Solent Waders and Brent Goose Strategy

Solent Waders and Brent Goose Steering Group

2020

Publication Details

This Strategy has been produced by the Solent Waders and Brent Geese Strategy Steering Group (SW&BGS Group). The SW&BGS Group comprises the following organisations:

Hampshire & Isle of Wight Wildlife Trust (HIWWT)
Natural England (NE)
The Royal Society for the Protection of Birds (RSPB)
Hampshire County Council (HCC)
Coastal Partners
Hampshire Ornithological Society

The text is based on the Solent Waders and Brent Goose Strategy 2010. Updates to the text have been written by Deborah Whitfield (HIWWT) in conjunction with the SW&BGS Steering Group.

Maps and GIS layers produced by Deborah Whitfield (HIWWT) under licence from the Ordnance Survey (no. 100015632 and Ordnance Survey Opendata).

The Strategy should be cited as:
Whitfield, D (2020) Solent Waders and Brent Goose Strategy Hampshire and Isle of Wight Wildlife Trust. Curdridge.

Front Cover Illustration: Brent Geese by Dan Powell

Published by:
Hampshire and Isle of Wight Wildlife Trust
Beechcroft House
Vicarage Lane
Curdridge
Hampshire
SO32 2DP

A company Ltd by guarantee & registered in England No. 676313; Charity No. 201081.

Acknowledgements

The Strategy update has been produced with vital contributions from the Solent Waders and Brent Goose Strategy Steering group and the project team at Hampshire and Isle of Wight Wildlife Trust, namely Trevor Codlin, Ruth Kernohan and Catherine McGuire who designed and co-ordinated the movement study survey work. We would also like to thank the survey team who included colleagues from our partner organisations, local expert birders and the Trust's Ecology Team. Thanks also go to Josh Nightingale, who designed and carried out the network analysis metric for the bird movement study.

The SW&BGS Group would also like to thank all the funding partners:

HIWWT, the Solent Forum, Natural England, Hampshire Ornithological Society, Hampshire Biodiversity Information Centre, the National Grid and Chichester Harbour Conservancy, and the following local authorities: Southampton City Council, Portsmouth City Council, Havant Borough Council, Eastleigh Borough Council, Gosport Borough Council Fareham Borough Council, Chichester District Council, the New Forest National Park Authority, New Forest District Council and Isle of Wight Council,

without whom the Strategy would not be possible.

For information on how to obtain further copies of this document and accompanying data please see the Strategy website: https://solentwbgs.wordpress.com/

Table of Contents

EXECUTIVE SUMMARY

The Strategy is the report of the Solent Waders and Brent Goose Strategy Steering Group. The group comprises a partnership of statutory and non-statutory bodies. The Strategy is a non-statutory document presenting evidence, analysis, and recommendations to inform decisions relating to strategic planning as well as individual development proposals.

The Strategy relates to internationally important brent goose and wading bird populations within and around the Special Protection Areas and Ramsar wetlands of the Solent Coast (Hampshire, Isle of Wight and West Sussex). The underlying principle of the Strategy is to wherever possible conserve extant sites, and to create new sites, enhancing the quality and extent of the feeding and roosting resource.

The primary aims of the Strategy are as follows:

- to identify the network of core areas that are regularly used and are of fundamental importance to over-wintering waterfowl across the Solent;

- to maintain a network of sites through better management and protection from development and recreational pressure, and to ensure that they will be resilient to the pressures of climate change and predicted sea level rise in the future;

- to provide a strategy that will ensure that the network of important sites is protected, whilst reducing the current uncertainty over site use, in order to better inform key coastal stakeholders.

Through its previous iterations in 2002 and 2010, the Solent Wader and Brent Goose Strategy (SW&BGS) has proven to be a useful tool for planners, developers, statutory consultees, as well as non-governmental organisations. It has been an important tool for highlighting issues where sites proposed for development fall within the important network of sites used by over-wintering wading birds and brent geese, that functionally support the Solent's Special Protection Areas (SPAs).

This 2019 report updates and replaces the Solent Waders and Brent Goose Strategy 2010. A new metric-based method has been developed to assess the value of sites. A new suite of maps, GIS layers and bird records have been produced, for use by local authorities and land managers, and notably in conjunction with the mitigation guidance.

The sites have been classified according to a metric scoring system, which incorporates the results of a bird movement study, the first of its kind. The study was carried out over three years, having begun with the Eastern Solent during the winter of 2016-17 followed by the Western Solent during the winter of 2017-18 and concluding with the Isle of Wight in 2018-19.

Recommendations are set out for planning policy makers, site owners and those involved in managing land within the Solent area in order to protect the integrity of this network of important sites.

Part 1 Background Information

1.1 Introduction

The natural and man-made environment of the Solent makes it one of the most important coastal zones in the UK. The diversity of habitats and species comprise an internationally important wildlife resource. In human and economic terms, the area has a long history of principally port-related industries. Good communications with the rest of the UK and Europe have led to the development of other industrial sectors in recent years with the result that the area is very densely populated. In addition, the coastline provides an attractive recreational resource for local people and those from further afield.

Land-use planning and management for these diverse interests have become increasingly complex in recent years. It is perhaps inevitable that conflicts have arisen between the needs of wildlife and those of people. Such conflict is exemplified in the Solent by the pressures for development on grasslands used for foraging by dark-bellied brent geese and as a roosting resource by wading birds, during the winter months.

Whilst there are statutory mechanisms in place to designate areas of special protection for important habitats and species, there is a mismatch between such sites and the needs of the particular species or habitats of interest. Brent geese and wading birds are species of international importance generally protected under European legislation and specially protected within designated sites, called Special Protection Areas (SPAs); but birds are mobile species, they are also dependent on sites outside of formal designations and rely on the availability of a network of feeding and roosting resources over the winter period.

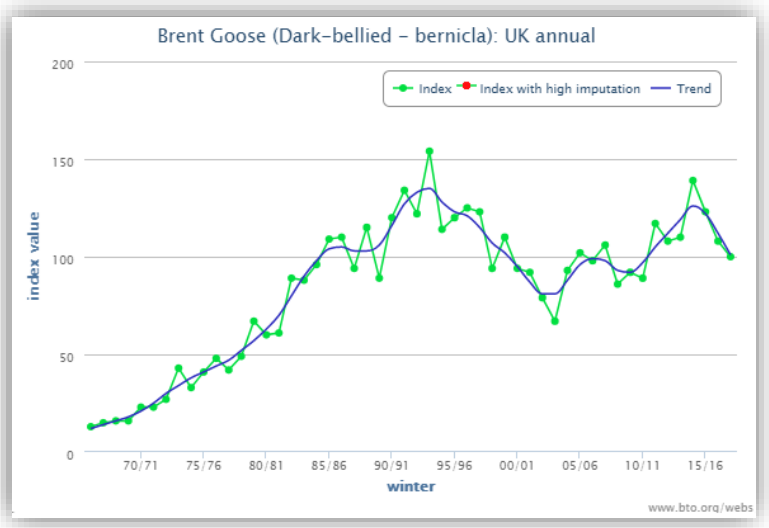
This Strategy is a practical attempt at addressing the issues surrounding these sites by providing information on the location of sites currently used by these birds, sites that are vulnerable to loss, and sites that have potential for future use by waders and/or Brent Geese, based on a spatial analysis of three years of field survey data.

1.2 Ecology of Waders and Brent Geese

1.2.1 Brent Geese

There are three races of Brent Geese, the dark-bellied *Branta bernicla bernicla*, the pale-bellied *Branta bernicla hrota* and the black *Branta bernicla nigrans*. Only the dark-bellied race occurs regularly in the Solent, therefore this strategy is concerned only with *Branta b. bernicla,* although for ease the text states simply brent geese.

The dark-bellied brent goose *Branta bernicla bernicla* is a winter visitor to the Solent from its breeding grounds in Siberia. Virtually the entire world population winters in north-western Europe. In nature conservation terms the species is of high international importance and is regarded as vulnerable because of the relatively small size of the world population, which has a highly variable breeding success. Numbers have fluctuated over time. After decades of low numbers following a major population crash in the 1930s, numbers have steadily increased but are yet to reach the previous peaks recorded in 1993/94, possibly due to changing conditions in their breeding grounds in Siberia (see Figure 1).



Source: Frost, T.M., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Robinson, A.E., Stroud, D.A., Wotton, S.R. and Balmer, D.E. 2019. *Waterbirds in the UK 2017/18: The Wetland Bird Survey.* BTO/RSPB/JNCC. Thetford.Data (except for supplementary counts highlighted in orange[*]) released under the Open Government Licence v3.0. To reuse, please include the following attribution statement: "Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2017/18 © copyright and database right 2019. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers."
[*]including supplementary counts from the Goose and Swan Monitoring Partnership (GSMP)
http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report

Figure 1. The annual indices and smoothed population trends for dark-bellied brent goose in the UK

Numbers of brent geese are largely controlled by predation pressure in the breeding season which is tied to the lemming cycle in the Arctic. In good years, predators such as Arctic Foxes concentrate on lemmings, leaving large numbers of young brent geese to survive to fledging. However, in poor lemming years the predators switch their diet to ground nesting birds, which can sometimes result in an almost complete breeding failure for brent geese.

