Lough Swilly
Special Protection Area

(Site Code 4075)

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VERSION 1

Conservation Objectives
Supporting Document

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SUMMARY

This document presents conservation objectives for the waterbird Special Conservation Interests of Lough Swilly Special Protection Area, designated under Directive 2009/147/EC on the conservation of wild birds (Birds Directive).

Part One presents an introduction to the Special Protection Area designation process and to the site designated as Lough Swilly Special Protection Area, as well as introducing the concept of conservation objectives and their formulation.

Part Two provides site designation information for Lough Swilly Special Protection Area.

Part Three presents the conservation objectives for this site together with a supporting summary table.

Part Four reviews the conservation status of the site Special Conservation Interest species including analysis of wintering (non-breeding) population trends, assignment of site conservation condition, and examination of site trends in light of all-Ireland and international status and trends. Importantly, this section states the current conservation condition of each of the site Special Conservation Interest species.

Part Five (Conservation Advice Notes) provides supporting information that is intended to assist the interpretation and understanding of the site-specific conservation objectives. This section includes a review of the ecological characteristics of the Special Conservation Interest species of Lough Swilly SPA, and examines waterbird distribution recorded during the 2009/10 waterbird survey programme, drawing also on data from SAC surveying and NPWS monitoring programmes. This section concludes with information and advice on events and activities at the site which may interact with waterbirds during the non-breeding season and includes an assessment of those activities that have the potential to cause disturbance to site Special Conservation Interest species and other non-breeding waterbirds at Lough Swilly.

PART ONE - INTRODUCTION

1.1 Introduction to the designation of Special Protection Areas

The over-arching framework for the conservation of wild birds within Ireland and across Europe is provided by Directive 2009/147/EC (Birds Directive) on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended). Together with the EU Habitats Directive (Council Directive 92/43/EEC), these legislative measures provide for wild bird protection via a network of protected sites across Europe known as Natura 2000 sites, of which the overriding conservation objective is the maintenance (or restoration) of 'favourable conservation status' of habitats and species.

Under Article 4 of Directive 2009/147/EC, Ireland, along with other Member States, is required to classify the most suitable territories in number and size as Special Protection Areas (SPAs) for the conservation of certain wild bird species, which are:

- species listed in Annex I of the directive
- regularly occurring migratory species

Also under Article 4, Member States are required to pay particular attention to the protection of wetlands, especially those of international importance.

The National Parks & Wildlife Service (NPWS) is responsible for the selection and designation of SPA sites in the Republic of Ireland. NPWS have developed a set of criteria, incorporating information relating to the selection of wetland sites developed under the Ramsar Convention **(**Ramsar Convention Bureau 1971), which are used to identify and designate SPAs**.** Sites that meet any of the following criteria may be selected as SPAs:

- A site holding 20,000 waterbirds or 10,000 pairs of seabirds;
- A site holding 1% or more of the all-Ireland population of an Annex I species;
- A site holding 1% or more of the biogeographical population of a migratory species;
- A site is one of the most suitable sites in Ireland for an Annex I species or a migratory species.

The biogeographic population estimates and the recommended 1% thresholds for wildfowl and waders are taken from Wetlands International (Wetlands International, 2002); thresholds reflecting the baseline data period used. The all-Ireland populations for the majority of wintering waterbirds are taken from Crowe et al. (2008).

Site specific information relevant to the selection and designation of a SPA is collated from a range of sources including the Irish Wetland Bird Survey (I-WeBS), The Wetland Bird Survey (WeBS) in Northern Ireland, species-specific reports and a wide range of scientific publications, reports and other surveys. If, following collation of all the available scientific data, a site has the relevant criteria for designation and is selected as an SPA, a list of species is compiled for which the site is nationally important. These species are called Special Conservation Interests.

The **Special Conservation Interests** of a site can be divided into two categories:

Selection species:

The species (or species assemblage) that a site is selected for, including all species that are internationally important and nationally important species where the site is regarded as one of the most suitable site in the country for the conservation of that species.

Additional Conservations Interests:

- Annex I or migratory species which exceed the all-Ireland 1% threshold (but are not selection species for the site).
- Wetlands and Waterbirds – in establishing their SPA network, Member States are explicitly required under Article 4 of the Birds Directive to pay attention to the protection of wetlands. To this end the wetland habitat that is contained within a specified SPA, and the waterbirds that utilise this resource, are therefore considered of Special Conservation Interest.

1.2 Introduction to Lough Swilly Special Protection Area

Lough Swilly SPA is a large coastal site located in north County Donegal. It is a long sea inlet, cut through a variety of metamorphic rocks and situated on the west side of the Inishowen Peninsula in north Co. Donegal. The SPA comprises the inner part of Lough Swilly from just east of Letterkenny northwards to Killygarvan (*c*. 2 km north of Rathmullan) on the west side and to *c*. 2 km south of Buncrana on the east side. It includes the estuaries of the River Swilly, the River Leannan and the Isle Burn and the predominant habitat is sand and mud flats which are extensive when exposed at low tide. Both 'estuaries' and 'mudflats and sandflats not covered by water at low tide' are listed on Annex I of the E.U. Habitats Directive (92/43/EEC).

The SPA also includes the adjacent Inch Lough. Inch Lough was created from intertidal habitat in the mid 19th century when two embankments were built to link Inch Island to the mainland. A railway embankment was then built dividing the area; the inner part (Inch Levels) being further drained to create polderland for agricultural use, while the outer part (Inch Lough) acted as a reservoir or lake for drainage water. There is some seepage of seawater back, creating brackish (lagoon) conditions within the lake. Whilst artificial in origin, Inch Lough is one of the largest and best examples of a shallow, low salinity lagoon in the country.

The site includes an additional man-made lagoon at Blanket Nook and three large areas of polderland (Blanket Nook, Big Isle and Inch Levels). The site therefore has a good variety of wetland habitats which leads to a wide diversity of bird life from wading birds that forage upon the tidal flats, to various wildfowl associated with the lagoons, to geese and swan species that forage across the polderland, now existing as improved pasture and arable fields. A small sandy island (Inch Island) is also used by nesting terns, swans and gulls.

The Site Synopsis for Lough Swilly SPA and a map showing the SPA boundary are given in Appendix 1.

1.3 Introduction to Conservation Objectives

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve '*favourable conservation status'* and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2010). In its broadest sense, favourable conservation status means that an ecological feature is being maintained in a

satisfactory condition, and that this status is likely to continue into the future. Definitions as per the EU Habitats Directive are given in Box 1.

Box 1

Favourable Conservation Status as defined by Articles 1 (e) and 1(i) of the Habitats Directive

The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- *its natural range and areas it covers within that range are stable or increasing; and*
- *the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and*
- *the conservation status of its typical species is favourable'.*

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- *the population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and*
- *the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and*
- *there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.*

Site-specific conservation objectives define the desired condition or range of conditions that a habitat or species should be in, in order for these selected features within the site to be judged as favourable. At site level, this state is termed 'favourable conservation condition.'

Site conservation objectives also contribute to the achievement of the wider goal of biodiversity conservation at other geographic scales, and to the achievement of favourable conservation status at national level and across the Natura 2000 network[1].

1.4 How Lough Swilly SPA Conservation Objectives were formulated

This document presents conservation objectives for the non-breeding waterbird Special Conservation Interests of Lough Swilly SPA. Conservation objectives for breeding species Black-headed Gull, Sandwich Tern and Common Tern (in prep.) are not presented here.

Conservation objectives for SPA sites are aimed at maintaining bird populations through the protection of habitats supporting them and against negative impacts of disturbance. Therefore conservation objectives are determined not only for waterbird populations, but importantly, for the biotic and non-biotic components of the site that underpin the long-term maintenance of the waterbirds' abundance, distribution and range. To this end, conservation objectives are defined for attributes[2] relating to waterbird species populations, and for attributes related to the maintenance and protection of habitats that support them. These attributes are:

[1]Note that the terms 'conservation condition' and 'conservation status' are used to distinguish between site and the national level objectives respectively.

[2]Attribute can be defined as: 'a characteristic of a habitat, biotope, community or population of a species which most economically provides an indication of the condition of the interest feature to which it applies' (JNCC, 1998).

- Population Status
- Population distribution.
- Habitat range and area (extent).

PART TWO – SITE DESIGNATION INFORMATION

2.1 SPA Qualifying Features – Lough Swilly Special Protection Area

Lough Swilly is selected for SPA designation as it regularly holds an assemblage of over 20,000 wintering waterbirds making this a site of international importance. The mean peak number of waterbirds within the SPA boundary during the baseline period (1995/96 – 1999/00) was 29,108 individuals.[3]

The selection and additional special conservation interests listed for Lough Swilly SPA are as follows:

1. The site regularly supports 1% or more of the biogeographical population of the Annex I species Whooper Swan (*Cygnus Cygnus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,673 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

2. The site regularly supports 1% or more of the biogeographical population of the Annex I species Greenland White-fronted Goose (*Anser albifrons flavirostris*). The mean peak number of this species within the SPA during the baseline period (1994/95 – 1998/99) was 847 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

3. The site regularly supports 1% or more of the biogeographical population of Greylag Goose (*Anser anser*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,218 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

4. The site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 722 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

5. The site regularly supports 1% or more of the all-Ireland population of Teal (*Anas crecca*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,581 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

[3] Total waterbirds – includes all waterbird species recorded at the site.

6. The site regularly supports 1% or more of the all-Ireland population of Mallard (*Anas platyrynchos*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,169 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

7. The site regularly supports 1% or more of the all-Ireland population of Red-breasted Merganser (*Mergus serrator*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 127 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

8. The site regularly supports 1% or more of the all-Ireland population of Great Crested Grebe (*Podiceps cristatus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 284 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

9. The site regularly supports 1% or more of the all-Ireland population of Oystercatcher (*Haematopus ostralegus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,595 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

10. The site regularly supports 1% or more of the all-Ireland population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 7,285 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

11. The site regularly supports 1% or more of the all-Ireland population of Curlew (*Numenius arquata*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,720 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

12. The site regularly supports 1% or more of the all-Ireland population of Redshank (*Tringa totanus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,404 individuals. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

13. During the breeding season, the site regularly supports 1% or more of the all-Ireland population of Black-headed Gull (*Chroicocephalus ridibundus*)[4]. In 2001 a breeding population of 800 pairs was recorded. This exceeds the All-Ireland 1% threshold making the site of national importance for this species. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

[4] Formerly *Larus ribibundus.*

14. During the breeding season, the site regularly supports 1% or more of the all-Ireland population of Sandwich Tern. In 2001 a breeding population of 258 pairs was recorded. This exceeds the All-Ireland 1% threshold making the site of national importance for this Annex I species. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

15. During the breeding season, the site regularly supports 1% or more of the all-Ireland population of Common Tern. In 2001 a breeding population of 89 pairs was recorded. This exceeds the All-Ireland 1% threshold making the site of national importance for this Annex I species. Further to the species assessment, Lough Swilly was selected because it is one of the most suitable sites in the country for the conservation of this species.

The following species are identified as additional Special Conservation Interests (SCIs) for Lough Swilly SPA:

Wigeon (*Anas penelope*)
Shoveler (*Anas clypeata*)
Scaup (*Aythya marila*)
Goldeneye (*Bucephala clangula*)
Grey Heron (*Ardea Cinerea*)
Coot (*Fulica atra*)
Knot (*Calidris canutus*)
Greenshank (*Tringa nebularia*)
Common Gull (*Larus canus*)

The wetlands contained within Lough Swilly SPA are identified of conservation importance for breeding and non-breeding migratory waterbirds. Therefore the wetland habitats and the waterbirds that utilise this resource are considered to be an additional Special Conservation Interest.

Table 2.1 provides a designation summary for Lough Swilly SPA.

Note that throughout this document, Special Conservation Interest species are listed in the order of Selection Species followed by additional Special Conservation Interest species. Within these two categories, species are listed in taxonomic order.

Table 2.1 Designation Summary: listed species for Lough Swilly Special Protection Area

SPA Name	Lough Swilly					
SPA Site Code	4075					
	Special Conservation Interests	**Annex I species**	**Baseline population**	**Population status at baseline**		
Site Selection Species	Assemblage of over 20,000 waterbirds					
	Whooper Swan	Yes	1,673	International Importance		
	Greenland White-fronted Goose	Yes	847	International Importance		
	Greylag Goose		1,218	International Importance		
	Shelduck		772	All-Ireland Importance		
	Teal		1,581	All-Ireland Importance		
	Mallard		1,169	All-Ireland Importance		
	Red-breasted Merganser		127	All-Ireland Importance		
	Great Crested Grebe		284	All-Ireland Importance		
	Oystercatcher		1,595	All-Ireland Importance		
	Dunlin		7,285	All-Ireland Importance		
	Curlew		1,720	All-Ireland Importance		
	Redshank		1,404	All-Ireland Importance		
	Black-headed Gull (breeding)		800 pairs	All-Ireland Importance		
	Sandwich Tern (breeding)	Yes	258 pairs	All-Ireland Importance		
	Common Tern (breeding)	Yes	89	All-Ireland Importance		
Additional Special Conservation Interests	Wigeon		1,580	All-Ireland Importance		
	Shoveler		60	All-Ireland Importance		
	Scaup		103	All-Ireland Importance		
	Goldeneye		170	All-Ireland Importance		
	Grey Heron		57	All-Ireland Importance		
	Coot		514	All-Ireland Importance		
	Knot		303	All-Ireland Importance		
	Greenshank		48	All-Ireland Importance		
	Common Gull		1,523	All-Ireland Importance		
Other conservation designations associated with the site[a]		**SAC**	**Ramsar**	**IBA**	**Wildfowl Sanctuary**	**Other**
		Yes	**Yes**	**Yes**	**Yes**	

[a] Note that other designations associated with Lough Swilly may relate to different areas and/or some of these areas may be outside the SPA boundary.

2.2 Lough Swilly - species importance in relation to populations occurring at National, Regional and County spatial scales

The importance of the non-breeding populations of the Special Conservation Interest species of Lough Swilly SPA relative to national populations, and the species' occurrence at regional and county level is shown in Table 2.2. Note that breeding species are not included within this table.

'Region' refers to regions as defined by Irish Regions Office and in the case of the border region takes into account cross-border sites Lough Foyle and Carlingford Lough. 'County' refers to wetland SPA sites in County Donegal and includes the cross-border site Lough Foyle.

Table 2.2 Non-breeding waterbird populations of Lough Swilly SPA – national, regional and county importance

Site Special Conservation Interests (SCIs)	Numbers of International Importance	Numbers of National Importance	National Importance Rank[1]	Regional Importance Rank[2]	County Importance Rank[3]
Whooper Swan*	1,673		1	1	1
Greenland White-fronted Goose*	847		4	1	1
Greylag Goose*	1,218		2	2	1
Shelduck*		772	6	1	1
Teal*		1,581	4	1	1
Mallard*		1,169	2	2	2
Red-breasted Merganser*		127	3	1	1
Great Crested Grebe*		284	2	2	1
Oystercatcher*		1,595	4	3	2
Dunlin*		7,285	4	2	1
Curlew*		1,720	4	2	2
Redshank*		1,404	5	2	1
Wigeon		1,580	15	2	2
Shoveler		60	13	1	1
Scaup		103	4	2	1
Goldeneye		170	6	2	1
Grey Heron		57	3	1	1
Coot		514	6	1	1
Knot		303	13	3	2
Greenshank		48	1	1	1
Common Gull		1,523	4	2	2

* Denotes site selection species. n/c = not calculated.

[1]National importance rank - the number given relates to the importance of the non-breeding population a SCI species during the baseline period (1995/96 – 1999/00) relative to the national population.

[2]Regional importance rank - the number given relates to the importance of the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to the numbers that occur at sites within the Border region.

[3]County importance rank - the number given relates to the importance of the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to the numbers that occur at wetland sites within Co Donegal.

PART THREE - CONSERVATION OBJECTIVES FOR LOUGH SWILLY SPA

3.1 Conservation Objectives for the non-breeding Special Conservation Interests of Lough Swilly SPA

The overarching Conservation Objective for Lough Swilly Special Protection Area is to ensure that waterbird populations and their wetland habitats are maintained at, or restored to, favourable conservation condition. This includes, as an integral part, the need to avoid deterioration of habitats and significant disturbance; thereby ensuring the persistence of site integrity.

The site should contribute to the maintenance and improvement where necessary, of the overall favourable status of the national resource of waterbird species, and continuation of their long-term survival across their natural range.

Conservation Objectives for Lough Swilly Special Protection Area, based on the principles of favourable conservation status, are described below and summarised in Table 3.1. Note that objectives should be read and interpreted in the context of information and advice provided in additional sections of this report.

Objective 1: *To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Lough Swilly SPA.*

This objective is defined by the following attributes and targets:-

- To be favourable, the long term **population trend** for each waterbird Special Conservation Interest species should be stable or increasing, indicating that the populations are maintaining themselves.[5] Waterbird populations are deemed to be unfavourable when they have declined by 25% or more, as assessed by the most recent population trend analysis[6]

- To be favourable, there should be no significant decrease in the numbers or **range (distribution)** of areas used by the waterbird species of Special Conservation Interest, other than that occurring from natural patterns of variation.[7]

Note that some levels of disturbance of a singular or cumulative nature could result in displacement of waterbirds or a reduction in their numbers and therefore adversely affect the achievement of Objective 1.

[5] Note that 'population' refers to site population (numbers wintering at the site) rather than the species biogeographic population.

[6] Population trend analysis is presented in Section 4.

[7] Distribution from the 2009/2010 waterbird survey programme is introduced in Section 5.

Objective 2: *To maintain the favourable conservation condition of the wetland habitat at Lough Swilly SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.*

This objective is defined by the following attributes and targets:-

- The permanent **area** occupied by the wetland habitat should be stable and not significantly less than the areas of **4,162**, **2,419**, **201** and **317** hectares for subtidal, intertidal, supratidal and lagoon (and associated habitats) respectively, other than that occurring from natural patterns of variation.[8]

[8] A map of these broad habitat zones is provided in Appendix 1.

Table 3.1. Conservation Objectives for the non-breeding waterbird Special Conservation Interests of Lough Swilly SPA

Objective 1: *To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Lough Swilly SPA, which is defined by the following list of attributes and targets (note that this objective relates to all waterbird species of Special Conservation Interest).*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Population	Population trend	Percentage change	The long term population trend should be stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) is undertaken (where appropriate) using waterbird count data collected through the Irish Wetland Bird Survey and other surveys
Range	Distribution	Number and range of areas used by waterbirds	There should be no significant decrease in the numbers or range of areas used by waterbird species, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in Section 5

Objective 2: *To maintain the favourable conservation condition of the wetland habitat at* Lough Swilly *SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets.*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Area	Subtidal, Intertidal, Supratidal and lagoon (and associated) habitat areas	Area (Ha)	The permanent **area** occupied by the wetland habitat should be stable and not significantly less than the areas of **4,162**, **2,419**, **201** and **317** hectares for subtidal, intertidal, supratidal and lagoon (and associated) habitats respectively, other than that occurring from natural patterns of variation	As defined by seaward extent of the SPA boundary up to MLWM; MLWM to MHWM; and MHWM to SPA boundary (the latter value is minus terrestrial habitat) (Appendix 1)

PART FOUR – REVIEW OF THE CONSERVATION CONDITION OF WATERBIRD INTEREST FEATURES

4.1 Population data for non-breeding waterbird SCI species of Lough Swilly SPA

Lough Swilly is a large drowned river valley (ria) which extends some 43km from the 'mouth,' near Fanad Head in the north, to Letterkenny at its head in the south. The inner estuary is the section inwards from Buncrana towards Letterkenny, is estuarine in nature, and comprises intertidal and coastal habitats that are included in both the SPA boundary and within waterbird surveys undertaken as part of the Irish Wetland Bird Survey (I-WeBS). The site is complex, in terms of its large size, range of habitats and diversity of species that utilise them.

Table 4.1 presents population[9] data for the non-breeding waterbird Special Conservation Interest (SCI) species of Lough Swilly SPA. The principal data source is the Irish Wetland Bird Survey (I-WeBS). Additional data sources are outlined in Appendix 2. For the majority of species, the baseline shown is the five-year average (based on annual peak counts) for the period (1995/96 – 1999/00) and the recent five-year average is the period 2005/06 – 2009/10. To facilitate calculation of the recent five-year average, the dataset comprises I-WeBS data for the period 2005/06 – 2008/09 and count data from the high tide count undertaken as part of the 2009/10 waterbird survey programme. Note that for some species (see box below), the baseline and recent data periods used are different.

Peak counts are used because they reflect more accurately the importance of a site for a particular species. The assessment of five-year periods helps to account for fluctuations in numbers or where there are inconsistencies in data gathering (e.g. incomplete coverage, bad weather). In general however, and taking into account all potential sources of error in counting wetland birds, resulting data are regarded to be underestimates of population size (Underhill & Prŷs-Jones, 1994).

BOX 2

Whooper Swan – The baseline data period is 1995/96 – 1999/00; the recent data period is 2004/05 – 2008/09. Data are from I-WeBS and the National Swan Survey.

Greenland White-fronted Goose - two datasets are shown:-

1. data are taken from the Irish Greenland White-fronted Goose census carried out by NPWS. Data for Lough Swilly and Lough Foyle are combined as the Greenland White-fronted Geese using both sites are considered one discrete flock. The baseline data period is 1994/95 – 1998/99; the recent value shown is the peak count for spring 2009 (Fox et al. 2009).
2. data are from the Irish Wetland Bird Survey (I-WeBS). The baseline period (1994/95 – 1998/99) is given plus the most recent five-year average (2005/06 – 2009/10). To facilitate calculation of the recent five-year average, the dataset comprises I-WeBS data for the period 2005/06 – 2008/09 and count data from the high tide count undertaken as part of the 2009/10 waterbird survey programme.

Greylag Goose – the baseline data period is 1995/96 – 1999/00; the recent data period is 2004/05 – 2008/09. Data for the Icelandic breeding population of Greylag Goose that winters in Ireland are taken from special surveys organised through I-WeBS. Undertaken during November each year, these surveys aim to assess the distribution and status of the migratory flocks wintering in Ireland. Note that data are adjusted to account for feral flocks that occur within Ireland.

[9] Note that 'population' refers to site population (numbers wintering at the site) rather than a species' biogeographic population.

Table 4.1 highlights where the numbers shown surpass thresholds of international or all-Ireland importance. Note that these thresholds are different for the two time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2006) while all-Ireland thresholds are given within Crowe et al. (2008).

Gull species are not assigned 1% thresholds in Table 4.1. The wintering distributions of gull species are widespread and not monitored routinely during I-WeBS therefore standard methods of population estimation and threshold setting are difficult. SCI selection in relation to gull species therefore relates to the known most important sites for the gull species in question and a 'threshold of significance' is applied, which in the case of the Common Gull is 500.

Table 4.1 Site population data for waterbird Special Conservation Interest Species of Lough Swilly SPA: five-year mean peaks

Site Special Conservation Interests	Baseline Period (1995/96 - 1999/00)	Recent Site Average[a]
Whooper Swan	1,673 (i)	1,850 (i)
Greenland White-fronted Goose_1[a]	847 (i)	1,157 (i)
Greenland White-fronted Goose_2[a]	755 (i)	787 (i)
Greylag Goose*	1,218 (n)	2,183 (i)
Shelduck	772 (n)	515 (n)
Teal	1,581 (n)	2,066 (n)
Mallard	1,169 (n)	994 (n)
Red-breasted Merganser	127 (n)	88 (n)
Great Crested Grebe	284 (n)	172 (n)
Oystercatcher	1,595 (n)	1,883 (n)
Dunlin	7,285 (n)	4,192 (n)
Curlew	1,720 (n)	1,839 (n)
Redshank	1,404 (n)	2,176 (n)
Wigeon	1,580 (n)	1,271 (n)
Shoveler	60 (n)	41 (n)
Scaup	103 (n)	83 (n)
Goldeneye	170 (n)	120 (n)
Grey Heron	57 (n)	55 (n)
Coot	514 (n)	486 (n)
Knot	303 (n)	638 (n)
Greenshank	48 (n)	59 (n)
Common Gull	1,523 (n/c)	1,379 (n/c)

[a]See Box 2 for explanation of data periods used.
(i) Denotes numbers of international importance; (n) denotes numbers of all-Ireland importance. n/c = not calculated.
Note that the international and all-Ireland 1% thresholds used to assess the baseline and recent site averages are different. International thresholds are outlined in Wetlands International (2002) and Wetlands International (2006); all-Ireland thresholds are shown within Crowe et al. (2008).

4.2 Waterbird population trends at Lough Swilly SPA

The calculation and assessment of waterbird population trends follows the UK Wetland Bird Survey 'Alerts System' which provides a standardised technique for monitoring changes in the numbers of non-breeding waterbirds over a range of spatial scales and time periods.

The method focuses on the use of population indices. In the context of bird populations, an index number can be defined as a measure of population size in one year, expressed in relation to the population size in another year (Underhill & Prŷs-Jones, 1994). Changes in the index numbers can therefore explain the pattern of population change over time.

For Lough Swilly SPA, annual population indices were calculated for each SCI species for the data period 1994/95 to 2008/09. Details of methodology are provided in Appendix 3.

Table 4.2 shows site population trends for the non-breeding waterbird Special Conservation Interest species of Lough Swilly SPA. Trends are given for the 'long-term' 12-year period (1995–2007) and the recent five-year period (2002-2007). The values given represent the percentage change in index (population) values across the specified time period. Positive values equate to increases in population size while negative values reflect a decrease in population size across the specified time period.

Trends generated from the long-term dataset are necessary to detect real long-term changes; waterbirds are relatively long-lived birds and changes in population size can take several years to become evident. The short term trend can be useful as an indicator to assess whether species numbers at the site are remaining stable, showing signs of recovery or continuing to decline. For example, although a species' long-term trend may be negative, the short-term trend could be positive if numbers have increased during the five year period being assessed. Importantly, the short-term trend may detect more rapidly where a species population is beginning to decline.

Trend analysis was not carried out for the Common Gull because gulls are not routinely counted during I-WeBS leading to an incomplete dataset. For this species a measure of population change was calculated using the generic threshold method (JNCC, 2004) comparing population size at two time intervals, based on five-year means (see Appendix 3 for methods).

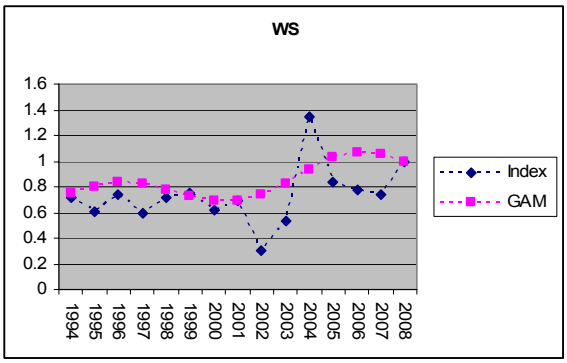
Table 4.2 Site Population Trends for waterbird Special Conservation Interest species of Lough Swilly SPA

	Special Conservation Interests	Site Population Trend[1] 12 Yr	Site Population Trend[2] 5 Yr	Population Change[3]
Site Selection Species	Whooper Swan	+ 30.7	+ 42.2	-
	Greenland White-fronted Goose	+ 39.7	- 35.5	-
	Greylag Goose	+ 49.4	+ 5.4	-
	Shelduck	- 8	- 2	-
	Teal	+ 37	+ 9.0	-
	Mallard	+ 0.6	+ 1	-
	Red-breasted Merganser	- 7.5	- 3	-
	Great Crested Grebe	- 29	- 30.8	-
	Oystercatcher	+ 25.3	+ 21.7	-
	Dunlin	- 47.9	- 22.5	-
	Curlew	- 17.6	- 7.2	-
	Redshank	+ 44.8	+ 22.5	-
Special Additional Conservation Interests	Wigeon	+ 60.7	+ 55.9	-
	Shoveler	+ 16.3	+ 71.2	-
	Scaup	-9.6	+133.6	-
	Goldeneye	- 32.7	- 5.7	-
	Grey Heron	+ 44.5	+ 16.6	-
	Coot	+ 1.2	- 22.6	-
	Knot	+ 52	+ 121.9	-
	Greenshank	+ 88.5	+ 54.8	-
	Common Gull	-	-	- 9.5

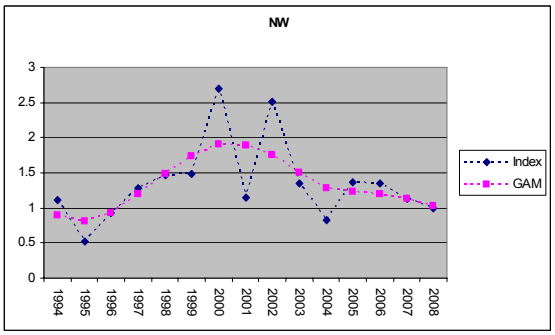
[1]Site population trend analysis: 12 yr = 1995–2007
[2]Site population trend analysis: 5 yr = 2002–2007.
[3]Site population change based on two five-year – means (1995/96 – 1999/00 and 2005/06 – 2009/10).

For selected species, explanatory notes are given below to aid the interpretation of trends. Note that graph headings use waterbird species codes; a list of these is provided in Appendix 4.

Whooper Swan – for Whooper Swan, Lough Swilly forms part of the Lough Swilly/Lough Foyle/River Foyle complex as the birds move frequently around the whole area. The area is particularly important as a staging area in late October/early November when thousands of swans congregate at the site before making onwards movements. Variations in these staging flocks could therefore exert influence over the calculated site trend although this has been addressed to some extent by limiting the analyses to the months November – March. High levels of interchange between flocks within the overall complex also leads to some difficulties in assigning high confidence to the observed site trend.



