0
Balearn Moss	NK035542	21.6
Red Moss of Candyglirach	NJ745009	18.0
Corthie Moss	NJ834570	17.7
Auchintoul Moss	NJ620537	17.1
Red Moss	NJ917155	11.4
Stewartfield Moss†	NJ861574	10.0
Moss of Redhills	NJ680358	9.5
Harestone Moss	NJ931192	8.9
St Fergus Moss	NK031542	8.8
North Cookney Croft	NO869936	8.3
Red Moss of Netherley	NO860942	7.9
Auchmacleddie (Skelmanae) Moss	NJ915587	7.3
Burreldale Moss	NJ835237	7.0
Red Moss of Blackrigg	NJ905601	6.7
Skene Moss	NJ752107	5.9

Craigmaud Moss	NJ882586	5.2
Hare Moss	NO908994	4.8
North Cowfords Moss	NJ881615	4.3
Moss of Cairns	NJ819363	4.2
Whitley Moss	NJ530572	3.7
Auchinderran Moss	NJ616559	3.7
Moss of Blackhillock	NJ822425	3.4
Fisherman's Moss	NJ626567	3.1
Moss of Tifty	NJ790409	2.7
Blackhills Moss	NJ616576	2.6

* about half of total area is in Moray

† possibly mis-classified

Scottish / UK Significance

Britain has nearly 70,000 ha of peatland formed from raised bogs, with the largest areas in England, but a majority of sites in Scotland³. In Scotland, the Central Belt and the NE Scottish coastal plain are the main areas of raised bog development. An area of approximately 5360 ha in NE Scotland was formerly raised bog, 19% of the total area in Scotland and 8% of area in Britain (see table). Throughout the country, much of the area of raised bogs has been lost and bogs with primary near-natural vegetation are now very rare.

It is not possible to compare the remaining extent of raised bog in NE Scotland with other areas of Britain due to a lack of comparable data.

Region	Former extent of raised bog Area (ha)
Moray	558
Aberdeenshire	4704
Aberdeen City	99
NE Scotland	5361
Scotland	27,892
Great Britain	69,663

Source: NPRI³

Associated Species & Example Key Sites

Reidside Moss is probably the least degraded raised bog in NE Scotland and has the most extensive *Sphagnum* cover. The drying out of the last lowland mosses may have caused the decline of the marsh fritillary *Boloria euphrosyne* (Short list) which is now extinct in NE Scotland. The small pearl-bordered fritillary *Boloria selene* and large heath *Coenonympha tullia* (Long list) are also butterflies of raised bogs and wet moorland. The large heath is still found at Red Moss of Netherley.

Area / Quality Trend

There are no raised bogs in Britain with completely natural vegetation and only small areas of near-natural vegetation remain. Scotland has a higher proportion of sites retaining primary bog and near-natural vegetation than England. In NE Scotland, 48% of the original area retains bog vegetation (2125 ha) but most of this is secondary and only 13% is primary open bog. All sites have been damaged to some degree.

Factors Influencing Trend

The main factors affecting bogs in NE Scotland are domestic peat cutting, agricultural reclamation and afforestation. In Aberdeenshire, a quarter (1134 ha) of the original bog area is now arable or pastoral farmland. In both Aberdeenshire and Moray a large proportion of the area is now forestry plantations.

Information sources

1. Lindsay, 1995 2. Stoneman & Wilson, 1996 3. Lindsay & Immirzi, 1996

2.3.27 Broad habitat: **Fen, carr, marsh, swamp and reedbed**

These wetland habitats often occur together and include the key habitats Fen and Reedbeds (see 2.3.28 and 2.3.29 below)¹. In swamps, the water-table is at, or above, the surface level of the vegetation for most of the year and the vegetation is species-poor compared to fens. Marsh, although rather ill-defined, usually refers to vegetation on mineral soil with the water table close to, but not usually above, ground level. Carr is wet woodland, usually of alder or willow, occurring in association with the above habitats (see also 2.3.5 Wet woodlands).

It is not possible to estimate the area of each sub-habitat or the total area for this group of habitats as the various surveys of NE Scotland have all used different wetland habitat categories. The LCS category 'marsh' is defined as wetland, with or without trees and/or drains². This could, therefore, include all the above habitats, but the estimated total area (5.4km²) is less than half the area recorded for 'fen' (11.9km²) by the NHS³. The latter category includes carr and reedbeds. The LCS category 'peatland' may also include some fen habitat - there is some correspondence between areas mapped as 'fen' by NHS and 'peatland' by LCS around the River Ythan, for example. The NCMS uses a different category again, 'marginal inundation' which includes swamp and fen⁴. Although possibly under-estimating the extent of wetland habitats, the NCMS surveys in the 1940s, '70s, and '80s, do suggest that swamp and fen habitats, already very limited in area, were being lost at a considerable rate, with a decrease from 2.38 km² in the 1940s to about 1km² in the 1980s.

Some of the larger fen or marsh areas are found at Strathbeg and Dinnet, also near the mouth of the Spey, by the River Lossie and lower parts of the Dee^{2 3}. Examples of willow carr can be found at Eslie Moss near Fettercairn, Braefoot swamp, near Turriff⁵, and Grandhome Moss in Aberdeen City⁶.

Information sources

1. BSG, 1995b 2. LCS88 3. NHS 1983-85 4. NCMS 5. David Welch, pers. comm.
6. Charles Gimingham, pers. comm.

2.3.28 Key habitat: **Reedbeds**

Current Status & Extent

Reedbeds are fens or swamps dominated by the common reed *Phragmites australis*. There are c.33 reedbed sites in NE Scotland with a total area of approximately 116 ha¹. The largest areas are at Loch Spynie, near Lossiemouth, in Moray, and Loch of Strathbeg in Aberdeenshire. Most sites are small, less than 2 ha in area. Sites over 0.5 ha are listed below. Map 11 shows the distribution of all sites.

Distribution

District	Site	Grid ref	area (ha)
Moray	Loch Spynie	NJ236665	38
	Spey Bay	NJ347656	8
Aberdeenshire	Cortes Loch, Rathen	NK004593	1
	Cullen Coast	NJ550670	2
	Loch of Strathbeg	NK056583	29
	Loch of Skene	NJ785075	2
	Logie Buchan, Ythan Estuary	NJ990299	6
	Meikle Loch	NK030308	1
	Aboyne Loch	NO536999	1
	Braeroddach Loch	NJ481003	3
	Blackmoss, Ordie, Dinnet	NJ460017	3
	Ordie, Dinnet	NJ457019	1
	Loch Davan, Dinnet	NJ440010	14
	Loch Kinord	NO437997	1
	Loch of Leys	NO705978	2
	Lochhead of Leys	NO696976	1
Loch of Lumgair	NO853826	2	
Aberdeen City	Corby & Lily Lochs	NJ924145	1

Data from RSPB (East Scotland). NB Areas, particularly of smaller sites, are approximate.

Scottish / UK Significance

The total area of reedbed in Britain is 6524 ha, of which the majority is found in England and 1137 ha in Scotland². Thus the reedbed area in NE Scotland represents about 10% of the Scottish and less than 2% of the UK totals respectively.

Associated Species & Example Key Sites

Reedbeds, including Loch Spynie and Loch of Strathbeg are among the main breeding habitats of the reed bunting³ (Middle list). Other breeding birds include willow, sedge and grasshopper warblers and water rail (Long list). At Loch Spynie in early autumn, swallows (Long list) form large communal roosts in the reedbeds numbering 5000 - 10,000 birds³.

Area / Quality Trend

In England and Wales, many reedbeds (other than RSPB reserves) decreased in size between national surveys in 1978/79 and 1993². The earlier survey did not include Scotland so there is no data on change in NE Scotland. There is no evidence of change in area at Loch of Strathbeg¹.

Factors Influencing Trend

The most common cause of reduction in reedbed area in England and Wales was scrub encroachment. Some reedbeds increased in area due to natural reed expansion.

Information sources

1. RSPB (East Scotland) 2. Painter *et al.*, 1995 3. Cook, 1992

2.3.29 Key habitat: **Fens**

Current Status, Extent & Distribution

Fens are minerotrophic wetlands, i.e. they receive at least some water and nutrients from the soil, rock and ground water. Fens are generally found in lowland areas, often along low river banks and loch shores, on floodplains, waterlogged hollows and valley bottoms. They can be acid or calcareous¹.

