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The Flow Country

The peatlands of Caithness and Sutherland

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Part IV

17 The ornithological importance of the Caithness and Sutherland blanket bogs

This report has described the peatlands of Caithness and Sutherland principally in structural, hydrological and botanical terms. The blanket bogs are also of great ornithological importance, both nationally and internationally. This ornithological interest is fully described in the NCC's publication *Birds, Bogs and Forestry* (Stroud *et al.* 1987). So that the patterns of ornithological importance can be related to other features of conservation interest, this chapter summarises the main findings of that report.

General characteristics of the avifauna

The Caithness and Sutherland blanket bogs support a particularly varied northern type of bird fauna not found in identical composition elsewhere in the world. This includes several taxonomic/ecological groups - waders, other waterfowl, raptors and scavengers, passerines and a miscellany of other types.

There are particularly important breeding populations of golden plover, dunlin, greenshank and arctic skua. The lochs and smaller *dubh lochain* support breeding red-throated and black-throated divers, greylag geese, widgeon, teal, common scoters and red-breasted mergansers. Common and black-headed gulls nest in small colonies. Rare breeding waders include Temminck's stint, ruff, wood sandpiper and red-necked phalarope. Raptors such as hen harrier, golden eagle, merlin, peregrine and short-eared owl also use the bogs as breeding or feeding areas. Many of these species have their main distribution in sub-arctic and arctic areas, and the peatlands of Caithness and Sutherland have considerable ecological affinities with the arctic tundras.

Considerable bird populations are present (Table 10), although densities of individual species are often low. As described below, Stroud *et al.* (1987) estimated that some 4,000 pairs of golden plover, 3,800 pairs of dunlin and 630 pairs of greenshank breed on these peatlands.

The NCC's Moorland Bird Surveys

In 1979, the NCC launched a programme of breeding bird surveys of moorlands likely to be affected by afforestation. This particularly concentrated on Caithness and Sutherland (Stroud *et al.* 1987), where its aims were fivefold -

- 1 to identify, from sites surveyed, breeding bird assemblages of high nature conservation interest in terms of species diversity and population density;
- 2 to collect data to assess and identify habitat features important to the breeding birds and from these associations to predict the location of other areas of high ornithological interest;
- 3 to estimate the size of the populations of breeding birds (especially waders) dependent on the peat flows of Caithness and Sutherland;
- 4 to understand the effects that rapid changes - especially those resulting from afforestation - would have on these birds;
- 5 to make recommendations for the conservation of the bird assemblages of the Caithness and Sutherland peatlands.

To these ends, sample areas were surveyed in Caithness in 1979, 1980 and 1984 and in Sutherland from 1980 to 1986. Additionally to the NCC's survey work, the Royal Society for the Protection of Birds carried out other surveys in the same region between 1980 and 1986. In total, the NCC and RSPB surveyed waders on 77 sites (sample areas) in Caithness and Sutherland. The sites were chosen to include many examples of all the major peatland habitats within the total range of types occurring within Caithness and Sutherland. Full details of the methodology employed by the surveys are given by Stroud *et al.* (1987).

The results of these surveys demonstrated that the waders are outstanding in overall numbers and diversity, and the occurrence of at least 15 breeding species reflects the variety of peatland and open

Species	Arctic breeding species (Sage 1988)	Annex I species of EEC Birds Directive	Schedule I species of Birds	Appendix I species of W & C Act 1981	Estimated Caithness/Sutherland Peatlands population (pairs)	Estimated British population (pairs) ²	Percentage of British population in Caithness/Sutherland	Status elsewhere in EC	Percentage of EC population in Caithness/Sutherland	World distribution
Red-throated diver	★	★	★	★	150	1,000-1,200	14%	Absent	14%	Boreal—high arctic
Black-throated diver	★	★	★	★	30	150	20%	Absent	20%	Boreal—mid arctic
Greenland white-fronted goose	★	★			c. 200 ³	c. 9,500 ³	2%	9,300 ³ (Ireland)	1%	W. Greenland/Britain/Ireland — restricted and localised
Grey heron		+				3,500-8,500		Scattered		Temperate Palaearctic — at N.W. limit of range
Greylag goose		+	★		c. 300	600-800	43%	Scattered	— ⁴	Scattered — eastern continental to subarctic
Wigeon	★	+			80	300-500	20%	Absent	20%	Palaearctic
Teal	★	+				3,500-6,000		Widespread		Widespread — continental to low arctic
Mallard	★	+				40,000+		Widespread		
Common scoter	★	+	★		30+	75-80	39%	c. 100 (Ireland)	16%	Boreal—low arctic
Goldeneye		+	★			>40				
Red-breasted merganser	★	+				1,000-2,000		North only		Boreal—low arctic
Goosander		+				900-1,300				
Hen harrier	★	★	★		30	600	5%	Scattered	1%	Widespread
Sparrowhawk						15-20,000				
Buzzard						8-10,000		Widespread		Widespread
Golden eagle	★	★	★		30	510	6%	Scattered	<1% ⁵	Widespread
Kestrel		+		★		30-40,000		Widespread		Widespread
Merlin	★	★	★	★	30	600	5%	Ireland only	4%	Boreal—low arctic — decreasing in numbers in Britain for reasons attributed to land-use change
Peregrine	★	★	★	★	35	730	5%	Scattered	<1% ⁶	Widespread
Red grouse								<i>L. l. scoticus</i> elsewhere only in Ireland		Boreal—low arctic — British/Irish race decreasing throughout range
Black grouse						10-50,000				Northern coastal to low arctic
Oystercatcher	★	+				33-43,000		Mainly northern and coastal		Northern coastal to low arctic
Ringed plover	★	+		★		8,600		Scattered — northern coastal		Northern coastal to mid arctic
Golden plover	★	★			3,980	22,600	18%	<650 prs	17%	Boreal—mid arctic, but several distinct races: most of temperate population breeding in Britain
Lapwing		+			500	181,500	<1%	Scattered		Boreal—continental — Britain holding highest numbers in Europe
Temminck's stint	★	+	★	★	<10	<10	—	Absent	—	Montane boreal—low arctic
Dunlin	★	+		★	3,830	9,900	39%	<1,000 prs	35%	Boreal—mid arctic, but temperate population largely restricted to Britain
Snipe	★	+			c. 500+	29,600	3%	Widespread but local		Boreal—low arctic arctic
Woodcock		+				8-35,000		Scattered		Boreal—low arctic: Palaearctic to N. India
Ruff	★	★	★		<10	10-12	—	Local in Low Countries: c. 2,000 prs	—	Temperate—boreal—low arctic
Curlew		+			500	33-38,000	1%	<10,000 prs	1%	Mid continental—subarctic
Redshank		+			100	32,100	<1%	Scattered		Widespread — continental, mainly northern
Greenshank		+	★		630	960	66%	Absent	66%	Boreal to edge of low arctic — mainly natural forest bogs in Fennoscandia
Wood sandpiper	★	★	★	★	<10	1-12	—	c. 150 prs	—	Boreal to edge of low arctic
Common sandpiper		+		★	500	17-20,000	3%	Scattered		Widespread — continental to low arctic

