

5th SESSION OF THE MEETING OF THE PARTIES

14 – 18 May 2012, La Rochelle, France

“Migratory waterbirds and people - sharing wetlands”

DRAFT INTERNATIONAL SINGLE SPECIES ACTION PLAN FOR THE CONSERVATION OF THE GREENLAND WHITE-FRONTED GOOSE

Introduction

This International Single Species Action Plan for the Conservation of the Greenland White-fronted Goose (*Anser albifrons flavirostris*) was initiated in 2009 by the Scottish Natural Heritage under the auspices of their Species Action Framework. The Action Plan has been compiled by a team led by David Stroud of the UK's Joint Nature Conservation Committee. Drafts of the plan went through rigorous consultations with experts from the species' range states, international organisations, and the AEWA Technical Committee, followed by official consultation with governmental officials in the range states. The draft plan was endorsed for submission to MOP5 by the Technical Committee at its 10th Meeting in September 2011 and the Standing Committee at its 7th Meeting in November 2011.

The Action Plan follows the revised format for Single Species Action Plans approved by MOP4 in September 2008.

Action requested from the Meeting of the Parties

The Meeting of the Parties is invited to review this draft SSAP and adopt it for further implementation.

Draft International Single Species Action Plan for the Conservation of the Greenland White-fronted Goose

Anser albifrons flavirostris

2012 – 2022



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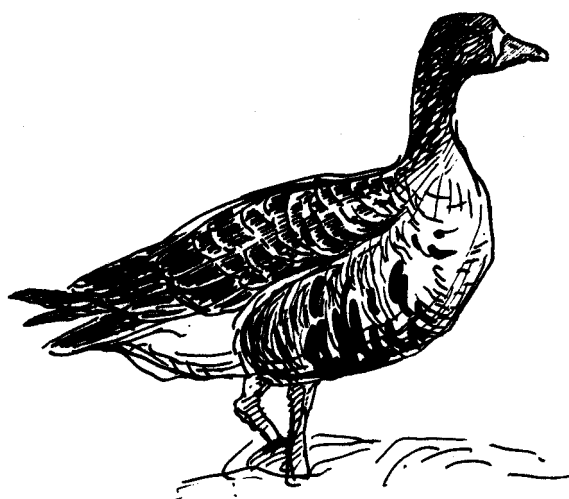


(The logos are placed in no particular order)

Agreement on the Conservation of
African-Eurasian Migratory Waterbirds (AEWA)

**International Single Species Action Plan for the
Conservation of the Greenland White-fronted Goose**

Anser albifrons flavirostris



AEWA Technical Series No. XX

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The compilers would welcome any further information pertinent to this plan and its implementation.

With essential (past and present) contributions and input from all those contributing to the *International Greenland White-fronted Goose Action Planning Workshop, Islay; 24-26 February 2009*:

Denmark: Tony Fox, Christian Gladher & Jesper Madsen;

Greenland: Jens Bagger;

Iceland: Aevor Petersen, Arnór Þ. Sigfússon & Einar Þorleifsson;

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European Union: European Commission (Micheal Ó Briain & Stefan Leiner); and

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Particular thanks for their inputs to Olivia Crowe, Sergey Dereliev, Larry Griffin; Baz Hughes, Carl Mitchell, Dave Norriss and David Tierney for detailed comments on early drafts, and Chris Urquhart for support, input and advice throughout. Thanks especially to Hugh Boyd, Kathy Dickson, Larry Hindman, Keith McAloney, Tim Moser, Paul Padding and Bruce Pollard from North America who despite being unable to attend the workshop, nonetheless took time to prepare material on Canada Geese which was discussed at it.

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We gratefully acknowledge generous funding and financial support for the development of the Action Plan and the Islay Workshop in February 2009 from Scottish Natural Heritage (SNH) under the auspices of their Species Action Framework (www.snh.org.uk/speciesactionframework/default.asp).

The Islay Workshop would not have happened without the dedicated inputs of the staff from SNH's Islay office. Huge thanks go to Tracey Johnston, Wilma Kelly, Margaret Morris, Rae McKenzie and Chris Urquhart for making it happen.

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Thanks to all who participated in the Islay Workshop and contributed to discussions on, and drafting of, the Action Plan. Thanks especially to all those who gave presentations at the meeting, chaired sessions or led discussions. We thank John Bowler, Ruth Cromie, Olivia Crowe, Tony Fox, Christian Gladher, Arnór Þ. Sigfússon, David Stroud, Christine Urquhart, Alyn Walsh and Einar Þorleifsson for their presentations to the children of Islay's primary schools during the workshop and particularly to Ian Francis for developing the concepts that were presented.

The population monitoring data presented here have been derived from the twice annual international Greenland White-fronted Goose Census since 1982/83. In Britain this has been coordinated by the Greenland White-fronted Goose Study (GWGS) (with financial support variously from NCC, JNCC and WWT), whilst in the island of Ireland it has been coordinated by the National Parks and Wildlife Service (NPWS). We particularly acknowledge the long-term support of many volunteer counters who have dedicated much time each year in counting and aging flocks on the wintering grounds, and searching for individually marked geese. Thanks to all for their efforts!

Major thanks are also due to Hugh Boyd, Oscar Merne, the late Robin Ruttledge and Malcolm Ogilvie for their pioneering work from the 1950s onwards in laying the foundations of our current detailed knowledge of the distribution and abundance of Greenland Whitefronts on their wintering grounds.

The long-term support by the NPWS of the Irish ringing programme at Wexford since 1983 has been completely crucial to understanding the dynamics of this population. Particular thanks are due to Oscar Merne, Dave Norriss, Paddy O'Sullivan, Alyn Walsh, Chris Wilson and John Wilson for their respective inputs over many years. Thanks also for financial support to maintain the database of resightings.

Thanks also to Carl Mitchell, Malcolm Ogilvie, Larry Griffin and all those involved in catching smaller numbers of GWfG on Islay and at Loch Ken since the mid-1990s. Hopefully this plan will help stimulate longer-term and more sustained ringing activity in Scotland!

In recent years, studies in Iceland on geese staging in spring and autumn have been made at Hvanneyri, west Iceland, together with the capture and ringing of further samples of geese and associated animal health studies of both captured and shot geese. The support of Landbúnaðarháskóli Íslands, Hvanneyri has been critical to the success of these studies and we thank also Náttúrufræðistofnun Íslands (Icelandic Institute of Natural History) in Reykjavik for their helpful advice and discussions, as well as for permission to capture and ring geese. Thanks to all of those (from Iceland, Denmark, UK, Ireland, Canada and Germany) who have supported or participated in this work, especially Ian Bainbridge, Hugh Boyd, Ríkharð Brynjólfsson, Kendrew Colhoun, Ruth Cromie, Andy Douse, Olafur Einarsson, Tony Fox, Ian Francis, Morten Fredericksen, Guðmundur Guðmundsson, Guðmundur Hallgrímsson, Rich Hearn, Jón Einar Jónsson, Roy King, Jens Nyland Kristiansen, Kerstin Langenberger, Vinni Madsen, Graham McElwaine, Timme Nygaard, Jón Gunnar Ottósson, Anne Würtz Pedersen, Aevær Petersen, Nick Picozzi, Phil Shepherd, Arnór Þ. Sigfússon, David Stroud, David Sowter, John Turner, Alyn Walsh, Chris Wilson, John Wilson, Anna Guðrún Þórhallsdóttir and Björn Þorsteinsson.

In Greenland, our knowledge of goose breeding ecology derives largely from whole summer GWGS expeditions in 1979 and 1984 together with July ringing expeditions in 1989, 1992, 1997, 2008 and 2009. Other research was undertaken in 1995, 1998, 1999 and 2010. Thanks to all the many participants on those trips¹, as well as to the other biologists and travellers whose observations in Greenland have allowed us to piece together some of the summer life of this goose (at different times and places).

Since the first survey flight in 1989, aerial surveys at different times of the summer have added immeasurably to our knowledge of the distribution and relative abundance of geese in Greenland and to the identification of important areas, many of which are either existing Ramsar sites or qualify as such. These surveys were funded by the Wildfowl & Wetlands Trust (UK), the National Environmental Research Institute (DK) and Ducks Unlimited (USA). We particularly thank Leif Petersen for flying these surveys so very safely, and also thank Bruce Batt, John Frikke, Tony Fox, Christian Glahder, Rich Malecki, David Stroud and Alyn Walsh for their observations.

The cover photo was provided by Chris Wilson and the vignettes on the title page and in the text were drawn by Jens Frimer Andersen.

Reviews: This International Single Species Action Plan should be reviewed and updated every three years (first review in 2015). An emergency review will be undertaken if there is a sudden major change liable to affect the population (section 4.1).

¹ listed at <http://greenland08.wikispaces.com/file/view/DIY%20guide%20to%20catching%20v2.pdf>

We gratefully acknowledge and warmly remember the contributions made by Jens Bagger (Greenland) and Lady Philippa Scott (UK) to the development of this plan, both of whom sadly passed away during the course of its development.

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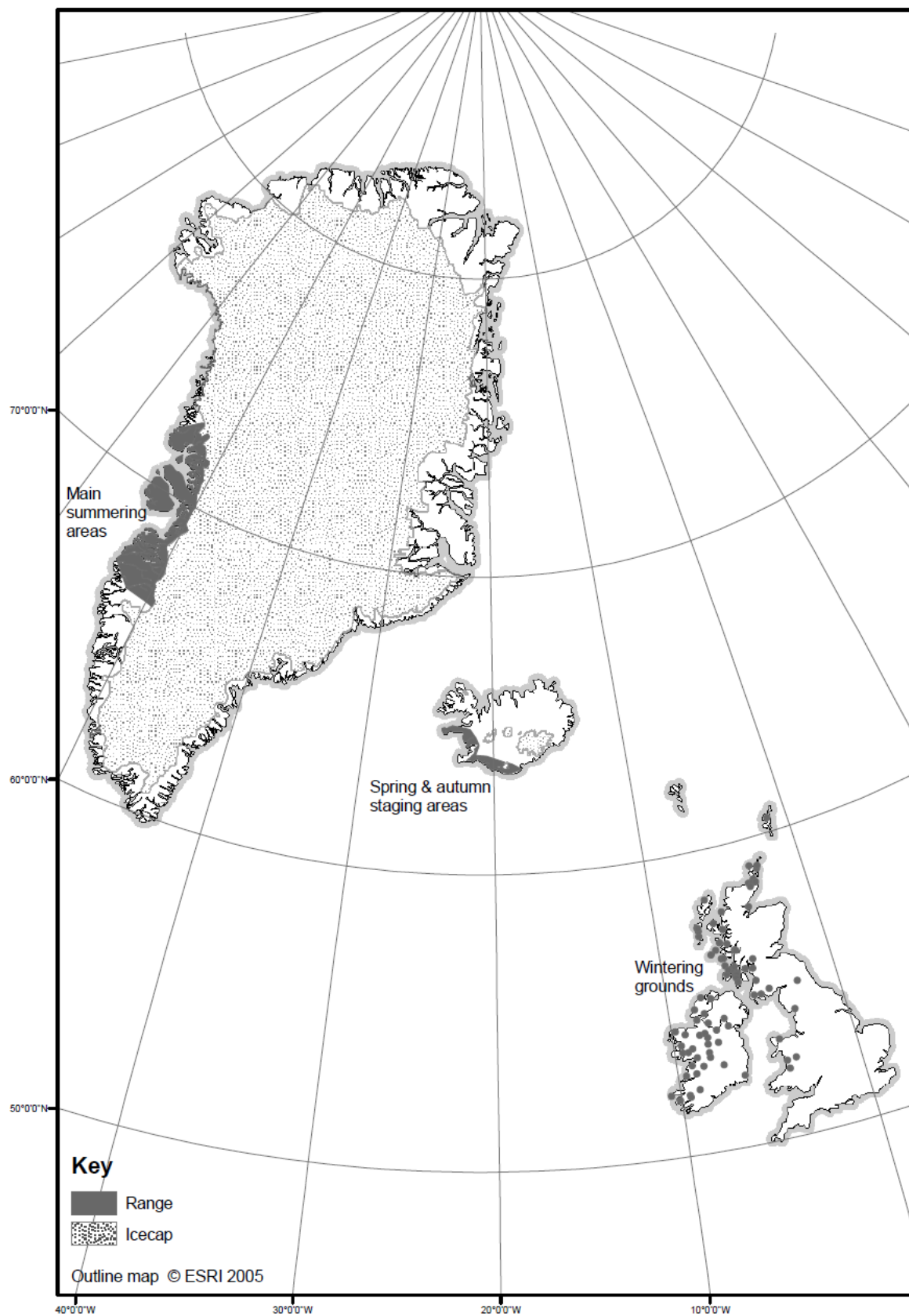
Acronyms and abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
ASI	Area of Scientific Interest (IE)
ASSI	Area of Special Scientific Interest (Northern Ireland)
CCW	Countryside Council for Wales
CMS	Convention on Migratory Species
DEFRA	Department for Environment, Food and Rural Affairs (UK)
ESRI	Environmental Systems Research Institute, Inc.
EU	European Union
EUNIS	European Union Nature Information System
GB	Great Britain (Scotland, Wales & England)
GR	Greenland
GS	Grønlands Selvstyre
GWfG	Greenland White-fronted Goose
GWGS	Greenland White-fronted Goose Study
IBA	Important Bird Area (as identified by BirdLife International)
IINH	Icelandic Institute of Natural History (Náttúrufræðistofnun Íslands)
IE	Republic of Ireland
IS	Iceland
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee (UK)
NAW	National Assembly of Wales (Wales)
NCC	Nature Conservancy Council (GB)
NCR	Nature Conservation Review (GB: list of highest priority conservation areas)
NERI	National Environmental Research Institute (DK)
NGO	Non-Governmental Organisation
NHA	National Heritage Area (Ireland)
NO	Norway
NP	National Park (Ireland)
NPWS	National Parks and Wildlife Service (IE)
NR	Nature Reserve (IS)
NNR	National Nature Reserve (GB and Ireland)
pNHA	Proposed National Heritage Area (Ireland)
RSPB	Royal Society for the Protection of Birds (UK)
SAC	Special Area of Conservation (EU Habitats and Species Directive; IE & UK)
SNH	Scottish Natural Heritage (UK)
SPA	Special Protection Area (EU Birds Directive; IE & UK)
SSI	Site of Scientific Interest (IS)
SSSI	Site of Special Scientific Interest (GB)
UK	United Kingdom (Northern Ireland, Scotland, Wales & England)
WWT	Wildfowl & Wetlands Trust (UK)

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Geographical scope of the Action Plan



Map 1. World range of Greenland White-fronted Goose.

Foreword

Greenland White-fronted Geese are special to me for various reasons. First of all, because my husband, Peter Scott, described them as a new race (with Christopher Dalgety), but also because it has been my great pleasure to see them in every country in Britain, which they visit in the winter. I saw them first on the Wexford Slobs in 1951, and later in Wales, on Islay and also near Loch Ken in Scotland. Then there is always the excitement of spotting the odd one or two mixed among the flock of European White-fronts on the Dumbles at Slimbridge.

It is a special goose to many other people for a whole range of different reasons and I am so pleased to know that this international management plan has been drafted to look into the causes of their reduced numbers. Hopefully the plan will also ensure actions and continue international collaboration to safeguard the Greenland White-fronted Goose in the future.

Lady Philippa Scott
Slimbridge, UK

Preface

It is but a blink of the eye, in geological time, since Peter Scott and his friend Christopher Dalgety first described the Greenland White-fronted Goose *Anser albifrons flavirostris*, new to science, in 1948. Yet even in that short time, this charismatic goose has witnessed great changes. It has seen many of its traditional patterned peatland staging and wintering habitats drained or destroyed. Here, it has had to adapt to feeding first on marginal, low intensity farmland and latterly to more intensive agriculture as its habitat changed annually beneath its very feet. In the last 25 years, it has had to cope with an average warming of c. 1°C on the wintering grounds, a 3.7°C warming in parts of its breeding grounds, but no change in average temperatures at its crucial stopover refuelling point in Iceland.

Yet over the last 25 years, we have been able to track the changes in the total overall distribution and abundance of the entire population on the winter quarters, such that we now have a detailed understanding of the population dynamics of what was formerly one of Europe's poorest known geese. Pioneer work by Hugh Boyd and Malcolm Ogilvie (of the then Wildfowl Trust) and by Major Robin Rutledge and Oscar Merne in Ireland, established the basis for long-term monitoring of the population at specific sites in the 1960s, which formed the basis of the outstanding international collaboration that has characterised the research and conservation programmes since the late 1970s.

Following an expedition to the breeding areas in 1979, the Greenland White-fronted Goose Study has coordinated monitoring at all British wintering sites in partnership with the Wildfowl & Wetlands Trust and the Joint Nature Conservation Committee in cooperation with the National Parks and Wildlife Service in Ireland. This happy collaboration has since spawned a range of ecological studies, satellite telemetry, marking programmes and demographic monitoring, and most recently health-screening and ecophysiological studies. These programmes identified migration routes, staging areas and phenology, fundamental to underpinning conservation measures for the population. It was also this scientific foundation that alerted us to the fact that, after the recoveries of the 1980s following protection from hunting on the winter quarters, it was long term declines in breeding success in the 1990s which caused the sudden declines after the peak in numbers in 1999.

But science alone is not enough. Research needs to be converted to conservation actions. Most important areas on the breeding and wintering areas are protected as Ramsar sites or SPAs, many sites are specifically managed for the welfare of the geese and in the case of Islay, Coll and Tiree, and Kintyre major goose management schemes are now in place. Despite these safeguards, the population clearly still needs action now on a broader scale. This international species plan has been supported by Scottish Natural Heritage under the banner of its Species Action Framework and picks up the process started for a previous plan

agreed by representatives of the Range States at the Wexford workshop held in 1992 (Annex 5). It builds on the continuing collaboration and effort invested in the population of this goose and aims to provide the framework for forging better international collaboration to bring about its ultimate and effective implementation.

The Greenland White-fronted Goose has been a flagship for peatland conservation since the 1980s and has become familiar to many as a conservation success story of the 1990s. A BBC World Service radio documentary in 2008 called Greenland White-fronts “one of the world’s most charismatic birds”. Few can disagree with that assessment - certainly not those who have been fortunate enough to see a huge lifting flock at Wexford Slobbs or have sneaked a glimpse of a furtive family group feeding on the wild bogs of western Ireland and Scotland. And especially not for those who have been privileged to follow the great annual migration of these birds through Iceland, across the oceans and over the immensity of the Greenland ice cap to the tundras of west Greenland.

It is essential that we safeguard the possibility that future generations can continue to thrill to such spectacles, and we must ensure that gains in population size since the early 1980s — the result of major international collaborations then — are not to be lost now through our failure to work together to protect this unique goose.

Executive summary

Background

The Greenland White-fronted Goose *Anser albifrons flavirostris* is a distinctive race of a species that breeds in low arctic tundra landscapes throughout North America and Russia. The discrete population has very limited geographic range and no overlap with other races, breeding solely in west Greenland, migrating in spring and autumn through south and west Iceland to wintering grounds in the north and west of Scotland, west Wales, and the island of Ireland (Maps 1, 2 and 3).

Traditionally the race showed specialist adaptations to feeding in peatlands and other wetlands throughout its range. Away from the breeding grounds however, in recent decades Greenland White-fronts have changed to feeding in agricultural landscapes of varying degrees of farming intensity.

Population size and trends

Falling numbers reached a minimum of 14,300 birds in the late 1970s, initiating co-ordinated international conservation measures at that time. Protection from hunting on the wintering grounds in the early 1980s allowed the population to increase at c. 4% per annum, reaching a peak of 35,600 in spring 1999. Since then, however, numbers have declined rapidly, and the most recent assessment is of 22,844 in spring 2010 (Figure 2).

The immediate cause of the population decline is known to be chronic low productivity, which in most of the last ten years has not balanced mortality, causing a year-on-year reduction of numbers (Figure 1). Good long-term monitoring of population demographics at key sites has allowed a range of possible causes for this declining productivity to be explored. The ultimate cause or combination of causes remains unknown, but could relate to increased late winter/spring snow falls on the breeding grounds in recent years (thus limiting nesting opportunities) and/or to the consequence of inter-specific interactions on the breeding grounds with Canada Geese *Branta canadensis*, which in the late 1980s and early 1990s expanded their range from Canada into west Greenland. Investigations have revealed interactions between the two species during flightless moult in late summer when food becomes limiting, but no research has yet been undertaken on interactions in the pre-breeding and breeding periods – the time of year when any impact on productivity would be manifest. Such studies are an urgent priority if we are to better understand the nature of any competition.

Conservation and international legal status

The population has high conservation status as a consequence of its limited geographic range and relatively small population size. The population is categorised as “Endangered” using the IUCN’s global Red List criteria, is listed in Column A of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) Action Plan, Appendix II of the Bonn Convention (CMS) and on Annex I of the EU Directive on the conservation of wild birds.

By virtue of their highly traditional use of specific sites, the habitats of a significant proportion of the population are protected in Ireland, UK and Greenland. Such sites are designated both under national legislation as well as EU Birds Directive SPAs and as Ramsar sites. The most important area in west Iceland at Hvanneyri was specifically protected for geese in 2002, leading to its designation as a Ramsar site in 2011. There are few other areas specifically protected for the geese in Iceland however.

Threats and conflict management

Local conflicts have arisen in farmland landscapes on the wintering grounds. In Scotland, local goose management schemes have resolved these in four areas of international importance for the population. A range of other threats have been identified which have either been responsible for past local declines, or have the potential so to do in future. These include disturbance by humans; loss or modification of wetland feeding habitats (especially peatlands and/or roost sites); collision impacts with inappropriately located wind energy developments; and unsustainable hunting pressure (although the geese are now legally protected through nearly all of their world range).

This action plan is based on the AEWA International Single Species Action Plan format prepared by BirdLife International and provides a framework for the conservation of the Greenland White-fronted Geese

in each of the four Range States. The plan has been developed using internationally agreed standards including the monitoring and evaluation of implementation, linking threats, actions and measurable activities. Because Greenland White-fronted Geese depend on a network of sites in several countries, successful implementation of the plan will require effective international coordination of organisation and action.

Conservation objectives and top priority actions

The long-term goal of this plan (by 2020) is to establish and then maintain the favourable conservation status¹ of the international population of Greenland White-fronted Geese throughout its global range. In the short term (by 2015), the aim is to identify the causes of current low productivity which is leading to a rapid decline of the population, and then put in place measures to address (to the extent that is feasible) these factors in order to halt and reverse the decline.

a. The top priority action is to investigate the factors acting on geese on the breeding grounds responsible for currently reducing the annual production of young.

- Investigate and assess factors restricting productivity, through an international research programme, investigating a) potential competitive interactions with Canada Geese in west Greenland; and b) consequences of greater spring snow-fall in recent years.