Fen is a rare habitat in NE Scotland. It was not considered as a habitat type by the LCS88 survey but is probably included in the category 'marsh', defined only as 'wetlands' (see above). The Natural Habitat Survey of Grampian in 1983-85 recorded 11.9 km² of fen, including carr (wet scrub woodland) and reedbeds (see Map 12 and also 2.3.28)². The SWT survey of raised bogs noted that two 'bog' sites were actually fen which had been mis-classified; Moss Grey (NK069424, 100ha) and Arnhall Moss (NJ832051, 2 ha)³. A further 79 ha of fen was recorded within bog sites. Grandhome Moss in Aberdeen City was classed as Raised bog by the NPRI, but is now mainly fen with birch and willow carr (Charles Gimingham, pers. comm.).

District	fen peat soils (km²)	current fen area (km²)
Moray	5	2.1
Aberdeenshire	302	9.3
Aberdeen City	28	0.5
NE Scotland	335	11.9

From: Lindsay & Immirzi, 1996 & Natural Habitat Survey of Grampian

Scottish / UK Significance

Fen peat soils have been poorly recorded, especially in Scotland, but, of the known distribution in Britain, almost all is found in England and less than 1% in Scotland (1215 km²). Of this, more than a quarter (335 km²) is found in NE Scotland, so in Scottish terms the area was once important for fen habitat⁴.

Associated Species & Example Key Sites

Some of the larger fen sites are found at Wartle Moss (NJ72), Loch of Leys (NO7097), Loch of Lumgair (NO8582) and Loch of Strathbeg (NK05).

Area / Quality Trend

See 2.3.27 above.

Factors Influencing Trend

In Britain as a whole, fens are affected by drainage and conversion to agricultural land, and hypertrophication e.g. due to agricultural run-off. If not managed to maintain open-fen communities, there is often a natural succession to scrub and woodland⁵.

Information sources

1. Lindsay, 1995
2. NHS 1983-85
3. Stoneman & Wilson, 1996
4. Lindsay & Immirzi, 1996
5. BSG, 1995b

2.3.30 Broad habitat: **Standing open water**

Status, Distribution & Significance

This habitat class consists of all water bodies from a few metres across to the biggest lochs. It includes both natural lochs and lochans, and man-made reservoirs and ponds. Standing waters are generally classified according to their nutrient status, the main types being oligotrophic (nutrient-poor),

mesotrophic (intermediate nutrient levels) and eutrophic (high nutrient levels). A fourth type, dystrophic waters, occurs in peaty areas of the Scottish Highlands; these are highly acidic lochs and lochans with low oxygen levels and a very limited flora and fauna¹. The key habitats Eutrophic standing waters and Mesotrophic lakes are considered below (sections 2.3.31 & 2.3.32).

The majority of lochs in NE Scotland drain from resistant rocks such as granite and are oligotrophic and acidic. Oligotrophic waters are species-poor with a low biomass of lower plants and animals¹. The fish fauna are predominantly salmonid, including arctic charr (Long list).

The LCS88 survey gives the total area of standing waters (over 2ha) as 2,440 ha (1.6% of the Scottish total)². This obviously excludes many smaller water bodies. The NCMS recorded a very similar area in the late 1980s; 2,000 ha of lochs plus 600 ha of reservoirs³. Mesotrophic and eutrophic lochs are generally found in the lowlands while oligotrophic are well represented in the Cairngorms. The largest of these is Loch Muick. The North-east holds some of the highest standing water bodies in the UK, including Loch Etchachan at over 900m and many smaller lochans. A survey of Scottish lochs is currently underway by Scottish Natural Heritage, so more information should be available soon on lochs in the area.

Lochs are important feeding, breeding and roosting areas for many species of bird, e.g. water rail, ducks, geese (many long list spp), and also used by otter and water vole (Short list). All amphibians are dependent on standing water for breeding. The white-faced dragonfly *Leucorrhinia dubia* (Long list) breeds in acid, oligotrophic bog pools.

Trends & Influential Factors

The fresh waters of Scotland as a whole are largely in good condition relative to the rest of Europe, with over 90% of the area considered to be of excellent quality⁴. The main threats are acidification in upland areas and eutrophication where the catchment includes human settlements and farmland.

The oligotrophic upland lochs, because of their naturally low pH levels and poor buffering capacity, are susceptible to acid rain, caused by atmospheric pollutants. Large conifer plantations in upland catchments can also lead to acidification. A study of sediment deposits showed that some Cairngorms lochs have suffered acidification since the mid to late 19th century. Lochs affected include Lochnagar, Loch nan Eun, Lochan Uaine and the Dubh Loch. The latter drains into Loch Muick which now also shows increased acidity⁵. In lowland areas, eutrophication is a greater threat. Agricultural pollution such as fertilisers and slurry, and sewage effluent can lead to nutrient enrichment. Other types of pollution can occur. Recreation, including boating, fishing and walking, can lead to trampling of vegetation at the water margin and disturbance to wildlife, but such effects are probably very localised.

The area of reservoirs increased from 200 ha in the 1940s to 600 ha in the 1980s³.

Information sources

1. BSG, 1995b 2. LCS88 3. NCMS 4. Harriman & Pugh, 1994 5. Bayfield & Conroy, 1996

2.3.31 Key habitat: Eutrophic standing waters

Current Status, Extent & Distribution

Eutrophic waters are typical of lowland areas of Britain. They supporting a high biomass of vegetation, abundant plankton and a variety of coarse fish such as cyprinids, perch and pike. Many are important for breeding and wintering wildfowl, which contribute to the nutrients in the water through their droppings. Only those water naturally rich in nutrients are included in the key habitat, not those which have become eutrophic through pollution¹.

There are naturally eutrophic lochs in NE Scotland, and also lochs which are naturally mesotrophic but have been altered by increased nutrient input as a result of human or other activities. There is no easily available information on the number of eutrophic lochs in the North-east, but they are likely to be found in the low-lying areas, on richer soils and on agricultural land (see Map 1). Naturally eutrophic waters are probably rare.

Loch Spynie, in Moray is an example of a naturally eutrophic loch². Loch of Strathbeg and Loch of Skene are considered to have been naturally mesotrophic, but are now suffering eutrophication and Aboyne Loch may also be becoming nutrient-enriched³ (see 2.3.32).

Scottish / UK Significance

Eutrophic waters are rare in northern Scotland but much more common in lowland southern Britain.

Associated Species & Example Key Sites

Large numbers of wildfowl occur at both naturally eutrophic lochs and those which have become artificially eutrophic through anthropogenic nutrient inputs.

Area / Quality Trends

Several naturally mesotrophic lochs in the North-east have become or are becoming eutrophic. No information was available on trends in the quality of naturally eutrophic lochs.

Factors Influencing Trend

Hypertrophication from artificial nutrient enrichment can occur in naturally eutrophic lochs, leading to algal blooms. This has occurred as a result of agricultural run-off at Rescobie and Balgavies Lochs in Angus⁴. The causes of eutrophication in mesotrophic lochs is considered in 2.3.32 below.

Information sources

1. BSG, 1995b
2. NERP/B, 1994
3. Mike Davidson (SEPA), pers.comm.
4. Ingram & Noltie, 1981

N.B. Surveys currently underway by SNH and SEPA should provide more information on the chemical characteristics lochs in the North-east.

2.3.32 Key habitat: Mesotrophic lochs

Current Status, Extent & Distribution

Mesotrophic lochs are characterised by a narrow range of nutrients, of which the main indicative nutrients are inorganic nitrogen (0.3 - 0.65 mg/l) and total phosphorus (0.01 - 0.03 mg/l)¹. They hold the highest diversity of macrophytes of any type of loch, including a relatively high proportion of rare and scarce plants. Number of invertebrate and fish species are also high.

Several larger lochs in NE Scotland are, or were, naturally mesotrophic. The shallow Lochs Kinord (31ha) and Davan (71ha) at Dinnet are the largest lochs in the Dee valley. The submerged and littoral flora of Loch Kinord has been described as the finest in northeast Scotland². Aboyne Loch, further down the valley, is an artificial loch, created in the mid 19th century, but also has a rich flora, including the pondweed *Potamogeton compressus* (Middle list) which is now found nowhere else in Scotland. Loch of Skene and Loch of Strathbeg are naturally mesotrophic but are now more eutrophic than mesotrophic.

Work is currently underway by SEPA to compile a database and formulate Conservation Action Plans for these lochs in northeast Scotland. The SNH loch survey should also provide more information. However, the criteria used by SEPA and SNH to define mesotrophic status of lochs differ³.