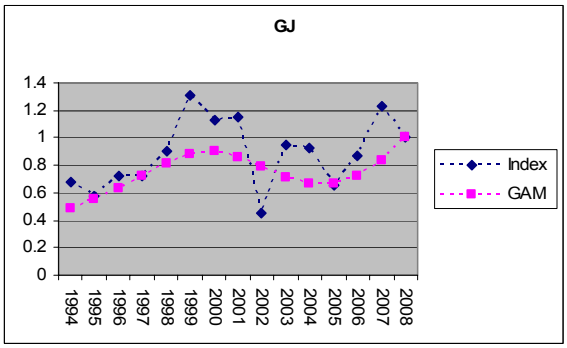
Greenland White-fronted Goose – follows a slightly different methodology (See Appendix 3). The calculation of percentage change indicates a long-term increase for this species at this site. However, caution is urged because the start year (1995) represents the lowest index value for the species within the dataset.



Nationally and globally, the species has been in decline and of high conservation concern for several decades. A ban of hunting of this species in Ireland and Scotland from 1983 onwards resulted in an increase in the Irish wintering population until the late 1990's; thereafter the population has declined to current levels despite a cessation of hunting in Iceland, the species' staging area. The more recent population decline has been attributed largely to low productivity.

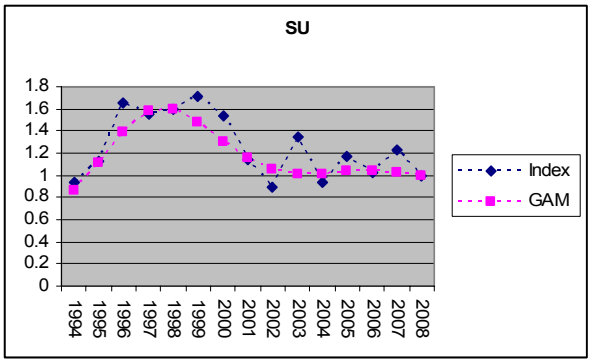
Therefore the 10-year and 5-year site trend for Lough Swilly, that indicates a declining site population, is in line with the national trend for that period.

Greylag Goose – similar to Whooper Swan, Lough Swilly is part of the Lough Swilly/Lough Foyle/River Foyle complex for this species, because birds move on a regular basis between the three sites. Lough Swilly is the most important in recent decades (Sheppard, 2002; Hearn & Mitchell, 2004). An estimate of the numbers of feral Greylag Geese is deducted from the site numbers prior to analyses. The estimate is based on counts carried out in September or early October, before the migrant birds have arrived.

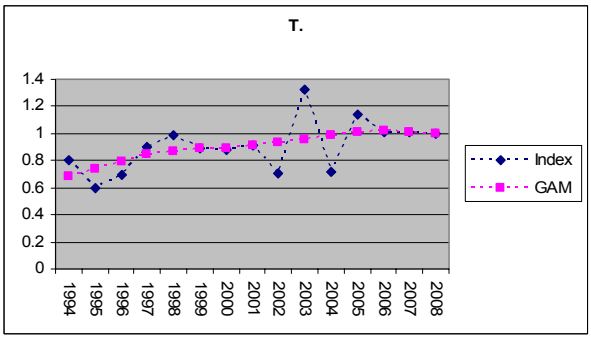


The calculation of percentage change in the smoothed trend indicates a long-term increase for this species at this site. Given the inter-annual variation in the index values, interpretation is difficult but at minimum the site population appears stable.

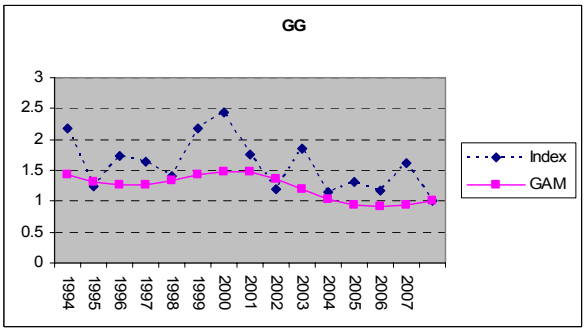
Shelduck – calculation of percentage change in the smoothed trend indicates a long-term decline for Shelduck at this site. The graphed trend highlights that the species occurred in much greater numbers during the mid to late 1990's than in recent years.



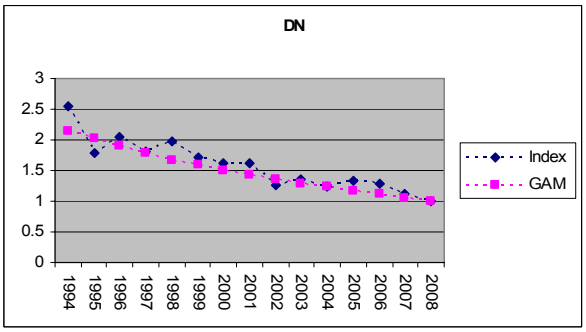
Teal – shows a long-term and short-term trend for increase at Lough Swilly in line with an increasing trend throughout I-WeBS.



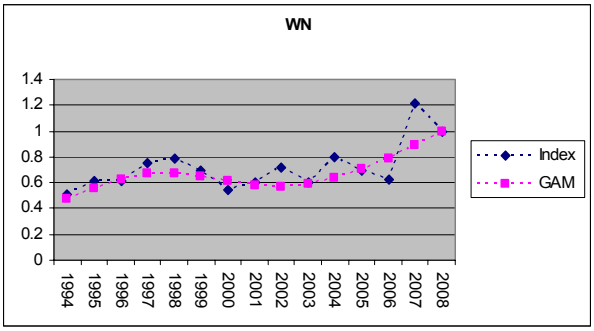
Great Crested Grebe – numbers can fluctuate widely, halving or doubling or more between months which leads to wide variation between annual totals and annual indices. Nevertheless, a trend for decline is clear from the dataset.



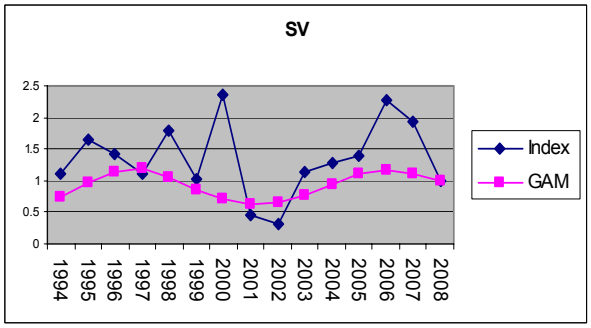
Dunlin – the trend shows a steady decline throughout, and follows the national trend and that evident in Northern Ireland and Britain (Calbrade et al. 2010).



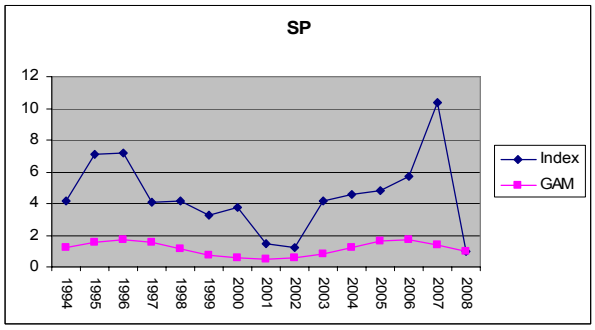
Wigeon – trend for progressive increase which occurs against a backdrop of decline at national and all-Ireland scale.



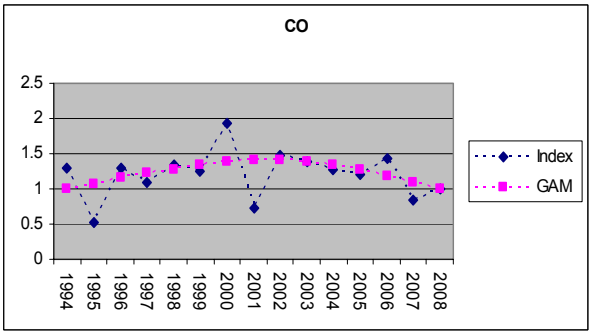
Shoveler – shows great inter-annual variation leading to an erratic trend which is difficult to interpret. The data suggests a period of increase in the mid 1990's followed by a decline. Since 2003 the site population has increased to close to earlier levels.



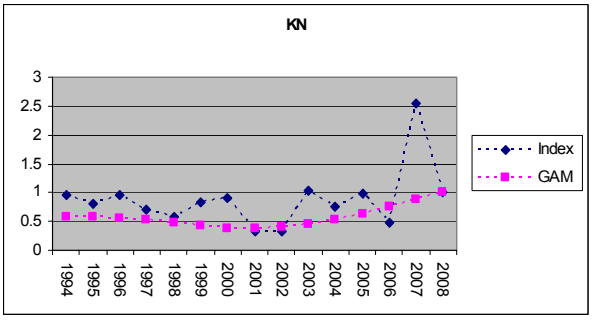
Scaup – numbers declined during the late 1990's/early 2000's but increased from 2003 to an all-time site peak number (240 individuals) in 2007/08. The calculation of percentage change indicates a strong short-term increase for this species at this site.



Coot – at Lough Swilly, Coot numbers fluctuate widely due to weather (Sheppard, 2002) leading to great intra- and inter-annual variation and the variable trend graphed to the right. Nonetheless, there was a marginal increase in numbers up to the early 2000's which has been followed by a steady decline to former levels.



Knot – are known to be mobile species which can lead to intra- and inter-annual variation. However the trend at Lough Swilly has been relatively stable. A peak count of 1064 birds in 2007/08 was considerably higher than annual peaks from other years within the recent five-year period (See Table 4.1).



4.3 Lough Swilly SPA – site conservation condition of non-breeding waterbirds

Conservation condition of waterbird species is determined using the longer-term (12-year) site population trend (Table 4.3). For Common Gull, conservation condition has been assigned using % population change but this is tentative given factors (described above) in relation to their count coverage during the non-breeding season.

Conservation condition is assigned using the following criteria:

Favourable population = population is stable/increasing.

Intermediate (unfavourable) = Population decline in the range 1 - 24%.

Moderately Unfavourable population = populations that have declined between 25 – 49% from the baseline reference value.

Highly Unfavourable population = populations that have declined > 50% from the baseline reference value.

The threshold levels of >25% and >50% follows standard convention used for waterbirds (e.g. Lynas et al. 2007; Leech et al. 2002). The 'Intermediate' range (1% - 24% decline) allows for natural fluctuations and represents a range within which relatively small population declines have the potential to be reversible and less likely to influence conservation status in the long-term (Leech et al. 2002). Declines of more than 25% are deemed of greater ecological significance for the long-term.

With regards the 21 non-breeding waterbird species of Special Conservation Interest for Lough Swilly SPA, and based on the long-term (12-year) population trend for the site, it has been determined that:-

1. 3 species are currently considered as **moderately unfavourable** (Great Crested Grebe, Dunlin and Goldeneye);
2. 5 species are considered as **intermediate (unfavourable)** (Shelduck, Red-breasted Merganser, Curlew, Scaup and Common Gull);
3. 13 species are currently considered as **favourable** (Whooper Swan, Greenland White-fronted Goose, Greylag Goose, Teal, Mallard, Oystercatcher, Redshank, Wigeon, Shoveler, Grey Heron, Coot, Knot and Greenshank).

Table 4.3 Non-breeding waterbirds of Lough Swilly SPA – Current Site Conservation Condition

	Special Conservation Interests	Site Population Trend	Site Conservation Condition
Site Selection Species	Whooper Swan	+ 30.7	Favourable
	Greenland White-fronted Goose	+ 39.7	Favourable
	Greylag Goose	+ 49.4	Favourable
	Shelduck	- 8	Intermediate (Unfavourable)
	Teal	+ 37	Favourable
	Mallard	+ 0.6	Favourable
	Red-breasted Merganser	- 7.5	Intermediate (Unfavourable)
	Great Crested Grebe	- 29	Moderately Unfavourable
	Oystercatcher	+ 25.3	Favourable
	Dunlin	- 47.9	Moderately Unfavourable
	Curlew	- 17.6	Intermediate (Unfavourable)
	Redshank	+ 44.8	Favourable
Special Additional Conservation Interests	Wigeon	+ 60.7	Favourable
	Shoveler	+ 16.3	Favourable
	Scaup	-9.6	Intermediate (Unfavourable)
	Goldeneye	- 32.7	Moderately Unfavourable
	Grey Heron	+ 44.5	Favourable
	Coot	+ 1.2	Favourable
	Knot	+ 52	Favourable
	Greenshank	+ 88.5	Favourable
	Common Gull	- 9.5	Intermediate (Unfavourable)

4.4 Conservation condition in light of all-Ireland and International trends

Site conservation condition and population trends for waterbird species of Special Conservation Interest at Lough Swilly SPA have been reviewed in light of species' all-Ireland and international trends. This information review is presented in Table 4.4.

The calculation of all-Ireland trends (island of Ireland) for the long-term (12-year) data period has been facilitated by the provision of indices from the I-WeBS and the WeBS database (kindly provided by the I-WeBS office and the British Trust for Ornithology). International trends follow Wetlands International (2006).

An additional assessment is carried out with regards the relationship between a species' site trend and the current all-Ireland trend for the specified time period 1994/95 to 2008/09. The colour coding in Table 4.4 represents the following cases:-

Grey – species for which analysis was not undertaken.
Green – species whose populations are stable or increasing at both site level and all-Ireland level.
Yellow - species whose populations are stable or increasing at site level but decreasing at all-Ireland level.
Beige – species whose populations are declining at both site level and all-Ireland level. Therefore there is a potential for factors at a larger spatial scale to be influencing the observed trend at site level.
Orange - species whose populations are exhibiting an intermediate (1 - 25%) decline at site level but are stable or increasing at all-Ireland level.
Pink - species whose populations are exhibiting a moderate (25 – 49%) decline at site level but are stable or increasing at all-Ireland level.
Red - species whose populations are exhibiting a high (>50%) decline at site level but are stable or increasing at all-Ireland level.

In the case of pink and red categories (not used for species at Lough Swilly) where populations are stable at national level, but significant declines are seen at site level, it is reasonable to

suggest that site-based management issues may be responsible for the observed declining site population trends (Leech et al. 2002).

Table 4.4 Non-breeding waterbird populations of Lough Swilly – additional population review, status and trends

Site Special Conservation Interests (SCIs)	BoCCI Category[a]	Site Conservation Condition	Current Site Trend 12 Yr[b]	Current all-Ireland Trend[d]	Current International Trend[e]
Whooper Swan	Amber	Favourable	+ 30.7	+ 44.3	Increase
Greenland White-fronted Goose	Amber	Favourable	+ 39.7	Decline	Decline
Greylag Goose	Amber	Favourable	+ 49.4	+ 25	Stable
Shelduck	Amber	Intermediate (Unfavourable)	- 8	+ 4.5	Stable
Teal	Amber	Favourable	+ 37	+ 11.3	Increase
Mallard	Green	Favourable	+ 0.6	- 16	Stable
Red-breasted Merganser	Green	Intermediate (Unfavourable)	- 7.5	- 11	n/c
Great Crested Grebe	Amber	Moderately Unfavourable	- 29	- 18	Decline
Oystercatcher	Amber	Favourable	+ 25.3	+ 23.6	Decline
Dunlin (*alpina*)	Amber	Moderately Unfavourable	- 47.9	- 46.5	Stable
Curlew	Red	Intermediate (Unfavourable)	- 17.6	- 25.7	Decline
Redshank	Red	Favourable	+ 44.8	+ 22.7	Stable/Decline
Wigeon	Amber	Favourable	+ 60.7	- 20.2	Stable
Shoveler	Red	Favourable	+ 16.3	+ 21.3	Stable
Scaup	Amber	Intermediate (Unfavourable)	-9.6	+ 88.7	Stable
Goldeneye	Amber	Moderately Unfavourable	- 32.7	- 50.7	Stable
Grey Heron	Green	Favourable	+ 44.5	+ 29.2	Increase
Coot	Amber	Favourable	+ 1.2	- 34	Stable
Knot	Red	Favourable	+ 52	- 3	Decline
Greenshank	Amber	Favourable	+ 88.5	+ 79.7	Stable
Common Gull[c]	Amber	Intermediate (Unfavourable)	- 9.5	n/c	n/c

*Denotes site selection species; n/c = not calculated.
[a]See Lynas *et al.* (2007) for detailed listing criteria; [b]Site population trend analysis: 12 yr = 1994–2007; [c]trend based on two five year averages (see text); [d]All-Ireland trend calculated for period 1994/95 to 2008/09; [e]International trend after Wetland International (2006).

PART FIVE – SUPPORTING INFORMATION

5.1 Introduction

Part Five of this report is based around the need to review, collate and disseminate site-specific information relating to the Special Conservation Interests of Lough Swilly SPA.

The information provided in Part Five is intended to:-

- provide information to assist the interpretation and understanding of the site-specific conservation objectives;
- facilitate the identification of conservation priorities and direct site management measures;
- inform the scope and nature of Appropriate Assessments in applying the provisions of Article 6 of the Habitats Directive.

Section 5.2 provides selected ecological summary information for the non-breeding waterbirds of Lough Swilly SPA. This is intended to aid the interpretation of species distribution data provided within Section 5.3 of this report and related appendices. Finally, Section 5.4 provides summary information for activities and events that occur at Lough Swilly SPA that may either act upon the habitats within the site, or may interact with waterbirds using the site.

Note that the information provided in this document does not provide a comprehensive assessment on which to assess plans and projects as required under the Habitats Directive, but rather should inform the scope of the assessments and help direct where further detailed examinations are required.

Part 5 should be reviewed in light of the results of the SAC benthic surveying and monitoring programmes and the Lough Swilly SAC Marine Advice Notes (NPWS, 2011).

The information provided is based on best-available information at time of report production (December 2010).

5.2 Waterbird species – Ecological characteristics, requirements and specialities – summary information

Waterbirds, defined as '*"birds that are ecologically dependent on wetlands"* (Ramsar Convention, 1971), are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. The I-WeBS database shows 81 waterbird species that have been recorded at Lough Swilly SPA during the period 1999/00 – 2009/10 representing ten families: *Gaviidae* (divers), *Podicipedidae* (grebes), *Anatidae* (swans, geese and ducks), *Rallidae* (Water Rail, Moorhen & Coot), *Haematopodidae* (oystercatchers), *Charadriidae* (plovers and lapwings), *Scolopacidae* (sandpipers and allies) and *Laridae* (gulls and terns) plus *Phalacrocoracidae* (Cormorants) and *Ciconiiformes* (Herons).

Waterbird Special Conservation Interest species for a SPA are selected as per the criteria outlined in Section 1.1, which focus on numbers of waterbirds at a site. As described in Section 1.1, the wetland habitat that is contained within a SPA, and the waterbirds that utilise this resource are considered an additional Special Conservation Interest for the site. This acknowledges the importance of wetland habitats for waterbirds, and importantly for the total

assemblage of waterbirds that utilise a site including those species that occur neither regularly or in significant numbers but for which the site is of importance. It also gives due consideration to seasonality; to species which utilise the site upon passage or are present during months of the year outside of the non-breeding season[10] or species that use the site at certain times only (e.g. as a cold weather refuge).

Table 5.1 gives population data for a selection of other waterbirds (non-SCI species) that use Lough Swilly during the non-breeding season. Data are taken from the I-WeBS database. Note that the international and all-Ireland 1% thresholds used to compare with the baseline and recent site averages are different. These thresholds (periods 1994/95 – 1998/99 and 1999/00 – 2003/04) are outlined in Crowe et al. (2008).

Table 5.1 Selected (non SCI) waterbird species that occur at Lough Swilly SPA during the non-breeding season – five year mean peak data (I-WeBS)

Species	Baseline Data Period (1995/96 – 1999/00)	Recent Site Average (2004/05 – 2008/09)
Mute Swan *Cygnus olor*	265 (n)	295 (n)
Barnacle Goose *Branta leucopsis*	12	31
Light-bellied Brent Goose *Branta bernicla hrota*	152	451 (i)
Tufted Duck *Aythya fuligula*	282	688 (n)
Red-throated Diver *Gavia stellata*	18	17
Great Northern Diver *Gavia immer*	19	10
Little Grebe *Tachybaptus ruficollis*	38 (n)	89 (n)
Slavonian Grebe *Podiceps auritus*	11	11
Golden Plover *Pluvialis apricaria*	749	1885 (n)
Lapwing *Vanellus vanellus*	1408	2172 (n)
Black-tailed Godwit *Limosa limosa*	78	192 (n)
Bar-tailed Godwit *Limosa lapponica*	139	122

(i) Denotes numbers of international importance; (n) denotes numbers of all-Ireland importance

Although waterbirds are linked by their dependence on water, different species vary considerably in aspects of their ecology due to many evolutionary adaptations and specialisations to their wetland habitats. Different species or groups of species may therefore utilise wetland habitats in very different ways which relates to how species are distributed across a site as a whole.

Table 5.2 provides selected ecological information for waterbird SCI species of Lough Swilly SPA. Information is provided for Selection Species (Table 5.2a) and for additional Conservation Interests (Table 5.2b). Information is provided for the following categories:

- waterbird family (group);
- winter distribution – species distribution range during winter (based on the period 1996/97 – 2000/01 (after Crowe, 2005));
- trophic (foraging) guild (after Weller, 1999; see Appendix 5);
- food/prey requirements;
- principal supporting habitat within the site;
- ability to utilise other/alternative habitat in/around the site;
- site fidelity (species 'faithfulness' to wintering sites).

Further information to aid understanding of categories and codes is provided in the table sub text.

[10] Non-breeding season being defined as September – March inclusive

Table 5.2a Waterbirds – Ecological characteristics, requirements & specialities – non-breeding waterbird selection species

	Family (group)	Winter distribution[A]	Trophic Guild[B]	Food/Prey Requirements[C]	Principal supporting habitat within site[D]	Ability to utilise other/alternative habitats[E]	Site Fidelity[F]
Whooper Swan *Cygnus cygnus*	Anatidae (swans & geese)	Widespread	1, 7	Wide	Polderland - agricultural habitats	2	Moderate/ High
Greenland White-fronted Goose *Anser albifrons flavirostris*	Anatidae (swans & geese)	Highly restricted	7	Narrower	Polderland - agricultural habitats	2	High
Greylag Goose *Anser anser*	Anatidae (geese)	Highly restricted	7	Narrower	Polderland - agricultural habitats	2	High
Shelduck *Tadorna tadorna*	Anatidae (shelducks)	Intermediate	1, 5	Wide	Intertidal mud and sand flats	3	High
Teal *Anas crecca*	Anatidae (dabbling ducks)	Very widespread	1	Wide	Shallow subtidal, lagoons and intertidal mud and sandflats	3	Weak
Mallard *Anas platyrynchos*	Anatidae (dabbling ducks)	Very widespread	1	Wide	Shallow subtidal, coastal lagoons and associated habitats plus intertidal mud and sandflats	1	Moderate
Red-breasted Merganser *Mergus serrator*	Anatidae (sea ducks)	Intermediate	2	Highly specialised	Sheltered & shallow subtidal plus lagoons	1	Unknown
Great Crested Grebe *Podiceps cristatus*	Podicipedidae (grebes)	Widespread	2/3	Narrower	Sheltered & shallow subtidal plus lagoons	3	High
Oystercatcher *Haematopus ostralegus*	Haematopodidae (wading birds)	Intermediate	4	Narrower	Intertidal mud and sand flats	2	High
Dunlin *Calidris alpina*	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	3	Moderate
Curlew *Numenius arquata*	Scolopacidae (wading birds)	Very widespread	4	Wide	Intertidal mud and sand flats	2	High
Redshank *Tringa totanus*	Scolopacidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	Moderate

[A] Winter distribution: 1 = very widespread (>300 sites); 2 = widespread (200 – 300 sites); 3 = intermediate (100 – 200 sites); 4 = localised (50-100 sites); 5 = highly restricted (<50 sites) (based on Crowe (2005).

[B] Waterbird foraging guilds. 1 = Surface swimmer, 2 = water column diver (shallow), 3 = water column diver (deeper), 4/5 = intertidal walker (out of water), 6 = intertidal walker (in water), 7 = terrestrial walker. Further details are given within Appendix 5.

[C] Food/prey requirements - where 1 = species with a wide prey/food range; 2 = species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and 3 = highly specialised foraging requirements (e.g. piscivores).

[D] Principal supporting habitat present within Lough Swilly SPA. Note that this is the main habitat used when foraging, other habitats may be used at other times, for example when roosting.

[E] Ability to utilise alternative habitats refers to the species ability to utilise other habitats adjacent to the site. 1 = wide-ranging species with requirement to utilise the site as and when required; 2 = reliant on site but highly likely to utilise alternative habitats at certain times (e.g. high tide); 3 = considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited habitat requirements. Note, a score of 1 for sea ducks and divers relates to propensity for within-season movements although the site is an important part of the species' wintering range.

[F] Site fidelity on non-breeding grounds: 0 = unknown; 1 = weak; 2 = moderate; 3 = high (based on published information).

Table 5.2b Waterbirds – Ecological characteristics, requirements & specialities – additional conservation interest species

	Family (group)	Winter distribution[A]	Trophic Guild[B]	Food/Prey Requirements[C]	Principal supporting habitat within site[D]	Ability to utilise other/alternative habitats[E]	Site Fidelity[F]
Wigeon *Anas penelope*	Anatidae (dabbling ducks)	Very widespread	1, 5	Narrower	Intertidal mud and sand flats , sheltered & shallow subtidal and lagoon and associated habitats	1	Weak
Shoveler *Anas clypeata*	Anatidae (diving ducks)	Intermediate	1	Wide	Sheltered & shallow subtidal and lagoons	3	Moderate
Scaup *Aythya marila*	Anatidae (diving ducks)	Localised	2	Wide	Sheltered & shallow subtidal and lagoons	1	Unknown
Goldeneye *Bucephala clangula*	Anatidae (diving ducks)	Widespread	2	Wide	Sheltered & shallow subtidal and lagoons	3	Unknown
Grey Heron *Ardea cinerea*	Ardeidae (herons)	Very widespread	6	Narrower	Sheltered & shallow subtidal; coastal lagoons	1	Unknown
Coot *Fulica atra*	Rallidae (rails)	Widespread	1/2/7	Wide	Coastal lagoon	3	Unknown
Knot *Calidris canutus*	Scolopacidae (wading birds)	Localised	4	Narrower	Intertidal mud and sand flats	3	Moderate
Greenshank *Tringa nebularia*	Scolopacidae (wading birds)	Intermediate	6	Wide	Intertidal mud and sand flats	3	High
Common Gull *Larus canus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal mud and sand flats & sheltered & shallow subtidal	2	Moderate

[A] Winter distribution: 1 = very widespread (>300 sites); 2 = widespread (200 – 300 sites); 3 = intermediate (100 – 200 sites); 4 = localised (50-100 sites); 5 = highly restricted (<50 sites) (based on Crowe (2005).
[B] Waterbird foraging guilds. 1 = Surface swimmer, 2 = water column diver (shallow), 3 = water column diver (deeper), 4/5 = intertidal walker (out of water), 6 = intertidal walker (in water), 7 = terrestrial walker. Further details are given within Appendix 5.
[C] Food/prey requirements - where 1 = species with a wide prey/food range; 2 = species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and 3 = highly specialised foraging requirements (e.g. piscivores).
[D] Principal supporting habitat present within Lough Swilly SPA. Note that this is the main habitat used when foraging, other habitats may be used at other times, for example when roosting.
[E] Ability to utilise alternative habitats refers to the species ability to utilise other habitats adjacent to the site. 1 = wide-ranging species with requirement to utilise the site as and when required; 2 = reliant on site but highly likely to utilise alternative habitats at certain times (e.g. high tide); 3 = considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited habitat requirements. Note, a score of 1 for sea ducks and divers relates to propensity for within-season movements although the site is an important part of the species' wintering range.
[F] Site fidelity on non-breeding grounds: 0 = unknown; 1 = weak; 2 = moderate; 3 = high (based on published information).

5.3 The 2009/10 waterbird survey programme

5.3.1 Introduction

The 2009/10 waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. These surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a survey undertaken primarily on a rising tide or at high tide, and on-going NPWS Regional Management-led monitoring.

At Lough Swilly SPA, a survey programme of four low tide counts (Oct, Nov & Dec 2009 and Feb 2010) and a single high tide count (Feb 2010) was completed across the site. Waterbird species were counted within a series of 14 count sections (subsites) (Appendix 6). Behaviour was recorded within two categories (foraging or roosting/other) and position of birds was noted in relation to broad habitat types. The definitions of the broad habitats (Table 5.3) were defined specifically for the survey programme and do not follow strict habitat-based definitions for these areas.

Table 5.3 Definition of broad habitat types used

Broad Habitat Type	Broad Habitat Description
Intertidal (areas between mean high water and mean low water)	Refers to the area uncovered by the tide and most likely dominated by mudflats and sandflats. It may also include areas of rocky shoreline, areas of mixed sediment and grave/pebbles or shingle and gravel shores.
Subtidal (areas that lie below mean low water)	Refers to areas that are covered by seawater during counts. During low-tide counts it will include offshore water, tidal channels and creeks as well as tidal rivers.
Supratidal/Coastal	This category pertains to the shore area and habitats immediately marginal to and above the mean high-water mark. The supratidal section is an integral part of the shoreline. This broad habitat also includes areas of saltmarsh where the saltmarsh is contiguous with coastal habitats lying above. Note that patches of lower saltmarsh (e.g. *Spartina*) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	All areas above supratidal habitat including polderland. Also includes aquatic habitats that are not tidal (e.g. lagoon).

In addition to the main survey programme described above, an additional 'roost survey' was undertaken during the high tide period on 10th March 2010. During this survey, roost sites were located, species and numbers counted and the position of the roosts marked onto field maps.

