1. A BRIEF DESCRIPTION OF THE GREENLAND WHITE-FRONTED GOOSE AND ITS CONSERVATION AND RESEARCH PROGRAMMES

1.1 Introduction

Nearly twenty years have now passed since the introduction of a moratorium on the shooting of Greenland White-fronted Geese *Anser albifrons flavirostris* in Ireland and its protection from hunting in Scotland. The excellent collaboration between a wide range of enthusiasts, non-government organisations and government departments since that time has enabled regular winter counts to monitor the changes in abundance of the entire population. Over this period, the status of individual flocks and of the population as a whole has changed radically and there has been considerable interest in the patterns of such changes and their causes.

For this reason, we have decided to try and produce a review of information available relating to the Greenland White-fronted Goose available on the World Wide Web. In the first instance, we shall concentrate on the presentation of count information, much of which was produced in the form of the 12 year report produced in 1994. However, it is our intention to update this information as time allows and to add more current and historic material as time goes on. We will also hope to review progress in research and conservation that has been made over the years and the conservation challenges and information requirements which still remain to be addressed. Until now, much of the information has been presented piecemeal in national annual reports and publications. The intention will continue to be to provide information for the benefit of the people who are good enough to give up considerable amounts of time to watch, study and count Greenland White-fronted Geese, often in very remote areas and all too frequently in poor conditions. Although the emphasis is therefore very much on the information relating to count data, we have tried to incorporate more general accounts of information from other aspects of the various research programmes involved, in order to give a backdrop against which the count information can be viewed.

1.2. Background

The Greenland White-fronted Goose is one of five recognised subspecies of the circumpolar White-fronted Goose. Whereas the major North American and Western Palearctic populations of Whitefronts both number well over 300,000 individuals, the current population of the Greenland subspecies numbers less than 30,000 geese.

The population breeds in the low arctic coastal fringe of west Greenland and migrates south through south and west Iceland during September/October to winter exclusively in Ireland and Britain (Figure 1). Throughout its range on the Celtic fringe of the British Isles, it is associated with a landscape characterised by peatlands and low intensity agricultural land. Unlike many other northern-nesting geese, their wintering areas are often remote and the flocks relatively small and difficult to locate. For this reason, they pose rather different problems in the assessment of their overall population size when compared to other north west European goose populations.

1.3. Population assessment

Although the Wildfowl Trust pioneered the development of count networks and research programmes into most of Britain's wintering goose populations during the 1950s, the Greenland Whitefront, with its remote wintering resorts and highly dispersed nature, was less well-known than many of the other goose populations. Hugh Boyd established regular counts of the subspecies on Islay and Dr Malcolm Ogilvie continued subsequently to count the subspecies during his annual counts of Islay-wintering Barnacle Geese from the Greenlandic population. In the mid-1960s, Hugh Boyd also analysed the ringing/recovery data generated by catching programmes stimulated in Greenland by Dr Finn Salomonsen at the Zoological Museum in Copenhagen. At the single most important Irish wintering resort, the Wexford Slobs in south-eastern Ireland, Oscar Merne also pioneered the establishment of thorough counts in the late 1960s, attempting in particular to establish co-ordinated counts of the south and north Sloblands so as to avoid double counting. However, in both Britain and Ireland, very few other sites for wintering Greenland White-fronted Geese were counted on a regular basis and our knowledge of the well-being of the whole population was very much based on the changes in numbers at these major sites.

In the late 1970s, alarmed by the serious declines of Greenland White-fronted Geese at a number of resorts, Major Robin Ruttledge in Ireland and Dr Malcolm Ogilvie in Scotland and Wales, put together an historical analysis of the distribution and abundance of the subspecies to examine patterns of change at as many sites for which information was available. As a result of this partly anecdotal information, they assessed that during the 1950s, the population numbered between 17,500 and 23,000 birds. What was very clear, however, was that by the late 1970s, the numbers had fallen to perhaps as low as 14,300. This was very much mirrored in mid-Wales, where the small flock of wintering Whitefronts had fallen from just over 200 geese in the early 1970s to a minimum of 34 birds. This decline was despite the voluntary ban imposed by the local Wildfowling Club, and was not in response to any obvious change in habitat use or management on the wintering site. Students at the nearby University College of Wales at Aberystwyth started to undertake research into the changing status of the population and established the independent Greenland White-fronted Goose Study (GWGS) in the late 1970s to set up a regular count network at known sites in Britain and to further our understanding of this goose. Since this pattern appeared to be the same throughout the wintering range, there was an urgent need to know more about the precise status of the population and the causes of this dramatic decline. Paramount was the need for an accurate assessment of the size and distribution of the population throughout the wintering area.

The work of Major Ruttledge in Ireland formed the basis for the establishment of a network of counters there, organised by the Forest and Wildlife Service (now the National Parks and Wildlife Service of the Office of Public Works). This in turn came about following the introduction of a 3 year moratorium on hunting Whitefronts in response to concerns about apparent population levels. The network was established largely through the use of professional ranger staff and supplemented by amateur observers where necessary, mostly members of the Irish Wildbird Conservancy (IWC). Through cooperation with the Royal Society for the Protection of Birds (RSPB) and the Department of the Environment and the Forest Service in Northern Ireland, it was possible to extend coverage to the whole of the island of Ireland.

In Britain, the counts are co-ordinated by GWGS who were later supported and part-funded initially by the Nature Conservancy Council, and latterly by the Joint Nature Conservation Committee (JNCC) through a sub-contract from The Wildfowl & Wetlands Trust (WWT) at Slimbridge, who also supply all counts from the Wetland Birds Survey count database. The GWGS counts use a network of largely amateur observers, supplemented by wardens and professional staff where appropriate. On Islay, regular counts are now carried out throughout the winter by Scottish Natural Heritage (SNH) in support of their goose conservation programmes on the island (see below). SNH also provide coverage of a number of other sites in Scotland. This network has achieved complete synchronous coverage of virtually all known winter resorts of Greenland White-fronted Geese since 1982/83. The overall change in the count totals are summarised in Figure 2. Before protection, counts were carried out on Islay and Wexford, and these counts show the increase in numbers at these two resorts following the cessation of hunting (Figure 3).

1.4. Wintering distribution

The wintering distribution is distinctive in being concentrated in the northern and western fringes of Britain and Ireland (Figure 1). The two most important wintering resorts continue to be at the Wexford Slobs in south-east Ireland and the Inner Hebridean island of Islay in Scotland (see Figure 1). It is important to note, however, that a great many of the flocks number less than 50 wintering geese, and one of the great challenges facing the effective conservation of the Greenland White-fronted Goose is the need to maintain its current range and distribution, as required by international legislation (EU Birds Directive). Many of the smaller flocks have continued to decline, have remained relatively stable or are showing only very slight increases compared with the more spectacular increases experienced at the major resorts.

The distinctive northern and western distribution within Ireland and Britain is no accident. It mirrors the climatic template for the formation of oceanic blanket bog which formed the traditional wintering habitat for the subspecies before Man substantially modified the landscapes of Britain and Ireland. The high rainfall and consequent acid soils has inhibited rapid agricultural development in much of northern and western Britain and Ireland. Originally, the geese foraged almost exclusively on the overwintering perennating organs of various bog plants, notably the Common Cotton-grass (*Eriophorum angustifolium*) and the White-beaked Sedge (*Rhynchospora alba*). The Cotton-grass withdraws nutrients back down into the lower stem area during winter in preparation for the subsequent spring, and it is this lower stem which the geese traditionally rooted for in the upper horizons of boglands. Similarly, White-beaked Sedge stores nutrients in small bulbils which are highly nutritious and much sought after in the bogs by the geese. Being situated on the mild western fringe of the European land mass, such boglands were not

subject to frost and hence were available to the geese throughout most normal winters. The use of remote bogland sites in the past also added to the difficulties of adequate census.

1.5. Spring migration

The geese depart Britain and Ireland for Iceland in mid-April, usually waiting for a high pressure system to offer suitably assisting tail winds, which may enable them to make landfall within one day. In Iceland, they encounter a land still emerging from the grips of winter, but their habitat use is remarkably similar to that in Ireland and Britain. In the lowland south, they feed mainly upon the new growth of grass in hayfields managed to provide winter keep for stock, but the subspecies uses wetlands far more than the Greylag Geese (*Anser anser*) and the Pink-footed Geese (*Anser brachyrhynchus*) which also use these lowlands in spring. Here, especially in the boggy wetlands of Myrar on the west coast of Iceland, they feed on the Cotton-grass in the same way as traditionally occurred in Britain and Ireland, as well as up-rooting the lower stem of another sedge, *Carex lyngbeii* which used to be grown as a hay-crop before the advent of grass hayfield cultivation earlier this century. This sedge occurs nowhere else in Europe outside Iceland and produced very high quality hay, grown in traditionally flooded hayfields. One particular area, an experimental farm at Hvanneyri, has maintained a large area of traditional *Carex lyngbeii* marsh which is annually harvested for its haycrop, and this, together with grass hayfields (all of which are free from hunting) provides a very significant staging area in Borgarfjörður.

1.6. Breeding

In late April and early May, the geese begin to arrive on the breeding grounds after flying to Greenland and traversing the interior ice-cap to reach the breeding grounds along the west coast.

On arrival in west Greenland, the geese forage on food material first available in lowland areas. In a few important gathering areas, Whitefronts feed on the below-ground bulbils of Marsh Arrow Grass (*Triglochin palustre*) and the sea-grass (*Puccinellia*), which are amongst the first food items freed from the thaw in lowland bare mud flats. As the spring thaw progresses, so the geese start to utilise Cotton-grass in the same way as elsewhere in their range, up-rooting the lower stem and nipping off the above-ground leaves which are left distinctively floating on the surface of the marsh.

Typically, arriving pairs feed on their own, the male vigilant, looking out for potential predators, the female feeding for up to 70% of the 24 hours of daylight. In snow-free years, females appear to feed for around two weeks before the first eggs are laid around 19-22 May. However, in years with very late snow-lie (as occurred in 1984), this may be delayed until mid-June. The female incubates the clutch, usually 6 eggs, alone for 28 days or so whilst the male remains feeding in the general vicinity, accompanying the female for her short recesses from the nest to feed and drink.

Elsewhere in the world, White-fronted Geese produce more offspring each summer (as measured by the percentage young in the arriving winter flocks, generally 30-40%) than the Greenland race (average 15%). However, brood size amongst the Greenland birds is much greater than elsewhere, so it would seem that although fewer adult geese in the population succeed in bringing off young, they breed more successful when they do so. Clearly this could be related to high predation rates, with many pairs attempting to nest losing whole clutches, but conditions may encourage high gosling survival if the eggs are allowed to hatch successfully. Predators are quite common in the breeding areas, although gulls and skuas (*Larus* and *Stercorarius* species) are generally absent from the inland nesting areas of the geese and are therefore less important than in other parts of the range of the White-fronted Goose. Arctic Foxes (*Alopex lagopus*) and Ravens (*Corvus corone*) are frequent and both species will take goose eggs, but we have no evidence to suggest that changes in their abundance are responsible for the poor breeding performance of the Greenland White-fronted Goose, or that this was the cause of the dramatic decline between the 1950s and 1970s, although there is some evidence from hunting records of Caribou that this important Arctic Fox prey item increased unusually during the same period.

The detailed studies of the breeding season so far undertaken have all been in inland central west Greenland. Further north in the breeding range, the topography and available habitats are very different. It is not yet known how the ecology of the geese in these northern areas relates to that in the regions studied so far.

As the summer progresses, the geese gradually move up-hill in the mountainous parts of their range, following the

progressive thaw of the cotton-grass wetlands that are the staple providers of their food. Breeding birds tend to nest as close to the high plateau lakes (generally 400-600 m a.s.l.) which are the ultimate brood-rearing and moulting areas for the geese. These higher altitude lakes are the very last areas to thaw and are supplying the geese with fresh new growth of the delayed spring thaw into August. After the moult, geese disperse to heathy areas to feed on the rich berry crops of the autumn which provide the geese with reserves in preparation for the autumn migration.

1.7. Autumn migration

Greenland White-fronted Geese again migrate through Iceland in the autumn, resorting more to wetland areas compared to those habitats used in the spring, although using the same western and southern lowlands. Their diet is similar to the spring, predominantly utilising the storage organs of sedges laid down during the summer for the coming winter, as well as the last vestiges of grass growth in the hayfields.

1.8. Winter dispersal

Using individually inscribed leg-rings and collars fitted to geese captured on lakes in Greenland during their flightless period it is possible to look at the winter dispersal of geese to the wintering grounds in Britain and Ireland. Geese ringed in two small areas of Greenland in 1979, 1984, 1989 and 1992 have been seen throughout the wintering range, from Orkney in the very north to the extreme south-west of Ireland. Hence geese present together in the same flock on the moulting areas may well spend the winter many kilometres apart. This has implications for hunting mortality, since local hunting on the wintering grounds will affect the population from many breeding areas.

The early results of resightings of ringed geese showed that geese were remarkably site-loyal, coming back to the same small area of the wintering grounds year after year. One of the birds which we marked in 1979 was still present in winter 1993/94 (having returned with a brood of goslings in 1991/92) on the same three farms on the Inner Hebridean island of Islay as she had used in all the intervening years. Cannon-netting of geese at Wexford Slobs and a number of other localities carried out by the NPWS since 1983 has also demonstrated the same phenomenon. Here, the geese have been marked with engraved plastic neck collars to overcome the difficulties of spotting leg rings in the long grass. The findings are the same, however, with geese returning to the same wintering area year after year. At the Wexford Slobs, it has been possible to define discrete and often very different home ranges for individual marked birds throughout the site. Some 15% of geese do show between-winter changes in wintering site, but we think this is largely linked with birds pairing for the first time and shifting to a new wintering area which was the traditional site of their mate. Since both sexes show equal levels of site change, it appears at present that no one sex "chooses" the wintering site for the pair. Some "staging" does also seem to occur, where birds depart their wintering areas and move to other sites before ultimate departure northwards to Iceland. For example, geese departing from Wexford have been seen elsewhere in Ireland, and geese stopping off briefly on Kintyre and Islay in autumn have then spent the rest of the winter at Wexford as usual.

These findings have great importance for the effective conservation of this important population, since it is clear that much of the decline in the population has been as a result of the loss of habitat, particularly bogland and other wetland types. Being so site-loyal, the Greenland Whitefront is remarkably vulnerable to habitat modification or loss. This certainly helps explain the loss of many bogland flocks during the 1950s and 1960s when drainage was most severe. During the last twelve years of monitoring, only three completely new flocks have come to light on the wintering areas, despite an encouraging increase in population. This marked inability to colonise many new feeding opportunities and the extreme site-loyalty of marked birds suggests the bird is "trapped" to some extent by tradition, and the methods for the effective protection of this population must take account of this. The large concentrations of Greenland White-fronted Geese are relatively easy to protect, since regularly occurring numbers exceed those needed to qualify for national and international protection measures. But it is often the smaller, more vulnerable flocks which are showing the most dramatic declines. It is especially important that management of areas with small numbers of geese which fail to attain the level required for specific protection be carried out, although this may need some new mechanism in order to safeguard their future adequately. It was for these reasons that it was felt necessary to construct a population conservation plan which could examine the different problems faced by the geese in the different nations throughout their range and to come up with answers to some of the difficulties involved (see section 1.13).

1.9 Breeding success

We have already mentioned that Greenland Whitefronts differ from most other races of Whitefront in their low productivity. As well as monitoring the overall numbers of geese, it is important to assess the breeding success of Greenland White-fronted Geese. This enables us to assess the well-being of the population in terms of its ability to replace dying birds, but also provides an important basis for the estimation of mortality rates in the population. Geese wintering in different parts of their range in Ireland and Britain may also exhibit different levels of breeding success. Wexford wintering birds tend to have a higher percentage of young than flocks elsewhere in Ireland, although there has been a significant decline in production since protection (Figure 4). However, Islay geese generally return with fewer young proportionally than are found in flocks elsewhere in Scotland (Figure 4). Overall, the annual patterns of breeding success are very similar throughout, so a good breeding season means a high proportion of young at all wintering resorts, whilst a poor season is reflected in uniformly low production (as in 1972 and 1992).

For this reason it has been important to obtain estimates in the field of the proportion of young geese in as many different flocks as possible. Field estimates of young are available from Wexford and Islay over a much longer time period than the twelve years of the present census survey (Figure 4). It is interesting to note that whilst in the 1970s and early 1980s, the productivity of the Wexford birds was nearly always greater than that of Islay wintering geese, in recent years this difference has reduced and Islay productivity has exceeded that at Wexford in some years. As yet, the significance of such changes can only be speculated upon, but demonstrates the need for long-term monitoring to interpret such data.

1.10. Family behaviour

As well as seeing how individual geese moved through the different parts of their range, individual marking can tell us a great deal more about goose behaviour. One of the most interesting features of marking individual geese is the opportunity for study of family behaviour.

It is usual in geese that family parties remain together for most of their first winter, but offspring are lost from family groups in spring. However, marked Whitefronts show unusually persistent long-term parent-offspring and sibling-sibling relationships, one particular collared female remaining with her female offspring for six winters. Even after four winters, more than a quarter of the offspring are still with at least one of their parents. However, this does not seem to imply that the geese defer breeding, since the majority of birds pair in their third year and breed in their fourth, very much as might be expected from studies of captive birds. It would seem rather that if a goose does not pair up with a mate, it will remain with related birds in the safety of a family unit. This is important, since we know that large groups of Whitefronts are dominant over smaller aggregations, so there are benefits from associating with a large group, especially if those birds are close relatives.

1.11. Hunting

Before 1981, the Greenland White-fronted Goose was legal quarry throughout all of its range. There is little doubt that, during the 1950s, 1960s and 1970s, the effects of habitat loss and modification on the population were exacerbated by the considerable off-take of birds through hunting. Birds were being killed on the breeding areas, shot legally in Iceland on migration in autumn as well as poached illegally there in spring, whilst substantial numbers were killed on the wintering areas, particularly in Ireland (where this was the only wild goose species widely available as a quarry species).

Individual marking programmes and the regular resightings of individually marked birds can also tell us a great deal about changes in the death rate of the population and its effect on the overall population size. Re-analysis of old data in recent years suggests that hunting caused additional mortality to that of natural causes at Wexford Slobs, since mortality was higher in years with the greatest shooting bags. This may seem self-evident, but it is often argued that shot birds would have been the weaker birds which would have died anyway. This is apparently not the case amongst Greenland White-fronts, which show a lower overall survival in the population in years with heaviest shooting mortality. For this reason, there was a very strong case for regulating the kill. From 1982, the population was protected in Ireland and Scotland under their respective legislations; although this left the Welsh flocks still legal quarry (because two Whitefront races occur in Wales and could not be distinguished in the field and hence by law).

However, the important Dyfi Estuary flock is the subject of a welcome local voluntary ban by the local wildfowling club. The Greenland Home Rule Authority has also protected the goose for much of the summer and their movement to remote heaths in autumn (*i.e.* the period when they are legal quarry) effectively ensures their protection even at this time. The Greenland Whitefront remains a quarry species in Iceland and it is considered that as many as 2,000 are shot annually there, a substantial proportion of the total autumn flight.