At the most recent population estimate, Great Britain supports 98,000 dark-bellied brent geese (Frost, T. et al., 2019) primarily at coastal sites in southern and eastern England. The Solent harbours and coast are a particularly important area for brent geese. At their winter peaks, the population of brent geese in Chichester and Langstone Harbours in the five winters represented 20% of the national population and 9% of the international population (Frost, T. et al., 2019). It is estimated that the Solent as a whole supports about 10-13% of the world population of dark-bellied brent geese and about 30% of the UK population (Stillman et al., 2009). Internationally important sites for brent geese include Portsmouth Harbour, Langstone and Chichester Harbours and the North West Solent; additional nationally important sites for Brent Geese in the Solent include Beaulieu Estuary, Southampton Water and Newtown Estuary (Calbrade et al., 2010).

Brent geese arrive in the UK from mid-September, but the majority arrive in October to early November with numbers reaching their peak in January. Birds usually depart from late February, but this can vary with season. Brent geese traditionally winter on coastal mud flats, where they initially feed on eelgrass, Zostera spp. and later on various marine algae, particularly Enteromorpha spp., and sea lettuce *Ulva lactuca*. At any one site, the availability of food will be dependent on local factors such as the extent of the resource itself, die back in harsher winters and pollution. Availability is also dictated by the tidal regime which exposes the mudflats for varying periods.

In the 1930s it was believed that a fungal disease of eelgrass was a major factor in the 75% crash in brent goose numbers as the availability of this food source was largely wiped out. Since the 1950s, brent geese have diversified their feeding habits to include farmland with cereals and pasture, and amenity grasslands. This behaviour was first noted in the Solent in the 1970s. Terrestrial habitats, such as cereal fields and amenity grasslands, are of great importance as alternative feeding areas as the birds' nutritional requirements cannot be met by natural food sources. This is partly due to the reduction in natural inland habitat such as coastal grassland, lost to development and agriculture.

Brent geese feed in daylight and the use of terrestrial feeding sites is greatest at high tide. In years with large numbers of juveniles (first winter birds), more use is made of terrestrial sites. This is partly due to competition for food on the intertidal from older, more efficient feeders, and partly because grass is more nutritious. Although families may choose to graze nutrient-rich grassland for their young, there is a trade-off with the increased risks associated with exposure to predators and disturbance compared to feeding on the intertidal. Harsh winters also cause an increased use of terrestrial sites as eelgrass dies back.

The suitability of sites for brent geese depends on distance from the coast, the size of the grazing area, the type of grassland management, visibility and disturbance. Brent geese prefer large open sites where they have clear sightlines and short, lush grass for grazing. They use a great deal of energy travelling between feeding areas, so tend to preferentially select sites adjacent to the coast. However, brent geese are often seen to fly over some apparently suitable sites to reach others, so there are undoubtedly more subtle factors controlling the desirability of sites.

Disturbance can have a marked effect on brent geese. When mildly alarmed, they raise their heads but quickly resume feeding. When levels of disturbance increase, they fly away and resettle when the cause of disturbance has passed or look for another quieter site nearby. The effects of disturbance have been investigated as part of a wider Solent study, commissioned by the Solent Recreation Mitigation Partnership, which aimed to measure the distribution of human activities and their effects on coastal birds and to determine the current and future impact of human disturbance on wintering bird populations of the Solent.

Brent geese are long-lived animals with a life expectancy of up to 30 years, although most do not survive that long. Brent geese exhibit faithfulness to their wintering grounds, with the same individuals having been recorded at the same site for over 20 years. The populations occurring in the Solent harbours appear to form discrete sub-populations; movement between and within sub-populations was identified an area in need of further research in the 2010 Strategy and has been investigated by carrying out an additional bird movement survey for the 2020 update.

1.2.2 Waders

The Solent supports significant populations of wading birds of international importance, (including a number that are listed on Annex I of the EC Birds Directive) and a number of species that exceed the thresholds of national importance.

Many species of wading birds migrate thousands of miles to overwinter in the UK, whilst others remain to breed (albeit in small numbers in the Solent). Several waders are passage migrants travelling annually from as far afield as the Arctic and Siberia, refuelling in the UK to carry on further to the southern-most tip of Africa.

The Solent coastline provides an internationally important wintering area for these species and this is recognised by its almost complete coverage as SPA and Ramsar. The average wintering population of all waders in the Solent exceeds 90,000 annually (BTO WeBS Core Counts, 2001-2006).

The Solent's intertidal habitats, its mudflats, shingle and saltmarsh provide vital feeding and roosting grounds. Waders are specially adapted to feeding in wetlands, adopting a variety of tactics to feed on invertebrates such as worms and molluscs, and in some cases fish that occupy the mudflats of estuarine areas. Waders are gregarious species, feeding and roosting together in large numbers and in the case of dunlin, in their tens of thousands.

The pattern of movement of wading bird communities is dependent on time of day, tidal water movements and weather conditions. Most species feed at low tide and roost at high tide. Natural roosting sites include saltmarsh areas, shingle banks and coastal grasslands. Waders are also known to roost on man-made structures such as boats, wharfs, jetties and piers. Roosting sites tend to be closer the coast, perhaps no more than 100 metres from mean high water. They are usually situated away from sources of disturbance, such as housing and industry, and have good visibility. Like brent geese, particular preferences for certain sites are not yet fully understood.

In recent years, curlew numbers have shown worrying declines (Frost, T. et al., 2018) and it has been added to the Red List of UK Birds of Conservation Concern and as Near Threatened on the IUCN Red List. The loss of inland grassland sites may be a contributing factor. In the Solent, key inland roosting and feeding sites for curlew are under threat. It is vital that the Strategy is used to inform decisions, and where important sites are identified the impacts are avoided to ensure that the network in maintained. There may of course be situations where mitigation and/or compensation measures could be used, in such instances early engagement with statutory consultees and relevant local authority ecologists is recommended

Disturbance is thought to have a serious negative effect on wading bird populations as the cost of energy expended by birds flying away from a source of disturbance may impact on their survival rates. Waders generally live for 10-18 years but some species/individuals can live much longer. They exhibit repeatable patterns of behaviour, for example in the case of migration, returning to the same sites year on year. Numbers have fluctuated significantly in the last 50 years, and some species have shown dramatic declines. The cause of the declines is not fully understood; however, hunting along migration routes, habitat change, shifts in distribution due to climatic factors and predation may be contributing factors.

1.3 The Solent's Current Site Designations

Much of the Solent coastline is recognised as being internationally important for birds and as a consequence is afforded high levels of protection. There are three SPAs: Solent and Southampton Water, Portsmouth Harbour and Chichester & Langstone Harbours (and a new SPA: Solent and Dorset Coast which is specifically for tern species). These sites are additionally designated as 'Wetlands of International Importance' under the Ramsar Convention (commonly known as Ramsar sites).

Both designations include recognition of the international importance of the Solent harbours and estuaries for wintering waterbird assemblages, and/or individually important populations of one or more species. Together they support a total wintering population of around 150,000 birds (see

Stillman et al., 2009 for a review). The boundaries of these designated sites generally follow the landward extent of the key semi-natural habitats such as mudflat, saltmarsh or grazing marsh, which support the bird populations. However, they do not encompass all the surrounding land used by the birds for which the international sites have been notified.

Underpinning the international designations in the Solent are Sites of Special Scientific Interest (SSSIs). These are more extensive than the international site boundaries in some landward areas, but still do not protect all terrestrial sites used by the wintering waterbirds. Other features such as plant communities or invertebrate populations may also be cited on the SSSI and Ramsar designations.

Non-statutory sites designated at the local level include Local Nature Reserves and County Wildlife Sites, known as Sites of Importance for Nature Conservation (SINCs) in Hampshire and the Isle of Wight or Sites of Nature Conservation Importance (SNICs) in Sussex. These locally important sites contain habitats or species identified as a priority at a county level. There are over 3000 SINCs in Hampshire, over 250 in Sussex and over 300 on the Isle of Wight. The County Wildlife Sites programme is linked with the local planning system; once they have been identified they are usually included by the Local Authorities in the appropriate Development Plan Documents.

1.4 Need for the Waders and Brent Goose Strategy

While there has been considerable survey attention dedicated to intertidal areas through, for example, the Wetland Bird Survey (WeBS) counts, comparatively little attention has been given to the ecologically-linked inland sites, such as fields and grasslands used for feeding and roosting and the vital role of such sites in supporting the designated site populations. In order that decision-makers and land-owners/land-managers comply with the requirements of the European legislation protecting migratory coastal bird populations (see Part 5), there is a critical need for a clear understanding of which of these sites are important for wintering birds, the factors that make these sites important, and how their relative importance is likely to change in respect of predicted sea level rise and other coastal changes.