5.3.2 Waterbird distribution data and analyses

The primary aim of data analyses was to understand how waterbirds are distributed across Lough Swilly SPA during the autumn and winter months. By assessing patterns of waterbird distribution at low and high tide, together with examination of data on sediment and invertebrate distribution and abundance, we aimed to identify areas (subsites) within the site that support critical waterbird functions (i.e. foraging & roosting) on a species by species basis.

Data analyses were undertaken to determine the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the site as a whole. Analyses were undertaken on datasets as follows:

- Total numbers (low tide surveys);
- Total numbers (high tide survey);

- Total numbers foraging intertidal;
- Total numbers foraging subtidal;
- Total numbers of roosting birds;
- Density – foraging birds.

For each of the analyses listed above and for each survey date completed, subsites were ranked in succession from the highest to the lowest in terms of their relative contribution to each species' distribution across subsites surveyed. Rank positions were then converted to categories (see Box 3 below) with the exception of assessments relating to the single high tide survey that are presented simply by subsite rankings. The highest rank position/category for each subsite across any of the low tide count dates is presented in a subsite x species matrix.

Box 3

Rank Position - Categories

Very High (V)	Any section ranked as 1.
High (H)	Top third of ranking placings (n = total number of count sections species was observed in)
Moderate (M)	Mid third of ranking placings (n = total number of count sections species was observed in)
Low (L)	Lower third of ranking placings (n = total number of count sections species was observed in).

Waterbird count data are also presented as species distribution maps ('dot density maps'). Dot-density maps show species distribution divided into 'foraging' birds and 'roosting/other' birds, for low tide and high tide surveys separately. The maps show the number of birds represented by dots; each dot representing one, or a pre-determined number of birds. As the dots are placed in the appropriate subsites and broad habitat types for the birds counted, the resulting map is equivalent to presenting numbers and densities, and provides a relatively quick way of assessing species distribution. **Note however, that dot-density maps are not intended to show the actual position of each bird; the dots are placed randomly within subsites so no conclusions can be made at a scale finer than subsite.** This is particularly relevant to the high tide count where dots are placed randomly across subsites although the intertidal habitat was largely submerged. Also during field surveys, waterbirds recorded within subsites 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels) were classified as within the broad habitat 'terrestrial' although these subsites comprise a mixture of aquatic, near-shore and terrestrial elements. For some species dot density maps therefore place the dots randomly across the whole subsite even though the species may have been largely recorded within certain areas of the subsite only (e.g. Mallard that occurred both on land and in water). More detailed information with regards species/flock positioning is presented as separate discussion notes for each SCI species.

Subsite rankings and dot-density maps relate to the distribution of waterbirds at subsite level as recorded during the 2009/10 waterbird survey programme. Care must be taken however in the interpretation of these data and subsite rankings in isolation should not be used to infer a higher level of conservation importance to one area over another without a detailed examination of data and understanding of each species' ecology. For instance, while some species are known to be site-faithful, both at site level and within-site level (e.g. Dunlin), other species may range more widely across a site e.g. Knot, whose inter- and intra-annual variations in distribution are likely linked to annual variations in spatfall of its mollusc prey and prey depletion during the non-breeding season. As explained in the discussion notes for each SCI species (Section 5.3.4), some species by their nature may aggregate in high numbers, while others (e.g. Greenshank, Grey Heron) may not. It is also important to consider that distribution maps and data refer to a

single season of low tide surveys. Although important patterns of distribution will emerge, these distributions should not be considered absolute; waterbirds by their nature are highly mobile and various factors including temperature, direction of prevailing winds, changing prey densities/availabilities and degree of human activity across the site, could lead to patterns that may change in different months and years.

Please note that in places, standard waterbird codes are used in figures, tables or data files; these codes are listed in Appendix 4.

5.3.3 Summary Results

A total of 63 waterbird species were recorded during the 2009/10 survey programme at Lough Swilly SPA. Cummins and Crowe (2010) provide a summary of waterbird data collected.

All SCI species were recorded within all counts undertaken with the exception of Greenland White-fronted Goose which was not recorded during the final low tide survey (15/02/2010).

Table 5.4 shows peak numbers (whole site) for SCI species recorded during the low tide (LT) and high tide (HT) surveys.

Average % occupancy, defined as the average proportion of subsites in which a species occurred during low tide counts, varied greatly and ranged from the very restricted distributions of Scaup and Coot (7% - equivalent to one count subsite only) to the most widespread species across the site - Oystercatcher, Curlew and Common Gull (% occupancy > 80%).

Average % area occupancy, defined as the average proportion of the whole site area that the species occurred in during low tide counts was lowest for Scaup and Coot. Greenland White-fronted Goose also had a restricted distribution across the site with average subsite occupancy of 8.9% equating to *c*12% of the entire area counted. The most widespread species in terms of area occupied was Common Gull (Table 5.4).

Table 5.4 Lough Swilly SPA 2009/2010 waterbird surveys – summary data

Site Special Conservation Interests (SCIs)	Peak number recorded - LT surveys[I]	Peak number recorded - HT survey[II]	Average subsite % occupancy [III]	Average % area occupancy[III]
Whooper Swan*	2,720 (i)	320 (i)	25 (7.1)	29.8 (4.0)
Greenland White-fronted Goose*	472 (i)	511 (i)	8.9 (6.8)	12.3 (10.5)
Greylag Goose*	775 (n)	496 (n)	12.5 (3.6)	19.0 (3.2)
Shelduck*	536 (n)	595 (n)	44.6 (21.3)	40.7 (19.9)
Teal*	2,943 (n)	1,585 (n)	35.7 (5.3)	39.3 (6.0)
Mallard*	1,246 (n)	545 (n)	53.6 (12.4)	58.0 (12.8)
Red-breasted Merganser*	105 (n)	50 (n)	53.6 (21.5)	53.2 (24.8)
Great Crested Grebe*	128 (n)	308 (n)	60.7 (9.2)	61.5 (7.0)
Oystercatcher*	2,103 (n)	1,416 (n)	87.5 (3.6)	80.8 (3.8)
Dunlin*	2,929 (n)	749	46.4 (9.2)	43.4 (9.4)
Curlew*	1,259 (n)	1,454 (n)	89.3 (4.1)	86.0 (7.0)
Redshank*	1,928 (n)	1,304 (n)	78.6 (5.8)	76.2 (6.8)
Wigeon	1,759 (n)	753	44.6 (12.2)	45.6 (17.9)
Shoveler	58 (n)	23	17.9 (9.2)	19.3 (11.0)
Scaup	12	49 (n)	7.1 (0)	11.8 (4.6)
Goldeneye	115 (n)	108 (n)	33.9 (14.7)	40.1 (14.3)
Grey Heron	46 (n)	25	75.0 (13.7)	75.0 (12.2)
Coot	860 (n)	200	7.1 (0)	5.8 (3.5)
Knot	108	603 (n)	16.0 (6.8)	16.3 (8.0)
Greenshank	56 (n)	27 (n)	55.4 (12.2)	56.9 (7.0)
Common Gull	3,087	882	84.0 (3.6)	85.0 (4.2)

* Denotes site selection species.
(i) denotes numbers of International importance; (n) denotes numbers of all-Ireland importance (1% thresholds; 1999/00 – 2003/04 Crowe et al. 2008).
[I] 4 low-tide counts undertaken on (20/10/09, 03/11/09, 01/12/09, 15/02/2010).
[II] 1high-tide count undertaken on (06/02/2010).
[III] Mean (± s.d.) calculated across low tide counts.

Species richness (total number of species) across the whole site was relatively consistent throughout the survey programme; a total of 51, 51, 48 and 55 species recorded during the four low tide counts respectively. 53 species were recorded during the high tide count in February 2010.

Species richness at subsite level varied considerably. The average across low tide surveys ranged from 4 species (Subsite 0A462) to 35 species (0A499). Higher species diversity was recorded during low tide surveys with the exception of 0A462 (Table 5.5).

Table 5.5 Subsite species richness

Subsite	Mean (±S.D) (Low Tide Surveys)	High Tide Survey	Peak Overall
0A399	26	20	31 (LT)
0A462	4	14	14 (HT)
0A482	11	13	15 (LT)
0A483	15	15	18 (LT)
0A484	15	23	23 (LT)
0A485	16	9	18 (LT)
0A486	19	18	24 (LT)
0A487	13	16	18 (LT)
0A488	17	21	24 (LT)
0A489	18	18	21 (LT)
0A490	14	14	16 (LT)
0A491	13	13	14 (LT)
0A494	20	16	23 (LT)
0A499	35	34	39 (LT)

5.3.4 Waterbird distribution

Data analyses determined the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the site as a whole. Selected results from these 'subsite assessments' are shown in Tables 5.6 (a–f) which aim to provide a quick and easy way to discover which subsites were utilised to a greater extent than others on a species by species basis and with respect to different behaviours.

Ranked assessments relate to the position (zone) that birds were observed in; for example intertidal or subtidal. In some cases data for different broad habitats have been combined such as intertidal and supratidal habitats (roosting birds) or terrestrial/coastal lagoon.

The categories L, M, H, V used in the tables relate to final rank positions (see 5.3.2 for methodology). Rank numbers are used in Table 5.6 (c) (rank average foraging density) and Tables 5.6 (e, f & g) that relate to the single high tide survey. Where boxes are left blank, means simply that a species was not recorded in that particular subsite, for the behaviour being assessed.

The fact that different subsites may be categorised as 'Very High' for the same species highlights that several subsites may be equally important for the aspect of the species' wintering ecology in question. This approach, rather than averaging across all surveys, allows for equal weightings to be given for temporal differences – e.g. concentrations of foraging birds in different subsites at different times reflecting the natural pattern of distribution across time as species move in response to changing prey densities or availabilities.

Waterbird distribution maps ('dot-density maps') are provided in Appendix 7.

Summary roost data and a map showing actual[11] locations of roost sites (10th March 2010) are presented in Appendix 8. Roost records should be regarded as a snap-shot of roosting waterbirds during the survey period. The data only includes diurnally-roosting birds and it should be borne in mind that several species seek foraging habitat (terrestrial habitat, exposed intertidal) throughout the tidal cycle, especially when the weather is cold. In particular, dabbling ducks can avail of feeding opportunities throughout the tidal cycle (lagoons) and roosting numbers and locations may be in constant flux.

To aid interpretation of maps and tables, discussion notes on the distribution of each SCI species are provided in the following pages. This information draws upon the full extent of the data collected and analysed for Lough Swilly SPA.

[11] The roost map shows the actual recorded position of roost sites (in contrast to dot-density maps).

Table 5.6 (a) Lough Swilly SPA Subsite assessment – total numbers during LT surveys (across all behaviours and habitats) (L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods)

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS	V			M				L					H	V
NW						V							V	H
GJ	V													V
SU	L			V	M	L	V	M	M	V			V	M
T.	V						V			M	L		M	V
MA	V		L	M		L	M		H	M	L	L	H	V
RM	L	L		H	V	V	M	H	V	M	M	H	M	H
GG	H	M	H	M	V	H	M	L	V	V	H	M		H
OC	M	L	M	V	M	V	L	H	V	H	H	L	H	
DN	M		M	H		V	V	L	H	M			V	H
CU	V	L	L	V	M	H	H	M	H	H	H	H	V	L
RK	M		M	V	M	H	V	M	M	H	M		V	H
WN	H				M	L	H		M	H	L		M	V
SV							V	V					V	H
SP					V									V
GN	H			M		M		M	M	H	H			V
H.	V	L	L	M	M	M	H	M	M	H	M	H	H	V
CO														V
KN	H						V	H	V	V	V			H
GK	V			M	V	M	L	L	H	M	V	L	H	V
CM	V	L	M	H	H	H	L	M	V	L	H	M	V	H

Table 5.6 (b) Lough Swilly SPA Subsite assessment – total numbers foraging intertidally[I] subtidally[II] and within terrestrial/coastal lagoon habitats combined [III] (LT surveys). *Note that data for SV, GN, and H. have been combined across all habitats; data for Teal** is for subtidal and lagoon aquatic habitats combined.

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS[III]	V												H	V
NW[III]						V							V	H
GJ[III]	V													V
SU[I]				V		L	V	M	L	V			V	
T.[I]							V			V			H	
T.**	H						H			M			H	V
MA[I]				H		L			V	V	M		V	
MA[III]	H		M										H	V
RM[II]	M	L		H	V	V	M	H	V	L	M	V	L	
GG[II]	V	M	M	H	V	H	M	M	V		L	M		
OC[I]	M	L	M	V	M	V	L	V	V	M	H	M	H	
DN[I]			M	H		V	V	M	H	M			V	
CU[I]	M	L	M	V	M	H	M	M	V	H	H	L	V	
RK[I]	M			V	M	H	V	M	M	H	L		V	
WN[III]	H													V
WN[I]						H	V		H	V			V	
SV*							V	V						
SP[II]					V									
GN*	H					H		M	M	H	H			V
H.*		L	L	H	H	H	V	M	L	L	M	L	V	V
CO[III]														V
KN[I]	M						V	V	V	V	V			
GK[I]	V				V	M	M	M	H	M	H	L	H	
CM[I]	L		M	V	M	V	L	H	H	L	M	H	M	

Table 5.6 (c) Lough Swilly SPA Subsite assessment – ranked average foraging density for selected species - intertidal[I] and subtidal[II] (LT surveys)

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
SU[I]				3		7	1	5	6	2			4	
T.[I]							1			2			3	
MA[I]				3		4			1	5	6		2	
RM[II]	9	12		3	4	2	1	6	5	8	11	7	10	
GG[II]	2	10	9	7	1	5	4	6	3	12	11	8		
OC[I]	2	8	7	3	1	5	13	4	6	12	11	10	9	
DN[I]			4	5		2	1	7	8	6			3	
CU[I]	2	11	13	1	3	4	10	7	5	8	9	12	6	
RK[I]	2			4	3	7	1	6	9	8	10		5	
WN[I]						5	1		3	2			4	
SV[II]							1	2						
GN[II]	2	7				5	7	4	6	1	3			
KN[I]	1	2					1	4	6	5	3			
GK[I]	1				2	3	9	5	6	10	7	8	4	
CM[I]	3		7	2	4	1	11	6	8	12	10	5	9	

Table 5.6 (d) Lough Swilly SPA Subsite assessment – total numbers (roosting/other behaviour) within LT surveys (Intertidal/Supratidal[I], Subtidal[II] and All habitats combined[III]).

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS[III]	V			M				L						V
NW	*Not recorded in roosting/other behaviour*													
GJ[III]	V													V
SU[I]							V			V				
T.[I]							V			H			V	
MA[III]	V						H			M	M	L	H	H
RM[II]				V						H				
GG[II]		H	V	V					H	V	V	M		
OC[1]			M	H	H				V	V	M	L	V	
DN[I]			V						V					
CU[III]	V				M		V	M	L	H	L	V		M
RK[I]	L		H				V		V	H			L	V
WN[III]	V				M		M			V	M		V	V
SV[III]													V	H
SP	*Not recorded in roosting/other behaviour*													
GN[II]				V						H	V			
H.[III]	*V*		M						V	V	M	H		V
CO	*Not recorded in roosting/other behaviour*													
KN[I]							H		V					
GK[III]	V													
CM[III]	V	M	M	H	H				V	L	H	H	H	V

Table 5.6 (e) Lough Swilly SPA Subsite assessment – total numbers HT survey (across all behaviours and habitats)

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS							2						3	1
NW													1	
GJ														1
SU				2	5		1	6	7	3			4	8
T.	3						1			4			5	2
MA	4	12		5	8	9	7	9	2	3	11		6	1
RM	6	5			6		4		8		3	2		1
GG	7	4	3	5	2		10	6	1	11	9	8		
OC	12	9	6	5	8	13	2	3	11	1	10	7	4	
DN	5	2	4							3			1	
CU	8			2	5	12	3	8	7	4	6	10	1	11
RK	8			4	7	11	3	6	9	2	9		1	5
WN	3				8	6	2	8	6	5			4	1
SV								2						1
SP		1			2									
GN	4	5					8	6	2	6	3			1
H.	5			2	4				3	6	6			1
CO														1
KN							1			2				
GK	5				1	7		7	5	3	2	7		3
CM	7		5	3	2	13	10	1	6	8	12	9	11	4

Table 5.6 (f) Lough Swilly SPA Subsite assessment – total numbers (roosting/other behaviour) within HT surveys (Intertidal/Supratidal[I], Subtidal[II] and All habitats combined[III]).

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS[III]														1
NW	*Not recorded in roosting/other behaviour*													
GJ	*Not recorded in roosting/other behaviour*													
SU[II]				1						2				
T.[III]							2			3				1
MA[III]	2			3	5		4	6		7				1
RM[II]												1		
GG[II]			1									2		
OC[1]			6	5	7		1	2		3	9	7	4	
DN[I]			1	2						3				
CU[III]	4			1	6	10	3	9		11	5	6	2	8
RK[I]	7			3	6		4			2			1	5
WN[III]	4				5		2			3				1
SV	*Not recorded in roosting/other behaviour*													
SP[II]		1												
GN[II]											1			
H.[III]	4			1	3				1	5	5			
CO	*Not recorded in roosting/other behaviour*													
KN[I]							1							
GK[III]	2				1			2				2		
CM[III]	5		4	3	2		8	1		6	9	6		

Table 5.6 (g) Lough Swilly SPA Subsite assessment – total numbers foraging intertidally[I] subtidally[II] and within terrestrial/coastal lagoon habitats [III] (HT survey). *Note that data for SV, GN and H. have been combined across all habitats; data for Teal** is for subtidal and lagoon aquatic habitats combined.

Subsite ► / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS[III]							2						3	1
NW[III]													1	
GJ[III]														1
SU[I]							3		2				1	
T.[I]							1			2			3	
T.**	2									3			4	1
MA[III]													2	1
RM[II]	4	3			4		2				1			
GG[II]	7	3	4	4	2		10	6	1	11	8	8		
OC[I]	3								2	1	4	4	4	
DN[I]										2			1	
CU[I]	3								1	2	5	5	4	
RK[I]	7			5	6	10	1	4	8	3	8		2	
WN[III]	2													1
SV*								2						1
SP[II]					1									
GN*	3	5					8	6	2	4	4			1
H.*				2										1
CO	*Not recorded*													
KN[I]										1				
GK[I]	4					4			2	2	1			
CM[I]										1			2	

Lough Swilly SPA (4075) - Waterbird Survey Programme 2009/10

Waterbird distribution - discussion notes

Where mentioned, information on benthic communities is from NPWS (2011). Bird Usage Mapping refers to data collected as part of the NPWS 'Bird Usage Surveys' and undertaken at Lough Swilly by NPWS Northern Division. 'I-WeBS' refers to count data recorded at Lough Swilly as part of the Irish Wetland Bird Survey.

Note that species' foraging densities when shown take into account the area of habitat within which the species foraged. For example, the densities of waders Dunlin and Curlew foraging intertidally were calculated in relation to the area of intertidal habitat within each subsite, excluding subtidal and supratidal habitat.

Whooper Swan *Cygnus Cygnus* - Family (group): Anatidae (geese)

The Whooper Swan is a migratory species and has a Palearctic breeding distribution between 50° N and 70° N, extending from Iceland to the Bering Sea (Robinson et al. 2004). Four breeding populations have been identified in the Western Palearctic and Asia. The majority of the Icelandic breeding population of Whooper Swans winter in Britain and Ireland (McElwaine et al. 1995; Robinson et al. 2004).

Historically the species was known to winter in areas with freshwater wetland habitats or brackish lagoons and coastal bays. A change to feeding on terrestrial habitats has been observed since the mid 1990's (Crowe, 2005) with grassland and increasingly, arable habitats used by foraging individuals.

In terms of total numbers, Lough Swilly is the most important coastal wetland in the Republic of Ireland for Whooper Swans and the Lough Swilly/Lough Foyle complex is known as a major autumn and spring staging ground for the species (Robinson et al. 2004).

Numbers

Internationally-important numbers of Whooper Swans were recorded in all survey months at Lough Swilly SPA, with the exception of the final low tide survey (15/02/2010). The peak count of 2,720 was recorded on 3rd November 2009.

Whooper Swans were recorded in a total 5 subsites throughout the entire survey programme: A399 (Blanket Nook), 0A483 (Fahan Creek), 0A487 (Castle Shanaghan), 0A494 (Big Isle) and 0A499 (Inch Lough & Levels).

Highest proportions of Whooper Swans were recorded within 0A499 (Inch Lough & Levels) on three low tide survey occasions with A399 (Blanket Nook) supporting the highest proportion during the low tide survey on 3rd November 2009, albeit that the numbers (1460) were only slightly higher than that recorded within 0A499 (Inch Lough & Levels) (1233) on the same day.

Subsite 0A499 (Inch Lough & Levels) supported internationally-important numbers in all survey months, with the exception of the final low tide survey (15/02/2010). The peak subsite count of 1,324 individuals compares favourably with peak numbers recorded during I-WeBS.

Foraging Distribution

Whooper Swans are primarily herbivorous, feeding on aquatic plants, grasses and agricultural plants such as grain and vegetables.

During low tide surveys, Whooper Swans were recorded with greatest frequency and highest numbers within 0A499 (Inch Lough & Levels). The importance of this subsite for Whooper Swans is well documented (e.g. Sheppard, 1993, NPWS Bird Usage Mapping) where the swans feed across the 'levels' (polderland) which is predominantly agricultural grassland, stubbles and crops. Despite the known mobility of the species, Inch Lough & Levels remains the single most important subsite used by the species; Sheppard (1993) stating '*only Inch Levels are constantly used*,' a feature confirmed by the 2009/10 waterbird surveys.

0A499 (Inch Lough & Levels), or more specifically, the levels, supported internationally-important numbers of foraging Whooper Swans in all survey months, with the exception of the final low tide survey (15/02/2010). The peak number recorded in this subsite was 1,278 foraging Whooper Swans (20/10/09). The habitat during the survey period was a mixture of arable crops (BC1) and improved agricultural grassland (habitat codes after Fossitt, 2000).

On one occasion (03/11/09), high numbers (1460) were recorded foraging within A399 (Blanket Nook) which is similar to Inch Lough & Levels in comprising coastal lagoon, wetland, polderland and agricultural habitats.

Smaller numbers were recorded foraging within terrestrial habitat associated with 0A486 (Swilly Estuary) and 0A494 (Big Isle).

Roosting Distribution

Whooper Swans forage diurnally and roost at night, therefore it is to be expected that relatively low numbers were recorded in roosting/other behaviour during the 2009/10 waterbird surveys.

Whooper Swans were recorded in roosting/other behaviour in greatest numbers and frequency within 0A499 (Inch Lough & Levels) with the exception of one survey (01/12/09) when the greatest proportion but low numbers (9 individuals) were observed within 0A399 (Blanket Nook). A few individuals were recorded within roosting/other behaviour at 0A483 (Fahan Creek) and 0A487 (Castle Shanaghan).

Inch Lough is known as an important night-time roost for geese and swan species at Lough Swilly SPA.

Greenland White-fronted Goose *Anser albifrons flavirostris* - Family (group): Anatidae (geese)
The Greater White-fronted Goose (*Anser albifrons*) has five subspecies and a circumpolar breeding distribution. The subspecies Greenland White-fronted Geese (*A. a. flavirostris*) breeds solely in western Greenland and winters almost entirely in Ireland and north and west Scotland. Historically these geese wintered on bogland, callowland and rough grassland but in recent decades have changed to feeding in agricultural landscapes of varying degrees of farming intensity (Stroud & Fox, 2009). The global population of Greenland White-fronted Geese is estimated at 23,162 and nearly 50% of this population winters in Ireland (Fox et al. 2009). About three-quarters of these birds are found at Wexford Harbour and Slobs. Lough Swilly is important for being one of very few other sites to support internationally important flocks during winter.
Numbers
Greenland White-fronted Geese were recorded during four of the five surveys; absent from the final low tide count on 15th February 2010. Whole site numbers of international importance were recorded on two occasions (03/11/09 & 06/02/10). The site peak number of 551 was recorded during the high tide count on 6th February 2010. Greenland White-fronted Geese were recorded in three subsites; distributing across, on average, 12% of the total survey area. Subsite peak numbers of 511 and 458 Greenland White-fronted Geese were recorded within 0A494 (Big Isle) on 06/02/10 (HT survey) and 03/11/09 (LT survey) respectively. These counts surpass the threshold for international importance. Greenland White-fronted Geese were also recorded in low numbers and with low frequency in 0A485 (Ballybegley) and 0A499 (Inch Lough & Levels). 0A494 (Big Isle), 0A485 (Ballybegley) and 0A499 (Inch Lough & Levels) have been noted previously as favoured areas of Greenland White-fronted Geese (Sheppard, 2002).
Foraging Distribution
Greenland White-fronted Geese feed primarily on below-grounds plant parts such as stems, stolons rhizomes, tubers and seeds (BWPi, 2004). At Lough Swilly, they forage within agricultural grassland, much of which is polderland claimed from intertidal habitats in the mid 19th century. 0A494 (Big Isle) supported large flocks of foraging geese on two occasions (511 and 458 on 06/02/10 and 03/11/09 respectively. On one occasion 0A485 (Ballybegley) supported the main foraging flock within the site (115 geese). Far fewer individuals were observed foraging within 0A499 (Inch Lough & Levels) and on two occasions only. Flock position maps revealed almost identical positioning of foraging flocks within 0A494 (Big Isle) on both 3rd November 2009 and 6th February 2010. On both occasions, the birds foraged in two large, loose flocks across the most northern extent of the terrestrial element of the subsite (area known as Big Isle), across both improved agricultural grassland (GA1) and tilled land (BC3), although a greater proportion and density were within the tilled land.
Roosting Distribution
All observations of Greenland White-fronted Geese were of foraging birds with none involved in roosting/other behaviour. Inch Lough is known as an important night-time roost for geese and swan species at Lough Swilly SPA.

Greylag Goose *Anser anser* - Family (group): Anatidae (geese)
Greylag Geese occur throughout the mid-latitudes of Europe and Asia and is polytypic with eight recognised populations within two subspecies (Wetlands International, 2006). The Icelandic-breeding population (*A. A. anser*) winters largely in the UK with smaller numbers wintering in Ireland (Hearn & Mitchell, 2004). During winter the migratory population overlaps with resident populations. Migratory Greylag Geese are not distinguishable in the field from resident feral flocks. This account therefore refers to all Greylag Geese recorded during the 2009/10 waterbird surveys with no attempt to distinguish between migratory and resident birds.
Numbers
Greylag Geese were recorded in all five surveys. The peak count of 775 individuals was recorded on 1st December 2009. During the survey period Greylag Goose were recorded exclusively within two subsites: 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels). 0A499 (Inch Lough & Levels) supported the species on all five survey occasions with peak subsite numbers recorded on 1st December 2009 (724 individuals). 0A399 (Blanket Nook) supported higher numbers and peak site proportions early in the survey period (October and November counts).
Foraging Distribution
Greylag Geese are herbivorous, foraging typically within agricultural habitats during daylight hours and roosting within communal roost sites close to water at night. The majority of survey observations of Greylag Geese were therefore of foraging birds. Foraging distribution was confined to two subsites: 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels). 0A399 (Blanket Nook) supported higher numbers and peak site proportions early in the survey period (October and November counts); thereafter 0A499 (Inch Lough & Levels) supported all observed foraging individuals. The importance of Blanket Nook (0A399) and Inch Loughs and Levels (0A499) for Greylag Geese is well documented (e.g. Sheppard, 1993, NPWS Bird Usage Mapping) where the geese feed across the 'terrestrial' element of the subsites (polderland) which is now predominantly agricultural grassland, stubbles and crops. In 0A399 (Blanket Nook) during the October and November low tide surveys, the main concentrations of Greylag Geese were located in the north-west of the polderland. Within Inch Loughs and Levels (0A499) on 01/12/09, almost all the Greylag Geese recorded (710 Individuals) foraged in one location (north-east of polderland) together with smaller numbers of Whooper Swans and Canada Geese (*Branta canadensis*). 114 individuals foraged in a similar position (field just south) during the final low tide survey on 15/02/10.
Roosting Distribution
The majority of observations of Greylag Geese were of foraging birds. The exception was during the low tide count on 1st December 2009 when 51 Greylag Geese were observed roosting/other within 0A399 (Blanket Nook), the only greylags observed within this subsite on this survey day.