1.12. Conservation

At present, the most important mechanisms for protecting Whitefronts on the wintering areas are those of overall protection from hunting (discussed above) and site safeguard. The latter enables designation of sites of local, national or international importance for the geese to ensure sympathetic management for the future. These are defined in terms of the population size at particular resorts, at regional level. In the UK, many of the most important wintering sites are protected under domestic legislation (as Sites of Special Scientific Interest, SSSI or Areas of Special Scientific Interest, ASSI in Northern Ireland). Sites supporting at least 1% of the world population of Greenland Whitefronts qualify as Ramsar Wetlands of International Importance, while those supporting at least 1% of the British population qualify for protection under domestic legislation there. Under the EU Directive on the Conservation of Wild Birds, Ireland and the UK have an obligation to conserve bird habitats as a means of maintaining populations. In part this is achieved by the establishment of a network of protected areas for birds throughout the community, so-called Special Protection Areas (SPAs). The Directive also establishes an obligation on member states to ensure the survival of all wild bird species by ensuring their survival and reproduction throughout their area of distribution.

However, even when a site does reach the levels required for international site protection, such as occurred at Eilean na Muice Duibhe ("Duich Moss") on Islay, there are still battles to be fought to ensure full protection. The site is a roost for over 1,600 Greenland Whitefronts and was threatened in 1985 by exploitation for peat for a local distillery. The peatland is of great conservation importance as a bog in its own right, but the geese confirmed its international significance. The conflict was translated misleadingly into a "distillery jobs versus geese" story by a media with little interest in the real issues, and an unnecessary confrontation was created. The destruction of the wetland would have been in direct breach of the EU Birds Directive which requires special protection of habitats used by the geese, which are listed as being of particular importance on Annex 1 of the Directive. Eventually, with pressure from the European Commission and the threat of legal action in the European Court of Justice, an alternative source of peat from an adjacent area was secured. A management agreement was signed with the owners, and the site is now a National Nature Reserve, SPA and Ramsar Site.

As the geese have been displaced increasingly from more traditional feeding areas, there has been a growing tendency for them to feed on intensively managed agricultural grasslands which brings them into direct conflict with farmers. These undoubtedly have caused local problems, as on Islay. While individual farmers bear the cost of damage on their land, nationally, the impact on agriculture is infinitesimally small. However, this led to the issuing of licences by the Scottish Office to kill Greenland White-fronted Geese on Islay in response to alleged "serious" agricultural damage. This highly contentious move created very vocal opposition from conservation groups, as well as the Greenlandic Government, who claimed that such killing could not be justified amongst a population so small in world terms, especially in the absence of a strict definition of what actually constitutes serious agricultural damage.

For this reason, a package of proposals has since been drawn up by the Scottish Office to enter into management agreements with farmers on Islay to assist financially with the difficulties encountered by individual farmers bearing the brunt of the goose grazing. This exciting programme was established in winter 1992/93 and has done away with the need for granting of shooting licences.

Despite progress in Britain and Ireland, adequate site protection and the development of management plans for all sites on the wintering grounds, is still required. In Iceland, too, there is presently no site protection at all, except for the experimental farm at Hvanneyri where the persistent anti-hunting stance of the local manager and the fortunate sympathetic management have coincidentally ensured the effective protection of a site of considerable international importance. The identification of roost sites in particular, as candidates for national site safeguard, remains a priority.

In Greenland, enormous strides have been made in site safeguard with the designation there of five Ramsar sites of international importance, protecting the summering habitat of perhaps 20% of the world population. This, together

with the development of future educational links between Greenland and other range states is an extremely encouraging leap forward for a country with very limited funding for nature conservation, but with a very real appreciation of the importance of its natural resources.

Despite all this activity, the world range of this small population of geese remains restricted to just four countries, Greenland, Iceland, Britain and Ireland. This creates both problems and opportunities. It enables, for instance, the development of a flyway conservation plan for the population to guide national and international conservation and management actions, since the involvement of relatively few governments and organisations eases the development of such an agreed programme. Such a Plan was developed, at the invitation of, and funded by, the Irish NPWS, assisted by the International Waterfowl and Wetlands Research Bureau (IWRB) and drafted by the Joint Nature Conservation Committee in the United Kingdom. The project culminated in the Wexford Workshop of March 1992, where a meeting of all the governments and organisations involved with Greenland White-fronted Geese agreed to adopt the proposed Plan tabled at the Workshop. There are possibilities in the future to incorporate such a Plan within other international agreements, such as the Ramsar Convention or under the Bonn Convention (see section 1.13 for full details).

Government representatives at the meeting discussed, and agreed in principle, a Memorandum of Understanding outlining ways in which the Range States could work more closely together in the implementation of the Conservation Plan. Although this has yet to be formally signed, it is to be hoped that it will not be too long before the governments formalise this important document.

One of the areas highlighted by the Plan has been the development of educational programmes, with the suggested development of formal links between sites in the flyway. On Islay, an impressive initiative of school education programmes and community involvement developed by Scottish Natural Heritage has seen the development of links between schools on this island and in Greenland. Dr Ron MacDonald and Glenn Campbell carried out a highly successful trip to west Greenland in the summer of 1993 to establish formal links which will hopefully continue long into the future. The "twinning" of reserves throughout the flyway not only strengthens protection measures at any one site, but also enables the exchange of information and establishes direct liaison between different countries and the people involved with Whitefront conservation. As the future conservation of the geese and their habitats will depend on human actions in the countries concerned, any initiatives which develop the concepts of shared responsibility and understanding must ultimately benefit the geese.

1.13 The Greenland White-fronted Goose International Conservation Plan

There was an upsurge in research and survey work carried out on the Greenland White-fronted Goose in the 1970s, prompted by the expressions of concern for the continuing decline of the population then, reinforced by the plight of certain flocks on their traditional wintering grounds in Ireland and Britain. The pioneering work of Finn Salomonsen in Greenland during the 1940s and 1950s provided a vital basis for present studies, as has more recnt work of Arnþor Garðarsson and Ævar Petersen in Iceland. The period was, and continues to be, characterised by excellent relations and co-operation at international and national levels between many government and non-government organisations and individuals involved. It is perhaps hardly surprising that a Flyway Conservation Plan for the population had been widely discussed at an informal level since the mid-1980s.

The opportunity to formalise this idea arose at the fourth meeting of the Conference of the Contracting Parties to the Ramsar Convention in Montreux, in June 1990. The Ramsar Bureau had convened an informal meeting of the Range States, namely Greenland (plus Denmark) Iceland, Ireland and the United Kingdom, at the instigation of the Greenland Government under Article 5 of the Convention, which encourages joint wetland conservation initiatives. Its purpose was to discuss Greenland's concern that different conservation policies, particularly in relation to hunting, were being applied in each of the Range States where the goose occurred. Article 5 calls upon Contracting Parties to consult with one another, not only on cross-border wetlands, but also other matters of mutual interest.

Following discussions, Ireland offered to host a workshop at which the Range States could discuss future co-operation in caring for this common resource. To facilitate this process, Ireland's official wildlife agency, the NPWS of the Office of Public Works contracted the IWRB to assist with the convening of a workshop and to develop a draft International Conservation Plan. In turn, IWRB sub-contracted the UK Joint Nature Conservation Committee (JNCC) to undertake the drafting of the Plan. All arrangements were guided by a steering committee composed of the various parties and interests involved.

Following full consultations with all relevant governmental and non-governmental interests, a draft International Conservation Plan was tabled for discussion before representatives of those interests at the Greenland White-fronted Goose Workshop held at Wexford between 4 and 6 March 1992. The Workshop accepted the draft Plan subject to certain revisions which are now being undertaken. The endorsement of the Plan is reflected in the Wexford Declaration (see Appendix) which was agreed by all represented at the Workshop - Range States, national and international organisations, hunting associations and farmers. Furthermore, a draft Memorandum of Understanding was negotiated between the Governments of interested parties and to date, Denmark, Ireland, Iceland and the United Kingdom have indicated acceptance of its terms. Once Greenland has indicated its acceptance a formal signing ceremony shall be arranged, hopefully in 1994. The Secretariat for the agreement shall be provided at that time and for a period of five years by the NPWS in Ireland.

The Plan is based upon a modified version of the former Nature Conservancy Council's site-based management planning system. It contains two essential elements necessary for success: expert analysis of conservation requirements as a basis for action and a formally agreed mechanism whereby the parties or Range States may work together to implement the desired actions. In brief, the Plan comprises three essential sections, recognised as forming the basis for decisions relating to which actions will be performed and when, namely: description, evaluation and prescription.

The descriptive elements incorporates a synthesis of all the available information in a standardised and compartmentalised form. This checklist approach also aids the addition of any new information, and revision in the light of changing circumstances.

The evaluation process starts with an assessment of descriptive information according to standard principles. Firstly it identifies ideal objectives, which in this case are:

1. To maintain and enhance the population, recognising that current population size represents an absolute minimum;

2. To maintain and enhance viable numbers throughout the present geographical range, and to encourage the re-occupation of formerly frequented areas where the geese are now extinct, and to avoid further contraction of range to a few centres of population;

3. To ensure that any interactions with people are according to the principles of sustainability and to give special emphasis to the avoidance of agricultural conflicts on the wintering or staging grounds;

4. To ensure that any consumptive use of the population should be wisely undertaken on the basis of sustainability; and

5. To ensure full international co-operation between the Range States in joint programmes of monitoring, research, conservation and liaison to the benefit of Greenland White-fronted Geese.

The Plan then examines these in relation to the constraints which apply in each Range State. These are usually availability of resources, both financial and human, existing frameworks of national legislation and the problems of human perceptions and attitudes to the geese. The outcome is the derivation of a series of more specific or operational objectives which can be attained within a realistic timescale.

At this stage it is necessary to introduce "specified limits" so that it is possible to judge progress, i.e. when actions are going according to Plan or not. An important provision therefore is that certain negative trends or events should trigger an emergency review and remedial action. Such trigger points have been identified, provisionally, as follows:

1. Total population has declined by more than 15% in any period of three years;

2. The proportion of young at main wintering sites is below the long-term average for three consecutive years; or

3. Any major environmental changes within the range of the Whitefronts liable to affect population levels.

Finally, there is the prescriptive element which derives detailed prescriptions and work programmes which by necessity have to be made largely in the context of national plans. This requires co-ordination, i.e. ongoing, regular meeting of experts and the administration concerned which will be co-ordinated by a Secretariat which Ireland has offered for a period of five years.

So what of the future? The Wexford Workshop, through the issue of a declaration signed by all parties present, implicitly gave support to the Conservation Plan. This was a very real achievement and it is fair to say that the all important preliminary framework has now been established. Subsequent to the Workshop, a Memorandum of Understanding was circulated to the Range States, the intention of which was to formalise co-operation on Greenland White-fronted Goose conservation. To date, all the Range States have indicated a willingness to sign, but we await formal comment from Greenland.

It would appear that the Plan produced at Wexford is a robust and relevant one. Many of the requirements and undertakings are designed to fit in with pre-existing international agreements and commitments such as the EU Birds Directive and the Ramsar and Bonn Conventions. In the latter case, it is entirely possible that the Greenland White-fronted Goose International Conservation Plan, with the agreement of the Range States concerned, may in time become subsumed into the draft Agreement on the Conservation of African-Eurasian Migratory Waterbirds of the Bonn Convention. It would ideally fit under the umbrella of this agreement, but in any case the nature of the Plan ensures that it is a flexible and useful model for international co-operation in the conservation of migratory species.

One thing that the Plan does identify is the need to continue to gather information about this population. Its ideal objectives include maintaining numbers and distribution, a process only possible if numbers are regularly monitored and the information shared between interested parties. The use of the population by man must accord with the principles of sustainability and avoid agricultural conflict, both of which require information gathering and analysis. The triggers in the Plan for review are based upon population size, distribution and the numbers of young being produced by the population. What is clear, therefore, is that, far from "knowing enough" about the Greenland White-fronted Goose, it is absolutely vital that our present efforts on monitoring, research and conservation continue to be developed in the most effective ways. Fundamental is the role of the census in providing information on population distribution, size and change and a measure of breeding success. Without the commitment of a vast army of volunteers and professionals who carry out such counts, international collaboration to safeguard Greenland White-fronted Geese would simply not be possible, and many of the ambitious aims of the Conservation Plan would simply be unattainable.

The 1970s and 1980s have seen the Greenland White-fronted Goose pulled back from a course of substantial decline and we have made major strides forward in the protection of this population and its habitat throughout its range. However, there remains a great deal more still to be achieved. It is vital, therefore, that the progress made in recent years is sustained into the next century.

2. COUNTRY REPORTS

Although this report is written primarily to set out the results of the twelve years of population census data, the availability of a country-wide report produced by each of the Range States at the Wexford Workshop in March 1992 offers the possibility for an overview of the research and conservation status of the Greenland White-fronted Goose in Ireland, Great Britain, Iceland and Greenland. As far as possible, the same format for reporting is given for each nation, but for the Irish and British sections, site accounts are given in detail for each of the known regular wintering sites in those islands.

2.1 Republic of Ireland and Northern Ireland

In this report, the island of Ireland is treated as a single biogeographical unit, even through White-fronted Goose conservation is dependent on the actions of two separate jurisdictions. This has been possible due to the excellent co-operation traditionally forthcoming with habitat and species surveys of mutual interest and concern. In the case of the Greenland White-fronted Goose, joint surveys have been undertaken since they were first established in 1982.

Distribution

The present range of the species has not changed markedly over time. The distribution is essentially restricted to the west and the north midlands of the country, with the notable exception of Wexford Slobs (historically a relatively recently colonisation). The existing range still closely follows traditional habitats, the bogs and callows which often occur in close juxtaposition. Loss of these traditional habitats, through peat harvesting and arterial drainage, accelerated in the 1940s, causing local flock declines and extinctions. Afforestation, particularly of the western blanket bogs also became an important factor from the 1950s onwards. Some cases of habitat loss have been offset by a move to agricultural land. Nonetheless, despite a steady increase in overall population, the underlying trend is a gradual contraction of range, with flock extinctions at two sites (Bunduff and Inny Valley) since the survey began in 1982.

Abundance

Since 1982, the total population has effectively doubled in size from 16,500 to 29,000, increasing at a rate of 8-9% per annum. In Ireland, growth overall has been slower, 5.5-6.5% per annum, from *c.*8,500 to *c.*14,600. Approximately two-thirds of the population is located at one site, the Wexford Slobs, where numbers have increased from *c.*6,000 to *c.*10,000 in 1992. The remainder winter in 33 flocks throughout the west and north, varying in size from less than 10 to more than 500 individuals. Seventeen flocks have increased, eight decreased and ten are stable or fluctuating. Those flocks showing declines or in need of remedial conservation action are generally the smaller ones, which fall below the standard 1% Ramsar criterion for international importance and the 1% criterion for importance in an Irish context. Urgent efforts must focus here if further range contraction is to be avoided.

Research

The NPWS was instrumental in putting in place a reliable system for estimating the size and distribution of the population on its wintering grounds. Co-operation with the Irish Wildbird Conservancy (IWC), RSPB, DoE (NI) and GWGS (UK) ensures regular and simultaneous coverage of the species range throughout Ireland, Northern Ireland, Scotland and Wales on a number of occasions each winter. The system achieves the necessary international coverage as well as being flexible to meet more localised population monitoring requirements.

A marking and resighting programme was initiated in 1983 at the Wexford Slobs which continues. This is a co-operative programme, launched by the first GWGS expedition to Greenland in 1979. Whitefronts have been caught during further expeditions there in 1984, 1989 and 1992, on Islay in 1991 and 1992 (by the Wildfowl & Wetlands Trust), and at Sheskinmore (Co. Donegal) and Lough Owel (Co. Westmeath). A total of 1,163 Whitefronts have been marked in Ireland since 1983, the majority in Wexford.

In addition to these primary studies, investigations of habitat use, feeding ecology and the factors affecting flock size

trends have been analysed, together with the effects of disturbance.

Protection and conservation

The national legal frameworks are provided for by the Wildlife Act 1976 (Republic of Ireland), and the Wildlife, and Nature Conservation and Amenity Lands Orders of 1985 (Northern Ireland). These incorporate the obligations of the EU Birds Directive which places the Greenland White-fronted Goose on Annex 1 (rare, vulnerable and endangered species) making it subject to the provisions of Article 4. The Ramsar, Bonn and Berne Conventions add considerable international weight to the measures and must be taken into account to ensure the conservation of the population and its habitats.

In the Republic of Ireland, open seasons may be changed annually and incorporate bag limits; the actual open season has been progressively shortened since 1975/6 (from September to January inclusive, to mid-November to January in 1982). A national moratorium on Whitefront hunting was introduced in 1982/3, but lifted at Wexford only in 1985/6 and 1989/90 with bag limits in both years.

Both sets of legislation allow for the acquisition and management of sites, as Nature Reserves for example, the setting up of management agreements with landowners and the securement of land already in government ownership. Management agreements may cover such issues as maintenance of habitat, control of disturbance levels, provision of access for research and monitoring, certain roles for landowners and farming practice.

Extensive licensing provisions exist covering matters such as sale, damage to agriculture, taxidermy, methods of capture, scientific study, ringing etc. Compensation for alleged damage to agriculture is not paid by either jurisdiction.

The principal difference exists in relation to Areas of Scientific Interest (ASIs, Republic of Ireland) and ASSIs in Northern Ireland. ASSIs have statutory recognition and protection while in the Republic this status is presently being developed. However, the majority of the 450 feeding sites identified in the research programme have been given ASI status within 103 separate ASIs in the Republic and as such have been incorporated into County Development Plans giving them quasi-legal status.

To date 13 nature reserves have been designated in the Republic with White-fronted Goose interest. These reserve areas have been given further international recognition under the EU Birds Directive as Special Protection Areas (4), Ramsar Sites (9) and as Council of Europe Biogenetic Reserves (3) implimented under the Berne Convention. These include a number of raised bog sites in the Midlands (flock numbers 3, 22, 23 and 26) whose purchase has been assisted by the precursor to the LIFE programme, the ACE-Biotopes Programme, under the EU Birds Directive. A number of other sites have been identified as qualifying for international status. Management agreements were also established for eight sites, mainly concerned with a category of small flocks which otherwise had low conservation priority. Here, we sought landowner's cooperation to provide suitable feeding, protection from poaching and minimise disturbance at preferred feeding sites. Several agreements have lapsed recently but the merits of their case could usefully be discussed further.

Sixty-eight statutory "no shooting areas" have also been established in the Republic with the consent of landowners and hunters, of which 23 cover important sites within the ranges of 19 separate flocks. Some sites are also listed on the European CORINE conservation site database, which whilst offering no statutory protection, identifies the site of considerable importance.

Wintering site accounts

Twelve years have now passed since the introduction of a moratorium on shooting Greenland White-fronted Geese in Ireland and since regular winter counts were instigated. The status of individual flocks and of the total population has changed considerably since then and we have been particularly interested in the patterns underlying these changes.

Although it has been presented piecemeal in earlier annual reports and publications, much of what follows has not previously been brought together for counters. This section is followed by a brief account of each flock, updating the Ruttledge and Ogilvie (1979) paper in **Irish Birds**.

One of the key findings to emerge from the resighting of marked geese has been the extraordinary site loyalty that characterises Greenland Whitefronts, reinforcing the existing perception of a conservative species, slow to adapt to changes in its environment. This means that unfavourable conditions can result in flock declines or extinctions rather than a local redistribution of geese. To maintain current geographical range and diversity of feeding habitats, conservation problems therefore need to be tackled at the flock level.