Species	Arctic breeding species (Sage 1986)	Annex 1 species of EEC Birds Directive	Schedule 1 species of Birds Convention	Appendix 1 species of W & C Act 1981	Estimated Caithness/Sutherland peatlands population (pairs)	Estimated British population (pairs) ²	Percentage of British population in Caithness/Sutherland	Status elsewhere in EC	Percentage of EC population in Caithness/Sutherland	World distribution
Red-necked phalarope	★	★	★	★	<10	19-24	—	Absent	—	Montane boreal—low arctic
Arctic skua	★	+			60+	2,800+	2%	Absent	2%	Boreal—high arctic
Black-headed gull		+				120-220,000		Widespread but scattered		Continental—boreal
Common gull	★	+			c. 4,000	40,000	10%	Scattered		Northern continental to low arctic
Great black-backed gull		+				22,000		Scattered and localised — Ireland/France/Denmark		Coastal — North Atlantic
Lesser black-backed gull		+				70,000+		Scattered — coastal		Continental coastal to low arctic
Short-eared owl	★	★		★	50	1,000+	5%	Widespread	4%	Widespread
Skylark		+				2 million		Widespread		Widespread
Meadow pipit	★	+				1-1.5 million		Widespread		Widespread — continental—subarctic
Grey wagtail		+		★		15-40,000				
Pied wagtail		+		★		300,000				
Dipper				★		20-25,000		Scattered — subalpine		Widespread — sub-montane—subarctic: declines in highly afforested areas attributed to acid run-off
Whinchat		+		★		15-30,000				
Stonechat		+		★		20-40,000				
Wheatear	★	+		★		60,000		Widespread		Widespread
Ring ouzel		+				6-12,000		Subalpine/alpine		Alpine to boreal—subarctic
Sedge warbler		+		★		200,000				
Hooded crow						1 million				
Raven						4,000				
Twite		+		★		15-30,000				

1 Species marked ★ are listed on Annex 1 of the EEC Directive on the Conservation of Wild Birds as requiring special protection measures, particularly as regards their habitat under Article 4(1). Species marked + are migratory and require similar habitat protection measures under Article 4(2).

2 This excludes the whole of Ireland.

3 Individuals.

4 EC population uncertain owing to unknown proportion of feral birds in other populations. The population in north-west Scotland is the only one thought to be natural, owing to separation from others.

5 Most of the EC population is of the south European race *homeyeri*; Britain holds all of the EC population of the nominate race, 6% of which occur on the Caithness and Sutherland peatlands.

6 Most of the EC population consists of the Mediterranean race *brookei*; Caithness and Sutherland peatlands hold 5% of the EC population of the nominate race.

Table 10

Population and distribution data for birds occurring on the peatlands of Caithness and Sutherland.

water habitats. Golden plover, dunlin, greenshank and curlew occur with high constancy in the sample areas and so have large total populations within the region (see below). Common sandpiper and snipe are also widespread and numerous, but several species are somewhat local - lapwing, oystercatcher, redshank and ringed plover.

The overall density of waders at different sites varied considerably (Figure 82). In Caithness, densities for all breeding waders ranged from 0.9 to 14.0 pairs/km², and in Sutherland from 0.2 to 14.3

pairs/km². The overall mean density of breeding waders was 5.4 pairs/km², but this excluded steep, montane and other areas unsuitable for waders as explained by Stroud *et al.* (1987). The number of breeding waders found on any one site varied between one and ten.

Densities of individual species varied widely according to the differing ecological conditions of the sites. These are summarised and explained in more detail elsewhere (Stroud *et al.* 1987).

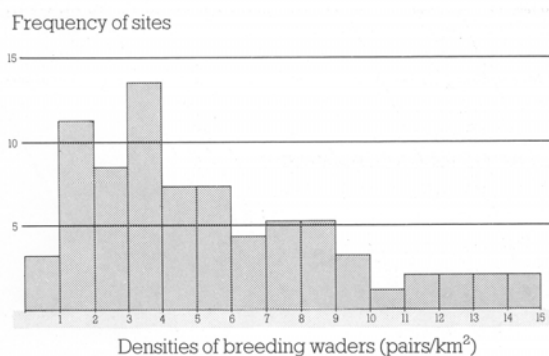


Figure 82 The total density of breeding waders on surveyed sites in Caithness and Sutherland.

Overall distribution and numbers of peatland birds in Caithness and Sutherland

Only about one fifth of the peatlands of the region has been surveyed in detail by the standard method employed. Yet the 77 plots surveyed, covering 51,929 ha (Table 11: 19% of the remaining area suitable for breeding waders), required 433 separate visits during 22 man-summers of fieldwork over the period 1979-1986. There are obviously considerable logistical and financial constraints to surveying the remaining 81% of the peatlands to the same standard. A major aim of the analysis in *Birds, Bogs and Forestry* was thus -

- to find out if there were consistent relationships between breeding bird densities and habitat features recognisable on standard Ordnance Survey maps;
- to use any such associations, in combination with information on such habitat features derived from the maps, to predict the ornithological quality of the unsurveyed areas;
- to examine the further possibility of using such associations between breeding densities and map attributes to estimate the total bird populations found in each habitat category and in the total peatland area;
- to enable pre-afforestation maps to be used to assess the previous ornithological quality of land now afforested and, from this, to estimate the reductions in populations, on the same principle as that used for estimating the present populations.