In 2002, the Brent Goose Strategy went a long way towards identifying important sites for feeding brent geese in the Solent Harbours of Portsmouth, Langstone and Chichester. The 2002 Strategy proved a very useful tool to both planners and conservationists. It was therefore proposed that this work be updated and expanded to cover the entire Solent and to include roosting sites for wading birds. In 2010, the Strategy was enlarged and expanded to cover the whole of the Hampshire coast and also the north coast of the Isle of Wight; at the same time the breadth of the strategy increased to include over-wintering waders, as well as brent geese. The wading birds included in the study were either listed on Annex I of the Birds Directive and/or listed as qualifying features of the Solent's SPA sites, or form part of the SPA assemblage (a full list is provided in Appendix I). This strategy identified sites where there was regular recorded use, classifying these as "important". Sites where too few records were collected to be confident of regular use were classified as "uncertain". The strategy also used the data gathered to model the features of sites which make them potentially suitable for use by waders and/or brent geese, thus creating a set of habitat suitability criteria.

In order for the strategy to continue as a useful and important tool for all user groups, in 2016, the decision was taken by the Solent Waders and Brent Goose Strategy (SWBGS) Steering Group

to take forward the next phase of the strategy. The 2010 Strategy focused on the identification of sites in order to raise awareness, but this latest strategy looked to prioritise the conservation of the existing key network of sites used by birds and maintain them in favourable management through agreements with landowners and/or land acquisition. From 2016 to 2019 survey work focused on understanding how and when birds use the various sites in order to demonstrate their functional relationship to the SPA and a new bird movement study was devised; the findings published as the Solent Wader and Brent Goose Strategy 2020.

Current pressures from development, recreation, coastal re-alignment, climate change, sea level rise and coastal squeeze all highlight the urgent need to identify currently important sites and the potential changes in the usage of sites by birds over time. The updated Strategy aims to provide all those engaged with strategic planning and development management with a robust evidence base. This evidence will assist in assessing plans and projects which could impact on these sites. This is particularly important, given the relatively recent requirement for development plans, in addition to project-level proposals, to be assessed under the tests of The Habitats Regulations.

The principle objective of the Strategy is to inform decisions relating to strategic planning as well as individual development proposals, to ensure that sufficient feeding and roosting resources continue to be available and the integrity of the network of sites is restored and maintained, in order to ensure the survival of the Solent's coastal bird populations. The underlying principle is to, wherever possible, conserve extant sites and to create new sites, enhancing the quality and extent of the feeding and roosting resource.

A further ambition of this Strategy is to enable decision-making to look across boundaries and view important wintering waterbird sites as part of a network of sites, rather than isolated features of the landscape. The information provided here can help with the assessment of any 'in-combination' effects that might impact on the integrity of the network of important feeding and roosting sites, and hence impact on the statutory designated sites themselves.

The Strategy also attempts to quantify the factors that make a site suitable for birds which could be used to inform the creation of new or alternative feeding or roosting sites. In doing so, the strategy aims to help reduce the conflicts between the needs of wintering coastal birds, development and recreational pressures by promoting an integrated approach to land use and management, together with improved awareness and understanding.

Part 2 - The Survey

2.1 Survey Aims

To provide the data necessary to develop this Strategy, survey work was undertaken with the following survey aims:

1. To continue to document the locations of extant feeding sites for brent geese and high-water roost sites for wading birds, especially those outside the intertidal habitats of the Solent coastline.

2. To identify the network of currently used sites and carrying ground truthing and by carrying out a bird movement study in order to better understand how sites are functionally connected.

The previous findings relating to site characterisation and site vulnerability from the 2010 Strategy are included in Part 5 for completeness.

2.2 Survey Methodology

Potential survey sites have been identified by the Waders and Brent Goose Steering Group, using the knowledge of local bird experts and ecologists. All sites known to be used in the past or considered potentially suitable (due to their location or habitat) were mapped within a Geographical Information System (GIS). Site boundaries were defined using existing boundaries such as fields, seawalls or followed changes in habitat type. A total of 1,036 sites across the Solent have been digitised, see Figure 2 below.

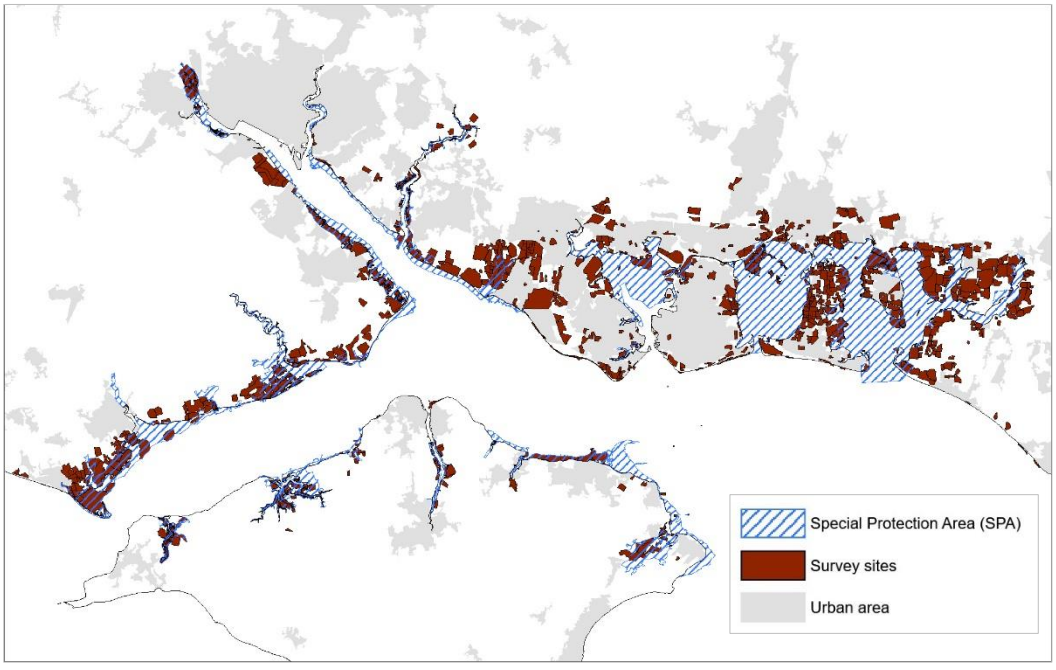


Figure 2. The survey project area, showing the extent of survey sites and the SPA.

The survey sites reflect land uses at the time the survey was designed. Since the survey commenced there have been a number of changes in land use, which will need to be considered

when drawing on the data. Bird use was recorded for each site but did not aim to identify whether the birds tended to use one part of the site more than another.

The most recent organised survey was begun in the winter of 2016/17. Sites were surveyed by expert surveyors including WeBS counters and trained volunteers. Three years of ground-truthing and bird movement survey work was carried out in three geographical phases: the Eastern Solent; the Western Solent, and the Isle of Wight. The Eastern Solent data gathering took place in the winter of 2016/17, the Western Solent in 2017/18 and the Isle of Wight in 2018/19. Over 25 surveyors took part (a full list of acknowledgements is provided in Appendix III).

The aims of the ground-truthing were to gather information on sites where bird usage was classified as "uncertain" in the 2010 Strategy and to remove sites by virtue of land use that makes them unsuitable for bird use. This was carried out by expert surveyors visiting sites and noting current land use, making an assessment of likely use by birds and where appropriate recommending adjusting boundaries to follow those on the ground. This information, in combination with up to date mapping and aerial photography checks were used to update survey site boundaries.

The bird movement survey method was trialled in October 2016 and refined to form a standard replicable method by November 2016. The method divided Solent regions into sections, a lead surveyor and three support surveyors were assigned to each section and each survey lasted four hours. Both movement observations and species counts (as per the previous Strategy surveys) were recorded.

Survey times and days were selected using tide timetables, with surveys carried out three times a month, alternating between, morning, midday and evening, around the high-tide, over the winter period from October to March. Although high-tide was not found to be crucial in driving movements of birds between sites, it was used as a basis to maximise chances of seeing birds on the inland sites, which was also found to increase over the course of the winter, as the intertidal feeding resources depleted.

In order to observe movements both within and across sections, surveyors kept in touch by mobile phone. Within sections two surveyors were based at "vantage" point locations and one surveyor at a point from which they would move to follow any movement observations.

Observations of movements were recorded on a bespoke survey form and annotated on a map and the maps were used to provide additional information as well as confirming site and movement locations. Sites codes from the previous strategies were used for consistency.

The records were collated along with the previous records from the 2010 Strategy, and supplemented with bird data from Hampshire Ornithological Society, Hampshire & Isle of Wight Wildlife Trust (HIWWT), the Solent Birds Studies bird surveys and Solent Birds Recording App, as well as additional surveys by Hampshire Biodiversity Information Centre surveys for the coastal local authorities.