Scottish / UK Significance

Mesotrophic lakes or lochs are relatively uncommon in the UK and found mainly around the margins of upland areas in the north and west¹.

Associated Species & Example Key Sites

The Dinnet lochs are important for breeding and wintering wildfowl (many Long list species). The damselfly *Coenagrion hastulatum* breeds only in mesotrophic pools and lochs, e.g. at Dinnet. (See also under Broad habitat above).

Area / Quality Trends

Mesotrophic lochs are a rare type of loch in the North-east, and deteriorating in quality. Aquatic plants and fish have declined in many mesotrophic lochs in the area in the past 10 years. Some of the most important naturally mesotrophic lakes in the UK have now become eutrophic¹.

Factors Influencing Trend

The primary factor affecting this loch type is nutrient pollution, from farm fertilisers, sewage effluent and discharges of other organic pollutants such as slurry. Such pollution causes increasing eutrophication of lochs, resulting in algal blooms. The shading effect of the algae, and also the direct effect of the increased nutrient levels, lead to the loss of macrophytes, and in turn, of associated invertebrates. As well as the lochs which are now classed as eutrophic, Loch Davan has suffered slight eutrophication from small quantities of fertiliser run-off and treated sewage effluent in the Milton of Logie burn^{4 5}.

Large numbers of waterfowl also contribute to the increase in nutrient levels through their droppings, for example at Loch of Strathbeg and Loch of Skene. At Loch of Strathbeg total phosphorus now stands at about 61mg/l but is calculated from historical land use information to be only 26mg/l naturally. Loch of Skene (a Ramsar site) total phosphorus is now 167 mg/l, calculated to have increased from 33mg/l. Cotehill Loch on the Sands of Forvie NNR is managed as a wildfowl shooting site. It is now no longer mesotrophic, eutrophication resulting from a combination of the large numbers of birds and the considerable quantities of food put out to attract them.

Information sources

1. Biodiversity Steering Group, 1995b
2. Marren, 1990
3. Willie Duncan (SNH) pers.comm
4. Pugh, 1985
5. Bayfield & Conroy, 1996
6. Mike Davidson (SEPA) pers.comm.

2.3.33 Broad habitat: Rivers and burns

Status, Distribution & Significance

Running waters of NE Scotland vary from large rivers to the smallest upland and coastal burns, all draining towards the North Sea. The main rivers with their entire catchments within the North-east are the Dee, Don, Deveron and Ythan. The area also includes the lower reaches of the Spey and the Avon, one of its tributaries (Map 1). The Spey and Dee are among the largest rivers in Scotland and rise at altitudes of about 1310m, higher than any other British rivers¹. The Dee has a catchment of 2100 km². Smaller rivers include the Lossie, Ugie and Cowie. The area also covers small parts of the Findhorn and North Esk catchments. Detailed distribution of smaller burns is shown on the OS maps.

The Rivers Lossie, Spey, Deveron, Don and Dee rise in the uplands, over nutrient-poor rocks and soils, and are generally oligotrophic with good water quality². The Dee, for example, is oligotrophic from

source to estuary, which is now rare in British rivers³. Water quality is high in most of the tributaries, but slightly lower in the Dinnet burn which drains the Dinnet lochs. This is due to small quantities of fertiliser run-off and treated sewage effluent in the Milton of Logie burn which feeds Loch Davan³. Water quality is also high throughout the length of the Spey⁴, and most of the Don, but the latter is polluted near its mouth.

The Dee is regarded as of national importance as an excellent example of a highland eroding river, with high headwaters and characteristic fauna and flora relatively unaffected by man. It is also of importance for salmonid fisheries and recreation¹. The Spey is of similar importance, as are the freshwater systems of the area as a whole, which not only provide drinking water for domestic use, but also for whisky distilling, especially in the Lossie, Spey and Deveron catchments.

Many species are closely associated with rivers and burns, including otter and water vole (Short list), dipper, kingfisher, goosander and red-breasted merganser (Long list), salmon and the 3 species of lamprey (Long list). Freshwater invertebrates include the fresh-water pearl mussel (Short list), and stonefly *Brachyptera putata* (Middle list), while crane fly *Rhabdomastix hilaris* and stiletto fly *Thereva lunulata* (Middle list) are found on sand and shingle banks. Aquatic plants include water-crowfoots *Ranunculus fluitans* and *R. hederaceus* (Long list).

Trends & Influential Factors

There are a variety of threats to rivers and streams. Some of the main threats are pollution, including acidification and eutrophication, excessive water abstraction, construction of dams and reservoirs, inappropriate bank management, such as overgrazing and loss of riparian woodland, land drainage and flood defences⁵.

Most rivers of the North-east are still largely unpolluted and unaffected by eutrophication. Acidification is a potential threat and some of the headwaters already show increased acidity. The Allt an Dubh Loch in Glen Muick is classed as 'normally acid' (mean pH < 5.6) and the Dee above Mar Lodge as 'frequently acid' (minimum pH < 5.6)².

The water courses with the highest nutrient and pollution levels are those which arise on low lying lands, such as the Ythan, the Ugie and the many coastal burns. These waters have increased algae levels.

Information sources

1. Maitland, 1985
2. Bayfield & Conroy, 1996
3. Pugh, 1985
4. NERP, 1995
5. BSG, 1995b
6. Harriman & Pugh, 1994

2.3.34 Broad habitat: Arable

Status, Distribution & Significance

Arable land is defined by the BSG as the total area of crops, plus bare fallow, plus grassland less than five years old¹. There is therefore some overlap with Improved grassland (see 2.3.18). Tilled land accounts for 41% of the land area in Great Britain and 28% in Scotland according to the BSG¹. The LCS land class 'arable' accounts for only 11% of Scotland's land area, but the total for 'arable' + 'improved grassland' (25%) corresponds better with the BSG estimate².

Arable is the most extensive single habitat category in NE Scotland. The LCS recorded 319,200 ha, accounting for more than a third of the area. This also represents a large proportion (36%) of the total area in Scotland². Within NE Scotland, the proportion of arable land is highest in northern

Aberdeenshire, especially the old Banff & Buchan district, where 77% of the area is arable. Even within Aberdeen City, arable is the second most extensive habitat (4900 ha, 26%), after urban development. SOAEFD data for 1988 show a total of 389,796 ha of crops and grass³, which suggests that the LCS included some grass in the arable category.

In June 1995, SOAEFD recorded 171,300 ha of crops plus 1224 ha of fallow plus 25,996 ha of set-aside⁴. The amount of grassland less than 5 years old is not recorded but there was 66,887 ha of grass for mowing and a further 125,310 ha of grass for grazing. Thus there was a total of 390,717 ha of crops and grass. Cereals accounted for 79% of crops (132,829 ha), the other main crops being rape and linseed (19,412 ha), fodder crops (9311 ha) potatoes (6849 ha) and vegetables (2000 ha).

Much of the wildlife interest of arable areas is found at the field edges and Cereal field margins are therefore considered as a key habitat¹ (see 2.3.35 below).

Trends & Influential Factors

Although there has been no change in the total area of crops plus grass in NE Scotland since 1988, there has been a decrease in the area of cereal crops^{3 4}. Throughout much of Britain, the fauna and flora of arable land has been seriously affected by many factors including the use of herbicides and insecticides, removal of hedgerows, changes in sowing times and crop rotation, and improved drainage¹.

Information sources

1. BSG, 1995b
2. LCS88
3. DAFS, 1989 (Economic Report on Scottish Agriculture, 1988)
4. SOAFD Economic Report on Scottish Agriculture, 1996

2.3.35 Key habitat: Cereal field margins

Current Status & Extent

For the national action plan, cereal field margins are defined as 'strips of land lying between cereal crops and the field boundary, and extending for a limited distance into the crop, which are deliberately managed to create conditions which benefit key farmland species'¹. The main types include: a 6m 'wildlife strip' adjacent to the crop, which is cultivated but not cropped, a 6m or 12m 'conservation headland', forming the outer margin of the crop, and managed with reduced pesticides. Both are bordered by a 1m sterile strip to prevent the spread of arable weeds into the crops. Game crops, stubble or grassland fallows, lying between the annual crop and field boundary are also included as cereal field margins.

The potential extent of the habitat clearly depends on the area of cereal crops. Cereal crops account for 51% of arable land (see definition above) in Great Britain and 44% in Scotland¹. In NE Scotland, the proportion is somewhat lower; in 1995 cereals made up 79% of crops but only 34% of the total crops plus fallow, set-aside and grass². Barley is the main cereal grown (104,301 ha), with smaller areas of wheat (19,803 ha) and oats (8454 ha).