One of our earliest objectives was to compile an up-to-date site inventory for the purposes of site protection, since by the early 1980s the accounts in Ruttledge and Ogilvie's paper had been outdated by further habitat loss and changed flock feeding patterns. Throughout the site accounts, we have identified the flock numbers used by Ruttledge and Ogilvie (1979) to identify changes recognised since their analysis. In contrast to the situation in Britain where roost conservation has been emphasised, feeding sites rather than roosts appear to be the commonest factor limiting a flock's range quality in Ireland.

Of all flocks, 40% have declined and a further 10% have shown no increase since the shooting moratorium, despite an overall increase in numbers in Wexford and elsewhere in Ireland. During the same period, flocks on large and medium-sized ranges had increased on average by 17% and 4% respectively, while those with small ranges had declined by 52%. So trends are strongly related to range size, specifically to the number and size of feeding sites. Hence, flocks which are described as being of "local" and "regional" importance are often declining. More importantly, these dispersed groups are the very flocks which are of greatest significance if the overall range of Greenland White-fronted Geese is to be maintained. The site assessment of Irish flocks is based upon "all-Ireland" criteria.

Flight is an energetically expensive activity and site size may be important to disturbed geese for two reasons. Firstly, our data show that the probability of geese remaining on site after a disturbance flight increases with increasing site size; so on average, flight duration is shorter on large sites than on small ones. Secondly, disturbed geese spend longer selecting alternative feeding locations on small than on larger ranges. Whitefronts on small ranges generally stay in one group, so they are rarely able to use other geese already on the ground to gauge the inherent dangers of landing on small sites. Survey results show that on small ranges the "best" available site is more strongly preferred than on larger ranges where a number of alternatives provide reasonable feeding conditions; recent observations of disturbance flight duration show that flocks on small ranges change destination choice more frequently than other flocks, occasionally returning to their starting point after more than twenty minutes flying! For this reason, throughout the site accounts which follow, we have given a category of range size for each flock, coded as follows: (A) ranges with more than ten feeding sites, one or more being over 400 ha., (B) ranges with 3-10 feeding sites, usually under 100 ha., rarely up to 250 ha., and (C) ranges with 1 or 2 feeding sites under 100 ha. in extent. Note that this information is not available for sites outside of Ireland.

We have also shown, contrary to our original impressions, that flock size trends are not strongly related to the frequency of disturbance flights *per se*. The results above suggest this is because the total time disturbed geese spend flying is primarily determined by flight duration rather than by flight frequency.

These results have highlighted the importance of range size to energy costs and so to the condition of overwintering geese. However, small ranges may also provide comparatively poor circumstances for obtaining the required quality and quantity of food. Small flocks on small sites may have to spend more time alert for predators and have less time to feed; opportunities for night-time feeding may be fewer and food quality is likely to be lower because of the restricted choice small ranges are known to offer.

As we might expect, given the faithfulness of Greenland Whitefronts to their winter ranges, range conditions are also related to the breeding success of individual flocks, probably by determining the body reserves that geese accumulate prior to migration. The measure of breeding success used was the proportion of years a flock's mean brood size exceeded the annual mean brood size of the Irish population outside Wexford. Breeding success is positively correlated with both range size and with the quality of springtime feeding; that is in spring flocks on intensive grassland performed better than flocks on bog, while the score of flocks using low intensity managed grassland was intermediate.

These analyses emphasise the central role of winter range size to the survival prospects of individual flocks. Admittedly Greenland Whitefront flocks are to be found increasingly on farmland, but they only readily exploit new opportunities when these occur within traditional feeding areas. The acquisition of completely new feeding sites, let alone major shifts in feeding range, happens rarely and over protracted periods. Their conservative behaviour is well suited to the exploitation of predictably-located wet bog patches that formed traditional feeding grounds, but is poorly

adapted to coping with rapid land-use changes of recent decades. The success with which flocks on small ranges can cope with their current dilemma is a moot point, but evidently the primary concern must be for site conservation.

The census also found pattern in relation to latitude. Independent of the effects of range size, flocks at the southern end of the winter range are performing poorly by comparison with those in the north of the country. Declines were first commented on by Don McMahon in Cos. Cork and Kerry in the early 1980s; combined peak numbers of flocks in these two counties have declined by 81% since 1983/84 and flocks immediately to the north, in Cos. Limerick and Clare are now being similarly affected. The explanation of this rather worrying development is unclear. However the fact that all the flocks involved also exhibit within-year declines, particularly in April, indicates a regional problem in spring, possibly associated with deteriorating feeding conditions.

Note that all the annual counts presented in the following site accounts for both Ireland and Britain are peak counts for each winter and thus may not give an accurate indication of overall within-winter use - peak counts may often occur when numbers are inflated by passage birds staging at a site (we know that this does happen from movements of marked individuals). For the same reason, adding site counts to derive local or national totals severely overestimates the true totals.

In the following site accounts, new code numbers have been given to each flock which identifies their location in Figure 1. Wherever possible, the equivalent flock identified by Ruttledge and Ogilvie (1979) is identified as, for example (R&O 14).

1. Loughs Foyle and Swilly, Cos. Donegal and Derry.

Status: An internationally important flock which has increased steadily in size since 1982/83 (R&O 40).

Site safeguards: There has been a management agreement between NPWS and the land-owners of the largest feeding site, on the Inch levels, in recent years. Lough Swilly and neighbouring feeding sites on the Inch levels, Big Isle and Blanket Nook are ASIs. No-shooting areas over parts of the estuary used as a roost are also currently being negotiated. No protection is currently afforded to Northern Ireland sites on Lough Foyle, although Lough Swilly (including Inch Lough and Levels and Blanket Nook) has recently been proposed as an SPA and Ramsar Site.

Habitat: Traditional bogland sites on the Inishowen peninsula were deserted prior to 1940 (see Norriss and Wilson 1993) in favour of large open areas of polder. The flock now uses waste potatoes and cereal grains, particularly in wet winters, but most feeding occurs on intensively-managed grassland.

Range size: (A). The favoured feeding site on the Inch levels is c.600 ha., but several of the 17 known alternatives support significant regular usage.

Maximum winter counts:

1982/83	217	1988/89	267
1983/84	223	1989/90	318
1984/85	254	1990/91	369
1985/86	245	1991/92	418
1986/87	239	1992/93	371
1987/88	240	1993/94	575

Threats: Considerable shooting disturbance on both Loughs, at present mitigated by the size of the feeding range. A proposal to build an airstrip on an important subsidiary Lough Swilly site at Big Isle could have far-reaching consequences for Whitefronts.

2. Dunfanaghy, Co. Donegal.

Status: Numbers steadily increasing, national importance since the mid-1980s (R&O 39).

Site safeguards: A small portion of the dune slacks at New Lake, Dunfanaghy, have been acquired by the state for

nature conservation. The Calabber valley and farmland around New Lake are ASIs.

Habitat: Traditional blanket bog sites in and to the west of the Calabber valley appear to have been deserted since the mid-1980s. Intensive grassland and a dune slack bordering New Lake are now regularly used but high within-winter count variability suggests hitherto unlocated sites. Lowest numbers are recorded in autumn, suggesting Inishbofin may be regularly used until food supplies are exhausted. However, Whitefronts have not been seen flighting to and from the island and the issue remains unresolved.

Range size: (B). A number of small (5-10 ha.) open farmland and semi-natural grassland sites.

Maximum winter counts:

1982/83	72	1988/89	227
1983/84	93	1989/90	249
1984/85	120	1990/91	228
1985/86	175	1991/92	219
1986/87	154	1992/93	193
1987/88	196	1993/94	131

Threats: None known at present.

3. Sheskinmore Lough, Co. Donegal.

Includes two sub-flocks at Lough Barra bogs and the Glencolumbkille peninsula, Co. Donegal; the latter was not recorded by Ruttledge and Ogilvie (1979).

Status: Formerly international, assuming national importance since the mid-1980s following loss of an important complex of bog feeding sites (R&O 36/38).

Site safeguards: The core feeding areas and roost at Sheskinmore Lough and sections of the Lough Barra bogs have been acquired by NPWS for conservation partly under ACE and 176.4 ha. were designated as a Ramsar Site in 1987; a section of Sheskinmore marsh is owned by the IWC. All other feeding sites are ASIs. Sheskinmore and Inishkeel have been proposed as SPA and Ramsar Sites.

Habitat: Marsh, wet meadow and unimproved pasture at Sheskinmore are used throughout the winter with significant supplementary use of surrounding bogs. Both sub-flocks are restricted to bogs except for some spring feeding on semi-natural coastal grassland.

Range size: (B). Sheskinmore is large enough for disturbed geese to resettle within the site; the three largest bog sites are between 25-50 ha.
(C). Lough Barra bogs and Glencolumbkille, both restricted to two small areas of bog.

Maximum winter counts:

Sheskinmore

1982/83	337	1988/89	113
1983/84	380	1989/90	128
1984/85	145	1990/91	122
1985/86	358	1991/92	74
1986/87	205	1992/93	108
1987/88	281	1993/94	104

Lough Barra bogs (left) and Glencolumbkille (right)

1982/83	32 68	1988/89	15 18
1983/84	52 70	1989/90	14 23
1984/85	18 33	1990/91	21 16

1985/86	12 26	1991/92	5 14
1986/87	29 21	1992/93	5 21
1987/88	8 12	1993/94	5 19

Threats: Afforestation and turbary remain threats at all bogland sites not owned by conservation agencies.

4. Pettigo, Co. Donegal.

Status: Numbers steadily increasing until 1988/89, with an abrupt decline in 1990/91, national importance (R&O 35/37).

Site safeguards: An area of bog by Lough Derg is a National Nature Reserve and is designated as a Ramsar Site (900 ha.); there is no formal protection but restricted access to Brownhall estate limits disturbance. A major lowland feeding site at Durnesh Lough and bogland on the Pettigo plateau are ASIs.

Habitat: The traditional bogland range has been rarely used since the early 1980s except during 1992/93 when remarkably most feeding occurred on bogland. The main flock now normally uses two coastal grassland farms. Small numbers still regularly feed on an island on Lough Derg and an isolated bog site at Meenaguse.

Range size: (B). The preferred site at Brownhall is c.80 ha., while the main alternative comprises a number of fields (<10 ha.) bordering Durnesh Lough.

Maximum winter counts:

1982/83	110	1988/89	224
1983/84	104	1989/90	182
1984/85	112	1990/91	127
1985/86	156	1991/92	128
1986/87	160	1992/93	131
1987/88	167	1993/94	96

Threats: The recent decline is possibly linked to a deterioration in the suitability of the Brownhall grasslands for Whitefronts since 1989, which has resulted in heavier use of the limited and comparatively disturbed pastures at Durnesh Lough.

5. Bunduff, Co. Sligo.

Status: A small declining flock. Maximum counts here exaggerate normal numbers present; in danger of extinction (R&O 33).

Site safeguards: Bunduff marshes are an ASI; no other protection.

Habitat: Marshes at Bunduff and pasture favoured by Barnacle Geese.

Range size: (C). The main feeding site comprises 20 ha. of marshes, encircled by roads. A number of Barnacle Goose sites, including Inishmurray, have also been irregularly used.

Maximum winter counts:

1982/83	23	1988/89	16
1983/84	12	1989/90	5
1984/85	9	1990/91	33
1985/86	21	1991/92	2
1986/87	25	1992/93	0
1987/88	8	1993/94	0

Threats: Bunduff itself is very vulnerable to disturbance and alternative grassland sites would appear to have too

short a sward for Whitefronts.

6. Lough Macnean, Co. Fermanagh.

Status: Regional importance (R&O 2).

Site safeguards: No legislative protection, but access difficulties to the main site on Cushrush Island minimise disturbance from the land.

Habitat: Intensive grasslands exclusively.

Range size: (C). Cushrush Island is about 20 ha. in size; two small sites (<5 ha. each) on the mainland shore are also occasionally used.

Maximum winter counts:

1982/83	77	1988/89	66
1983/84	98	1989/90	77
1984/85	56	1990/91	90
1985/86	46	1991/92	84
1986/87	60	1992/93	80
1987/88	62	1993/94	61

Threats: Disturbance is the major threat. Helicopters and quarry-blasting are the most frequent causes of flights; farming and a nearby outdoor pursuit centre apparently cause little problem.

7. Lough Oughter, Co. Cavan.

Status: Regional importance. Known to Ruttledge (pers. comm., part of R&O 2) but only documented in that geese on Upper Lough Erne were thought to originate from Lough Macnean (Ruttledge and Ogilvie 1979). The most important sites are all on Lough Oughter, but small numbers are recorded using Upper Lough Erne almost annually.

Site safeguards: None. Upper Lough Erne and Lough Oughter have recently been proposed for SPA and Ramsar designation.

Habitat: Intensively-managed grasslands.

Range size: (C). Two or three small regular feeding sites atop drumlins. Small parties occasionally use similar ground in Upper Lough Erne, Co. Fermanagh.

Maximum winter counts:

1982/83	nc	1988/89	52
1983/84	nc	1989/90	59
1984/85	nc	1990/91	63
1985/86	57	1991/92	67
1986/87	72	1992/93	79
1987/88	68	1993/94	87

Threats: Disturbance from agricultural activities would appear to be the only threat.

8. Caledon, Cos. Armagh and Monaghan.

Status: Regional importance. Not documented by Ruttledge and Ogilvie (1979).

Site safeguards: No statutory protection of the two feeding sites; a management agreement between the landowner and the Department of Agriculture (Northern Ireland) over drain maintenance permits winter flooding at Caledon.

Habitat: Wet pasture and lake margins at Caledon. A second site just over the border in Co. Monaghan has been reseeded following arterial drainage of the River Blackwater.

Range size: (C). The range contains only two feeding sites (of 15 and 20 ha.).

Maximum winter counts:

1982/83	84	1988/89	76
1983/84	72	1989/90	72
1984/85	82	1990/91	75
1985/86	80	1991/92	80
1986/87	98	1992/93	64
1987/88	nc	1993/94	64

Threats: Vulnerable to disturbance; agricultural disturbance on the Co. Monaghan site and army helicopters are particularly important.

9. Lough Conn, Co. Mayo.

Includes one sub-flock in the Ox mountains.

Status: National importance (R&O 29).

Site safeguards: A management agreement between NPWS and the landowner of the largest feeding site on Annagh island has been in place since 1990. Sites around Lough Conn and the lake itself are ASIs. The main feeding area in the Ox mountains is also an ASI, part of which has been acquired by the NPWS for nature conservation.

Habitat: Fertilised pastures around Lough Conn, with some early season use of callows. Whitefronts in the Ox mountains use blanket bog exclusively, coming down to Lough Conn in hard weather.

Range size: (B). An island in Lough Conn of c. 25 ha. is the preferred feeding site, with only two alternatives each <5 ha. One site is known in the Ox mountains, but the range has not been systematically surveyed.

Maximum winter counts: Counts for both areas are combined.

1982/83	114	1988/89	175
1983/84	139	1989/90	181
1984/85	109	1990/91	167
1985/86	169	1991/92	138
1986/87	137	1992/93	145
1987/88	167	1993/94	100

Threats: Conflicts with agriculture have been a problem for a number of years. Stocking levels on Annagh island have been particularly high since 1990, forcing the geese to feed on smaller, more disturbed sites. These changes may be responsible for a recent drop in numbers. Extensive afforestation and turbary threaten the viability of the Ox mountain birds' range.

10. Bog of Erris, Co. Mayo.

Comprises up to five sub-flocks. While range boundaries have shown little change since 1982, some movement

between sub-flocks is inferred from year-to-year count variability (R&O 27/28).

Status: The Keenagh-Dooleeg More-Bellacorick sub-flock listed by Ruttledge and Ogilvie (1979) became extinct in the late 1980s. The remainder are collectively of national importance, although none qualify individually.

Site safeguards: The Owenduff headwaters are a NNR and are designated as a Ramsar Site (1,382 ha.), since the site is one of the best developed and least disturbed Atlantic blanket bog systems in Europe. Termoncarragh Lake and all the more important bogland feeding sites are ASIs. No other specific conservation measures exist.

Habitat: Whitefronts in the Owenduff occur primarily on blanket bog. Elsewhere marsh, callows, wet and intensively managed grassland are used according to availability.

Range size:

1. Belmullet (C). Two small feeding sites of c.15 and 5 ha.
2. Owenmore river mouth (C). One feeding site of <10 ha.
3. Carrowmore Lough (B). Six regularly used feeding sites of 10-30 ha., mostly around the lake shore.
4. Owenduff (B). Eighteen bogland feeding areas are known, scattered over 200 km^2; two wet grassland sites are also irregularly used.
5. Maumykelly-Altnabrocky (C). Two widely separated sites each containing <1 ha. of suitable feeding ground.

Maximum winter counts:

Flock	1	2	3	4	5
1982/83	18	0	36	35	6
1983/84	26	0	25	38	9
1984/85	29	0	23	31	7
1985/86	27	0	36	41	9
1986/87	17	0	22	37	6
1987/88	30	0	34	47	8
1988/89	38	0	37	42	15
1989/90	22	20	38	50	15
1990/91	51	37	52	18	17
1991/92	71	27	37	10	0
1992/93	70	28	28	8	0
1993/94	81	27	40	17	10

Figures are maximum winter counts and because of some between-flock movements, their sum overestimates the Bog of Erris population.

Threats: Bogland habitat losses to forestry and peat extraction in the past have been severe and are continuing. Good grazing is scarce so agricultural disturbance and overgrazing are also chronic problems.

11. Errif and Derrycraff, Co. Mayo.

Status: A widely dispersed flock and therefore difficult to count (R&O 25/26). Good coverage was obtained in 1986/87 and 1991/92. International importance in 1986/87, but the decline to a national rating recorded since then seems to be well authenticated. Currently used sites to the south-east of Louisburgh are documented as the range of a separate extinct flock by Ruttledge and Ogilvie (1979).

Site safeguards: All bogland sites (save one which was discovered as it was being planted) are ASIs. Despite this

protection, several sites have been destroyed by forestry.

Habitat: More than 95% of feeding recorded on bogland, although wet pasture has become more important since 1990.

Range size: (A). Over thirty known feeding sites, some of which are still comparatively extensive.

Maximum winter counts:

1982/83	120	1988/89	145
1983/84	78	1989/90	74
1984/85	138	1990/91	78
1985/86	173	1991/92	133
1986/87	275	1992/93	176
1987/88	216	1993/94	135

Threats: Forestry continues to be the major threat to bogland sites. Exploratory gold mining continues in the area.

12. Connemara, Co. Galway.

Status: This flock, like the Errif/Derrycraff flock, is also widely dispersed and difficult to count. National importance in two of the three years for which good counts exist (R&O 20/21/22).

Site safeguards: All feeding sites are within ASIs. Leam West bog, south-east of Maam Cross is the only statutory National Nature Reserve used by Whitefronts.

Habitat: All feeding takes place on bogland.

Range size: (A). Sixty known feeding sites, scattered over 300 km^2.

Maximum winter counts:

1982/83	nc	1988/89	nc
1983/84	nc	1989/90	134
1984/85	99	1990/91	nc
1985/86	99	1991/92	nc
1986/87	nc	1992/93	60
1987/88	nc	1993/94	105

Threats: Forestry, turf extraction and mining.