However, that even knowing the causes of low productivity, it is unlikely that reproductive success can be enhanced in the short-term. Accordingly it is essential that measures are also taken to:

b. ensure that geese arrive in Greenland in optimal condition for successful breeding;

- Develop the existing international network of conservation management areas, especially on the staging grounds, to ensure that all key sites are appropriately protected and managed.

c. minimise additional sources of mortality;

- Take all possible steps to eliminate avoidable sources of mortality and disturbance, particularly shooting and collisions with man-made structures.

d. minimise impacts on geese at local scales (such as disturbance or changes in habitat) particularly smaller flocks, or those with restricted distribution, so as to avoid further flock extinctions, to avoid further contraction of range; and

- Assess the need for, and develop as appropriate, local habitat management measures on the wintering grounds so as to optimise quality of agricultural feeding areas, and thus avoid further flock extinctions.

e. to maintain and further develop monitoring and research programmes so as to provide necessary data and information concerning the current conservation status of the population.

- Maintain the long-term marking, re-sighting and counting programmes at the main Irish wintering site of Wexford.
- Develop a complementary Scottish marking programme, at locations which allow for sustained resighting effort.
- Maintain the annual international population census, improving coverage where deficient, and collecting more extensive assessments of age-ratios throughout the range.
- Enhance knowledge of numbers and distribution on the staging and breeding areas to develop site safeguard programmes

The plan is addressed to Greenland, Iceland, the UK and Ireland which share responsibility for the population.

¹ As defined by Article 1 of the Convention on Migratory Species.

1. Biological assessment

1.1. Taxonomy and population structure

Phylum: *Chordata*

Class: *Aves*

Order: *Anseriformes*

Family: *Anatidae*

Genus: *Anser* (Linnaeus 1758)

Species: *Anser albifrons* ((Scopoli) 1769)

Sub-species: *Anser albifrons flavirostris* (Dalgety & Scott 1948)

Of the four currently recognised races of holarctic Greater White-fronted Goose *Anser albifrons*, the Greenland-breeding race *flavirostris* is the most morphologically distinct (Ely *et al.* 2005; Kear 2005), and the most recently described (Dalgety & Scott 1948).

Some commentators have suggested a specific rank for the taxon, though Ely *et al.* (2005) demonstrated that whilst *flavirostris* is morphologically separable from other populations, it represents an extreme form within a demonstrable pattern of increasing body size throughout the circumpolar breeding range of the species.

1.2. Distribution throughout the annual cycle

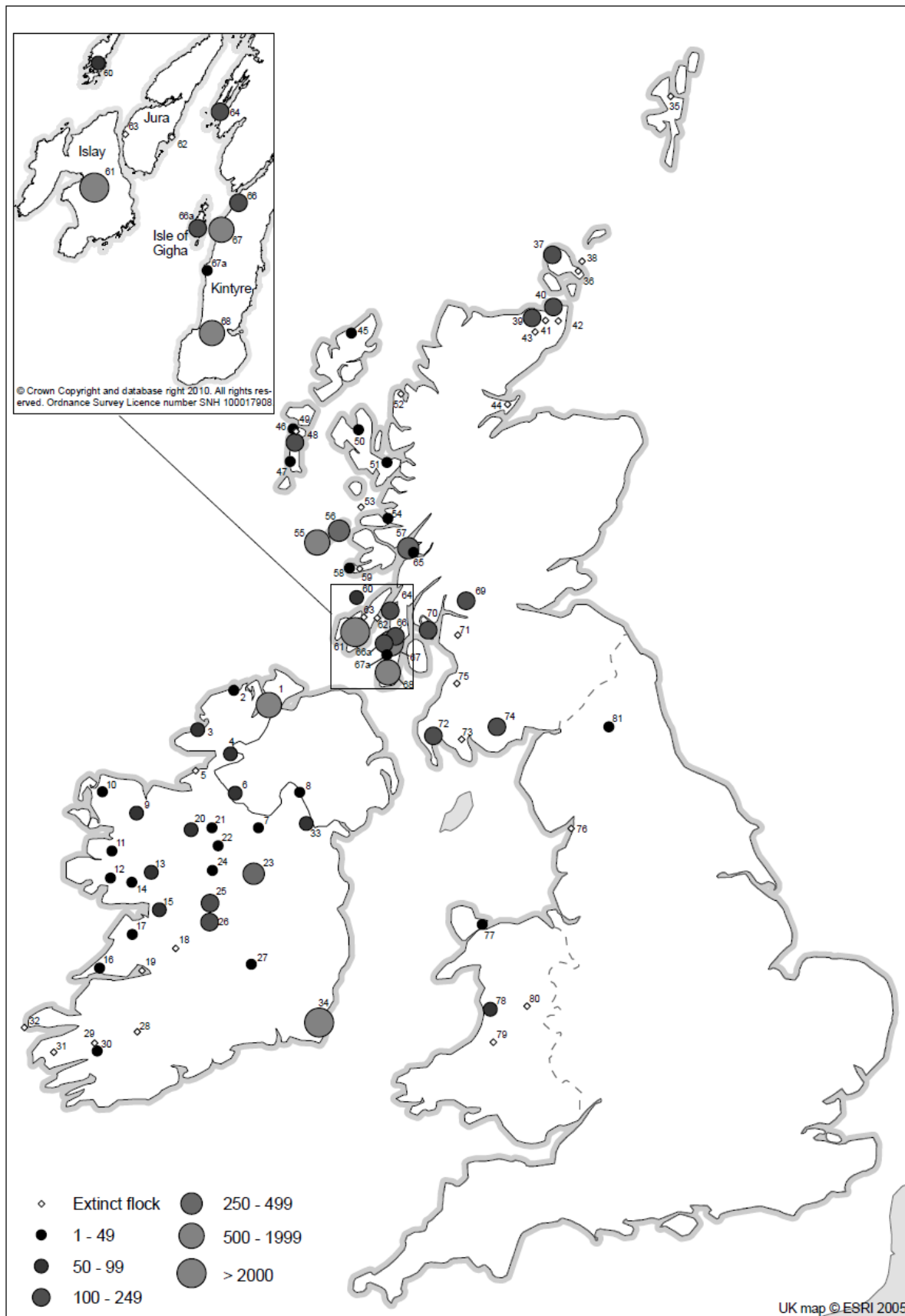
The single population nests solely in west Greenland (occurring in low arctic tundra from 64° – 73° N), crosses the extensive Greenland ice-cap on spring and autumn migration to stage in lowland agricultural areas and wetlands in west and south Iceland. The geese then migrate further south to wintering grounds in Britain and Ireland (Map 1).

There are also consistent records of small numbers wintering in Rogaland, southern Norway since the first ringing recovery in 1962, and annual observations since 1986 (Shimmings 2003). An increasingly number of birds are being recorded in Canada and USA (Sherony 2008), probably being caught-up with migrating flocks of Canada Geese *Branta canadensis* now widely breeding in west Greenland.

The population is unusual amongst arctic breeding geese in undertaking two separate long-distance migratory flights - each in excess of 1,000 km over inhospitable terrain - between its wintering and breeding areas.

Table 1. Geographical distribution of the Greenland White-fronted Goose.

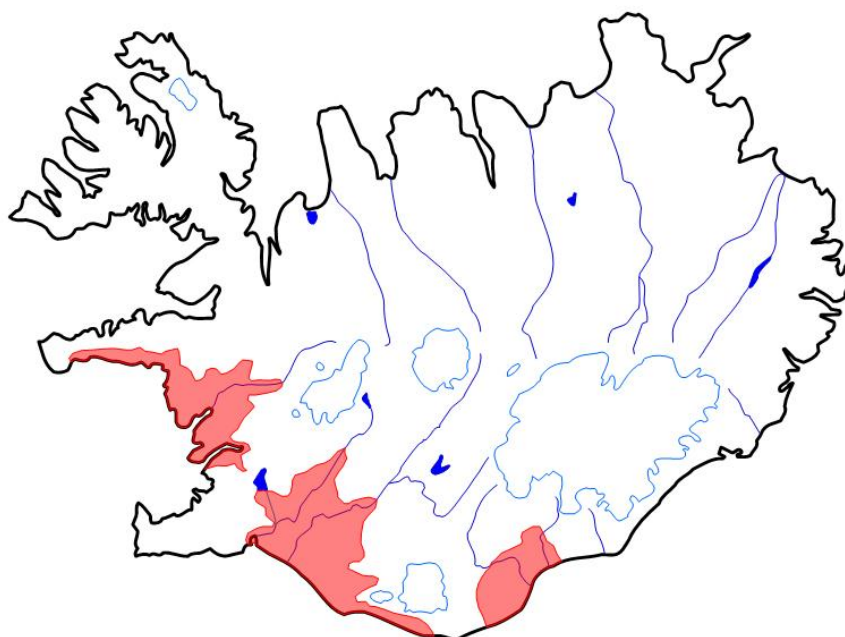
Primary Range States (Countries regularly containing >1% of regional populations)			Other Range States (Regularly seen, but holding <1% of population)	Countries where Greenland White-fronted Goose is vagrant
Country	Breeding	Non breeding	Non breeding	Non breeding
Greenland	X		Norway	Canada
Iceland		X		USA
United Kingdom		X		Several European countries, including Sweden, The Netherlands, Denmark, Faeroe Islands
Ireland		X		



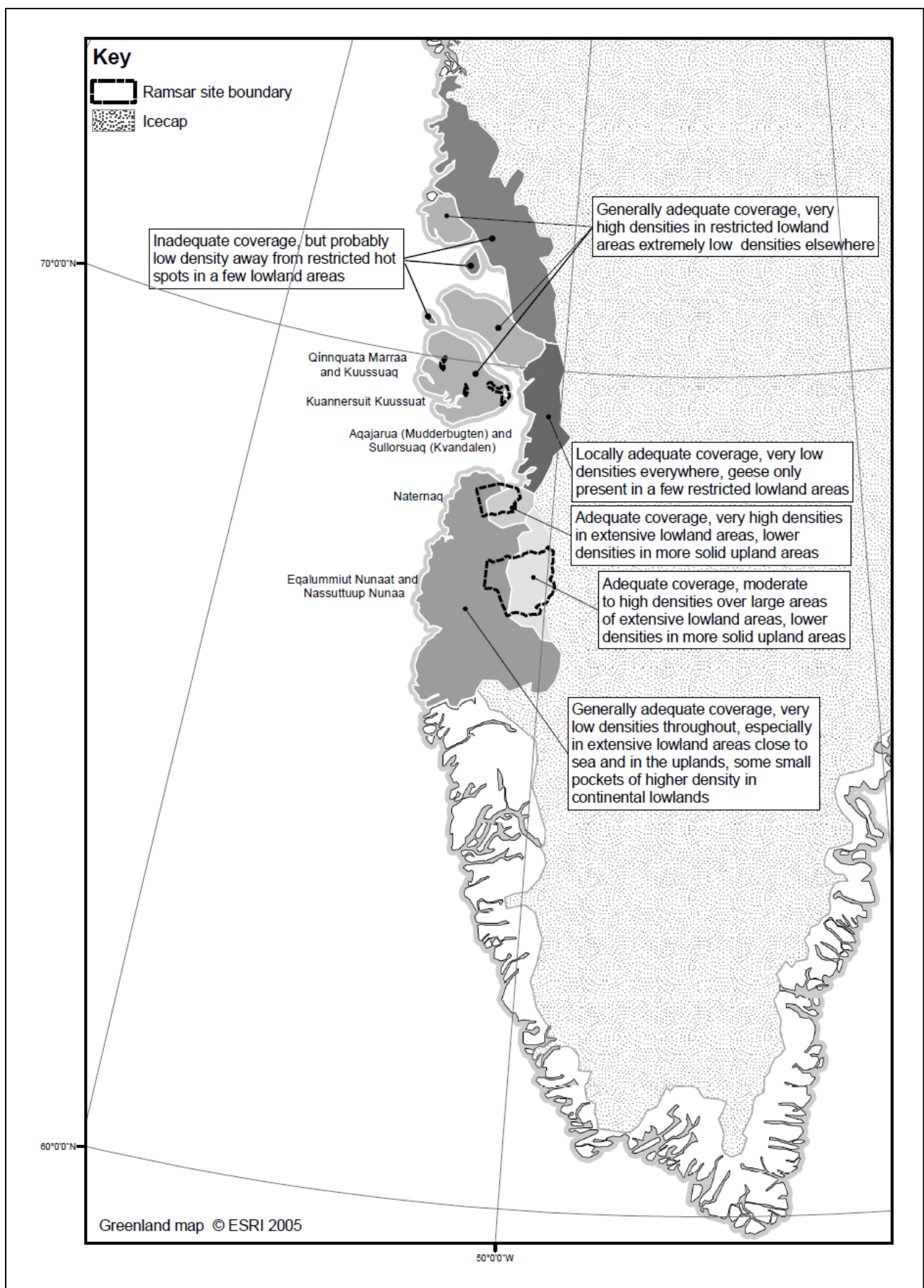
Map 2. Location of all known regular Greenland White-fronted Goose wintering sites used since 1982/83. See Annex 4b for details of flocks and respective site-safeguard. Symbol size indicates size of each flock as of spring 2008. Based on Fox *et al.* (1994).



Map 3a. Distribution map showing the recovery locations of all Greenland White-fronted Geese ringed in Greenland, Iceland, United Kingdom and Ireland and recovered dead/shot in Iceland. The cluster of points highlight the two important staging areas in the western lowlands (counties Borgarfjarðarsýsla, Mýrasýsla and Snæfellsnes- og Hnappadalssýsla), and also in the southern lowlands of Rangárvallasýsla and Árnessýsla together with the south east in Vestur-Skaftafellssýsla. Source: Fox *et al.* (1999) updated to July 2008.



Map 3b. Map of main staging areas of Greenland White-fronted Geese in Iceland. Source: Einar O. Torleifsson & Ragnhildur Freysteinsdóttir, 2006.



Map 4. Extent of areas known to be used by breeding and moulting Greenland White-fronted Geese in west Greenland. Source: surveys by Greenland White-fronted Goose Study; NERI; Ducks Unlimited).

The extent of the historic British and Irish wintering range seems to have been originally limited by the extent and distribution of lowland peatland areas (raised bogs or patterned blanket mires) which did not regularly freeze in winter, enabling the geese to feed on the underground parts of bog plants. During the 20th century, low intensity farmland within the traditional range became increasingly used, although many flocks continue to use peatlands as roost sites in most areas (Ruttledge & Ogilvie 1979; Fox *et al.* 1994, 1998, 1999a). Since flocks that feed in winter on intensively managed grasslands have had better reproductive success in recent decades (Fox *et al.* 2005), an increasing proportion of the population now occur on such grasslands (*e.g.* at Wexford, Kintyre and Islay).

Observations of individually marked birds have demonstrated high site fidelity at all times of the year, with individuals returning over many years to very small wintering and staging home ranges. On the wintering grounds this is manifest in the small number of regularly-used sites; the entire world population of the Greenland White-fronted Goose being currently confined to just *c.* 80 regular sites in Ireland and Britain (Map 2; Annex 4b. Ruttledge & Ogilvie 1979; Fox *et al.* 1994¹).

In Iceland, spring and autumn staging occurs on lowland farmland in the south (mainly Scottish-wintering birds) and west (mainly Irish-wintering birds; Map 3a and 3b). Here, more intensive (in an Icelandic context) farmland is used, as well as natural wetlands including lakes, marshes, peatlands and saltmarshes (Francis & Fox 1987; Fox *et al.* 1999).

In Greenland (Map 4), a range of low arctic wetland types are used during summer (May-September) for staging, nesting, brood-rearing and moult (Stroud 1981; Fox *et al.* 1983; Fox & Stroud 1988; Glahder 1999a,b). In the southern part of the range, xeric continental inland areas are used – geese typically nest in large valleys with marshes, moving to moult in late summer on higher altitude lakes and wetlands on upland plateaux. In more northerly areas, nesting occurs in low, freshwater wetlands close to the coast (Fencker 1950; Joensen & Preuss 1972).

After the flightless moult, in August and early September, birds are reported to gather on lakes close to the edge of the ice-cap (Salomonsen 1950), although there is very little information about the distribution and behaviour of the geese in these months in Greenland.

1.3. Habitat requirements

Greenland White-fronted Geese depend primarily on wetlands throughout their annual cycle either as a source of food, or as disturbance-free refuge areas where feeding occurs on agricultural areas (primarily grasslands).

Breeding habitat requirements:

- Lack of disturbance during nesting and moulting periods.
- Undisturbed lowland arrival areas are probably of critical importance to females for rapidly regaining body condition (and hence improving chances of reproductive success) after migration (Fox & Madsen 1981; Glahder 1999a; Fox 2003).
- Access to adequate food supply to sustain female condition, raise goslings and successfully complete moult.
- Adequate feeding habitat in proximity to open water to which flightless geese can resort during flightless moult period.
- Undisturbed access to heathland habitats post moult where geese can accumulate fat stores by foraging on abundant carbohydrate-rich berries is likely to be important for the accumulation of fuel stores prior to autumn migration (although very little is known about this period of the annual cycle).

¹ updated at <http://greenlandwhitefront.homestead.com/>

Non-breeding habitat requirements:

- Undisturbed wetland roost site.
- Access to adequate feeding areas comprising either natural wetlands or managed agricultural landscapes with varying degree of management intensification.
- Sites with multiple feeding areas giving the potential to move locally in response to disturbance.

1.4. Survival and productivity

Like most goose populations in the Northern Hemisphere, when not subject to hunting, individuals are typically long-lived, exhibiting annual adult survival rates of up to 90%, although first year survival is typically lower than that of adults. This has been shown to be the case amongst Greenland White-fronted Geese, where long time series of count and age ratio data show an average of 89% for the crude annual survival rate amongst adult birds (Fox 2003). Annual survival rates based on resightings of marked individuals during 1983-1997 was 79% for adults and 68% for juveniles (Fox 2003). This estimate was made during a period when autumn hunting was permitted in Iceland - which accounts for the overall difference to that calculated by census data.

At Wexford Slobs, retrospective analysis of crude annual adult survival rate showed an inverse relationship with hunting mortality, and that the slope of this regression model did not differ significantly with that predicted if hunting mortality was completely additive to other sources of mortality (Fox 2003). In other words, the adults dying as a result of being shot were not a “harvestable excess” in the population that would have died of other causes anyway, potentially through some density-dependent mechanism, such as limited food supply. This finding is of considerable importance for management of the population, since with the cessation of winter hunting, the population increased at a rate of *c.* 4% per annum (in line with the theoretical prediction) and as a result of the survival of those birds that would have previously been shot prior to the hunting ban.

This makes hunting regulation a powerful management tool with which to effect change in overall population size, since reduction of the winter hunting bag by a given number of individuals will likely increase the population size by that same amount at the end of the first closed hunting season. In this context, it is important to stress that during the period of expansion in the population during the 1980s, production was sufficiently high that the annual autumn kill in Iceland (over 3,200 individuals in 1995 – Statistics Iceland 2011) did not inhibit an increase in overall population size. However, following the prolonged subsequent period of decline in overall numbers since 1999, it was clear that this additive source of mortality (over 3,700 taken in 2001) was not assisting the recovery of the species towards favourable conservation status in very recent years. Accordingly, the Icelandic Government stopped the autumn hunt of the population from September 2006 onwards.

Although there was no trend in the proportion of young recorded in samples in the autumn flocks prior to protection in the early 1980s, average productivity was marginally, though not significantly greater from 1983-1995 (Figure 1). However, since 1996, average productivity has been significantly lower than previously.

In relatively long-lived birds, such as geese, change in overall population abundance is usually more sensitive to small changes in annual survival than, relatively larger, changes in reproductive output. However, resightings of marked individuals enable the estimation of age- and year-specific survival rates using capture-recapture and other modelling techniques. These show no significant change in annual adult survival or emigration from Wexford over the period (Fox 2003; Fox *et al.* 2006 a,b). Unusually, therefore, the decline in abundance of this population since 1999 is the result not of falling survival, but of a long-term decrease in the production of young (since 1996).

This has been evident amongst the sample of marked individuals at Wexford where the proportion of each year-class of goslings captured and marked in their first winter which survive to breed *at all* during their lifetime has fallen since marking began in 1983 from *c.* 15% to less than 5% in the early 1990s (Fox 2003).

This suggests that, even when the population was increasing, a remarkable 85% of Wexford Greenland White-fronted Geese *never* survived to successfully reproduce. In recent years, this proportion has fallen to even lower levels still. This feature of Greenland White-fronted Goose population dynamics is unusual amongst White-fronted Goose populations and indeed amongst grey geese *Anser* spp. in general. Quite why so few adult birds ever recruit into the reproductively successful element of the population remains a mystery. It is not clear if many more attempt to breed but fail, or if the opportunities to initiate breeding in this population are simply restricted in some way.

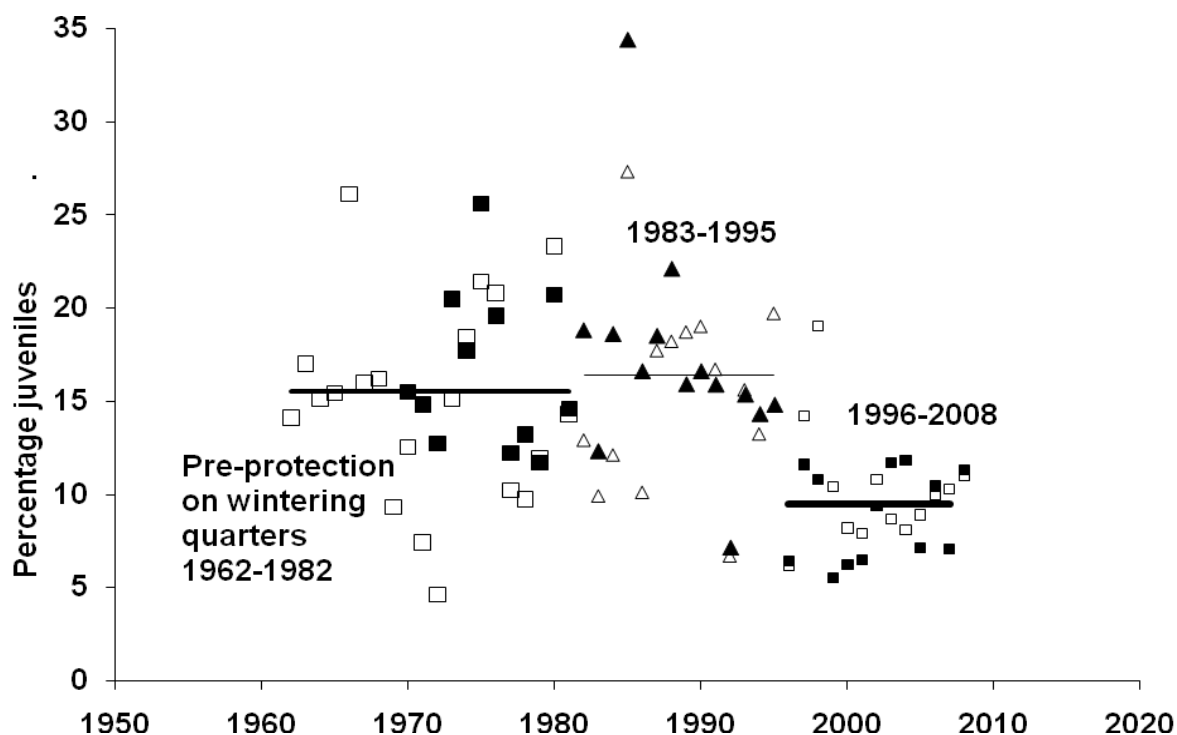


Figure 1. Changes in the proportions of young Greenland White-fronted Geese sampled in winter from Wexford Slob (triangular symbols) and Islay (square symbols) for the years breeding 1962 – 2007. Year is summer of breeding. Data are shown from the period prior to the cessation of hunting on the wintering areas (up to winter 1981/82), the period immediately following protection until 1995 and since 1995, with mean values shown for each of the three periods. Data courtesy National Parks and Wildlife Service Ireland and GWGS/Dr Malcolm Ogilvie, respectively.