The national action plan focuses on cereal field margins, rather than arable field margins in general, because of the predominance of cereals among arable crops and lack of knowledge of the wildlife benefits of other arable crop margins. Potentially, NE Scotland could support a large network of cereal field margins, with over 132,000 ha of cereal crops (31% of the Scottish total)² and a potential area of just over 11,000 ha of 6m margins. Although only about 6% of the total potential area of managed margins in the UK¹, this would still represent a valuable resource, as this part of the country has different proportions of cereal types, relative to the UK as a whole, (e.g. more oats and spring cereals) and a different assemblage of cereal field-dwelling species.

Distribution

At present very few farmers in the North-east manage cereal field margins to benefit wildlife, and there is no information available at present on the extent of the habitat. One area where field margins are being created is within the Cairngorm Straths Environmentally Sensitive Area (ESA). Here, farmers leave 2m margins around their fields with a 6m no-spray zone. In other parts of the North-east some farmers are known to be enthusiastic supporters of wildlife-friendly management techniques and already use them. However, no data are available on the extent of these areas. Set-aside schemes include nearly 26,000 ha across the North-east². Although these are usually whole fields, they may include ground which could be classed as Cereal field margins, or at least perform the same function.

Creating more managed Cereal field margins in the North-east would bring benefits, not only for wildlife naturally occurring in cereal fields, but also for those of water margins. Many water courses run alongside cereal fields and are important for both aquatic life and terrestrial plants and animals living close to the water. These watercourses suffer from the effects of chemical spraying and the establishment of managed cereal field and water margins could benefit both habitats at once. Financial help in the form of grant aid is available to farmers to carry out both types of management.

Scottish / UK Significance

At present the importance of the area for this habitat in the area is likely to be limited, but there is significant potential.

Associated Species & Example Key Sites

Many species of plant and animal which inhabit cereal fields would benefit from the presence of managed cereal field margins. Over 2,000 invertebrate and 300 plant species are known to inhabit cereal fields. Cereal field margins could provide nesting and feeding sites for farmland birds such as grey partridge and skylark (Short list), and are also important for rare arable weeds, such as cornflower *Centaurea cyanus*, and shepherd's needle *Scandix pecten-veneris* (Middle list), corn buttercup *Ranunculus arvensis*, greater yellow rattle *Rhinanthus serotinus* (Long list). Many species of arable weeds are now extinct in the North-east, including shepherd's needle.

Area / Quality Trends

Only a small increase in NE Scotland in recent years.

Factors Influencing Trend

The main factors which have reduced the wildlife value of cereal fields in Britain generally, are the increased use of herbicides and insecticides, change to earlier sowing & harvesting and loss of winter stubbles, and reduction in rotation of crops¹.

Information sources

1. BSG, 1995b 2. SOAFD Economic Report on Scottish Agriculture, 1996 3. David Welch, pers. comm. 4. Cameron Watt, (SOAEFD)

2.3.36 Broad habitat: Boundary features

Biologically rich boundary features include mainly hedgerows, drystone dykes and ditches, but also the linear verges of grasslands, roads and railways.

Status, Distribution & Significance

The total UK extent of hedges is estimated to be in the region of 450,000 km (BSG) to 465,000 km (CS 1990). Of this total, 81% is in England (leaving 88,350km elsewhere). Survey data for two of these features in NE Scotland is available from the NCMS from the 1940s to the late 80s. The most recent

figures, from around 1988, put the lengths of hedgerows and ditches at 2,128 and 8,463 km respectively, Hedges in NE Scotland thus make up only 0.5% of the UK total.

Trends & Influential Factors

Hedgerows have decreased greatly since the 1940s, when the NE Scottish total was 8,237 km. By the 1970s this had fallen to 4761 km. The total recorded loss by the late 80s was 66% and has probably continued to some extent since then. Conversely, ditches have increased since the 1940s, from 2,561 km, to 3,424 km in the 70s, a total increase by the 1980s of 230% in 40 years.

Information sources

NCMS, Countryside Survey 1990.

2.3.37 Locally important habitat: **Rocks and scree**

Status, Distribution & Significance

In the national list of key habitats, the BSG states that 'Caves and natural rock exposures are to be reviewed for possible inclusion'¹. Thus it seems likely that a national action plan will be prepared for this habitat. At present, coastal cliffs and rock are covered under the Broad & key habitat Maritime cliff and slope (2.4.11) and broad habitat: Boulders and rock above high tide mark (2.4.6), while rocky outcrops and scree in the mountains come under the Broad habitat: montane. However, rocks and scree at low to medium altitudes inland are not specifically included in any BSG category, so there seems a need to consider rocky habitat away from the coast separately. It has also been suggested that quarries and old mine workings could be included in this habitat type.

The LCS recorded 1060 ha of cliffs, bare rock, crag and scree, mostly in the old Kincardine & Deeside district and Moray². Some of this will be coastal, but mosaics of both heather moorland and good rough grass with rock & cliffs, were listed as locally significant mosaics. The NCMS survey in the 1980s recorded around 700 ha of rock and a further 300 ha of quarries³. In Aberdeen City, there are several former quarry sites which have not been reclaimed, including the large Rubislaw quarry⁴.

Although not extensive, rock outcrops can be important for lichens and bryophytes⁵. For example, Elm gyalecta lichen *Gyalecta ulmi* (Short list) grows on the Lion's Face, near Braemar, and the limestone outcrop on the north side of Morrone. Craig Leek, east of Braemar, is also important for rare lichens. Rock ledges often have a flushed soil, and may be of interest for their vascular plants communities (see 2.3.24). Several species of bird also use ledges on inland crags and cliffs for nesting, e.g peregrine, golden eagle (Long list). The old mine at Coire Buidhe (NJ2415) is a good site for lichens. Rare snails such as *Vertigo alpestris* and *V. pusilla* (suggested as locally important) are found on rocks and scree, the former at Craig Leek, the latter at Cothall Quarry. Another snail *Ashfordia granulata* (Long list) has been recorded at Cothall and Tomintoul quarries⁶.

Information sources

1. BSG, 1995b
2. LCS88
3. NCMS
4. Stuart Macpherson (Aberdeen City Council), pers. comm.
5. Brian Coppins (RBGE), pers. comm.
6. Richard Marriott, pers.com.

2.3.38 Broad habitat: **Urban**

Status, Distribution & Significance

Although including buildings and hard surfaces, urban wildlife habitats are defined for the purposes of the BSG as greenspaces and associated ecological niches found within built-up areas. Greenspaces can be divided into the following categories, although the BSG considers only the latter two of these groups:

- i. Remnants of ancient natural systems, including woodland, wetland, freshwater and estuarine.
- ii. Pre-industrial rural landscapes with arable land, meadows, heathland grazing marshes and villages.
- iii. Managed greenspaces, including town parks, amenity grassland, private gardens and planted shrubberies. These can support a variety of wild invertebrate and bird species, including some uncommon species, such as those adapted to garden juniper.
- iv. Naturally seeded urban areas or industrial sites such as demolition sites, disused railway land or unused industrial land. These areas can often be rich in species, the different successional stages of colonisation in such sites often forming the main strongholds for invertebrates and lichens.

The availability of survey data is poorest for the latter two of these groups. The main land cover and habitat surveys which have been carried out either generalise these types of habitat into larger categories (eg as 'Urban' by the LCS88), or do not record them (eg the NHS, which only covers natural and semi-natural habitats).

Within the NE of Scotland there are many settlements, ranging in size from the City of Aberdeen, with a population of over 200,000, to small rural villages. The total area of the NE classed as Urban is around 13,360 ha, 1.5% of the area of the NE (LCS88). Aberdeen forms a significant proportion of the urban land in the NE (40%) and, for this account therefore, only Aberdeen City District will be considered, due to lack of information from other built-up areas.