Data was checked and filtered prior to analysis and any duplicate records were removed. Records were filtered to be within the survey period (October to March inclusive) and non-target species omitted. All records were collated into a single "master" dataset. Each record was spatially linked

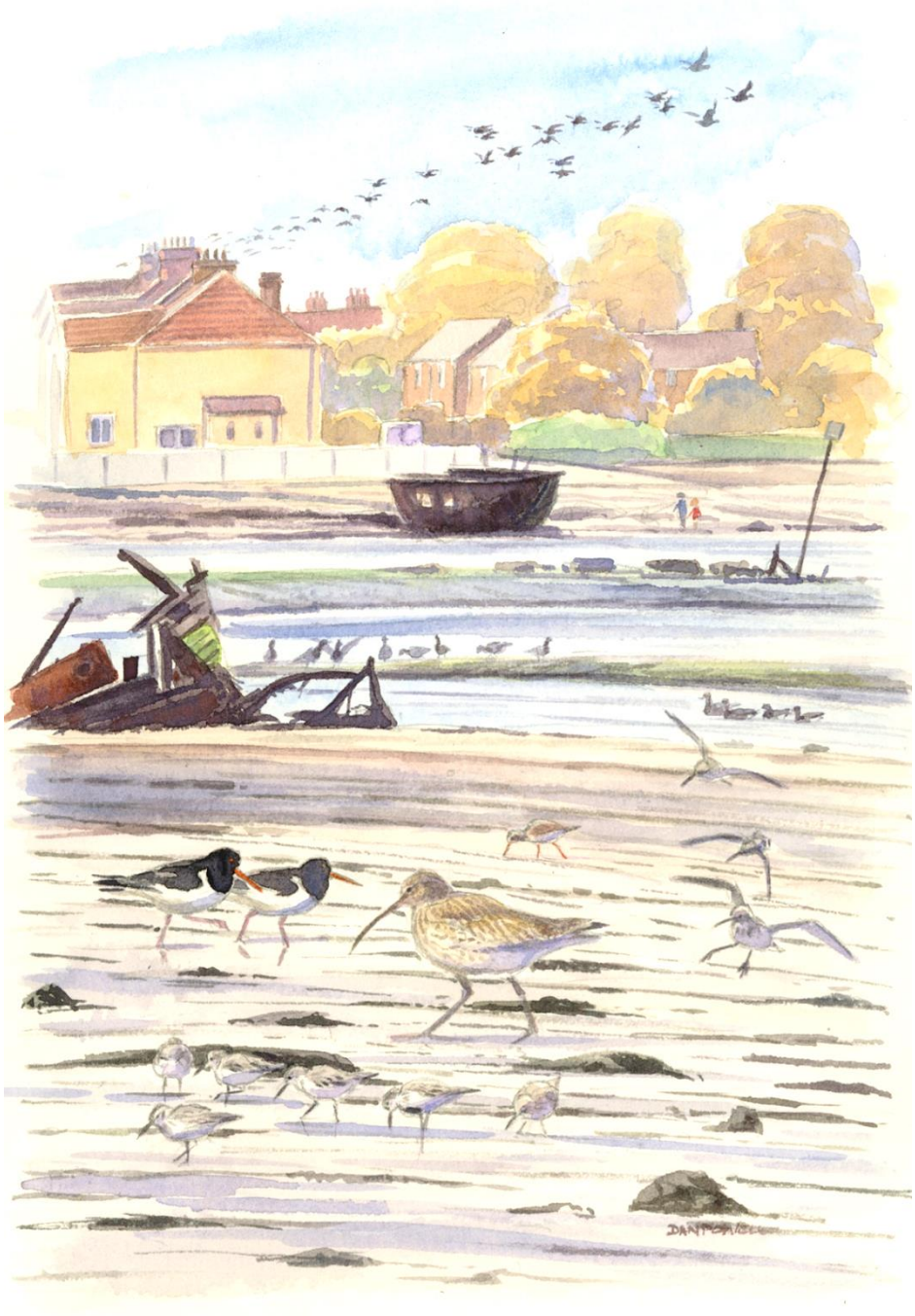
to a network survey site and assigned the site's unique code using GIS. These data were formatted to a consistent standard with obvious errors and removed.

2.3 Summary of Survey Results

Over 25,000 records have been collated since the winter of 2006-7, with over 10,000 gathered during 2020 survey period. Of the 1,036 sites identified for survey, 802 sites had records for waders and 649 had records for brent geese.

A total of 24 different wading bird species were recorded, with curlew, oystercatcher and redshank being the most frequently recorded species, the highest individual count was for dunlin with 15,000 recorded twice in Chichester Harbour in a single location. For brent geese, counts were reported for numbers in excess of 3,000, with maximum counts of 3,500 at Farlington Marshes and 4070 on Hayling Island.

Part 3 - Analysis of Current Use



3.1 Analysis of Site Use

In a change to the previous 2010 Strategy, a new assessment method for site importance was devised in order to better inform mitigation decisions relating to impacts on wader and brent goose sites. In order to assess the importance of each site, a metric-based analysis technique was developed; five metrics were devised; sites were given a score for each metric and then each score was summed to give an overall score. The overall score results in a classification of site importance as either "core", "primary support area", "secondary support area" or "low use site".

3.1.1 Metrics

The first three metrics assess each site in relation to population and assemblage thresholds.

1) **Comparison to national population thresholds**: the BTO publishes national and international thresholds for each species **(BTO, 2017)**, after which a count of that species should be considered important, scoring as follows:

0: Site has less than the GB threshold for any species

1: Site has more than the GB threshold for any species

2) Comparison to SPA designated features of interest: compares records for species that are designated a 'feature of interest' in the closest SPA i.e. the number of birds recorded compared to **the population sizes listed in the SPA citations** (JNCCa, 2017; JNCCb 2017), scoring is as follows:

0: Site has <1% of SPA's designated population

2: Site has 1-5% of SPA's designated population

3: Site has ≥5% of SPA's designated population

3) The third metric assesses the 'feature of interest" for the closest SPA for **species assemblage**. The total of all max counts for all species recorded, compared to the assemblage population size listed in the SPA citations (JNCCa, 2017; JNCCb, 2017). For Portsmouth Harbour a proxy threshold was used as no assemblage figure is given in the SPA citation, instead the WeBS core count five year average has been used (BTO 2018 Frost et al. 2020 https://www.bto.org/sites/default/files/wituk-2018-19-web.pdf) the scoring as follows:

0: Site has <1% of SPA's designated assemblage population

2: Site has 1-5% of SPA's designated assemblage population

3: Site has ≥5% of SPA's designated assemblage population

In order assess the value of sites at the local level a fourth metric was newly devised and termed the “Local Value” metric.

4) The fourth metric, **Local Value**, compares records for each site to local population thresholds for each SPA area. The threshold is set as the third quartile for each species based on the frequency distribution from all records for each species, used in the Strategy.

0: Site has no records higher than the local value for any species

1: Site has more than one record hight the local value for any species

The fifth metric, max count has been used in all previous strategies to identify sites that support large numbers of birds.

5) The fifth metric is the **max count** of any target species recorded on the site.

In order to identify roosting sites used by particular species of wading bird, a sixth metric was designed and termed Species Incidence.

6) The sixth metric, **species incidence** aims to identify sites that are important for site faithful and gregarious wader species such as redshank. Sites thresholds were set as those having more than 10 records for a single wader species and with over 10 of those records making up 50% or more of the total species records for the site.

0: Sites not passing the two Species Incidence metric thresholds
1: Site passing the two Species Incidence metric thresholds

The seventh metric relates a site’s importance to a **network score** for birds moving to and from the intertidal areas to inland sites, and between inland sites. This metric uses data from the HIWWT bird movement surveys.

The network of sites used by brent geese and waders were mapped, and all movements where both the origin and destination were observed by a surveyor were analysed. The properties of this network were then assessed, this identified two types of sites: those that function as ‘hubs’, with connections to lots of other sites, and those that function as ‘bottlenecks’, linking two areas of the network together. Hubs are identified by their degree: defined as the number of other sites to which they are connected, bottlenecks are identified by their “betweeness centrality”: this is a measure of the number of pathways through the network that pass through a given site. Some sites may score highly on both metrics, functioning essentially as both a hub and a bottleneck. The concept of hubs and bottleneck sites is illustrated in Figure 3 below:

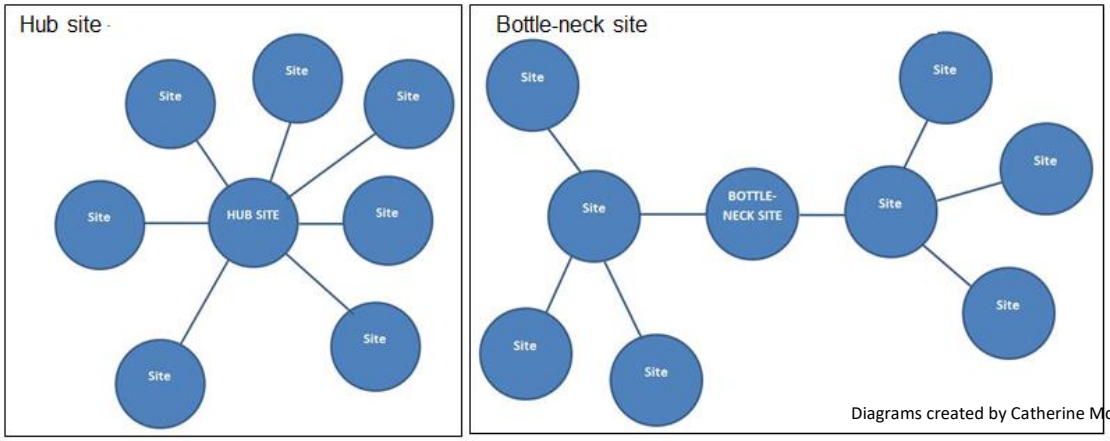


Figure 3: Hub and bottleneck sites

The network analyses were conducted using the igraph software package (Csardi & Nepusz, 2006).