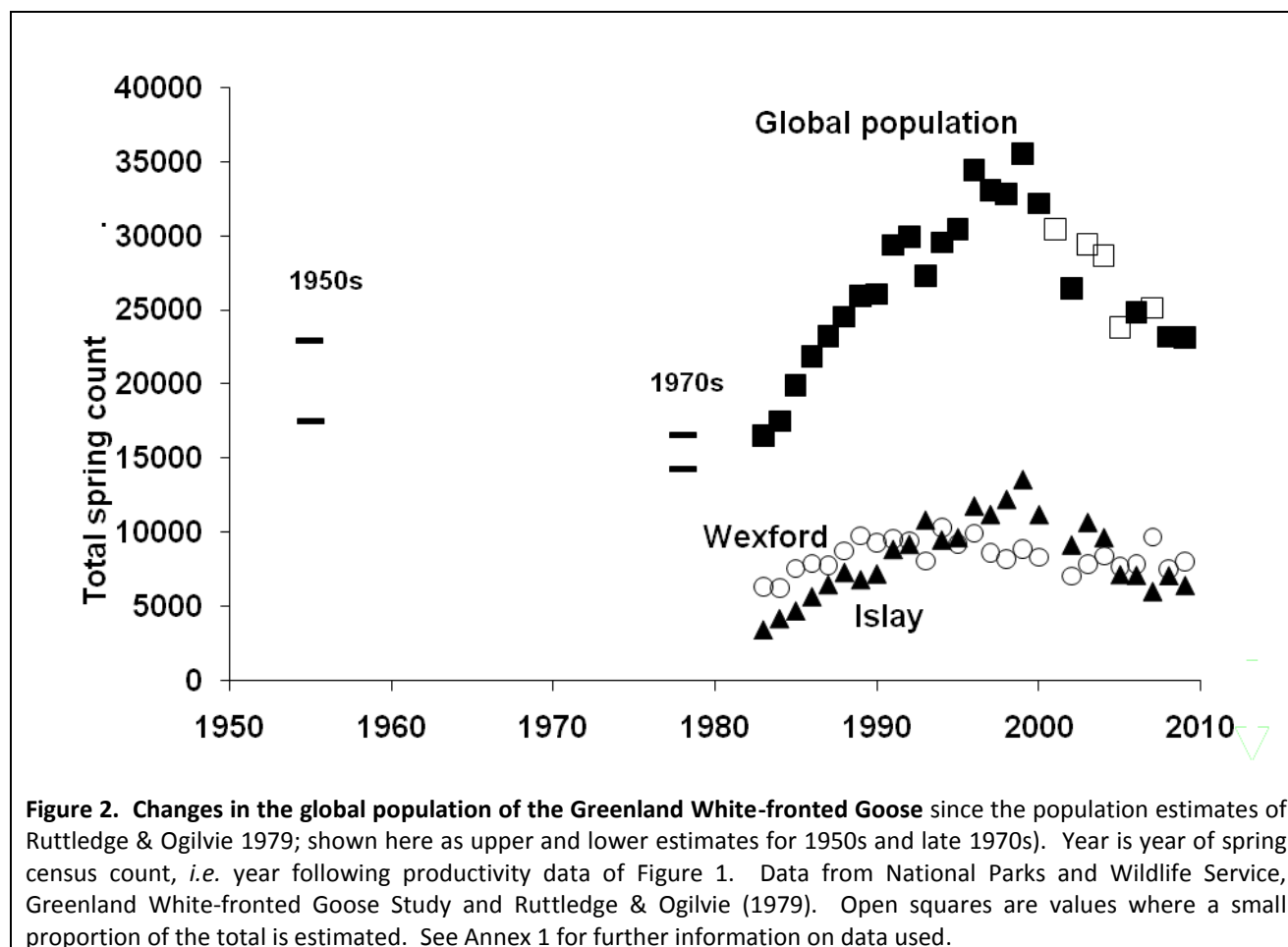
1.5. Population size and trend

Although the race comprises a single population, leap-frog migration occurs; more northerly breeding birds tend to winter in the south of the wintering range (Wexford, Ireland) while birds breeding in more southerly areas tend to winter in Scotland (Salomonsen 1950; Kampp *et al.* 1988). Against this overall pattern, White-fronts ringed in one breeding area of Greenland have been observed to disperse between many wintering sites (Stroud *et al.* 2002) suggesting that associations on the winter quarters do not necessarily reflect summering and breeding population distributions.

Our knowledge of numbers and distribution prior to the 1950s is generally poor. Improved information suggests that the world population declined from 17,500–23,000 in the 1950s to 14,300–16,600 in the late 1970s (Rutledge & Ogilvie 1979). Conservation measures were implemented on the wintering grounds and in Greenland in the early 1980s, and census coverage of all wintering resorts enabled subsequent detailed monitoring of the population under protection. Numbers more than doubled from spring 1983 to reach 35,600 by spring 1999, increasing initially at an overall average annual rate of 6.6%, slowing progressively to increase overall at an average of 4% per annum between 1982 and 1999 (Fox *et al.* 1998, 2006a; Figure 2;

Annex 1). Studies at Wexford have shown that shooting mortality was additive to natural mortality, such that protection from shooting gave enhanced adult survival rates, leading to the observed population growth (Fox 2003).

Since 1995 however, reproduction has been markedly lower than in previous years and since 1999 overall numbers have declined by over a third over eight years, with the most recent global population count finding just 22,844 in spring 2010 (Figure 2; Annex 1; Fox *et al.* 2009).



The geese are highly site-loyal to wintering areas (Wilson *et al.* 1991, Warren *et al.* 1992) and demonstrate a very traditional use of sites at all times of the year, including Iceland in spring and autumn (Fox *et al.* 2002). However, even during the period of increase, numbers at different wintering sites showed different trends. Overall, at the peak period of increase in the mid 1990s, 20 sites had shown significant increases, 35 had shown no trend, 18 had shown significant decreases in wintering numbers after protection and indeed flocks at seven sites had disappeared (Fox *et al.* 1998).

At that time, other local factors seemed to affect the propensity of a wintering flock to show increases or decreases. Irish flocks experiencing low disturbance from human activities (*e.g.* agriculture or recreation) with many alternative feeding areas generally showed higher rates of increase than those using a restricted number of sites where they suffered high rates of disturbance (Norris & Wilson 1988, 1993).

Since the 1950s, the population has progressively shifted from using natural wetland habitats and low-intensity farmland; flocks using winter ranges where they exploit the most intensive agricultural habitats (cereal stubble, root crops and intensively managed grassland) produced a greater percentage of young than those exploiting low-intensity agricultural habitats and traditional wetlands (Fox *et al.* 2005, 2006a).

Because individuals show high levels of site fidelity, there is limited potential for colonising new areas, re-colonisation of deserted sites, or large-scale immigration from other areas to supplement declining flocks although exchange of individuals does occur regularly and young birds establishing pair bonds typically show changes in wintering site.

Table 2 lists those sites with the smallest numbers most likely to become extinct on the basis of current population trends (also shown in Map 5).

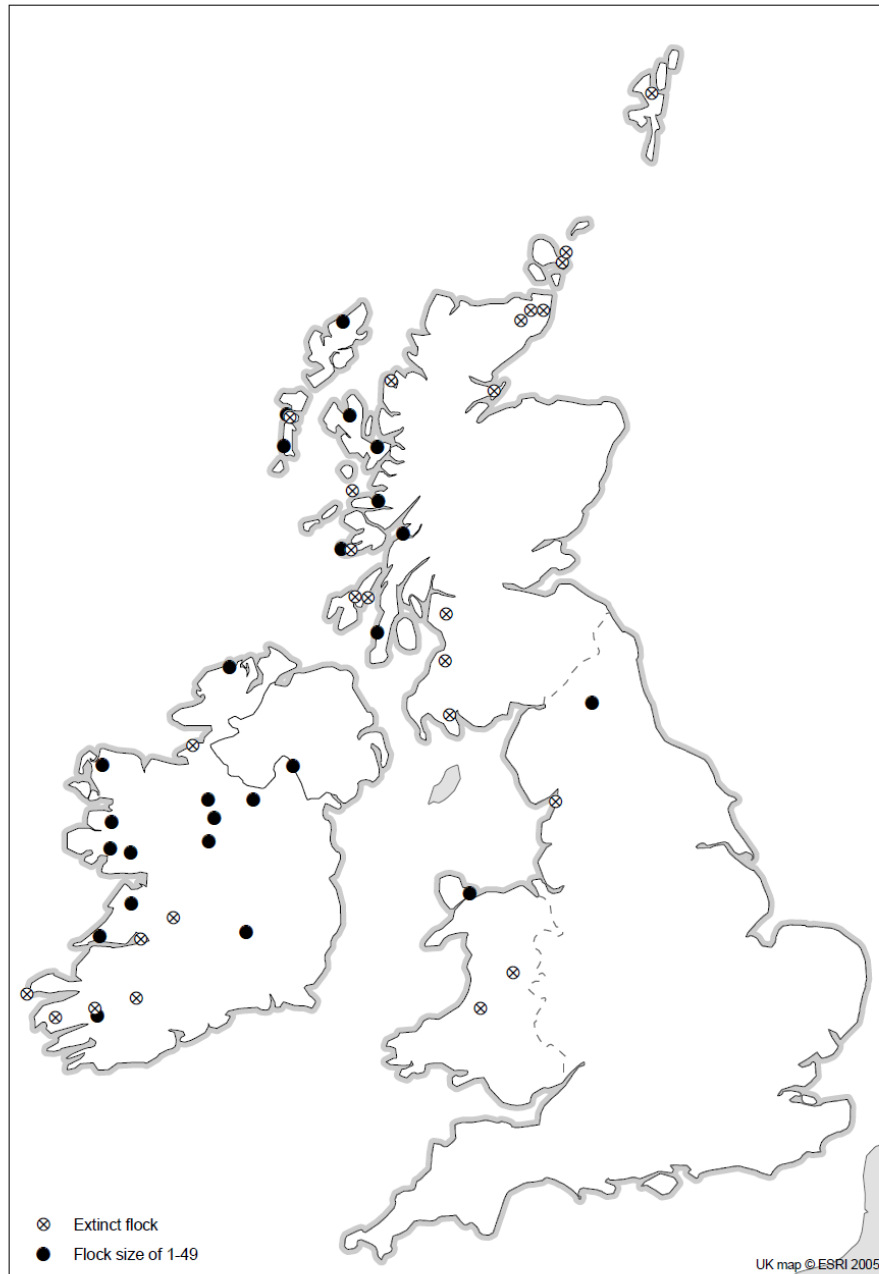
This is therefore a classic meta-population, where wintering numbers at various sites show differing trends in abundance that contribute to an overall pattern in global numbers.

Population Viability Analyses (PVA) have previously been undertaken (Pettifor *et al.* 1996, 1999; Trinder *et al.* 2005). However, the basic premise of such analyses is to predict scenarios of future population development based on past conditions and data. When the important demographic parameters show relatively dampened change over extended periods of time, this type of approach may be adequate, for example, to assess the effects of changes in hunting mortality on population change over time. However, such models do not predict the unpredictable, and due caution therefore needs to be used in their application to developing management recommendations in the face of unexpected change. Given that it is known that future conditions will be very different from the past in respect of several factors, not least competitors on the breeding grounds and the implications of climate change, the utility of such approaches is doubtful. Indeed the previous PVAs in the 1990s completely failed to predict the onset of the current population decline.

Table 2. Greenland White-fronted Goose flocks most at risk of extinction. Flocks with <50 birds in spring 2009.

Flock (for site numbers see Map 2)	Status
SCOTLAND	
Sullom Voe, Shetland (35)	Extinct
Orkney, Tankerness/Holm (36)	1
Orkney, Loch of Swannay	Probably extinct ?
Orkney, Stronsay (38)	Extinct
Caithness, Loch Scarmclate (41)	Probably extinct ?
Caithness, Loch Winless/Loch Wester (42)	Probably extinct ?
Caithness, Loch Meadie/Loch a'Cherigal (43)	Probably extinct ?
Loch Eye, Ross & Cromarty (44)	Extinct
Loch of Strathbeg, Aberdeenshire (44a)	1 - Irregular
Western Isles, Lewis, Loch Urrahag (45)	21
Western Isles, Benbecula, Nunton/Griminish (46)	41
Western Isles, South Uist, Kilpheder/Askernish/Loch Hallan (47)	23
Western Isles, North Uist (49)	Extinct
Skye, Loch Snizort (50)	28
Skye, Broadford (51)	36
Lochalsh, Plockton (51a)	0 - Extinct ?
Gairloch, Loch Sguod & Longa Island (52)	Extinct
Muck, Highland (53)	Extinct
Loch Shiel, Highland (54)	32
Benderloch Peninsula and Lismore Island (57)	43
Mull, Loch Poit na h-I/Fidden (58)	32
Mull, Loch Assapol (59)	8
Jura, Lowlandsman's Bay (62)	0 - Extinct ?
Jura, Loch a'Chnuic Bhric (63)	0 - Extinct ?
Moine Mhor, Strathclyde (65)	19
Barr Loch, Renfrew (71)	Extinct
Bladnoch Valley and Wigtown Bay, Dumfries and Galloway (73)	Extinct
Various lochs in Ayrshire (75)	Extinct
ENGLAND	
Morecambe Bay and the Lancashire Mosses (76)	Extinct
Northumberland, Grindon Loch (81)	9

Flock (for site numbers see Map 2)	Status
WALES	
Anglesey, Clwyd (77)	Extinct
Cors Caron, Dyfed (79)	Extinct
Bryn-du, Powys (80)	Extinct
Ystumllyn, Gwynedd	Extinct
IRELAND	
Dunfanaghy, Co. Donegal (2)	6
Sheskinmore Lough, Co. Donegal (3)	37
Bunduff, Co. Sligo (5)	Extinct
Lough Oughter, Co. Cavan (7)	14
Caledon, Cos. Armagh and Monaghan (8)	3
Lough Conn, Co. Mayo (9)	43
Bog of Erris, Co. Mayo (10) Owenduff	17
Bog of Erris, Co. Mayo (10) Carrowmore	37
Bog of Erris, Co. Mayo (10) Termoncarragh	22
Errif and Derrycraff, Co. Mayo (11)	30
Connemara, Co. Galway (12)	31
Lower Lough Corrib, Co. Galway (14)	39
Tullagher, Co. Clare (16)	15
North County Clare (17)	45
Lower Lough Derg, Co. Clare (18)	Extinct
Fergus and Shannon Estuaries, Cos. Clare and Limerick (19)	Extinct
Drumharlow Lough, Cos. Leitrim and Roscommon (21)	????
Loughs Kilglass and Forbes, Cos. Leitrim, Longford and Roscommon (22)	Extinct?
North Lough Ree, Cos. Longford, Roscommon and Westmeath (24)	30
River Nore, Co. Kilkenny (27)	7
Kilcolman, Co. Cork (28)	Extinct
Doo Lough, Co. Kerry (29)	Extinct
Killarney Valley, Co. Kerry (30)	14
Inny Valley, Co. Kerry (31)	Extinct
Blasket Islands, Co. Kerry (32)	Extinct
Stabannan, Co. Louth (33)	40



Map 5. Greenland White-fronted Goose flocks most at risk of extinction. Sites and data as in Table 2.

1.6. Life history

Reproduction

In the 1980s, marked geese typically bred first at three years old (Warren *et al.* 1992), but cohorts hatched in the early 1990s first bred successfully at four-five years old (Fox 2003). Many offspring show prolonged associations with their parents, and marked individuals have remained with one or other parents for up to nine winters, a trait not witnessed amongst other populations of arctic nesting geese. It is far from clear whether these prolonged parent-offspring relationships are the cause of poor recruitment or a manifestation of the difficulties faced by young birds attempting to reproduce. Difficulties in reproducing may make association with parents and contributing to their reproductive output a better lifetime investment (via inclusive fitness) than attempting to breed and failing.

Breeding

Energetic studies suggest that geese arrive on migration from Iceland after traversing the ocean and the Greenland ice cap with substantial reserves to buffer poor conditions in west Greenland. Remote studies using satellite telemetry (Fox *et al.* 2003) and aerial survey (Glahder 1999a,b) shows the birds feed at lowland gathering areas on arrival in early spring which is likely to be important for recouping female body stores prior to subsequent nesting. Although it is known that some females initiate rapid follicular development before departing from Iceland (and hence the population is to some extent a partial “capital breeder”) substantial contributions to the chemical make-up of the eggs and to fat stores necessary to maintain sitting females during incubation are thought to be obtained from endogenous sources after arrival in west Greenland. Such flexibility enables adjustment of the initiation of egg-laying in response to prevailing weather conditions. In spring, those birds earliest to attain optimal body condition on the wintering grounds are likely amongst the first to depart for Iceland, have longest to ‘refuel’ there, and may also be amongst the first to arrive in west Greenland. Such birds probably thus have more time and resources to invest in larger clutches than later arriving birds, assuming good conditions on arrival to west Greenland. This may contribute to the relationship between the intensity of agriculture associated with each wintering site and the contrasting reproductive success measured amongst different flocks (Fox 2003; Fox *et al.* 2005).

The highly solitary breeding strategy is possibly a consequence of high predation pressure (principally by Arctic Foxes *Alopex lagopus*). Incubation lasts for c. 25-27 days. Breeding biology was summarised by Fox & Stroud (1988, 2002).

Feeding

In summer the geese feed initially on over-wintering subterranean plant parts and as summer progresses, the preference shifts to grazing leaves of various wetland species. In winter, feeding occurs largely on agricultural grasses but nocturnal feeding also occurs at night-time roost sites. In Iceland, the geese now feed largely on farmland grasses although they formerly fed in natural saltmarshes and other wetlands. Diet is further summarised by Fox & Stroud (2002).

Outside breeding season

The geese demonstrate unusual social structuring with long lasting family relationships (Warren *et al.* 1992). Flocks typically comprise extended families of several generations. Greenland White-fronts show strong fidelity to sites and use of limited home-ranges within sites over many years (Wilson *et al.* 1991). All these factors highlight a high ‘cultural’ element of learnt behaviour in the selection and use of sites.

1.7. Summary of key knowledge

Habitat use and food requirements are generally well known (Fox & Stroud 2002). The species depends primarily on agricultural landscapes containing natural wetlands in the non-breeding season, and low-arctic tundra landscapes in Greenland. Diet in most Range States is broadly known (summarised by Fox & Stroud 2002), and consists of a range of plants of natural wetlands and agricultural grasses. The reliance on the winter quarters and in Iceland on agricultural land gives some cause for concern in the future, especially given the potential effects of economic and global change on farming systems and the consequent risks of farmland being no longer managed for agriculture. Under such circumstances however, extensive natural wetlands still remain in the areas frequented by the geese.

Knowledge of distribution and abundance of the population is good, with a range of studies, many of which are internationally co-ordinated, having been undertaken since the late 1970s in Greenland, Iceland, Ireland and the UK. These are broadly summarised by Fox & Stroud (2002) and Fox (2003); with information on key sites available at <http://greenlandwhitefront.homestead.com/>. Fox & Stroud (2002) provide a broad overview of knowledge of the population and its ecology at the turn of the millennium.

The total non-breeding population in spring 2010 was estimated at 22,844 (Annex 1). Data quality is good, there having been a co-ordinated international census undertaken twice each winter in nearly all years since 1982/83. Demographic monitoring has been undertaken at the key wintering sites since the 1960s (Merne unpubl., Ogilvie 1983: both summarised by Fox 2003 and Fox *et al.* 2006a) and has been successful in

identifying the probable causes of the recent population decline, namely low reproductive output failing to balance annual losses in recent years. The major shortcoming has been our inability to distinguish the precise causes of the reduction in reproductive output in this population and as a result derive concrete proposals of management actions to offset this adverse development.

Studies show that the population exhibits individual inter-annual site loyalty (after dispersal associated with pairing) which underlines the importance of a network of protected areas to support the effective conservation of the population. Generally such a network is in place on the breeding and wintering areas and is effective, but some further assessment of the present efficacy is a priority, for example consideration of appropriate designation of feeding areas.

Knowledge of spring and autumn staging areas and ecology is reasonable, but could be much improved, given the critical nature of the three weeks staging period undertaken in Iceland, the potential for global change to create mismatches in timing of food availability and the general lower level of site safeguard there. An unknown proportion of the population uses a modest number of sites during spring and autumn staging in Iceland (Annex 4a) and there is an important need for further detailed inventory information on the characteristics of sites used (including whether or not hunting occurs there).

The breeding range of the population is restricted to a limited area of low-arctic west Greenland. Aerial surveys undertaken since 1988 have served to identify key areas of importance, particularly in the period immediately after the geese arrive in west Greenland in May, when they congregate at a relatively high density in a small number of early thawing lowland areas (Glahder 1999a,b). Breeding surveys in 1999 and 2005 have broadly identified areas of greatest significance for nesting (Malecki *et al.* 1999 and unpublished data) and an August 2007 survey of post-moult distributions has added to knowledge by identifying areas important for pre-migration fattening on the summer grounds (Fox & Gladher 2010). These surveys suggest that c. 25% of the breeding and summering populations occur within the boundaries of Ramsar sites designated in west Greenland for the population (Annex 4a), although there are several sites outside the existing Ramsar sites which hold very high densities (*e.g.* Nussuaq, Ubekendt Ejland, Itsako / Svartenhuk) (Fox & Gladher 2010).