Shelduck *Tadorna tadorna* - Family (group): Anatidae (ducks)
Tadorna tadorna has five known populations which breed across temperate Eurasia. The northwest Europe population breeds and winters along coasts of Britain, Ireland, Scandinavia, the Baltic and continental Europe. A breeding species in Ireland, adult Shelducks undertake a moult migration each autumn to the Helgoland Bight area of the Wadden Sea (Prater, 1981). Following the moult, the Shelducks then gradually make their way back to wintering areas. The wintering population is thought to be enhanced by Shelducks from continental Europe (Wernham et al. 2002).
Numbers
Shelduck were recorded in all five surveys; the site peak of 595 birds occurring during the February 2010 high tide count. Shelduck were recorded within 10 subsites overall, but with regularity (three low tide surveys or more) within only five subsites: 0A483 (Fahan Creek), 0A486 (Swilly Estuary), 0A487 (Castle Shanaghan), 0A489 (Leannan Estuary) and 0A494 (Big Isle). Average % subsite occupancy was 46%, representing c40% of the total area surveyed. Notable low tide subsite counts were recorded on 15th February 2010 when 129, 134 and 168 individuals were recorded in subsites 0A486, 0A494 and 0A489 respectively. The latter count (168) surpasses the all-Ireland threshold of importance. The peak high tide count of 206 Shelducks in 0A486 (Swilly Estuary) also represents numbers of all-Ireland importance.
Foraging Distribution
Shelducks can forage in a variety of ways from scything their bill through wet mud on exposed tidal flats, to dabbling and scything in shallow water and up-ending in deeper waters. They can therefore forage throughout the tidal cycle, albeit for different prey items and with differing methods at various tidal stages. During low tide surveys at Lough Swilly, all observation of foraging Shelducks were from intertidal habitat. Overall the species was recorded foraging within seven subsites but only two subsites supported foraging individuals during all four low tide surveys: 0A486 (Swilly Estuary) and 0A494 (Big Isle). The largest proportions of foraging individuals were recorded from different subsites on each low tide survey occasion: 0A486 (Swilly Estuary), 0A494 (Big Isle), 0A483 (Fahan Creek) and 0A489 (Leannan Estuary) for the four low tide surveys respectively. The importance of Swilly Estuary, Leannan Estuary and Fahan Creek for Shelduck has been noted previously (Sheppard, 2002). 0A494 (Big Isle) supported over 80% of foraging Shelducks during the high tide survey on 6th February 2010 (79 individuals). All of the aforementioned subsites are classified as the same benthic community type i.e. mud community complex. This community is characterised by inner estuarine muds (silt-clay fraction 39-96%) (NPWS, 2011) and an invertebrate community characterised by oligochaete worms (*Tubificidae*), polychaete worms *Hediste diversicolor* and *Pygospio elegans,* bivalve molluscs *Macoma balthica* and *Scrobicularia plana* and crustacean amphipod *Corophium volutator.* In addition, this community type supports the Mud Snail *Hydrobia ulvae,* a favoured prey of Shelduck. The greatest foraging density (foraging intertidal) recorded was 0.7 birds ha^{-1} (0A486, 15/02/2010). Average subsite foraging density was also greatest for this subsite (average 0.26 birds ha^{-1}). Average whole site foraging density (intertidal) was 0.08 Shelduck $ha.^{-1}$
Roosting Distribution
Relatively few Shelducks were recorded undertaking roosting/other behaviour, the exception being 62 individuals roosting intertidally and 74 roosting subtidally within 0A483 (Fahan Creek) during the high tide survey (06/02/10). During the roost survey of 10th March 2010, 57 Shelducks were recorded at four individual locations within 0A483 (Fahan Creek).

Teal *Anas crecca* - Family (group): Anatidae (ducks)

Anas crecca has five breeding subspecies that occur across north and northwest Europe, Siberia and into Asia (Wetlands International, 2006). Teal are largely migratory, moving south of their breeding range during winter. Being highly responsive to cold spells they can show rapid and extensive movement during these periods. Teal breeding in Britain and Ireland are supplemented during winter by birds from a range extending from Iceland, through Scandinavia to northwest Siberia (Wernham et al. 2002).

Numbers

Across the whole site, numbers of Teal were above the threshold of all-Ireland importance during all survey months. A peak count of 2,953 individuals was recorded on 3rd November 2009.

Teal were recorded within six subsites overall and on all five survey occasions within four subsites: 0A399 (Blanket Nook), 0A486 (Swilly Estuary), 0A494 (Big Isle) and 0A499 (Inch Lough & Levels). 0A486 (Swilly Estuary) and 0A499 (Inch Lough & Levels) supported numbers of of all-Ireland importance on four and three survey occasions respectively, although the subsite peak count (910 individuals) was recorded for 0A399 (Blanket Nook) on 3rd November 2009.

0A486 (Swilly Estuary) held the greatest proportion of total site Teal on three survey occasions (01/12/09, 06/02/2010 & 15/02/2010).

Foraging Distribution

Teal are omnivores and have a variety of foraging methods (e.g. dabbling and up-ending) within differing habitats and water depths.

During the survey programme, Teal foraged within intertidal, subtidal and lagoon habitats.

Teal foraged subtidally within 0A486 (Swilly Estuary), (Leannan Estuary) and 0A494 (Big Isle) and terrestrially within 0A399 (Blanket Nook).

Teal foraged within the lagoon habitat of 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels). Inch Lough & Levels supported the greatest proportions of total site numbers (individuals foraging within water) across all five surveys with numbers of all-Ireland importance on three separate occasions.

Small numbers of Teal were recorded foraging intertidally within 0A489 (Leannan Estuary) and 0A494 (Big Isle) on two survey occasions each, but by far the largest number of Teal were recorded foraging intertidally within 0A486 (Swilly Estuary). 693 foraged intertidally during the high tide count on 6th February 2010, together with a further 150 individuals within 0A489 (Leannan Estuary).

Within Swilly Estuary (0A486) Teal foraged intertidally in the sheltered upper estuarine reaches, close to the channel of the Swilly River and saltmarsh dominated by *Spartina* sp. Of note were flocks that often occurred along the southern shoreline (Farsetmore as per 6'' maps). This general area supported good numbers during the 2009/10 survey programme e.g. flocks of 60 and 318 individuals (01/12/09), flock of 131 on 06/02/10 and flock of 201 on 15/02/10. This compares favourably with previous bird usage mapping e.g. flock of 121 Teal (15/11/01), flock of 127 Teal (07/02/02) and flock of 104 on 25/01/05. Previous NPWS Bird Usage mapping further confirms the importance of inner Swilly Estuary for this species.

Sheppard (2002) notes that Swilly Estuary, Blanket Nook, Inch and Leannan Estuary are areas favoured by Teal.

Roosting Distribution

Teal were recorded roosting within intertidal and subtidal habitats primarily within 0A486 (Swilly Estuary), 0A489 (Leannan Estuary) and 0A494 (Big Isle). The largest intertidal roost was 606 Teal within 0A494 (Big Isle) on 3rd November 2009, a large roost comprising mainly Teal, Wigeon and Mallard. In the same position exactly, but one month earlier (21/10/2009), 183 Teal roosted along with Wigeon and Shoveler.

Large numbers of Teal were recorded in roosting/other behaviour within 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels), peaking with 910 individuals within Blanket Nook on 3rd November 2009.

During the roost survey of 10th March 2010, 232 Teal were recorded roosting at ten locations within four subsites: 0A489 (Leannan Estuary), 0A399 (Blanket Nook), 0A484 (Ballymoney) and 0A499 (Inch Lough & Levels); the largest of these roost locations supported 50 individuals (0A489, Leannan Estuary).

Mallard *Anas platyrynchos* - Family (group): Anatidae (ducks)

Mallards are the most common and widespread of northern hemisphere dabbling ducks (Delaney et al. 1999) with a wide breeding range across northern Eurasia and north America with the band extending from Arctic tundra to the subtropical zone (Wernham et al. 2002). Mallards breeding in northwest Europe, including Ireland, are largely sedentary or dispersive with short movements made during cold spells. The winter population in Ireland is increased by migratory individuals from various locations including Iceland, Northwest Russia, Poland and Germany (Wernham et al. 2002).

Numbers

Across the whole site, numbers of Mallard peaked in October 2009 (1,246 birds) and thereafter declined from 729 on 3rd November 2009 to 477 on 15th February 2010. All whole-site counts surpassed the threshold of all-Ireland importance. The early peak in numbers is consistent with the pattern described in Crowe (2005) in that Mallards congregate early at some of the larger sites, with a subsequent reduction in numbers attributable to both the start of the hunting season and the re-distribution of some individuals to other smaller wetland sites.

Mallards were recorded in all of the 14 subsites surveyed although subsite use varied considerably between the five surveys and ranged from 35% subsite occupancy on 3rd November 2009 to 85% occupancy during the high tide count (06/02/10). Average % area occupancy varied from 40 – 84%.

Mallards were recorded on all five survey occasions within five subsites: 0A399 (Blanket Nook), 0A486 (Swilly Estuary), Ray (0A490), 0A494 (Big Isle) and 0A499 (Inch Lough & Levels). On 20th October 2009, 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels) supported subsite numbers of all-Ireland importance (468 and 584 Mallards respectively).

0A499 (Inch Lough & Levels) held the greatest proportions of Mallards during three of the low tide surveys (47%, 50% and 28% of total Mallards on 20/10/09, 01/12/09, 15/02/09 respectively) plus during the high tide survey (06/02/10). The majority of individuals were associated with the aquatic habitat. 0A399 (Blanket Nook) supported the greatest proportion of Mallards (35% of total) on 3rd November 2009.

Foraging Distribution

Mallards are omnivores and feed upon a wide variety of food items including seeds, plants and animal material (e.g. crustaceans, molluscs). They also have a variety of foraging methods including dabbling and up-ending, across differing habitats and water depths as well as terrestrial grazing, although the species is essentially a shallow-water duck, water depth usually less than 1m when foraging (Wernham et al. 2002).

At Lough Swilly, Mallards foraged within intertidal, subtidal, terrestrial and lagoon habitats. 0A499 (Inch Lough & Levels) was by far the most important subsite for foraging Mallards, the only subsite to support foraging individuals on all five survey occasions and with the exception of the final low tide survey, supporting the highest numbers.

0A488 (Shellfield) was notable in supporting good flocks (>90 individuals) of Mallards foraging intertidally on two survey occasions; on both occasions positioned along the upper shore ('intertidal mixed sediment with polychaetes') between Ballygreen Point and Shellfield. 0A399 (Blanket Nook) supported good numbers foraging terrestrially on 03/11/09.

Roosting Distribution

Mallards were recorded within roosting/other behaviour (across all habitats) within 10 subsites but with regularity (> 3 occasions) in only four subsites: 0A399 (Blanket Nook), 0A486 (Swilly Estuary), 0A489 (Leannan Estuary) and 0A494 (Big Isle). In the latter, a regular low tide roosting area was alongside the Isle Burn channel as it crosses the mudflats leading to the main river channel. This site was frequented by roosting Mallards, Teal and Wigeon.

0A399 (Blanket Nook) supported the greatest proportion of roosting Mallards during all four low tide surveys.

During the roost survey of 10th March 2010, 262 Mallards were recorded roosting at 21 locations within seven subsites: 0A489 (Leannan Estuary), 0A490 (Ray), 0A488 (Shellfield), 0A300 (Blanket Nook), 0A484 (Ballymoney), 0A499 (Inch Lough & Levels) and 0A483 (Fahan Creek). 0A499 (Inch Lough & Levels) supported the greatest number of roosting individuals (131) across five locations and also the single largest roost (46 individuals).

Red-breasted Merganser *Mergus serrator* - Family (group): Anatidae (sea ducks)

Red-breasted Mergansers have a wide breeding range which spans northern Europe, Russia, Siberia and North America. The Irish breeding population is thought to be sedentary. Large flocks of moulting birds congregate at several sites in Ireland and numbers remain relatively stable throughout the wintering season apart from some peaks possibly reflecting passage populations (Crowe, 2005) or cold weather movements. The wintering population is thought to contain additional birds from central Europe, eastern Greenland (Robinson, 1999) and Iceland (Scott & Rose, 1996).

Numbers

By their nature, wintering flocks of Red-breasted Mergansers usually comprise relatively small numbers, as reflected by the all-Ireland threshold of 35 individuals.

At Lough Swilly, whole site numbers remained relatively stable across October to February (range 50 – 66 individuals) and peaked on the final low tide count (105 individuals on 15th February 2010). All counts therefore passed the threshold of all-Ireland importance.

Red-breasted Mergansers were recorded in a total of 13 subsites across the survey period. Subsite use varied between the five surveys and ranged from five to nine subsites during the first four surveys; the species occurring within 11 subsites during the final low tide survey.

The subsite peak of 50 individuals was recorded in 0A488 (Shellfield) on 15th February 2010. 32 individuals were recorded within 0A485 (Ballybegley) on the first low tide count (20/10/09).

0A488 (Shellfield) recorded the greatest numbers on two survey days (44% and 48% of the total site numbers on 3rd November 2009 and 15th February 2010 respectively). 0A484 (Ballymoney) and 0A485 (Ballybegley) also supported peak proportions (40 and 61% of the total respectively) on two low tide survey occasions. Peak numbers during the high tide count were recorded in 0A499 (Inch Lough & Levels).

Foraging Distribution

Red-breasted Mergansers are sea ducks that feed on fish, obtained by frequent dives from the surface. They prefer shallow waters (range 3 – 6m) (BWPi, 2004)

During low tide surveys, foraging Red-breasted Mergansers utilised between four to eight subsites. Although some subsites supported only a few individuals, some aggregation of individuals did occur. Peak concentrations occurred in different subsites across the low tide surveys (0A485, 0A488, 0A484, 0A491) with numbers ranging from 22 – 32, representing 49 – 64% of the whole site numbers on the respective days. No pattern of subsite usage is evident from the dataset, rather a pattern for aggregation in certain subsites on differing days, likely related to the species moving in response to their mobile prey.

Roosting Distribution

The majority of Red-breasted Mergansers were recorded foraging. Small numbers of individuals were recorded roosting/other within 0A483 (Fahan Creek), 0A489 (Leannan Estuary) and 0A491 (Rathmullan).

Three roosting flocks were recorded during the roost survey of 10th March 2010 (18, 12 and 27 individuals within 0A491 (Rathmullan), 0A490 (Ray) and 0A462 (West Inch) respectively).

Great Crested Grebe *Podiceps cristatus* - Family (grosup): Podicipedidae (grebes)
Great Crested Grebes are a widespread breeding species; one population of the nominate subspecies breeds and winters in north and west Europe (Wetlands International, 2006). It is thought likely that the majority that breed within Ireland are resident, with individuals breeding at inland wetlands (lakes) moving to coastal sites for the winter period. Some immigration of individuals due to cold weather movements is likely (Crowe, 2005) but the true nature of this species' movements is poorly known (Wernham et al. 2002).
Numbers
Between 29 and 128 Great Crested Grebes were recorded during low tide counts with three out of the four surveys recording numbers that surpassed the all-Ireland threshold of 55. The site peak count of 308 was recorded during the high tide count (06/02/2010). Throughout the survey period, Great Crested Grebes were recorded within 13 subsites, between eight and ten subsites used during any one survey. Four subsites were used during all four low tide surveys: 0A399 (Blanket Nook), 0A484 (Ballymoney), 0A486 (Swilly Estuary) and 0A499 (Inch Lough & Levels). 0A484 (Ballymoney) supported peak subsite numbers (40% and 48% of site total) during two low tide surveys (20/10/09 & 03/11/09). 0A488 (Shellfield) supported 70% of the site's total during the final low tide count (15/02/10) and peak numbers (30% of site total) during the high tide survey (06/02/10). 0A489 (Leannan Estuary) supported peak numbers on 01/12/09 (6 individuals) although total site numbers on this day (29) were significantly lower than recorded during other surveys. The subsite peak was 93 individuals within 0A488 (Shellfield) on 06/02/10 (HT). This subsite also supported numbers of all-Ireland importance during the final low tide survey (15/02/10). 0A484 (Ballymoney) supported numbers of all-Ireland importance (61) during November 2009 (03/11/09).
Foraging Distribution
Great Crested Grebes are largely piscivorous, diving in a general range of 2-4m, although deeper dives have been recorded for this species previously (BWPi, 2004). During the survey programme of 2009/10, Great Crested Grebes at Lough Swilly showed a clear preference for foraging within subtidal waters of 0A484 (Ballymoney), thereafter 0A488 (Shellfield). This same preference has been noted previously (Sheppard, 2002). Other subsites used to a lesser degree during low tide surveys included: 0A399 (Blanket Nook), 0A462 (West Inch), 0A485 (Ballybegley), 0A486 (Swilly Estuary) and 0A491 (Rathmullen). The species ranged more widely during the high tide survey (06/02/10), recorded in 11 subsites in comparison with five to seven subsites used during low tide surveys.
Roosting Distribution
Relatively few Great Crested Grebes were recorded roosting. Notable exceptions include 23 individuals within 0A482 (Lisfannan) during the high tide survey and 20 within 0A490 (Ray) during the low tide count on 3rd November 2009.

Oystercatcher *Haematopus ostralegus* - Family (group): Haematopodidae (wading birds)

Haematopus ostralegus is polytypic; four subspecies are recognised of which only two occur within western Europe and Africa (Delaney et al. 2009). The nominate race breeds in western and northern Europe as far as Iceland, Norway and Finland and includes those birds that breed within Ireland. Irish-breeding birds are partial migrants, some moving south during winter while others remain on the Irish coast. Wintering birds are supplemented by breeding birds from Iceland and the Faeroe Islands (Wernham et al. 2002).

Numbers

During the 2009/10 surveys, Oystercatchers at Lough Swilly were recorded in numbers of all-Ireland importance in all months. The site peak was 2,103 individuals on 3rd November 2009. Oystercatchers were widespread across the site occurring in 13 subsites with an average subsite occupancy (% subsites) of 87%. They occurred in 11 subsites across all four low tide surveys.

0A485 (Ballybegley), 0A483 (Fahan Creek) and 0A488 (Shellfield) supported peak proportions during the low tide surveys. Of these, 0A483 (Fahan Creek) is notable in recording peak or second highest site proportions in all four LT surveys. 0A485 (Ballybegley) was in the top five of subsite rankings in all low tide surveys. The subsite peak count was 582 Oystercatchers within 0A483 (Fahan Creek) on 3rd November 2009. 520 individuals were recorded within 0A488 (Shellfield) during the final low tide count (15/02/10), representing 35% of the site total on that day.

Foraging Distribution

Oystercatchers are large wading birds that forage primarily on tidal flats although the species can be found foraging along non-estuarine coastline or terrestrially for earthworms. On tidal flats their food consists of Cockles (*Cerastoderma edule*), Mussels (*Mytilus edulis*) and to a lesser degree other bivalve molluscs such as *Macoma balthica*, *Scrobicularia plana* and *Mya arenaria* as well as larger polychaetes such as *Arenicola marina* and *Hediste diversicolor.* Cockles and Mussels are favoured prey items and '*universally important during winter'* (Zwarts et al. 1996) because these bivalves live in the upper sediment and are nearly always accessible, although it is now known that individual birds may be specialised by way of morphology with regards choosing one or the other of these prey items and their means of handling them.

Oystercatchers at Lough Swilly foraged within 11 subsites during all four low tide counts. A further two subsites recorded infrequent and small numbers of foraging individuals. Peak proportions of foraging Oystercatchers were recorded within 0A485 (Ballybegley) (277 birds), 0A487 (Castle Shanaghan) (417 birds), 0A483 (Fahan Creek) (280 birds) and 0A488 (Shellfield) (520 birds) on the four low tide surveys respectively.

Although often described as a widely distributed '*evenly spread'* species (Sheppard, 2002), the 2009/10 surveys suggests a degree of subsite preference. 0A483 (Fahan Creek) supported peak numbers on one occasion (01/12/09) and second highest numbers on all other low tide survey occasions. Another notable subsite was 0A485 (Ballybegley) in that it was always ranked in the top five subsites for foraging Oystercatchers. 0A487 (Castle Shanaghan), 0A488 (Shellfield) and 0A494 (Big Isle) also supported notable numbers/proportions of foraging birds.

0A485 (Ballybegley), 0A487 (Castle Shanaghan) and 0A488 (Shellfield) are notable in that they all have beds of native oysters *Ostrea edulis.* Despite the name Oystercatcher, Oysters do not form a great proportion of the Oystercatcher diet and the relationship between the bird species and the benthic community is more likely related to the fact that native shellfish beds support diverse communities of invertebrates through their role as providing substratum (for attachment e.g. algae), shelter, sediment stabilisation and habitat complexity amongst other factors. At Lough Swilly, the native oyster beds occur in areas classified as 'intertidal mixed sediment with polychaetes' where species such as Cockles (*Cerastoderma edule*) and Mussels (*Mytilus edulis*) also occur.

Flock maps show that Oystercatchers foraging within 0A485 (Ballybegley) were positioned directly in relation to the position of shellfish beds. Flock maps for the surveys of 0A487 (Castle Shanaghan) are incomplete, but those for latter surveys show Oystercatchers foraging within the southern extent of the '*Ostrea edulis* dominated community' where native mussel beds were also observed. Much of 0A488 (Shellfield) is classified as '*Ostrea edulis* dominated community', and flocks maps and NPWS Bird Usage mapping recorded large flocks of Oystercatchers foraging from Ballygreen Point southwards.

In contrast, 0A483 (Fahan Creek) is not known to support native Oyster beds and is dominated by a 'mud community complex' (NPWS, 2011). However, the northwest section of this subsite near Lackan Point has a range of substrate types, including areas of shingle/gravel and rocky outcrops/reefs that may support Mussels. Furthermore, core sample data from this subsite reveals the presence of a Cockle bed along the western shoreline. The northern section of the subsite was favoured by foraging Oystercatchers with flock positions remarkably similar on a month to month basis.

The greatest foraging density (foraging intertidal) recorded was 3 birds ha^{-1} (0A487 03/11/09). Average subsite foraging density was greatest in 0A484 (1.6 birds ha^{-1}). Average whole site foraging density (intertidal) was 0.5 Oystercatchers ha^{-1}.

Roosting Distribution

Oystercatchers were recorded in roosting/other behaviour within 10 subsites. During low tide surveys numbers and regularity within subsites was variable; only 0A482 (Lisfannan) recorded roosting birds in all four low tide surveys. 0A488 (Shellfield) recorded significant numbers of roosting birds during the first two low tide surveys 123 and 250 individuals respectively for 20/10/09 and 03/11/09).

1,279 Oystercatchers were recorded roosting within nine subsites during the high tide survey (06/02/10). 0A486 (Swilly Estuary) recorded the highest numbers (247) closely followed by 0A487 (Castle Shanaghan) (235 birds) and 0A489 (Leannan Estuary) (226 individuals). 0A483 (Fahan Creek) and 0A494 (Big Isle) supported >150 roosting Oystercatchers.

During the roost survey (10/03/10), 664 Oystercatchers were recorded roosting within eight subsites: 0A482, 0A483, 0A484, 0A487, 0A488, 0A489, 0A490, 0A491. 0A487 (Castle Shanaghan) supported the highest number of roosting birds (177) divided into two roost sites

supporting 167 and 10 individuals. Another notable roost site was 110 individuals within 0A489 (Leannan Estuary). 0A483 recorded the highest number of individual roost sites (seven locations) totalling 135 roosting birds.

Dunlin *Calidris alpina* - Family (group): Scolopacidae (wading birds)

The Dunlin is a Holarctic and highly migratory wader, breeding widely in Arctic zones across Europe, Asia and North America. The nominate form *alpina* breeds from northern Scandinavia eastwards across European Russia and western Siberia to 85^0 E (Delaney et al. 2009). This race migrates southwest to winter along the coasts of Western Europe, south to Iberia, western Mediterranean and beyond. *C. a. alpina* originating from the western part of their breeding range moult mainly in the Wadden Sea and begin to arrive in Ireland during October (Crowe, 2005).
Ireland has a small and declining breeding population of *Calidris alpina schinzii* which are believed to winter mainly in west Africa (Delaney et al. 2009).

Numbers

Relatively low numbers of Dunlin (547) were recorded during the first low tide survey (20/10/09) and thereafter numbers increased to a peak in February (2,929).

Overall, Dunlin were recorded within 10 subsites but subsite usage between surveys varied with on average, 46% of subsites used by Dunlin during low tide surveys, representing 43% of the total site area.

Only 0A489 (Leannan Estuary) and 0A485 (Ballybegley) supported Dunlin in all four low tide surveys. However, 0A494 (Big Isle) was the most important subsite for the species (in terms of total numbers) in three out of the five surveys and recorded the peak subsite count (1,133 birds on 01/12/09). 0A485 (Ballybegley) supported peak numbers during one survey (20/10/09) and the second highest numbers during two other surveys (300 and 1062 individuals on 03/11/09 and 01/12/09 respectively).

Foraging Distribution

0A489 (Leannan Estuary) and 0A485 (Ballybegley) supported foraging Dunlins in all four low tide surveys.

Peak numbers of foraging Dunlins were recorded within 0A485 (Ballybegley) (20/10/09), 0A494 (Big Isle) (03/11/09 & 01/12/09) and 0A486 (Swilly Estuary) (15/02/10). In terms of overall numbers supported when foraging, 0A494 (Big Isle) was the most important subsite for this wader species.

Dunlin are generally considered to prefer muddy estuaries (e.g. Hill et al. 1993; Summers et al. 2002) but the species is fairly adaptable with a wide prey range including small size-classes of bivalves, gastropod molluscs (e.g. *Hydrobia ulvae*) and crustaceans such as *Corophium volutator* and Gammarid amphipods, although polychaete worms are the most preferred prey items. Much of the intertidal habitat of Lough Swilly is muddy in nature and the subsites listed above as supporting peak numbers of Dunlin (0A485, 0A494, 0A486) are all inner estuarine subsites characterised by the benthic community 'mud community complex' and distinguished by invertebrate species such as *Corophium volutator,* the Polychaete *Hediste diversicolor* and smaller spionid worms *Pygospio elegans* and *Eteone* sp., all considered suitable prey items for Dunlins.

Within 0A485, Dunlins foraged within mudflats west of Ballylawn and Ardnadition. Just south of this but within 0A494 (Big Isle), large numbers of Dunlins (950) foraged on 01/12/09 but on other occasions the Dunlins were located along the inner sheltered mudflats southwest of the 'isle'.

A large flock of 320 Dunlin foraged together with Light-bellied Brent Geese, Ringed Plover and Oystercatcher at the northern end of White Strand (0A482, Lisfannan) on 15/02/10.

The greatest foraging density recorded (foraging intertidal) was 10 birds ha^{-1} (0A486 15/02/10). 0A485 (Ballybegley) supported 5.9 birds ha^{-1} on 1st December 2009; the average for this subsite was 2.3 birds ha^{-1}. Average whole site foraging density (intertidal) was 0.75 Dunlins ha^{-1}.

Roosting Distribution

During the high tide survey (06/02/10) Dunlins roosted within five subsites: 0A399 (Blanket Nook), 0A482 (Lisfannan), 0A483 (Fahan Creek), 0A488 (Shellfield) and 0A489 (Leannan Estuary). The greatest number (274) representing 66% of the total number of roosting individuals were recorded within 0A482 (Lisfannan) and positioned within terrestrial and intertidal habitat. Within 0A482 (Lisfannan), the favoured roost site was at the north of White Strand and in particular, the north side of the pier where Dunlins roosted along with other species such as Ringed Plovers.

Only 87 Dunlin were recorded roosting during the roost survey on 10th March 2010. These birds were located within three subsites: 0A491 (Rathmullen) (5 birds), 0A482 (Lisfannan) (71 birds) and 0A483 (Fahan Creek) (11 birds).

Curlew *Numenius arquata* - Family (group): Scolopacidae (wading birds)

The Curlew has a widespread breeding range across temperate latitudes of the Palearctic region, occurring across Europe and Asia from Ireland in the west to northern China in the east (Delaney et al. 2009). The nominate subspecies breeds across Europe and winters in Europe. Ireland supports a small and declining population of breeding Curlew. Irish breeding birds are thought to make only short migrations and are mainly resident during winter with numbers enhanced by birds moving in from breeding grounds in Fennoscandia, the Baltic and northwest Russia (Delaney et al. 2009).

Numbers

During the 2009/10 waterbird survey programme, monthly counts of Curlew recorded variable numbers, peaking on the high tide survey day (06/02/10) with 1,454 birds. The low tide peak of 1,259 birds was recorded on 03/11/09. All months however recorded numbers that surpassed the threshold of all-Ireland importance.

Curlew were a widespread species, occurring in 12-13 subsites across all surveys, with a % occupancy (no. subsites) of 89% representing 86% of the total site area. 11 subsites supported Curlew in all four low tide surveys.

The peak subsite count was 716 Curlew in 0A483 (Fahan Creek) on 3rd November 2009, representing 57% of the total site numbers and surpassing the threshold for all-Ireland importance. 0A483 (Fahan Creek) recorded peak numbers on two survey occasions (03/11/09 & 01/12/09). 0A494 (Big Isle) recorded peak numbers on 20/10/09 and 0A399 (Blanket Nook) recorded peak numbers on 15/02/2010.

0A483 (Fahan Creek) was notable in being ranked in the top four subsites (in terms of total numbers) in all four low tide surveys. 0A494 (Big Isle) recorded peak numbers during the high tide count (06/02/10).

Foraging Distribution

Curlews are the largest intertidal wader to spend the non-breeding season within Ireland. Within intertidal areas they seek out larger prey items such as crabs, large worms and bivalves. Their de-curved bill is ideally suited to extracting deep-living worms such as Lugworms (*Arenicola marina*). Curlews also feed amongst damp grasslands for terrestrial worms; this activity perhaps more common during the high tide period, is likely to play an important part in achievement of sufficient energy intake.

During low tide surveys, Curlews were recorded foraging intertidally within 13 subsites. Of these, nine subsites supported foraging Curlews in all four low tide surveys (0A399, 0A483, 0A484, 0A485, 0A488, 0A489, 0A490, 0A491 and 0A499). Peak foraging proportions were recorded within three subsites: 0A494 (Big Isle, 20/10/09), 0A483 (Fahan Creek, 03/11/09 and 01/12/09) and 0A488 (Shellfield, 15/02/10).

At some sites Curlews are known to be widely distributed and sometimes evenly distributed (e.g. Musgrove et al. 2003). The observations at Lough Swilly are somewhat at variance with this because, although widespread, Curlews at Lough Swilly exhibited a degree of subsite preference. 0A483 (Fahan Creek) was notable in supporting the greatest proportions of foraging Curlews during two low tide counts. The southern shoreline of this sheltered subsite was particularly favoured where the Curlews often foraged along with Oystercatchers. 0A488 (Shellfield) was notable in supporting the greatest proportions during a low tide count and during the high tide count (06/02/10). 0A489 (Leannan Estuary) was notable for being ranked in the top five subsites for foraging Curlew on all survey occasions.

The highest recorded subsite foraging density was 2.07 foraging Curlew ha^{-1} (0A483 Fahan Creek) on 3rd November 2009. The highest average foraging density was 1 Curlew ha^{-1} (0A483). As a territorial species, high foraging densities are unlikely for Curlew.

Roosting Distribution

During low tide surveys relatively few Curlews were recorded in roosting/other behaviour. Notable exception were 171 roosting intertidally on 3rd November 2009 in 0A486 (Swilly Estuary) and 170 roosting intertidally on 15th February 2010 within 0A399 (Blanket Nook).