7) Sites were included for their network value if they scored:

2 or higher for bottlenecks and/or
2 or higher for hubs

If sites scored a 2 in either category they were marked for inclusion with a "yes"

3.1.2 Site Classifications

The quantitative scores from each of the metrics were then summed to then classify each site.

Core Areas are defined as sites that have either:

- a network value;
- and/or the max score of 7 in the 3 metrics: GB Importance, SPA Importance and SPA Assemblage;
- and/or a max count of bird use of 1000 or more.

Primary Support Areas are defined as sites that have:

- a score 3-6 in the 3 metrics: GB Importance, SPA Importance and SPA Assemblage;
- and/or sites that score 1 in the wader metric: Species Incidence.

Secondary Support Areas are defined as sites that have:

- a score of 1-2 in the 4 metrics: GB Importance, SPA Importance, SPA Assemblage and Local Value.

Low Use Sites are defined as sites that:

- have records of birds but in low numbers (score 0).

In a change to previous iterations “uncertain” sites were redefined for this update as being sites with positive records of more than 100 birds but with less than three records, they have also been renamed as “candidate” sites, as their classification is likely to change on the submission of more records.

Candidate Sites are defined as sites that:

- have records of high numbers of birds (max count equal to or greater than 100) and/or a total score equal to or greater than 1 in the 3 metrics: GB Importance, SPA Importance and SPA Assemblage but have less than 3 records in total.

In a further change to previous iterations, sites within the SPA sites not classified but are shown to provide complete picture of the Solent-wide network:

SPA Sites are defined as sites:

- that fall within the SPA area that have bird records and thus forming part of the ecological network.

Sites with only negative records are not mapped but provided for information as a separate list and GIS layer entitled “Sites with Negative Records”

3.2 Update to the Strategy 2010

This strategy updates the Brent Goose Strategy 2002 and the Solent Waders and Brent Goose Strategy 2010. Where up to date data does not exist in the 2010 or 2020 iterations or for sites identified as "important" in the 2002 Strategy, the 2002 Strategy remains the best available data source. It is recommended that those sites identified as important in 2002 but lacking recent data be surveyed and re-assessed using the 2020 methods.

3.3 Limitations of the Data

It is important to recognise several limitations of the data. The use of sites fluctuates with population size, which is dependent on breeding success at summer breeding grounds; usage can therefore change from year to year. In certain winters the numbers of juvenile brent geese can be relatively low and therefore recent surveys may not be representative of sites used by these birds in more productive years.

The use of some sites will vary if the land use or management changes. For example, if a field is ploughed or allowed to scrub over, it will no longer be suitable to for use. The data therefore can only reflect the use of sites as dictated by their management regime during the study period.

The use of many sites is affected by disturbance from, for example, recreational activity, which can also vary considerably according to (i) day of the week e.g. greater use of sports pitches at weekends and Wednesday afternoons (ii) weather e.g. more dog walkers, golfers etc. may be present during dry weather. It is also likely that data collection by recorders has been biased towards (i) weekends and (ii) dry weather, which may mean numbers have been under recorded, as these are the times when higher levels of disturbance are likely.

The complete use of sites under extreme weather conditions is also unlikely to have been captured. For example, in extreme winters brent geese have been known to fly far inland to find suitable feeding sources, this has been observed over the course of the surveys and may occur again in future years.

In addition, recorder effort has been unevenly distributed with the result that some sites have been counted more regularly than others. Ideally, sites should have been counted every two weeks. This is been addressed in part by applying the new classification method for low use and candidate sites.

Part 4 - Site Characterisation Analysis

4.1 Site Factors

The original Brent Goose Strategy 2002 identified a suite of factors likely to influence the use of sites by brent geese i.e. habitat, land management, size and shape. This was investigated further for the 2010 Strategy by carrying out a number of detailed statistical comparisons of site use in relation to factors such as topography and proximity to the coast.

Statistical correlations show that factors that describe how urban the area surrounding a site is, e.g. distance to road, area of buildings, relative distance of buildings and number of homes at different travel times, all significantly correlate with brent goose and wader site usage. Factors which describe the position and topography of the site, such as linear distance to high water, mean height and range in height (relative to sea level) also all significantly correlate with use.

Many of the factors were found to be interrelated i.e. large sites tended to have more uniform shapes, and preferred habitats such as shingle banks tend to be long and thin, making it difficult to isolate the importance of particular factors. All the site factors and their relationship to use are listed in Table 3 below.

Table 3. Site Factors - significant correlating factors and their effect on the suitability of sites for waders and Brent Geese.

	Waders		**Brent Geese**	
Factor	**More suitable**	**Less suitable**	**More suitable**	**Less suitable**
Area (ha) *	Larger	Smaller	Larger	Smaller
Shape - size/perimeter*	Irregular – long and thin	Regular - square	Regular - square	Irregular – long and thin
Area of buildings within 50m (m2) zone*	No buildings in this zone	Buildings in this zone	Not significant	Not significant
Area of buildings within 50-500m (m2) zone*	No buildings in this zone	Buildings in this zone	No buildings in this zone	Buildings in this zone
Area of buildings within 500-2500m (m2) zone*	No buildings in this zone	Buildings in this zone	Not significant	Not significant
Homes within 15 mins *	No homes	Homes within	Not significant	Not significant
Homes within 30 mins *	No homes	Homes within	Not significant	Not significant
Mean height (m)*	Low lying	High ground	Low lying	High ground
Range in height (m)*	Flat	Uneven	Flat	Uneven
Distance to Road (km)*	Further away	Closer	Not significant	Not significant
Distance to MHW (km)*	Closer	Further away	Closer	Further away
Isolation Index	More isolated from other sites	Closer to other sites	Close to other Brent sites	Further away from other Brent sites
Habitat*	Coastal and grassland sites, then agricultural	All other habitats	Coastal and grassland sites, then agricultural	All other habitats

* interrelated factor

Although most factors affect site suitability in predictable ways, the reasons for certain effects are less clear, for example for brent geese the significance of buildings within the different distance zones varies; the only significant zone to make a site less suitable is the middle distance: 50-500m. Perhaps this acts as a source of intermittent disturbance or possibly this area impacts on flight paths or sight lines in some way. It is clear that more work would be needed in this area to explain these interactions. However, the analysis does provide a broad evidence base for identifying the factors which make a site suitable for waders and/or brent geese and as a result has a number of potential applications, for example:

• firstly, the findings could be used to inform land management decisions to improve and maintain existing sites for birds e.g. grazing and cutting regimes for coastal grasslands or scrub control;

• secondly, they could be used to inform the acquisition of land for nature conservation purposes, to increase the current resource in the most suitable areas;

• and thirdly, they could be used to inform the creation of new sites that may be necessary to offset any losses within the Solent due to any of the current pressures identified in Part 5.

Part 5 - Issues

5.1 Site Protection

Despite being species of international importance, many brent goose feeding sites and wader roost sites around the Solent fall outside of the statutory nature conservation site boundaries. The majority of brent goose feeding sites are amenity/ recreation grasslands and improved farmland with little intrinsic nature conservation interest, and therefore are easily overlooked and therefore vulnerable to loss or damage from development and other land use changes. Some sites may have a limited level of protection from development through open space or recreational policies or as County Wildlife Sites, however such designations do not fully reflect their importance in supporting the wintering bird populations within the statutory designated sites.
The designation of the statutory national and international sites is intended to ensure the long-term distribution and abundance of priority species, and the distribution, structure and function of the habitats necessary to support them. Therefore, it must be recognised that the feeding and roosting sites supporting the Solent's designated wader and brent geese populations are functionally important for the integrity of the internationally important sites.

5.2 Development Pressure

The south of England has a number of densely populated urban areas and there are huge development pressures, particularly in South Hampshire. There are 1.7 million residential properties (equating to approximately three million residents) within 50km of the Solent shoreline (Stillman et al., 2009). The Solent is a busy commercial, industrial and residential area. Other development types e.g. port improvements are also focused in the area. Pollution threats, development and recreation pressures are all listed under 4.3 of the Solent SPA documentation under "vulnerabilities" (see: www.jncc.gov.uk/page-1401).