On 2 February 2011, the Icelandic government announced the designation of a Ramsar site at Hvanneyri in Borgarfjörður, western Iceland. This is the most important staging area in western Iceland and the designation is of major importance for the Irish-wintering component of the population which uses this area.

Approximately 60% of all wintering Greenland White-fronted Geese in Scotland enjoy some site safeguard of their feeding and/or roosting areas (Annex 4b).

In Ireland, of the 34 formerly known traditional wintering flocks, eight are now extinct and a further 17 are highly threatened (Table 2, Annex 4b). A further seven traditional sites used by five other flocks have been abandoned, although other sites are still used by these flocks. Of the 26 extant flocks, nearly all (24) enjoy protection under domestic Irish legislation as either NHAs or proposed NHAs. A total of 14 flocks have some of their range protected by internationally designated protected areas (either as a Ramsar site and/or SPA) and where Greenland White-fronted Geese are a specific justification for the designation of the site. This allows targeted management of the site to occur directed at the requirements of the geese.

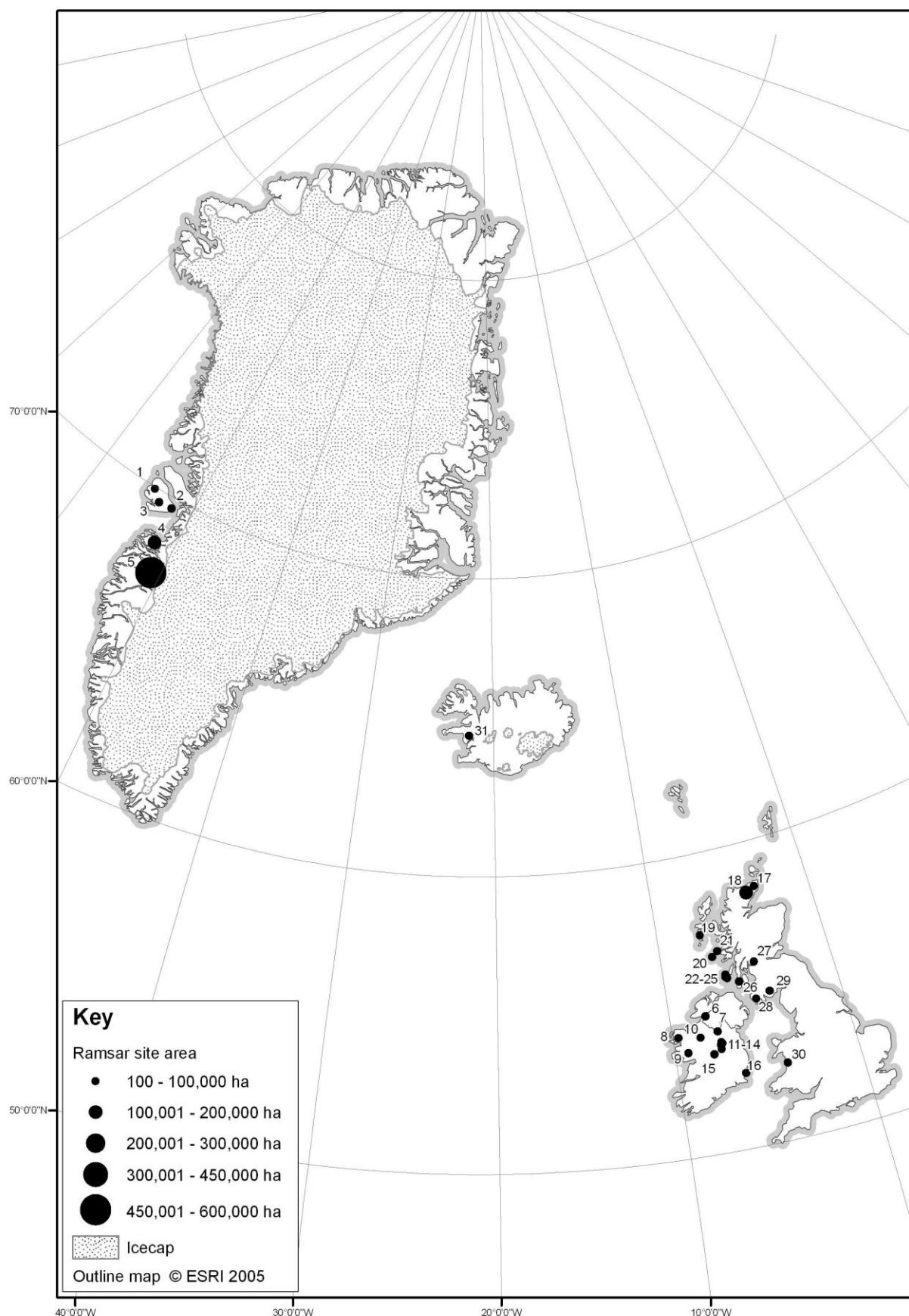
A further 14 flocks have some part of their range covered by internationally designated protected areas (either a Ramsar site, SPA and/or a SAC) but where Greenland White-fronted Geese are *not* a specific justification for the designation of the site. This limits the scope to manage the site for geese, but confers a degree of 'existence protection' to the habitats concerned.

In Scotland, of the 46 formerly known traditional wintering flocks, 16 are now extinct and a further 12 are highly threatened (Table 2, Annex 4b). Of the 30 extant flocks, over half (19) are protected as SSSIs. Ten flocks have some of their range protected by internationally designated protected areas (either Ramsar or SPA) and where Greenland White-fronted Geese are a qualifying species. A further nine international designations cover other flocks, although without geese as qualifying interests.

In England, the single regular site is unprotected, whilst in Wales, four flocks are now extinct, although the remaining site on the Dyfi estuary is protected by multiple designations (Table 2, Annex 4b). The long-standing voluntary suspension on shooting of Greenland White-fronted Geese by the local shooting club on the Dyfi Estuary has probably avoided that flock becoming extinct.

The distribution of internationally important wetlands designated under the Ramsar Convention for the protection of their Greenland White-fronted Geese is shown in Map 6. This suggests that whilst there is some need to review the current precise extent of the protected area network coverage in all of the Range States, current coverage on the wintering and breeding grounds is at least adequate for purpose. Further analysis is needed to assess how good site safeguard coverage is in Iceland compared to the ideal and to determine how effective site safeguard may be in delivering appropriate sympathetic management prescriptions for the population on protected sites where the species is given as a reason for site protection.

Demographic studies show that in the absence of hunting mortality, the population is generally long-lived but under all circumstances (especially compared to other grey goose species) shows very low reproductive output. The species can therefore buffer periods of low reproduction, but the overall population size is very vulnerable to relatively small changes in annual survival. This makes the sustained maintenance of long-term survival rates an important management objective during periods of population decline. The reduction of the contribution from hunting mortality over the last 30 years has therefore been critical in restoring the population to favourable conservation status and the cessation of the autumn hunt in Iceland has almost certainly helped to reduce the rate of decline in very recent years. The challenge now remains to find a method to restore reproductive output to previous levels, if indeed this is possible.



Map 6. Distribution of wetlands designated as Ramsar sites for the protection of Greenland White-fronted Geese. Numbers relate to listing of sites given in Annex 4c.

2. Threats

2.1. General overview of threats

It is well-established, with high confidence, that the main driver of the current population decline is a long-term trend of declining productivity such that not enough young are produced each year to balance mortality. A range of possible issues have been considered as the ultimate cause of this declining productivity (Fox 2003 and summarised in Fox *et al.* 2006a). These include climate change, density dependent limitations, and changes of diet leading to poorer condition and thus lower female productivity. The two issues which are the most likely contributors (either independently or more likely in combination) are:

- i) competitive interactions with Canada Geese *Branta canadensis* which have recently expanded their range and are now breeding widely in west Greenland (Fox *et al.* 1996; Nyeland 2001; Kristiansen & Jarrett 2002); and
- ii) a switch in the Atlantic Multidecadal Oscillation¹ which has had the consequence of greatly increasing precipitation in April and May, with implications for constraining the availability of food for geese on arrival in Greenland and possibly also nest sites (Boyd & Fox 2008).

Several other threats which have been responsible for local declines, or which have the potential to do so, have been identified. These include disturbance by humans, loss or modification of wetland feeding habitats (especially peatlands and/or roost sites), collision impacts with inappropriately located wind energy developments, and unsustainable hunting pressure.

A summary of the main actual or potential threats to the status of Greenland White-fronted Geese is given in Table 3. **Note that the assessment of the seriousness of each of these threats is in terms of their impact on the status of the global population. At smaller scales (for example at individual sites or nationally) these, and other factors, may pose significantly higher threat risks to national or local status.**

¹ “North Atlantic sea surface temperatures show a 65–80 year cycle, known as the Atlantic Multidecadal Oscillation (AMO), with warm phases during 1860–1880 and 1940–1960, and cool phases during 1905–1925 and 1970–1990. Since 1995, the AMO has reverted to a warm phase, associated with the passage of more frequent frontal systems, especially in spring across the west coast of Greenland.” (Boyd & Fox 2008)

Table 3. Main actual or potential threats to the status of Greenland White-fronted Geese.

Key to threat assessment ranks¹:

Critical: a factor causing or likely to cause very rapid declines (>30% over 10 years);

High: a factor causing or likely to cause rapid declines (20-30% over 10 years);

Medium: a factor causing or likely to cause relatively slow, but significant, declines (10-20% over 10 years);

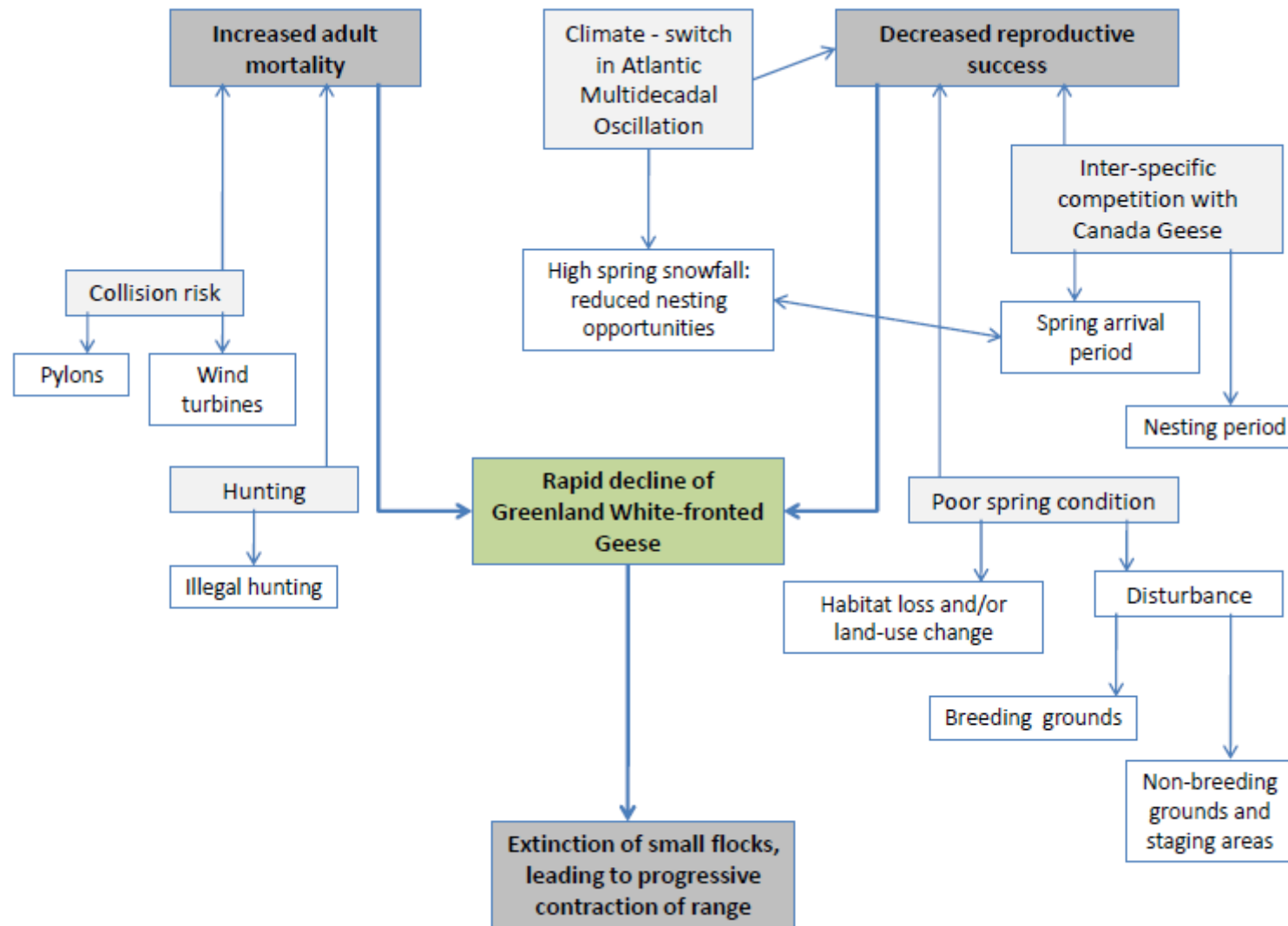
Local: a factor causing or likely to cause significant impacts at specific sites

Unknown: a factor that is likely to affect the species but it is unknown to what extent

Threat		Seriousness of actual or potential threat	
A	Inter-specific competition	Interactions with Canada Geese <i>Branta canadensis</i> on spring arrival, and summer nesting, areas	Unknown/critical
B	Climatic impacts	Change of habitats	Unknown
		Constrained nesting due to high spring snowfall thus reducing productivity	Unknown/critical
		Changes in melt phenology and hence mismatch in timing of food availability through summer	Unknown/high
C	Human disturbance on the breeding grounds	Disturbance at spring arrival areas	Unknown/local
		Disturbance on moulting areas (including by vehicles, aircraft and helicopters)	Unknown/local
D	Human disturbance on the non-breeding grounds	Planes/helicopters	Unknown/local
		Disturbance of roost sites	Unknown/local
		Deliberate and accidental disturbance from farmland feeding sites	Unknown/local
		Habitat loss/modification	Unknown/local
E	Reducing mortality	Illegal shooting	Unknown/medium
		Legal hunting (Wales and England only)	Unknown/high in England & Wales only
		Collision risk with wind-turbines	Local
		Collision risk with power-lines	Local
F	Habitat loss or degradation	Inappropriate management	Local
		Cessation of established goose management schemes which promote co-existence with farmers	Unknown
		Pollution	Unknown/local
		Mining/mineral extraction	Local
		Infrastructure development	Unknown/local
		Land-use change	Unknown/medium

¹ Note that the AEWA Species Action Plan format categorises threat ranks quantitatively. Knowledge of the population dynamics of Greenland White-fronted Geese does not allow the impacts of actual or potential threats to be addressed, hence most are categorised as 'unknown', together with best expert judgement as to their relative importance.

Threat		Seriousness of actual or potential threat	
G	Inadequate monitoring and knowledge management	Poor or inappropriate decision-making	Unknown
		Conflicting policies in different Range States	Unknown
		Inadequate knowledge to inform policy development	Unknown
		Inadequate communication between research, monitoring and provision of advice to inform policy	Unknown
H	Contraction of range	Extinction of smaller flocks at edge of range	Unknown/medium
I	Impacts on condition	Disease	Unknown
		Pollution including poisoning from embedded or ingested lead shot	Unknown



Problem tree diagrammatic representation of the key threats described above.

3. Treaties, legislation and policies relevant for management

The following section briefly reviews the obligations of the Range States (Table 3) arising from the major international conventions and agreements. The population is also the subject of national conservation legislation and policies.

3.1. Global conservation status

The Greenland White-fronted Goose has been categorised as “Endangered” using IUCN’s global Red List criteria [criteria A4abcd, C1] (Boertmann 2007; Eaton *et al.* 2009).

3.2. International conventions and agreements

3.2.1. Convention on the Conservation of Migratory Species of Wild Animals (CMS)

The White-fronted Goose is listed in Appendix II of the Convention on the Conservation of Migratory Species (CMS). This Appendix refers to migratory species that have an unfavourable conservation status or would benefit significantly from international co-operation organised by tailored agreements. The Convention encourages the Range States to conclude global or regional Agreements for the conservation and management of individual species or, more often, of a group of species listed on Appendix II.

3.2.2. The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

AEWA is a regional agreement under the Bonn Convention. Governments adopting the Agreement formally recognise “*the need to take immediate action to stop the decline of migratory waterbird species*” and commit to undertake a range of actions to this end both nationally, as well as collaboratively with other countries. These actions include research and monitoring, and the development of single species action plans for highest conservation status species.

The Greenland White-fronted Goose is listed in Annex II of this Agreement, as well as listed in Category 2* of Column A of AEWA’s Action Plan (as revised at MoP4 in 2008). Parties that are Range States of a migratory waterbird species listed in Column A shall endeavour:

- a) to conserve and, where feasible and appropriate, restore those habitats of the species which are of importance in removing the species from danger of extinction;
- b) to prevent, remove, compensate for, or minimize, as appropriate, the adverse effects of activities or obstacles that seriously impede or prevent the migration of the species; and
- c) to the extent feasible and appropriate, to prevent, reduce or control factors that are endangering or are likely to further endanger the species, including strictly controlling the introduction of, or controlling or eliminating, already introduced exotic species.

The asterisk against the Category 2 status refers to a provision in the AEWA Action Plan which states:

- “By way of exception for those populations listed in Categories 2 and 3 in Column A only and which are marked by an asterisk, hunting may continue on a sustainable use basis where hunting of such populations is a long-established cultural practice. This sustainable use shall be conducted within the framework of special provisions of a species action plan at the appropriate international level.”

However this issue was discussed at the 2009 international workshop on Islay and the conclusion (Annex 6) was that:

- “With low annual productivity it is critically important to reduce sources of mortality. This will conserve the very small numbers of successful breeders that produce subsequent generations and help restore the population to former levels. To this end, the workshop concluded that

hunting cannot currently be undertaken on a sustainable basis and any kill would exacerbate the current unfavourable conservation status of the population.

Should the status of the population change to the extent that a sustainable harvest would be appropriate at some future time, then the Workshop participants agreed that this conclusion would need to be revisited.

Notwithstanding the fact that Iceland and Greenland have yet to ratify the Agreement, AEWA gives the UK and Irish governments a mechanism to take forward necessary conservation actions with Iceland and Greenland so as to restore Greenland White-fronted Geese to favourable conservation status. Indeed, the UK government's Implementation Plan for AEWA (DEFRA 2002a) "*aim[ed] to conclude agreement on the Greenland White-fronted Goose international plan in 2002/3*". Further, Scottish Ministers have recently stated that "*Given the migratory nature of most of the goose populations found in Scotland, it is inevitable that some of the potential future threats to viability will arise in areas outwith the limits of our own national policy framework. Close international collaboration and partnership will be essential if migratory goose populations are to be managed effectively across the entirety of their range*" (Finnie & Brankin 2005).

3.2.3. Ramsar Convention on Wetlands

The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an inter-governmental treaty that provides the framework for the conservation and wise use of wetlands and their resources through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world. It recognises the fundamental ecological functions of wetlands as regulators of water regimes and as habitats supporting a characteristic flora and fauna.

The Convention requires that each Contracting Party designate at least one suitable wetland within its territory for inclusion in a List of Wetlands of International Importance maintained by the Ramsar bureau. Wetlands should be selected for the List on account of their international significance in terms of ecology, botany, zoology, limnology or hydrology, particularly as habitat for waterfowl.

The Convention establishes guidelines for the formulation and implementation of national wetland management and conservation policies, including establishing inventories of wetlands, determining priorities for each site, requiring impact studies for all projects that may affect wetlands, regulating the use of wild flora and fauna to avoid over-exploitation, and drafting legislation that encourages wetland conservation, taking into account international responsibilities for the conservation, management and wise use of migratory stocks of waterbirds.

The UK's implementation of the Ramsar Convention's Strategic Plan (DEFRA 2002b) stated that the UK would "*Finalise [a] MoU with Iceland, Greenland and Ireland concerning the common conservation management of Greenland White-fronted Geese by 2004, stressing particularly the role of Ramsar sites in the long-term conservation of this population.*"

3.2.4. EU Directive on the conservation of wild birds

The European Union's Directive on the conservation of wild birds (EC/2009/147) provides an overarching framework for the conservation of Greenland White-fronts on their wintering grounds (Lang 1982). Further detail and implications are summarised in Annex 7.

EU funding through a number of programmes linked to the Birds and Habitats Directives has been important in the acquisition of several Irish sites severely threatened by drainage and peat extraction. In some case management agreements were developed with landowners in order to maintain and improve the habitat for the geese (European Commission 1994). ACE Biotope Project 803 cost approximately €1m and was 50% funded by the Commission. The sites included Sheskinmore, Ballykenney/Fisherstown Bog, Garriskill Bog, All Saints Bog, Middle Shannon Callows and the Wexford Slobs or parts thereof.

Recognising the scale of afforestation, drainage and peat extraction occurring on peatland habitats of known importance to Annex I listed bird species including Greenland White-fronted Goose the

Commission funded 50% of the overall cost of another project (no. 804) which in total amounted to €1m. This project selected and acquired parts of Carrobehly Bog and Ballinagare Bog to ensure their long term conservation (European Commission 1994).

The legacy of the EU ACE programme is one of considerable importance to Greenland White-fronts in Ireland as it enabled Irish conservation bodies to secure the long term protection of both peat and grassland habitats in order that they would be available to the geese. Over 60% of the Irish population directly benefitted through the acquisition of land and ongoing management agreements on the Wexford Slob (European Commission 1994).

The population is listed as one of a small number of species considered as priorities for funding under the EU's LIFE Nature programme, in particular with respect to the development of international plans to help "*focus on the most urgent and important actions for the different species.*"

Sites classified as SPAs for the conservation of Greenland White-fronts or as SACs to protect habitats of European Community interest (*e.g.* peatlands) (Annex 4b) need to be managed to preserve or restore their natural value, and to sustain the species (or habitats) for which they have been legally classified. Accordingly, conservation objectives need to be established for each of these sites, and relevant conservation measures implemented accordingly, through a management planning process.

3.2.5. EU Directive on the conservation of natural habitats and wild fauna and flora

The Habitats and Species Directive requires the classification of Special Areas of Conservation (SACs) for listed habitats and (non-avian) species. At some of their wintering sites, Greenland Whitefronts occur on some habitats classified as SACs – notably a number of raised or blanket bogs as well as some other coastal habitats such as in Wexford Harbour.

As birds are not included amongst the species for which SACs can be classified, it is not possible to manage such sites specifically for geese, but nonetheless these sites provide a basic level of protection against land-use which is of benefit to the geese. Further detail concerning the Habitats Directive are summarised in Annex 7.