During the high tide survey (06/02/10), 956 Curlew were recorded roosting across intertidal, terrestrial and supratidal habitats. 0A483 (Fahan Creek) recorded the greatest numbers (266 roosting intertidally) followed by 0A494 (Big Isle) and 0A486 (Swilly Estuary) where 246 and 207 roosted respectively.

557 Curlews were recorded roosting during the roost survey of 10th March 2010. Highest total numbers (145) were recorded roosting within 0A399 (Blanket Nook). One roost within this subsite supported 132 Curlew, the largest single roost site recorded on the survey day. 0A490 (Ray) recorded 102 roosting Curlew divided amongst five roost locations. Other subsites to support roosting Curlew were: 0A483, 0A484, 0A487, 0A488, and 0A489.

Redshank *Tringa totanus* - Family (group): Scolopacidae (wading birds)

Tringa totanus breeds widely across the Palearctic in a band that extends both into the low arctic and Mediterranean zones. The taxonomy of the species has proved complex but generally five populations are recognised including *T. t. britannica,* a small and declining population that breeds in Britain and Ireland and *T. t. robusta* which breeds in Iceland and the Faeroes and winters in Britain, Ireland and the North Sea area (Delaney et al. 2009).

Numbers

Total numbers of Redshanks were above the threshold of all-Ireland importance during all survey months. The peak low tide number was 1,928 individuals (03/11/09). 1,304 Redshanks were counted during the high tide count (06/02/10).

Redshanks were recorded within 12 subsites overall and within 10 subsites during all four low tide surveys: 0A399, 0A483, 0A484, 0A485, 0A486, 0A487, 0A488, 0A489, 0A494, 0A499.

The peak subsite count of 613 Redshanks was recorded within 0A486 (Swilly Estuary) (03/11/09) which represented 32% of the total site numbers present on the survey day and surpassed the threshold of all-Ireland importance. 0A494 (Big Isle) supported numbers of all-Ireland importance (413) during the high tide count (06/02/10).

Foraging Distribution

Redshanks forage mainly by pecking at the surface or probing within intertidal mudflats; favouring the muddier sections of sites where they prey upon species such as the ragworm *Hediste diversicolor* or mud snail *Hydrobia ulvae.* A particularly favoured prey is the burrowing amphipod *Corophium volutator.*

At Lough Swilly, Redshanks foraged regularly (3 low tide counts or more) within 10 subsites. Peak foraging proportions during low tide surveys were recorded for three subsites as follows: 0A486 (Swilly Estuary) (20/10/09 & 03/11/09), 0A483 (Fahan Creek) (01/12/09) and 0A494 (Big Isle (15/02/10). Peak foraging proportions were in the range 33 – 39% of the total Redshanks foraging across the site.

0A494 (Big Isle (15/02/10) is notable for being ranked in the top three subsites for foraging Redshanks in all five surveys. 0A486 (Swilly Estuary (15/02/10) is notable for being ranked as the top subsite for foraging Redshanks on three survey occasions (two low tide surveys plus the high tide survey). Both of these subsites have muddy sediment, classified as the benthic community type 'mud community complex' (NPWS, 2011), one variant of which is dominated by the invertebrate species *Corophium volutator. C. volutator.* was recorded with most abundance from 0A489 (Leannan Estuary) (ranked 'high' in terms of Redshank foraging distribution) and also recorded from core samples in 0A486 (Swilly Estuary) and 0A483 (Fahan Creek).

No pattern at a scale smaller than subsite is evident with Redshanks positioned differently from month to month; however this is considered the norm as Redshanks tend to only aggregate where prey densities are highest (e.g. Goss-Custard, 1969) and quickly move on to other patches as prey become depleted.

The greatest subsite foraging density (foraging intertidal) recorded was 3.4 birds ha^{-1} (0A486, 03/11/09). 0A399 (Blanket Nook) supported 2.3 birds ha^{-1} on 20th October 2010. The greatest foraging density across whole-site intertidal habitats was recorded for the low tide count on 3rd November 2009 (0.68 Redshanks ha^{-1}) while the average site foraging density (intertidal) was 0.4 Redshanks $ha.^{-1}$

Roosting Distribution

During low tide survey the greater majority of Redshanks were observed foraging. 206 roosted within 0A486 (Swilly Estuary) on 1st December 2009.

During the high tide survey (06/02/10) 745 Redshanks were recorded roosting. Of these 285 individuals were roosting intertidally at one location within 0A494 (Big Isle). Significant numbers also within 0A489 (Leannan Estuary) (208) and 0A483 (Fahan Creek) (122).

314 Redshanks were recorded roosting during the roost survey of 10th March 2010. The greatest number were recorded within 0A486 (Swilly Estuary) at two separate roost locations. One of these, an intertidal roost just off Bogay, supported 153 individuals – the largest single roost site recorded during the survey. 0A483 (Fahan Creek) recorded 43 roosting Redshanks at four roost locations.

Wigeon *Anas penelope* - Family (group): Anatidae (dabbling ducks)

Wigeon have a widespread breeding distribution across northern Europe and Asia, from Iceland and northern Britain across Scandinavia, and northern Russia to the Russia to the Bering Sea coast (Wernham et al. 2002). The species is highly migratory. Five main wintering groups are known; birds breeding in northwest and northeast Europe and west Siberia, winter in northwest Europe.

Numbers

At Lough Swilly numbers of Wigeon peaked in October (1,759 individuals) and remained at numbers of all-Ireland importance during all low tide counts. The high tide survey recorded 753 individuals.

Wigeon were recorded within 10 subsites overall, but with regularity (four surveys or more) within five subsites: 0A399 (Blanket Nook), 0A486 (Swilly Estuary), 0A489 (Leannan Estuary), 0A494 (Big Isle) and 0A499 (Inch Lough & Levels).

Highest numbers in all five surveys were recorded for 0A499 (Inch Lough & Levels) with numbers representing 40 – 81% of the site totals across the various surveys. The peak subsite count was 1,425 Wigeon on 20th October 2009 (0A499).

Foraging Distribution

The Wigeon diet is almost entirely vegetarian and a major part of the diet comprises coastal seagrass and algae species which are taken by grazing or dabbling in shallow water. They may also feed upon grasslands and agricultural crops for seeds, stems and rhizomes. A gregarious bird, they are rarely seen far from water.

At Lough Swilly, Wigeon were recorded foraging within terrestrial, intertidal and subtidal habitats. Intertidal feeding was less common with relatively few individuals in each low tide survey; one exception being 228 Wigeon foraging upon the tidal flats of 0A486 (Swilly Estuary) on 1st December 2009. The majority of individuals foraged across terrestrial and aquatic (lagoon) habitats of 0A399 (Blanket Nook) and 0A499 (Inch Lough & Levels) and 0A499 supported the greatest number of individuals during all surveys. These results compare favourably with previous records of the site (Sheppard, 2002; NPWS bird usage mapping).

Roosting Distribution

Apart from the first low tide survey (20/10/09), over 300 Wigeon were recorded in roosting/other behaviour during all surveys. 451 Wigeon were roosting/other on 3rd November 2009; the majority located within 0A494 (Big Isle) and 0A499 (Inch Lough & Levels). In Big Isle, 190 Wigeon roosted intertidally alongside the Isle Burn channel as it crosses the intertidal flats leading to the main channel. This large roost also supported 606 Teal and 141 Mallard ducks.

0A399 (Blanket Nook) and 0A489 (Leannan Estuary) also held regular flocks of roosting/other Wigeon.

During the roost survey of 10th March 2010, 304 Wigeon were recorded roosting across five subsites: 0A399, 0A483, 0A484, 0A494 and 0A499. The largest single roost was of 105 birds (0A399) where the Wigeon roosted intertidally on the eastern shore, together with 17 Wigeon and 20 Mallards. 0A494 held the greatest number (110) divided between two roost locations.

Shoveler *Anas clypeata* - Family (group): Anatidae (dabbling ducks)

Shoveler has a widespread breeding distribution across north America, Canada, north and eastern Europe, Siberia to central Asia (Wetlands International, 2006). The small numbers of Shoveler breeding in Ireland are largely sedentary or dispersive and numbers during winter are supplemented by birds from other locations within northwest and central Europe. The wintering population is relatively small (c2500 individuals) (Crowe et al. 2008).

Numbers

Shoveler were recorded in all survey months, the site peak of 58 birds recorded on 3rd November 2009. They were recorded within four subsites: 0A486 (Swilly Estuary), 0A487 (Castle Shanaghan), 0A494 (Big Isle) and 0A499 (Inch Lough & Levels). The subsite peak of 25 individuals was recorded for 0A487 (Castle Shanaghan) on 3rd November 2009.

Average % occupancy (number subsites) ranged from 14% to 28%. The species occupied, on average, 19% of the total count area.

Peak proportions during low tide were recorded within three subsites – 0A494 (20/10/09), 0A486 (03/11/09 & 15/02/10) and 0A487 (01/12/09). 0A499 (Inch Lough & Levels) supported the highest numbers during the high tide count (06/02/10).

Foraging Distribution

Shoveler are omnivorous, taking a range of items from planktonic crustaceans and small molluscs, to insects, larvae, plant material and seeds. A true dabbling duck, Shoveler feed by surface-feeding, swimming with head and neck immersed, up-ending, and less often, by shallow dives (BWPi, 2004).

At Lough Swilly, Shoveler foraged within three subsites: 0A486 (Swilly Estuary), 0A487 (Castle Shanaghan) and 0A499 (Inch Lough & Levels), although the latter subsite was during the high tide survey only.

Roosting Distribution

During low tide counts, Shoveler were recorded roosting intertidally within 0A494 (Big Isle) (maximum 20 individuals). Smaller numbers were recorded roosting within 0A499 (Inch Lough & Levels). Shoveler were not recorded roosting during the roost survey of 10th March 2010.

Scaup *Aythya marila* - Family (group): Anatidae (diving ducks)
Two subspecies of *Aythya marila* (*marila, mariloides*) comprise four populations which have a circumpolar breeding distribution, including eastern and western Siberia, northern Europe, Alaska and Arctic Canada. One population of the nominate form breeds in northern Europe and western Siberia and winters in western Europe including Ireland. The wintering population is around 4,400 birds (Crowe et al. 2008).
Numbers
Relatively few individuals were recorded during low tide surveys at Lough Swilly, the low tide peak of 12 birds recorded on 15th February 2010. The site peak (49 birds) was recorded during the high tide count (06/02/10). This site peak is relatively consistent with recent previous years, 48 and 56 Scaup recorded for 2005/06 and 2006/07 respectively (I-WeBS), although the peak was much lower (22) in 2008/09. An all-time site peak of 240 was recorded in 2007/08 (I-WeBS) with higher than usual numbers recorded during NPWS bird usage mapping as well (e.g. 113 on 14/01/2007). During 2009/10, Scaup were recorded within three subsites: 0A484 (Ballymoney), 0A462 (West Inch) and 0A499 (Inch Lough & Levels). % area occupancy was, on average, just 11% of the total site area. The subsite peak was 28 Scaup was recorded for 0A462 (06/02/10). During the first three low tide surveys, Scaup were recorded exclusively within 0A499 (Inch Lough & Levels). They were present in both 0A484 (Ballymoney) and 0A462 (West Inch) during the high tide count and only within 0A484 (Ballymoney) during the final low tide survey (15/02/10).
Foraging Distribution
During the non-breeding season, Scaup are considered a true marine duck species with a distribution concentrated along open coasts and within partially enclosed estuaries, with little or no association with freshwater or brackish habitats. A diving species, Scaup take a variety of food items including crustaceans, insects and plant material although molluscs are thought to dominate the diet in many areas (BWPi, 2004). Diving depth is generally within the range 0.5 – 3.5 m, maximum dives up to 6m (BWPi, 2004). Scaup were recorded foraging within 0A484 (Ballymoney) and 0A499 (Inch Lough & Levels).
Roosting Distribution
28 Scaup were recorded in roosting/other behaviour within 0A462 during the high tide survey 06/02/10). During the roost survey (10/03/10), 42 Scaup were recorded roosting subtidally within 0A462 (West Inch).

Goldeneye *Bucephala clangula* - Family (group): Anatidae (diving ducks)
Six populations are described for this migratory species. The population that breeds within north and northwest Europe winters in northwest and central Europe (Wetlands International, 2006). The wintering population in Ireland is about 9600 individuals (Crowe et al. 2008).
Numbers
Numbers of Goldeneye increased from 38 on 20th October 2009 to a peak of 115 in February 2010. Goldeneye were recorded within 10 subsites across the whole survey period (0A399, 0A462, 0A483, 0A485, 0A486, 0A487, 0A488, 0A489, 0A490 and 0A499) but occupancy varied from 2 subsites (20/10/09) to 8 subsites (06/02/10) throughout the survey programme. Average % occupancy (no subsites) was 33% and representing an average 40% of the total site area. Greatest numbers were recorded within 0A499 (Inch Lough & Levels) which held the site peak of 82 birds on 15th February 2010.
Foraging Distribution
Goldeneye make shallow-water dives for their prey which may comprise molluscs, crustaceans and insect larvae, although the species has a wide and varied diet. The majority of Goldeneye were recorded foraging within 0A499 (Inch Lough & Levels) during all five surveys which recorded a peak number of 82 individuals foraging on 15/02/10. Smaller numbers foraged irregularly within 0A399 (Blanket Nook), 0A488 (Shellfield) and 0A490 (Ray) with occasional observations from 0A485 (Ballybegley), 0A487 (Castle Shanaghan) and 0A489 (Leannan Estuary). The species was most widespread during the high tide survey when 106 Goldeneye foraged across eight subsites: 0A399, 0A462, 0A486, 0A487, 0A488, 0A489, 0A490 and 0A499 although the majority (61) were located within 0A499 (Inch Lough & Levels).
Roosting Distribution
Goldeneye were recorded roosting/other within three subsites: 0A483 (Fahan Creek), 0A489 (Leannan Estuary) and 0A490 (Ray). Observations were of one or two birds only, with the exception of 22 roosting/other within 0A490 on 1st December 2009. 5 Goldeneye were observed roosting within 0A490 (Ray) during the roost count of 10th March 2010.

Grey Heron *Ardea cinerea* - Family (group): Ardeidae (herons)
Grey Herons occur throughout much of the Palearctic, Africa and south Asia. Although migratory, the species is largely resident in Ireland. Some immigration is known.
Numbers
Numbers of Grey Heron at Lough Swilly peaked in October 2009 (46 individuals) which surpasses the all-Ireland threshold of importance. Grey Herons were widespread across the site, occurring in all 14 subsites. Distribution was most widespread in October and November (13 and 11 subsites respectively) which dropped to seven subsites during the high tide survey. As Grey Herons are usually solitary when feeding a widespread distribution is to be expected; aggregation of birds is unlikely, especially as many individuals hold territories when feeding. 0A499 (Inch Lough & Levels) recorded the greatest numbers of Grey Herons in all surveys with a subsite peak of 13 individuals on 03/11/09.
Foraging Distribution
Across the survey programme Grey Herons foraged within 13 subsites. Most subsites supported a single or up to five individuals; 0A499 (Inch Lough & Levels) however, recorded between three and ten foraging Grey Herons during the survey programme. Peak proportions during low tide surveys (across all habitat types) were supported by: 0A499 (Inch Lough & Levels), 0A494 (Big Isle), 0A486 (Swilly Estuary) and 0A499 (Inch Lough & Levels), for the four low tide surveys respectively. 0A499 (Inch Lough & Levels) also held the greatest number and almost all of the species recorded during the high tide survey (06/02/10).
Roosting Distribution
Grey Herons were observed in roosting/other behaviour within nine subsites, generally one or two individuals. Highest numbers were recorded roosting within 0A399 (Blanket Nook) on three survey occasions. 13 roosted within 0A499 (Inch Lough & Levels) on 3rd November 2009. Only two Grey Herons roosted during the roost survey (10/03/10), both within 0A488 (Shellfield).

Coot *Fulica atra* - Family (group): Rallidae (rails)
Coot *Fulica atra* are a widespread breeding species distributed across Europe, parts of Africa, the Middle East, Asia and Australasia (Wetlands International, 2006). One population of the nominate subspecies breeds and winters within northwest Europe, including Ireland. The Irish breeding population is thought to be largely sedentary but there is a distinct increase of birds during winter due to an influx of migratory birds (Wernham et al. 2002).
Numbers
Numbers of Coot during the first three low tide surveys surpassed the threshold of all-Ireland importance and peaked with 860 individuals on 03/11/09. Coot were recorded exclusively within one subsite: 0A499 (Inch Lough & Levels).
Foraging Distribution
Coot typically inhabit large, still or slow moving waterbodies with shallow water. They are largely aquatic when foraging, feeding upon vegetation but also invertebrates, small fish and even frogs (BWPi, 2004). The 2009/10 surveys recorded Coot foraging exclusively within one subsite: 0A499 (Inch Lough & Levels). Previous studies have highlighted the same habitat and subsite preference (Sheppard, 2002). Although primarily an aquatic forager (hence dots in dot density maps are placed within the lagoon habitat), Coots may also forage on land (e.g. grassland). One observation (20/10/09) recorded a large flock of 84 Coot foraging together with Greylag Geese. Foraging in the proximity of geese is thought to benefit Coot due to a lower scan rate (vigilance) and a higher peck rate leading to greater intake rates (Randler, 2004).
Roosting Distribution
No observations were made of Coot in roosting/other behaviour during the main survey programme and they were not recorded roosting during the roost survey on 10th March 2010.

Knot *Calidris canutus* - Family (group): Scolopacidae (wading birds)
Knot are a high Arctic breeding species. Two populations are recognised in Western Eurasia and Africa *C. c canutus* and *C. c. islandica*. The latter breeds in north and east Greenland and northern Canada and winters in north-west Europe. Ireland supports a relatively small proportion of the total population during winter (c5%). The Wadden Sea is an important staging ground for the species after a non-stop flight from the breeding grounds (van der Kam, 2004).
Numbers
Whole-site numbers of Knot varied considerably across the survey period from a minimum seven individuals (20/10/09) to a site peak of 603 individuals during the high tide survey (06/02/2010). The latter value surpasses the threshold of all-Ireland importance. Knot were recorded within seven subsites: 0A399 (Blanket Nook), 0A486 (Swilly Estuary), 0A487 (Castle Shanaghan), 0A488 (Shellfield), 0A489 (Leannan Estuary), 0A490 (Ray) and 0A499 (Inch Lough & Levels). 0A486 (Swilly Estuary) was notable in supporting significant numbers (108 and 550) on two occasions (LT 01/12/09 and HT 06/02/10). Leannan Estuary (0A489) supported 53 Knot during the high tide count (06/02/10). Thereafter most observations were generally of less than 15 individuals. Knots were never recorded in more than three subsites during any one survey.
Foraging Distribution
Knots are true mud and sandflat foragers; pecking visible items off the surface or probing to the depth that their bill (3.5cm) allows. The preferred prey items are bivalve molluscs including *Scrobicularia plana, Macoma balthica* and *Mytilus edulis* of smaller size-classes that are able to be swallowed. Subsite use by foraging Knots was irregular across the survey programme. Small numbers (6 individuals) foraged within 0A490 (Ray) on 20th October 2009. The following month, small numbers (5 individuals or less) foraged across three subsites: 0A399 (Blanket Nook), 0A487 (Castle Shanaghan) and 0A488 (Shellfield). 108 Knot foraged within 0A486 (Swilly Estuary) on 1st December 2009. Small numbers foraged within 0A486 (Swilly Estuary), 0A489 (Leannan Estuary) and 0A490 (Ray) on 15th February 2010. Such variability in subsite use is not unexpected. Knot are considered a mobile species during winter, both within and sometimes between sites, a factor linked to the variable nature of its prey items (linked to spatial variations in annual spat fall) and that the wader moves in search of more profitable areas as patches of its sedentary prey items become depleted. With the exception of three Knot observed foraging within 0A399 (Blanket Nook) all other observations were from the western shores of the site and within habitat described as 'intertidal mixed sediment with polychaetes' or 'mud community complex' where a distinguishing species of the latter is the bivalve *Macoma balthica*, a favoured prey item of Knots. *M. balthica* was recorded relatively frequently across the site and within five of the count subsites (note that core samples were not taken from all subsites) and in most abundance from 0A489 (Leannan Estuary) and 0A487 (Castle Shanaghan). The mollusc was recorded along with *Scrobicularia plana* within 0A486 (Swilly Estuary).
Roosting Distribution
During the low tide survey programme, Knots were recorded within roosting/other behaviour on a single occasion when 10 individuals were recorded within 0A488 (Shellfieldl) (03/11/09). 550 Knots roosted intertidally within 0A486 (Swilly Estuary) during the high tide survey (06/02/10). No Knots were recorded during the roost survey of 10th March 2010.

Greenshank *Tringa nebularia* - Family (group): Scolopacidae (wading birds)

The Greenshank is a monotypic species that breeds widely across Northern Eurasia. Two populations are recognised in Western Eurasia and Africa, of which one, breeds in northern Europe and winters mainly in Southwest Europe, Northwest Africa and west Africa (Delaney et al. 2009). Ireland supports a relatively small proportion of this population during winter.

Numbers

Numbers of Greenshank across the whole site peaked in October 2009 (56 individuals); following the pattern noted in Crowe (2005) of an early peak in numbers due to passage birds. Numbers in all survey months surpassed the threshold for all-Ireland importance.

Greenshank were recorded within 12 subsites overall. Apart from certain times when they flock together (e.g. passage birds), Greenshanks generally exhibit a widespread distribution across their wintering site related to their territorial nature over their foraging patch; hence a relatively wide distribution is to be expected.

Peak proportions during low tide surveys were recorded for: 0A399 (Blanket Nook) (20/10/09 & 15/02/10), 0A484 (Ballymoney) (03/11/09 & 01/12/09), 0A490 (Ray) (03/11/09) and 0A499 (Inch Lough & Levels) (01/12/09 & 15/02/10). The subsite peak of 33 Greenshanks surpasses the threshold of all-Ireland importance (20/10/09).

Foraging Distribution

Greenshanks usually forage within (wading) or beside watercourses where they exhibit a variety of feeding methods to take a diversity of prey including insects, polychaete worms and small fish. The highest proportion of foraging Greenshanks was recorded for 0A484 (Ballymoney) on three low tide survey occasions. 0A399 (Blanket Nook) also supported the highest proportions on another survey day. 0A399 (Blanket Nook) was the only subsite to record foraging Greenshank during all four low tide surveys.

Roosting Distribution

During low tide surveys most Greenshanks were recorded foraging and not involved in roosting/other behaviour.

The high tide survey (06/02/10) recorded a single Greenshank within three subsites (0A399, 0A487 and 0A491) plus ten roosting individuals within 0A484 (Ballymoney).

A total of seven Greenshank were recorded roosting during the roost survey (10/03/2010) – four individuals within 0A399 (Blanket Nook), two within 0A484 (Ballymoney) and one within 0A483 (Fahan Creek).

Common Gull *Larus canus* - Family (group): Laridae (gulls)

The Common Gull breeds widely across the Palearctic and in North America (Mitchell et al. 2004). In Ireland, the species is most widely seen during winter when wintering birds arrive from Scotland and continental Europe (Wernham et al. 2004).

Numbers

Numbers of Common Gull across the whole site peaked in October 2009 (3,087 individuals). Thereafter between one and two thousand Common Gulls were recorded during each low tide survey.

Common Gulls were recorded within all 14 subsites. The subsite peak of 2,056 individuals was recorded for 0A494 (Big Isle) on 20/10/09. The second highest count of 1,442 was recorded for 0A399 (Blanket Nook) on 01/12/09.

The species ranged widely across the site and no particular pattern in site usage was observed other than for 0A399 (Blanket Nook) which supported peak proportions on two low tide survey occasions. 0A483 (Fahan Creek) and 0A499 (Inch Lough & Levels) supported good numbers in all low tide counts.

Foraging Distribution

Common Gulls foraged across 12 subsites overall.
Significant numbers were recorded within 0A483 (Fahan Creek) during all four low tide surveys (93, 80, 99, 180 individuals), the gulls foraging both intertidally and subtidally. This subsite supported the peak proportions on two survey occasions (01/12/09 & 15/02/10). 0A485 (Ballybegley) supported the highest numbers on 20/10/09 (276 birds) and 03/11/09 (159 birds); numbers that represented 49% and 48% of the total numbers recorded on those days respectively.

Roosting Distribution

With the exception of the first low tide survey, greater numbers of Common Gulls were observed roosting/other than foraging in all low tide surveys. 592 individuals were observed roosting/other intertidally within 0A399 (Blanket Nook) on 01/12/09. 0A499 supported peak numbers on two survey occasions. 0A482 (Lisfannan) and 0A483 (Fahan Creek) supported good numbers during all low tide surveys. 0A488 (Shellfield) and 0A494 (Big Isle) supported significant numbers on single occasions.

Common Gulls were recorded roosting/other within nine subsites during the high tide survey (06/02/10); peak numbers (220) within 0A487 (Castle Shanaghan) and 157 and 122 within 0A484 (Ballymoney) and 0A483 (Fahan Creek) respectively.

384 Common Gulls were recorded roosting during the roost survey (10/03/2010) within six subsites: 0A399, 0A482, 0A484, 0A486, 0A491 and 0A499. The largest number (183) were recorded within 0A499 (Inch Lough & Levels), representing 48% of the site total on that day. These birds were divided between three separate locations, one of these was the single largest roost (85 individuals) recorded on the day.

5.4 Lough Swilly - Activities and Events

5.4.1 Introduction

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve '*favourable conservation status'* and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2010). In its broadest sense, favourable conservation status means that an ecological feature is being maintained in a satisfactory condition, and that this status is likely to continue into the future.

At site level, the concept of 'favourable status' is referred to as 'favourable condition.' This relates to not only species numbers, but importantly, to factors that influence a species abundance and distribution at a site. The identification of activities and events that occur at a designated site is therefore important, as is the assessment of how these might impact upon the waterbird species and their habitats, and thus influence the achievement of favourable condition. Site-based management and the control of factors that impact upon species or habitats of conservation importance will be fundamental to the achievement of site conservation objectives.

This section of the report provides summary information on activities and events that occur at Lough Swilly that may either act upon the habitats within the site, or may interact with the Special Conservation Interest species and other waterbirds using the site.

5.4.2 Assessment Methods

An information review was undertaken which included NPWS site reporting files, bird usage mapping, Donegal County Development Plan (Donegal County Council, 2006), relevant Local Area Plans and other available documents relevant to the ecology of the site.

During the 2009/10 waterbird survey programme, field workers were required to record activities or events that occurred at the site that may potentially impact upon waterbirds. This information, together with results from a 'site activity questionnaire' provides valuable information gained from 30+ hours of coordinated surveyor effort across the whole extent of the SPA site.

Information collected is held in a database for easy maintenance and updating as necessary. Activities and events are categorised based on the standard EU list of pressures and threats used for Natura 2000 reporting.

Activities and events that have the potential to cause disturbance to waterbirds were scored according to their frequency, intensity and likely response level, using a methodology adapted from that used for monitoring Important Bird Areas (IBAs) (Birdlife International, 2006). The rationale for scoring is provided in Tables 5.7 and Table 5.8. Scores were assigned based on best-available information. Timing/frequency and intensity were scored in relation to observations recorded during the 2009/10 waterbird survey programme. Response was scored based on best expert opinion.

Note that insufficient information was available to undertake the assessment for fishery and aquaculture activities within the site.

Table 5.7 Scoring system for disturbance assessment

Frequency/Duration	(A) Timing Score	Intensity	(B) Scope Score	Response	(C) Severity Score	TOTAL IMPACT SCORE OF THREAT A + B + C
Continuous	3	Active, high-level	3	Most birds disturbed all of the time	3	9
Frequent	2	Medium level	2	Most birds displaced for short periods	2	6
Infrequent	1	Low-level	1	Most species tolerate disturbance	1	3
Rare	0	Very low-level	0	Most birds successfully habituate to the disturbance	0	0

Table 5.8 Scoring system - definitions & rationale

Frequency/Duration	Rationale
Continuous	Continuous motion or noise; not necessarily 24-hours per day but zones of fairly continuous activity such as a port or marina.
Frequent	Frequently observed during the survey programme, can be up to several times per 6 hour tidal cycle; and/or known to occur on a frequent basis.
Infrequent	Observed only once or twice during the survey programme and known/considered likely to be infrequent.
Rare	Known to occur but not observed during the survey programme and considered likely to be rare in occurrence.
Intensity	**Rationale**
Active, high-level	Would indicate an active event that is likely to displace waterbirds during its presence e.g. active shipping channel, speed boats, quad bikes, loose dogs.
Medium-level	Lower intensity events such as non-powered watercraft, vehicles, people walking along a shoreline (without dogs) – that are likely to result in waterbirds moving but birds will be less 'alarmed' than (1) and response will be species-specific.
Low-level	Although activity may be of a nature to displace waterbirds, birds move only slightly, resume normal behaviour quickly or show no determinable response at all; e.g. solitary walkers close to site but not impacting on waterbirds' immediate location; cars passing on an adjacent road…
Very low-level	Any activities considered to impart little effect upon waterbirds.
Response	**Rationale**
Most birds disturbed all of the time	Birds do not return - therefore equivalent to habitat loss.
Most birds displaced for short periods	Birds return once disturbance has ceased.
Most species tolerate disturbance	Weak response, birds may move slightly away from disturbance source.
Most birds successfully habituate to the disturbance	Little determinable effects.

Scores from the three categories were added together to result in an overall 'disturbance score as follows:-

Scores 0 – 3 = Low
Scores 4 – 6 = Moderate
Scores 7 – 9 = High

5.4.3 Overview of activities at Lough Swilly

A table of activities and events recorded across Lough Swilly SPA is given within Appendix 9. This table is as complete as possible within the given time-frame of the current assessment, and will be subject to change over time. It should therefore be viewed as a working and evolving assessment. Categories and sub-category codes that are used in this document relate to the standard EU list used for Natura 2000 reporting.