Population estimates and losses of blanket bog waders

Using habitat preferences shown by waders in Caithness and Sutherland (Table 12), Stroud *et al* (1987) derived four categories of "landform". These landforms combine ecological features of importance to waders and physical features identifiable from map evidence. As such they describe identifiable patterns of structural variation across the peatlands.

Category	Area (ha)	Category as percentage of land area
Total area of Caithness and Sutherland	764,094	100%
Ancient, semi-natural and long-established woodland	12,204	1.60%
Forestry plantations	73,046	9.56%
'Improved' agricultural land and human settlements	104,090	13.62%
Fresh water (minimum area)	25,170	3.29%
Land too steep/high for moorland waders (including some high-altitude blanket bog) and coastal areas	279,484	36.58%
Remaining area of blanket bog currently suitable as breeding habitat for moorland waders*	270,100	35.35%
Total moorland surveyed (included in last category)	51,929	6.80%

* The area of peatland recorded as suitable habitat for breeding waders does not equate to the full extent of blanket bog. There are considerable areas of steep, high-altitude blanket bog that are not considered suitable breeding habitat.

Table 11

Land-use and ornithological survey in Caithness and Sutherland.

	Vegetation type								Vegetation height			Vegetation age			Wetness		
	<i>Trichophorum/ Myrica</i> mire	<i>Calluna/ Eriophorum</i> mire	<i>Juncus</i> flushes	Dry <i>Trichophorum</i>	Dry <i>Calluna</i> sward	Grass patches	Mosaic of vegetation types	<10cm	10-20cm	>20cm	Young	Medium	Old	Pool/dubh lochan complexes	Bog	Damp	Dry
Golden plover	+	+	●	—	—	●	●	+	+	+	+	●	●	+	+	+	●
Dunlin	+	+	●	—	—	—	●	+	●	—	+	●	●	+	+	●	—
Greenshank	+	●	—	—	●	—	+	+	●	—	+	+	●	+	+	+	+
Curlew	—	—	+	—	—	●	+	+	+	+	+	●	—	—	—	+	●
Snipe	—	—	+	—	—	+	+	+	+	+	+	—	—	—	●	+	—
Redshank	—	—	+	—	—	+	+	+	+	+	+	●	—	—	—	+	—

Key: + preferred
— avoided
● no obvious trend

Habitat preferences encompass all the summer activities during the breeding season and include habitats selected for their feeding, nesting and young rearing potential. The surveys did not aim to locate nests, they have tended to record birds in their most visible locations, often at or near feeding places.

The features used in formal identification of categories from maps are given in Table 13, and the following descriptions amplify these in relation to what can be seen on the ground.

Category A comprises the very wettest areas of peat, with numerous pool complexes and extensive *Sphagnum*-dominated flows set in a bog-covered landscape. Maps show high densities of *dubh lochain* clustered into obvious pool complexes, but there are also scattered larger lochans. The ground is either virtually flat or gently sloping, with no steep gradients. There are few, if any, rocky outcrops and no crags are shown on the maps.

Category B consists of sloping blanket bog with pools and is drier. There is a low density of pools, set more or less discretely on gentle slopes, and the ground consists of gentle ridges and watersheds but is not flat. Rocky outcrops and drier morainic features, whilst not numerous, can be evenly spaced across wide areas. There are often numerous larger lochs within the landscape. The blanket bog communities are drier and less *Sphagnum*-dominated than in the previous category, and the surface vegetation is often eroded into gullies. These are either natural or are caused by overgrazing or

by severe fires which expose often extensive areas of bare peat.

Category C is that of steeper and more broken ground. Here the gradients are steeper, with no substantial areas of pools or *dubh lochain*. The ground is often highly eroded, with few, if any, wet *Sphagnum*-dominated areas. Rocky outcrops and dry morainic features are abundant. Podsollic and gley soils with shallow peat surface horizons prevail, rather than true blanket peat. The vegetation tends to have *Trichophorum cespitosum*, *Molinia caerulea* or *Calluna vulgaris* dominant and is of the type characterised as 'wet heath' or, in the driest situations, acidic dwarf shrub heath.

Category D is the steepest ground, with screes, outcrops, crags, high montane watersheds and summits with fell-field and shallow montane blanket bog. This was considered to be unsuitable habitat for most moorland waders. Because of the very low wader densities found during preliminary work in these steep moorland and rocky areas, sample plots generally excluded such areas, and it does not form part of the analysis.

Stroud *et al.* (1987) found that each landform

Category	Dubh lochans	Streams	Lochs	Topography	Gradients
A: Pool complexes and wet <i>Sphagnum</i> flows	High density of pools and dubh lochans clustered in obvious pool complexes. Usually at least one pool complex or marsh symbol per 1 km ² . Pool complexes with more than 10 pools per complex.	Few streams, with none issuing from watershed mire pool complexes.	Scattered larger lochs, usually with gently curved edges indicating peaty banks.	Flat, open and obviously boggy.	Gently sloping to flat, with very low gradients. Generally less than five 25-ft contours crossed per 1 km ² diagonal at 1:25,000.
B: Sloping blanket bog with pools	Low density of pools set more or less discretely Pools less than 10 per complex, or less than one complex per 1 km ² .	More streams, often branched into dendritic drainage systems hillsides.	Larger lochs often numerous and irregular in shape.	Gentle ridges and watersheds.	Generally low gradients, but sloping gently— not flat. Usually from five to 12 25-ft contours crossed per 1 km ² diagonal at 1:25,000.
C: Steeper and broken ground	No marsh symbols or dubh lochans marked on 1:25,000 map. Very few, if any pools.	Streams and waterfalls down steep slopes.	Few large lochs, although sometimes surrounded by steep banks.	Hillsides and broken or rough ground indicated on map.	Gradients steeper: more than 13 25-ft contours per 1 km ² diagonal at 1:25,000.
D: Montane and other unsuitable areas	None.	Linear, with many waterfalls and streams descending steep slopes.	Small lochs usually in corries, often steeply embanked.	Mountainous, with considerable areas of bare rock/scree shown on map.	Very steep slope, usually more than 25 25-ft contours per 1 km ² diagonal at 1:25,000.