13. Rostaff and Killower, Cos. Mayo and Galway.

Comprises two sub-flocks treated separately (as flocks 19 - Lough Corrib and 23 - Altore Lough) by Ruttledge and Ogilvie (1979).

Status: Taking both sub-flocks together, numbers are of national importance.

Site safeguards: The main feeding sites are ASIs.

Habitat: Seasonal use of turlough callows, wet and dry grasslands.

Range size: (B). Both ranges have six feeding sites, those favoured being somewhat larger for the Killower birds (20-40 ha.) than for the Rostaff sub-flock (10-25 ha.).

Maximum winter counts: for Rostaff (left) and Killower (right)

1982/83	88 27	1988/89	79 64
1983/84	73 29	1989/90	83 126
1984/85	76 24	1990/91	86 106
1985/86	85 36	1991/92	86 68
1986/87	89 42	1992/93	84 55
1987/88	85 43	1993/94	86 106

Threats: None reported but agricultural disturbance could become a problem.

14. Lower Lough Corrib, Co. Galway.

Status: Regional importance. This range was irregularly used in the 1960s and 1970s, leading to the suggestion that geese may have been from the Killower flock (part of R&O 19); certainly they are now separate flocks.

Site safeguards: The two most important feeding sites are ASIs. Lough Corrib has been proposed for SPA and Ramsar designation.

Habitat: Callows and wet grassland in the early 1980s, but intensively managed grasslands throughout the winter in recent years.

Range size: (B). Three feeding sites of 25-45 ha. on the edge of an extensive former flood plain of the Clare and Cregg rivers.

Maximum winter counts:

1982/83	83	1988/89	105
1983/84	66	1989/90	79
1984/85	74	1990/91	91
1985/86	84	1991/92	107
1986/87	82	1992/93	92
1987/88	86	1993/94	97

Threats: None known though the flood plain is in multiple private ownership and disturbance may become a problem if the intensification of grassland management continues.

15. Rahasane Turlough, Co. Galway.

Status: Regional importance although numbers have been close to qualification for national status since 1990/91 (R&O 18).

Site safeguards: Rahasane and nearby Creganna are ASIs. Rahasane Turlough has recently been proposed as an SPA and Ramsar Site.

Habitat: Callows and reseeded grassland.

Range size: (C). The flock have only two feeding sites, of c. 50 and 15 ha.

Maximum winter counts:

1982/83	67	1988/89	105
1983/84	50	1989/90	79
1984/85	63	1990/91	125
1985/86	62	1991/92	124
1986/87	66	1992/93	120
1987/88	71	1993/94	96

Threats: The winter flood regime of Rahasane turlough has reportedly altered in recent years, effectively restricting the flock to Creganna for long periods. The consequences for the geese of drainage attempts at Rahasane in 1992 are as yet unclear.

16. Tullagher, Co. Clare.

Status: Regional importance (part of R&O 17).

Site safeguards: The roost and surrounding callows are an ASI. A management agreement between the NPWS and the landowner covers nearby farmland (an ASI) favoured by the flock.

Habitat: Seasonal usage of the Tullagher Lough wetlands has given way during the 1980s to winter-long feeding on intensively managed grasslands.

Range size: Two small farms of 15 and 20 ha. are currently used, although traditional habitats are also available.

Maximum winter counts:

1982/83	41	1988/89	52
1983/84	64	1989/90	66
1984/85	27	1990/91	61
1985/86	52	1991/92	72
1986/87	43	1992/93	62
1987/88	55	1993/94	73

Threats: Shooting has been a problem in the past and may continue to restrict options on an already small range.

17. North County Clare.

Status: Regional importance (part of R&O 17).

Site safeguards: Most wetlands used by this flock since 1982 are listed as ASIs.

Habitat: Seasonal usage of marsh, callows, wet and dry grassland until the mid-1980s, which saw a changeover to grassland reseeds.

Range size: (B). Fifteen known traditional sites on wetlands up to 80 ha., which have generally been deserted in favour of up to three reseeds of <2 ha.

Maximum winter counts:

1982/83	19	1988/89	52
1983/84	53	1989/90	55
1984/85	49	1990/91	74
1985/86	56	1991/92	39
1986/87	67	1992/93	74
1987/88	42	1993/94	40

Threats: None reported.

18. Lower Lough Derg, Co. Clare.

Status: Regional importance (part of R&O 17). Winter counts have been quite variable relative to counts of other flocks. Direct observation and corresponding changes in neighbouring flocks suggest the Lough Derg flock sometimes uses other Co. Clare ranges for extended periods.

Site safeguards: Sites on Lough Derg and Lough O'Grady are ASIs.

Habitat: Seasonal use of marsh, callows and wet and dry grasslands.

Range size: (B). Five known feeding sites, four of which are grassy islands of 5 ha. or less.

Maximum winter counts:

1982/83	16	1988/89	0
1983/84	37	1989/90	19
1984/85	37	1990/91	24
1985/86	47	1991/92	15
1986/87	73	1992/93	14
1987/88	32	1993/94	17

Threats: Some illegal shooting is suspected, but the main threat seems to come from recreational disturbance.

19. Fergus and Shannon Estuaries, Cos. Clare and Limerick.

Status: Three separate flocks regularly found on the Fergus estuary and on the southern shore of the River Shannon, along the River Deel and the River Maigue, by aerial wildfowl counts in the 1970s (O.J. Merne pers. comm.). All three flocks were still present in reduced numbers in the early 1980s, but subsequently have been restricted to sites on the Fergus estuary (part of R&O 17).

Site safeguards: Two small areas of saltmarsh are Wildfowl Sanctuaries; otherwise they are unprotected. The Shannon and Fergus Estuary complex has recently been proposed as an SPA and Ramsar Site.

Habitat: Early season use of saltmarsh, feeding later on intensively managed grasslands.

Range size: (A). A very large winter range comprising 27 known feeding sites; several hundred hectares of suitable polder are available on the east bank of the River Fergus alone.

Maximum winter counts:

1982/83	50	1988/89	21
1983/84	68	1989/90	21
1984/85	34	1990/91	12
1985/86	35	1991/92	5
1986/87	18	1992/93	49
1987/88	42	1993/94	0

Threats: Disturbance from wildfowling and aircraft can be heavy. In addition illegal shooting of the geese is occasionally suspected.

20. Lough Gara, Cos. Sligo and Roscommon.

Status: International importance. This can be a difficult flock to count accurately and counts from the 1982/3 and 1983/4 winters may have underestimated numbers present (R&O 31).

Site safeguards: The lake, main feeding areas and roost are an ASI. The Upper Lough and minor feeding sites along the shore are a Wildfowl Sanctuary. Lough Gara has recently been proposed as an SPA and Ramsar Site.

Habitat: Traditional wetland habitats had been largely deserted prior to the recent drainage of the Upper Lough. Geese now feed on intensively managed grasslands bordering the lake, with only limited use of bogs and callows.

Range size: (B). Seventeen feeding sites have been recorded, the largest being just over 50 ha. of farmland. The

geese use an island on the Lower Lough or the Lough itself when disturbed.

Maximum winter counts:

1982/83	101	1988/89	605
1983/84	246	1989/90	514
1984/85	350	1990/91	500
1985/86	447	1991/92	465
1986/87	432	1992/93	500
1987/88	421	1993/94	538

Threats: Increasing numbers in the 1980s led to damage complaints from landowners on the largest feeding site. A number of unrelated poaching incidents have also been reported.

21. Drumharlow Lough, Cos. Leitrim and Roscommon.

Status: Formerly of national importance, becoming regionally important since 1989 (R&O 34). A small group of geese using the northern end of Lough Allen and the surrounding mountains may be a discrete flock but their habits are not well known. Ruttledge and Ogilvie (1979) list North Lough Allen sites as being used by the Lough Macnean flock (R&O 2).

Site safeguards: Drumharlow Lough is an ASI but no protection exists for any of the feeding sites; those at the east end of the lake are listed in CORINE.

Habitat: Callows, wet rough pastures and reseeded grasslands.

Range size: (B). Two feeding sites of 40 and 60 ha., with fifteen further small sites of up to 20 ha., often considerably less.

Maximum winter counts:

1982/83	78	1988/89	176
1983/84	116	1989/90	75
1984/85	174	1990/91	82
1985/86	108	1991/92	82
1986/87	127	1992/93	100
1987/88	132	1993/94	152

Threats: Forestry is an increasingly important land use locally and may threaten some of the wetter farms. Disturbance from angling and boating is also increasing, although their impact is unknown.

22. Loughs Kilglass and Forbes, Cos. Leitrim, Longford and Roscommon.

Status: National importance although this flock's habit of occurring in a number of widely-spread groups makes it difficult to count (R&O 3).

Site safeguards: The major lakes (Kilglass, Boderg, Bofin, Rinn and Forbes) are ASIs, but apart from one lakeshore wetland and the Rinn River callows, no feeding sites are protected. Farmland at Kilglass and Castle Forbes is listed in CORINE. Ballykenny/ Fishertown Bog was pruchased with ACE support.

Habitat: Callows, marsh and wet pasture along the Rinn river and Kilglass Lough; other groups of geese use reseeds almost exclusively. Raised bogs appear not to have been used since the mid 1980s.

Range size: (A). A very extensive range with twenty known feeding sites, several of the larger sites >100 ha. The lakes and bogs provide a number of refuges nearby when geese are disturbed.

Maximum winter counts:

1982/83	168	1988/89	148
1983/84	100	1989/90	123
1984/85	106	1990/91	240
1985/86	110	1991/92	240
1986/87	82	1992/93	240
1987/88	113	1993/94	240

Threats: None at present. Indeed prosperous farming conditions locally could lead to further improvements in grass quality and expansions of feeding range.

23. Midland lakes, Co. Westmeath.

Status: International importance. Ruttledge and Ogilvie (1979) considered the geese at Lough Ennel and Lough Iron to be discrete flocks but our observations of geese, including thirteen birds ringed in autumn 1986, show that nowadays one flock ranges over all the Midland lakes (R&O 5/7).

Site safeguards: The major lakes (Derravaragh, Iron, Owel and Ennel) and raised bogs bordering Lough Derravaragh are ASIs. Garriskill Bog was purchased with ACE support. However, none of the feeding sites have statutory protection apart from a 10 ha. field on the shore of Lough Iron which is owned by NPWS. Loughs Derravaragh, Ennel, Glen, Iron and Owel have been recently proposed for both SPA and Ramsar designation.

Habitat: Limited use of callows in winter, but most feeding takes place on intensively managed farmland. Use of raised bogs is now rare, even as refuges, since disturbed geese normally move temporarily onto lakes.

Range size: (A). Sixteen known feeding sites. Lough Iron is the single most important site where they use three farms of 60-100 ha. bordering the lake.

Maximum winter counts:

1982/83	366	1988/89	343
1983/84	300	1989/90	300
1984/85	342	1990/91	357
1985/86	388	1991/92	344
1986/87	445	1992/93	300
1987/88	365	1993/94	346

Threats: Some agricultural conflict sporadically, but geese are dispersed and therefore generally tolerated at the main sites around Lough Iron. No other threats currently.

24. North Lough Ree, Cos. Longford, Roscommon and Westmeath.

Comprises two sub-flocks, around the River Inny mouth on the eastern lake shore and a peninsula and islands north of Portrunny Bay at the north-west end of the lake (R&O 6/8).

Status: Formerly regional status, numbers have increased to national importance since 1990/91.

Site safeguards: Lough Ree, its islands and the Portrunny peninsula are ASIs but the feeding sites around the River Inny mouth are unprotected.

Habitat: Callows, wet grassland and semi-natural dry grassland.

Range size: (B). The River Inny geese have nine known feeding sites, the group to the north of Portrunny Bay have five; all are less than 15 ha. in size. The Portrunny Bay group appear on Lough Derg, where there is considerable shooting pressure, at the end of January but their feeding range during the shooting season remains unknown.

Maximum winter counts:

1982/83	72	1988/89	84
1983/84	63	1989/90	nc
1984/85	68	1990/91	125
1985/86	113	1991/92	107
1986/87	90	1992/93	75+
1987/88	100	1993/94	70

Threats: Shooting disturbance restricts feeding site choice on Lough Derg from October to January.

25. River Suck, Cos. Galway, Offaly and Roscommon.

Status: International importance (R&O 11/13/24).

Site safeguards: All major feeding sites are ASIs. In addition callows and farmland at Muckanagh and Cloonlaughlin are designated Wildfowl Sanctuaries and NPWS have purchased bogland at Lurgeen, in the north-west of the flock's range. Both the Middle Suck Callows (Shannonbridge to Athleague) and the Shannon Callows (Portumna to Athlone) have been recently proposed for SPA and Ramsar designation.

Habitat: Raised bogs have been rarely used in recent years. Callows and wet pasture are the most important autumn and winter habitats with heavier use of intensive grasslands in spring.

Range size: (A). The core feeding area comprises a string of thirteen closely spaced sites, each 30-70 ha., bordering the middle reaches of the River Suck and together forming one very large complex. Small numbers also regularly use a second, smaller complex along the mouth of the River Suck and the River Shannon south to Shannonbridge. A separate sub-flock centred on Glenamaddy turlough uses four sites, each less than 20 ha.

Maximum winter counts:

1982/83	290	1988/89	429
1983/84	336	1989/90	263
1984/85	412	1990/91	520
1985/86	407	1991/92	506
1986/87	483	1992/93	275
1987/88	495	1993/94	322

Threats: Individual sites have become temporarily unsuitable due to sheep grazing and temporary human habitations, but no pressures have threatened the integrity of the core range, which is protected from major disturbance by the shallowness of the main river (preventing navigation by pleasure boats) and the remoteness of several sites during high water. Geese at Glenamaddy and along the lower River Suck are more vulnerable to disturbance, particularly during the shooting season, and are occasionally displaced to the core range.

26. Little Brosna, Cos. Offaly and Tipperary.

Status: International importance. Ruttledge and Ogilvie (1979) recognised four populations of Whitefronts on the River Shannon between Portumna and Athlone but shooting pressure and habitat loss have since caused significant changes in numbers and distribution (R&O 12/part of 11).

Site safeguards: The entire range, apart from some farmland sites which are of minor importance, are listed as ASIs. The eastern and western sections of the most important feeding site on the Little Brosna are Wildfowl Sanctuaries. Two neighbouring raised bogs are used as refuges and are part-owned by NPWS. The Little Brosna Callows from the confluence with the Shannon, have recently been proposed as an SPA and Ramsar Site. Mongan Bog (119 ha.) was designated as a Ramsar Site in 1987 and All Saints Bog was purchased with ACE support.

Habitat: A variety of wetland habitats along the floodplains of the Little Brosna and from its confluence with the Shannon south to Lough Derg (see Mayes 1985). Small numbers feed throughout the winter on intensively

managed grassland to the east of Lough Derg.

Range size: (A). The largest feeding range in the country outside Wexford, despite the destruction of enormous areas of raised bog and the unsuitability of much of the Shannon callows because of disturbance. Thirty-four feeding sites have been recorded, of which the Little Brosna is the largest (625 ha.).

Maximum winter counts:

1982/83	359	1988/89	485
1983/84	358	1989/90	486
1984/85	299	1990/91	548
1985/86	385	1991/92	528
1986/87	408	1992/93	557
1987/88	419	1993/94	555+

Threats: Disturbance from shooting, fishing and boating already considerably curtail this flock's distribution through most of the winter, yet control of shooting and fishing within the Little Brosna Sanctuary depend largely on the goodwill of local landowners while pressures for increased access continue.

27. River Nore, Co. Kilkenny.

Status: Regional importance (R&O 9).

Site safeguards: No protection measures except for a subsidiary roost at Granstown Lough, which is a NNR.

Habitat: All feeding is on intensively-managed grassland.

Range size: (B). Eight known feeding sites, several of 50 ha. or more, comprise a quite respectable range. However only one suitable roost, at Shanahoe marsh, is available for much of the winter, the alternative at Granstown Lough being too enclosed and disturbed for regular use.

Maximum winter counts:

1982/83	80	1988/89	57
1983/84	70	1989/90	57
1984/85	58	1990/91	66
1985/86	66	1991/92	46
1986/87	70	1992/93	46
1987/88	85	1993/94	42

Threats: Agricultural disturbance can sometimes be a problem at a number of sites simultaneously. However the major threats stem from shooting disturbance and drainage at the Shanahoe marsh roost, whose security is essential for this flock's survival.

28. Kilcolman, Co. Cork.

Status: A small, locally important and declining flock (R&O 14).

Site safeguards: Kilcolman marsh is an ASI which, apart from some small peripheral areas, is jointly managed by a private owner (Mrs Margaret Ridgway) and by NPWS as a National Nature Reserve.

Habitat: Whitefronts still use Kilcolman marsh as a roost but have largely vacated the site for feeding in favour of nearby intensively managed grassland.

Range size: (C). Apparently restricted to two small feeding sites of 25 and 8 ha.

Maximum winter counts:

1982/83	21	1988/89	9
1983/84	21	1989/90	2
1984/85	19	1990/91	15
1985/86	27	1991/92	3
1986/87	42	1992/93	6
1987/88	6	1993/94	6

Threats: Disturbance levels are very low, particularly on the National Nature Reserve. The reasons for the decline of this and other flocks in the south-west are poorly understood, notwithstanding the small range size.

29. Doo Lough, Co. Kerry.

Status: This flock has declined from national importance in the first two years of the survey to near extinction in the early 1990s. In common with others in the south-west, it also typically exhibits peak numbers in early winter followed by substantial within-winter declines (part of R&O 15).

Site safeguards: The main feeding site at Doo Lough is an ASI.

Habitat: Mainly reseeded wet pasture although recent sporadic use of a small lowland bog bordering one farmland site has also been recorded.

Range size: (C). Two small feeding sites (25 and 5 ha.) are used; the flock roosts on a neighbouring mountain lake.

Maximum winter counts:

1982/83	86	1988/89	25
1983/84	99	1989/90	30
1984/85	55	1990/91	8
1985/86	70	1991/92	6
1986/87	39	1992/93	6
1987/88	23	1993/94	3

Threats: Some deliberate scaring took place and poaching was suspected when numbers were higher. Although these problems have now eased, agricultural disturbance levels remain high.

30. Killarney Valley, Co. Kerry.

Status: Regional importance (part of R&O 15).

Site safeguards: Almost the entire winter range lies within the Killarney National Park, the only bogland flock to be afforded such comprehensive protection.

Habitat: Exclusively bogland feeding (see Carruthers 1991 and 1992).

Range size: (B). Sixteen known feeding sites, although more than 90% of feeding occurs on the four largest sites.

Maximum winter counts:

1982/83	69	1988/89	40
1983/84	57	1989/90	33
1984/85	52	1990/91	41
1985/86	60	1991/92	37
1986/87	64	1992/93	36
1987/88	51	1993/94	43

Threats: Deer shooting by Park management staff was a source of serious disturbance in the 1980s. Control practices have now been changed to minimise conflict with the Whitefront flock, but recreational disturbance remains a serious potential hazard, particularly from hikers along a trail bordering the major feeding site.

31. Inny Valley, Co. Kerry.

Status: Not documented by Ruttledge and Ogilvie (1979). Local importance in the early 1980s. Whitefronts have not overwintered since 1984/85 (the record in 1990/91 relates to a single sighting) and this flock must now be regarded as extinct.