The term 'activity and event' is broad and the standard Natura list includes various built elements such as roads, bridges and car-parks that may occur adjacent to a site and therefore exert some pressure upon it in terms of disturbance, as well as other factors such as the encroachment of Common Cord-grass *Spartina anglica*. In the majority of cases, activities and events are shown in relation to the subsite within which they were observed or are known to occur. In a few cases, and particularly in relation to fisheries, the activities are recorded as 'known to occur' but with unknown spatial extent.

Site Overview

Lough Swilly is a long sea inlet cut through a variety of metamorphic rocks, situated on the west side of the Inishowen Peninsula in north Co. Donegal. The SPA comprises the inner part of Lough Swilly from just east of Letterkenny northwards to Killygarvan (*c.* 2 km north of Rathmullan) on the west side and to *c.* 2 km south of Buncrana on the east side; it includes the adjacent Inch Lough.

Forming part of the site are a series of improved pasture and arable fields on the south side of Lough Swilly which are the product of polderisation (Big Isle, Blankey Nook and Inch Levels).

Other habitats represented in the site are salt marshes, lagoons (at Inch Lough and Blanket Nook), rivers and streams, sand and shingle beaches, lowland wet and dry grasslands, drainage ditches, reedbeds and scrub. Inch Lough, whilst artificial in origin, is one of the largest and best examples of a shallow, low salinity lagoon in the country.

The main land uses in and around Lough Swilly are agriculture, fishing, aquaculture, infrastructure development and recreation. In the past, shooting was a significant activity at the site but this has reduced greatly in recent years. The large areas of empoldered farmland are intensively managed for cattle, winter cereals and root crops.

Fisheries and aquaculture are important for the local and wider economy. Donegal County Council (2006) states that '*in accordance with Government policy, the Council will support and promote the sustainable development of the aquaculture sector in order to maximise its contribution to jobs and growth in coastal communities and the economic well being of the County*.'

Various inshore fishery activities occur within the site although their spatial extent is largely unknown. Fishing methods include mobile gear - bottom trawls and dredges (the latter related to bottom-grown mussels), and static gear (pots and creels) for Shrimp, Lobster and Brown Crab.

Historically, Lough Swilly is noted for a wild native Oyster *Ostrea edulis* fishery. The fishery continues to present day although is subject to annual licensing. Lough Swilly also has a seed mussel fishery that supplies mussels to the bottom-grown sector.

Lough Swilly is a classified Bivalve Mollusc Production Area, the outer extent of which is delineated by a line drawn between Fanad Head and Dunaff Head. The most recent classification is Grade B (highest quality) for Mussels and Oysters (as per 15th June 2010).[12] Within the Lough Swilly SPA boundary the following aquaculture activities are/have been licensed: bottom-grown Mussels, rope-grown Mussels and Oysters. Fish-farming (Salmon) occurs in the outer reaches of Lough Swilly, outside of the SPA boundary. The Lough Swilly CLAMS Group was established in 2000 and a CLAMS plan completed and launched in September 2001. The CLAMS Group has been involved in lobbying for adequate pier facilities

[12] Criteria for the classification of bivalve mollusc harvesting areas under Regulation (EC) No 854/2004, Regulation (EC) 853/2004 and Regulation (EC) 2073/2005.

for both licensed aquaculture holders and fishermen within the Lough (Aquaculture Initiative, 2008). Lough Swilly forms an important part of the remit area for the Cross-Border-Aquaculture Initiative (CBait), contributing to the significant outputs of the six border counties, for example 26,613 tonnes in 2006 (Aquaculture Initiative, 2008).

County Donegal has long been recognised for its unique coastal environment and what this can offer in terms of coastal/marine leisure and tourism. Lough Swilly is no exception; as well as sheltered bays and harbours and a long maritime tradition it boasts a rich diversity of wildlife and a scenic landscape.

Marina developments at Buncrana and Rathmullen, together with a recently-developed marina at Fahan, serve leisure boating activities. Sea angling originates mainly from Rathmullen although Donegal County Council (2006) lists Fahan as having the potential for development as a centre for sea angling. Boating, sailing, Jet skiing and sail boarding are popular activities. Beaches occur at Rathmullan and Fahan and facilitate walking and swimming.

Hunting in the form of wildfowling has been a long tradition at the site. In recent years the activity has decreased partly because some privately-owned lands have become 'no-shooting' areas. Blanket Nook is a Wildfowl Sanctuary. Nowadays, very limited wildfowling can occur almost anywhere but is concentrated in certain areas (e.g. Swilly Estuary). Shooting within Inch Lough and Levels is managed and monitored by the National Parks and Wildlife Service.

Inch Lough and Levels is owned mostly by Donegal Creameries PLC. Inch Lough is leased to NPWS under a 33 year lease which commenced in 2002. An Grianán Farm, a large portion of the Levels, is rented out to a number of farmers on an annual basis. NPWS (2006) raised the issue of a noted reduction in grassland across Inch levels and the wider Lough Swilly area, and a subsequent increase in arable crops. This has implications for wintering geese and swan populations that rely on grass foraging, especially during the spring pre-migratory stage.

Spartina anglica is evident within Lough Swilly and covers extensive areas within Swilly Estuary and Leannan Estuary.

Increased urbanisation is evident at Letterkenny, Rathmullan and Buncrana which has led to pressures upon Waste Water Treatment facilities. Economic growth and prosperity in recent decades has resulted in an expansion of holiday homes in the region, particularly at Rathmullan, and Buncranna. A Golf Course is located adjacent to the north shore of inner Swilly Estuary (OA486).

5.4.4 Disturbance Assessment

Potential disturbance-causing activities were recorded within 12 subsites during the 2009/10 waterbird survey programme. The categories represented were: human (on-foot, shoreline), human (on-foot, intertidal aquaculture), bait diggers, powered watercraft, horse riding, dogs, aircraft, shooting, hand-gathering of molluscs and vehicles.

Summary results from the disturbance assessment are presented in Table 5.9 and a full assessment is given in Appendix 10. Although aquaculture activities are known to occur across the site, little activity was recorded during the 2009/10 waterbird survey programme, therefore these activities were not assessed. Similarly, as the spatial extent and frequency of fisheries activities are unknown, these are not included in the assessment.

Table 5.9 shows the highest score attained for each subsite (peak disturbance score) together with the activities that were assigned this score. The scores were assigned based on survey results and consultation responses but the intensity and response scores also draws on theoretical responses of waterbirds to disturbance. It should be borne in mind that not every event such as walking, winkle picking or dog exercise may cause disturbance to waterbirds. Waterbird responses will vary with each case and the scores calculated here are based on likely responses if a disturbance is caused. Individual activities are scored separately and there has been no attempt to produce cumulative scores for different activities occurring at the same time, although cumulative effects are likely.

It is clear from Table 5.9 that all 14 subsites surveyed are subject to a variety of activities that have the potential to cause disturbance to waterbirds. Although some high-intensity activities were recorded (jet skis, motorised vehicles) their frequency was not continuous so an overall 'high' disturbance score was never attained. Many different activities were scored as 'frequent' however, and together with medium-level intensities and a response amounting to displacement (albeit for short periods), these resulted in Moderate disturbance scores.

0A482 (Lisfannan) and 0A491 (Rathmullen) recorded the greatest number of activities and events, linked to tourism and recreation and the subsites' positions in relation to major towns (Buncrana and Rathmullen respectively). The development of a marina at 0A483 (Fahan Creek) is related to the moderate disturbance score associated with powered watercraft and jet skis.

Hand gathering of molluscs was recorded across the greatest number of subsites (11 subsites). Walking (including with dogs) was the next most frequently recorded activity, occurring within nine subsites overall. Shooting (wildfowling) was recorded infrequently during the 2009/10 waterbird survey programme and at four subsites only. January 2010 was the coldest January for 25 years (Met Éireann, 2010) and in response to freezing conditions, the Department of the Environment, Heritage and Local Government extended a temporary closure of the hunting season for wild birds (6th January 2010 to 20th January 2010).

The Golf Course adjacent to 0A486 (Swilly Estuary) has resulted in a moderate disturbance score since a tee was developed on the embankment which causes disturbance to roosting flocks. There is also a small airfield adjacent to 0A486 which causes disturbance to waders and ducks. Planes and microlites originating from this airfield also disturb feeding geese within 0A494 (Big Isle) (R. Sheppard pers. comm.).

An overall 'moderate' disturbance score relates to an activity that can displace birds for the length of time over which the activity takes place. The significance of the impact that even a short-term displacement could cause should not be underestimated. In terms of foraging habitat, displacement from feeding opportunities not only reduces energy intakes but also leads to an increase in energy expenditure as a result of the energetic costs of flying to an alternative foraging area. There are also various knock-on ecological effects of displacement such as increased competition within and/or between different species for a common food source.

Another important consideration is whether birds have alternative habitat to move to during a disturbance event. Birds that show the greatest response to disturbance and fly away (traditionally seen to be the ones that 'respond' the most to disturbance) may do so because they have alternative habitats to go to. In contrast, birds that are apparently less-disturbed and do not move away from a patch may be forced to behave in this way because they do not have alternative disturbance-free sites to go to. In terms of impacts at population level, the species most affected will be the ones whose fitness[13] is reduced by individuals being constrained to stay

[13] defined as a measure of the relative contribution of an individual to the gene pool of the next generation.

and ‘cope’ with the disturbance as opposed to species that can move to an alternative habitat of similar quality (Gill et al. 2001).

The significance of disturbance events is therefore highly species-specific. Furthermore, its significance will vary according to a range of factors including:-

- Timing (birds may be more vulnerable pre- and post- migration) or at the end of the winter when food resources are lower;
- Age of birds - for example, immature (1st winter birds) may be marginalised by older more dominant flocks and therefore already be under pressure to gain their required daily energy intake;
- Weather - birds being more vulnerable during periods of severe cold weather;
- Site fidelity – some species are highly site faithful at site or within-site level and therefore will be affected more than species than range more widely;
- Predation forces - increased competition may force some waterbirds to move into areas where they are subject to increased predation – i.e. indirect impact is an increased predation risk.

As a final review, Table 5.10 shows peak disturbance scores overlaid on the subsite assessment table (total waterbird numbers, LT surveys). Where a species distribution and activity responsible for the peak score are not likely to coincide, the table is left unshaded, although in practice this is infrequent because the majority of species’ distributions may potentially interact with the activity types in question. An example is 0A491, where walking or horse riding in intertidal areas might affect Curlews or Oystercatchers but the same activities are unlikely to have direct disturbance effects upon Red-breasted Mergansers feeding in the same area when inundated by the tide.

Table 5.9 Disturbance Assessment – Summary Table

Subsites and peak disturbance assessment scores

Scores 0 – 3 = Low Scores 4 – 6 = Moderate Scores 7 – 9 = High (see text for explanation)

Grey shading refers to subsites where activities occurred but were unassessed (fisheries & aquaculture).

Subsite Code	Subsite Name	Total Number Activities	Peak Disturbance Score	Activity Responsible
0A399	Blanket Nook	8	6	• Wildfowling
0A462	West Inch	6	5	• Walking • Horse Riding
0A482	Lisfannan	16	6	• Car parks (associated disturbance) • Jet Skis • Sailing
0A483	Fahan Creek	13	6	• Powered watercraft • Jet Skis
0A484	Ballymoney	3		
0A485	Ballybegley	8	6	• Powered watercraft • Walking
0A486	Swilly Estuary	4	6	• Golf Course • Wildfowling
0A487	Castle Shanaghan	7	6	• Wildfowling
0A488	Shellfield	7	5	• Walking
0A489	Leannan Estuary	10	4	• Walking • Hand gathering molluscs
0A490	Ray	11	5	• Sailing • Motorised vehicles
0A491	Rathmullen	16	6	• Walking • Horse Riding
0A494	Big Isle	5	5	• Flight path
0A499	Inch Lough & Levels	5	6	• Walking • Wildfowling

Table 5.10 Lough Swilly SPA – subsite rankings based on total numbers (LT surveys) x peak disturbance score

Note that where a species distribution and activity responsible for the peak score are unlikely to coincide, the table is left unshaded. Grey shading refers to subsites where activities occurred but were unassessed (fisheries & aquaculture).

Subsite ▶ / Species ▼	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
WS	V			M				L					H	V
NW						V							V	H
GJ	V													V
SU	L			V	M	L	V	M	M	V			V	M
T.	V						V			M	L		M	V
MA	V		L	M		L	M		H	M	L	L	H	V
RM	L	L		H	V	V	M	H	V	M	M	H	M	H
GG	H	M	H	M	V	H	M	L	V	V	H	M		H
OC	M	L	M	V	M	V	L	H	V	H	H	L	H	
DN	M		M	H		V	V	L	H	M			V	H
CU	V	L	L	V	M	H	H	M	H	H	H	H	V	L
RK	M		M	V	M	H	V	M	M	H	M		V	H
WN	H				M	L	H		M	H	L		M	V
SV							V	V					V	H
SP					V									V
GN	H			M		M		M	M	H	H			V
H.	V	L	L	M	M	M	H	M	M	H	M	H	H	V
CO														V
KN	H						V	H	V	V	V			H
GK	V			M	V	M	L	L	H	M	V	L	H	V
CM	V	L	M	H	H	H	L	M	V	L	H	M	V	H

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APPENDIX 1

SITE NAME: LOUGH SWILLY SPA

SITE CODE: 004075

Lough Swilly is a long sea inlet cut through a variety of metamorphic rocks, situated on the west side of the Inishowen Peninsula in north Co. Donegal. The SPA comprises the inner part of Lough Swilly from just east of Letterkenny northwards to Killygarvan (*c*. 2 km north of Rathmullan) on the west side and to *c*. 2 km south of Buncrana on the east side; it includes the adjacent Inch Lough. Also forming part of the site is a series of improved pasture and arable fields on the south side of Lough Swilly between Farsetmore and Inch Levels – these are of importance to geese and swans. It includes sections of the estuaries of the River Swilly, the River Leannan and the Isle Burn and the predominant habitat is a series of extensive sand and mud flats which are exposed at low tide - both estuaries and sand/mud flats are listed on Annex I of the E.U. Habitats Directive. Other habitats represented in the site are salt marshes, lagoons (at Inch Lough and Blanket Nook), rivers and streams, sand and shingle beaches, lowland wet and dry grasslands, drainage ditches, reedbeds and scrub. Inch Lough, whilst artificial in origin, is one of the largest and best examples of a shallow, low salinity lagoon in the country; it supports what is probably the largest population in the country of the Red-listed charophyte *Chara canescens*. A small sandy island, used by nesting terns, swans and gulls, occurs in the southern part of the lagoon.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Great Crested Grebe, Grey Heron, Whooper Swan, Greenland White-fronted Goose, Greylag Goose, Shelduck, Wigeon, Teal, Mallard, Shoveler, Scaup, Goldeneye, Red-breasted Merganser, Coot, Oystercatcher, Knot, Dunlin, Curlew, Redshank, Greenshank, Black-headed Gull, Common Gull, Sandwich Tern and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site supports an excellent diversity of waterfowl species in autumn and winter as well as breeding terns, gulls and ducks. The shallow waters provide suitable habitat for grebes and diving duck, while the intertidal flats are used by an abundance of wildfowl and waders. At high tide, the duck and wader species roost on the salt marshes and shorelines, with some species moving to the adjacent pasture and arable fields. The combination within this site of extensive feeding areas and safe resting and roosting sites makes this one of the most important wetlands in the north-west of the country for wintering waterfowl.

Lough Swilly SPA supports internationally important numbers of Whooper Swan (1,673 - mean peak for the five winters 1995/96-1999/2000), Greenland White-fronted Goose (847 for the Lough Swilly flock - mean peak for the five winters 1994/95-1998/99) and Greylag Goose (1,218 - mean peak for the five winters 1995/96-1999/2000). The main areas of the site used by these species are at Big Isle, Farsetmore, Blanket Nook, Ballylawn and Inch Levels. The flock sizes for Whooper Swan and Greylag Goose are the highest in the country**.** Considerably higher numbers of Whooper Swan (peak of 1,946) have been recorded, especially early in the season, as this is the area where the swans make their Irish landfall in autumn on their return from breeding grounds in Iceland. Both Greenland White-fronted Goose and Whooper Swan are listed on Annex I of the E.U. Birds Directive.

The site includes nationally important populations of 18 wintering waterbird species as follows (all figures are mean peaks for the five winters 1995/96-1999/00): Great Crested Grebe (284), Grey Heron (57), Shelduck (772), Wigeon (1,580), Teal (1,581), Mallard (1,169), Shoveler (60), Scaup (103), Goldeneye (170), Red-breasted Merganser (127), Coot (514), Oystercatcher (1,595), Knot (303), Dunlin (7,285), Curlew (1,720), Redshank (1,404), Greenshank (48) and Common Gull (1,523). Other species which occur include Light-bellied Brent Goose (152), Pochard (102), Golden Plover (749), Lapwing (1,408), Ringed Plover (81), Grey Plover (15), Bar-tailed Godwit (139) and Turnstone (73). The site is an important area for Great Northern Diver (19) and the rare Slavonian Grebe (11). The rare winter visitor, Pink-footed Goose, also occurs (15). Nationally important numbers of Mute Swan (265) also use the site.

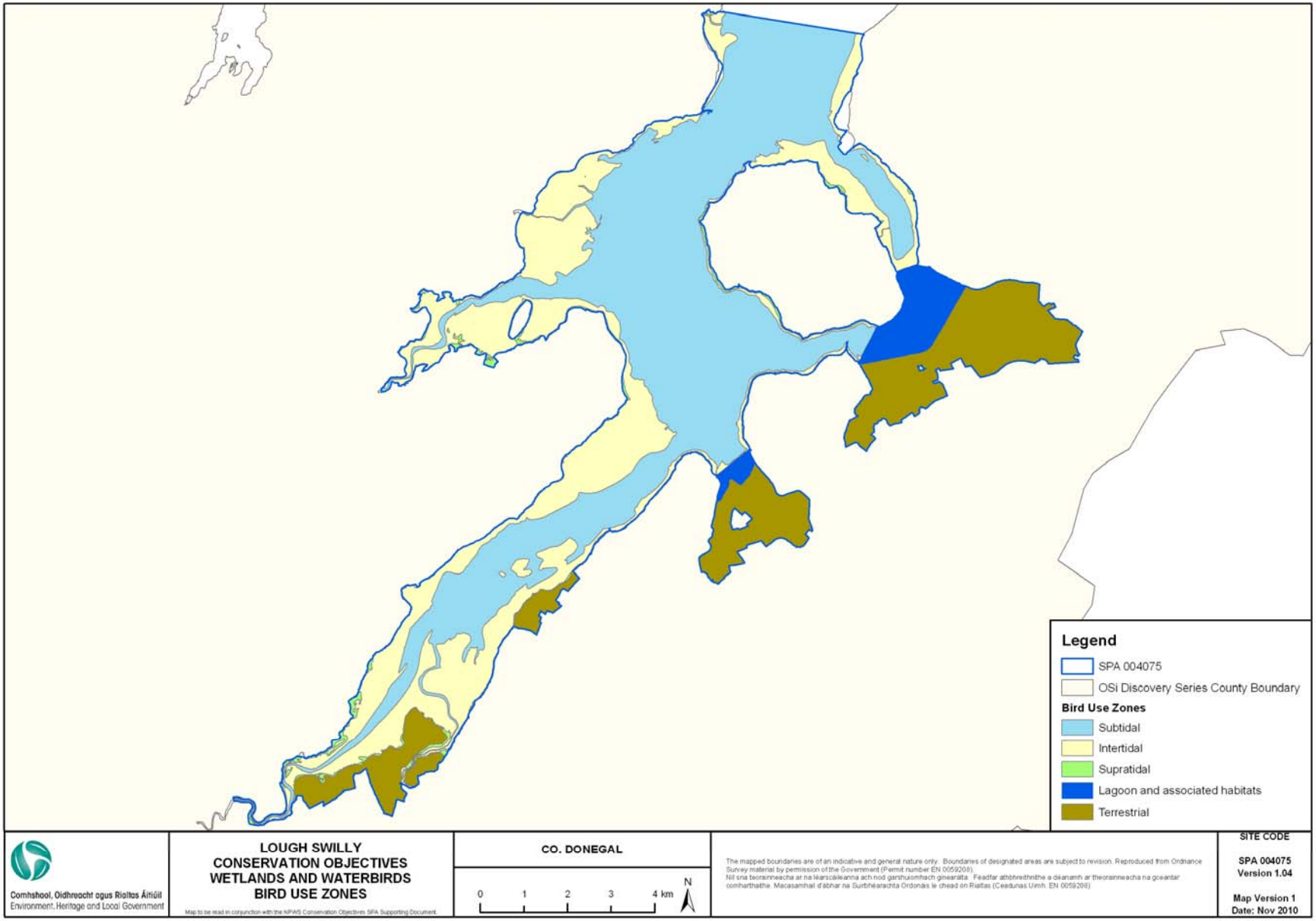
The small island in Inch Lough supports the largest tern colony in the north-west, with nationally important populations of Sandwich Tern (258 pairs in 2001) and Common Tern (89 pairs in 2001) occurring. These two species are listed on Annex I of the E.U. Birds Directive. There is also a nationally important colony of Black-headed Gull (800 pairs in 2001), which represents one of the largest populations in the country.

Several species of duck breed on Inch Lough, most notably Tufted Duck, with an estimate of between 100 and 200 pairs occurring in 1997. Mute Swan breeds in important numbers and a concentration of 50 pairs on the small island in Inch Lough is most unusual as this species seldom nests in colonies. Whooper Swan, a very rare breeding species in Ireland, has been recorded nesting at Inch Lough. Lapwing breeds in regionally important numbers either on wet grass fields within the levels or around the edge of the lagoon. Coot also breed (estimate of 50 pairs in the 1990s).

Lough Swilly SPA is of major ornithological importance for wintering waterbirds, with three species occurring in numbers of international importance and 18 occurring regularly in numbers of national importance. The site is regularly used by more than 20,000 waterfowl and as such is of international importance. Additionally, it holds nationally important breeding populations of three species, i.e. Sandwich Tern, Common Tern and Black-headed Gull. The site is used by a good range of species that are listed on Annex I of the E.U. Birds Directive.

29.4.2010


SPA
004075
DONEGAL
NORTHERN
IRELAND
BUNCRANA
Bun Cranncha
RATHMULLAN
Ráth Maolain
INCH ISLAND
Inch Island
An Inis
Lough Swilly
Loch Súilí
Newtown Cunningham
An Baile Nua
Legend
SPA 004075
LOUGH SWILLY
SPA 004075
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0 1 2 3 4 KM
N
Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Site Code
SPA 004075
Version 1.04
Map Version 1
Date: Oct 2010



Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government

LOUGH SWILLY
CONSERVATION OBJECTIVES
WETLANDS AND WATERBIRDS
BIRD USE ZONES

Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document

CO. DONEGAL

0 1 2 3 4 km N

SITE CODE
SPA 004075
Version 1.04

Map Version 1
Date: Nov 2010

APPENDIX 2

Waterbird data sources

Irish Wetland Bird Survey (I-WeBS)
I-WeBS began in the Republic of Ireland in 1994/95 and aims to monitor wintering (non-breeding) waterbird populations at the wetland sites upon which they rely. Counts are carried out by volunteers and professional staff of the partner organisations across the months September to March of each year. I-WeBS counts take place on a rising tide or close to high tide. For further information please refer to Crowe (2005).

The I-WeBS Programme monitors the larger coastal wetland sites together with inland lakes, turloughs, rivers and callows. However the resulting dataset is incomplete for some waterbird species that utilise other habitats such as non-wetland habitat (e.g. grassland used by many species and particularly foraging geese, and swans), non-estuarine coastline, small and ephemeral wetlands and the open sea; the latter of which is obviously difficult to monitor from land-based surveys (Crowe, 2005).

A number of additional and special surveys are therefore conducted on an annual or regular basis and data collected are, where appropriate, integrated into the I-WeBS database. These surveys include those undertaken for swan and geese species that forage typically during daylight hours across terrestrial habitats (e.g. grassland, arable fields) using coastal wetlands sites at night when they congregate to roost. Some of the additional surveys are carried out at certain times, aimed at providing a better estimate of numbers (e.g. Greylag Geese) and for some species an assessment of breeding success during the previous summer (e.g. Light-bellied Brent Geese). These surveys are introduced briefly below and more information is provided in Crowe (2005).

- Swan Surveys

Coordinated international censuses are carried out of the wintering populations of Whooper Swan (*Cygnus cygnus*) and Bewick's Swan (*Cygnus columbianus bewickii* at four or five-yearly intervals. The surveys are organised by I-WeBS, the Irish Whooper Swan Study group (IWSSG) and WWT.

- Greenland White-fronted Goose

Greenland White-fronted Geese are concentrated at relatively few sites during winter, many of which are non-wetland habitats. The species is therefore not covered adequately by the I-WeBS programme. The Greenland White-fronted Goose census was initiated in the late 1970's and is carried out by NPWS in Ireland and by JNCC and Scottish Natural Heritage (SNH) in Scotland.

- Greylag Geese

Data for the Icelandic breeding population of Greylag Goose that winters in Ireland are taken from special surveys organised through I-WeBS and undertaken during November each year. The surveys aim to assess the distribution and status of the migratory flocks wintering in Ireland and focus on known feeding areas (grassland & agricultural land). When calculating population estimates of the Icelandic birds, data collected are adjusted to account for feral flocks that also occur within Ireland.

- Barnacle Goose (*Branta leucopsis*)

A wintering population from the northeast Greenland breeding population winters mainly on offshore islands along the west coast of Ireland. An aerial survey is conducted of the principal wintering areas every four to five years.

- Light-bellied Brent Geese

Special autumn surveys of this species have been conducted since 1996 and organised in the Republic of Ireland by the Irish Brent Goose Research Group (IBGRG). The survey is currently conducted on a bi-annual basis during the month of October which coincides with the autumn arrival of the species. Data collected are integrated into the I-WeBS database.

APPENDIX 3

Population Indexing and Trend Analysis: a synopsis

An index number can be defined as a measure of population size in one year expressed in relation to the size of the population in another selected year (Leech et al. 2002). Changes in the index numbers can therefore explain the pattern of population change over time (Underhill & Prŷs-Jones, 1994).

Population indices are calculated separately for each species at a site. Monthly count data are used from the Irish Wetland Bird Survey (I-WeBS). For each year included in an analysis, a total is obtained by summing the number of birds present in a predetermined number of months. The final year in the series is then scaled to equal 100 (please see example in table).

Summed counts	Index
264.41	128.11
262.21	127.04
234.0	113.37
126.0	61.05
197.23	95.56
206.4	100.00

In order to overcome the problem of counts deemed of poor quality (e.g. poor visibility) or incomplete counts, or where there are missing values in the dataset, values can be imputed by the use of the Underhill Index (Underhill & Prŷs-Jones, 1994). The Underhill Index uses a Generalised Linear Model (GLM) to calculate the influence of both the site surveyed and the timing of the count (month, year), on the number of birds recorded. This method is used widely to replace missing data points (e.g. Houlahan et al. 2000; Atkinson et al. 2006; Leech et al. 2002; Gregory et al. 2005; Crowe et al. 2008).

A further step, as used for example by the UK WeBS Alert system (Leech et al. 2002), is to use Generalised Additive Models (GAM) to fit a smoothed curve to the trend. GAMs are non-parametric and flexible extensions of the generalised linear model where the linear predictor of the GLM is replaced by a general additive predictor which allows mean abundance to vary as a smooth function of time. Count data are assumed to follow independent Poisson distribution with 0.3T degrees of freedom (e.g. after Atkinson et al. 2006).

The GAM analysis is performed on the count data (post imputing of values from the Underhill Index) and produces smoothed counts used for indexing (Note that both smoothed and un-smoothed indices) are graphed in Section 4.2.

Although un-smoothed indices themselves can be used to assess population trends over time this is primarily through using the line-of-best-fit over a long (e.g. 10-year) time period, which can then give an average annual change (one year to another). However this method is not best suited to assessing the change between one time period and another. The GAM extension to the methodology allows calculation of proportional change in population size from one time period to another which can be undertaken for differing time periods (i.e. different start and end years) and be extremely valuable when assessing a long time period. Section 4.2 presents trends calculated for the 'long-term' 12-year period (1995–2007) and the recent five-year period (2002-2007). The values given represent the percentage change in index (population) values across the specified time period, calculated by subtracting the smoothed index value at the start of the time-frame (1995) from the smoothed index value in the reference year (2007):-

$$\text{Change} = ((I_y - I_x) / I_x) \times 100$$

where I_y is the index from the current year and I_x is the index value at the start of the selected time period.

The reference year is the penultimate year in the time-frame because, when smoothing, the GAM takes into account values from both the preceding and following year. The last value in the smoothed dataset (2008) is therefore likely to be the least robust because it has no following year.

Note that the above % change calculation is the same as the 'generic threshold method' used where the current and baseline 5-year means are used in place of index values (e.g. for Common Gull in Section 4.2).

The final result is therefore % change in population size across a specified time period. Larger values indicate larger proportional changes in population size; positive values indicating relative increases while negative values indicate relative decreases over the specified time period.

Further information on population indexing and trend analysis using GAMs can be found in various references; for particular reference to waterbirds see Leech et al (2002) and Atkinson et al. (2006). For information on the UK WeBS Alerts system, please see Thaxter et al. (2010).

Limitations

The months chosen for the calculation of population indices aim to reflect the months when the populations at a site are the most stable, excluding months when there may be fluctuations due to passage populations. Despite this, some datasets still present a high degree of variability or fluctuation both within and between years. Because of this, we assess each species separately and take into account where a species shows a history of wide fluctuations between years (within national dataset), or where a species naturally exhibits within-season fluctuations (e.g. species considered to have weak site faithfulness). Where necessary the results of the trend analysis are assigned necessary caution.