Table 4. Membership by Range States of relevant multi-lateral environmental Agreements

Range State	Convention on the Conservation of Biological Diversity	Convention on the Conservation of Migratory Species	Agreement on the Conservation of African-Eurasian Migratory Waterbirds	Ramsar Convention on wetlands	European Union's Directive on the conservation of wild birds	European Union's Directive on the conservation of natural habitats and wild fauna and flora
Greenland (Denmark)	✓	✓		✓		
Iceland	✓			✓		
United Kingdom	✓	✓	✓	✓	✓	✓
Ireland	✓	✓	✓	✓	✓	✓

3.3. Past international action planning and co-operation

There has been a high level of informal international co-operation between interested parties in the four Range States since the early 1980s (as expressed by the Acknowledgments section of this plan). A twice annual international Greenland White-fronted Goose Census was initiated in 1982/83 and continues to the present (Fox *et al.* 1994). In Britain this has been co-ordinated by the Greenland White-fronted Goose Study

(GWGS) (with financial support variously from NCC, JNCC and WWT), whilst in the island of Ireland it has been co-ordinated by the National Parks and Wildlife Service (NPWS).

More recently there has been co-operative research in both Iceland and Greenland involving participants from all of the Range States, Denmark, Canada and USA. This high level of co-operation has been fundamental to developing the understanding of conservation needs presented in this Action Plan.

A meeting of Range States was convened by Greenland during the 4th Conference of Parties of the Ramsar Convention in 1990 to discuss the international conservation of Greenland White-fronted Geese in the light of the then decision by the UK government to permit damaging development to the most important UK roost site, the peatland Eilean na Muice Duibhe (Duich Moss) on Islay (GWGS 1986). Following EU intervention, this development was subsequently halted and the site given international protection (Annex 4b). This interest led to an initiative to develop international co-operation for the conservation of the population.

In 1992, the government of Ireland and the International Waterfowl and Wetlands Research Bureau (now Wetlands International) convened an international workshop to discuss an action plan for the Greenland White-fronted Goose (Stroud 1992). That meeting agreed that the then current population level of 30,000 should represent an absolute minimum population size. Although the draft action plan which was discussed in detail was subsequently not formally agreed by governments, the Range States' representatives agreed a statement of policies relevant to the shared conservation management of the population. This 'Wexford Declaration' is given in Annex 5. There remains confusion as to the status of the 1992 plan however; for example, the Birds Directive web-page on threatened species action planning indicating that an international action plan exists for Greenland White-fronted Geese.

An international technical workshop related to research and monitoring of migratory geese in Iceland was held there in September 2001. Participants at that meeting concluded (Frederiksen 2001) that:

- "Co-ordination and co-operation between Iceland and the UK on the conservation management of shared migratory goose populations should continue to be furthered, both at governmental levels as well as at a technical level. ... The possible development of a flyway plan to consider conservation management of waterbird populations breeding and wintering within the Canada/Greenland/Iceland/UK/Ireland flyway was noted. There was support for investigation as to how international co-operation within this flyway can be taken forward. Such co-operation could and should occur both at governmental and at technical levels. The African-Eurasian Waterbird Agreement may help to assist such co-ordination."

An informal meeting of experts was organised in April 2004 at the time of the *Waterbirds Around the World* global flyways conference in Edinburgh, Scotland (Francis 2004). This was attended by 19 participants from seven countries and two international organisations (AEWA and CMS) and representing a wide range of relevant governmental and non-governmental organisations. The meeting reviewed the deteriorating status of the population, and explored possible policy and management options. The main conclusions were summarised by Francis (2004).

In 2007, in the light of continuing decline, Scottish Natural Heritage added the population to its list of priority species for conservation action under its Species Action Framework (SNH 2007). This provided resources to draft an initial international plan and to arrange an international workshop to discuss it. The workshop was held on the island of Islay, Scotland in February 2009¹. The workshop conclusions (Annex 6) have been incorporated into this plan.

¹ All the presentations made to the Islay workshop which present considerable further detail not possible to include in this Plan are available at <http://gwfg-conservation.wikispaces.com/Islay+international+workshop>.

3.4. National institutions, laws and policies affecting Greenland White-fronted Goose conservation

A summary of the institutional, legislative and policy framework that relates to the conservation of birds and their habitats in the Range States is beyond the scope of this action plan. Summaries of the conservation and protection status of the Greenland White-fronted Goose in the Range States is provided in Annex 2, and conservation initiatives in Annex 3, and are discussed below.

The Greenland White-fronted Goose is protected by legislation throughout the Range States (other than in the UK - specifically in England and Wales) and it is illegal to kill them whether deliberately or otherwise. In Iceland, they have been protected since September 2006, whilst in Greenland, they have been totally protected since March 2009 ([*Hjemmestyrets bekendtgørelse nr. 8 af 2. marts 2009 om beskyttelse og fangst af fugle*](#)).

The most recent review of the goose management policy in Scotland (Crabtree *et al.* 2010), highlighted the importance of management policies for Greenland White-fronted Geese. The Scottish Government's response (Scottish Government 2011) specifically referred to the challenges associated with Greenland White-fronts and indicated expectation that there would be the "*introduction of SNH management agreements introduced for small, dispersed populations of the most vulnerable populations*", as well as "*continued efforts to develop flyway plans and international collaboration to protect threatened species*".

In all Range States, the attitude of the public and conservation authorities toward Greenland White-fronted Geese is generally positive, although conflicts with agricultural activities have occurred on the wintering grounds. The establishment of goose management schemes¹ at the main Scottish sites (Islay, Coll & Tiree, and on Kintyre) have helped to reduce tensions with farmers in these areas.

At the main Scottish wintering haunt of Islay, Greenland White-fronted and Barnacle Geese *Branta leucopsis* attract many thousands of bird watchers each winter, contributing significantly to the economy of the island.

¹ <http://www.snh.org.uk/about/ab-pa09e.asp>

4. Framework for action

In the long-term, the goal of this plan is to restore the favourable conservation status¹ of Greenland White-fronted Geese throughout their international range, as demonstrated by their assessment as Least Concern status against IUCN Red List criteria by 2022.

In the short term, the aim is to identify the causes of current low productivity, the issue which is leading to a rapid decline of the population, and then put in place measures to address these factors so as to (i) halt the decline (to the extent feasible) and (ii) restore the population to late 1990 levels by 2015.

Actions need to be taken with respect to four main issues:

- a. The top priority action is to investigate the factors acting on geese on the breeding grounds that are responsible for currently reducing the annual production of young.

Even knowing the causes of low productivity however, it is unlikely that reproductive success can be enhanced in the short-term. Accordingly it is essential that measures are also taken to:

- b. ensure that geese arrive in Greenland in optimal condition for successful breeding;
- c. minimise additional sources of mortality;
- d. minimise impacts on geese at local scales (such as disturbance or changes in habitat) particularly with regard to smaller flocks, or those with restricted distribution, so as to avoid further flock extinctions and thus further contractions of range; and
- e. maintain and further develop monitoring and research programmes so as to provide necessary data and information concerning the current conservation status of the population.

More specifically, the threats identified above² need to be addressed by actions taken under nine main objectives to the benefit of Greenland White-fronted Geese, their habitats and the human populations with which the geese come into contact. *The sequence of these objectives below (or actions within objectives) does not imply relative priorities, which are given in Table 5 below.*

1. Investigate the factors acting on geese on the breeding grounds responsible for currently reducing the annual production of young:

- 1.1. Investigate and assess factors impacting on productivity, through an international research programme, investigating a) potential competitive interactions with the increasing population of Canada Geese in west Greenland; and b) the consequences of greater spring snow-fall in recent years; and assess feasibility of intervention strategies in the light of this research. [A]
- 1.2. Continue periodically to monitor the distribution and relative abundance of goose species in west Greenland to input to population modelling, as well as giving context to already designated sites, and identifying other sites of nature conservation importance. [A & G]

2. Ensure that geese arrive in Greenland in optimal condition for successful breeding:

- 2.1. Limit and try to avoid disturbance in the prelude to migration at spring staging areas so as to optimise the condition of potentially breeding geese. [C & D]
- 2.2. Identify and protect critical sites used in the staging and pre-breeding period. [C, B & D]
- 2.3. Manage sites used in the pre-breeding period to optimise the quality and quantity of food for potentially breeding geese. [C & D]

¹ As defined by Article 1 of the Convention on Migratory Species

² Specific threats identified in Table 3 are cross-referenced here in square brackets, e.g. [A] = indicates an action that addresses the issue of inter-specific competition.

- 3. Take all possible steps to minimise mortality, thus protecting the critical stock of actual or potential successful breeders:**
 - 3.1. Introduce and/or maintain protection from hunting throughout the year¹ (and critically during the crucial spring migration and pre-breeding period) whilst the population has its currently unfavourable conservation status. [C & E]
 - 3.2. Work through relevant hunter's organisations to promote knowledge of relevant hunting regulations. [E]
 - 3.3. Quantify the scale of illegal hunting by undertaking X-ray studies of captured birds as opportunities allow. [E & I]
 - 3.4. Enforce legislation on hunting *e.g.* especially action against illegal shooting in spring and autumn. [C & E]
 - 3.5. Ensure that any wind-farm and similar infrastructure developments where there is collision risk are subject to EIAs. [E]
- 4. Minimise impacts on geese at local scales (such as disturbance or changes in habitat) particularly smaller flocks, or those with restricted distribution, so as to avoid further flock extinctions, to avoid further contraction of range:**
 - 4.1. Seek agreements with land managers at key sites as well as within the locale of smaller flocks important to maintaining range, for example using agri-environment measures so as to secure and optimise the quality of agricultural feeding areas. [D, F & H]
- 5. Maintain and further develop monitoring and research programmes so as to provide necessary data and information concerning the current conservation status of the population:**
 - 5.1. Support the maintenance of an international population model with accurate estimation of mortality and productivity rates to underpin scientifically-based management decisions. [G]
 - 5.2. Monitor survival rates and productivity by supporting continued ringing, ring reporting, studies of individually marked birds and maintenance of necessary databases. [G]
 - 5.2.1. Maintain the long-term programme of marking, resighting and counting geese at the main Irish wintering site of Wexford.
 - 5.2.2. Develop a complementary programme of marking in Scotland, at locations which allow for sustained resighting effort.
 - 5.2.3. Strongly encourage the collection of more extensive assessments of productivity at sites throughout the range.
 - 5.3. Maintain the twice-annual international census (including productivity estimation) at all known wintering resorts; improve coverage where this is deficient; seek to involve Iceland and Norway; and report results to other Range States. [G]
 - 5.3.1. Enhance monitoring of Irish wintering flocks away from Wexford so as to better determine trends in population size and productivity for these sites.
 - 5.3.2. Review the effectiveness of the winter monitoring programme.
 - 5.4. Undertake extensive surveys of staging and breeding areas to identify further sites of nature conservation importance and secure their adequate protection. [G]
 - 5.5. Maintain and further develop national inventories of sites regularly used, especially those of national and international importance, and particularly on the staging and breeding areas in Iceland and Greenland, as a basis for protection and appropriate management. [G]

¹ The 2009 Islay Workshop (Annex 6) concluded that hunting cannot currently be undertaken on a sustainable basis and any kill would exacerbate the current unfavourable conservation status of the population.

5.6. Undertake research to assess levels of disease and impacts of pollutants (especially levels and consequences of embedded and/or ingested lead shot) and resultant impacts on condition. [I]

6. Ensure that important areas for Greenland White-fronted Geese are appropriately protected and managed:

6.1. Designate all wetlands of international importance for Greenland White-fronted Geese under the Ramsar Convention and/or the EU Birds Directive as appropriate, promoting especially the conservation of sites necessary to maintain range and encouraging the restoration of habitat at sites which were previously of similar importance. [F]

6.2. At designated sites of importance: [F]

6.2.1. Inform central and local government of the importance and location of protected sites;

6.2.2. Enhance knowledge of sites and requirements among user-groups (*e.g.* hunters, farmers); and

6.2.3. Use sites wisely *sensu* Ramsar Convention, through the preparation and implementation of management plans.

6.3. Ensure that policies for development (*e.g.* tourism) avoid areas where, or periods when, Greenland White-fronted Geese are sensitive to disturbance. [G]

7. Ensure that any interactions with people are sustainable giving special emphasis to the avoidance of agricultural conflicts:

7.1. Establish adequate disturbance-free refuge zones or time periods in areas of international importance. [D]

7.2. Ensure that strategies to scare birds from sensitive farmland always include provision of disturbance-free refuges. [D]

7.3. Produce and disseminate advisory materials on the assessment and alleviation of crop damage for those people directly concerned. [D]

7.4. Work with local farming communities to maintain or establish local management strategies for the alleviation of crop-damage problems in areas with specific difficulties sharing good practice and experience as appropriate. [D & F]

8. Encourage support for policies and measures for Greenland White-fronted Goose conservation amongst all whose activities impinge on, or who otherwise share landscapes with the geese:

8.1. Inform the general public, and in particular farmers and hunters as relevant, of the objectives and provisions of this plan in order to ensure that it has broad support. [E]

8.2. Publish and disseminate knowledge of important sites and their management requirements within local and central government, conservation and agricultural agencies, and other relevant land-use advisory bodies. [G]

8.3. Consider needs of Greenland White-fronted Geese when developing conservation and other land-use (*e.g.* agri-environment) policies away from protected areas. [F]

8.4. Encourage and promote educational and public awareness programmes amongst communities (and especially in schools living in areas holding important concentrations of geese). [F & G]

9. Ensure full international co-operation between Range States in joint programmes of monitoring, conservation and liaison:

9.1. Support the implementation, development and future review of this international plan. [G]

9.2. Share knowledge relevant to the objectives of this plan between Range States. [G]

- 9.3. Encourage both formal (*e.g.* governmental) and informal (*e.g.* via schools) twinning initiatives between internationally important sites or other areas with concentrations of geese. [G]
- 9.4. Co-operate in collaborative international research including population monitoring. [G]
- 9.5. Train staff at key sites, and co-operate with international exchanges of staff and relevant training material so as to promote best practice in site and species management techniques. [G]
- 9.6. Participate in emergency review meetings should alert thresholds be reached. [G]

A summary of more specific activities by country is given in Table 5.

4.1. Alert thresholds

A meeting of Range State representatives and other interested parties shall be convened in the event of one or more of the following conditions being met in order to consider responses to the continued deterioration of population status:

- if overall population size falls below 20,000 individuals;
- if overall population size otherwise falls by more than 25% in a period of three consecutive years;
- if annual productivity falls below 7%¹ for three consecutive breeding seasons at Wexford and/or Islay; or
- other unexpected events occur which are likely to significantly affect the population.

¹ This is defined as half the average productivity of *c.* 14% at these sites since the 1970s.

Table 5. Priorities and time-scales for actions to be taken by the Range States and others.

Key to priority ratings¹:

Critical: a Result that is needed to prevent a large decline in the population, which could lead to extinction. These are shaded in grey for emphasis.

High: a Result that is needed to prevent a decline of more than 20% of the population in 20 years or less.

Medium: a Result that is needed to prevent a decline of less than 20% of the population in 20 years or less.

Low: a Result that is needed to prevent local population declines or which is likely to have only a small impact on the population across the range.

Other: a Result that is not possible to categorise with the above priority ratings

Key to time scale criteria:

Continuous: an ongoing or annual action

Short-term: completed within the next 1-3 years

Medium-term: completed within the next 1-5 years

Long-term: completed within the next 1-10 years

Objective 1: Investigate the factors acting on geese on the breeding grounds responsible for currently reducing the annual production of young

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
Understanding of the current drivers of population decline	1.1. Investigate and assess factors impacting on productivity, through an international research programme, investigating a) potential competitive interactions with the increasing population of Canada Geese in west Greenland; and b) the consequences of greater spring snow-fall in recent years; and assess feasibility of intervention strategies in the light of this research. Applicable to: GR with other Range States	Critical	Short-term	GWGS, NERI, WWT and others
	1.2. Continue periodically to monitor the distribution and relative abundance of goose species in west Greenland to input to population modelling, as well as giving context to already designated sites, and identifying other sites of nature conservation importance. Applicable to: GR with other Range States	Other	Medium-term (aerial survey at least once every five years)	GWGS, NERI and other relevant organisations in North America

¹ Note that the AEWA Species Action Plan format categorises priority ratings quantitatively. Knowledge of the population dynamics of Greenland White-fronted Geese does not allow such attribution. Priorities given here are best expert judgements as to the relative importance of each action.

Objective 2: Ensure that geese arrive in Greenland in optimal condition for successful breeding

Result	Action	Priority	Time scale	Organisations responsible
Annual productivity maximised	2.1. Limit and try to avoid disturbance in the prelude to migration at spring staging areas so as to optimise the condition of potentially breeding geese. Applicable to: UK, IE, IS, GR	Critical	Short-term	Government conservation agencies
	2.2. Identify and protect critical sites used in the staging and pre-breeding period. Applicable to: IS, GR	Critical	Short-term	Government conservation agencies
	2.3. Manage sites used in the pre-breeding period to optimise the quality and quantity of food for potentially breeding geese. Applicable to: IS, GR	Critical	Short-term	Government conservation agencies

Objective 3: Take all possible steps to minimise mortality, thus protecting the critical stock of actual or potential successful breeders

Result	Action	Priority	Time scale	Organisations responsible
Mortality minimised	3.1. Introduce and/or maintain protection from hunting throughout the year (and critically during the crucial spring migration and pre-breeding period) whilst the population has its currently unfavourable conservation status. Applicable to: All Range States	Critical	Short-term	Government ministries and conservation agencies (especially DEFRA & NAW in England and Wales respectively)
	3.2. Work through relevant hunter's organisations to promote knowledge of relevant hunting regulations. Applicable to: All Range States	Critical	Medium	Relevant hunting organisations
	3.3. Quantify the scale of illegal hunting by undertaking X-ray studies of captured birds as opportunities allow. Applicable to: All Range States	Medium	Continuous	Government conservation agencies, ringing groups and NGOs as appropriate (GWGS, WWT)

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
	3.4. Enforce legislation on hunting <i>e.g.</i> especially action against illegal spring shooting. Applicable to: All Range States	Critical	Short-term	Government ministries, conservation agencies and police
	3.5. Ensure that any wind-farm and similar infrastructure developments where there is collision risk are subject to EIAs. Applicable to: All Range States	High	Short-term	Government conservation agencies

Objective 4: Minimise impacts on geese at local scales (such as disturbance or changes in habitat) particularly smaller flocks, or those with restricted distribution, so as to avoid further flock extinctions, to avoid further contraction of range

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
Extent of range maintained	4.1. Seek agreements with land managers at key sites as well as within the locale of smaller flocks important to maintaining range, for example using agri-environment measures so as to secure and optimise the quality of agricultural feeding areas. Applicable to: UK, IE, IS	Other	Medium-term	Government ministries and conservation agencies including SNH, CCW and NPWS

Objective 5: Maintain and further develop monitoring and research programmes so as to provide necessary data and information concerning the current conservation status of the population

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
Necessary data for conservation management of population and	5.1. Support the maintenance of an international population model with accurate estimation of mortality and productivity rates to underpin scientifically based management decisions Applicable to: All Range States	Critical	Continuous	GWGS, NERI, NPWS, SNH and others

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
key sites collected annually	<p>5.2. Monitor survival rates and productivity by supporting continued ringing, ring reporting, studies of individually marked birds and maintenance of necessary databases.</p> <ul style="list-style-type: none"> • Maintain the long-term programme of marking, resighting and counting geese at the main Irish wintering site of Wexford. • Develop a complementary programme of marking in Scotland, at locations which allow for sustained resighting effort. • Strongly encourage the collection of more extensive assessments of productivity at sites throughout the range. <p>Applicable to: All Range States</p>	Critical	Continuous	GWGS, NPWS, NERI, WWT and others
	<p>5.3. Maintain the twice-annual international census (including productivity estimation) at all known wintering resorts; improve coverage where this is deficient; seek to involve Iceland and Norway, and report results to other Range States.</p> <ul style="list-style-type: none"> • Enhance monitoring of Irish wintering flocks away from Wexford so as to better determine trends in population size and productivity for these sites. • Review the effectiveness of the winter monitoring programme. <p>Applicable to: UK, IE, IS & NO</p>	Critical	Continuous	NPWS and GWGS with support from WWT/JNCC Goose and Swan Monitoring Programme
	<p>5.4. Undertake extensive surveys of staging and breeding areas to identify further sites of nature conservation importance and secure their adequate protection.</p> <p>Applicable to: IS & GR</p>	Critical	Short-term	Government conservation agencies

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
	<p>5.5. Maintain and further develop national inventories of sites regularly used, especially those of national and international importance, and particularly on the staging and breeding areas in Iceland and Greenland, as a basis for protection and appropriate management.</p> <p>Applicable to: All Range States</p>	Other	Medium-term	JNCC, NPWS, IINH, GS with GWGS
	<p>5.6. Undertake research to assess levels of disease and impacts of pollutants (especially levels and consequences of embedded and/or ingested lead shot) and resultant impacts on condition.</p> <p>Applicable to: All Range States</p>	Other	Medium	NPWS, GWGS, WWT

Objective 6: Ensure that important areas for Greenland White-fronted Geese are appropriately protected and managed

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
Favourable conservation status of important sites established and maintained	<p>6.1. Designate all wetlands of international importance for Greenland White-fronted Geese under the Ramsar Convention and/or the EU Birds Directive as appropriate, promoting especially the conservation of sites necessary to maintain range and encouraging the restoration of habitat at sites which were previously of similar importance.</p> <p>Applicable to: All Range States</p>	Medium	Medium-term	Governments of Greenland, Iceland, Ireland and UK

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
	6.2. At designated sites of importance (including Ramsar sites, SPAs and SACs): <ul style="list-style-type: none"> • Inform central and local government of the importance and location of protected sites; • Enhance knowledge of sites and requirements among user-groups (<i>e.g.</i> hunters, farmers); and • Use sites wisely <i>sensu</i> Ramsar Convention, and fulfil legal obligations under the Birds and Habitats Directives (Annex 7), through the preparation and implementation of management plans for each site. Applicable to: All Range States	Medium	Medium-term	Government conservation agencies including SNH and CCW
	6.3. Ensure that policies for development (<i>e.g.</i> tourism) avoid areas where, or periods when, Greenland White-fronted Geese are sensitive to disturbance. Applicable to: GR	High	Medium-term	Government of Greenland

Objective 7: Ensure that any interactions with people are sustainable giving special emphasis to the avoidance of agricultural conflicts

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
Avoidance of conflicts with land managers	7.1. Establish adequate disturbance-free refuge zones or time periods in areas of international importance. Applicable to: All Range States as appropriate	High	Short-term	Government conservation agencies including SNH, CCW and NPWS
	7.2. Ensure that strategies to scare birds from sensitive farmland always include provision of disturbance-free refuges. Applicable to: UK, IE, IS	High	Short-term	Government conservation agencies including SNH, CCW and NPWS

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
	<p>7.3. Produce and disseminate advisory materials on the assessment and alleviation of crop damage for those people directly concerned.</p> <p>Applicable to: UK, IE, IS</p>	Medium	Medium-term	Government conservation agencies and NGOs
	<p>7.4. Work with local farming communities to maintain or establish local management strategies for the alleviation of crop-damage problems in areas with specific difficulties sharing good practice and experience as appropriate.</p> <p>Applicable to: UK, IE, IS</p>	Other	Medium-term	Government conservation agencies including SNH and NPWS

Objective 8: Encourage support for policies and measures for Greenland White-fronted Goose conservation amongst all whose activities impinge on, or who otherwise share landscapes with the geese

Result	Action	Priority	Time scale	Organisations responsible
Promotion of goose conservation by local communities	8.1. Inform the general public, and in particular farmers and hunters as relevant, of the objectives and provisions of this plan in order to ensure that it has broad support. Applicable to: All Range States	Other	Short-term	Government conservation agencies and NGOs
	8.2. Publish and disseminate knowledge of important sites and their management requirements within local and central government, conservation and agricultural agencies, and other relevant land-use advisory bodies. Applicable to: All Range States	Other	Short-term	Government conservation agencies and NGOs
	8.3. Consider needs of Greenland White-fronted Geese when developing conservation and other land-use (<i>e.g.</i> agri-environment) policies away from protected areas. Applicable to: All Range States	Other	Continuous	Relevant government ministries and departments
	8.4. Encourage and promote educational and public awareness programmes amongst communities (and especially in schools living in areas holding important concentrations of geese). Applicable to: All Range States	Other	Continuous	Government conservation agencies and NGOs

Objective 9: Ensure full international co-operation between Range States in joint programmes of monitoring, conservation and liaison

Result	Action	Priority	Time scale	Organisations responsible
Effective international co-operation	9.1. Support the implementation, development and future review of this international plan. Applicable to: All Range States	Other	Short-term	Government conservation agencies and NGOs

<i>Result</i>	<i>Action</i>	<i>Priority</i>	<i>Time scale</i>	<i>Organisations responsible</i>
and liaison for the benefit of the population	9.2. Share knowledge relevant to the objectives of this plan between Range States. Applicable to: All Range States	Other	Short-term	Government conservation agencies and NGOs
	9.3. Encourage both formal (<i>e.g.</i> governmental) and informal (<i>e.g.</i> via schools) twinning initiatives between internationally important sites or other areas with concentrations of geese. Applicable to: All Range States	Other	Long-term	Government conservation agencies and NGOs
	9.4. Co-operate in collaborative international research including population monitoring. Applicable to: All Range States	Critical	Short-term	Government conservation agencies, NGOs and research institutions
	9.5. Train staff at key sites, and co-operate with international exchanges of staff and relevant training material so as to promote best practice in site and species management techniques. Applicable to: All Range States	Other	Long-term	Government conservation agencies and NGOs including SNH, CCW and NPWS
	9.6. Participate in emergency review meetings should 'alert' thresholds be reached. Applicable to: All Range States	As necessary	As necessary	Government conservation agencies and NGOs

5. Bibliography

The following list gives sources referred to in this action plan. A full, key-worded bibliography of literature is available at <http://gwfg-conservation.wikispaces.com/Links+and+resources> including much historical material and references to limited circulation and unpublished reports.