Site safeguards: None; part of the former range was afforested about 1980.

Habitat: Exclusively bogland.

Range size: (C). Six small feeding sites were recorded but how many of these still remain is uncertain.

Maximum winter counts:

1982/83	5	1988/89	0
1983/84	3	1989/90	0
1984/85	2	1990/91	3
1985/86	0	1991/92	0
1986/87	0	1992/93	0
1987/88	0	1993/94	0

32. Blasket Islands, Co. Kerry.

Status: A flock of national importance until 1983/84, which has declined to near extinction since 1990. Listed by Ruttledge and Ogilvie (1979) as deserted.

Site safeguards: A feeding site on the Great Blasket is part owned by OPW and it is proposed that the whole island be acquired as a National Park. The main feeding site on Beginish Island is an ASI and one abandoned mainland site is a Wildfowl Sanctuary.

Habitat: Low intensity grassland.

Range size: (C). Six feeding sites are documented although use is currently restricted to the two islands, with feeding areas of 14 and 5 ha.

Maximum winter counts:

1982/83	90	1988/89	31
1983/84	94	1989/90	9
1984/85	60	1990/91	0
1985/86	40	1991/92	6
1986/87	47	1992/93	22
1987/88	28	1993/94	14

Threats: Traditional mainland sites are no longer suitable because of excessive agricultural disturbance and heavy grazing by sheep. Competition from sheep and rabbits is also a problem on the islands, compounded by a die-back of above-ground vegetation following winter storms.

33. Stabannan, Co. Louth.

Status: A recently established flock of regional importance developed since Ruttledge and Ogilvie (1979). Numbers

seem only to be slowly increasing, in contrast to the flock of Greylag Geese which have increased dramatically to over 1,000.

Site safeguard: The area protected by an ASI designation and management agreement extends considerably beyond the feeding range of the Whitefronts to include major feeding sites used by Greylags and Whooper Swans.

Habitat: Exclusively arable and intensively managed grassland.

Range size: (A) Two small sites within the ASI, but the area available totals nearly 500 ha..

Maximum winter counts: first recorded in 1987/88.

1987/88	42	1991/92	28
1988/89	27	1992/93	38
1989/90	26	1993/94	41
1990/91	36		

Threats: The Whitefronts here benefit from a management agreement concerned primarily with conserving internationally important numbers of Greylag Geese and Whooper Swans so agricultural conflicts do not pose a threat at present.

34. Wexford Slobs and Cahore, Co. Wexford.

Status: International importance; Wexford sites regularly held 30-38% of the total winter population in the early 1980s, but their relative importance has steadily declined in recent years and absolute numbers have stabilised since 1989/90 (R&O 10).

Site safeguards: The original NNR of 110 ha., now a Ramsar Site and SPA, has been extended by a further acquisition of 84 ha. The site, including both North and South Slob and Wexford Harbour, and another feeding site at Cahore are ASIs. The principal roost site within the Raven Point National Nature Reserve is separately designated as a Ramsar Site (589 ha.) and the whole of Wexford Slobs and Harbour (c.4,000 ha. in total) has recently been proposed as one SPA and Ramsar Site.

Habitat: Seasonal use of stubble fields, roots and intensive grassland; unharvested sugar beet is made available to the geese *in situ* on the reserve during the winter.

Range size: (A). The North and South Slobs (1,000 and 950 ha. respectively) form the core of the feeding range, although some surrounding farmland is intermittently used. A coastal wetland at Cahore (80 ha.) becomes important in February and March.

Maximum winter counts:

1982/83	6363	1988/89	11016
1983/84	6606	1989/90	9539
1984/85	7918	1990/91	10790
1985/86	8255	1991/92	10000
1986/87	8769	1992/93	8428
1987/88	8781	1993/94	10356

Threats: Changes in farm management practices such as extensive sheep grazing, set aside or conversion of farmland to forestry restrict the available feeding areas. Furthermore conflict with agriculture does occur despite local management agreements and geese are excluded from some areas of grassland, especially in spring. There is some evidence to suggest that geese had reached the carrying capacity of the Slobs in the late 1980s, when scaring and sheep grazing were widespread, prior to the systematic provisioning of sugar beet to feed geese in winter. Recent increases in the proportion of tillage on the North Slob has further reduced the potential area available to foraging geese. The entire site lies below sea-level and is only maintained by pumping. With projected increases in sea level and the fall in the value of agricultural land, future conflicts could arise over the appropriate land-use of the Sloblands.

2.2 Britain

Distribution

The present range of the Greenland White-fronted Goose has not changed markedly since the review of Ruttledge and Ogilvie (1979), and remains restricted to the north and west of Britain. As in Ireland, this distribution follows the traditional natural distribution of bogs and wetlands which were its former traditional wintering area, although several flocks exist now on sites which are known to have been newly colonised during the 1930s (e.g. Colonsay and some areas on Kintyre). More latterly, new flocks have become established on Jura (during the early 1980s) and at Sullom Voe on Shetland (first recorded in 1987/88 on artificial habitat). There have been several modifications in the use of different areas since 1982/83, most conspicuously on Orkney where the Tankerness/Holm flock on Mainland which apparently deserted the area for three seasons in the late 1980s and early 1990s. In Caithness, the two major flocks remained relatively stable since 1982/83. Observations in the early 1980s showed that birds in lowland areas regularly commuted to the peatlands of the interior of Caithness, but their use of this patterned bogland apparently declined, perhaps as a result of afforestation of such areas. No such behaviour has been recorded in recent years. Sporadic records of geese on North Uist suggest that this flock, described by Ruttledge and Ogilvie (1979) as extinct, have not recolonised the site.

Several sites have been totally abandoned during the last twelve years, notably Loch Eye in Easter Ross, which historically supported up to 80 Greenland White-fronted Geese, but no birds have been seen there since 1987/88. This has occurred in spite of protection of the Loch and adjacent parts of the Dornoch Firth as SSSIs. This may have perhaps be linked to changes in agriculture and the changes in abundance of other grey geese in the area, notably a large increase in the Greylag Geese numbers using the area. The flock which wintered at Clachan (and considered genuinely separate from the Tayinloan/Rhunahaorine group) has not been seen since 1987/88, but may have since become amalgamated with other flocks in this particular part of Argyll. Barr Loch in Renfrew has shown no evidence of use since 1977, despite the presence of a permanent warden there; its past status as a regular site is questionable, records may have related to staging birds moving elsewhere. Records from the Loch Sguod area of Wester Ross, too, may have always resulted from staging birds *en route* elsewhere, so the lack of recent records from this resort may not represent a true flock extinction. This situation highlights the difficulties of covering very remote flocks easily, and there remains considerable fieldwork to be done to confirm the status of infrequently used site. However, it is known that the Bladnoch Valley in Dumfries and Galloway has indeed become deserted during the last twelve years, and recent intensive survey by Paul Shimmings and Paul Collin show that the areas once used are no longer visited by Greenland White-fronted Geese. Similarly, the small flock in upland Central Wales in very recent winters has abandoned its former haunts completely based upon intensive fieldwork there by Barry Long.

In summary, therefore, there have been four flock extinctions and two new sites colonised in the last twelve years. Seven additional flocks have been discovered since the account of Ruttledge and Ogilvie (1979) which are now known to have existed prior to 1982/83, namely two flocks on both Orkney and Mull, and single flocks on Lewis, Skye and Danna/Keills. Improved coverage has also confirmed the presence of a flock on Benbecula and two groups on South Uist in the Outer Hebrides, as well as regular flocks at Lismore, Benderloch and Moine Mhor in Argyll, where the status of Greenland Whitefronts remained obscure at the time of the earlier analysis.

Abundance

The wintering population in Scotland has almost trebled from *c.*7,000 in 1982/83 to *c.*19,000 in 1999/2000. Over two-thirds of these now occur on the island of Islay, where numbers have increased from 3,500 in 1982/83 (i.e. approximately half the Scottish total) to between 11,200 (spring) and 13,900 (autumn) in 1999/2000. On the basis of recorded movements of individually marked birds, it is known that Islay is comprised of several flocks and hence cannot be regarded as a single "site" or flock unit in its own right. Away from the island, there are a further 33 regularly used wintering areas, mostly in western Scotland, varying in size from less than ten individuals to more than 1000. Four sites (Tiree, Coll, Rhunahaorine and Machrihanish) all support more than 500 birds and all have shown increases in the last twelve years. Eleven sites have recently supported 100 or more birds (two flocks in Caithness, Benderloch, Colonsay, Jura, Keills/Danna, Loch Lomond, Bute, Stranraer, Loch Ken and Dyfi Estuary) of which six show stable trends in numbers; the remainder have increased. Six sites supporting 50-100 birds have been stable or slightly increased their numbers, but of the remaining eleven flocks with less than 50 individuals, five continue to decline and none show any sign of increase. As is the case in Ireland, it is precisely the small groups that are in need of the most urgent conservation action, since we have seen four extinctions of small flocks during

the last twenty years and we may be witnessing the beginning of the end of yet more.

The current threshold of 1% of the population to qualify a site for international importance fails to protect these smaller groups, which are typically far from other wintering resorts. Hence attention must be given to these flocks if range contraction (flagged as a very important conservation objective in the management plan for Greenland White-fronted Geese and an obligation of governments under the EU Birds Directive) is to be avoided.

Research

GWGS first established a network of observers throughout the wintering range in Scotland and Wales and has co-ordinated the census of the population ever since in collaboration with NPWS, RSPB and DoE(NI) in Ireland to ensure international co-ordination. A number of accounts of the analyses of local flock abundance, distribution and behaviour have been published over the years, detailed in the following site reports. In addition, counts supplied to the Wetland Bird Survey (organised by the British Trust for Ornithology, WWT, RSPB and JNCC) collate counts from sites not included in the monitoring of sites regularly used by the geese.

In more recent years, various involved bodies have carried out detailed counts. In Scotland, SHN have begun to count Greenland White-fronted Goose in their South West Scotland Region, including 10-15 counts each winter on Islay. At the RSPB Loch Gruinart Reserve on Islay, special counts are done for the entire reserve on an even more frequent basis. In Wales, the statutory body there, the Countryside Council for Wales (CCW) has recently carried out special surveys of upland resorts historically used by the geese. Special surveys of some of the Dumfries and Galloway and Kintyre flocks have also been carried out for SNH by the RSPB. WWT also initiated detailed studies of the geese on Islay under contract to SNH, with particular emphasis upon the definition of flock units on the island, relating feeding areas to specific roost sites and assessing home ranges of collared and radio-tagged geese. The studies demonstrated that there were substantial differences between the reproductive success of different "sub-populations" between different parts of the island and in different years. Their studies also concentrated on habitat use and assessed the effectiveness of different management techniques (such as liming, fertilising and rush-cutting in old pastures) as a basis for creating refuges which could be used to "decoy" geese away from more sensitive crops. All these studies were initiated to provide detailed information to underpin the Goose Management Scheme on the island (see below).

Marking and resighting of individually marked birds was first initiated by GWGS as a result of their 1979 expedition to west Greenland, and the Study continues to maintain the database of resightings of individually marked birds to the present day. Considerable analysis has already been undertaken and also continues currently.

Protection and conservation

The Wildlife and Countryside Act (1981), Environmental Protection Act (1990) and the Natural Heritage (Scotland) Act (1991) provide the legislative basis for the protection of Greenland White-fronted Geese in Great Britain. As in Ireland, these domestic legislation instruments incorporate the requirements under the EU Birds Directive which lists Greenland Whitefronts on Annex 1 (see the Irish section for full details). Ramsar, Bonn and Berne Conventions also apply.

In England and Wales, the Wildlife and Countryside Act permits an open season for White-fronted Geese during 1 September - 1 February; in practice this applies to Russian Whitefronts (*Anser albifrons albifrons*), except at the last remaining regular Greenland Whitefront resort on the Dyfi Estuary. Fortunately, the Dyfi flock has been the subject of a voluntary ban by the local wildfowling organisations since 1972. In Scotland, since 1982, White-fronted Geese have been protected under the Wildlife and Countryside Act, which grants effective protection to Greenland Whitefronts as few Russian Whitefronts occur here. However, between 1988 and 1992, more than 150 geese were shot under licences issued by the Scottish Office to shoot unlimited numbers on the island of Islay.

Because of Islay's outstanding international importance for Greenland White-fronted and Barnacle Geese, a Goose Management Scheme was introduced in 1992/93 by SNH to encourage sympathetic management on land where the geese occur regularly. Financial incentives have been offered under this voluntary scheme to support goose use on farms throughout the island. Payments are offered on the basis of the average numbers of geese using specific fields and in return, the recipients of financial support agree to specific farming practices to ensure sympathetic management for geese. The mechanism has been welcomed, since previously, only farmers who managed areas already of importance for geese could receive financial inducement to encourage geese. The Scheme is a great step forward for goose conservation on the island, since enrolment in the Scheme does away

with any need to grant licences to shoot geese.

Site protection in Great Britain is based upon designation of Sites of Special Scientific Interest (SSSI), and as will be seen from the site accounts that follow, many of the roost sites and some of the feeding areas used by the geese are protected under this mechanism. Additional protection through international recognition for has been forthcoming for many sites that qualify, but further progress on declaration of the list of proposed Ramsar and EU Special Protection Areas is awaited to complete this level of site safeguard for the population wintering in Britain. These sites, as with SSSIs, will then require the further formulation and implementation of site management plans to ensure their future.

Wintering site accounts

35. Sullom Voe, Shetland

Status: Regional importance. A newly colonised site, apparently used from 1987/88 onwards. Maximum counts have occurred in April in some years suggesting geese use the area prior to spring departure.

Site safeguards: Informal through restricted access to the development site.

Habitat: New land claim within Orka Voe, comprising peat waste covered in top soil, with two large pools, smaller ponds and marshy areas (see Dale 1990).

Maximum winter counts:

1982/83	0	1988/89	nc
1983/84	0	1989/90	nc
1984/85	0	1990/91	8
1985/86	0	1991/92	nc
1986/87	0	1992/93	nc
1987/88	14	1993/94	nc

Threats: Little at present, since disturbance is restricted through strict security related to the oil terminal. When disturbed, the flock moves to the nearby island of Bigga in Yell Sound.

36. Tankerness/Holm, Orkney

Status: Regional importance (R&O 42). Apparently deserted for a while as a regular feeding area in recent years, the decline at this site seemed to match an increase in the regular wintering flock on Stronsay. The reasons for this change in wintering site remain unknown. These birds have also been seen on Sanday. The geese are still occasionally seen during most winters in this area of the Mainland, perhaps suggesting this is a preferred site, despite their movement to Stronsay.

Site safeguards: None

Habitat: The geese formerly used areas of marginal moorland, rough pasture and reseeded grassland in this area of east Mainland Orkney, but there has been considerable land claim of semi-heath areas and rough pasture about the fringes of the areas used by the geese which may have precipitated their departure from the vicinity.

Maximum winter counts:

1982/83	34	1988/89	0	1994/95	29
1983/84	36	1989/90	0	1995/96	21
1984/85	48	1990/91	0	1996/97	14
1985/86	48	1991/92	31	1997/98	19
1986/87	28	1992/93	30	1998/99	7
1987/88	26	1993/94	16	1999/00	60

Threats: Generally there has been little disturbance in the area, apart from that from regular farm work, and no attempts to drive geese from fields. There do not appear to be any problems associated with shooting. Continuing land claim may have contributed to the temporary abandoning of this site, although assuming it is the same flock using Stronsay, they seem to be able to settle at alternative feeding areas.

37. Loons/Isbister, Orkney

Status: Regional importance (new since R&O). In recent years, the flock has become very elusive, and the fluctuations in the annual count suggest hitherto unlocated alternative feeding areas in the vicinity. In very recent years, they have fed rather more in the Hundland and Swannery areas further east of their former range.

Site safeguard: Areas used by the geese lie within the Loch of Isbister and the Loons SSSI and RSPB reserve.

Habitat: The geese use a variety of habitats, including bogland with open water, rough pasture and reseeded grassland as well as denser marshland vegetation in the Loons area. Agricultural change and drainage is not considered a problem in the area in recent years.

Maximum winter counts:

1982/83 46	1988/89 66	1994/95 99
1983/84 49	1989/90 94	1995/96 166
1984/85 31	1990/91 89	1996/97 160
1985/86 49	1991/92 119	1997/98 121
1986/87 79	1992/93 79	1998/99 125
1987/88 75	1993/94 98	1999/00 143

Threats: None known

38. Stronsay, Orkney

Status: Regional importance. Not known to Ruttledge and Ogilvie (1979). Considered perhaps to be part of the group of birds that also used the Tankerness/Holm area of east Mainland Orkney.

Site safeguard: None.

Habitat: The geese will use stubble on the island in autumn but spend much of the winter on rough pasture and reseeded grassland. They frequently use the area about Meikle Water on the island.

Maximum winter counts:

1982/83 nc	1988/89 49	1994/95 30
1983/84 nc	1989/90 60	1995/96 62
1984/85 48	1990/91 0	1996/97 nc
1985/86 48	1991/92 30	1997/98 nc
1986/87 52	1992/93 33	1998/99 nc
1987/88 54	1993/94 37	1999/00 34

Threats: There does seem to be some local but low-level disturbance from shooting on the island, but agricultural land use change and drainage do not give cause for concern regarding the habitat of these geese.

39. Westfield, Caithness Lochs, Caithness District, Highland Region

Status: International importance (part of R&O 43). This group would seem to be the most discrete of the groups of wintering birds in Caithness, utilising agricultural land south-west of Thurso and roosting either on the Broubster

Leans wetland or on the northern end of Loch Calder. Despite some counting difficulties, there is considerable variation in the maximum numbers of birds recorded each year, but there seems to be some trend towards a recent increase. Several leg-ringed individuals caught in Greenland have been recorded amongst this flock, enabling the linkage of different sites used by this group of birds (see Laybourne and Fox 1988).

Site safeguard: The roost and feeding area at Broubster Leans is designated as an NCR SSSI and is a component of the Caithness Lochs proposed SPA and Ramsar Site.

Habitat: Cereal and reseeded grassland characterise much of the area used by the flock, which feed on stubble on arrival in autumn. Later, the geese switch to feeding on rough pasture and reseed, especially the rough pasture and bog of the valley floor in Forss Water, eventually grazing high quality reseed in the spring prior to departure.

Maximum winter counts:

1982/83 224	1988/89 199	1994/95 206
1983/84 140	1989/90 209	1995/96 352
1984/85 150	1990/91 180	1996/97 210
1985/86 190	1991/92 329	1997/98 206
1986/87 165	1992/93 190	1998/99 230
1987/88 163	1993/94 196	1999/00 255

Threats: Drainage and agricultural disturbance continue in the area, which may have some adverse effects on the geese and certainly modifies their distribution locally.

40. Loch Heilen/Loch of Mey, Caithness Lochs, Caithness District, Highland Region

Status: International importance (part of R&O 43). Two leg-ringed birds from Greenland have been read at this site, as well as a Wexford marked female with her family. Resightings have confirmed the use of several areas around the vicinity by this group of birds. The geese may also move as far as Loch of Toftinghall in some winters.