Table 13

Features used in categorisation of the Caithness and Sutherland peatlands into four landforms for estimation of breeding wader populations. Landforms were assessed from 1:25,000 maps.

category held differing densities of breeding waders. The validity of using these landform types to estimate numbers and densities of breeding waders was demonstrated in a series of detailed statistical tests, explained more fully in their report. The conclusions drawn from these tests were that -

- the categories of peatland (Table 13) are real and reflect identifiable habitat types;
- it is possible to identify these categories on the basis of map evidence alone.

This has important implications, since it means that the quality of bird habitats of the whole area of blanket bog of Caithness and Sutherland outside survey sites can be assessed.

The total area suitable for breeding waders was divided into three of the four landform categories, as described by Stroud *et al.* (1987). The area of each of the three landform categories was then calculated, and multiplying by the average densities for each category provided population estimates for the peatlands of Caithness and Sutherland. Stroud *et al.* (1987) give the detailed calculation of these totals in their Table 4.5. The distribution of these different areas across the Caithness and Sutherland peatlands is shown in Figure 83.

Golden plover

A total of 3980 pairs of golden plovers is estimated to breed on the remaining unplanted peatlands in

Caithness and Sutherland. The total British breeding population is estimated at about 22,600 pairs (data collated for Piersma 1986); thus the Caithness and Sutherland peatlands hold some 18% of British breeding golden plovers and 17% of the breeding population within the European Communities' territories (Table 10).

The breeding distribution shows that golden plovers avoid agricultural land in the extreme north-east of Caithness and have a strong affinity for peatland. Unlike dunlin and greenshank, golden plover densities are often greater on slightly eroded peatlands where there is an even spacing of small hags and hillocks. The highest densities coincide with the area of greatest forestry expansion (Stroud *et al.* 1987), thus giving a potential for further severe losses if afforestation of peatland habitat continues at its current rate.

Dunlin

A total of 3830 pairs of dunlins is estimated to breed in Caithness and Sutherland. Thus Caithness and Sutherland hold about 39% of the British breeding population of 9900 pairs and 35% of the European Communities' breeding population (Table 10). The highest breeding densities in Caithness and Sutherland show close agreement with the extensive wet areas of peatland. This species is thus one which would be directly and significantly affected by loss of further peatland habitat in Caithness and Sutherland.

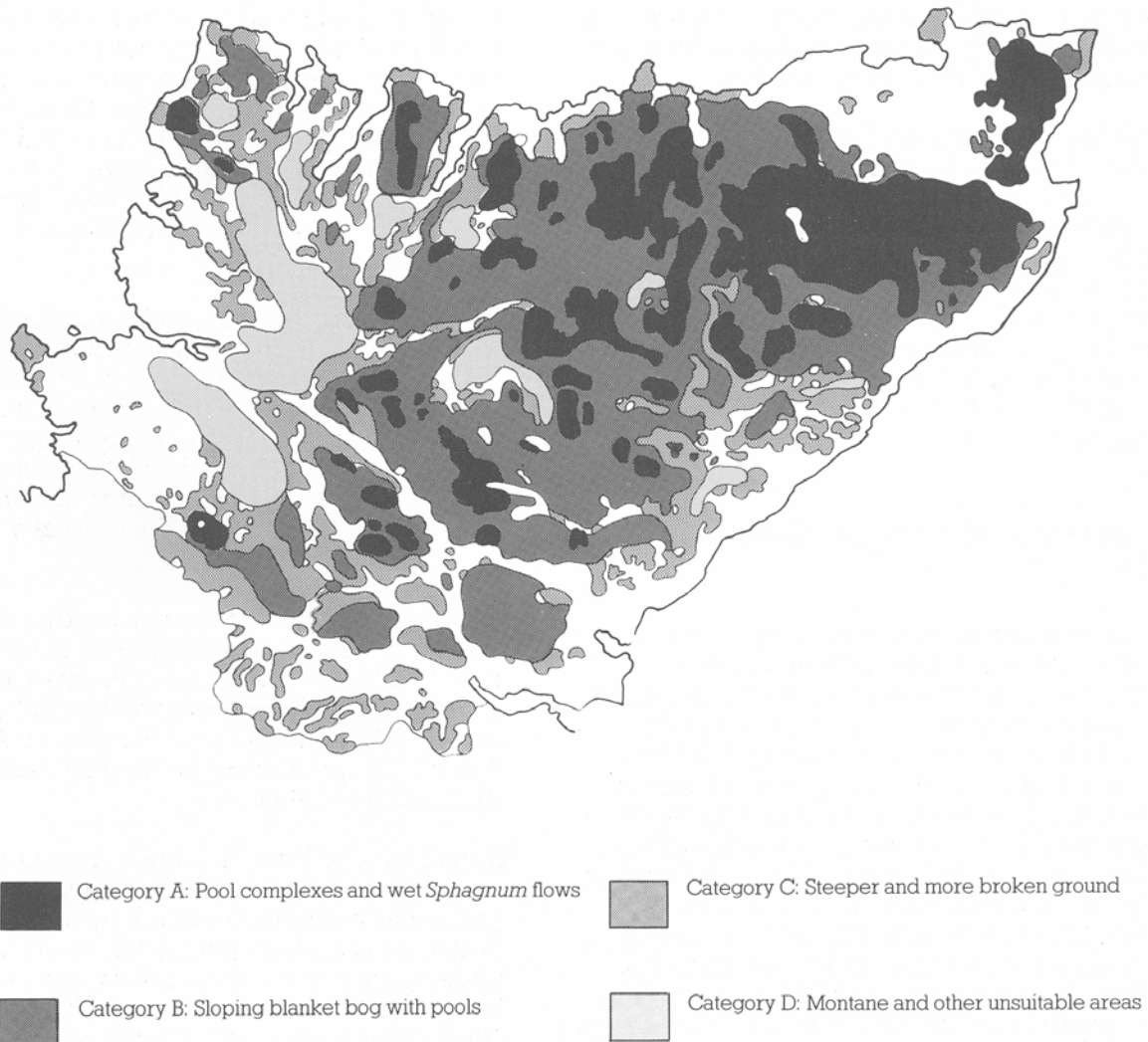


Figure 83 Extent and quality of habitat for breeding moorland waders on the Caithness and Sutherland peatlands, shown as the landform categories of Table 13.