A high proportion of imputed counts can limit the effectiveness of the analysis to aid in the interpretation of the dataset. Species for which 50% or more of the monthly count values are imputed are excluded from analysis. But sometimes the calculation of population change may involve a comparison between winters where, at least one has a value based on a high proportion of imputed data. Where data for adjacent winters are relatively complete this is not a serious concern because of the smoothing technique used. However, where data for a number of consecutive winters rely heavily on imputed data then the resulting result is considered less reliable (Thaxter et al. 2010). Where necessary the results of the trend analysis are assigned necessary caution.

Despite the smoothing effects of the GAM analysis, interpretation of population trends may sometimes still be difficult. Therefore we calculate proportional change in the population across differing time periods (in the case of Lough Swilly for 12-year, 10-year and 5-year periods) to assess more effectively how the population has fared over time.

Greenland-White-fronted Goose

Baseline site data for Greenland White-fronted Goose is taken from the Irish Greenland White-fronted Goose census carried out by NPWS. Data for Lough Swilly and Lough Foyle is combined as the individuals using both sites are considered one discrete flock. Limited census data for the site in several seasons since 2000/01 precludes an assessment of site trends following the methodology given above.

Trend assessment for this species therefore used data from the Irish Wetland Bird Survey (I-WeBS) for the months January to March across the data period 2004/05 – 2008/09.

Population indexing, smoothing and calculation of % change across time follows the methodology given above.

Population Indexing and Trend Analysis: hypothetical example

The example below shows the population index and smoothed index for a hypothetical species at a site. Note that the change in population size from the current to a previous specified year is calculated using the penultimate smoothed index value as the ‘current’ year. This is because during smoothing, the GAM takes into account values from both the preceding and following year. The last value in the smoothed dataset is therefore likely to be the least robust because it has no following year.

Example

Year	Index	GAM
1994	63.41	68.61
1995	80.11	71.27
1996	72.08	70.43
1997	59.16	68.10
1998	74.43	67.19
1999	65.04	66.43
2000	59.15	67.54
2001	84.11	71.16
2002	59.76	74.34
2003	95.41	78.51
2004	68.23	80.94
2005	88.97	84.33
2006	92.10	87.57
2007	81.82	90.76
2008	100.00	95.74

Term	Change
5 Year	+ 22.08
10 Year	+ 33.27
12 year	+ 27.34

APPENDIX 4

Waterbird species codes

AE	Arctic Tern	*Sterna paradisaea*
BY	Barnacle Goose	*Branta leucopsis*
BA	Bar-tailed Godwit	*Limosa lapponica*
BE	Bean Goose	*Anser fabalis*
BS	Bewick's Swan	*Cygnus columbianus*
AS	Black Swan	*Cygnus atratus*
BH	Black-headed Gull	*Chroicocephalus ridibundus*
BN	Black-necked Grebe	*Podiceps nigricollis*
BW	Black-tailed Godwit	*Limosa limosa*
BV	Black-throated Diver	*Gavia arctica*
BG	Brent Goose	*Branta bernicla*
CG	Canada Goose	*Branta canadensis*
CM	Common Gull	*Larus canus*
CS	Common Sandpiper	*Actitis hypoleucos*
CX	Common Scoter	*Melanitta nigra*
CN	Common Tern	*Sterna hirundo*
CO	Coot	*Fulica atra*
CA	Cormorant	*Phalacrocorax carbo*
CU	Curlew	*Numenius arquata*
CV	Curlew Sandpiper	*Calidris ferruginea*
DN	Dunlin	*Calidris alpina*
GA	Gadwall	*Anas strepera*
GP	Golden Plover	*Pluvialis apricaria*
GN	Goldeneye	*Bucephala clangula*
GD	Goosander	*Mergus merganser*
GB	Great Black-backed Gull	*Larus marinus*
GG	Great Crested Grebe	*Podiceps cristatus*
ND	Great Northern Diver	*Gavia immer*
NW	Greenland White-fronted Goose	*Anser albifrons flavirostris*
GK	Greenshank	*Tringa nebularia*
H.	Grey Heron	*Ardea cinerea*
GV	Grey Plover	*Pluvialis squatarola*
GJ	Greylag Goose	*Anser anser*
HG	Herring Gull	*Larus argentatus*
JS	Jack Snipe	*Lymnocryptes minimus*
KF	Kingfisher	*Alcedo atthis*
KN	Knot	*Calidris canutus*
L.	Lapwing	*Vanellus vanellus*

LB	Lesser Black-backed Gull	*Larus fuscus*
PB	Light-bellied Brent Goose	*Branta bernicla hrotra*
ET	Little Egret	*Egretta garzetta*
LG	Little Grebe	*Tachybaptus ruficollis*
AF	Little Tern	*Sterna albifrons*
MA	Mallard	*Anas platyrhynchos*
MU	Mediterranean Gull	*Larus melanocephalus*
MH	Moorhen	*Gallinula chloropus*
MS	Mute Swan	*Cygnus olor*
OC	Oystercatcher	*Haematopus ostralegus*
PG	Pink-footed Goose	*Anser brachyrhynchus*
PT	Pintail	*Anas acuta*
PO	Pochard	*Aythya ferina*
PS	Purple Sandpiper	*Calidris maritima*
RM	Red-breasted Merganser	*Mergus serrator*
RH	Red-throated Diver	*Gavia stellata*
RK	Redshank	*Tringa totanus*
RP	Ringed Plover	*Charadrius hiaticula*
RU	Ruff	*Philomachus pugnax*
SS	Sanderling	*Calidris alba*
TE	Sandwich Tern	*Sterna sandvicensis*
SP	Scaup	*Aythya marila*
SU	Shelduck	*Tadorna tadorna*
SV	Shoveler	*Anas clypeata*
SY	Smew	*Mergus albellus*
SN	Snipe	*Gallinago gallinago*
NB	Spoonbill	*Platalea leucorodia*
DR	Spotted Redshank	*Tringa erythropus*
T.	Teal	*Anas crecca*
TU	Tufted Duck	*Aythya fuligula*
TT	Turnstone	*Arenaria interpres*
WA	Water Rail	*Rallus aquaticus*
WM	Whimbrel	*Numenius phaeopus*
WG	White-fronted Goose	*Anser albifrons*
WS	Whooper Swan	*Cygnus Cygnus*
WN	Wigeon	*Anas penelope*
WK	Woodcock	*Scolopax rusticola*

APPENDIX 5

Waterbird foraging guilds (after Weller, 1999)

Guild	Foods	Tactics	Examples
(1) Surface swimmer	Invertebrates, vegetation & seeds	Strain/sieve/sweep/dabble/grab/up-ending	'Dabbling ducks'; e.g. Shoveler, Teal, Mallard, Pintail, Wigeon, Gadwall
(2) Water column diver – shallow[a]	Fish & Invertebrates;	Search/grab	'Diving ducks' e.g. Pochard, Tufted Duck, Scaup, Eider,
(3) Water column diver – greater depths	Fish & Invertebrates	Search/grab	Common Scoter, divers, grebes, Cormorant
(4) Intertidal walker, out of water	Invertebrates	Search (probe)/grab	Sandpipers, plovers
(5) Intertidal walker, out of water	Invertebrates, vegetation	Sieve/grab/graze	Shelduck, Avocet, Spoonbill, Wigeon, Light-Bellied Brent Goose,
(6) Intertidal walker, in water	Fish	Search/strike	Grey Heron
	Fish, Invertebrates	Probe, scythe, sweep/grab	Spoonbill, Greenshank
	Fish	Stalk	Little Egret
	Invertebrates	Probe	Several sandpiper species
(7) Terrestrial, walker (e.g. grassland/marsh)	Vegetation (inc. roots, tubers & seeds)	Graze, peck, probe	Many geese species

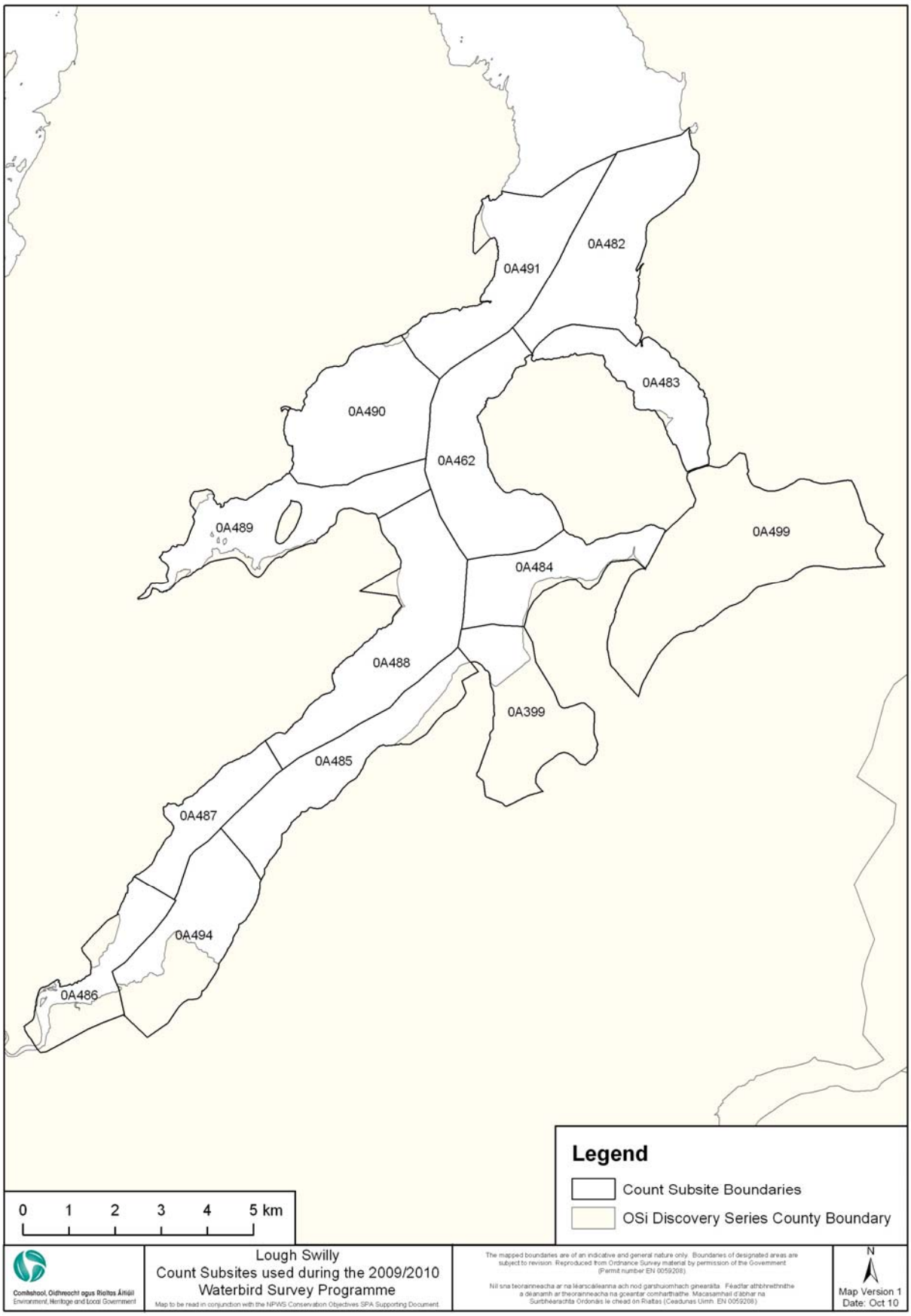
[a] dives <3m.

Please note that this table refers to generalised foraging strategies and is meant as a guide only. There is a great deal of variation between sites, seasons, tidal states and indeed, individual birds themselves. For example, some waterbird species may deploy several of the methods, e.g. Shelduck may forage by sieving intertidal mud (5) or by up-ending (1) and Pintail, although generally known as a 'dabbling' duck, does occasionally dive for food.

APPENDIX 6

Lough Swilly SPA (4075) – Waterbird survey programme 2009/10 – Count Subsites

Subsite	Name
0A399	Blanket Nook
0A462	West Inch
0A482	Lisfannan
0A483	Fahan Creek
0A484	Ballymoney
0A485	Ballybegley
0A486	Swilly Estuary
0A487	Castle Shanaghan
0A488	Shellfield
0A489	Leannan Estuary
0A490	Ray
0A491	Rathmullan
0A494	Big Isle
0A499	Inch Lough & Levels


0A482
0A491
0A483
0A490
0A462
0A489
0A499
0A484
0A488
0A399
0A485
0A487
0A494
0A486
Legend
Count Subsite Boundaries
OSi Discovery Series County Boundary
0 1 2 3 4 5 km
Lough Swilly
Count Subsites used during the 2009/2010
Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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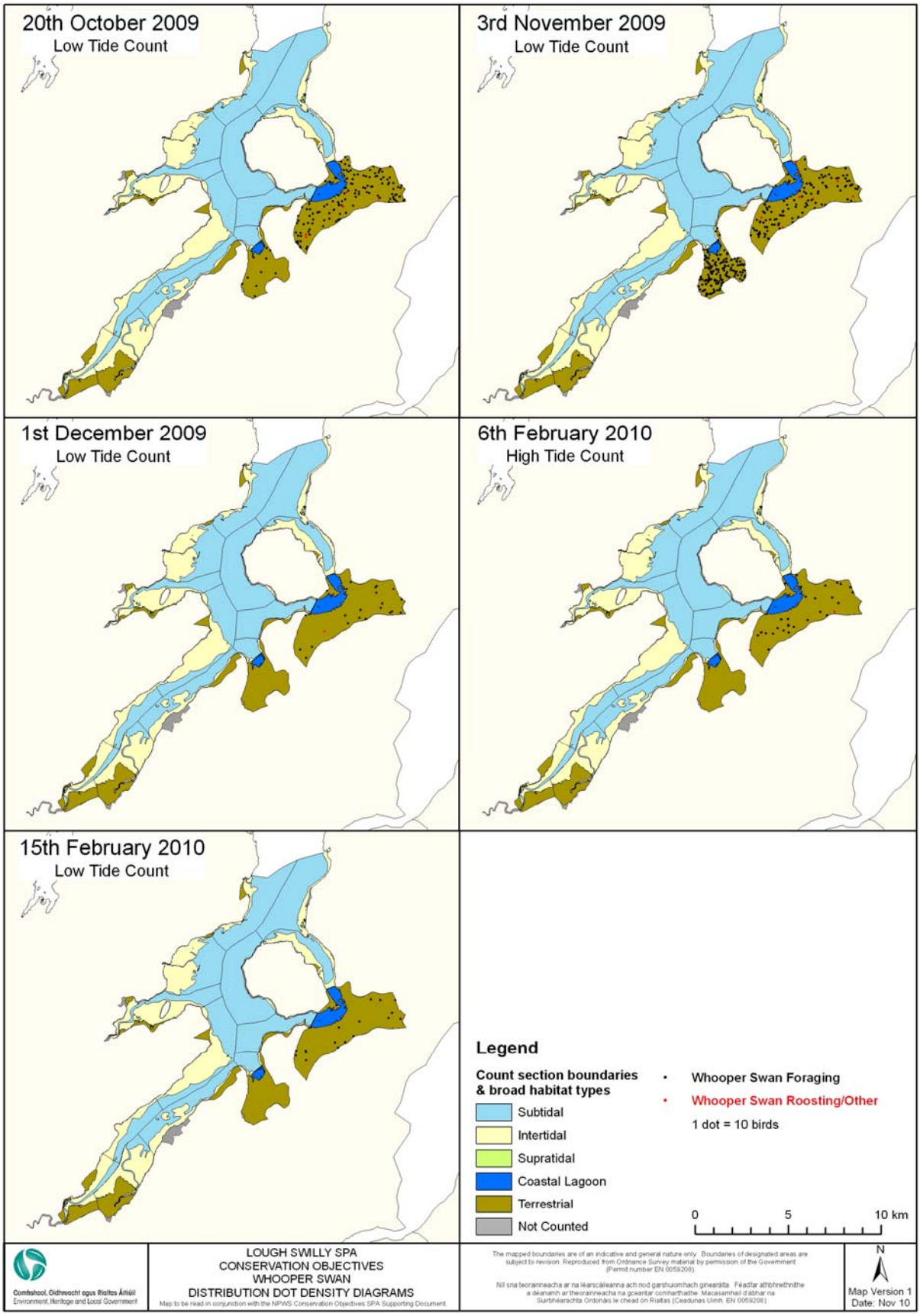
Map Version 1
Date: Oct 10

APPENDIX 7

Lough Swilly (4075)

Waterbird distribution (dot-density diagrams) recorded during the low tide and high tide surveys (October 2009 – February 2010)