Aberdeen City District covers an area of 18,790 ha, equivalent to 2.1% of the area of NE Scotland. The habitats of the district have been covered by two surveys: Grampian NHS 1983-85 and LCS 1988. The LCS survey, the more generalised of the two, covers the entire land surface of the area, whereas the NHS includes only those areas regarded as natural or semi-natural habitat. The LCS88 survey gives the make-up of the District as follows (in decreasing order of area):

Urban	5,280ha	(28%)
(includes areas such as recreational grassland, woods and parks)		
Arable	4,880ha	(26%)
Improved grassland	4,070ha	(22%)
Coniferous plantation	1,120ha	(6%)
Rural Development	850ha	(4.5%)
Habitat Mosaics	790ha	(4.2%)
Good Rough Grassland	660ha	(3.5%)
Broadleaved woodland	260ha	(1.4%)
Fresh waters	160ha	(0.9%)
Sand dunes	160ha	(0.9%)
Mixed woodland	130ha	(0.7%)
Tidal waters	120ha	(0.6%)
Heather moorland	110ha	(0.6%)
Scrub	70ha	(0.4%)
Felled woodland	40ha	(0.2%)
Marshes	20ha	(0.1%)
Recent planting	20ha	(0.1%)

The results of the NHS for the District are shown in Table 2. The table also shows the proportions of each of the major habitat classes which are protected within SINS (Sites of Interest to Natural Science).

Another source of information on the presence of good wildlife habitats in the District is the list of District Wildlife Sites, 78 sites highlighted from a survey by the NCC in 1987, in both the urban and 'rural' parts of the District. These sites include many of the broad and key habitats described by the BSG and are extremely valuable in the urban area for conservation, recreation and education, as well as enhancing the environmental quality of Aberdeen City. A summary of the BSG habitat classes present in each of the DW Sites is presented in Table 3, which also shows the percentage of each general habitat protected by the non-statutory SINS designation (Sites of Interest to Natural Science). Important plant and animal species are found in many of these sites and these are highlighted in the DWS column in Appendix 2; see also Section 4.2. The locations and approximate extent of the District Wildlife Sites is shown in Map 13.

Aberdeen clearly holds substantial interest in terms of BSG habitats present on District Wildlife Sites. 51 sites hold broad-leaved woodland (including 21 with birch woodland), 27 sites hold lowland or coastal heathland, 25 sites have rivers or burns, 18 sites have fen/carr/marsh habitats, 14 have standing open water and 13 have extents of scrub.

Trends & Influential Factors

Factors which affect urban habitat include development of unused or derelict land and management practices in parks and greenspaces which decrease habitat diversity (BSG).

Information sources

BSG, LCS88, NHS 1983-85.

Further information is required on some of the habitat types which are not covered in the LCS88 and NHS surveys, especially for group iv (see above). This information is probably available from town and city council planning departments.

District Wildlife Sites

- | | |
|--------------------------------------|---|
| 1 Balnagask to Cove | 31 Den Wood |
| 2 Tullos Hill | 32 North Burn of Rubislaw |
| 3 Don Estuary | 33 Bucksburn Gorge |
| 4 Balgownie/Blackdog Links | 34 Den of Maidencraig |
| 5 Charlestown Wood | 35 Cults Den |
| 6 Loirston Loch | 36 Cults Quarry |
| 7 Kincorth Hill | 37 Murtle House and Newton Dee |
| 8 River Dee Valley | 38 Hillhead Road |
| 8.1 Kincorth Hill | 39 Burnbrae Moss |
| 8.2 Bridge of Dee | 40 Farburn Wood |
| 8.3 Pitfodels Castle | 41 Gough Burn |
| 8.4 Garthdee | 42 Den of Moss-side |
| 8.5 Morison Island/Shakkin Briggie | 43 Foggieton |
| 8.6 Lover's Walk to St Maiks Well | 44 Murtle Den |
| 9 River Don Valley | 45 Blacktop |
| 9.1 Braes of Don | 46 Binghill Wood |
| 9.2 Crook of Don | 47 West Hatton |
| 9.3 Woodside | 48 Brimmond Hill |
| 9.4 Lower and Upper Persley Woodland | 49 Elrick Hill |
| 10 Kinta Valley | 50 Tyrebagger Hill |
| 11 Lochside/Denmore | 51 Woodlands Wood, Beidleston |
| 12 Scotstown Moor (Perwinnes Moss) | 52 Moss of Auchlea |
| 13 Newton of Shielhill | 53 Rotten of Gairn |
| 14 Corby Loch | 54 Guttrie Hill |
| 15 Glashie How | 55 Culter House Woods |
| 16 Danestone House | 56 Hill of Ardbeck |
| 17 Cornhill Hospital | 57 Culter Burn |
| 18 Den of Leggart | 58 Woodend Woods, Peterculter |
| 19 Westburn of Rubislaw | 59 Little Hill, Caskieben |
| 20 Rubislaw Den | 60 Kinaldie Den |
| 21 Hilton Wood | 61 Culter Compensation Dam |
| 22 Clerkhill Wood | 62 Old Manse Wood |
| 23 Grandholme Moss | 63 Baads Moss |
| 24 Stoneyhill Wood | 64 Mid Anguston Quarry |
| 25 Monument Wood | 65 Leucher Moss |
| 26 Persley Quarries | 66 Southlasts Mire |
| 27 Walker Dam and Rubislaw Link | 67 Aberdeen - Inverness and Kittybrewster
Railway Line |
| 28 Allan Park Pond | 68 Woodland Walks, Foggieton |
| 29 Deeside Old Railway | |
| 30 Hazelhead Park | |

2.4 Habitat accounts: Coastal & marine

2.4.1 Broad and Key habitat: Estuaries

Current Status & Extent

Estuaries are partially enclosed tidal areas, with at least part of the shoreline composed of 'soft' shore, open to saline water from the sea and receiving freshwater from rivers or run-off¹. There are nine estuaries in the area, all small and mostly of the bar-built type. The biggest estuaries are Findhorn Bay and the Ythan. The Moray coastline west of Findhorn can also be regarded as part of the much larger estuary of the Inner Moray Firth. Estuaries have permanent channels and intertidal areas and include other key habitats such as Saltmarsh (2.4.3) and Reedbeds (2.3.27). The Sand dunes (2.4.8) associated with the Ythan Estuary are nationally important, as are the Kingston shingles (2.4.5 Coastal vegetated shingle structure) which close the estuary at Spey Bay.

The water quality in NE Scotland's estuaries is generally good (grade 1), except for the canalised part of the Lossie Estuary, the Don and the lower part of Ythan (grade 2).

Distribution

District	Estuary	Grid ref.	Total area (ha)	Shoreline length (km)
Moray	Findhorn Bay	NJ0364	c 650	c 20
	Lossie Estuary	NJ2470	56	13.3
	Spey Bay	NJ3465	49	4.9
Aberdeenshire	Banff Bay	NJ6964	102	8.6
	Inverugie	NK1247	c 12	c 3
	Ythan Estuary	NK0026	282	28.2
Aberdeen City	Don Estuary	NJ9509	23	5.5
	Dee Estuary	NJ9405	97	18.7
Aberdeenshire	St Cyrus	NO7362	156	12.8

Scottish / UK Significance

NE Scotland's estuaries represent less than 0.3% of the total estuarine area of 581,300 ha in the UK.

Associated Species & Example Key Sites

Estuaries are important for many species of wildfowl and waders². The Ythan has the largest number of breeding eider in Britain and shelduck also breed. It also holds large numbers of wintering pink-footed geese while at the Lossie Estuary, the numbers of wintering greylag geese are important. Other ducks found in local estuaries include wigeon, teal, goldeneye and mallard. Ringed plovers breed in small numbers at Lossie, Spey Bay, Ythan and St Cyrus and in winter, many waders are present, including turnstone, purple sandpiper, knot, redshank, lapwing and golden plover (all Long list spp.). Small numbers are found on most of the estuaries with the largest numbers of wintering waterfowl on the Ythan.

There are tern colonies at the Ythan, Spey Bay and St Cyrus. The sandwich tern colony on the Ythan has held more than half the Scottish breeding population³ and there are smaller colonies of common, arctic and little terns, also a herring gull colony. Findhorn Bay is an important feeding area for ospreys (all Long list).

All the estuaries in NE Scotland are used by otters (Short list) and there are common seal (Long list) haul-outs at the mouths of the Ythan and the Don. In summer and autumn, there is a large population of the sand goby *Pomatoschistus minutus* (Long list) in the Ythan Estuary.

Area / Quality Trend & Factors Influencing Trend

Estuaries are affected by a large number of human activities. Dock construction in Aberdeen harbour has substantially altered the lower part of the Dee Estuary and there are also harbours at Lossiemouth and Banff. The Ythan, however, is one of the least modified estuaries in Scotland. Many of the estuaries in the area are used for a wide variety of recreational activities both on the water and along the shore.

Estuarine areas are also affected by discharges into the river further upstream. The Lossie has high levels of lindane and heavy metals from industrial waste and the Don was once heavily polluted by a paper mill. The water quality has improved since installation of a treatment plant. Eutrophication has occurred in the Ythan Estuary as a result of agricultural run-off and sewage discharges further upstream. Spey Bay and Banff Bay are also affected by sewage discharges.