Greenshank

A total of 630 pairs of greenshanks is estimated to breed in Caithness and Sutherland on landform categories A, B and C. The total British breeding population is currently estimated at 960, with most of the remainder being in Ross and only small numbers breeding elsewhere (Sharrock 1976). Thus Caithness and Sutherland hold about 66% of the British (and therefore the European Communities') breeding population of this species (Table 10).

Although greenshanks are widespread in the extreme west of Sutherland (Nethersole-Thompson, D. & M. 1979), the habitat here is fragmented and discontinuous because of interruption by unsuitable high mountains. In Caithness and east Sutherland the breeding habitat is much more continuous. Greenshanks avoid the agriculturally modified land in the north and east of Caithness and are strongly associated with peatlands throughout both Districts.

Losses of peatland birds

The methods used to estimate the quality of breeding habitat and hence the overall numbers of breeding waders on existing moorland can also be used to estimate the losses of these on areas recently afforested. The areas of recent planting and land released for planting were superimposed on earlier, pre-afforestation Ordnance Survey maps and the quality of lost peatland habitats assessed according to the four landform categories of Table 13. It was then calculated that 912 pairs of golden plovers, 791 pairs of dunlins and 130 pairs of greenshanks once used moorland occupied or planned to be occupied by plantations (see Figure 26). On this basis, the original, pre-afforestation populations for the Caithness and Sutherland peatlands can be calculated to have been 4900 pairs of golden plovers, 4620 pairs of dunlins and 760 pairs of greenshanks. There has thus been an actual or predictable loss of 19% of golden plovers, 17% of

dunlins and 17% of greenshanks as a direct effect of afforestation. It has not been possible yet to estimate the losses of other breeding bird species, but many can be presumed to have been affected.

Some of the Caithness and Sutherland peatland birds which occur widely in the British uplands have already lost a good deal of ground elsewhere, through the widespread afforestation of their habitats on both blanket bog and drier moorland. These losses are almost certain to continue through still further afforestation, so that the Caithness and Sutherland populations of affected species will become an increasing proportion of the British totals - unless afforestation continues here, too, at the present rate.

The numbers of other peatland breeding birds

The previous section has shown that it is possible to estimate numbers of golden plover, dunlin and greenshank based on their characteristic association with certain habitat and landform types. For the other peatland birds there are varying difficulties in estimating total population size, previous losses to afforestation or areas which are especially important. For some of the rare species and those favouring localised habitats which are shown on, and therefore easily located from, detailed maps (e.g. pool systems, larger lochs or crags), there are already counts of a large proportion of the total population. Special surveys of arctic skua, black-throated diver, peregrine and golden eagle have given good census information about total breeding numbers.

Other species are patchily distributed according to the occurrence of specialised habitats which are not readily identifiable from maps (e.g. snipe, ringed plover and redshank), and yet others are evidently widespread but elusive (e.g. merlin and short-eared owl). The rarest species, especially of waders, are extremely difficult to find, and in such a large area it is unlikely that all breeding pairs have been discovered. The 77 surveyed sites may give a reasonable sample from which the total numbers of some of these other species could be estimated within broad limits, but there is no means yet of testing such an assumption.

Summary of the ornithological interest

The outstanding features of the ornithological interest of the Caithness and Sutherland peatlands are the high species diversity and the large populations of breeding waders. No fewer than 15 species of waders are known to nest in the region and these include 66%, 39% and 18% of the total British breeding populations of greenshank, dunlin and golden plover respectively. There is a wider

ecological spectrum of breeding birds, including waterfowl, raptors and passerines, than for any other moorland area in Britain. Important fractions of the total British breeding populations of other species are as follows - red-throated diver (14%), black-throated diver (20%), greylag goose (wild stock - 43%), wigeon (20%), common scoter (39%), hen harrier (5%), golden eagle (6%), merlin (5%), peregrine (5%), common gull (10%) and short-eared owl (5%),

Rare and local species are well represented, there being three species (Temminck's stint, ruff and wood sandpiper) each with 1-10 pairs nesting in Britain, two species (common scoter and rednecked phalarope) with 10-100 pairs nesting in Britain and seven species (black-throated diver, greylag goose, wigeon, hen harrier, golden eagle, merlin and peregrine) with 100-1000 pairs nesting in Britain.

For 11 species, the area contains significant fractions of the total EC breeding populations, as follows - red-throated diver (14%), black-throated diver (20%), wigeon (20%), common scoter (16%), hen harrier (1%), merlin (4%), golden plover (17%), dunlin (35%), greenshank (66%), arctic skua (2%) and short-eared owl (4%).

Several species have declined and/or are still declining elsewhere in Britain - wigeon, buzzard, golden eagle, merlin, red grouse, golden plover, dunlin, snipe, curlew, greenshank, red-necked phalarope and raven. Some of these have already been reduced in numbers through afforestation in other districts as well as in Caithness and Sutherland.

Many of the above species are mainly or wholly northern European (boreal-arctic) in distribution and depend in the rest of their range on naturally treeless open wetlands and tundras. Britain supports the southernmost populations of these birds because of the large extent of open moorland resembling these more northern habitats. Caithness and Sutherland are an especially favourable area for this bird assemblage because the conjunction of climate and topography have given large areas of wet blanket bog, with a wide variety of associated open water habitats which simulate tundra. Some of the characteristic breeding birds of northern tundra are different, however, the goose tribe being represented in Caithness and Sutherland only by the greylag and the whimbrel being replaced by the curlew, so that the precise combination of species is not exactly replicated anywhere else in the world.

In the winter the region remains important for several scarce or local bird species. The peatlands are used as feeding habitat and roosting sites by internationally significant numbers of Greenland white-fronted geese. Golden eagles and hen harriers stay to hunt the moors, and the red grouse population is resident.

Part V

18 The amalgamation of different conservation interests in the Caithness and Sutherland peatlands

by Dr D A Ratcliffe, Chief Scientist

The overlap of different interests and relevance of the ecosystem concept

The high degree of interest and, hence, the requirements for conservation of blanket bog, open waters and birds in the region overlap considerably and so are mutually reinforcing. Many parts of the peatlands have high combined interest, but this is not always so. While there is a general correlation in quality between certain structural/vegetational and ornithological features, an overall conservation case based on the one would fail to take adequate account of the other. There should not, moreover, be any presumption that an area rating highly for only one interest provides an insufficiently strong case for conservation action.