Site safeguard: Lochs Heilen, Mey and Watten are all SSSIs and are components of the Caithness Lochs proposed SPA and Ramsar Site. Lochs Heilen and Mey are alternative roosts for what appears to be the same group of birds (based on individual markings).

Habitat: The geese again use stubble fields in the early winter from arrival, moving to rough pastures during the majority of the winter. Loch of Mey, with its peripheral wetlands, shallow water areas and wet grassland seems to be attractive from January onwards, but the geese move to reseeded grassland in the spring.

Maximum winter counts:

1982/83 160	1988/89 162	1994/95 176
1983/84 80	1989/90 305	1995/96 258
1984/85 110	1990/91 160	1996/97 196
1985/86 100+	1991/92 148	1997/98 217
1986/87 200	1992/93 160	1998/99 215
1987/88 170	1993/94 178	1999/00 280

Threats: There is a high level of shooting in the Heilen area, especially of Greylags that are also shot under license during the spring. Such disruption during the period of rapid fat accumulation for Whitefronts could be detrimental. Duck shooting on Loch of Mey may also cause disruption. Rough grazing in the northern area around Loch Heilen was drained in the early 1980s, making the area less attractive to geese. Some of the base-rich wet grassland of the area has also become drier through wind-blown sand accumulation, reducing the attractiveness of the immediate area around the roost at Loch Heilen.

41. Loch Scarmclate, Caithness Lochs, Caithness District, Highland Region

Status: International importance (part of R&O 43). Geese feed in adjacent fields and flight to the loch to roost. There have been no individually marked birds seen at Scarmclate, but it is generally felt that flights between here and the Loch of Mey/Heilen complex identify these birds as part of the same group. The rather erratic nature of the counts from Scarmclate would tend to suggest that this is the case.

Site safeguard: Loch Scarmclate is an SSSI and a component of the Caithness Lochs proposed SPA and Ramsar Site.

Habitat: Mainly intensively managed farmland with cereals and reseeded grassland, although some rough pasture remains.

Maximum winter counts:

1982/83 80	1988/89 95	1994/95 56
1983/84 118	1989/90 130	1995/96 2
1984/85 129	1990/91 192	no regular numbers
1985/86 0	1991/92 59	since
1986/87 nc	1992/93 8	
1987/88 4	1993/94 14	

Threats: Greylags are shot in the area in spring and this usually disperses Whitefronts away from the loch in the morning. The loch is also much used by anglers.

42. Loch Winless/Loch Wester, Caithness Lochs, Caithness District, Highland Region

Status: International importance (part of R&O 43). There is little information about these birds and their interchange with the other flocks of Caithness, but the presence of a consistent small group in the general area suggests continuity of use of these resorts.

Site safeguard: Loch Winless, the Loch of Wester and the Moss of Killimster are all SSSIs and all are components of the proposed Caithness Lochs Ramsar Site and SPA.

Habitat: Moss of Killimster is a species rich lowland blanket mire, the nearby Loch of Winless is base-rich swamp and wet meadow, both attractive as feeding for the geese, which roost on the Loch of Killimster. Loch of Wester is a shallow mesotrophic loch with surrounding dune and rough pasture, reseed and bogland.

Maximum winter counts:

1982/83 53	1988/89 14	1994/95 67
1983/84 47	1989/90 0	1995/96 51
1984/85 45	1990/91 0	1996/97 0
1985/86 64	1991/92 29	1997/98 nc
1986/87 29	1992/93 6	1998/99 nc
1987/88 40	1993/94 nc	1999/00 nc

Threats: None known.

43. Loch Meadie/Loch a'Cherigal, Caithness District, Highland Region

Status: Regional importance (part of R&O 43). Possibly abandoned as a regular site in recent years. This area seemed to have been very important as a feeding area and roost in the 1970s, used especially in the early winter when the geese fed on their traditional bogland food items. Morning flights suggested birds commuted between the Loch Heilen area and these boglands at that time, but these no longer occur. Aerial survey and considerable ground searching suggests that with the afforestation of the peatlands, these areas are used much less than formerly and may be abandoned. More survey is required to determine the importance of these areas.

Site safeguard: Shielton Peatlands and the Loch More Wetlands are both SSSI (the former with NCR status), and are components of the Peatlands of Caithness and Sutherland proposed Ramsar Site and proposed SPA.

Habitat: Extensive areas of patterned bogland in the peatland interior of Caithness (the Flow Country) have held Whitefronts since late last century (see Laybourne and Fox 1988).

Maximum winter counts:

1982/83	38	1988/89	nc	not counted in
1983/84	10	1989/90	nc	subsequent
1984/85	40	1990/91	nc	years
1985/86	0	1991/92	nc	
1986/87	nc	1992/93	nc	
1987/88	nc	1993/94	nc	

Threats: Perhaps very little currently, although the massive afforestation of the area in the 1980s caused enormous change to the vegetation in the areas formerly used by the geese.

44. Loch Eye, Ross and Cromarty District, Highland Region

Status: Extinct (R&O 44). Very little was known of these birds which were always highly elusive amongst the large flocks of Greylag Geese using the area. It appears the Whitefronts fed with Greylags on stubbles and reseed, flighting to the Loch to roost.

Site safeguard: Loch Eye is an NCR SSSI. It was designated as a Ramsar Site and SPA in 1986. The Morrich More is also NCR SSSI and the geese also used parts of the Dornoch Firth SSSI.

Habitat: Loch Eye is a eutrophic lowland loch surrounded by rich agricultural land, with extensive cereal and rootcrop cultivation, reseeded and rough grassland. Geese used to feed out over the Morrich More, an extensive area of dune grassland with wetland communities, as well as feeding in rich agricultural areas along the southern shore of the Dornoch Firth.

Maximum winter counts:

1982/83	42	1988/89	0	none reported
1983/84	5	1989/90	0	in recent years
1984/85	15	1990/91	0	
1985/86	9	1991/92	0	
1986/87	17	1992/93	0	
1987/88	10	1993/94	nc	

Threats: Not known and the reasons for the decline and extinction remain unknown.

44a. Loch of Strathbeg, Grampian Region

Status: Probably not a traditional site in any way, but the occurrence of large numbers of Pink-footed Geese at and around this site, together with intensive observation coverage, means that Greenland White-fronted Geese have been reported in all recent years. The birds are difficult to find elusive amongst the large flocks of Pink-footed Geese using the area, feeding on stubbles and reseed, flighting to the Loch to roost.

Site safeguard: Loch of Strathbeg is an NCR SSSI. It was designated as a Ramsar Site and SPA in 1986 and is partly an RSPB reserve.

Habitat: Loch of Strathbeg is a eutrophic lowland loch surrounded by rich agricultural land, with extensive cereal and rootcrop cultivation, reseeded and rough grassland.

Maximum winter counts:

1994/95	7
1995/96	6
1996/97	4
1997/98	10
1998/99	4
1999/00	3

Threats: None known, although local goose hunting and disturbance occurs.

45. Loch Urrahag, Lewis, Western Isles

Status: Regional importance. An apparently new site, not mentioned by either Atkinson-Willes (1963) or Ruttledge and Ogilvie (1979), although Berry (1939) mentioned a flock on Lewis. The site has been regular since at least 1971, when 55 were present. There seems to have been a steady decline since that time with signs of a recent modest recovery. No marked birds have been seen amongst this flock.

Site safeguard: None.

Habitat: Rough sheep-grazed pasture with a little bogland, although the geese do resort to the elevated short maritime saltmarsh turf of local headlands, where they seek refuge from disturbance and probably roost.

Maximum winter counts:

1982/83	27	1988/89	20	1994/95	35
1983/84	29	1989/90	42	1995/96	21
1984/85	28	1990/91	41	1996/97	26
1985/86	17	1991/92	36	1997/98	25
1986/87	24	1992/93	28	1998/99	25
1987/88	20	1993/94	23	1999/00	24

Threats: In the early 1980s, poaching was a problem, and in 1982/3, the flock was heavily disturbed by local hunting. This gave considerable cause for concern at the time, but seems to be less of a problem in recent years (see Cunningham *et al.* 1990).

46. Nunton/Griminish, Benbecula, Western Isles

Status: Regional importance (part of R&O 45). Between 50 and 120 have been recorded on the island prior to the early 1960s (Atkinson-Willes 1963), but Ruttledge and Ogilvie (1979) reported 25-50 and declining. These may be part of the North Uist flock which was thought to have ceased to occur as a regular flock, but has shown recent recovery again (see below). Although few were reported in the early 1980s, there does seem to have been a decline in numbers after the late 1980s. This is another area where detailed survey to determine feeding and loafing areas would be useful.

Site safeguard: None.

Habitat: Little information, mainly machair and low-intensity farmland.

Maximum winter counts:

1982/83 nc	1988/89 37	1994/95 4
1983/84 0	1989/90 33	1995/96 0
1984/85 0	1990/91 20	1996/97 9
1985/86 nc	1991/92 7	1997/98 0
1986/87 0	1992/93 31	1998/99 48
1987/88 41	1993/94 4	1999/00 0

Threats: Heavily shot over in 1993/94, the flock probably joined the Kilaulay flock for most of this (and maybe preceeding) winter(s).

47. Kilpheder/Askernisk/Loch Hallan, South Uist, Western Isles

Status: Regional importance (part of R&O 45).

Site safeguard: Loch Hallan is NCR SSSI and includes adjacent machair fringing the loch which is used by the geese.

Habitat: Machair, low intensity farmland and bog, with freshwater areas.

Maximum winter counts:

1982/83 20	1988/89 46	1994/95 43
1983/84 19	1989/90 55	1995/96 60
1984/85 60	1990/91 55	1996/97 34
1985/86 22	1991/92 52	1997/98 47
1986/87 31	1992/93 36	1998/99 52
1987/88 56	1993/94 50	1999/00 7

Threats: The area is subject to shooting disturbance, although locals are generally careful to avoid shooting Whitefronts.

48. Loch Bee (Ardivachar/Kilaulay), South Uist, Western Isles

Status: Regional importance (part of R&O 45). There seems to have been a substantial decline in the numbers of whitefronts wintering on South Uist since the 1950s, when "up to 250 could still be found on the machair lands on the west coast". Between this group and the preceding one, the present total sometimes exceeds 100, but the Loch Bee group does seem to have better maintained its numbers over the monitored period, perhaps in recent years due to amalgamation of the Benbecula flock.

Site safeguard: Loch Bee Machair is NCR SSSI, is part of the South Uist Machair and Lochs proposed Ramsar Site and proposed SPA.

Habitat: Machair, extensive wet meadow, low intensity farmland and bog, with freshwater areas.

Maximum winter counts:

1982/83 55	1988/89 17	1994/95 109
1983/84 55	1989/90 73	1995/96 60
1984/85 60	1990/91 55	1996/97 106

1985/86	46	1991/92	75	1997/98	130
1986/87	54	1992/93	80	1998/99	120
1987/88	57	1993/94	109	1999/00	102

Threats: Shot over by local crofters and the Army Gun Club. There has been a recent prosecution for the illegal shooting of a Whitefront.

49. North Uist, Western Isles

Status: Regional importance (part of R&O 45). Until very recently, there seemed no reason to suppose the status of this flock had changed from the time of Ruttledge and Ogilvie (1979), who considered the island deserted as a regular haunt. The were c.100 on Kirkibost Island in January 1981 (W.A.J. Cunningham), but the odd groups encountered in recent years may well relate to migrating birds, or wandering individuals. Apart from the birds in 1991/92, none appeared to remain on the island for extended periods. In the late 1990s better coverage has found regular small numbers.

Site safeguard: None known.

Habitat: No information.

Maximum winter counts:

1982/83	nc	1988/89	1	1994/95	nc
1983/84	nc	1989/90	4	1995/96	nc
1984/85	29	1990/91	0	1996/97	23
1985/86	0	1991/92	8	1997/98	32
1986/87	0	1992/93	9	1998/99	5
1987/88	nc	1993/94	0	1999/00	11

Threats: No information.

50. Loch Snizort, Skye, Highland Region

Status: Regional importance (R&O 46). Although this flock has shown fluctuations over the years, the overall pattern seems to be one of a downward trend and no birds have been located at all in the last two winters. This may be the source of birds seen with increasing frequency at Plockton (see below). No marked individuals have been seen amongst this little flock. They are thought to roost either on the nearby Loch Niarscu or on the offshore Ascrib Islands. The geese have proved extremely elusive during 1991/2 and again in 1992/3, suggesting other undiscovered feeding areas may exist.

Site safeguard: None.

Habitat: Rough and intensified pasture with rushes, in the bottom of the Snizort valley and a football pitch.

Maximum winter counts:

1982/83	69	1988/89	30	1994/95	27
1983/84	58	1989/90	28	1995/96	31
1984/85	47	1990/91	26	1996/97	9
1985/86	47	1991/92	40	1997/98	3
1986/87	47	1992/93	33	1998/99	0
1987/88	32	1993/94	44	1999/00	0

Threats: There has been a house built on the Ascrib Islands in recent years which may have affected the population. The feeding geese suffer a little disturbance during the daytime from sheep, shepherds and dogs. The

river valley floods regularly but quickly abates, there has been little drainage or agricultural intensification of the area in recent years. Saturday football matches can have a profound effect on feeding patterns!

51. Broadford, Skye, Highland Region

Status: Regional importance, but not known to Ruttledge and Ogilvie (1979). This flock seems to have stabilised its numbers. No marked individuals have been seen amongst this flock. In recent years, up to 40 birds have been reported on the mainland near Plockton (counts below in brackets since 15 regularly reported in 1993/4), although it is far from clear whether these are the same geese as the Broadford birds. However, their attendance on the island may explain the anomalously high numbers in recent years.

Site safeguard: None.

Habitat: This flock feeds on in-bye fields immediately inland from Broadford Bay as well as the rough pasture of the Ardnish Peninsula. They also use saltmarsh and merse around the Harrapool area.

Maximum winter counts:

1982/83 26	1988/89 70	1994/95 65 (12)
1983/84 30+	1989/90 60	1995/96 73 (30)
1984/85 33	1990/91 37	1996/97 70 (12)
1985/86 70+	1991/92 39	1997/98 40 (10)
1986/87 30	1992/93 48	1998/99 34 (0)
1987/88 49	1993/94 47 (15)	1999/00 23 (10)

Threats: Very little. Although the Broadford site is much disturbed by walkers and dogs, there has been little change in recent years, and these are not thought to be a serious problem in the area. The owner is sympathetic.

52. Loch Sguod and Longa Island, Gairloch, Highland Region

Status: Extinct, but perhaps never a regular site, formally of regional importance. This flock was not known to Ruttledge and Ogilvie (1979), and was reported at various times in the past, but has currently ceased to occur with any regularity (see GWGS 1986a). The flock used the remote patterned mire systems around Loch Sguod, but also resorted to the undisturbed in-bye fields of Longa Island. Quite how many birds used the sites, and whether they were present all winter is difficult to judge. Recent sightings in the late 1980s seem to relate to relatively small numbers of birds staging in autumn, rather than constituting a regular wintering site. The Loch na Moine area of Sutherland has also been used by staging geese (GWGS 1986b), and it may be that Whitefronts use a large number of mire systems undetected in autumn and spring on migration, possibly throughout north and west Scotland.

Site safeguard: None.

Habitat: The extensive raised and blanket mire systems of the area were used by the geese, which were also reported to have fed in rough and improved pasture and in-bye fields in the general area.

Maximum winter counts:

1982/83 nc	1988/89 0	not counted in
1983/84 nc	1989/90 nc	subsequent
1984/85 nc	1990/91 nc	years
1985/86 0	1991/92 nc	
1986/87 0	1992/93 nc	
1987/88 14	1993/94 nc	

Threats: Not known.

53. Muck, Small Isles, Highland Region

Status: Regional importance (R&O 47).

Site safeguard: None.

Habitat: The short maritime grassland of An Maol used to be the favoured feeding area in the north-east of the island, but increasingly this flock has used improved fields throughout the island. Horse Island and the central pools and moorland are used as roosts and safe refuge from disturbance.

Maximum winter counts:

1982/83 nc	1988/89 40	1994/95 55
1983/84 29	1989/90 40	1995/96 73
1984/85 28	1990/91 nc	1996/97 62
1985/86 43	1991/92 nc	1997/98 62
1986/87 46	1992/93 nc	1998/99 32
1987/88 60	1993/94 55	1999/00 nc

Threats: Little disturbed on the island, the geese are seen as causing increasing conflict with agriculture on the island.

54. Loch Shiel, Highland Region

Status: Regional importance (R&O 48). One of the last Scottish flocks that still regularly uses patterned oceanic raised bog vegetation. Despite their vulnerable position, and much destruction of mire vegetation through afforestation in the area, this flock seems to have maintained their numbers in recent years.

Site safeguard: The extensive boglands of Kentra Moss and Claish Moss are both protected; Kentra Moss is NCR SSSI and a proposed Ramsar Site, while Claish Moss is NCR SSSI, NNR and a Ramsar Site. Loch Shiel is also an NCR SSSI.

Habitat: This small flock feeds in a variety of situations, including along the loch-shore of Loch Shiel, on croftlands and low intensity agricultural areas (especially wet, boggy fields with abundant rushes) as well as foraging on the extensive patterned mires of Kentra and Claish Mosses.

Maximum winter counts:

1982/83 100	1988/89 79	1994/95 50
1983/84 55-60	1989/90 60	1995/96 52
1984/85 29	1990/91 60	1996/97 40
1985/86 28	1991/92 46	1997/98 42
1986/87 35	1992/93 50	1998/99 56
1987/88 51	1993/94 48	1999/00 40

Threats: Reclamation and afforestation of peatlands areas has slowed in recent years, but has removed considerable areas of suitable habitat from the range of this flock. Some suggestion of agricultural conflict with crofters was reported in the mid 1980s.

55. Tiree, Strathclyde Region

Status: International importance (part of R&O 49).

Site safeguard: Parts of the feeding and roosting areas of the geese lie within the An Fhaodhail and the Reef SSSI and the Crossapol and Gunna SSSI. Both are NCR sites and are components, with other areas used by the geese,

of the proposed Tiree and Coll SPA and Ramsar Site.

Habitat: Rough pasture, boggy pools, dubh-lochans, wetlands and mire; the geese increasingly use pasture and reseeded grasslands, especially about the periphery of lochs and roost sites. The geese also use extensive areas of wind-blown machair on The Reef (see Fox *et al.* 1989).

Maximum winter counts:

1982/83 433	1988/89 728	1994/95 706
1983/84 640	1989/90 987	1995/96 1387
1984/85 750	1990/91 941	1996/97 1455
1985/86 708	1991/92 1101	1997/98 1464
1986/87 760	1992/93 585	1998/99 1444
1987/88 759	1993/94 470	1999/00 1347

Threats: Shooting has been a problem in the past, and duck shooting may cause local disturbance, but there seem few problems at present.

56. Coll, Strathclyde Region

Status: International importance (part of R&O 49).

Site safeguard: Parts of feeding and roosting areas of the geese lie within the Hough Bay and Ballevullin Machair SSSI and the Totamore Dunes SSSI on the island. Both are NCR sites and lie within the larger Tiree and Coll proposed Ramsar Site and SPA. The RSPB has recently acquired a large reserve in the south-west part of the island, including significant areas used by the geese.