Information sources

1. Barne *et al.*, 1996 2. Buck, 1993 3. Lloyd *et al.*, 1991

2.4.2 Key habitat: Seagrass beds

Current Status, Extent & Distribution

Seagrass beds develop on sandy or muddy substrates in intertidal and shallow subtidal areas to depths of about 4m. They are confined to sheltered coasts such as bays, inlets and channels¹. There are 3 British species of seagrass or eelgrass; *Zostera noltii* and *Z. angustifolia* are intertidal, while *Z. marina* is found mainly in the sublittoral zone. Only *Z. noltii* (dwarf eelgrass) and *Z. marina* (eelgrass) have been recorded in NE Scotland², although *Z. angustifolia* (narrow-leaved eelgrass) is found in the inner firths of the Moray Firth³. There is some uncertainty over the taxonomic status of *Z. angustifolia* and some intertidal records of *Z. marina* could relate to this species². Most of the coastline of NE Scotland is unsuitable for the formation of seagrass beds and this habitat has only ever been present along a stretch of the Moray coast in the inner Moray Firth. Since 1970, *Zostera* has only been found behind the Culbin Bar (NH96) and in Findhorn Bay (NJ06)^{2 3}.

Scottish / UK Significance

Seagrass beds are found around most Scottish coasts. The Moray Firth, especially the Cromarty Firth, is the most important area for intertidal seagrasses while *Z. marina* is more widespread on the west coast³. Other main sites in the UK are in southern England, Wales and Northern Ireland³.

Associated Species

Seagrass is an important food for several species of wildfowl e.g. brent goose, wigeon (Long list).

Area / Quality Trend

Seagrass beds were once more widespread along the Moray coast, found, for example, around Burghead². *Zostera* had disappeared from some areas by 1940. Both *Z. marina* and *Z. noltii* have also declined elsewhere in Britain.

Factors Influencing Trend

A major outbreak of a wasting disease (caused by a slime mould *Labyrinthula macrocystis*) led to a widespread and rapid decline of *Z. marina* in the 1930s^{2 3}. It is thought that environmental factors stressing the species may have contributed to its susceptibility to the parasite³. Populations did recover after the 1930s but rarely to their former abundance. Wasting disease has occurred again in the 1990s in the Isles of Scilly and although not recently recorded in Scotland, there is a possibility of another

widespread epidemic in British waters². The other two species appear to be less susceptible to the disease.

Seagrass beds are affected by natural factors such as storms, sea temperature and sunlight levels and a variety of anthropogenic factors¹. These include physical disturbance, (e.g. by trampling, bottom fishing gear), and pollution. Low levels of nutrient enrichment may increase production in *Zostera* but sewage discharge and agricultural effluents can lead to high nitrate concentrations which have been implicated in declines of *Z. marina*². Tributyltin (from anti-fouling paint) is accumulated by *Z. marina*, while various other heavy metals and organic compounds reduce the fixation of nitrogen².

Information sources

1. BSG, 1995b 2. Cleator, 1993 3. Stewart *et al.*, 1994

2.4.3 Broad and Key habitat: Coastal saltmarsh

Current Status & Extent

Saltmarsh vegetation develops in intertidal areas (between MHWS - MLWS) in sheltered waters, such as estuaries, where fine sediment can accumulate¹. Northeast Scotland has 260 ha of coastal saltmarsh^{2 3} (310ha according to LCS88). The largest area is at Culbin Sands / Findhorn where there is 320 ha of saltmarsh extending into Highland region (Map 14).

Most of the saltmarshes are found along the coast of the Moray Firth, but the Ythan Estuary has one of the larger areas of saltmarsh and there is also a small area at St Cyrus.

Distribution

District	Site	Grid Ref	Area (ha)
Moray	Culbin	NH950612	60.28*
	Findhorn Bay	NJ035618	118.05
	Lossiemouth	NJ245695	2.02
	Spey Bay	NJ344653	22.2
	Logie Head	NJ531677	0.8
	East Head, Portsoy	NJ596664	0.31
Aberdeenshire	Stakeness	NJ645658	6.51
	Deveron Mouth	NJ695637	0.7
	Pitullie	NJ953678	0.21
	Fraserburgh Bay	NK022648	2.0
	Loch of Strathbeg	NK070602	15.91
	Rattray Bay	NK106533	0.3
	Lunderton	NK116497	0.24
	River Ugie	NK116475	0.08
	Ythan Estuary	NK007284	25.19
Balmedie	NJ982192	0.2	
Aberdeen City	Don Mouth	NJ948094	0.51
Aberdeenshire	St Cyrus	NO744635	4.0

Source: Burd, 1989b

* part of a saltmarsh (total area 203 ha) extending outside NE Scotland

Scottish / UK Significance

There is approximately 44,400 ha of saltmarsh in 557 sites in Britain, mainly in England and Wales³. The saltmarshes of the area represent a small proportion of the Scottish (4%) and British (0.6%) totals.

However, there is a high proportion of mid to upper marsh communities (58%) compared to saltmarshes elsewhere in Britain.

Associated Species & Example Key Sites

About 70% of the saltmarsh in the area is at Culbin Sands / Findhorn, a site important for the extent and diversity of its saltmarsh habitats. Many rare invertebrate species are associated with ungrazed saltmarshes here and Scottish scurvy grass *Cochlearia scotica* (Middle list) occurs at the upper edge of the saltmarsh².

Area / Quality Trend

Saltmarshes in the area generally show net accretion or stability. Grazing, which tends to reduce species diversity, occurs at some sites; for example Strathbeg is heavily grazed by sheep, cows and rabbits. However, the large area at Culbin Sands and Findhorn Bay is not grazed³.

Factors Influencing Trend

Land reclamation is probably one of the main threats to saltmarshes in Britain but does not appear to be a problem in the area. Of other threats identified, pollution by agricultural chemicals may be the most likely³.

Information sources

1. Doody *et al.*, 1993 2. Barne *et al.*, 1996 3. Burd, 1989a, b

2.4.4 Broad habitat: Shingle above high tide mark

Status, Distribution & Significance

Shingle is defined as sediment with a mean grain size between 2 and 200mm diameter, i.e. larger than sand and smaller than boulders. Shingle beaches form in high energy environments where the waves pile up pebbles on the shore above the tideline¹. Five types of shingle beach have been recognised:-

- fringing beach - a narrow strip of shingle in contact with the land
- spit - a strip of shingle growing out from the coast
- bar - similar to a spit but growing across the mouth of an estuary or bay
- apposition beach - a series of large parallel ridges, often leading to formation of a cusped foreland
- barrier island - shingle deposited in shallow water offshore

Nearly one third of the coastline of England and Wales is bordered by shingle but in Scotland shingle beaches have a more restricted distribution, being found mainly in the southwest, the Moray Firth and the Northern Isles.

Vegetation can only become established on stable shingle structures, which are rather rare (see 2.4.5 Key habitat Coastal vegetated shingle structure). In NE Scotland there are two vegetated shingle structures: Culbin Bar, a barrier island which probably originated as a spit and Kingston Shingles, an apposition beach. There are also several shingle areas fringing beaches, mainly along the Moray Firth coast^{2 3}; some of the main sites are listed below:-

Site	Grid ref	length (km)
Findhorn	NJ0465	0.5
Covesea	NJ1770	0.5
Logie Head	NJ5368	1.0
Whitehills	NJ6365	1.5
Aberdour coast	NJ8864	2.0
Strathbeg	NK0759	0.5

Source: Barne *et al.*, 1996

Information sources

1. BSG, 1995b 2. Barne *et al.*, 1996 3. Doody *et al.*, 1993

2.4.5 Key habitat: Coastal vegetated shingle structures

Current Status, Extent & Distribution

There are two vegetated shingle structures in NE Scotland, both in Moray; Culbin Bar and Kingston shingles¹.

Site	Grid ref.	Area surveyed (ha)
Culbin Bar	NH9260	27
Kingston Shingles	NJ325660	127

Scottish / UK Significance

Although there are only two shingle structures in the area, these are two of the best examples of vegetated shingle structures in Britain, and Kingston Shingles is second only to Dungeness, Kent, in importance^{1 2 3}. Culbin Bar is unusual in being almost completely natural. Kingston, and the other major British sites in south-east England, have been considerably influenced by human activities. The shingle structures in the NE represent 19% of this habitat in Scotland (673ha) and 2.5% of the British total (5129ha).