While survey and evaluation have been approached in a compartmental way, dealing with different interests separately, this is an artificial procedure adopted for pragmatic reasons. A reductionist approach to conservation is usually unsatisfactory, because the ecosystem is more than the sum of its parts. The ecosystem represents the totality of nature, in the functional interdependence of the many physical and biological components and the complexity of their relationships. The ecosystem should thus be the basis of conservation concern.

Unless some attempt is made to define its physical limits in a real situation, the "ecosystem" nevertheless remains an abstraction. In the case of the Caithness and Sutherland peatlands, the central habitat type, blanket bog, is inseparable from open water habitats, varying from pools to lochs and from rills to rivers. The association with other mire types (especially soligenous and valley mires), wet heaths and dry, often rocky heaths is also close and usually lacking in clear boundaries. We are dealing with a moorland ecosystem complex as an entity which equates with a geographer's concept of "landscape"

Conservation practice should, as a principle, aim to maintain the wholeness of such an ecosystem

complex. In upland areas generally, conservation should attempt as far as possible to safeguard topographic units consisting of all the catchments which drain from a main watershed, down to the limits of enclosed farmland below. On low moorlands, with mainly gentle relief, it is usually more difficult to define topographic units than in high mountain country, and the areas involved are sometimes large.

The present impact and future portents of afforestation

By 1987, 67,000 ha (17%) of the original peatland area had been planted or programmed for planting, causing a direct loss of habitat through the ecological transformation involved. This overall figure does not convey how afforestation has fallen extra heavily on some of the best flow areas for peatland and ornithological interest. Beyond this direct impact, plantations can create severe and unnatural breaches of the topographic and ecosystem integrity mentioned above (e.g. Stroud *et al.* 1987, pp. 7, 80 and 88). The direct competition between conservation and recent afforestation has meant that areas of high peatland interest now frequently adjoin plantations and in some cases have even been lost since they were surveyed. Figure 84 indicates the distribution of surviving sites of national significance in relation to established or approved planting schemes. The more haphazard and unplanned the location of planting, in regard to non-forestry considerations, the more disruptive it tends to be in conservation impact. Most of the main peat-dominated river catchments in Caithness and Sutherland now contain some plantation forest (33 out of 41 in 1987). There are extremely worrying portents for overspill effects beyond the forest edge, adversely affecting peat structure and chemistry, hydrology and water chemistry, vegetation composition, breeding performance of birds and invertebrate populations (Chapters 6, 15 and 17; see also Stroud *et al.* 1987). Both the direct and the indirect impacts of afforestation (including overspill and edge effects) need a good deal more research

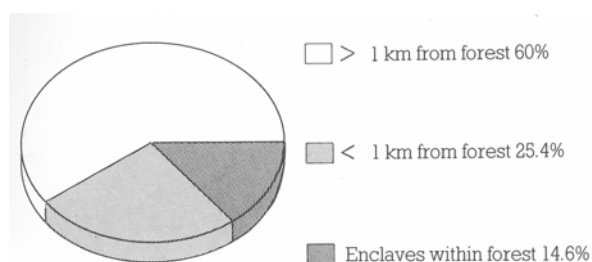


Figure 84 Sites identified as valuable for nature conservation by the NCC's Peatland Survey, classified according to their location relative to existing or programmed plantations.

before they can be fully understood and taken into account.

In March 1987 the Government confirmed and, indeed, extended its policy and provisions in support of an expansion of upland afforestation in Britain, though accepting that environmental considerations must be taken into account. It therefore has to be supposed that all plantable land within the Caithness and Sutherland peatlands is vulnerable to afforestation unless it is specifically protected to maintain the existing nature conservation interest (see Ogilvie 1986). Even where present landowners do not favour forestry, there is no guarantee against such land-use change in the longer term. From present practice, it can also be assumed that planting would mostly occur up to the exact boundary of any conservation areas and that its methods - and therefore its effects - would be substantially the same as those currently used. Even where a conservation designation is applied to open peatland, maintenance of existing nature conservation interest on areas adjoining forest cannot thus be assured.

National and international value

These may be summarised as follows -

National value:

- the large area and diversity of blanket bog as a physiographic/vegetation feature and the relative lack of disturbance in many places, giving the greatest extent of actively growing mire in Britain and one of the few areas of extensive natural terrestrial vegetation now remaining;
- the extensive development of patterned mire as a feature rare in British bogs elsewhere, and the great variety shown by these pool and hummock systems;
- the wide range of mire plant communities and their relationship to fields of variation in bioclimate, edaphic conditions and land-use influences;
- the abundance of certain rare or local bog plant species;

- the greater diversity of the breeding bird assemblage than that of moorland and bog elsewhere in Britain;
- the large total numbers of many bird species, treated as percentages of their total British populations (Table 10), and the consideration that some of these species are declining elsewhere and will continue to do so, especially as a result of afforestation;
- the presence of several nationally rare breeding bird species;
- the predicted equivalence of interest relating to habitats (mainly open waters) and groups (especially invertebrates) not yet fully surveyed.

International value:

- one of the largest and most intact known areas of blanket bog (a globally rare ecosystem type) in the world;
- a northern tundra-type ecosystem in a relatively southerly geographical and climatic location, by reason of the extreme oceanicity of the northern Scottish climate;
- development of unusually diverse systems of patterned surfaces on blanket bog, whereas elsewhere in the world, though analogous patterns occur, they are on different forms of mire;
- a floristic composition of blanket bog and associated wet heath vegetation unique in the world and representing a highly Atlantic influence on plant distribution and vegetation development;
- a tundra-type breeding bird assemblage showing general similarity to, but specific differences from, that occurring on arctic-sub-arctic tundras;
- significant fractions of the total breeding populations of certain bird species in Europe and particularly in the territories of the European Communities (Table 10);
- insular ecological and other adaptations by several bird species which may represent incipient evolutionary divergence in Britain.