Planning authorities should consult with Natural England on the likely direct or indirect effect of potential developments around SSSIs, SPAs and SACs in the Solent. In 2019, The SW&BGS Steering Group issued new guidance on mitigation and off-setting requirements in order to inform decisions regarding the development of SW&BGS sites. The guidance outlines proportionate requirements according the new site classification system, and an area-based payment scheme for offsetting impacts which cannot be avoided or mitigated on site, should permission be granted.

Several brent goose feeding sites and wader roosts have already been lost to development around the Solent, and the cumulative impact or knock-on effect on other sites has not been taken into account by decision-makers. It is intended that this Strategy be used as an evidence base to inform proposals and decisions, which may indirectly or directly impact on sites currently used by brent geese and wading birds. This evidence contributes to the baseline data for associated Habitat Regulation Assessments. This evidence will also inform the forward planning process. This Strategy is a non-statutory document although it seeks to inform such documents.

5.3 Disturbance Pressure

There is not only considerable pressure on existing land, both for housing and associated infrastructure, but also for access and recreation. The Solent coastline is an attractive location and draws people from a considerable distance for a range of recreational activities.

Many inland sites currently used by brent geese are also used for recreational, commercial, industrial or agricultural purposes, which on some occasions prevents or reduces usage by brent geese due to disturbance. Several sites used by waders at high tide are also vulnerable to disturbance, especially from recreational activities, which would likewise prevent them being used. Both waders and brent geese need a network of sites from which to choose and fly between in order to cope with changing circumstances at individual sites.

Additional housing will lead to more people visiting the coast and therefore has the potential to cause more disturbance to the birds. The Bird Aware Solent initiative, launched in 2017, aims to mitigate for increases in disturbance to coastal birds through a Solent-wide programme of rangering, awareness raising and access management; key activities which have been shown to reduce the impacts of increased visitor pressure. This programme is also funded via developer contributions.

It is vital that it is recognised that the density of the human population around the Solent and the current plans to further increase this, alongside the pressure to identify more green space for multi-functional usage and increased access to the coast in general, requires a multi-faceted approach in order to successfully conserve a robust network of roosting and feeding sites in the Solent.

5.3 Climate Change, Coastal Squeeze and Sea-Level Rise

There is also pressure on existing sites from climate change, coastal squeeze and sea-level rise. A large proportion of the most important coastal bird sites in the Solent are in flood risk areas as identified by the Environment Agency Flood Risk Zones. Sea-level rise is predicted at rates of 4mm to 15mm a year, over the next 60 years (Defra Flood and Coastal Defence Guidance, 2006) and climate change may also bring an increase in tidal surges and extreme weather events. This undoubtedly puts many important feeding and roosting sites identified in this Strategy at risk.

Coastal habitats are considered to be under threat from climate change. Predicted changes to existing intertidal habitat across the north Solent, regardless of defences or nature conservation designations, are estimated at an increase of 60 hectares (ha) for mudflat and at a loss of 812 ha for saltmarsh, over the next 100 years (Channel Coastal Observatory, 2008). Intertidal coastal squeeze resulting from maintenance of existing defences across the north Solent over the next 100 years is estimated to be approximately 5 ha of mudflat coastal squeeze and 495 – 595 ha of saltmarsh coastal squeeze.

These habitats are vital to wintering waterbirds and are key qualifying features of the Solent's national and international designations. Changes to them will have significant implications on site availability for coastal birds. It is therefore inevitable that inland sites will become even more important in the Solent in the future.

5.4 Land Management

Land management can be a crucial factor in site suitability for waders and brent geese. changes in land management can prevent some potentially good sites from being used, all of which combined, increases the pressure on the total network of sites. For example, coastal grassland sites no longer under a suitable management regime can quickly become unsuitable for roosting

waders or feeding Brent Geese as visibility decreases. Tree planting or other landscaping in and around amenity sites will also make these sites less suitable.

Ploughed fields, stubble and certain crop types are unsuitable for these birds and there are a few sites where Brent Geese are actively discouraged from feeding, particularly for crop protection on arable land through the use of gas guns and other bird scaring techniques. changes in the types of crops grown on farmland will also affect the suitability of these sites for brent geese. Currently there are no options for brent geese or wader roosting habitat within agricultural stewardship schemes.

5.4 Decision-Making

Experience has shown the value of incorporating the requirements of brent geese and wading birds into the planning system. This evidence may inform a variety of local and strategic development plans together with coastal management plans and green infrastructure strategies. Detailed guidance on how proposals affecting statutory designated sites, or the interest they support, should be treated can currently be found in the New Planning Policy Framework[1] paragraphs 174 to 177, the Government Circular[2] and the European Commission's pages on the "Management of Natura 2000 Habitats"[3]. A short summary of the requirements set out in the relevant policy and legislation is given here, however this is purely intended as an overview and is not definitive.

[1] *National Policy Planning Framework, February 2019, Ministry of Housing, Communities and Local Government*

[2] *Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System (ODPM 06/2005, Defra 01/2005)*

[3] *https://ec.europa.eu/environment/nature/natura2000/management/habitats/models_en.htm*

5.6.1 The Conservation of Habitats and Species Regulations 2017

Migratory waterbirds are protected under European legislation[4], translated into UK law by The Conservation of Habitats and Species Regulations 2017 as amended (commonly known as 'The Habitats Regulations'). The Habitats Regulations ensure that wintering waterbirds, including brent geese and waders, are specially protected within the Solent's SPAs and Ramsar sites. however, these species are dependent on roosting and feeding sites that are outside of the designated site boundaries and, therefore, these essential supporting sites must also receive adequate protection to ensure achievement of favourable conservation status. Article 4(4) of the Birds Directive states that 'outside these protected areas (SPAs), Member States should 'strive to avoid pollution or deterioration of habitats'. Therefore, it is clear that it is not simply the SPA itself that is important, but the interest features that give rise to the designation.

Any impact on a wader roost or brent goose feeding site outside of the SPA/Ramsar site boundaries may be considered to have an effect on the international site itself. Where impacts cannot be avoided or satisfactorily reduced/mitigated, the competent authority will need to ascertain that the plan or project will not have a negative impact on the designated populations, which would constitute an adverse effect on the integrity of the international site.

There is a detailed process by which a plan or project affecting an SPA/Ramsar or other international site, including feeding or roosting grounds beyond the boundary of the designated site, should be considered. This is set out under Regulations 63-69 for 'plans and projects', and Regulations 105-109 specifically for land use plans[3] of the Habitats Regulations and is further explained in the NPPF and the Government Circular.

The Solent Waders and Brent Goose Strategy grew out of the need to clarify and resolve potential site protection issues concerning offsite SPA features around the Solent. Documents such as this Strategy are an appropriate way forward in seeking to inform local decision-making. This Strategy therefore aims to inform the above process and, where possible, to ensure appropriate provisions are built into policy and projects at an early stage of their development.

[4] *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the 'Habitats Directive'); and Directive 2009/147/EC on the Conservation of Wild Birds (the 'Birds Directive').*

5.6.2 Planning Policy Statements

In addition to the site protection regime required under the Habitats Regulations, the NPPF in paragraphs 170-177 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

2.a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status o identified quality in the development plan

5.*d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*

and furthermore, in order protect and enhance biodiversity and geodiversity, plans should:

1.*a) Identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity (Circular 06/2005 provides further guidance in respect of statutory obligations for biodiversity and geological conservation and their impact within the planning system); wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation (Where areas that are part of the Nature Recovery Network are identified in plans, it may be appropriate to specify the types of development that may be suitable within them.); and*

1.*b) promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.*

This approach of establishing networks of natural habitats is a key principle of the Lawton Review (2010) which proposed that England's wildlife areas need to be 'more, bigger, better and more joined' if they are to form a coherent and resilient ecological network. Sites of biodiversity importance should be linked to provide routes or "stepping stones" for the migration, dispersal and genetic exchange of species in the wider environment. The importance of site linkages for wading birds and brent geese has been evidenced here by the bird movement study and identification of "bottleneck" and "hub" sites (see Section 3.1).

In addition, the Natural Environment and Rural Communities (NERC) Act 2006[5] also places a biodiversity duty on all public bodies, which is in addition to Local Authorities' existing duties under the Wildlife and Countryside Act to take steps to conserve and enhance SSSIs as part of their functions. This new duty extends to conserving biodiversity outside of designated sites.
Section 40, Part 3 of the NERC Act states:

"Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity."

[5] https://www.legislation.gov.uk/ukpga/2006/16/contents

Part 6 - Spatial Analysis - Future Use

6.1 Potential Sites

The identification of sites of current importance should help to protect the known resource for waders and Brent Geese. However, the coast is a dynamic habitat and site-use patterns may change with time. Suitability of sites may also change with increases in development and disturbance affecting the suitability of sites. There is therefore a need to identify potentially important sites as an alternative resource to help direct efforts to enhance and extend the resource.

As the site characterisation analysis of Part 4 has shown, the factors that make a site suitable for use are complex and often interrelated. A site may become suitable for use by birds due to its size, shape and proximity to the coast but is unused because of its land management.