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Annex 1. Population estimates for Greenland White-fronted Geese

Spring*	Wales	England	Islay	Rest of Scotland	GB combined subtotal	Wexford	Rest of Ireland	Global total	Count type	Source of assessment
1950s	550-650	100	2,500-3,000	2,250-2,870	5,400-6,620	4,000-6,000	6,500-8,500	17,500-23,000	Estimate based on international inventory of all known flocks (GE)	Ruttledge & Ogilvie (1979)
Late 1970s	45	0	3,700	2,800-3,600	6,545-7,345	5,000-6,000	2,800-3,300	14,300 – 16,600	Estimate based on international inventory of all known flocks (GE)	Ruttledge & Ogilvie (1979)
1983	73	0	3,441	3,768	7,282	6,363	2,896	16,541	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994); Stroud (1984)
1984	78	4	4,198	3,646	7,926	6,267	3,344	17,537	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1985	88	13	4,715	4,181	8,997	7,590	3,361	19,948	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1986	98	0	5,669	4,255	10,022	7,940	3,928	21,890	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1987	95	0	6,486	4,814	11,395	7,780	4,106	23,281	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1988	127	1	7,314	4,095	11,537	8,781	4,249	24,567	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1989	124	0	6,816	4,933	11,873	9,799	4,315	25,987	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1990	133	1	7,209	5,623	12,966	9,331	3,793	26,090	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1991	150	0	8,857	6,181	15,188	9,598	4,610	29,396	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1992	143	0	9,196	6,678	16,017	9,452	4,485	29,954	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1993	124	14	10,836	4,247	15,221	8,091	4,030	27,342	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1994	144	2	9,495	5,375	15,016	10,356	4,211	29,583	International census of all known flocks in spring (GO)	Fox <i>et al.</i> (1994)
1995	155	0	9,652	6,828	16,635	9,347	4,477	30,459	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
1996	178	12	11,784	7,935	19,909	10,195	4,400	34,504	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
1997	125	1	11,210	8,231	19,567	8,751	4,788	33,106	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
1998	109	0	12,224	7,287	19,620	8,306	4,899	32,825	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
1999	119	1	13,560	8,437	22,117	8,958	4,617	35,692	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
2000*	109	0	11,201	7,707	19,017	8,330	4,857	32,204	Modelled estimate based on partial	GWGS & NPWS; Fox <i>et al.</i>

Spring*	Wales	England	Islay	Rest of Scotland	GB combined subtotal	Wexford	Rest of Ireland	Global total	Count type	Source of assessment
									census in spring; 15% of Irish total was estimated (GE); see below	(2006a,b)
2001**								30,500	Foot & Mouth Disease access constraints; modelled estimate - see below (GE)	GWGS & NPWS; Fox <i>et al.</i> (2006a,b)
2002	93	10	9,161	6,899	16,163	7,133	3,158	26,454	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2006a)
2003*	126	9	10,677	7,460	18,272	7,915	3,286	29,473	Modelled estimate based on partial census in spring; 11% of Irish total was estimated (GE); see below	GWGS & NPWS; Fox <i>et al.</i> (2006a)
2004*	112	8	9,653	6,614	16,387	8,424	3,885	28,696	Modelled estimate based on partial census in spring; 14% of Irish total was estimated (GE); see below	GWGS & NPWS; Fox <i>et al.</i> (2006a)
2005*	92	7	7,152	6,779	14,030	7,707	2,105	23,842	Modelled estimate based on partial census in spring; 9% of Irish total was estimated (GE); see below	GWGS & NPWS; Fox <i>et al.</i> (2006a)
2006	84	7	7,111	7,085	14,287	7,892	2,716	24,895	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2008)
2007*	78	6	6,025	6,427	12,536	9,713	2,919	25,168	Modelled estimate based on partial census in spring; 12% of Irish total was estimated (GE); see below	GWGS & NPWS; Fox <i>et al.</i> (2008)
2008	77	13	7,086	5,937	13,113	7,536	2,559	23,208	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2008)
2009	59	10	6,429	6,008	12,506	8,034	2,623	23,163	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2009)
2010	75	14	5,744	6,097	11,841	8,381	2,622	22,844	International census of all known flocks in spring (GO)	GWGS & NPWS; Fox <i>et al.</i> (2010)

Data Quality:

GO = Good (Observed) based on reliable or representative quantitative data derived from complete counts or comprehensive measurements.

GE = Good (Estimated) based on reliable or representative quantitative data derived from sampling or interpolation.

Count data come from co-ordinated spring (late March/early April) counts undertaken at all known regular wintering localities since spring 1983.

* Missing values for 2003–2005 and 2007 (shown in italics) are estimated (because of uncollated counts from the rest of Ireland) on the basis of a regression model using total British and Wexford counts in other years (which explained 99% of the variance in the relationship between 1983 and 2000).

** Data are missing from 2001 (due to access restrictions during the foot-and-mouth epidemic) and the total count was estimated from a regression model predicting spring numbers from autumn counts (which explained 97% of the variance in the years 1982–2000).

Annex 2. Greenland White-fronted Goose conservation and legislative status in Range States

Country	GWfG status in national legislation	GWfG status in national Red Data Book (or equivalent)
Greenland	Fully protected in Greenland from April 2009 under the terms of Greenland Home Rule Executive Order No. 8 of 2 March 2009.	Listed as Endangered (according to IUCN criteria) in Red List of Greenland flora and fauna (Boertmann 2007).
Iceland	Since September 2006 <i>Anser albifrons flavirostris</i> has been protected. (Legally, through its removal from Regulation 456/1994 on Bird Hunting and Utilization of Wild Birds as a Natural resource by Regulation 516/2006. Both these Regulations were issued under the Law on Conservation, Protection and Hunting of Wild Birds and Wild Mammals, No. 64/1994).	
United Kingdom	<p><i>Anser albifrons</i> fully protected at all times by Wildlife and Countryside Act 1981 (as amended) in Scotland, and by the Wildlife (Northern Ireland) Order 1985 in Northern Ireland.</p> <p><i>Anser albifrons</i> is only protected in close season in England and Wales, and thus <i>A. a. flavirostris</i> is potentially a quarry species in both these countries¹³.</p>	<p><i>Anser albifrons flavirostris</i> is listed on the Red List of species of high conservation concern (as well as listed as Endangered according to IUCN criteria) in the most recent review of Birds of Conservation Concern (Eaton <i>et al.</i> 2009).</p> <p>In Northern Ireland, <i>Anser albifrons flavirostris</i> is listed on the Amber List of Birds of Conservation Concern (BirdWatch Ireland & RSPB Northern Ireland).</p> <p>In 2007, <i>Anser albifrons flavirostris</i> was added to the list of Priority Species of the UK Biodiversity Action Plan.</p>

¹³ However, at their only regular site in Wales (Dyfi Estuary), there is a long-standing voluntary no-shooting policy by local wildfowling clubs.

Country	GWfG status in national legislation	GWfG status in national Red Data Book (or equivalent)
Ireland	<p>Fully protected at all times by the Wildlife Act 1976 (as amended).</p> <p>European Communities (Wild Birds) (Greenland White-fronted Goose, Shoveler and Curlew) Regulations, 1992 (S.I. No. 228 of 1992) restricts the sale, transport for sale, keeping or offering for sale of <i>Anser albifrons flavirostris</i>.</p>	<p><i>Anser albifrons flavirostris</i> is listed on the Amber List of Birds of Conservation Concern (BirdWatch Ireland & RSPB Northern Ireland).</p>

Annex 3. Summary of recent relevant research and conservation by Range State

Country	Relevant research 1997-2011	Relevant conservation initiatives 1997-2011	General attitude of the public toward the GWfG?
Greenland	<ul style="list-style-type: none"> • Aerial surveys of staging and breeding areas in May 1995, May 1997, June 1999, May 2000, June 2005 and August 2007. [NERI & Ducks Unlimited] • Experimental studies of disturbance in Lersletten Ramsar site (1999 & 2000). [NERI & NPWS] • Ringing of geese in Isungua (1997, 2008 & 2009). [GWGS, NERI & NPWS] • Research into Greenland Whitefront – Canada Goose interactions (April-July 2010). [GWGS & WWT] 	<ul style="list-style-type: none"> • Ramsar Advisory Mission to Greenland, June 2009. 	<ul style="list-style-type: none"> • Unknown. Probably little contact with geese occurring in inland breeding areas.
Iceland	<ul style="list-style-type: none"> • Ecological, animal health and other studies (including catching and ringing) undertaken at Hvanneyri, west Iceland during spring staging periods in 1997, 1998, 1999 and 2007 and autumn staging periods in 2001, 2004 and 2005. [GWGS, NPWS, NERI and Landbúnaðarháskóli Íslands]. • Annual checking for marked birds at Hvanneyri and other locations 	<ul style="list-style-type: none"> • Designation of Hvanneyri as a Ramsar Site on 2 February 2011 by Minister for Environment, Svandís Svavarsdóttir. • Complete statutory protection given from September 2006. • Establishment of goose refuge at Hvanneyri on 3 May 2002. • Convened international workshop on management of grey geese at Hvanneyri in 2001 (Frederiksen 2001). [Icelandic Institute of Natural History, Landbúnaðarháskóli Íslands & Icelandic Ministry of the Environment] 	
United Kingdom	<ul style="list-style-type: none"> • Maintenance of annual autumn and spring international census (including long-term demographic monitoring). [co-ordinated by GWGS & including SNH inputs] 	<ul style="list-style-type: none"> • Reviews of national goose management policy for Scotland (Scottish Executive 2005; Crabtree 2010; Scottish Government 2011). [Scottish Government] 	<ul style="list-style-type: none"> • Generally positive. Some local agricultural conflicts at sites with locally high densities

Country	Relevant research 1997-2011	Relevant conservation initiatives 1997-2011	General attitude of the public toward the GWfG?
	<ul style="list-style-type: none"> • Small numbers of GWfG caught and ringed on Islay. [WWT and others] • Four GPS satellite tags deployed at Loch Ken in February 2008 to monitor winter movements and migration. [WWT] • Ringing effort at Loch Ken in 2008, 2009, 2010 and 2011. [WWT] 	<ul style="list-style-type: none"> • Establishment and maintenance of goose management schemes on Islay, Coll & Tiree and Kintyre. [SNH] • Listing of population by SNH Species Action Framework. (SNH 2007) • Classification of national suite of SPAs (Stroud <i>et al.</i> 2001) and Ramsar sites. • Sustained management of seven reserves of importance for GWfG (River Ken-Dee Marshes; Loch Gruinart & The Oa, Islay; Oronsay; Coll; The Loons and Loch of Banks, Orkney; Ynyshir, Wales). [RSPB] 	in Scotland.
Ireland	<ul style="list-style-type: none"> • Maintenance of annual autumn and spring international census (including long-term demographic monitoring). [co-ordinated by NPWS] • Marking of 21 birds with satellite transmitters at the Wexford Slobs to monitor movements during spring migration. [NPWS & NERI] • Sustained annual programme of capture, marking and resighting at the Wexford Slobs. [NPWS] 	<ul style="list-style-type: none"> • Classification of SPAs and Ramsar sites. [NPWS] 	<ul style="list-style-type: none"> • Generally positive. Some local agricultural conflicts at sites with locally high densities.

Annex 4a. Key breeding or staging sites for Greenland White-fronted Geese and their conservation status

Key sites holding >1% of national total assessed as present since 2000.

Country	Site name	Co-ordinates	Staging (ST) or breeding (BR)	Extent (ha)	National designation status (see acronyms p.3)	International designations: Ramsar	BirdLife IBA
GREENLAND							
	Itsako (Svartenhuk)	71°43'N 54°03'W	BR	8,000			✓ GL018
	Ubekendt Ejland	71°08'N 54°43'W	BR				
	Nussuaq	71°14'N 52°11'W	BR				
	Qínnaqata Marraa and Kuussuaq	69°56'N 54°14'W	BR	6,480		✓	✓ GL031
	Aqajarua (Mudderbugten) and Sullorsuaq (Kvandalen), Disko [containing :]	69°39'N 51°58'W	ST, BR	22,350		✓	✓ GL025
	• Aqajarua [28] ¹⁴	69°42'N 52°00'W	ST			✓	✓ GL025
	Kuannersuit Kuussuat, Disko	69°38'N 53°17'W	BR	5,190		✓	
	Naternaq (Lersletten) [proposed extension (Egevang & Boertmann 2001) to Ramsar site would also contain:]	68°24'N 51°46'W	ST, BR	184,010		✓	✓ GL031
	• Avissaariaata [18]	68°18'N 52°30'W	ST	2,248			✓ GL031
	• Pakalalik [19]	68°21'N 52°35'W	ST	1,141			✓ GL031
	Eqalummiut Nunaat and Nassuttuup Nunaa [containing:]	67°28'N 50°49'W	ST, BR	579,530		✓	✓ GL032
	• Qorllortoq [17]	67°45'N 50°05'W	ST	2,661		✓	✓ GL032
	• Qorllortoq [16]	67°37'N 50°55'W	ST	2,187		✓	✓ GL032

¹⁴ Square bracketed numbers/letters indicate standard site coding by Glahder (1999b) and Glahder *et al.* (2002) used to identify Greenlandic staging areas.

Country	Site name	Co-ordinates	Staging (ST) or breeding (BR)	Extent (ha)	National designation status (see acronyms p.3)	International designations: Ramsar	BirdLife IBA
	• Kuuk, Eqalummiut Nunaat [B]	67°31'N 50°34'W	ST	1,711		✓	✓ GL032
	• Siorarssuit [14]	67°22'N 51°30'W	ST	1,448		✓	✓ GL032
	• Qivitoq [15]	67°21'N 51°45'W	ST	513		✓	✓ GL032
	• Guutaap [13]	67°18'N 51°25'W	ST	383		✓	✓ GL032
	• Ilivilik [12]	67°09'N 51°10'W	ST	1,294		✓	✓ GL032
	• Isunngua (54)	67°08'N 50°20'W	ST	9,010		✓	✓ GL032
	Itinneq [A]	66°59'N 52°20'W	ST	3,140			
	Ivnajuagtoq [57]	66°35'N 51°25'W	ST	1,715			

ICELAND

	Hvanneyri, Borgarfjörður	64°34'N 21°46'W	ST, NB		Declared goose protection area in 2002	✓	✓ IS009
	Safamyri	67°47'N 20°35'W	ST, NB	200	SSI		
	Skúmsstadavatn	63°40'N 20°30'W	ST, NB	800	SSI		✓ IS027
	Pollengi-Hrosshagavík	64°10'N 20°25'W	ST, NB	1,400	SSI		✓ IS024
	Oddaflód - Lambhagavatn	63°46'N 20°27'W	ST, NB	1,500	SSI, NR 540 ha)		✓ IS026
	Olfusforir	63°57'N 21°15'W	ST, NB	1,000	SSI		
	Vetleifsholtbugar - Thykkvabæjarvatn	63°46'N 20°34'W	ST, NB	5,600	SSI		✓ IS025
	Ferjubakkafloi-Nordurá	64°36'N 21°40'W	ST, NB	1,500	SSI		✓ IS009

Annex 4b. All regular non-breeding or staging sites for Greenland White-fronted Geese and their conservation status

Important note regarding site safeguard: This listing summarises, for each wintering flock, significant relevant protective conservation designations at these locations. However, at any site, such designations do not necessarily cover all the areas used by geese – or indeed the most important areas. For many flocks, site designation protects roosting areas but does not protect feeding areas. Some flocks also occur within conservation sites, such as EU Special Protection Areas or Special Areas of Conservation that have been selected for other species or habitats – a situation which whilst providing a basic level of protection from gross land-use change (‘existence value’), limits the extent to which directed management will benefit Greenland White-fronted Geese.

Note that where multiple designations are indicated for one wintering site, this does not indicate that boundaries of these sites are necessarily co-incident.

Site name (numbers follow Map 2)	Rutledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
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SCOTLAND

Sullom Voe, Shetland (35)	Not known	Flock extinct							
Orkney, Tankerness/ Holm (36)	42								
Orkney, The Loons/ Isbister (37)	Not known		Loch of Isbister and The Loons, Orkney		105	SSSI		SAC	RSPB reserve
Orkney, Loch of Swannay	Not known	Flock probably extinct?							
Orkney, Stronsay (38)	Not known	Flock extinct							
Caithness, Westfield (39)	Part of 43		Caithness Lochs , [containing:]	58°29'N 03°20'W	1,378.45		✓	SPA: GWfG qualifying species	✓ UK116
	Part of 43		• Broubster Leans		172	SSSI, NCR	✓	SPA: GWfG qualifying species	RSPB reserve

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
								SAC	
	Part of 43		<ul style="list-style-type: none"> Loch Calder 		431	SSSI	✓	SPA: GWfG qualifying species	
Caithness, Loch Heilen/Loch of Mey (40)	Part of 43		Caithness Lochs , [containing:]	58°29'N 03°20'W	1,378.45		✓	SPA: GWfG qualifying species	✓ UK116
	Part of 43		<ul style="list-style-type: none"> Loch Heilen 		104	SSSI	✓	SPA: GWfG qualifying species	
	Part of 43		<ul style="list-style-type: none"> Loch of Mey 		69	SSSI	✓	SPA: GWfG qualifying species	
	Part of 43		<ul style="list-style-type: none"> Loch Watten 		433	SSSI	✓	SPA: GWfG qualifying species SAC	
Caithness, Loch Scarmclate (41)	Part of 43	Flock probably extinct?	Caithness Lochs , [containing:]	58°29'N 03°20'W	1,378.45		✓	SPA: GWfG qualifying species	✓ UK116
	Part of 43		<ul style="list-style-type: none"> Loch Scarmclate 		110	SSSI	✓	SPA: GWfG qualifying species	
Caithness, Loch Winless/Loch Wester (42)	Part of 43	Flock probably extinct?	Caithness Lochs , [containing:]	58°29'N 03°20'W	1,378.45		✓	SPA: GWfG qualifying species	✓ UK116
	Part of 43		<ul style="list-style-type: none"> Loch of Wester 		69	SSSI	✓	SPA: GWfG qualifying species SAC	
	Part of 43		Loch Winless, Caithness		28	SSSI			
	Not known		Caithness and Sutherland Peatlands , [containing:]	58°20'N 03°56'W	145,503		✓	SPA ¹⁵	✓ UK225

¹⁵ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
	Not known		<ul style="list-style-type: none"> Moss of Killimster, Caithness 		187	SSSI	✓	SPA ¹⁶ SAC	
Caithness, Loch Meadie/Loch a'Cherigal (43)	Not known	Flock probably extinct?	Caithness and Sutherland Peatlands , [containing:]	58°20'N 03°56'W	145,503		✓	SPA ¹⁷	✓ UK225
	Not known		<ul style="list-style-type: none"> Shielton Peatlands, Caithness 		5,593	SSSI	✓	SAC	
	Not known		<ul style="list-style-type: none"> Loch More Wetlands, Caithness 			SSSI	✓	SAC	
Loch Eye, Ross & Cromarty (44)	44	Flock extinct	Loch Eye, Ross & Cromarty	57°47'N 03°58'W	205.1	SSSI, NCR	✓	SPA	
Loch of Strathbeg, Aberdeenshire (44a)	Not known	Irregular	Loch of Strathbeg , Aberdeenshire	57°37'N 01°53'W	615.9	SSSI, NCR	✓	✓SPA ¹⁸	✓ UK181 RSPB reserve
Western Isles, Lewis, Loch Urrahag (45)	Not known								
Western Isles, Benbecula, Nunton/ Griminish (46)	Part of 45								
Western Isles, South Uist, Kilpheder/ Askernish/ Loch Hallan (47)	Part of 45		South Uist Machair and Lochs , [containing :]	57°18'N 07°20'W	3,352.3		✓	SPA ¹⁹	✓ UK247