Associated Species & Example Key Sites

Juniper *Juniperus communis* (Middle list) forms patches of scrub on bare shingle at Kingston. Ringed plovers (Long list) nest on shingle beaches.

Area / Quality Trend & Influential Factors

Kingston Shingles has previously been affected by shingle excavation and military activity, and is currently affected by afforestation, vehicle dumping and vehicular access. The latter has locally severe effects on the vegetation.

Information sources

1. Barne *et al.*, 1996 2. Sneddon & Randall, 1993 3. Sneddon & Randall, 1994

2.4.6 Broad habitat: **Boulders and rock above the high tide mark**

There do not appear to have been any surveys which have considered the habitat category of boulders and rock in the upper littoral zone.

More than one third (6700km) of the British coastline is rocky at the high tide mark and a high proportion (84%) of this is found in Scotland¹. Hard rocky shores are quite common in NE Scotland, grading into cliffs. The Natural Habitat Survey of Grampian records a total of 1678 ha of cliffs, rocky & shingle shores combined.

Information sources

1. BSG, 1995b 2. Doody *et al.*, 1993 3. Barne *et al.*, 1996

2.4.7 Broad habitat: **Coastal strandline**

On some types of shoreline, organic material frequently accumulates in a strandline around the high water mark¹. This can support annual vegetation and invertebrate communities. Strandlines are a rather transitory habitat and may be completely washed away by winter storms or be a precursor to other habitats, such as sand dunes. There is no estimate of the amount of strandline in the UK. Strandlines may occur on saltmarshes or shingle beaches (see 2.4.3, 2.4.4, 2.4.5). Along the coast of the Moray Firth, NE Scotland has some important wrack-matrix shingle beaches which have a significant accumulation of decaying seaweed and other detritus². These are important for the nationally scarce oyster plant *Mertensia maritima* (not listed).

Information sources

1. BSG 1995b; 2. Barne *et al.*, 1996.

2.4.8 Broad and Key habitat: **Coastal sand dune**

Current Status & Extent

Sand dunes form by accumulation of wind-blown sand grains, usually trapped by vegetation, and can only occur where there is a sufficiently large area of sandy beach drying out at low tide¹. Sand dunes are found along much of the coast of NE Scotland (Map 15), especially Moray and the east coast of Aberdeenshire between Fraserburgh and Aberdeen. South of Aberdeen, there is only one site in the area at St Cyrus².

A number of dune types are recognised, depending on how they are formed and dune habitats can also be classified according to the stage of succession and vegetation type^{1 3}. Foredunes or mobile dunes are actively building dunes, which are generally first colonised by marram grass *Ammophila arenaria*, sea couch grass *Elytrigia juncea* and lyme grass *Leymus arenarius*. Increasing in stability and diversity of vegetation are yellow dunes and dune grassland. On stable acid dunes, dune heath may develop. Dune slacks are a nationally rare type of wetland occurring within dune systems. Dune scrub and woodland can develop in both dry and wet areas of the dune system.

In NE Scotland, the total vegetated dune area is approximately 7000ha². The LCS88 survey records a dune area of 3358ha, but excludes dune woodland and scrub, which comprises about half the dune area in NE Scotland⁴ and forms a large proportion Scottish and British totals for this habitat (64% & 39% respectively of surveyed dunes)². The other main dune habitat types in the area are mobile & semi-

fixed dunes, fixed dune grasslands with approximately equal areas of acid and neutral / calcareous grassland, and dune heath & bracken².

Distribution

District	Site	Grid ref.	Area (ha)	Dune type
Moray	Culbin	NH980630	3100	acid
	Findhorn	NJ050648		
	Burghead Bay	NJ110680		
	Cummingstown	NJ132693		
	Hopeman	NJ143698		
	Covesea	NJ195713		
	Stotfield	NJ224709		
	Lossiemouth East	NJ250696		calcareous
Aberdeenshire	Cullen Bay	NJ500677		
	Findlater	NJ537673		
	Sandend	NJ557662		
	Whyntie Head	NJ630660		
	Boyndie Bay	NJ671647		
	Banff Bay	NJ695641		
	New Aberdour	NJ886647		
	Rosehearty	NJ935676		
	Fraserburgh Bay	NK010654		
	Inverallochy	NK050645		
	St Combs	NK053637		
	Loch of Strathbeg	NK080597	450	calcareous
	Ratray Head	NK104580		
	Ratray Bay	NK104550		
	Kirkton	NK119506		
	Ugie to Lunderton	NK117490		
	Peterhead	NK124452		
	Sandford Bay	NK123438		
	Cruden Bay	NK084350		
	Collieston	NK040285		
	Sands of Forvie	NK020270	763	acid
	Foveran to Drums	NK003233		
Menie to Pettens	NJ990205			
Balmedie	NJ978177			
Blackdog to Murcar	NJ965135			
Aberdeen City	Bridge of Don	NJ956105) 160	
	Aberdeen	NJ953070)	
Aberdeenshire	St Cyrus	NO753644		calcareous

Source: Barne *et al.*, 1996

Scottish / UK Significance

The sand dune habitats of the area are of considerable extent and variety. The total dune area (7022 ha) represents approximately 22% of the vegetated dune resource in Scotland (31,540ha) and 14% of the total for Great Britain (50,200ha)². As well as the large area of dune woodland, the area of dune heath is of national significance (12% of British total in surveyed sites). Several sites are of national importance.

Associated Species & Example Key Sites

Culbin Sands (3,100 ha) is the largest dune site in Britain and there is another very large dune system (763 ha) at the Sands of Forvie². There are good examples of dune slacks at Forvie while the Loch of Strathbeg is the largest dune freshwater system in Britain.

Several scarce species of vascular plant (not listed) are found in the area and several sites e.g. Culbin are important for lichens or invertebrates². The lichen *Cladonia mitis* (Middle list) is found on acid dunes at Culbin and Sands of Forvie, and Culbin is one of the 3 remaining sites for *Peltigera malacea* (suggested as locally important)⁵. The mosses *Bryum calophyllum* and *B. warneum* (Middle list) are found in calcareous dune slacks at Lossiemouth. The small blue butterfly *Cupido minimus* is found in dune grassland at St Cyrus, which is also of general importance for insects. Eiders and terns (Long list) nest among the dunes at Sands of Forvie, and wintering snow buntings (Long list) feed on marram grass seeds in sand dunes⁶.

Area / Quality Trend

At the majority of dune sites along the North Sea coast, erosion exceeds accretion, possibly due to coast protection structures interfering with sediment transport³. It is not clear whether dunes in NE Scotland follow this trend but there is concern that new groynes at Findhorn will reduce sediment supply and lead to erosion at Culbin². Although sand dunes are among the least modified of terrestrial habitats, areas have been lost or degraded by a variety of human activities and developments.

Factors Influencing Trend

A large area of natural dune vegetation has been lost to afforestation at Culbin. Gas pipelines pass through dunes at Cruden Bay and Rattray Bay but cause little damage. Recreational development has occurred at the inner edge of many sites, with car parks, campsites, caravan parks, and golf courses². These facilities also increase access, which can lead to erosion, trampling of vegetation and destabilisation. However, despite large numbers of people at, for example, Findhorn, Bridge of Don, Aberdeen and St Cyrus, such problems are relatively minor and localised in NE Scotland². Grazing, re-seeding and use of fertiliser alter the vegetation, for example, at Loch of Strathbeg. At this site, sand is also removed from the beach and dunes.

Information sources

1. BSG, 1995b
2. Barne *et al.*, 1996
3. Doody *et al.*, 1993
4. LCS88
5. Brian Coppins, pers. comm.
6. Adam Watson, pers.comm.

2.4.9 Broad habitat: Inlets and enclosed bays

The coastline of NE Scotland has only a few small estuaries and is generally lacking in inlets and enclosed bays. There are many artificial harbours, especially along the Moray Firth coast, where the shelter of the breakwaters may create some of the conditions of this habitat. The only natural inlet is the tidal area called The Gut, enclosed by sand and shingle bars at Culbin.

2.4.10 Broad and Key habitat: Saline lagoons**Current Status & Distribution**

Annochie lagoon near St Fergus (NK107533) is the only natural coastal lagoon in North-east Scotland. The area of the lagoon is 3 ha. Findhorn Bay, an estuary with a restricted mouth (see 2.4.1 Estuaries) approaches lagoon-like status but is not considered an important lagoonal habitat.