Using the site characterisation analysis, a statistical modelling exercise was used to identify sites as being potentially suitable for brent geese or waders using the ranges for each factor that most strongly correlated with important sites (Footprint Ecology Spatial Analysis Report, 2010). Sites are identified in the Strategy for which probability for being potentially suitable was greater than 0.5 (50%). All of these sites should be seen as warranting site-specific assessment and potential enhancement for the purpose of maintaining the integrity of the designated Solent wintering waterbird populations.

6.2 Vulnerable Sites

6.2.1 Effects of rising sea levels and increased coastal flooding

With rising sea-levels many sites will become vulnerable to temporary flooding with the potential risk of being lost completely. As this happens, sites that were once less important may become more important as they become closer to the coast; this is particularly significant for high tide wader roosts. In order to investigate which sites might change in importance and warrant particular attention, an analysis was carried out to find out which wader sites were most important during times of extreme high tide, a condition which might reveal where birds might go should more regularly used sites become unavailable permanently.

The wader data were filtered to select only those counts that were within 2.5 hours of high tide and where that high tide was particularly high i.e. the top 10% of high tides, in order to focus the analysis on sites used when low-lying sites were unavailable. The current use analysis was then repeated. Of the sites that were classified, a total of 31 (17%) scored lower on assessment and a total of 151 (83%) scored higher on assessment or stayed the same, indicating that the majority of high tide sites are used at times but a significant number will become even more used in the face of sea level rise. These sites are shown in map 45 in the Strategy Mapping Files.

All the survey sites were assessed to determine their vulnerability to sea level rise of above 1 metre. Contour data was extracted from Environment Agency LIDAR data and overlaid over the important sites for wading birds and brent geese identified in the current use analysis. It was found that 115 (62%) of the important brent goose sites and 78 (76%) of the important wader sites were vulnerable to sea level rise (i.e. more than 50% of their total area fell below 1 m relative to sea level). These sites are mapped and provided in the accompanying Strategy GIS files.

The vulnerability of sites was further investigated using Environment Agency Flood Zone data. Tidal Flood Zones are mapped by the Environment Agency and generally comprise land that is lower than the estimated height of the extreme surge tide in the relevant event. Zone 2 comprises land assessed as having between a 1 in 100 and 1 in 1000 probability of river flooding or between a 1 in 200 and 1 in 1000 probability of sea flooding. Zone 3 comprises land assessed as having a 1 in 100 or greater probability of river flooding or a 1 in 200 or greater probability of sea flooding. The Brent Goose and wader sites were queried to determine the number of important sites that fell within each flood zone. Not surprisingly, for both types of site a high proportion of sites are within areas identified as having a high risk of flooding, with for example 71% of Brent Goose sites and 52% of wader sites falling within Zone 2.

6.2.2 Effects of changes in coastal realignment

One of the most important but low-lying and consequently vulnerable sites for both waders and brent geese is Farlington Marshes, in Langstone Harbour. Farlington Marshes is a low-lying area of salt marsh, reedbed, grazing marsh and coastal grassland, surrounded by a seawall. It is used in significant numbers by both waders and brent geese. To the north are low-lying recreational fields, arable fields, a motorway and the urban areas of Portsmouth and Havant.

In a hypothetical scenario, the potential impact of managed retreat at Farlington Marshes was investigated as a case study into the effects of coastal realignment on a key coastal bird site. The study investigated whether there exists alternative low-lying feeding and roosting resource within the current known resource within the Harbour system, to replace Farlington Marshes' position within the important site network. In this scenario, a managed retreat policy that would involve a breach of the seawall and a loss of 105 ha of land was proposed.

As a result, it is assumed that a large majority of the sites that make up Farlington Marshes would be lost and thus unavailable to birds. The immediate effects on adjacent sites within Langstone Harbour would be a change to their distance to Mean High Water and a change to their site isolation index, which as established in the site characterisation analysis, are significantly correlated to site suitability. To investigate whether any of the currently identified sites could replace Farlington, the statistical model was re-run, applying the loss of sites and the site potential probabilities re-calculated (see Part 4).

The effect on site potential varied, with some sites becoming more suitable and some sites becoming less. Sites immediately behind Farlington showed the most marked change, becoming more potentially important by 6% but overall, the changes were very small. It can therefore be concluded that mitigating for the loss of Farlington Marshes would be impossible within the existing resource within Langstone Harbour and alternative sites would need to be newly created or sought outside the local network.

Many of the sites for both brent geese and waders are low-lying and close to the Mean High Water mark, and it is clear from this analysis that flooding and future sea level rise are likely to have significant impacts. Therefore, alternative sites must be actively secured and appropriately managed to buffer these effects in order to maintain the network of feeding and roosting sites necessary to support brent goose and wader populations in the Solent in the long-term.

An illustration of these issues may be made through a hypothetical scenario of doubling existing mapped urban development around the wader and brent goose sites. To investigate the effects

of increases in development the statistical model was re-run applying increases in development around the sites. This resulted in a decrease in predicted suitability across all wader and Brent Goose sites.

A doubling in the amount of existing developed area, around sites resulted in the number of the currently used sites falling from 83 to a predicted 49 for waders. In general, the brent goose site network seemed more robust than the waders but an overall decrease of was still predicted.

Increases in development across the Solent are likely to significantly damage the integrity of the coastal bird site network. The 'in-combination' effects of increased proximity to housing, increased visitor pressure, recreational activity and habitat loss are likely to be even greater. This further highlights the need to buffer the existing site network through improved management and creation of alternative sites to secure the Solent's brent goose and wader populations into the future.

Habitat loss was also considered, alone and in combination with increased housing. It was found that the decrease in importance as a result of habitat loss in combination with increased development results in a greater predicted decrease in overall site suitability than either factor on their own.

Part 7 - Policies and Proposals

The Solent Waders and Brent Goose Project Steering Group recommend that this Strategy be treated as an agreed evidence base for considering all relevant planning proposals. The Group further recommends that, to help avoid potential development and site protection conflicts arising, Local Planning Authorities consider using this evidence base to inform future strategic plans including Development Plan Documents and Supplementary Planning Documents. The following recommendations are phrased as policies which are commended to the relevant authorities.

7.1 Planning and Development

The Solent planning authorities of Havant Borough, Gosport Borough, Fareham Borough, Eastleigh Borough, Test Valley Borough, Southampton City, Portsmouth City, Winchester City, New Forest District, Chichester District, New Forest National Park Authority, Isle of Wight Council, Hampshire County Council and West Sussex County Council will need to take full account of wading birds and brent geese in all forward planning and development control decisions and in other activities which may have an effect on these sites (see Section 6). This Strategy will enable planning authorities to seek the advice of Natural England and other advisers in the event that a proposal is likely to impact on an important site. The Strategy will also assist individual proposals to be assessed in combination with other plans and projects.

Policy W&BG1

Planning Authorities will recognise the importance of the wading bird and brent goose sites outside of the statutory designated areas in the Solent and will use the Solent Waders and Brent Goose Strategy as a material consideration in the preparation of development plans and in the determination of planning applications.

It is strongly recommended that the relevant Local Biological Records Centre (LRC) (Hampshire Biodiversity Information Centre, Isle of Wight Local Records Centre, or Sussex Biodiversity Record Centre) and, where appropriate, the Chichester Harbour Conservancy be consulted for detailed information about individual sites. For partners and funders of the Solent Waders and Brent Goose Project Steering Group, there will be unlimited access to data and GIS layers via the LRCs, subject to a service level agreement where appropriate. For other parties, access to data will be managed in agreement with the relevant LRC and the Solent Waders and Brent Goose Strategy Steering Group, and will be subject to standard terms, conditions and charging policies.

Policy W&BG2

Planning Authorities will actively encourage the enhancement of existing and potential brent goose and wader sites, and where appropriate the creation of new sites through development control and forward planning functions.

In addition to protecting the existing feeding and roosting resource, it is imperative that Local Authorities seek all opportunities through their development control and forward planning functions to improve existing and potential sites (focusing on those identified in this strategy) or create new sites, in order to buffer the network of sites from the indirect effects of development. Local Authorities should also strive to ensure that new development does not prejudice options for future enhancement or extension of the resource.

The enhancement of identified potential sites and the creation of new sites is also particularly important in response to sea level rise. Coastal protection must not compromise or preclude the ability to preserve the interest features of European sites, ensuring that opportunities and options for sustainable flood management and migration of habitats and species are actively promoted.

7.2 Site Protection

It is critical that sufficient feeding and roosting areas continue to be available each winter to ensure the survival of the wading bird and Brent Goose populations, both at their current levels and also taking into account natural fluctuations in populations. A fundamental principle is to ensure protection of the existing level of feeding and roosting resource, conserving the currently important sites through appropriate management and protection from development and damaging activities.