¹⁶ Not classified for Greenland White-fronted Geese

¹⁷ Not classified for Greenland White-fronted Geese

¹⁸ Not classified for Greenland White-fronted Geese

¹⁹ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			<ul style="list-style-type: none"> Loch Hallan, Western Isles 		364	SSSI, NCR		SAC	
Western Isles, South Uist, Loch Bee (Adivachar//Kilaulay) (48)	Part of 45		South Uist Machair and Lochs , [containing :] <ul style="list-style-type: none"> Loch Bee Machair, Western Isles 	57°18'N 07°20'W	3,352.3 797	SSSI, NCR	✓ ✓	SPA ²⁰ SAC	✓ UK247
Western Isles, North Uist (49)	Part of 45	Flock extinct							
Skye, Loch Snizort (50)	Not known								
Skye, Broadford (51)	46								
Lochalsh, Plockton (51a)	Not known	Flock extinct ?							
Gairloch, Loch Sguod & Longa Island (52)	Not known	Flock extinct							
Muck, Highland (53)	47	Flock extinct							
Loch Shiel, Highland (54)	48 48		Loch Shiel , Lochaber Claish Moss, Lochaber	 56°44'N 05°44'W	3,374 568	SSSI, NCR SSSI, NCR, NNR	 ✓	SPA ²¹ SAC	

²⁰ Not classified for Greenland White-fronted Geese

²¹ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
	48		Kentra Bay and Moss, Lochaber		997	SSSI, NCR		SAC	
Tiree (55)	Part of 49		Sleibhtean agus Cladach Thiriodh (Tiree Wetlands and Coast) , Hough Bay and Ballevullin Machair, Tiree	56°30'N 06°53'W	1,772.5 510.1	SSSI, NCR SSSI, NCR	✓	SPA: GWfG qualifying species SAC SAC	✓UK256
			Crossapol & Gunna		973	SSSI, NCR	✓	SPA	
Coll (56)	Part of 49		Coll , [containing :] • Crossapol & Gunna • North East Coll Lochs & Moors Totamore Dunes and Loch Ballyhaugh, Coll	56°39'N 06°30'W	2,321.88 973 2,301 209.8	 SSSI, NCR SSSI SSSI, NCR	✓ ✓ ✓	SPA: GWfG qualifying species SPA: GWfG qualifying species SPA: GWfG qualifying species SAC	✓ UK256
Benderloch Peninsula and Lismore Island (57)	50/51		Lismore Lochs, North Argyll		111	SSSI			
Mull, Loch Poit na h-I/Fidden (58)	Not known								
Mull, Loch Assapol (59)	Not known								
Colonsay/Oransay (60)	52		Oransay and South Colonsay, North Argyll	56°01'N 06°13'W	2,016.9			SPA ²²	✓ UK123 RSPB reserve

²² Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Rutledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			Oronsay and South Colonsay Loch Fada, Colonsay, North Argyll		2,178.4 80.3	SSSI SSSI		SAC	
Islay (61) ²³	53		Eilean na Muice Duibhe (Duich Moss), Islay [containing:]	55°43'N 06°15'W	576.42		✓	SPA: GWfG qualifying species SAC	✓ UK135
			<ul style="list-style-type: none"> Eilean na Muice Duibhe, Islay Laggan, Islay	55°43'N 06°18'W	574 1,230.02	SSSI, NCR		SPA: GWfG qualifying species	✓ UK169
			<ul style="list-style-type: none"> Laggan Peninsula and Bay Bridgend Flats, Islay	55°46'N 06°16'W	1,270 331	SSSI, NCR	✓	SPA: GWfG qualifying species SPA ²⁴	
			The Oa, Islay	56°35'N 06°13'W	1,943	SSSI		SPA ²⁵	✓ UK221 RSPB reserve
			Rinns of Islay [containing:]	55°46'N 06°21'W	9,407.46		✓	SPA: GWfG qualifying species	✓ UK230
			<ul style="list-style-type: none"> Feur Lochain - Moine nam Faoileann 		384	SSSI, NCR	✓	SPA: GWfG qualifying species SAC	
			<ul style="list-style-type: none"> Glac na Criche 		265	SSSI, NCR	✓	SPA: GWfG qualifying species SAC	

²³ Usually treated for inventory purposes as a single 'site' (including by Rutledge & Ogilvie 1979), Islay actually holds multiple discrete flocks with different population trajectories, multiple roost sites (McKay 1992) and many feeding areas.

²⁴ Not classified for Greenland White-fronted Geese

²⁵ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			<ul style="list-style-type: none"> Rinns of Islay Gruinart Flats, Islay [containing:]	55°50'N 06°19'W	8,312 3,261.32 3,261	SSSI, NCR SSSI	✓ ✓ ✓	SPA: GWfG qualifying species SPA: GWfG qualifying species SPA: GWfG qualifying species	✓ UK172 RSPB reserve
Jura, Lowlandsman's Bay (62)	53a	Flock extinct ?							
Jura, Loch a'Chnuic Bhric (63)	Not known	Flock extinct ?							
Keills and Danna, Strathclyde (64)	Not known		Ulva, Danna and The McCormaig Isles, South Argyll		743	SSSI		SAC	
Moine Mhor, Strathclyde (65)	62		Moine Mhor, South Argyll		1,195	SSSI, NCR, NNR		SAC	
Kintyre, Loch nam Gad, Clachan (66)	Not known								
Isle of Gigha (66a)	Not known								✓ UK152
Kintyre, Rhunahaorine (67)	54		Kintyre Goose Roosts [containing:] <ul style="list-style-type: none"> Kintyre Goose Lochs Rhunahaorine Point 	55°31'N 05°37'W	412.37 282.5 326.3	SSSI SSSI SSSI, NCR, NNR	✓ ✓	SPA: GWfG qualifying species SPA: GWfG qualifying species SPA: GWfG qualifying species	
Kintyre, Glenbarr (67a)	54								

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
Kintyre, Machrihanish (68)	55		Kintyre Goose Roosts [containing:] • Kintyre Goose Lochs	55°31'N 05°37'W	412.37 282.5	 SSSI	✓ ✓	SPA: GWfG qualifying species SPA: GWfG qualifying species	✓ UK196
Loch Lomond, Strathclyde (69)	56		Loch Lomond [containing, <i>inter alia</i> :] • Endrick Mouth & Islands	56°03'N 04°30'W	510.49 406.7	 SSSI, NNR	✓ ✓	SPA: GWfG qualifying species SAC SPA: GWfG qualifying species SAC	✓ UK137
Isle of Bute, Strathclyde (70)	57		Central Lochs, Bute		189.4	SSSI			
Barr Loch, Renfrew (71)	63	Flock extinct							
Stranraer, Dumfries and Galloway (72)	58		Loch of Inch and Torrs Warren , [containing :] • Torrs Warren – Luce Sands, Wigtownshire	54°50'N 04°52'W	2,111 2,318.1	SSSI SSSI, NCR	✓ ✓	SPA: GWfG qualifying species SAC SPA: GWfG qualifying species	✓ UK191
Bladnoch Valley and Wigtown Bay, Dumfries and Galloway (73)	59	Flock extinct							
Loch Ken and River Dee Marshes, Dumfries and Galloway (74)			Loch Ken and River Dee Marshes [containing :] • River Dee (Parton to Crosmicheal), Wigtownshire	54°59'N 04°01'W	769.11 506.7	SSSI, NR SSSI, NCR	✓	SPA: GWfG qualifying species SPA: GWfG qualifying species	✓ UK174

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			<ul style="list-style-type: none"> Kenmure Holms, Wigtownshire Threave and Carlinwark Loch, Wigtownshire 		154.1 293.8	SSSI, NCR SSSI, NCR		SPA: GWfG qualifying species SPA: GWfG qualifying species	
Various lochs in Ayrshire (75)	64	Flock extinct							

WALES

Anglesey, Clwyd (77)	Deserted site b	Flock extinct	Anglesey						
Dyfi Estuary, Dyfed (78)	61		Dyfi Estuary/Aber Dyfi, [containing :] <ul style="list-style-type: none"> Cors Fochno 	52°32'N 03°59'W 52°30'N 04°00'W	2,508 652.7	SSSI, NNR, NCR SSSI, NNR, NCR	✓ ✓	SPA: GWfG qualifying species SAC	✓ UK085
Cors Caron, Dyfed (79)	Deserted site c	Flock extinct	Cors Caron/Tregaron Bog	52°15'N 03°55'W	865.6	SSSI, NNR, NCR	✓	SAC	
Bryn-du, Powys (80)	Not known	Flock extinct	Llyn Mawr, Montgomery	52°33'N 03°27'W	20.1	SSSI			
Ystumlllyn, Gwynedd	Not known	Flock extinct							

ENGLAND

Morecambe Bay and the Lancashire Mosses (76)	Deserted site a	Flock extinct							✓ UK044
Northumberland, Grindon Loch (81)	Not known								

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
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NORTHERN IRELAND

			Thought to be no ASSIs including flocks of Greenland White-fronted Geese						
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IRELAND

Loughs Foyle and Swilly, Cos. Donegal and Derry (1)	40		Lough Swilly SPA	55°00'N 07°37'W	8,547	pNHA		SPA: GWfG qualifying species	IE005
Dunfanaghy, Co. Donegal (2)	39		Horn Head to Fanad Head SPA	55°10'N 08°00'W	2,431	pNHA		SPA: GWfG qualifying species	IE011
			Inishbofin SPA	55°13'N 07°59'W	334	pNHA		SPA SPA	IE013
Sheskinmore Lough, Co. Donegal (3)	36/38		Sheskinmore Lough SPA	54°48'N 08°23'W	563	pNHA		SPA: GWfG qualifying species	IE020
			Lough Nillan Bog SPA	54°46'N 08°11'W	4,168	pNHA		SPA: GWfG qualifying species	IE022
			Cloghernagore Bog & Glenveagh National Park	54°54'N 08°07'W	31,666	pNHA	✓	SPA: GWfG qualifying species SPA ²⁶	IE016
			Gannivegil Bog	54°33'N 07°59'W	1,575	pNHA		SAC	
			Lough Unna/Lough Unshagh Bogs	54°40'N 08°40'W	1,692	pNHA			

²⁶ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			Slieve Tooley/ Tormore Island /Loughros Beg Bay	54°44'N 08°32'W	9,435	pNHA		SPA ²⁷	IE023
Pettigo, Co. Donegal (4)	35/37		Durnesh Lough SPA	54°34'N 08°11'W	144	pNHA	✓	SPA: GWfG qualifying species	IE029
			Pettigo Plateau Nature Reserve SPA (part of Dunragh Loughs/Pettigo Plateau)	54°37'N 07°57'W	900	pNHA, NNR		SPA: GWfG qualifying species	IE027
			Lough Derg (Donegal) SPA	54°37'N 07°52'W	914	pNHA		SPA ²⁸	IE028
			Tamur Bog	54°33'N 07°59'W	1,278	pNHA		SAC	
			Donegal Bay (Murvagh)	54°37'N 08°08'W		pNHA		SPA ²⁹	IE030
Bunduff, Co. Sligo (5)	33	Flock extinct	Bunduff Lough & Machair/ Trawalua/ Mullaghmore	54°26'N 08°26'W	976	pNHA		SAC	
Lough Macnean, Co. Fermanagh (6)	2	?Flock extinct?							
Lough Oughter, Co. Cavan (7)	Part of 2		Lough Oughter and associated Loughs SPA	54°01'N 07°27'W	4,921	pNHA	✓	SPA ³⁰	IE123
Caledon, Cos. Armagh and Monaghan (8)	Not known		Slieve Beagh (Eshbrack Bog)	54°19'N 07°10'W	1,183	NHA		SPA ³¹	
Lough Conn, Co. Mayo (9)	29		Lough Conn & Lough Cullin SPA	54°02'N 09°15'W	6,462	pNHA		SPA: GWfG qualifying species	IE047
Bog of Erris, Co.	27/28		Owenduff/Nephin Complex	54°03'N 09°40'W	25,704	pNHA, NP	✓	SPA: GWfG qualifying	IE046

²⁷ Not classified for Greenland White-fronted Geese

²⁸ Not classified for Greenland White-fronted Geese

²⁹ Not classified for Greenland White-fronted Geese

³⁰ Not classified for Greenland White-fronted Geese

³¹ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
			Rathbaun Turlough Lough Corrib SPA	53°35'N 08°59'W 53°26'N 09°15'W	69 17,412	pNHA pNHA	✓	SPA: GWfG qualifying species	IE056
Lower Lough Corrib, Co. Galway (14)	Part of 19		Lough Corrib SPA	53°26'N 09°15'W	17,412	pNHA	✓	SPA: GWfG qualifying species	IE056
Rahasane Turlough, Co. Galway (15)	18		Rahasane Turlough SPA Creganna Marsh SPA	53°13'N 08°47'W 53°15'N 08°54'W	380 168	pNHA		SPA: GWfG qualifying species SPA: GWfG qualifying species	IE058
Tullagher, Co. Clare (16)	Part of 17		Tullagher Lough & Bog	52°42'N 09°33'W	469	pNHA		SAC	
North County Clare (17)	Part of 17		East Burren Complex	52°58'N 08°55'W	18,911	pNHA		SAC	
Lower Lough Derg, Co. Clare (18)	Part of 17	Flock extinct	Lough Derg (Shannon)	52°55'N 08°24'W	13,761	pNHA		SPA ³⁴	IE130
Fergus and Shannon Estuaries, Cos. Clare and Li- merick (19)	Part of 17	Flock extinct	Fergus Estuary and Inner Shannon, North Shore	52°36'N 09°15'W		pNHA		SPA ³⁵	IE068
Lough Gara, Cos. Sligo and Roscommon (20)	31	Site abandoned	Lough Gara SPA Bellanagare Bog	53°56'N 08°27'W 53°49'N 08°26'W	2,692 1,208	pNHA pNHA	✓	SPA: GWfG qualifying species SAC	IE036

³⁴ Not classified for Greenland White-fronted Geese

³⁵ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
		Site abandoned	(Caher) Carrowbehy Bog	53°47'N 08°49'W	12,130	pNHA		SAC	
Drumharlow Lough, Cos. Leitrim and Roscommon (21)	34		Lough Drumharlow	53°57'N 08°08'W	1,022	pNHA			
Loughs Kilglass and Forbes, Cos. Leitrim, Longford and Roscommon (22)	3	Flock extinct?	Lough Boderg & Lough Bofin	53°51'N 07°56'W	1,347	pNHA			
		Site abandoned	Kilglass & Grange Loughs	53°50'N 08°01'W	941	pNHA			IE125
			Lough Forbes Complex (including Ballykenny/Fisherstown)	53°46'N 07°52'W	1,339	pNHA		SAC	IE125
Midland Lakes, Co. Westmeath (23)	5/7		Lough Iron SPA	53°36'N 07°28'W	940	pNHA	✓	SPA: GWfG qualifying species	IE135
			Lough Owel SPA	53°35'N 07°23'W	1,123	pNHA	✓	SPA ³⁶	IE139
			Lough Ennell SPA	53°28'N 07°23'W	1,719	pNHA	✓	SPA ³⁷	IE140
		Site abandoned	Garriskil Bog	53°39'N 07°27'W	325	pNHA		SAC	IE136
North Lough Ree, Cos. Longford, Roscommon and Westmeath (24)	6/8		Lough Ree SPA	53°32'N 07°58'W	14,371	pNHA		SPA ³⁸	IE128

³⁶ Not classified for Greenland White-fronted Geese

³⁷ Not classified for Greenland White-fronted Geese

³⁸ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
River Suck, Cos. Galway, Offaly and Roscommon (25)	11/13/24	Flock extinct	River Suck Callows SPA	53°26'N 08°14'W	3,183	NHA		SPA: GWfG qualifying species	IE129
			Four Roads Turlough SPA	53°30'N 08°14'W	100	pNHA		SPA: GWfG qualifying species	
			Lough Croan Turlough SPA	53°29'N 08°10'W	151	pNHA		SPA: GWfG qualifying species SAC	
			Lough Lurgheen Bog/ Glenamaddy Turlough	53°35'N 08°32'W	1,163	pNHA		SAC	
			Ballinturly Turlough SPA	53°35'N 08°14'W	152	pNHA		SAC	
			Middle Shannon Callows	53°11'N 08°00'W	5,832	pNHA		SPA ³⁹	IE131
			Mongan Bog	53°19'N 07°56'W	208	pNHA	✓	SAC	IE134
Little Brosna, Cos. Offaly and Tipperary (26)	12/part of 11	Site abandoned	River Little Brosna Callows SPA	53°08'N 08°03'W	1,152	NHA		SPA: GWfG qualifying species	IE132
			Redwood Bog	53°08'N 08°04'W		NHA		SAC	
			Dovegrove Callows SPA	53°07'N 07°56'W	125	pNHA		SPA: GWfG qualifying species SPA ⁴⁰	
			Lough Derg	53°19'N 07°57'W	13,761	pNHA			IE130
		Site abandoned	All Saints Bog & Esker SPA	53°07'N 07°56'W	370	pNHA		SAC	IE133

³⁹ Not classified for Greenland White-fronted Geese

⁴⁰ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
River Nore, Co. Kilkenny (27)	9					NNR			
Kilcolman, Co. Cork (28)	14	Flock extinct	Kilcolman Bog SPA	51°14'N 08°37'W	53	pNHA		SPA ⁴¹	IE085
Doo Lough, Co. Kerry (29)	Part of 15	Flock extinct	Doo Loughs	52°01'N 09°32'W	361	pNHA			
Killarney Valley, Co. Kerry (30)	Part of 15		Killarney National Park SPA Eirk Bog SPA	52°33'N 03°27'W 51°57'N 09°40'W	10,329 13	pNHA, NP pNHA		SPA: GWfG qualifying species SPA: GWfG qualifying species	IE078
Inny Valley, Co. Kerry (31)	Not known	Flock extinct	?	51°53'N 10°05'W					
Blasket Islands, Co. Kerry (32)	Listed as deserted	Flock extinct		52°05'N 10°35'W	3,622			SPA ⁴²	IE073
Stabannan, Co. Louth (33)	Not known	Flock moved to Lurgan- green (Dundalk Bay)	Stabannan-Braganstown SPA Dundalk Bay	53°52'N 06°26'W 53°55'N 06°20'W	490 5,164	pNHA pNHA	 ✓	SPA ⁴³ SPA ⁴⁴	IE120 IE121
Wexford Slob and Cahore, Co. Wexford (34)	10		Wexford Harbour & Slob SPA The Raven SPA	52°21'N 06°23'W 52°20'N	5,996 4,207	pNHA, part NNR pNHA	✓ ✓	SPA: GWfG qualifying species SPA: GWfG qualifying	IE102

⁴¹ Not classified for Greenland White-fronted Geese

⁴² Not classified for Greenland White-fronted Geese

⁴³ Not classified for Greenland White-fronted Geese

⁴⁴ Not classified for Greenland White-fronted Geese

Site name (numbers follow Map 2)	Ruttledge & Ogilvie (1979) site no.	Status of site (see also Table 2)	Protected site name	Co-ordinates	Area (ha)	National designation status (see acronyms p. 3)	Ramsar site	EU SPAs (& SACs)	BirdLife IBA and other status
				06°21'W				species	
			Cahore Marshes SPA	52°32'N 06°12'W	192	pNHA		SPA: GWfG qualifying species	IE103

Summary of site-related protection for wintering flocks of Greenland White-fronted Geese

	Extinct flocks	Near extinct/ highly threatened (Table 2)	Currently extant flocks with site protection through nationally designated sites	Currently extant flocks which have internationally designated sites with GW-fG as qualifying species covering some part of their range	Currently extant flocks which have internationally designated sites without GWfG as qualifying species covering some part of their range	Flocks with managed nature reserve covering some part of their range
Scotland	4	12	19	10	9	10
Wales	4		1	1		1
England	1	1				
Northern Ireland						
Ireland	8	17	24	14	8	3

Major sources of information:

Greenland: Glahder (1999b); Glahder *et al.* (2002); Egevang & Boertmann (2001); Heath & Evans (2000)

United Kingdom: Fox *et al.* 1994; Stroud *et al.* (2001); GWGS annual census reports

Ireland: Fox *et al.* 1994; NPWS annual census reports; D. Norriss & D. Tierney pers. comm.; Heath & Evans (2000); EUNIS Database (<http://eunis.eea.europa.eu>)

Iceland: Heath & Evans (2000)

nnex 4c. Ramsar sites designated for Greenland White-fronted Geese (key to Map 6)

Ramsar Site name	
Greenland	
1	Qínquata Marraa and Kuussuaq, Disko
2	Aqajarua (Mudderbugten) and Sullorsuaq (Kvandalen)
3	Kuannersuit Kuussuat
4	Naternaq (Lersletten)
5	Eqalummiut Nunaat and Nassuttuup Nunaa
Ireland	
6	Pettigo Plateau
7	Lough Oughter
8	Owenduff Catchment
9	Lough Corrib
10	Lough Gara
11	Lough Derravaragh
12	Lough Iron
13	Lough Owel
14	Lough Ennell
15	Mongan Bog
16	Wexford Wildfowl Reserve
United Kingdom	
17	Caithness Lochs
18	Caithness & Sutherland Peatlands
19	South Uist Machair and Lochs

Ramsar Site name	
20	Sleibhtean agus Cladach Thiriodh (Tiree Wetlands and Coast),
21	Coll
22	Rhinns of Islay
23	Gruinart Flats, Islay
24	Bridgend Flats, Islay
25	Eilean na Muice Duibhe (Duich Moss), Islay
26	Kintyre Goose Roosts
27	Loch Lomond
28	Loch of Inch and Torrs Warren
29	Loch Ken and River Dee Marshes
30	Cors Fochno & Dyfi
Iceland	
31	Hvanneyri, Borgarfjörður

Annex 5. The Wexford Declaration on the conservation of the Greenland White-fronted Goose (*Anser albifrons flavirostris*)

REALISING THAT the entire world population of the Greenland White-fronted Goose breeds in Greenland and winters in Ireland and the United Kingdom and that a significant proportion migrates through Iceland;

AWARE THAT the world population of the Greenland White-fronted Goose currently numbers only 30,000 individuals with about two thirds of this total wintering in two localities, and that within the last decade the population has numbered less than 18,000 individuals;

CONSCIOUS THAT individual Greenland White-fronted Geese exhibit a high degree of site fidelity, and that during recent years the disappearance of some local populations have caused a retraction of the traditional range and that other flocks remain vulnerable;

NOTING THAT many natural and semi-natural habitats, used by Greenland White-fronted Geese are threatened by loss, degradation particularly on their staging and on their wintering areas, and that uncontrolled hunting of the Greenland White-fronted Goose occurs while on migration;

AND FURTHER NOTING THAT the characteristic breeding biology and social behaviour of the Greenland White-fronted Goose, indicates vulnerability compared to other geese;

WELCOMING recent increases in some sections of the population and noting recent ecological adaptability of the bird;

TAKING ACCOUNT of the draft International Conservation Plan discussed at the Wexford Workshop in March 1992;

RECOGNISING THAT Greenland, Iceland, Ireland and the United Kingdom must take joint and equal responsibility for the conservation of the Greenland White-fronted Goose and recognising that farmers, hunters and conservation organisations have a role to play in achieving this objective;

The participants at the Greenland White-fronted Goose Workshop adopted the Declaration and recommended the following actions:

1. That Greenland, Iceland, Ireland and the United Kingdom agree and implement long-term co-operative measures, including an International Plan for the conservation of the Greenland White-fronted Goose.
2. That Greenland, Iceland, Ireland and the United Kingdom develop and implement national conservation plans including site plans or statements for the Greenland White-fronted Goose.
3. That Ireland and the United Kingdom take further steps, where necessary, to protect wintering areas and in particular traditional ones, of the Greenland White-fronted Goose.
4. That Greenland, Iceland, Ireland and the United Kingdom work to achieve closer integration between environmental policies and human uses, especially agriculture.
5. That Greenland, Iceland, Ireland and United Kingdom ensure that any hunting is carried out at a sustainable and equitable level taking account of the influence of disturbance so that the survival and distribution of the population are not jeopardised.
6. That Greenland be congratulated on the listing of exceptionally extensive areas of the breeding range under the Ramsar Convention.
7. That Ireland be congratulated for bringing together the range states and other interested parties and for offering to act as co-ordinator for follow-up action.