In essence, the outstanding importance of these peatlands, both nationally and internationally, lies in their total extent, continuity and diversity as mire forms and vegetation complexes and in the total size and range of species composition of their bird populations.

The total peatland area which should be conserved

The crucial question remaining is about how much of the total peatland area now left in Caithness and Sutherland is of national and international

conservation importance. The needs for conservation of peatland hydromorphological and vegetation interest have been presented in Part II, those for freshwater interest in Part III and those for ornithological interest summarised in Part IV. The factors considered above underline the great difficulty in trying to delineate isolated units of peatland of high quality which will satisfy the need to represent adequately the total field of interest and at the same time ensuring that the units will be individually viable and secure from gradual loss of interest. Because the Caithness and Sutherland peatlands are a *continuity* of subtle variation on a scale unique in Britain and indeed in the world, such a quest for a representative series of exemplary sites (see Chapter 13) would miss the essential point. This selective approach, adopted in *A Nature Conservation Review* and in the normal process of choice of sites for designation as Sites of Special Scientific Interest, is not appropriate, given the particular circumstances of the region as recorded by full survey information, knowledge of the international dimension and an evaluation of the losses that have already occurred through afforestation.

While there is still a premium on the protection of topographic/landscape units and catchments which have little or no forest, this also would be insufficient to meet the overall need for conservation of all interests within this ecosystem complex. This is because such catchments alone have only a small fraction of the total valuable extant peatland and the important bird populations. Some 67,000 ha of this outstanding natural heritage have already been, or will be, lost, and any further losses will represent a continuing depletion of its nature conservation value both to Britain and to the world. To protect its unique diversity and quality and its important bird-populations, the whole remaining peatland expanse should be conserved. The recommended area for nature conservation is thus obtained by adding together the three maps, for peatland hydromorphology and vegetation (Figure 68), fresh waters (Figure 81) and ornithology (Figure 83), to give the composite Figure 85, which includes "unplantable" land and totals 365,310 ha. Of this, 73,946 ha of peatland have been notified or are proposed as Sites of Special Scientific Interest. Land already planted or already programmed for planting is not included in these totals. Figure 86 shows the same information, but with "unplantable" land removed to highlight the "plantable" area. This vulnerable area totals 256,534 ha, but, within this, 28,722 ha of peatland have already been notified or are proposed as SSSIs, so that the area of importance which remains undefended against further afforestation is 227,812 ha.

The maintenance of the nature conservation interest over the peatlands is largely compatible with the traditional land-uses, which include crofting, game-management and fishing. Greater regulation of moor-burning and avoidance of further moor-gripping are desirable. Peat-cutting from trenches and baulks in present locations is quite acceptable

on its present scale, for it has had little impact on the main peatland areas. More extensive and mechanised peat-cutting could cause problems, but the peat resources of the area are such that, with careful planning and management, some development could take place without appreciably damaging nature conservation interests.

Claims and responsibilities for international designations will be considered briefly. Beyond this, the present report does not discuss the possible formal conservation measures which might be applied as safeguards.

International implications

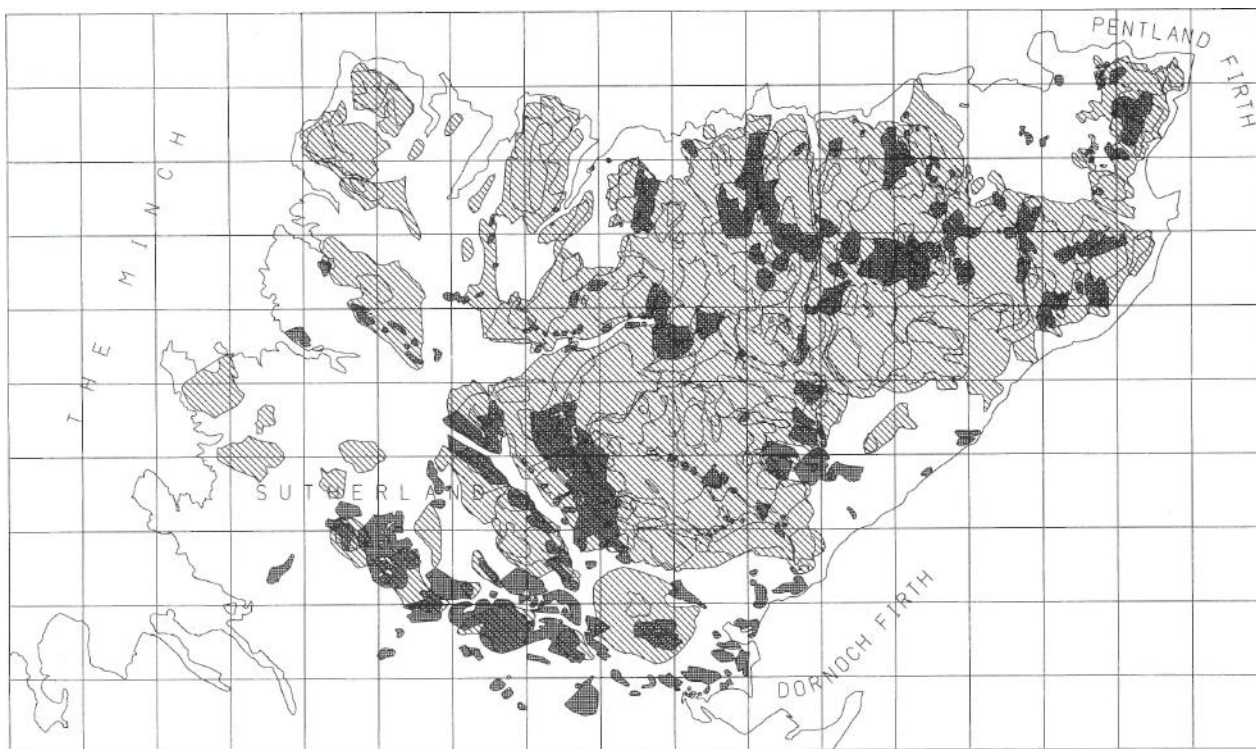
Stroud *et al.* (1987) have discussed the international importance of the Caithness and Sutherland peatlands in relation to overseas opinion and the requirements which stem from international treaties concerning nature conservation to which the United Kingdom is a party. Only the main points of this discussion will be summarised here.