Scottish / UK Significance

Annochie lagoon represents only 0.4% of Britain's total natural lagoonal resource (or 1% of the total outside the very large lagoon of The Fleet in Dorset). It is not considered an important site.

Associated Species

No significant lagoonal vegetation types or invertebrate species² occur at Annochie lagoon.

Information sources

Barne *et al.*, 1996

2.4.11 Broad and Key habitat: Maritime cliff and slope**Current Status, Extent & Distribution**

A sea cliff is defined as a break in slope between 15° and vertical at the border of land and sea¹. Hard rock cliffs, such as granite, are eroded slowly by the sea, and are often near vertical, accumulating soil and supporting vegetation only on ledges. Soft rock cliffs are more unstable and often form a vegetated coastal slope. Cliff-top habitats include maritime grassland and coastal heath (see 2.3.22).

Cliffs account for much of the coastline of NE Scotland, especially Aberdeenshire. The coastline of NE Scotland is approximately 350km long, of which a total length of 108.5km is cliffs. There are long stretches of cliffs between Cullen and Fraserburgh, south of Peterhead and most of the coast south of Aberdeen. Most are hard (consolidated) cliffs, but there are also soft (unconsolidated) cliffs, for example, at St Cyrus and Collieston.

Some of the important cliff sites are listed below:-

Biological SSSIs noted for cliff & cliff top habitat

District	Site	Grid ref.
Moray	Masonshaugh	NJ120693
	Clashach to Covesea	NJ167704
Aberdeenshire	Cullen to Skateness coast	NJ574669
	Gamrie & Pennan coast	NJ824673
	Bullers of Buchan coast	NK110380
	Collieston to Whinnyfold coast	NK060310
Aberdeen City	Cove	NJ954005
Aberdeenshire	Fowlsheugh	NO881799

Scottish / UK Significance

More than half the cliffs in Britain are found in Scotland and the northeast has 6% of Scottish total and nearly 3% of British total length.

Associated Species & Example Key Sites

Internationally important numbers of breeding seabirds are found at Troup, Pennan & Lion Heads, Buchan Ness to Collieston coast, and Fowlsheugh. Cliff nesting species include razorbill, gannet, shag (Long list), kittiwake and guillemot (not listed but important large colonies in NE)³. Dickie's bladder fern *Cystopteris dickieana* (Long list) is found in sea caves south of Aberdeen.

Area / Quality Trend & Influential Factors

The nature of cliffs has ensured that they remain among the least modified of terrestrial habitats. Coastal protection structures at the base of cliffs are rare in NE Scotland and therefore natural erosion is the main influence on the physical structure of the cliffs. However, large areas of cliff-top habitat have been lost in NE Scotland, as elsewhere, mainly to agriculture. Cliff habitats are popular for their scenic value and many cliff-top footpaths are heavily used. This can lead to erosion, trampling of vegetation and disturbance of breeding birds, but does not appear to have led to serious problems in NE Scotland.

Information sources

1. Doody *et al.*, 1993 2. Barne *et al.*, 1996 3. Lloyd *et al.*, 1991

2.4.12 Broad habitat: Open coast**Status, Distribution & Significance**

Open coast includes intertidal areas and subtidal areas out to the approximate limits of coastal influence. Where there is a gradually sloping seabed and only minimal input of freshwater from rivers, this is probably about 3 nautical miles from the low water mark or at a depth of 50m. Where estuarine plumes extend offshore or there are offshore features such as reefs, the coastal influence may extend further offshore. Open coast habitat can include waters up to 6 miles offshore¹.

In NE Scotland, it seems likely that the open coast habitat extends further offshore in the Moray Firth than along the North Sea coast, due to the greater estuarine input and degree of shelter in the Moray Firth. Intertidal habitats are strongly affected by the degree of exposure and also the tidal range. NE Scotland has a moderate tidal range, much less than some other parts of the UK. The mean tidal range at springs varies from 3.1m (Macduff) to 3.9m (Stonehaven). At Aberdeen, the mean spring tidal range is 3.7m and the maximum tidal range (LAT-HAT) is 4.9m.

Most of the coastline of NE Scotland is classed as exposed or moderately exposed². There are no extremely exposed shores and very sheltered shores are confined to the estuaries which are considered separately (2.4.1). Sand (mean particle size of 0.062 - 2mm) is the commonest intertidal sediment of open coast, and sandy shores are widespread in NE Scotland, as elsewhere along the North Sea coast. There is, for example, a long stretch between Aberdeen and the Ythan Estuary. Of intertidal hard substrata, exposed bedrock and boulder shores are found along the outer Moray Firth coast, and moderately exposed bedrock and boulder shores along the coast south of Aberdeen and also around Peterhead.

The sublittoral hard substrata of the area are poorly known and probably of limited extent below most rocky shores. However, there is an outcrop of bedrock on the seabed between Banff and Fraserburgh³. Most of the inshore area of NE Scotland has a sandy seabed but the sediments are generally coarser, gravel and sandy gravel, from Spey Bay to Rattray Head.

Many waders, e.g. dunlin, redshank (Long list) feed in intertidal areas and coastal waters are important for seabirds, seaduck and divers, e.g. razorbill, shag, cormorant (Long list), common scoter (Middle list), eider and red-throated diver (Long list). Seals (Long list) are found mainly in coastal waters, which are also frequented by harbour porpoise (Short list) and bottlenose dolphin (Middle list). Salmon, river lamprey and sea lamprey (Long list) also move through coastal waters, while the common goby (Long list) is found on the seabed, as are horse mussel (Middle list) and dogwhelk (Long list).

Information sources

1. BSG, 1995b 2. Doody *et al.*, 1993 3. Barne *et al.*, 1996

2.4.13 Broad habitat: **Open seawater column**

Status, Distribution & Significance

The open sea is defined as areas beyond 6 miles from the low water mark¹. NE Scottish waters include part of the Moray Firth and North Sea out to the boundary with Norwegian waters at approximately 2° E. The North Sea is influenced by both oceanic water from the North Atlantic and freshwater input from several major rivers. The major inflow of oceanic water is between Shetland and Norway resulting in high salinities in offshore waters of the northern North Sea². Offshore areas of the North Sea (except the Southern Bight) become thermally stratified in the summer months, with a marked thermocline. Close to the coast, the water remains well-mixed throughout the year. The stratification extends into the Moray Firth but off the Aberdeenshire coast there is a tidal front (the Buchan front), in the transitional zone between stratified and well-mixed water masses. Fronts are generally rich in plankton and therefore of importance to other marine animals³.

The open sea is important for many seabirds, e.g. razorbill (Long list), particularly during the breeding season and post-breeding moult, cetaceans such as porpoise (Short list), minke whale (Middle list), white-beaked dolphin (Long list) and fish, e.g. basking shark (Middle list).

Trends & Influential Factors

The North Sea is among the more heavily polluted seas of the world⁴. Pollutants enter the marine habitat from many sources and include oil, organochlorines, heavy metals and sewage. Marine ecosystems are also affected by over-exploitation of fish stocks, which has certainly occurred in the North Sea in the past.

Information sources

1. BSG, 1995b 2. Doody *et al.* 1993; 3. Barne *et al.* 1996; 4. Evans, 1987

2.4.14 Broad habitat: **Offshore seabed**

Status, Distribution & Significance

The seabed close to the coast is classified as Open Coast habitat (see 2.4.12 above), while that more than 6 miles from the coast and beyond the immediate influence of coastal processes is classified as offshore seabed¹. The offshore seabed covers the same area as the Open seawater column. The North Sea lies within the continental shelf and depths do not exceed 160m in NE Scottish waters, with most of the area 40 - 120m deep². The deepest waters are found in the Fladen Grund, a large depression centred about 150km east of the Moray Firth, and small areas in the outer Moray Firth.

Sediments are mainly sandy, varying in coarseness from sandy gravel to mud^{2 3}. The finer sediments are generally found in deep areas with weak tidal currents, e.g. large areas of sandy mud and some mud in the Fladen Grund. The coarsest sediments are small areas of sandy gravel extending from the coast near Fraserburgh and on the Smith Bank in the middle of the Moray Firth. Outcrops of rock are rare in the North Sea and are not found offshore in NE Scotland.

Trends & Influential Factors

The major impacts on the seabed are fisheries using bottom trawl gear and operational discharges around oil and gas installations¹. There are many platforms associated with the large oil and gas fields, mostly in the east of the area e.g. Forties oilfield, c 175km east of Aberdeen.

Information sources

1. BSG, 1995b 2. Doody *et al.*, 1993 3. Barne *et al.*, 1996