Wexford, Ireland
6th March 1992

Following a meeting between representatives of the range states of the Greenland White-fronted Goose at the Conference of the Contracting Parties to the Ramsar Convention at Montreux in June 1990, the first International Workshop on the conservation of the Greenland White-fronted Goose was held in Wexford, Ireland, from 4-6 March 1992 and was organised by the National Parks & Wildlife Service of the Office of Public

Works in Ireland in association with the International Waterfowl and Wetlands Research Bureau (IWRB). The workshop which discussed a draft international plan for the conservation of the Greenland White-fronted Goose was attended by 50 specialists, including representatives of governments, international bodies and non-governmental organisations from each of the range states.

Annex 6. Conclusions of the second international workshop on Greenland White-fronted Geese. Islay, 24-26 February 2009

Background

The population of White-fronted Geese that breed in Greenland, winter in Ireland and the UK and migrate through Iceland in spring and autumn, is amongst the smallest of goose populations in the world. The geese have particular cultural significance to human communities throughout their range, where they associate with peatlands and form an integral part of the local sense of place, celebrated in literature and art. They have been described as one of Europe's most iconic birds.

An international workshop on the conservation of Greenland White-fronted Geese under the auspices of the Species Action Framework was convened by Scottish Natural Heritage (SNH) and the Greenland White-fronted Goose Study (GWGS) on Islay, Scotland from 24–26 February 2009. Fifty participants from Ireland, UK (including Scotland, England, Wales and Northern Ireland), Iceland, Greenland, Denmark and Germany attended, with preparatory inputs from Canada. The meeting was a response to recent rapid declines in numbers of these rare geese which have a limited geographic range and are **Endangered** under IUCN Red Data List criteria. The workshop objective was to share information and assessments of current threats, and develop an international Action Plan summarising means to reduce or eliminate these.

Since the first international workshop in Wexford, Ireland in 1992, several conservation actions have been implemented (e.g. protected area networks in Greenland, Ireland and UK and the cessation of autumn hunting in Iceland in 2006, where c.3,300 were shot annually in 1995-2006). Islay participants recalled the Wexford workshop conclusion that the then population level of 30,000 represented an absolute minimum population size. After 1992, the population peaked at 35,600 in 1999, but rapidly fell to 23,200, based on the most recent March 2009 international census. The Islay Workshop agreed that urgent action needs to be taken to halt and reverse the current decline and, noting that priorities for action will differ in different parts of the world range, concluded that the causes of the population decline were:

- Numbers of birds hatched each year (recruitment) has been low and less than the numbers dying (mortality, which has not changed since the 1980s), especially since 1995.

- The causes of low recruitment remain unknown, but may relate either to consequences of increased snow-fall in April and May since 1995, and/or the consequences of inter-specific competition with rapidly increasing numbers of breeding Canada Geese in Greenland (which have colonised west Greenland from northern America). Other unknown factors may also be of significance.

Objectives

The long-term goal is to restore and maintain the Greenland White-fronted Geese to favourable conservation status throughout its range. The short term aim is to identify the causes of current low productivity responsible for recent rapid declines in the population, and (where feasible) establish measures to halt the decline.

- a. The top priority action is to investigate the factors acting on geese on the breeding grounds responsible for currently reducing the annual production of young.

It was concluded however, that even knowing the causes of low productivity, it was unlikely that reproductive success could be enhanced in the short-term. Accordingly it is essential that measures are taken:

- b. to ensure that geese leave wintering/staging areas for Greenland in optimal condition for successful breeding;
- c. to minimise all additional sources of mortality;
- d. to minimise local impacts on geese (e.g. disturbance or habitat change) particularly in smaller flocks or those with restricted distribution to avoid further flock extinctions and contraction of range; and
- e. to maintain and further develop monitoring and research programmes to provide necessary data and information concerning the current conservation status of the population.

Actions

These objectives will be delivered through the following actions:

a. Understanding causes of decline

- Investigate and assess factors restricting productivity, through an international research programme, investigating a) potential competitive interactions with Canada Geese in west Greenland; and b) consequences of greater spring snow-fall in recent years.

b. Optimising condition

- Develop the existing international network of conservation management areas, especially on the staging grounds, to ensure that all key sites are appropriately protected and managed.
- c. Minimising mortality**
- Take all possible steps to eliminate avoidable sources of mortality and disturbance, particularly shooting and collisions with man-made structures.
- d. Preventing flock extinctions**
- Assess the need for, and develop as appropriate, local habitat management measures on the wintering grounds so as to optimise quality of agricultural feeding areas, and thus avoid further flock extinctions.
- e. Population monitoring**
- Maintain the long-term marking, re-sighting and counting programmes at the main Irish wintering site of Wexford.
 - Develop a complementary Scottish marking programme, at locations which allow for sustained resighting effort.
 - Maintain the annual international population census, improving coverage where deficient, and collecting more extensive assessments of age-ratios throughout the range.
 - Enhance knowledge of numbers and distribution on the staging and breeding areas to develop site safeguard programmes.

Many of the actions above will be enhanced by developing better awareness of the conservation needs of the geese. In particular, there is a need to develop engagement with people likely to come into contact with the geese at different stages of their life-cycle, especially with farming communities and hunters. There is particular scope to develop educational programmes related to the geese as outlined in the Annex below. Further needs identified by the workshop are summarised in the Annex, together with more information on the priorities above.

Future international co-operation: next steps

The four Range States agreed to work together to (i) halt and reverse declines in the population and (ii) establish an international Steering Group to co-ordinate actions. The Steering Group will finalise an international action plan in consultation with other interested parties, agree a process for its

formal conclusion, and promote its implementation throughout the Range States. This will include the development of a costed work-plan relating to projects identified as priorities.

Bilateral and other intergovernmental arrangements for research and conservation projects involving more than one Range State will need to be established to complement the action plan.

Wide organisational support for the plan is important: the workshop requested SNH to approach relevant organisations, including those represented at the meeting, to request their support for the international action planning process.

Participants thanked SNH and GWGS for their initiative in convening the workshop and considered it timely to meet again in 2012 to review progress. Until then, they agreed to maintain regular contact through e-mail and web-based media⁴⁵.

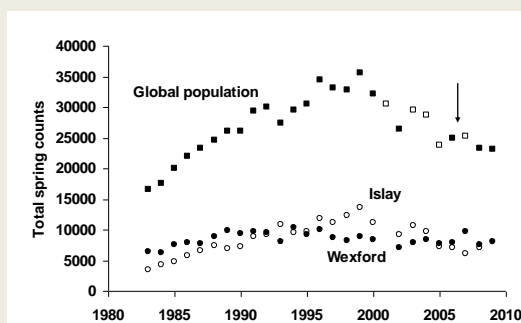
⁴⁵ e.g. via <http://gwfg-conservation.wikispaces.com>

ANNEX

Background - Greenland White-fronted Geese

In autumn, the entire population migrates from breeding areas in west Greenland, through Iceland to wintering grounds in Scotland and Ireland, usually arriving early to mid-October. The Wexford Slobs in Ireland and the Isle of Islay in Scotland together hold over two-thirds of the population in winter, while other flocks are scattered across west and north Scotland, and at a selection of locations in Ireland. The distribution is highly oceanic, linked to what was ancestrally their peat bog habitat, although now they feed most commonly on improved grasslands, there is usually a link to traditional peat bog or loch roost sites (as on Islay). In early-April, geese return north once more, first to Iceland where they 'refuel' in April, before migrating back to Greenlandic breeding grounds in early May.

Numbers declined from between 17,500-23,000 in the 1950s to 14,300-16,600 by the mid-1970s, which led to protection under the EU Birds Directive and cessation of hunting in Scotland and Ireland after 1982. The population increased to 35,600 by the late 1990s, since when numbers have dropped to 23,200 (March 2008) due to reduced production of young (annual adult survival has not changed).



Population size trend of Greenland White-fronted Geese

Research and conservation priorities

The cultural importance of Greenland White-fronted Geese

1. Greenland White-fronted Geese have had a very long association (known to extend over a thousand years) with human communities throughout their range. Their distinctive habitats and behaviour help give a sense of identity to the landscapes in which they occur. They occur in literature and art, and have been described as one of Europe's most

iconic birds. These associations provide a range of cultural, educational and economic opportunities, especially the potential to:

- a. develop educational links between schools in different parts of the range, for example through twinning programmes;
- b. develop educational resources linking geese, their habitats and life-cycle to the school curriculum; and
- c. be a flagship species not only for sustainable wildlife tourism, but also for promoting other aspects of environmental education.

People and geese

2. Geese co-exist with people through most of their world range, and depend on farmers in Iceland, Ireland and the UK to sustain the agricultural landscapes to which they have become adapted. The workshop welcomed recent progress to establish local goose management schemes in Scotland which have resolved the acute conflicts of the 1980s. The close involvement of the community in the development of these schemes has been crucial to their success.
 3. The adoption of the Scottish Goose Policy Framework for goose management in 2000 and which has been implemented in close co-operation with local communities and stakeholders at all levels, has been a success. The review of the Framework (due to report in August 2010), provides an important opportunity to fine-tune policies with respect to Greenland White-fronted Geese and Scottish agriculture. In particular, the review should address the need for policies to sustain smaller, traditional flocks whose viability is crucial to maintain the size and range of the overall population.
 4. In both Ireland and the UK there is a need to examine the need for local, governmental support mechanisms at smaller, un-designated sites.
 5. Educational materials that readily summarise key issues for Greenland White-fronted Goose conservation should be developed and disseminated to farmers, hunters and those in local government or elsewhere whose activities may influence the geese or their habitats.
- ### Reducing sources of mortality
6. With low annual productivity it is critically important to reduce sources of mortality. This

will conserve the very small numbers of successful breeders that produce subsequent generations and help restore the population to former levels. To this end, the workshop concluded that hunting cannot currently be undertaken on a sustainable basis and any kill would exacerbate the current unfavourable conservation status of the population.

7. Iceland was congratulated for its protection in 2006 of the population which has removed a major source of mortality, and was urged to ensure that this legal protection was fully respected.
8. Greenland announced proposals to provide protection throughout the months when the geese are present on the breeding areas to be effective from April 2009. This was highly welcomed.
9. The workshop congratulated the wildfowling clubs and others for their long-standing voluntary suspension on shooting of Greenland White-fronted Geese on the Dyfi Estuary, Wales which had probably avoided that flock becoming extinct. However, the geese remain legal quarry in Wales. Birds using the traditional wintering site of Grindon Loch in northern England are also still legal quarry. Government authorities in Wales and England were urged to remove Greenland White-fronted Geese from the quarry list in those countries at the earliest opportunity.
10. Man-made structures, for example, inappropriately sited on-shore or off-shore wind-turbines represent a potential source of mortality, and the meeting concluded that full environmental impact assessments based on thorough survey information should always be required with respect to any potential new turbine development in areas used by the geese. This would help remove potential conflicts at planning stages.

Research and monitoring: wintering grounds

11. Research at the main Irish wintering site of the Wexford Slob by the National Parks and Wildlife Service (NPWS) since 1983 was recognised as of fundamental importance to understanding the status, trends and dynamics of the population. The importance to the conservation of Greenland White-fronted Geese of sustaining this research effort cannot be over-stated. The workshop highly commended NPWS for this sustained effort and strongly urged that priority be given to its continuation.

12. A long-term strategy for ringing at flyway-scale should be developed which will deliver essential demographic data. The development of a programme of marking in Scotland, complementary to that at Wexford and at a location which allows for sustained resighting effort, is a high priority. The workshop welcomed the SNH's announcement that funding had been secured for such a three-year programme of marking.

13. The international population census established by NPWS and GWGS in 1982, and supported by other organisations and large numbers of volunteer participants, has resulted in detailed understanding of the distribution and abundance of the geese on their wintering grounds. NPWS and GWGS were urged to continue their efforts as a necessary basis for conservation policy both in relation to protected areas and actions for the population. Resources to that end need to be secured.

Future priorities are:

- The need for continuity and more regular coverage of Irish wintering sites away from Wexford.
- The need for better information on age-ratios at more sites.
- The need to better use monitoring data to identify and designate protected areas and ensure their appropriate management.
- Understanding mechanisms affecting small sites (the use of main and alternative feeding and roosting areas) based on an analysis of the characteristics of such sites.

Research and monitoring: migratory staging areas

14. In Iceland, the need for a good inventory of feeding and roosting sites was recognised as an important need.
15. The establishment of a network of protected key sites and which should include disturbance-free areas, especially in autumn, is important to complement sites elsewhere in the range.
16. Systematic collection of data on age-ratios during autumn staging would provide very valuable information on productivity, and would complement assessments made on the wintering grounds following further migration.

Research and monitoring: breeding grounds

17. The very rapid decline of the population is known to be the result of reduced productivity in recent years. Too few young geese are produced each year to balance losses, although the ultimate cause of this failure is unknown. There is an urgent need to investigate possible factors impacting on productivity, in particular potential competitive interactions with the increasing population of Canada Geese in west Greenland and the consequences of greater spring snow-fall in recent years (the latter based on archives of remote sensing images). Such research is urgently needed to help develop policies that may assist in addressing ultimate drivers of population decline and should be initiated as soon as it possible.

Protected areas

18. The workshop discussed the critical need to protect and appropriately manage key sites for Greenland White-fronted Geese in all Range States. It noted that major progress had been made in protecting key areas on the wintering grounds in the last decade.
19. The Ramsar Convention, to which all four Range States are Contracting Parties, was identified as providing an appropriate international framework for the protection of key sites. For the UK and Ireland, the EU Directive on the conservation of wild birds and its Special Protection Areas (SPAs) also provides a valuable legal framework.
20. A number of issues were identified for action:
- a. There is a long-established network of Ramsar sites in Greenland that include a significant proportion of the breeding areas. Most Ramsar sites are in the southern part of the breeding range used by Scottish birds. Survey and designation of sites in the northern part of the range and holding internationally important numbers at Svartenhuk, Nugssuaq, Sarqaq dalen and Disko would benefit Irish-wintering birds.
 - b. Iceland was encouraged to designate key wetland roosting sites under the Ramsar Convention to complement the international network established by Greenland, Ireland and the UK, and so as protect them from land-use change and disturbance.

There is a need for better statutory 'tools' – through national legislation - to help ensure the appropriate management of any such designated sites.

- c. The UK was encouraged to keep its established national network of EU SPAs under review and to ensure these are appropriately managed.
- d. Ireland was encouraged to complete its establishment of a national network of SPAs for Greenland White-fronts, noting that some important sites have already been designated (including as Ramsar sites), and that further sites are in the process of being designated.
- e. Appropriate management planning is needed at all sites to ensure the maintenance of favourable conditions for Greenland White-fronted Geese, especially in the context of ensuring that geese leave their wintering and staging areas for Greenland in optimal condition for successful breeding.

See also <http://gwfg-conservation.wikispaces.com/Islay+international+workshop> for presentations to, and background papers tabled at, the Islay workshop.

Annex 7. The legal regime provided by the Birds and Habitats Directives: implications for Greenland White-fronted Geese

Directive on the conservation of wild birds (EC2009/147)		
Article ⁴⁶	Requirements ⁴⁷	Implications for Greenland White-fronted Goose conservation
2	Requires Member States to maintain the populations of naturally occurring wild bird species present in the EU at a level which assures their long-term survival.	Requirement to restore the favourable status of Greenland White-fronted Geese
3	Requires Member States to “preserve, maintain or re-establish a sufficient diversity and area of habitats” for all wild bird species through a variety of specified policy measures.	Implications with respect to the management of regularly used wintering sites outwith protected areas.
4(1)	Requires Member States to undertake a range of special conservation measures to be undertaken for species listed on Annex I of the Directive and for regularly occurring migratory species. Such special conservation measures include the need to classify “most suitable territories” as	Requirement to select and classify national suites of Special Protection Areas. See Annex 4b for details of SPAs selected in Ireland and UK.

⁴⁶ Only those Articles particularly relevant to this Action Plan are listed.

⁴⁷ See the full text of the Directive for definitive expression of legal obligations (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF>) as also interpreted by relevant rulings from the European Court of Justice.

Directive on the conservation of wild birds (EC2009/147)		
Article ⁴⁶	Requirements ⁴⁷	Implications for Greenland White-fronted Goose conservation
	Special Protection Areas (SPAs) so as to “ensure their survival and reproduction in their area of distribution”.	
4(4)	Requirement to manage SPAs so as to avoid pollution, deterioration of habitats or disturbance to the species for which they have been established. [For classified SPAs this requirement is replaced by obligations under Articles 6(2), 6(3) & 6(4) of the Habitats Directive. See below.] Need also to strive to avoid pollution or deterioration of habitats outside SPAs.	
5 & 7	Regulates hunting of certain species that are either listed in Annex II/1 and may be hunting throughout the EU, or listed in Annex II/2 and may be hunted only in specified Member States.	Whilst Article 7 allows for the hunting of White-fronted Geese (since the species is listed in Annex II/2), Ireland gives complete protection to the Greenland White-fronts, whilst in the UK, they are protected in Scotland only (see Annex 2).
9	Provides for potential derogation from requirements of Articles 5, 6, 7 and 8 under a range of specified	

Directive on the conservation of wild birds (EC2009/147)		
Article⁴⁶	Requirements⁴⁷	Implications for Greenland White-fronted Goose conservation
	circumstances and where there are “no other satisfactory solutions” to conflict issues.	
10	Requires Member States to encourage research and other studies required as a basis for the protection, management and use of wild bird populations.	

Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)		
Article⁴⁸	Requirements⁴⁹	Implications for Greenland White-fronted Goose conservation
3	Requires Member States to establish a coherent European network of protected areas through the national classification of special areas of conservation (SACs)	SACs which overlap with Greenland White-front wintering sites are listed in Annex 4b. As SACs are selected on the basis of habitat and non-avian species interests and so their management cannot be directed to the requirements of the geese. SACs nonetheless

⁴⁸ Only those Articles particularly relevant to this Action Plan are listed.

⁴⁹ See the full text of the Directive for definitive expression of legal obligations (<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31992L0043:EN:NOT>) as also interpreted by relevant rulings from the European Court of Justice.

Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)		
Article⁴⁸	Requirements⁴⁹	Implications for Greenland White-fronted Goose conservation
		provide a basic level of protection against land-use which is of benefit to the geese. Many sites of importance for geese are classified both as SPAs and SACs (Annex 4b).
4(4)	Requires Member States to establish priorities for sites classified as SACs in the light of the importance of such sites for the conservation of priority habitats (Annex I) or priority species (Annex II).	The establishment of conservation priorities on SACs can have implications for Greenland White-front wintering habitats such as peatlands (see section 3.2.5 above).
6(1)	Requires that for SACs, Member States take appropriate conservation measures involving, as appropriate, management plans to maintain and restore, to a favourable conservation status, the habitats and species for which the site has been designated.	The conservation measures established in accordance with the priorities set under Article 4(4) can have implications for Greenland White-front wintering habitats such as peatlands (see section 3.2.5 above).
6(2)	Requires that for both SPAs and SACs, Member States avoid damaging activities that could significantly disturb the species for which the areas have been designated, or the deterioration of either the habitats of the protected species	Appropriate conservation measures need to be taken to avoid the deterioration of those habitats (such as peatlands) for which relevant SACs have been classified, and any damaging disturbances at

Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)		
Article ⁴⁸	Requirements ⁴⁹	Implications for Greenland White-fronted Goose conservation
	<p>or of the habitat types for which the sites are classified.</p> <p>Further guidance on implementation procedures has been published by the European Commission⁵⁰.</p>	those SPAs classified for Greenland White-fronted Geese (Annex 4b).
6(3) & 6(4)	<p>Establish the procedure to be followed when planning new developments that might affect a SPA or SAC. Thus:</p> <ul style="list-style-type: none"> Any plan or project likely to have a significant effect on a Natura 2000, either individually or in combination with other plans or projects, shall undergo an Appropriate Assessment to determine its implications for the site. The competent authorities can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of the site concerned. 	Any plan or project likely to have a significant impact on SPAs or SACs classified for either Greenland White-fronted Geese or its habitats needs to go through a detailed 'appropriate assessment' procedure before being authorised.

⁵⁰

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)		
Article ⁴⁸	Requirements ⁴⁹	Implications for Greenland White-fronted Goose conservation
	<p>(Article 6.3)</p> <ul style="list-style-type: none"> In exceptional circumstances, a plan or project may still be allowed to go ahead, in spite of a negative assessment, provided there are no alternative solutions and the plan or project is considered to be of overriding public interest. In such cases the Member State must take appropriate compensatory measures to ensure that the overall coherence of the Natura 2000 Network is protected. (Article 6.4) <p>Further guidance on implementation procedures has been published by the European Commission⁵¹.</p>	
7	Specifies that for classified SPAs obligations under the first sentence of Article 4(4) of the Birds Directive are replaced by	

⁵¹

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf and http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf

Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC)		
Article⁴⁸	Requirements⁴⁹	Implications for Greenland White-fronted Goose conservation
	obligations under Articles 6(2), 6(3) & 6(4) of the Habitats Directive above.	