Habitat: Geese use wind-blown machair grassland, improved grasslands and sedge-rich pasture, rushy pasture and *Juncus* marsh as feeding areas. Some very rough pasture, moorland and bog is also used and most birds still roost on bog pools and lochans at night (see Fox *et al.* 1989).

Maximum winter counts:

1982/83 343	1988/89 647	1994/95 1026
1983/84 435	1989/90 671	1995/96 962
1984/85 441	1990/91 792	1996/97 1047
1985/86 548	1991/92 621	1997/98 1052
1986/87 405	1992/93 551	1998/99 1122
1987/88 400	1993/94 865	1999/00 1014

Threats: Geese generally take to hill lochs where they normally roost when disturbed. The existence of a number of widely dispersed feeding areas enables the geese to move between areas when disturbed.

57. Benderloch Peninsula and Lismore Island, Strathclyde Region

Status: Regional importance (R&O 50/51).

Site safeguard: Some of the feeding and roosting areas fall within the Lismore Lochs NCR SSSI, which is a proposed Ramsar Site and SPA.

Habitat: This flock feeds on the north coast of the Benderloch Peninsula as well as on Eriska Island itself, especially the pasture north of Rubha Mor, although the habits and roost sites of this flock are not well understood.

Maximum winter counts:

1982/83 165	1988/89 76	1994/95 336

1983/84	100	1989/90	120	1995/96	376
1984/85	134	1990/91	314	1996/97	217
1985/86	84	1991/92	270	1997/98	318
1986/87	170	1992/93	112	1998/99	270
1987/88	215	1993/94	120	1999/00	224

Threats: None known.

58. Loch Poit na h-I, Mull, Strathclyde Region

Status: Regional importance (not known to R&O).

Site safeguard: None.

Habitat: Geese feed at Fidden on rough pasture, reseeded grassland and blanket mire. There are frequent sightings of geese from the nearby island of Iona and the geese roost at Loch Poit na h-I or nearby Erraid.

Maximum winter counts:

1982/83	52	1988/89	55	1994/95	68
1983/84	36	1989/90	48	1995/96	39
1984/85	48	1990/91	57	1996/97	127
1985/86	51	1991/92	44	1997/98	22
1986/87	81	1992/93	*	1998/99	85
1987/88	47	1993/94	*	1999/00	52

*see following site - in these two years the two Ross of Mull sites were counted as one.

Threats: None known.

59. Loch Assapol, Mull, Strathclyde Region

Status: Regional importance (not known to R&O).

Site safeguard: None.

Habitat: Intensified pasture fields above Loch Assapol, which is also the goose roost, where there is much rough pasture and good feeding habitat.

Maximum winter counts:

1982/83	46	1988/89	31	1994/95	38
1983/84	44	1989/90	57	1995/96	51
1984/85	21	1990/91	34	1996/97	40
1985/86	28	1991/92	31	1997/98	34
1986/87	28	1992/93	82*	1998/99	40
1987/88	25	1993/94	41*	1999/00	0

*see previous site - in these two years the two Ross of Mull sites were counted as one.

Threats: None known.

60. Colonsay and Oransay, Strathclyde Region

Status: National importance (R&O 52). The species apparently only colonised Colonsay and adjacent Oransay during the 1930s, since there are only two records prior to 1934. Current numbers appear rather less than the 200 or so which were regular by 1968 (Clarke and Clarke 1990).

Site safeguard: The feeding areas on Oransay and Loch Fada on Colonsay are protected as SSSI.

Habitat: Geese use fields and good grazing away from potential danger, feeding almost entirely on grassland in-bye fields. Birds roost on lochs or marshy areas away from feeding sites such as Loch an Sguid, Ardskenish Point, Loch Fada or the southern part of Oransay.

Maximum winter counts:

1982/83	58	1988/89	165	1994/95	185
1983/84	48	1989/90	120	1995/96	206
1984/85	66	1990/91	262	1996/97	169
1985/86	78	1991/92	210	1997/98	288
1986/87	128	1992/93	195	1998/99	128
1987/88	137	1993/94	150	1999/00	204

Threats: Damage from Greenland White-fronted Geese in recent winters has been cited as the reason for early reseeding of some fields, although Greylags and Barnacle Geese are also present. However, farmers on Colonsay and Oransay have been comparatively tolerant of geese, although any increase in damage could cause problems in the future.

61. Islay, Strathclyde Region

Status: International importance (R&O 53). Although traditionally presented as one site, observations of colour marked geese over several years has shown that separate flocks occur on the island each with discrete feeding and roosting areas. Further analysis of these flock ranges is being carried out by WWT under contract to SNH.

Site safeguard: Geese feed and roost within a number of SSSI with the following designations:

Eilean na Muice Duibhe NCR SSSI Ramsar and SPA
Bridgend Flats NCR SSSI Ramsar and SPA
Feur Lochain NCR SSSI Ramsar and SPA
Glac na Criche NCR SSSI Ramsar and SPA
Gruinart Flats NCR SSSI Ramsar and SPA
Rhinns of Islay NCR SSSI, proposed Ramsar and proposed SPA
Laggan Peninsula NCR SSSI SPA
Oa proposed Ramsar and proposed SPA

Habitat: The geese feed on a variety of habitats from the most intensively managed artificial grass swards to completely natural mire vegetation. Much gleaning of stubble and some root crops occurs, especially early in the winter, but almost all of the birds resort to bog vegetation to roost at night, where exploitation of traditional food items is common.

Maximum winter counts:

For the island of Islay, very detailed counts have been undertaken over many years. Since there are set count routes defined since monitoring began there in 1981/82, this gives an opportunity for detailed analyses of the counts there. Hence, as well as presenting maximum counts for each winter, a table of the peak autumn/early winter count of Greenland White-fronted Geese are also given in Table 2.

1982/83	3441	1988/89	7588	1994/95	12420
1983/84	4592	1989/90	8560	1995/96	15358
1984/85	5358	1990/91	8857	1996/97	13684
1985/86	6393	1991/92	10676	1997/98	15111
1986/87	6468	1992/93	11004	1998/99	15502

1987/88	7888	1993/94	11679	1999/00	14474

Threats: Much diminished due to the current implementation of the Goose Management Scheme (see above) to integrate agriculture and protection of the geese, but there is still disturbance from hunting and agricultural activity.

62. Lowlandman's Bay, Jura, Strathclyde Region

Status: Regional importance (R&O 53a).

Site safeguard: None.

Habitat: Main feeding area is rough *Juncus* pasture at Ardmenish and the saltmarsh at the head of Lowlandman's Bay. Roosting has been recorded on local lochs and flushes and bog feeding has been recorded in the vicinity.

Maximum winter counts:

1982/83	24	1988/89	nc	1994/95	nc
1983/84	18	1989/90	36	1995/96	nc
1984/85	36	1990/91	25	1996/97	nc
1985/86	34	1991/92	nc	1997/98	nc
1986/87	84	1992/93	20	1998/99	nc
1987/88	nc	1993/94	41	1999/00	15

Threats: Not known, but the small size of the flock and the fluctuations in its numbers give cause for concern.

63. Loch a'Chnuic Bhric, Jura, Strathclyde Region

Status: Regional importance. Local information indicates that the flock became established in the winter of 1980/81 with about half a dozen birds over-wintering, there being about twice that number the following winter. Since then, numbers have consolidated and increased progressively.

Site safeguard: None.

Habitat: The flock feed upon permanent pasture and undersown stubble adjacent to the south and east of Loch a'Chnuic Bhric. They use the loch as a daytime feeding area and disturbance refuge as well as a night-time roost. Birds seen feeding at Keills on Islay have been watched flying to this area suggesting that this flock also feeds on pasture on the larger island. This movement seems to have become more common as the flock has grown in numbers.

Maximum winter counts:

1982/83	55	1988/89	nc	1994/95	148
1983/84	52	1989/90	nc	1995/96	160
1984/85	72	1990/91	132	1996/97	140
1985/86	84	1991/92	120	1997/98	140
1986/87	24	1992/93	nc	1998/99	147
1987/88	54	1993/94	nc	1999/00	nc

Threats: None known.

64. Keills and Danna, Strathclyde

Region

Status: Regional importance, not known to Ruttledge and Ogilvie (1979).

Site safeguard: The geese use parts of the Ulva, Danna and McCormaig Isles SSSI.

Habitat: A variety of feeding sites are used by this flock, which favours newly reseeded grassland, fields and foreshore in the middle of Danna island.

Maximum winter counts:

1982/83 95	1988/89 200	1994/95 381
1983/84 107	1989/90 224	1995/96 414
1984/85 87	1990/91 245	1996/97 333
1985/86 110	1991/92 362	1997/98 441
1986/87 136	1992/93 288	1998/99 537
1987/88 197	1993/94 256	1999/00 372

Threats: None known.

65. Moine Mhor, Strathclyde Region

Status: Regional importance (R&O 62).

Site safeguard: The geese use parts of the Moine Mhor NCR SSSI which is National Nature Reserve and a proposed Ramsar Site. Fields used along the River Add lie outwith the SSSI.

Habitat: Moine Mhor (Crinan Moss) is a coastal raised mire retaining the original transition from saltmarsh through to raised bog vegetation to the south and west of the site. Geese use the surrounding low-intensity pasture along the River Add for feeding, resorting to the bog dome as a disturbance-free refuge, although this is also used for undisturbed daytime feeding.

Maximum winter counts:

1982/83 60	1988/89 60	1994/95 28
1983/84 53	1989/90 58	1995/96 45
1984/85 17	1990/91 60	1996/97 48
1985/86 51	1991/92 40	1997/98 28
1986/87 80	1992/93 28	1998/99 42
1987/88 132	1993/94 27	1999/00 33

Threats: Generally thought to be few; low-flying aircraft cause disturbance, as does limited Greylag Goose shooting in autumn.

66. Loch nam Gad, Clachan, Strathclyde Region

Status: Thought to be extinct in the late 1980s, regular coverage has proved this flock to number some 200 birds. Of regional importance, this flock does seem to be genuinely separate from concentrations of geese further south at Tayinloan/Rhunahaorine Point.

Habitat: An oligotrophic loch used principally as a roost, although also supporting some feeding on emergent vegetation. Rushy fields close to this loch and Loch Ciaran were also used.

Maximum winter counts:

1983/84	85	1994/95	nc	1997/98	203
1986/87	80	1995/96	191	1998/99	196
1987/88	c.100	1996/97	184	1999/00	232

- no other counts available

Threats: The roost site is now largely surrounded by afforestation.

67. Rhunahaorine, Kintyre, Strathclyde Region

Status: International importance (R&O 54). Local information suggests that the flock became established in 1934/35 when a flock of 18 first overwintered at the site (C. Currie, pers. comm.). Thorough surveys in recent winters have shown that as well as the core area of Rhunahaorine Point, feeding occurs on a range of fields south to Killean and Tayinloan. It is not clear if the establishment of feeding at Glencardoch Point further south has originated from Rhunahaorine birds or from geese wintering at Machrihanish. There is some movement to and from pastures south of Dun Chibhich on the nearby island of Gigha, but the extent and importance of Gigha to this flock are poorly understood. There remain many questions associated with the increase in the numbers of geese wintering on Kintyre in recent years, and there is a need to improve our present understanding of the highly complex situation regarding flock identities and movement. Sites on Kintyre were the subject of detailed surveys in 1986/87 (Bignal 1987), 1987/88 (Batty 1988) and by the RSPB in 1993/94.

Site safeguard: Rhunahaorine Point is NCR SSSI and a proposed Ramsar Site and proposed SPA.

Habitat: this flock uses all A mosaic of intensively managed pasture and low-intensity Juncus (rush) -dominated fields and wetlands. Stubble feeding is common in the autumn, and the flock roosts on a variety of local lochs.

Maximum winter counts:

1982/83	856	1988/89	1116	1994/95	1361
1983/84	763	1989/90	914	1995/96	1360
1984/85	855	1990/91	797	1996/97	1272
1985/86	852	1991/92	1499	1997/98	1193
1986/87	771	1992/93	993	1998/99	1532
1987/88	1005	1993/94	1038	1999/00	1585

Threats: Some local hunting of Greylags offer potential difficulties of disturbance, wounding and accidental killing of White-fronted Geese at this site. There have been several instances of illegal killing of birds at this site in recent years, some of which have led to successful prosecutions.

68. Machrihanish, Kintyre, Strathclyde Region

Status: International importance (R&O 55). See discussion for the site above relating to flock identity, movements and survey on Kintyre.

Site safeguard: Tangy Loch, the roost for the geese, has SSSI status and is a proposed Ramsar Site and proposed SPA. The feeding areas used by the flock are currently unprotected.

Habitat: Stubble feeding in autumn, but an array of grassland types are used throughout the winter, including reseeds.

Maximum winter counts:

1982/83	500	1988/89	907	1994/95	1044

1983/84	483	1989/90	1005	1995/96	1339
1984/85	600	1990/91	1240	1996/97	1629
1985/86	590	1991/92	1023	1997/98	931
1986/87	716	1992/93	1110	1998/99	1579
1987/88	944	1993/94	1180	1999/00	1322

Threats: As for the previous site, Greylags are present and hunted in the general area, and there have been cases of illegal shooting of Greenland White-fronted Geese recorded in recent years. The increased numbers have led to recent complaints alleging agricultural damage from farmers in the areas used by the geese.

69. Loch Lomond, Strathclyde Region

Status: International importance (R&O 56).

Site safeguard: Endrick Mouth is an NCR SSSI with National Nature Reserve status. Part of the site was designated as a Ramsar Site in 1976. It is proposed to enlarge this Ramsar Site to accommodate more fully the areas used by the geese. This enlarged area is proposed as an SPA.

Habitat: Birds roost on Loch Lomond, or on adjacent floodwaters near the mouth of the River Endrick. They feed in the marshes, but more frequently range over adjacent farmland, wet and flooded pasture and rough rushy grassland within the Reserve.

Maximum winter counts:

1982/83	118	1988/89	300	1994/95	230
1983/84	134	1989/90	300	1995/96	230
1984/85	122	1990/91	350	1996/97	245
1985/86	300	1991/92	350	1997/98	261
1986/87	234	1992/93	250	1998/99	306
1987/88	240	1993/94	137	1999/00	85

Threats: None known

70. Isle of Bute, Strathclyde Region

Status: Regional importance (R&O 57).

Site safeguard: Some of the roost sites of this flock are within the Central Lochs, Bute SSSI.

Habitat: This flock uses the large open reseeded fields and intensively managed pasture where they associate with Greylag Geese. The Whitefronts roost on a number of freshwater lochs (Loch Dhu, Greenan Loch and Quien Loch).

Maximum winter counts:

1982/83	70	1988/89	nc	1994/95	226
1983/84	69	1989/90	130	1995/96	210
1984/85	49	1990/91	160	1996/97	224
1985/86	145	1991/92	250	1997/98	223
1986/87	nc	1992/93	130	1998/99	273
1987/88	150	1993/94	213	1999/00	192

Threats: None known, the geese seem to have benefited from the reseeding and intensive grassland management on the island, but may suffer disturbance from Greylag hunting.

71. Barr Loch, Renfrew, Strathclyde

Region

Status: Extinct, past status obscure, possibly of regional importance (R&O 63).

Site safeguard: Barr Loch is an SSSI and RSPB reserve.

Maximum winter counts:

There has been no evidence of any goose use since the data reported by Ruttledge and Ogilvie (1979). The most recent record was of one bird in May 1977; the presence of a permanent warden on the site ensures that any geese present would have been detected. Given the sporadic nature of past records it seems unlikely that this was ever a traditional site, but perhaps a stopping off area for small numbers of geese moving between other sites.

72. Stranraer, Dumfries and Galloway Region

Status: International importance (R&O 58).

Site safeguard: The geese frequently roost on the intertidal flats of Torrs Warren-Luce Sands NCR SSSI, which is a proposed Ramsar Site and proposed SPA. Usually the flock uses inland lochs from October (especially the loch at Lochinch Castle) and the shore at Sandhead in spring. The core feeding area is West Freugh Airfield between the A715 and Piltanton Burn, and to the south of Stoneykirk to the west.

Habitat: Geese stubble feed in autumn but move to rough grassland and reseeded pasture later in the winter. They show some preference for certain regularly used areas which may suffer less disturbance. The geese may roost on the sea to the south of their feeding areas but more often resort to the freshwater lochs at night according to season.

Maximum winter counts:

1982/83 280	1988/89 650	1994/95 565
1983/84 350	1989/90 770	1995/96 550
1984/85 435	1990/91 620	1996/97 535
1985/86 530	1991/92 650	1997/98 680
1986/87 740	1992/93 550	1998/99 468
1987/88 700	1993/94 552	1999/00 440

Threats: Severe: there is much agricultural activity, which causes the flock to disperse, making counting difficult in some years. Since 1991, much regular commercial shooting of Greylags (up to 18 guns per day in the area) has very severely affected the Whitefronts.

73. Bladnoch Valley, Dumfries and Galloway Region

Status: Extinct (R&O 59).

Habitat: Not known, but probably reseeds in the valley.

Maximum winter counts:

1982/83 19	1988/89 0	no recent
1983/84 43	1989/90 nc	counts
1984/85 nc	1990/91 0	
1985/86 nc	1991/92 0	
1986/87 nc	1992/93 0	
1987/88 nc	1993/94 0	

Extensive survey by Paul Shimmings and Paul Collin in recent years has confirmed that this flock has abandoned this former site, despite regular numbers in the first two winters of the survey. Although always difficult to find in an area of rough pasture amongst complex topography, sufficient coverage in recent years shows they are no longer present. The cause of the extinction is not clear, although agricultural improvement of much of the grassland of the area has taken place.

74. Loch Ken, Dumfries and Galloway Region

Status: International importance (R&O 60). Three geese ringed originally at Wexford have been seen regularly at Loch Ken since 1985, and at least four different geese caught in west Greenland have also been regularly recorded at the site.

Site safeguard: Areas used by the geese include part of Loch Ken RSPB Reserve, the River Dee (Parton-Crossmichael), Kenmure Holms SSSI and Threave and Carlingwark Loch NCR SSSI. These areas were designated as a Ramsar Site and SPA in 1992.

Habitat: Reseeded grassland, wetlands and inundation marsh adjacent to a large (and long-established) hydro-electricity generation loch.

Maximum winter counts:

1982/83 305	1988/89 342	1994/95 293
1983/84 290	1989/90 550	1995/96 360
1984/85 285	1990/91 306	1996/97 320
1985/86 334	1991/92 382	1997/98 450
1986/87 350	1992/93 323	1998/99 357
1987/88 550	1993/94 325	1999/00 330

Threats: There is some local hunting of other species that may cause disturbance.

75. Various lochs in Ayrshire, Strathclyde

Status: Extinct, past status obscure, possibly of regional importance (R&O 64). Ruttledge and Ogilvie (1979) referred to sporadic sightings of small flocks at various lochs in Ayrshire in the early 1970s and considered these to be regular migration stopping-off sites, occasionally used for longer periods. Thorough survey throughout the area by the late Graham Stewart in the early 1980s failed to locate any Greenland Whitefronts on a large number of lochs counted for wildfowl, so whatever the former status, this area now seems to be deserted even during migration periods.

76. Morecambe Bay and the Lancashire Mosses, Lancashire and Cumbria.

Status: Extinct as regular traditional site, although reports of birds continue because of the large numbers of Pink-footed Geese in the area, and the observer effort (R&O "a").