In September 1986, the International Mire Conservation Group visited the region and concluded that the blanket bogs of northern Scotland were "unique and of global importance", but expressed dismay at the extent and rate of their destruction by afforestation.

The Bern Convention on the Conservation of European Wildlife and Natural Habitats requires the promotion of "national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species... and endangered habitats". Article 4 especially concerns conservation of endangered habitats and those important to breeding migratory species. The Caithness and Sutherland peatlands are especially relevant to these provisions.

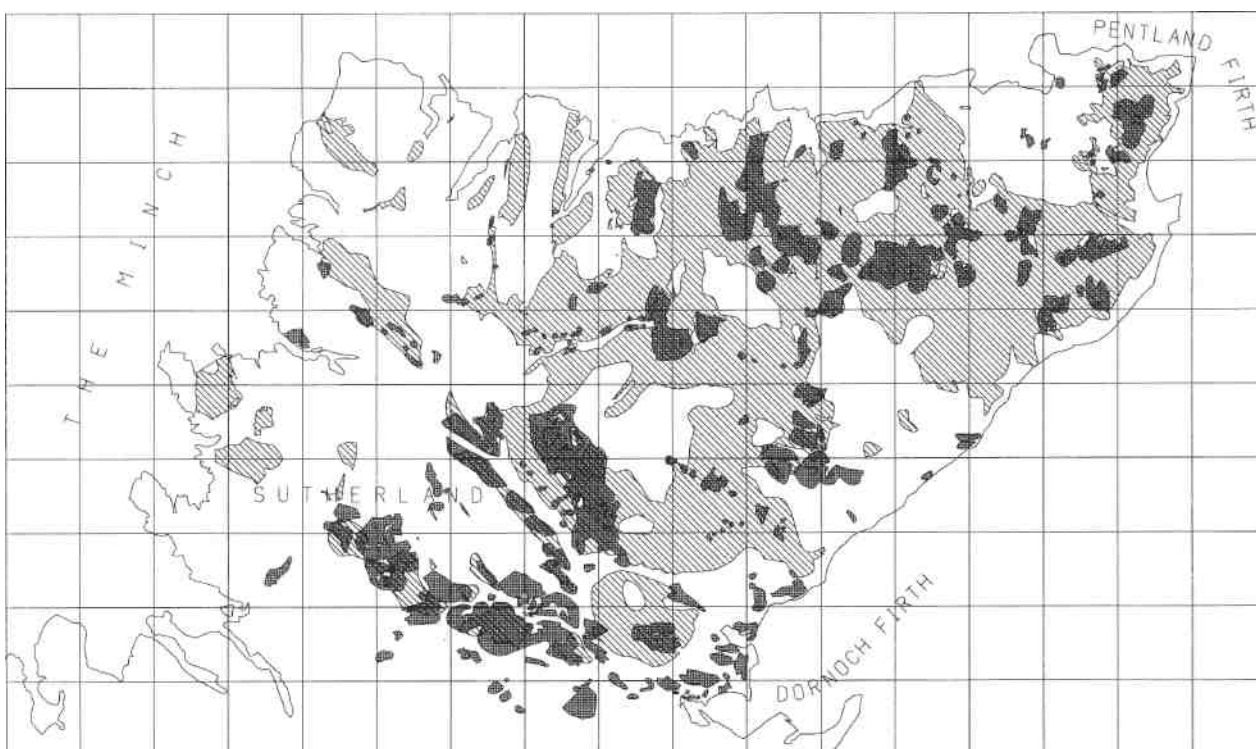
The Ramsar Convention on Wetlands of International Importance especially as waterfowl habitat requires contracting parties to promote the conservation of listed protected wetlands and gives eight criteria for assessment of international importance of wetlands for listing. The Caithness and Sutherland peatlands are exceptional in meeting all eight of these criteria.

The EEC Directive on the Conservation of Wild Birds requires that Member States give special attention to protection of the habitats of certain listed birds which are rare, vulnerable or otherwise needing particular attention and that similar measures are taken over other regularly occurring migratory species. The Caithness and Sutherland peatlands have 11 of the species listed in Annex 1, and most of the other breeding species of the area require habitat protection because they belong to the second, migratory group.



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Figure 85 Total area recommended for nature conservation, on the basis of "key" peatland systems and ornithological and freshwater interests. The extent of land already afforested or programmed for planting is shown by dark shading. Freshwater catchments lying entirely off the peat are not shown.



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Figure 86 Total recommended area for nature conservation, on the basis of "key" peatland systems and ornithological and freshwater interests, within the "plantable" zone. Land classed as "unplantable" by the Forestry Commission has been excluded. Land already afforested or programmed for planting is shown by dark shading. Freshwater catchments lying entirely off the peat are not shown.

The World Heritage Convention requires each State Party to nominate a list of "cultural and natural properties" which it considers to be of "outstanding universal value" against a set of carefully defined criteria. The peatlands of Caithness and Sutherland meet all three criteria for "natural heritage" and all four of the criteria for a natural heritage property of "outstanding universal value" (Clause 24), as well as fulfilling necessary conditions of integrity. Indeed, of all natural or semi-natural ecosystems occurring in Britain, this one comes closest to uniqueness on the world scale and appears especially well qualified for World Heritage listing.

This makes it clear that the international importance of the Caithness and Sutherland peatlands is lifted beyond mere opinion, in meeting specific criteria defined under all four of these formal international treaties. This is a factor needing careful consideration in reaching a domestic conservation strategy for the area.

A final reflection

During recent years, a great deal of concern has been expressed over the past losses of natural and semi-natural habitat and its wildlife in Britain. Many of these losses took place during earlier periods before nature conservation was conceived - notably the destruction of the great forests and the fenlands before 1800 AD. The post-1940 inroads into the coastlands, chalk grasslands, lowland heaths, moorlands, old hay meadows, marshes and hedges and the pollution of lakes and rivers mostly occurred in response to national need or before effective legislation and adequate knowledge existed. The area of the Caithness and Sutherland peatlands already lost to forestry - most of it since the passing of the Wildlife and Countryside Act 1981 - represents perhaps the most massive single loss of important wildlife habitat since the Second World War. Every effort must be made to prevent further losses.