The Conservation Objectives for the relevant international sites recognise that populations of wintering and migratory birds may change as a reflection of national or international trends or events. The Objectives are aimed at maintaining habitat capable of supporting internationally important species and numbers irrespective of these trends or events. The Objectives also state the need to provide suitable feeding and roosting habitat to support cited species outside of the designated site.

Member organisations of the Strategy Steering Group will continue to monitor and advise on suitable levels of feeding and roosting resource in the Solent necessary to ensure the long-term survival of the wading bird and Brent Goose populations, irrespective of natural fluctuations in population trends, in line with the Conservation Objectives for the European sites.

Policy W&BG4

Where appropriate, the important sites for wading birds and brent geese that fall outside the international and national designations should be considered for County Wildlife Site or Local Nature Reserves designation and given appropriate protection through Local Development Framework policies.

7.3 Mitigating/Compensatory Measures

Given the pressures for development in this densely populated area, there may be cases where loss or damage to an important wading bird or Brent Goose site outside the statutory protected areas cannot be avoided or impacts reduced/mitigated to such an extent that the impacts are de minimus. In such situations, the competent authority must carry out an Appropriate Assessment under the Habitats Regulations and, subject to meeting the tests of 'no alternatives' and 'imperative reasons of over-riding public interest', compensation must be secured to ensure no net loss of roosting or feeding resource whilst maintaining the ecological coherence of the network of statutory sites.

Policy W&BG5

Development proposals which could affect important wading bird and brent goose sites outside of the statutory designated areas need to demonstrate levels of impact, alone and in combination with other proposals. Where a negative impact upon an important wading bird or brent goose site cannot be avoided or satisfactorily mitigated, and the tests of the Habitats Regulations are met as necessary, appropriate compensatory measures will be sought, as per the SW&BGS Guidance on Mitigation and Offsetting Requirements.

Avoidance and mitigation measures may include carrying out construction works outside of the core winter period (October-March inclusive) or enhancing the feeding or roosting site to increase its capacity through favourable management. Such measures may be subject to consultation between the relevant authority and Natural England.

Offsite mitigation and compensatory measures, by comparison, involve creating new feeding or roosting sites or refuges, and must be subject to meeting the tests of the Habitats Regulations. Given the right conditions (location, size, habitat and appropriate management), it is possible that coastal birds will exploit new sites or refuges. Potential sites for this purpose have been identified in Parts 4 and 5 of the Strategy but further work is needed to identify suitable sites Solent-wide. Advice must nevertheless be sought from Natural England as to the most appropriate course of action on a case-by-case basis.

Where appropriate, planning permissions will have conditions attached to ensure the provision of preventative measures, or a legal agreement sought to secure long-term appropriate management and monitoring of the site, or replacement of habitats or features lost.

7.4 Site Management

Site management for wading birds and brent geese can cover a range of measures such as (i) direct habitat manipulation, e.g. implementing a mowing regime to ensure the availability of suitable grass for grazing; scrub clearance to maintain an open habitat or (ii) control of factors causing disturbance e.g. restricting or zoning recreational activity on important sites between October and March. This will be particularly important on sites with multiple uses where efforts should be made to integrate the needs of wading birds and brent geese with those of people.

Many of the sites currently used by brent geese are managed as sports grounds or amenity grasslands, which happen to also provide ideal brent goose grazing. However, levels of disturbance at these sites are often high, resulting in brent geese being forced to find alternative grazing. Other sites could be managed to increase their capacity for Brent Geese to help reduce the conflicts between geese and people elsewhere. Local Authorities should explore opportunities to provide alternative brent goose feeding sites or enhance the existing site network to accommodate brent geese, particularly on sites under their own management.

In harsh winters, or seasons with high numbers of young brent geese, it may be necessary to provide ‘refuge’ sites in January (when food is at its scarcest and bird numbers are at their highest). Refuge sites have been proven to work, and opportunities to provide temporary refuges in January should be explored. Some farmland sites may be the most appropriate locations for such refuges.

Particular needs of wader roosting sites include close proximity to feeding areas, uninhibited access to roosting sites, minimisation of disturbance and provision of extreme weather refuges.

Policy W&BG6
Public and private landowners or occupiers will be actively encouraged to favourably manage important Brent Goose and wader sites, and to ensure continued provision of suitable habitat in light of sea level rise predictions and other pressures on existing sites.

Sea level rise and coastal change are likely to result in the loss of important sites in the future. Whilst it is difficult to predict the precise nature of this impact, Part 5 of the Strategy attempts to identify vulnerable sites and sites that may become more important for waders and Brent Geese in the future. Sufficient provision should be made to ensure that potential land is available as an alternative to sustain the populations into the foreseeable future.

7.5 Strategy Integration

It is important that new strategies and plans, and updates to existing strategies and plans, for example Shoreline Management Plans, Port Development Master Plans, Green Infrastructure Plans and Open Space Strategies that might impact on important sites for coastal birds across the network, integrate with this Strategy.

A strategic approach to spatial land use planning is required to ensure opportunities are secured to enhance existing and potential sites and create new sites, above and beyond what can be done through local site based protection and mitigation.

It is intended that the spatial and electronic nature of this Strategy, in combination with promotional activities undertaken by the Solent Waders and Brent Goose Steering Group, will help make this possible.

7.6 Awareness and Promotion

There is a great need to work with local people to raise awareness of wading bird and Brent Goose ecology and their significance in the Solent. The importance of the coastal bird populations should be appreciated, particularly since internationally important numbers of these birds inhabit such a densely urban region. The value of adjacent terrestrial feeding and roosting sites that support the Solent populations should be promoted and understood.
There is also a need to work with those owning and managing important wading bird and Brent Goose sites to ensure they appreciate the value of the sites and will continue favourable management, as well as be aware of the potential conflicts between the needs of the waders and Brent Geese and those of people, and attempt to minimise them.

Policy W&BG7

Local Authorities, agencies and nature conservation organisations will raise awareness of the issues and develop a greater understanding of the importance of wading birds and Brent Geese amongst landowners and the general public.

7.7 Monitoring and Strategy Review

This Strategy will be reviewed by the Solent Waders and Brent Goose Strategy Steering Group after a five year period to take into account any changes in the distribution or numbers of wading birds and brent geese, or any changes in legislation or policy.

Policy W&BG8
The Solent Waders and Brent Goose Strategy Steering Group will meet regularly and as necessary, to ensure the implementation and review of this Strategy.

BIBLIOGRAPHY

British Trust for Ornithology WeBS Core Counts: www.bto.org.uk

British Trust for Ornithology WeBS Species Alert Counts: www.bto.org.uk

Calbrade, N.A., Holt, C.A., Austin, G.E., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Musgrove, A.J. (2010) Waterbirds in the UK 2008/09: The Wetland

Bird Survey. BTO/RSPB/JNCC in association with WWT, Thetford.

Channel Coastal Observatory (2008) Solent Dynamic Coast Project Main Report. Channel Coast Observatory.

English Nature (2004). Internal policy note on offsite impacts affecting designated species and site integrity.

Flood & Coastal Defence Appraisal Guidance (2006) Department for Food and Rural Affairs.

Hampshire Brent Goose Strategy Group (2002) Brent Goose Strategy South East Hampshire Coast. Hampshire and Isle of Wight Wildlife Trust.

Kershaw, M. and Cranswick, P. (2003) Numbers of wintering waterbirds in Great Britain, 1994/95-1998/99: I. Wildfowl and selected waterbirds. Biological Conservation 111: 91-104

Liley, D. and Sharpe, J. (2010) Solent Waders and Brent Geese Spatial Analysis Report. Footprint Ecology.

Stillman, R. A., Cox, J., Liley, D., Ravenscroft, N., Sharp, J. and Wells, M. (2009) Solent disturbance and mitigation project: Phase I report. Solent Forum.

APPENDIX I - List of Wading Birds

Wading birds included in the Strategy are listed below; birds are listed Annex I of the Birds Directive and/or listed as qualifying features of the Solent's SPA sites, and/or form part of the SPA or neighbouring SPA assemblages.

Species	**Taxon Name**
Avocet	*Recurvirostra avosetta*
Bar-tailed Godwit	*Limosa lapponica*
Black-tailed Godwit	*Limosa limosa*
Common Sandpiper	*Actitis hypoleucos*
Curlew	*Numenius arquata*
Dunlin	*Calidris alpina*
Golden Plover	*Pluvialis apricaria*
Green Sandpiper	*Tringa ochropus*
Greenshank	*Tringa nebularia*
Grey Plover	*Pluvialis squatarola*
Jack Snipe	*Lymnocryptes minimus*
Knot	*Calidris canutus*
Lapwing	*Vanellus vanellus*
Oystercatcher	*Haematopus ostralegus*
Purple Sandpiper	*Calidris maritima*
Redshank	*Tringa totanus*
Ringed Plover	*Charadrius hiaticula*
Ruff	*Philomachus pugnax*
Sanderling	*Calidris alba*
Snipe	*Gallinago gallinago*
Spotted Redshank	*Tringa erythropus*
Turnstone	*Arenaria interpres*
Whimbrel	*Numenius phaeopus*