Maximum winter counts: (maximum single counts at various locations in north-east England)

1982/83 33	1988/89 1	1994/95 3
1983/84 5	1989/90 16	1995/96 1
1984/85 13	1990/91 2	1996/97 5
1985/86 1	1991/92 6	1997/98 2

1986/87	3	1992/93	2	1998/99	10
1987/88	4	1993/94	5	1999/00	0

Individual birds or small flocks are located occasionally with flocks of Pink-footed Geese in Lancashire. There is no evidence to suggest that these individuals constitute traditional groups of returning Whitefronts. One collared bird ringed at Wexford spent much of one winter with Pink-feet on the south Lancashire Mosses. Similarly, a few Greenland Whitefronts also occur in grey goose flocks in eastern Scotland (Steele 1986) but again this area does not constitute a regular wintering site and hence is not featured here.

77. Angelsey, Gwynedd

Status: Unknown, possibly of regional importance (R&O "b"). Up to 200 Greenland White-fronted Geese have been reported from the island (see Fox and Stroud 1986) and small numbers regularly occur throughout the island at a number of haunts to the present. However, it is far from clear whether these constitute a regular wintering "site". The main area used by Whitefronts in the past, Llyn Bodgylched, has variously been claimed to support Russian and Greenland White-fronted Geese, although the latter were definitely present in December 1980. Up to 52 may have been present (largely distributed between Llyn Alaw and Llyn Trafwll), but only 13 were reported in 1996/97 and 4 in 1997/98. There is still a clear need to establish the proper status of this flock on the island, but it would seem that in recent years, numbers have been small and their use of sites generally irregular.

78. Dyfi Estuary, Dyfed

Status: National importance (R&O 61). The most important site in Wales, although currently without legislative protection from shooting. One collared bird, 3XH, captured at Wexford in November 1990, spent the winter of 1991/92 on the Dyfi.

Site safeguard: The geese feed and roost mainly within the Dyfi NCR SSSI which is a National Nature Reserve and Ramsar Site and includes part of Ynyshir RSPB Reserve.

Habitat: The geese feed on inter-tidal saltmarsh, *Spartina* mud-flats and on quiet undisturbed reseeded grassland on the Dyfi, roosting on the estuary. The flock very occasionally use the nearby Cors Fochno (Borth Bog) for feeding, but this is very rare compared with former times.

Population trend:

1982/83	73	1988/89	124	1994/95	155
1983/84	78	1989/90	131	1995/96	147
1984/85	89	1990/91	152	1996/97	125
1985/86	109	1991/92	143	1997/98	110
1986/87	95	1992/93	134	1998/99	167
1987/88	127	1993/94	160	1999/00	112

Threats: Geese feed primarily within the NNR and RSPB reserve which, together with international designation of the area, means that their habitats are relatively well protected. However, the geese do not have statutory protection and are dependent on a voluntary shooting ban self-imposed by the local wildfowling clubs. Numbers of sedentary feral Canada Geese have shown dramatic increases in recent years; these feed in the same habitats during winter and could pose competitive interaction problems in the future. Low-flying jet aircraft continue to be a problem.

79. Cors Caron, Dyfed.

Status: Extinct, formally of national importance (R&O "c"). Annual wildfowl counts have failed to find regular numbers, although c.39 were present in the area in December 1982 and occasional birds still occur (Fox and Stroud 1986).

Site safeguard: The site is a NNR and Ramsar Site.

Habitat: Formerly rough grassland, bog and peat-cuttings (Pollard and Walters-Davies 1968).

80. Bryn-du, Powys

Status: Extinct, formally of regional importance. Intensive survey during the winter of 1992/93 by B.K. Long failed to locate the flock and it is probable that it no longer exists. It is possible that it was always a satellite group from the Dyfi Estuary flock, and it is not clear if previous records refer to one or more flocks centred upon Bugeilyn and one in the Bryn y Fawnog/Llyn Hir area (CCW unpublished report).

Site safeguard: Llyn Mawr, where the geese have been seen roosting and feeding, is SSSI.

Habitat: Formerly reseeded grassland, bog and peat-cuttings of the Central Wales uplands (see Fox and Stroud 1986, Francis and Penford 1990).

Maximum winter counts:

1982/83	present	1988/89	nc	not subsequently
1983/84	nc	1989/90	0	counted
1984/85	20	1990/91	23	
1985/86	present	1991/92	nc	
1986/87	nc	1992/93	0	
1987/88	nc	1993/94	nc	

2.3 Iceland

Distribution

Analysis of ringing recoveries and resightings of Greenland White-fronted Geese in Iceland shows two major concentrations, the southern lowlands and western part of the country (Figure 4). Numbers tend to be larger in the southern lowlands where the majority of the birds appear to stage. Most recoveries come from early October when the geese are probably arriving in Iceland in large numbers. There are fewer recoveries in spring, when shooting of the geese is illegal, but still occurs.

Abundance

There are no accurate census data available for anywhere in Iceland. The geese pass through in spring and autumn over a vast area which makes accurate counting difficult. Up to 3,500 were counted in spring 1986 in the southern and western lowlands (Francis and Fox 1986), but it seems likely that the entire population stages in Iceland at some stage, although there is considerable turnover. In autumn, use of more wetland habitats and the shyness of birds being hunted makes assessment of numbers even more difficult, however, it seems possible that the entire population stops off in Iceland during the autumn as in spring.

Research

There has been relatively little research carried out in Iceland on the Whitefronts, although in recent years, expeditions to study their behaviour and feeding ecology, abundance and staging time have been carried out by GWGS and WWT in conjunction with local ornithologists. The results of this work will be forthcoming in the near future.

Protection and conservation

The main legislation relating to the geese is the Bird Protection Act of 1966 which has just been reviewed and revised. The results of this revision are wide ranging and may result in enhanced protection for the population which is presently hunted as a quarry species in the autumn. Although protected in spring, there are considerable numbers killed illegally at this time. There is no limit on the hunting bag for geese at present, nor are any bag statistics available to assess the size and extent of the kill each year. There are 20,000 gun licences issued in Iceland, covering more than 40,000 guns. In contrast to most western European states, the numbers of hunters are increasing dramatically, with about 350 new licences granted each year. In addition, tourist hunting by foreigners has started to become more popular in Iceland. It would seem difficult to persuade the Icelandic hunting organisations of the need for a ban on shooting of this population given the dramatic increase in its numbers. However, there is a clear need to establish some assessment of the numbers shot there each year. A new game act came into force in Iceland at the start of July 1994. Under this legislation, annual licences for hunting are granted only on submission of a record of the numbers and species taken in the previous season.

Although unlikely to cause significant agricultural damage in spring, the Greenland White-fronted Goose is regarded as just another goose causing agricultural damage to farmers. In the last 15 years, no licences have been given to any farmers to permit the killing of Whitefronts causing agricultural damage (as are granted for the killing of Greylag Geese for example). However, there are considerable problems with the identification of species by shooters and still some animosity amongst the farming community. It is likely that quite high numbers of geese are shot illegally in spring, but programmes aimed at better education of the hunters are being established and should improve the situation in the future.

At present, the Icelandic government is signatory to the Ramsar Convention, but there are only two sites in Iceland declared as Ramsar sites, and neither of these support Greenland White-fronted Geese. The Iceland government signed the Berne Convention in 1993, and will doubtless also become a signatory to the Bonn Convention.

There is currently one site with protection at least partly for Greenland Whitefronts, namely Pollengi in Biskuptungur. There are six sites known to be used by Whitefronts mentioned in the Nature Conservation Register of Iceland (which lists sites of national importance) and these also feature in the Important Bird Areas list compiled by the ICBP. Five of these are in the southern lowlands, the sixth in the west. There is a possibility of locating more sites which are important for the geese, particularly where high diversity of other organisms make sites of general scientific interest rather than being based on a single species. However, none of these sites have any statutory

protection at the moment, nor is there any management planning work, wardening or monitoring.

The most important site, at Hvanneyri in the west of Iceland, is an experimental farm (see section 1.5) and the establishment of a nature reserve is currently being negotiated there. It is important that this area should soon have special protection to ensure the maintenance of its present high interest as a staging area. Local planning authorities are now obliged to structure local plans which register, and take account of, local sites of nature conservation interest.

2.4 Greenland

Distribution

Greenland White-fronted Geese breed on the west coast of Greenland. This area experiences a relatively mild, oceanic climate compared with that of the east coast. There is patchy historical data relating to the precise distribution and concentration of summering birds, since many areas are very remote and not frequently visited. The Greenland Home Rule Authority, in conjunction with GWGS and the Greenland Environment Research Institute, has helped to fund aerial surveys of parts of the range of the Whitefront during the moult period. Survey takes place at 400 feet at low speed, enabling simple census of geese on moulting lakes. Flights were flown in 1988, 1989 and 1992.

The general impression has been that the southernmost birds occur around Nuuk in the interior parts of Godthåbsfjord closest to the ice-cap, with relatively few birds northwards to the Sukkertoppen ice-cap which reaches to the sea (Figure 5). In the area immediately north of the Sukkertoppen ice-cap, the relatively high plateau areas are largely devoid of suitable vegetation and consequently of geese, and extensive aerial survey in 1988 found very few birds in the area northwards until the inner reaches of Kangerlugssuaq (Søndre Strømfjord).

Northwards from Kangerlugssuaq, aerial survey has shown the greatest densities of birds occur close to the ice-cap, with densities falling rapidly towards the coast. In part, these patterns may relate to spring snow melt and soil thaw, since satellite imagery show that inland areas lose their snow cover much earlier (by as much as one month) than the more mountainous areas closer to the coast near Sisimiut (Holsteinsborg). Important concentrations occur all the way northwards to the inland areas south of Naternaq. It would seem that these areas all support geese behaving very much as those studied in Eqalummiut nunaat during the expeditions of 1979 and 1984, the hilly terrain imposing a pattern of thaw which the geese use to maximise the nutritional content of their forage (see section 1.6). The population elsewhere in the range may have different ecological features, especially in the flat lowland areas such as Naternaq.

Naternaq itself is an extraordinary lowland area, created by the isostatic recovery of marine sediments, supporting very high concentrations of Greenland White-fronts over a substantial area. The area was first found to hold large numbers of geese during the aerial survey of 1988, when extrapolation from restricted survey suggested as many as 6,000 geese present. Repeat surveys in 1989 and 1992 found c.2,500 geese which was confirmed by a ground party visit in 1991. The geese feed in this area amongst the numerous lakes and wetlands studded throughout a flat open plain composed of highly unstable fine glacial deposits. These wetlands and the fringes of the lakes support a very rich emergent and peripheral vegetation which form the foraging areas for the geese. The geese are present throughout the summer in this area, breeding and moulting in the same vicinity. Thus, it is clear that at this site, altitude is not an important determinant of feeding ecology, and we suspect that the geese switch between different food items through the season as their feeding profitability changes given the diversity of wetland habitats in this area.

Further northwards, there are important concentrations of geese in the Aqajarua-Sullorsuaq area on Disko Island and in the lowlands of the Svartenhuk peninsula, first located by Henning Thing in 1988, surveyed in 1989 and covered from the air in 1992, when 885 birds were found. These two particular areas some similarities, but such extensive lowland areas are highly restricted in west Greenland, and extensive aerial survey in 1992 suggested that there were few other comparable areas of lowlands suitable for the population, with the deep fjord geography of the northern coast beyond Disko Bay resulting in very low densities of geese over large areas.

A major discovery of the 1992 survey was a concentration of 740 geese in the upland interior part of the Nuusuaq Peninsula, north of Disko Island. As the dry barren habitats here are atypical of other known moulting areas, it is possible that geese gather here from other areas solely to moult. Although there is no known moult migration amongst Greenland White-fronted Geese, it cannot be ruled out for these particular individuals.

Geese are known to breed as far north as Upernavik since Salomonsen encouraged ringing of geese by the locals there in the 1950s. Recent expeditions to the extreme north of Greenland has indicated at least some White-fronted Geese in the vicinity of Avanersuaq (Thule), which represents a very considerable range extension, and one which has probably only occurred in very recent years.

Abundance

It is important to emphasise that with the exception of a few fertile lowland sites, the Whitefront in Greenland occurs at very low densities over vast areas. Unlike some other arctic-nesting goose species, the Whitefront does not breed colonially. This clearly has particular implications for site-based conservation. On arrival in spring, weather and snow conditions may vary widely from year to year, but it does seem apparent that there are traditional arrival areas in Greenland which can support relatively high numbers of birds. Such sites may be used by locally breeding birds, but limited resighting information suggests that these may be joined by geese breeding further north in the range which use these as staging areas en route to ultimate summering grounds. Identification and protection of these crucial staging areas, where the geese may be especially vulnerable to disturbance, remains a particularly high priority.

In late summer, non-breeders and family groups move to traditional moulting areas, which in the central parts of the range at least, tend to be on high plateau lakes which are the last to thaw. During this period, the birds become flightless, shedding and regrowing their flight feathers prior to the autumn migration. This is a time of vulnerability for the geese which are perhaps more concentrated than at any other time during the summer, except during spring aggregations. Such a period of vulnerability makes it important that potentially damaging or disruptive activities (such as mineral exploitation or heavy tourist activity) be directed away from such important moulting areas during the brief period that they are used by the geese. Again, a full identification of the areas and sites of especial importance remains a high research priority, to enable planning to take account of them.

Research

The ringing of Greenland White-fronted Geese was pioneered by Finn Salomonsen in the late 1940s, who encouraged Greenlanders to capture geese, ring and release them under a bounty scheme. This generated a large number of recoveries and helped define mortality rates and migration routes at that time. Recoveries from the 1950s showed that there were peaks in May (arrival) and July (during the

flightless moult), the two periods of concentration and vulnerability.

Ringing was recommenced in 1979 and 1984 with the major expeditions to Eqalummiut nunaat, with follow-up projects in the area immediately north of Kangerlugssuaq in 1989 and 1992.

Protection and conservation

Until 1985, Whitefronts could be shot in Greenland at any time, but from that year, legislation restricted hunting to the period from 15th August until their departure. The limited information we have suggests that geese move into very remote interior areas post moulting, such that by the 15th August, geese are protecting themselves by movement to inhospitable terrain. No statistics are available to assess either the number of hunters involved in goose shooting, nor the total bag size involved. Local information however, suggests that summer goose shooting is a highly specialist activity undertaken by very few individuals.

In 1989, the Home Rule Authority announced the declaration of five major Ramsar wetlands of international importance covering an estimated 700,000 hectares of the goose summering grounds. These are summarised in Table 3 and represent the breeding area for perhaps as much as one fifth of the total world population of Greenland White-fronted Geese. Another area of lowlands on the Svartenhuk peninsula is being considered as an additional proposed Ramsar site for future designation.

The Home Rule Authority has produced a series of leaflets on the Ramsar sites and their importance, available in four different languages which have been widely distributed amongst interested parties.

Table 3. Areas protected under the Ramsar Convention as Wetlands of International Importance which includes summering areas for Greenland White-fronted Geese. Estimated goose population totals derive from aerial census results in summer 1992.

LOCATION	Area(km^2)	Estimated goose populations
Eqalummiut nunaat-Nassuttuup nunaa	**5,000**	**3,000**
Naternaq	**1,500**	**2,600**
Aqajarua-Sullosuaq	**300**	**320**
Qinguata-Kuussuaq	**60**	**100**
Kuannersuit kuussuat	**45**	**100**

3. SUMMARY**Error! Bookmark not defined.**

The population of the White-fronted Goose which breeds in west Greenland winters exclusively in Ireland and Britain. Analysis of historical information showed a dramatic decline in population numbers between the 1950s and the late 1970s, largely as a result of habitat loss and modification, general disturbance and over-exploitation by hunting. The important review of Ruttledge and Ogilvie (1979) highlighted the lack of good quality information for many wintering resorts and the need to establish a network of regular counts to monitor adequately the population size and distribution of the population.

Internationally co-ordinated counts of Greenland White-fronted Geese at all known wintering resorts have been carried out since 1982/83 when the population was first protected by legislation on the wintering and breeding grounds. This report presents a site-by-site analysis of the winter counts from 1982/83 to the present day. Between 1982/83 and 1993/94, the population rose from 16-17,000 to 29-30,000, with most dramatic increases at the population's two major winter resorts, Wexford Slobs (south east Ireland where numbers increased from 5-6,000 to just over 10,000) and Islay (the Inner Hebridean island off south west Scotland, where numbers have increased from 3,500 to 9-11,000 currently).

The population in Ireland is distributed between 35 sites, mainly throughout the west and north of the country, in flocks ranging in size from less than 10 individuals to more than 500. Seventeen of these have increased over the period, eight decreased and ten are stable or have shown fluctuating numbers. In Britain, there are 33 regular sites, four of which exceed 1,000 geese in winter. Most flocks here have increased or remained stable over the last twelve years, but five show continued declines.

The declining flocks or those in need of most urgent conservation action in both countries are generally the smaller ones which fall below the standard 1% Ramsar criterion for international importance. Six flocks have become extinct during the period of the census. Research has shown that the declining flocks all tend to have few alternative (and usually low quality) feeding sites available to them. This emphasises the need for a site by site treatment of the conservation problems posed by each of these flocks for the effective maintenance of the distribution and abundance of the present range of the population.

At the same time, there have been problems associated with agricultural conflict at some of the major sites, particularly in areas where increases have occurred. At Wexford Slobs the provision of a refuge area, local management agreements and mid-winter feeding have all eased local problems. On Islay, a Goose Management Scheme implemented in 1992/93 encourages sympathetic management of goose feeding areas based on goose use. In both Ireland and Britain, site safeguard designations based upon domestic legislation protects many of the other flocks, whilst those attaining international importance are either designated or are waiting to be designated as Ramsar sites of international importance or European Union Special Protection Areas. Further progress on these designations would be greatly welcomed in both states to ensure adequate protection for the population. Such protection cannot safeguard the small flocks which fail to attain levels of national or international importance and which pose a particularly difficult conservation challenge to protect and maintain the current wintering distribution of the population.

An International Conservation Plan for the population has been drafted at the instigation of the Irish Government, culminating in the Wexford Workshop of interested parties in March 1992. Unfortunately, the Agreement awaits signature by the various states involved, although agreement on a Memorandum of Understanding has been agreed by the governments concerned. It sets out to develop a flyway-wide agreement to guide national and international conservation, management and research actions.

The 1970s and 1980s have seen the Greenland White-fronted Goose pulled back from the course of substantial decline and great strides have been made in protecting the population in the future. This has only been achieved as a result of the influence of national and international wildlife legislation and management practices through the provision of advice based on our knowledge of the geese. A great deal of this knowledge comes from the counters and their understanding and experience of local wintering birds. However, there remains a great deal to be achieved. For this reason, it is vital that the population continue to monitored into the next century to provide a basis for the development of site-based national and international conservation measures. The survey information to date has been based upon the enormous efforts of a large number of counters, and it is clear that this effort continues to be a vital part of the conservation monitoring programme for the population.

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Finally, we would urge that this is not the end of ths story: the information presented here shows the importance of every single flock of Greenland White-fronted Geese and the different problems faced by each of them. The goose population represents a shared resource and the responsibility to protect them is common to us all. We are very grateful to everybody who has helped in contributing to our understanding, by their counts and answers to our enquiries. We hope that you will continue to assist with the compilation of this information.

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