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Whooper Swan Foraging
Whooper Swan Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
WHOOPER SWAN
DISTRIBUTION DOT DENSITY DIAGRAMS
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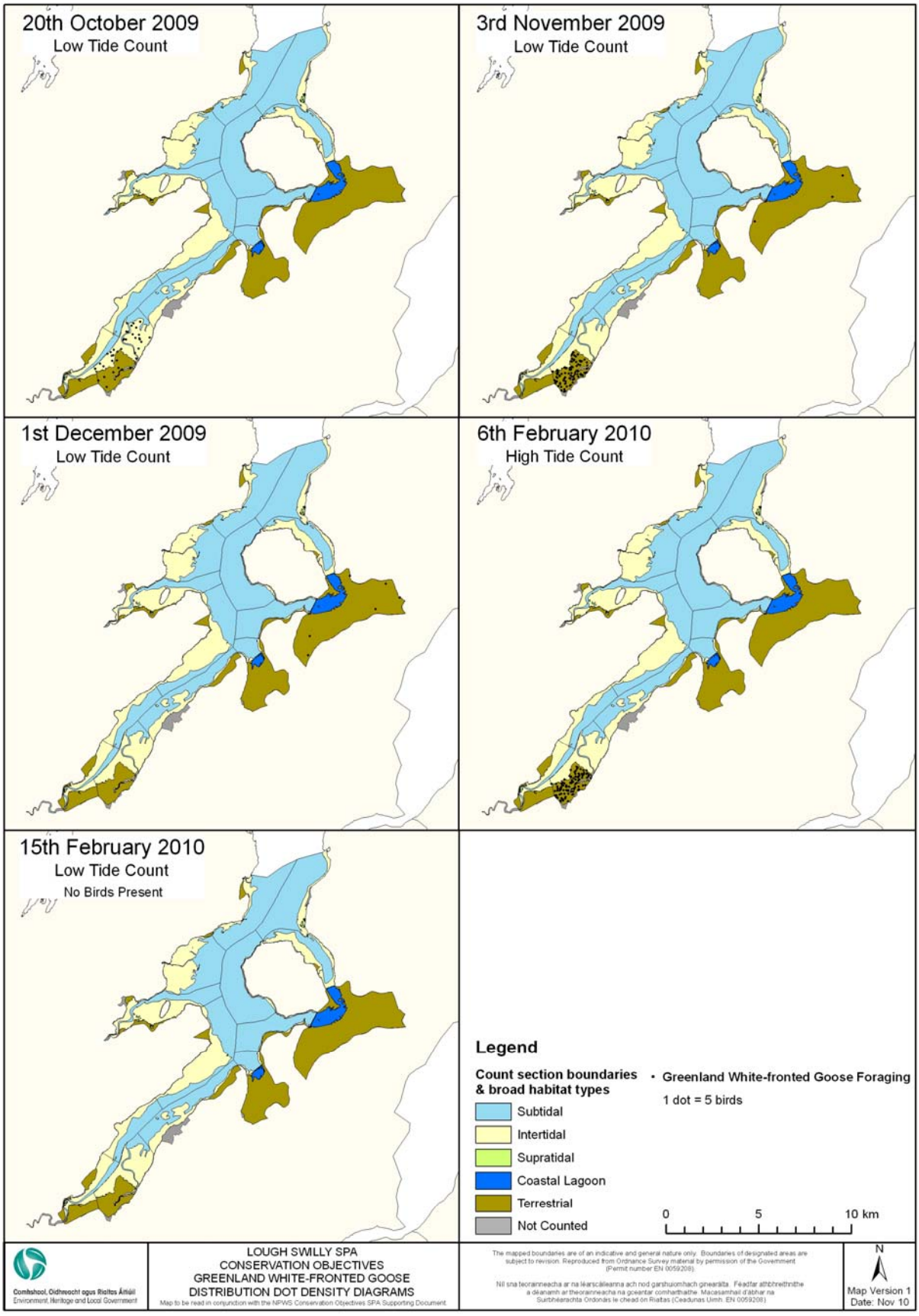
N
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
No Birds Present
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Greenland White-fronted Goose Foraging
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GREENLAND WHITE-FRONTED GOOSE
DISTRIBUTION DOT DENSITY DIAGRAMS
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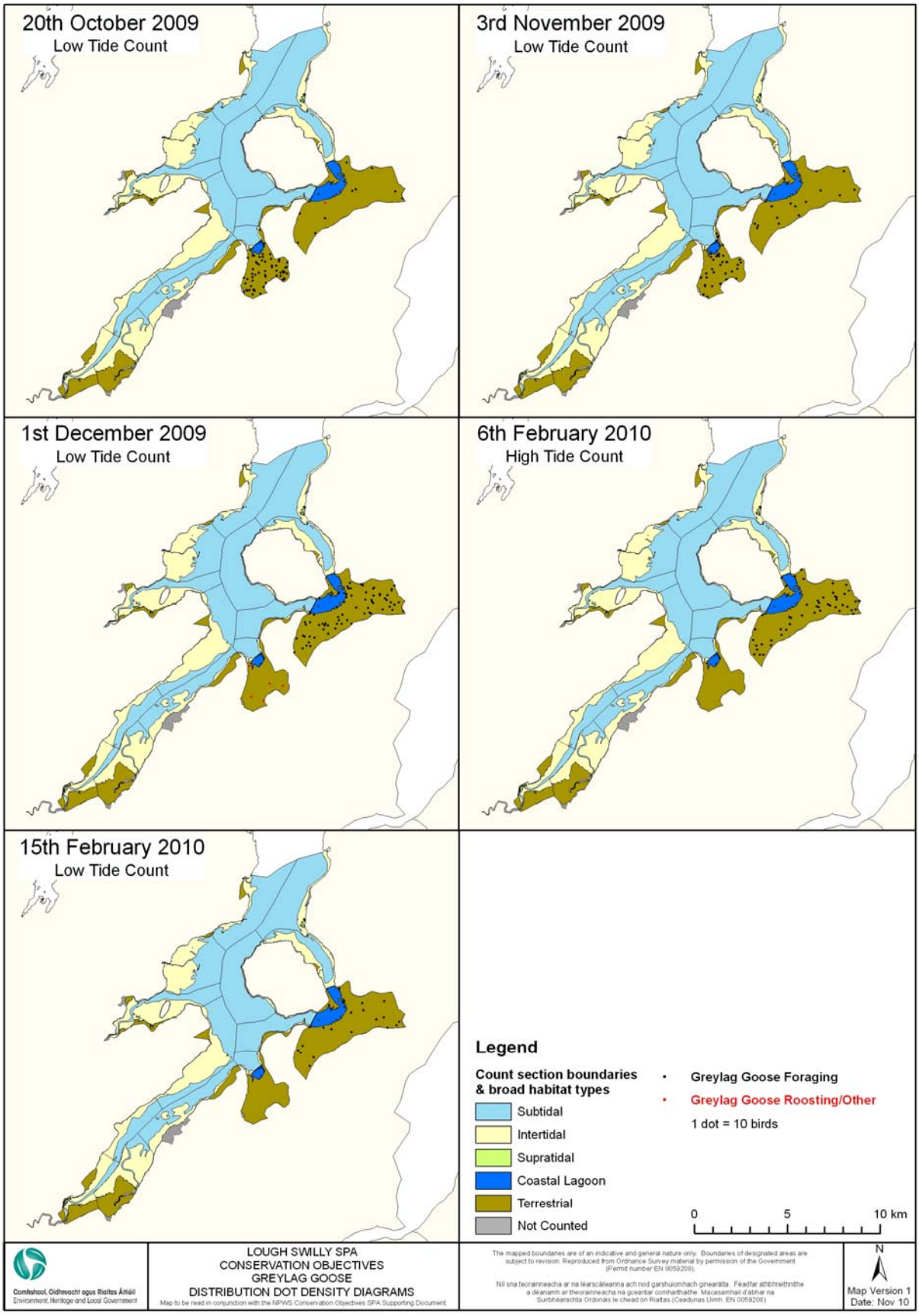
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Greylag Goose Foraging
Greylag Goose Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GREYLAG GOOSE
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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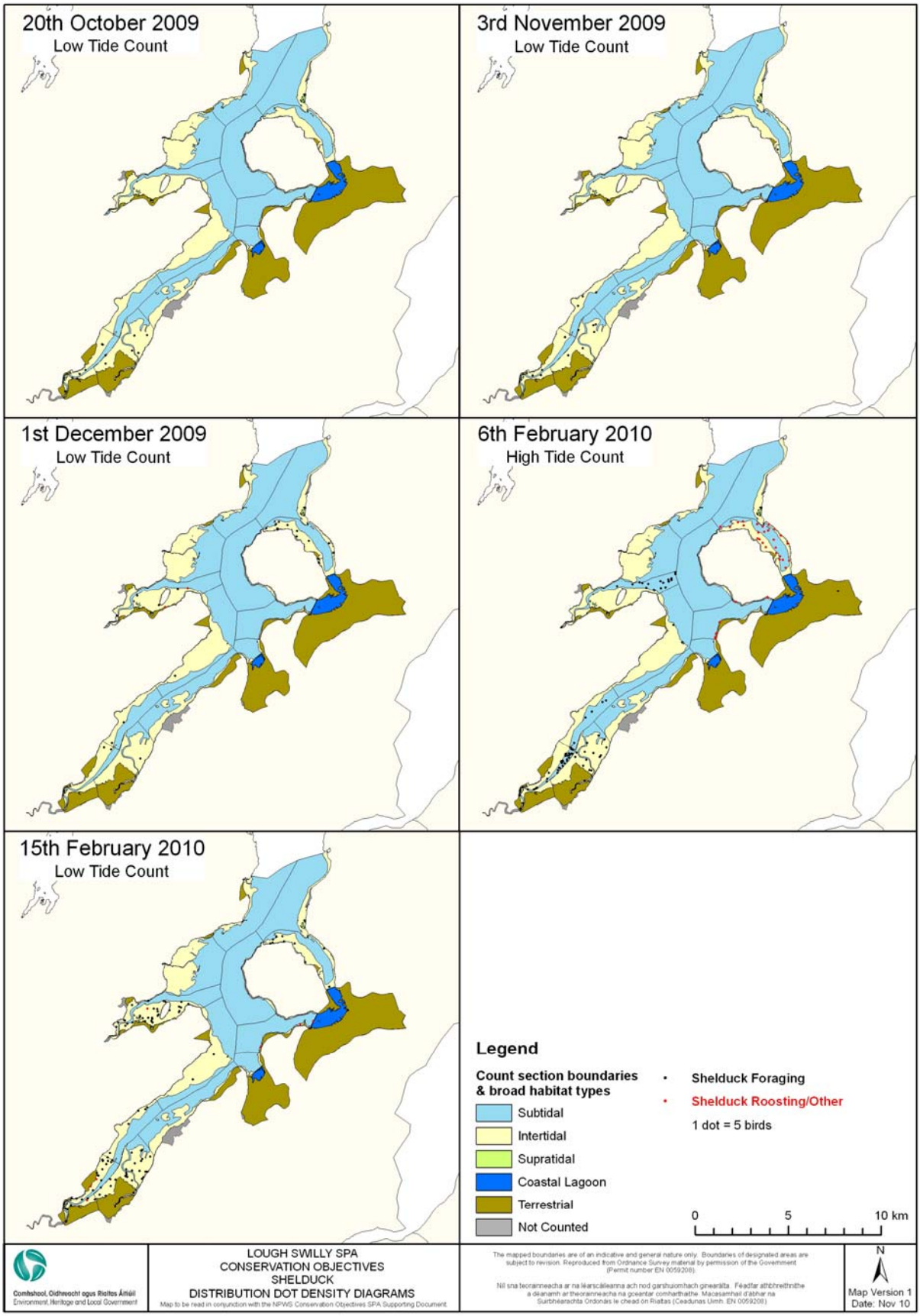
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Shelduck Foraging
Shelduck Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
SHELDUCK
DISTRIBUTION DOT DENSITY DIAGRAMS
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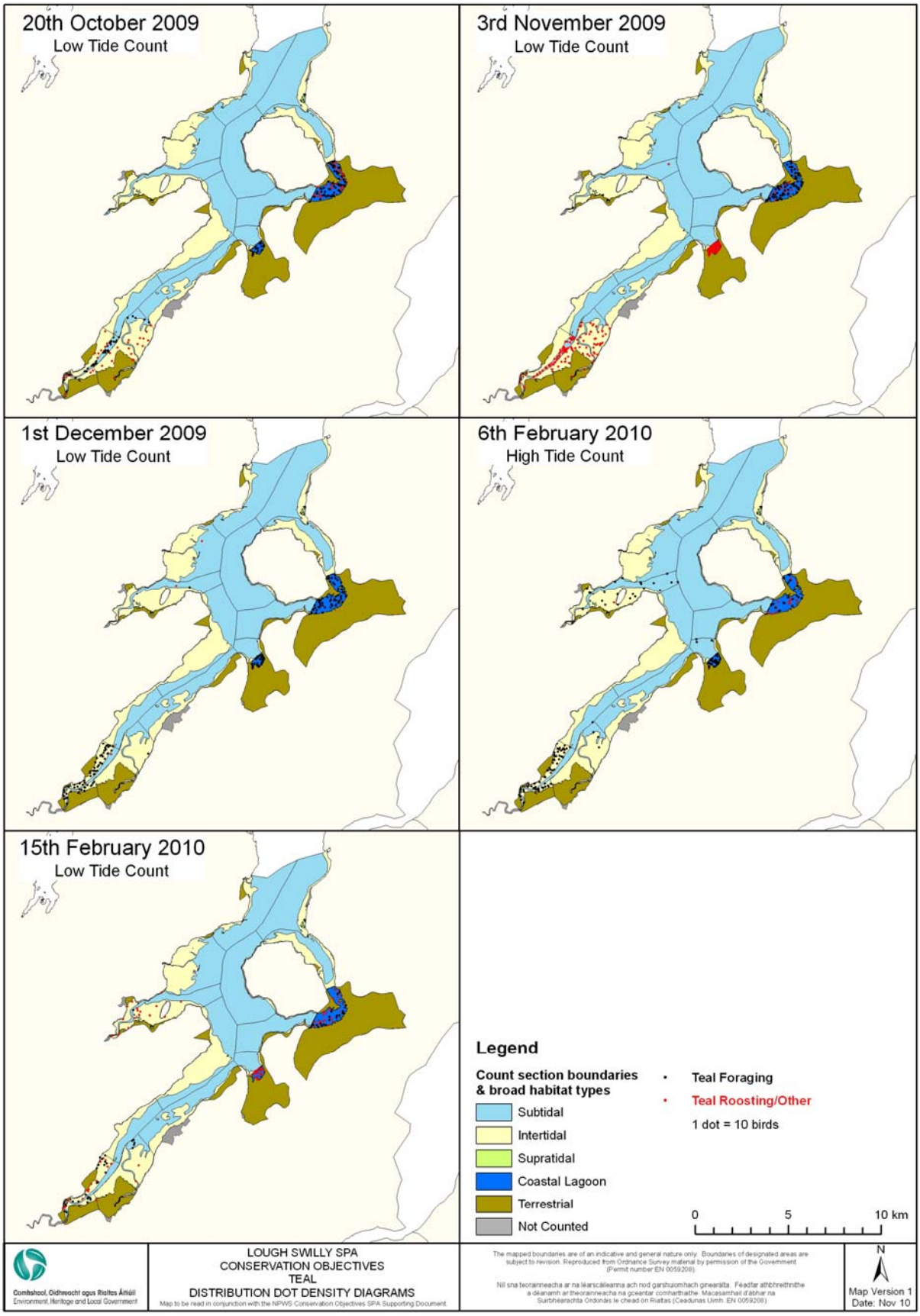
Date: Nov 10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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Teal Foraging
Teal Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
TEAL
DISTRIBUTION DOT DENSITY DIAGRAMS
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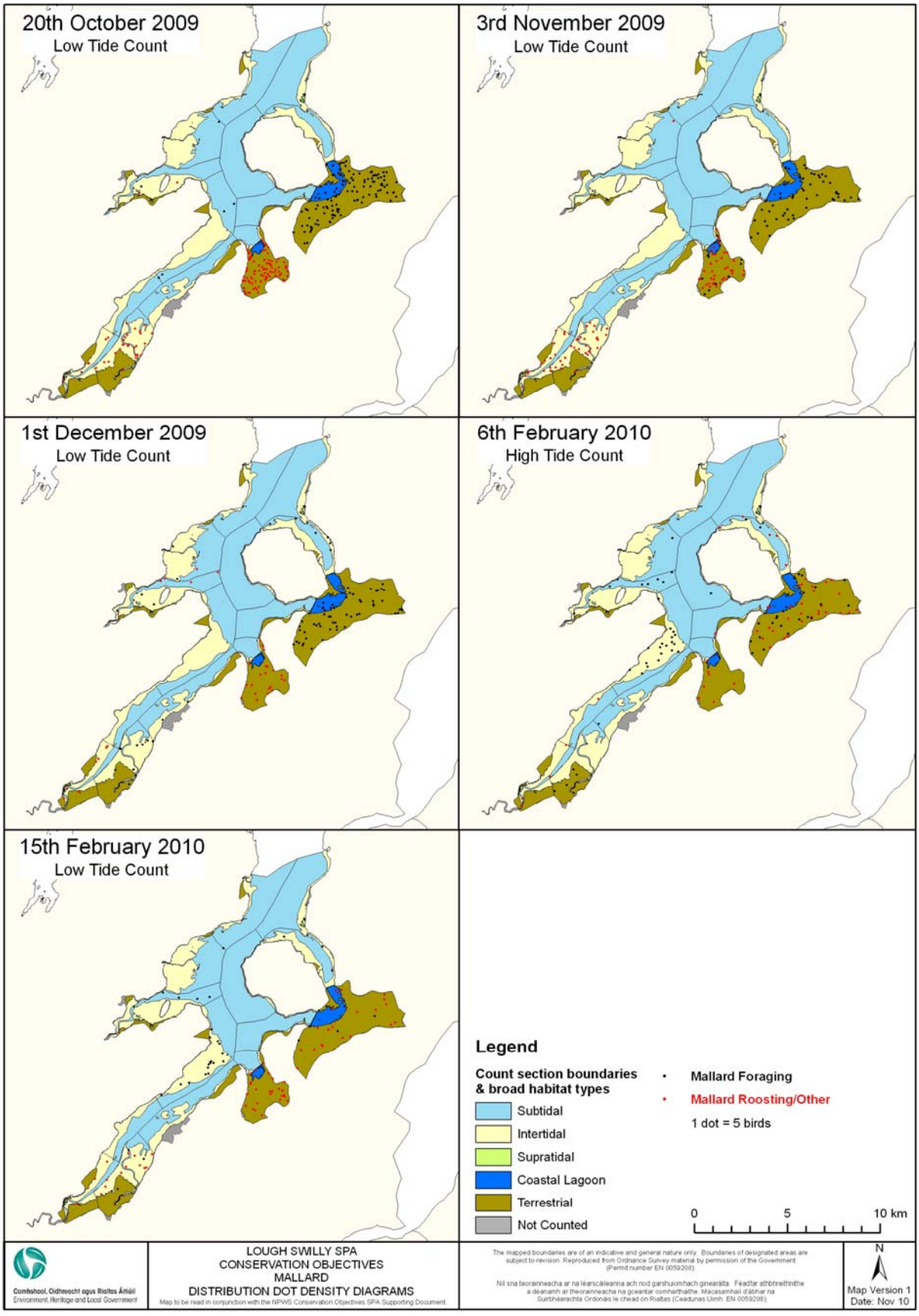
Date: Nov 10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3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Mallard Foraging
Mallard Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
MALLARD
DISTRIBUTION DOT DENSITY DIAGRAMS
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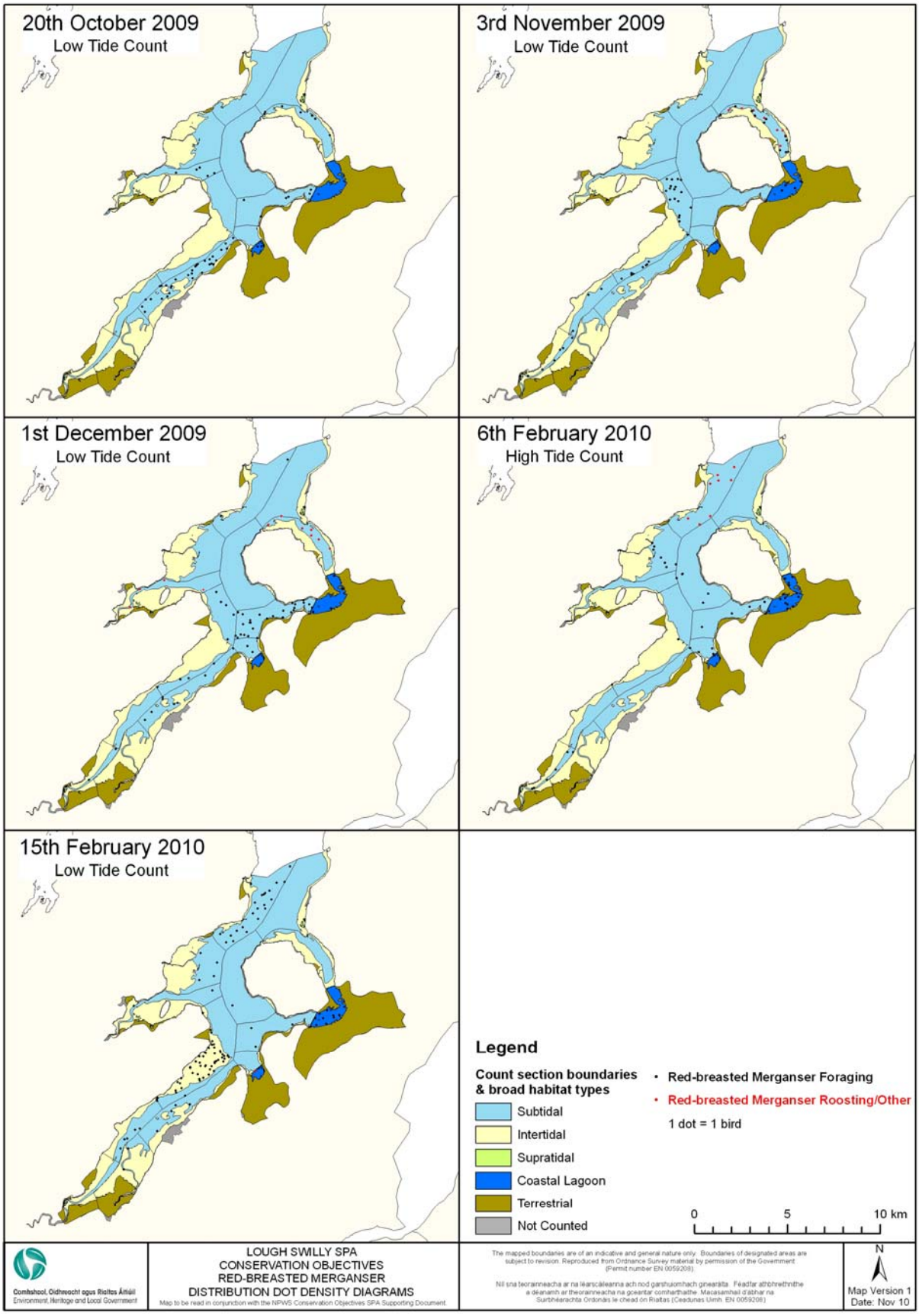
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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Red-breasted Merganser Foraging
Red-breasted Merganser Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
RED-BREASTED MERGANSER
DISTRIBUTION DOT DENSITY DIAGRAMS
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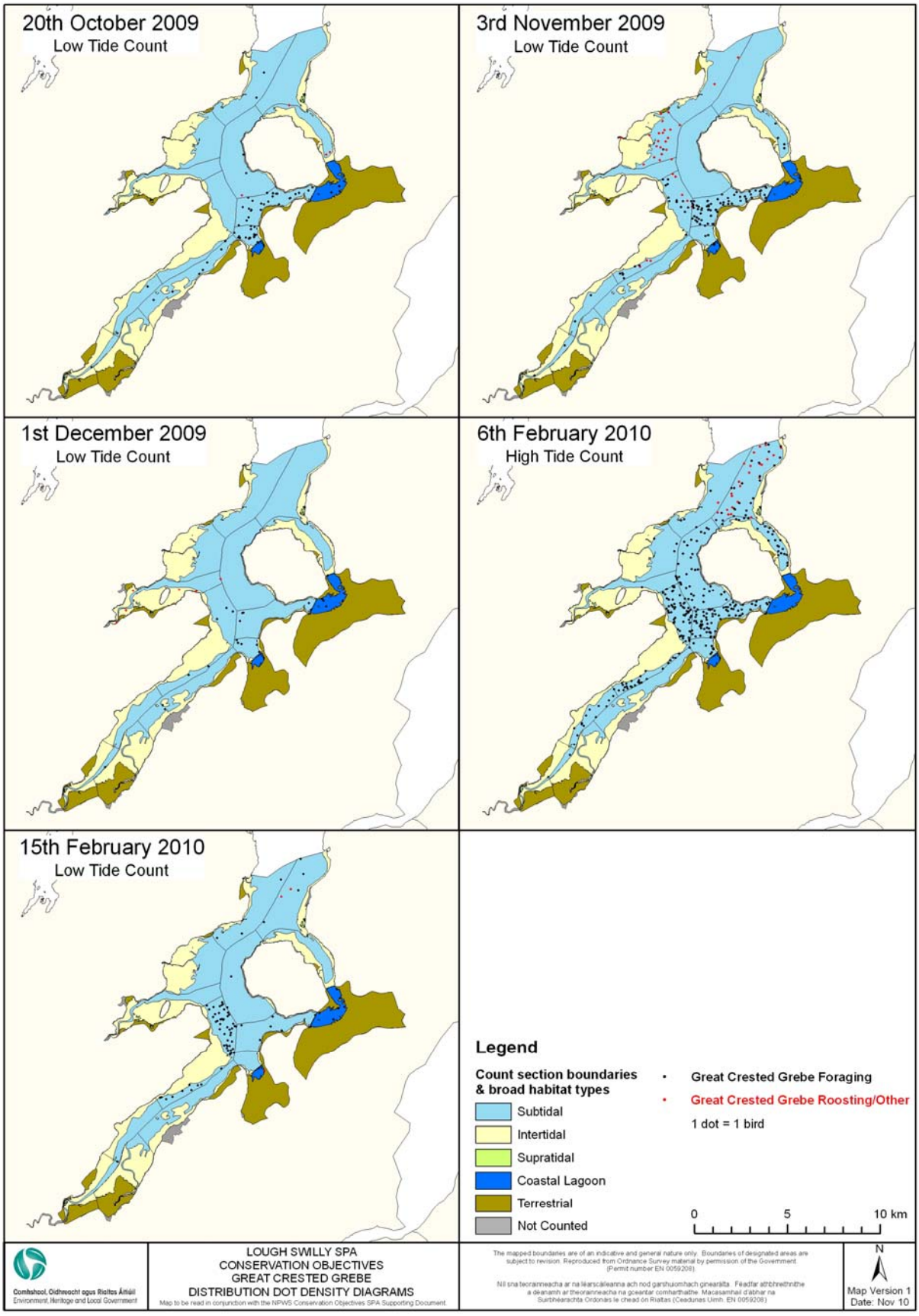
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High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Great Crested Grebe Foraging
Great Crested Grebe Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GREAT CRESTED GREBE
DISTRIBUTION DOT DENSITY DIAGRAMS
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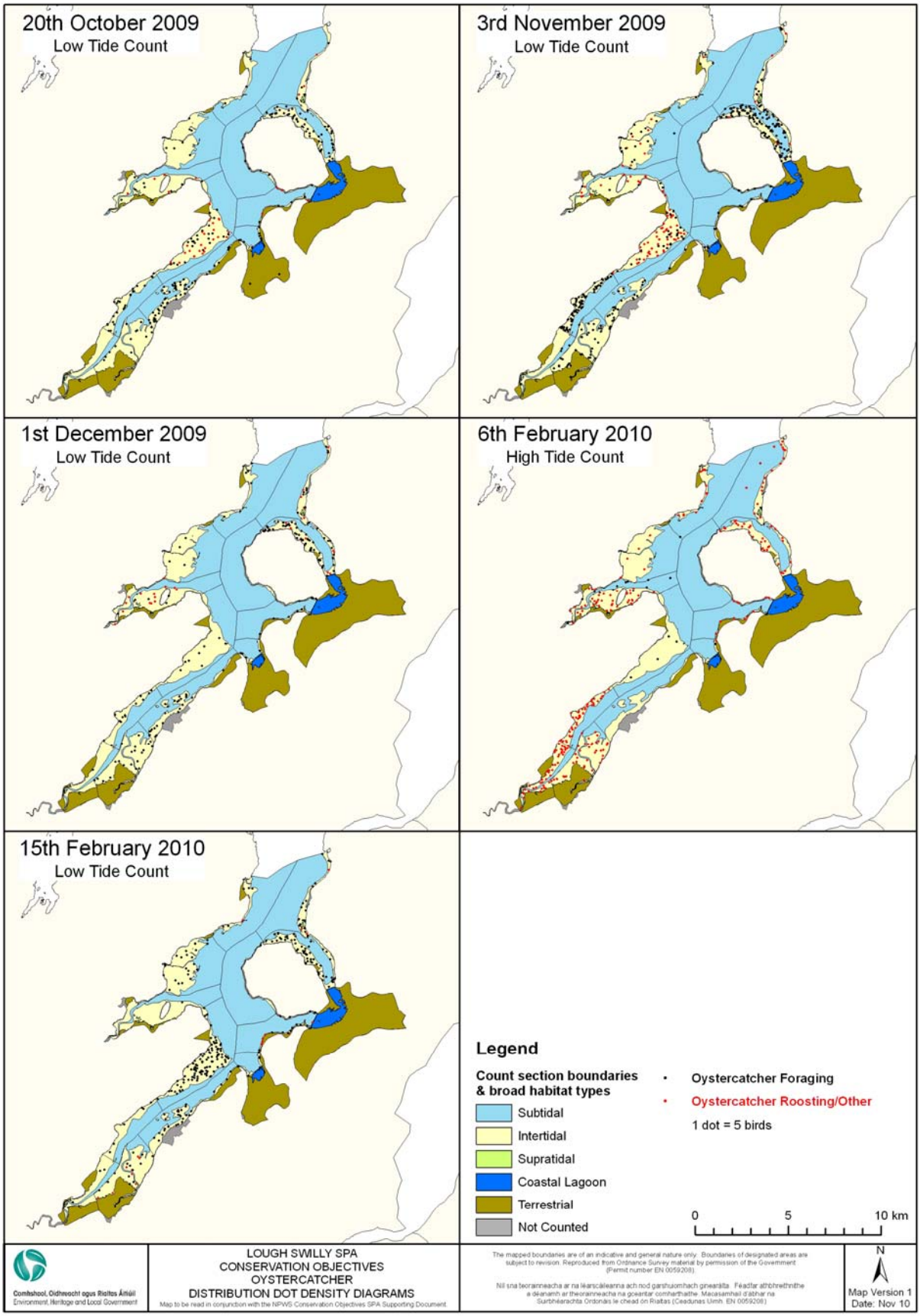
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3rd November 2009
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1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Oystercatcher Foraging
Oystercatcher Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
OYSTERCATCHER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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Map Version 1
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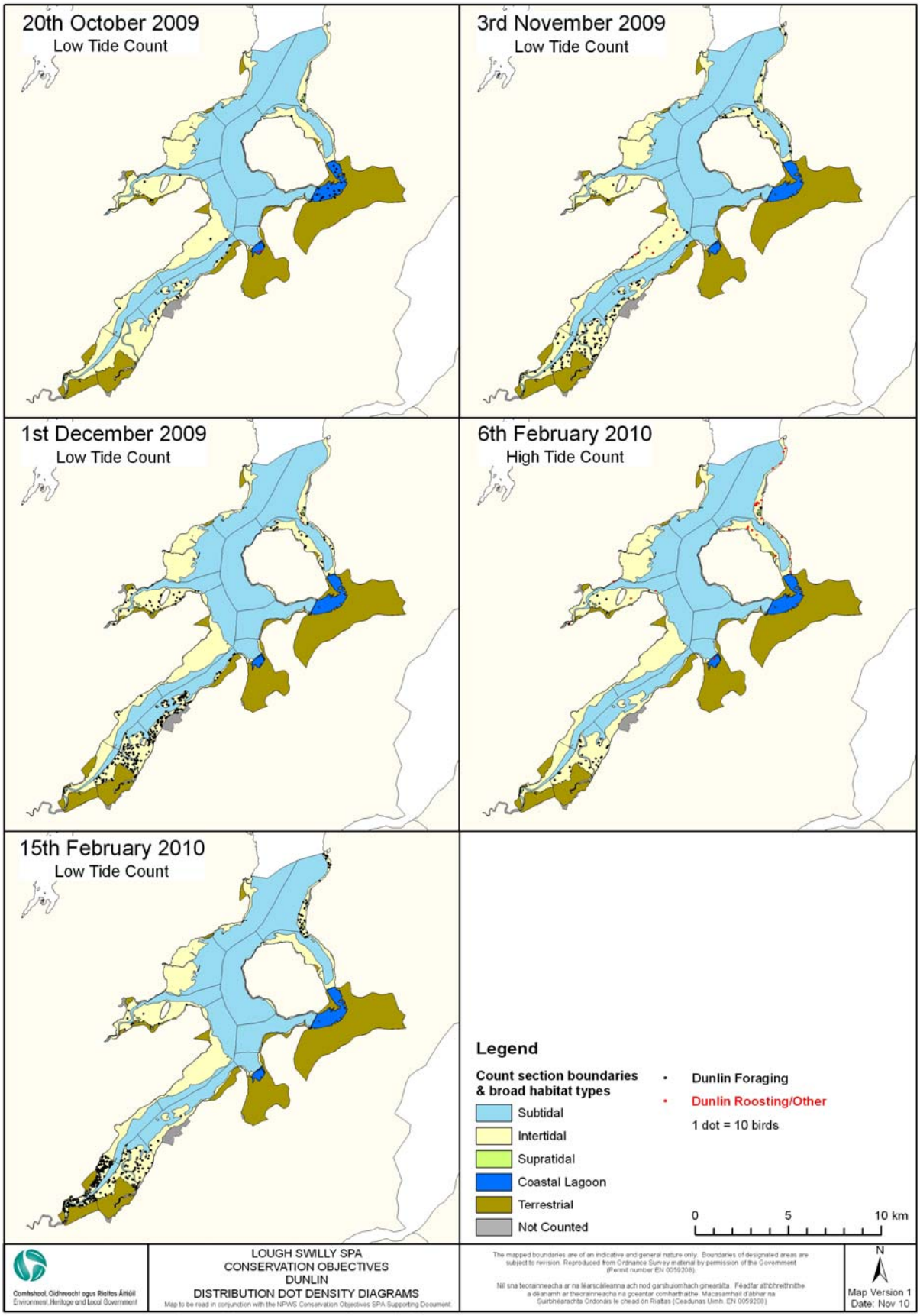
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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Dunlin Foraging
Dunlin Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
DUNLIN
DISTRIBUTION DOT DENSITY DIAGRAMS
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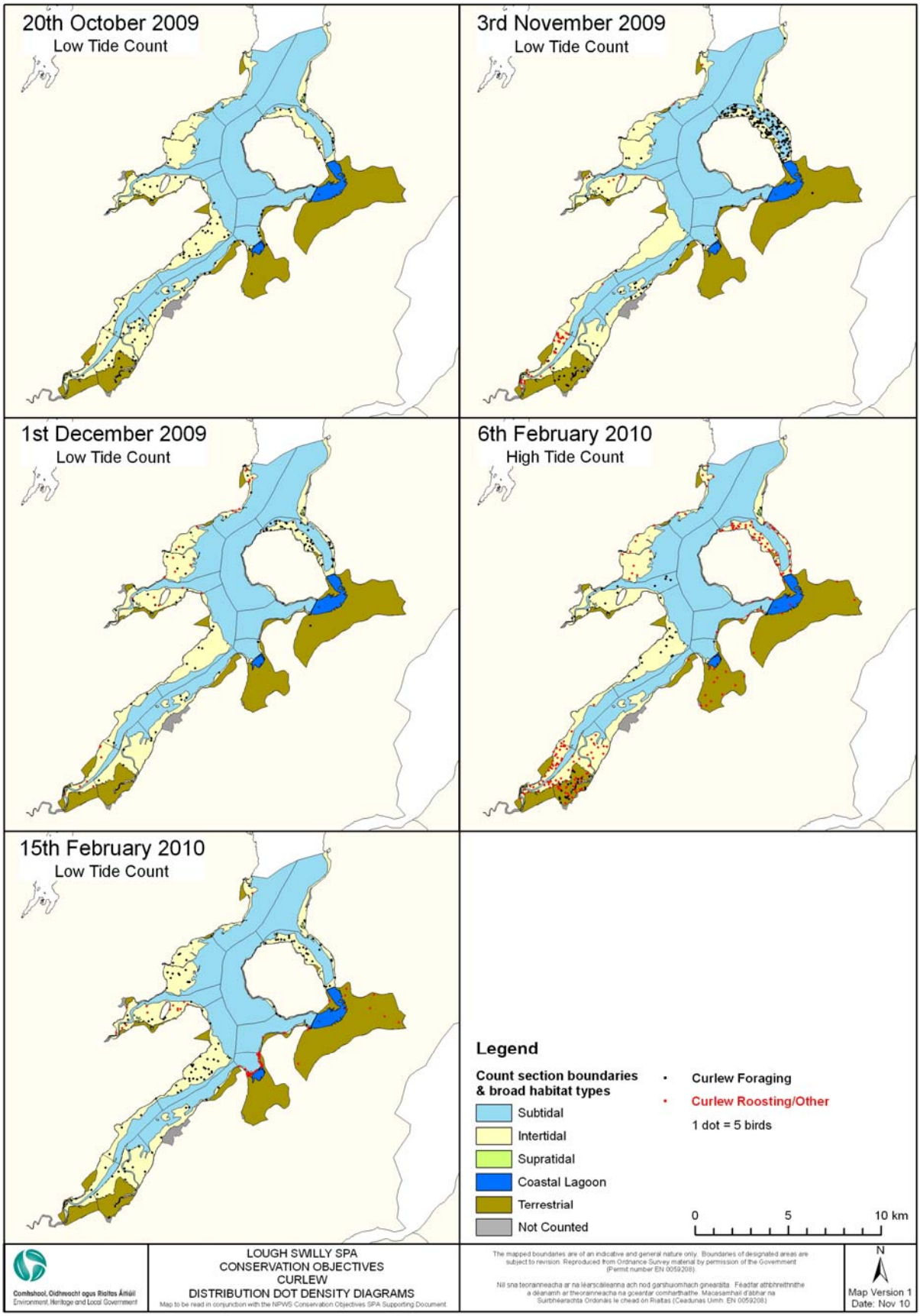
Date: Nov 10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3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Curlew Foraging
Curlew Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
CURLEW
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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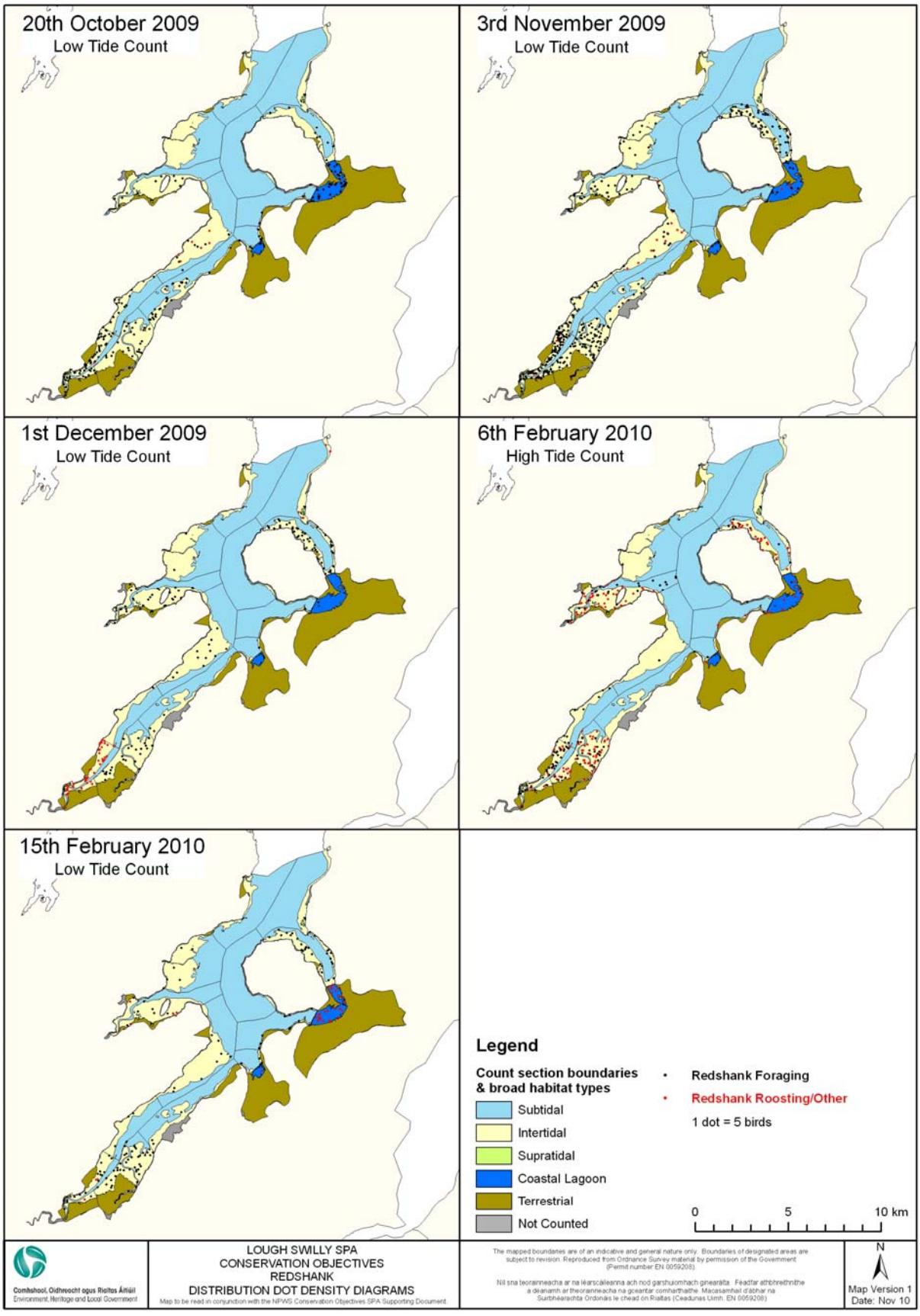
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Redshank Foraging
Redshank Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
REDSHANK
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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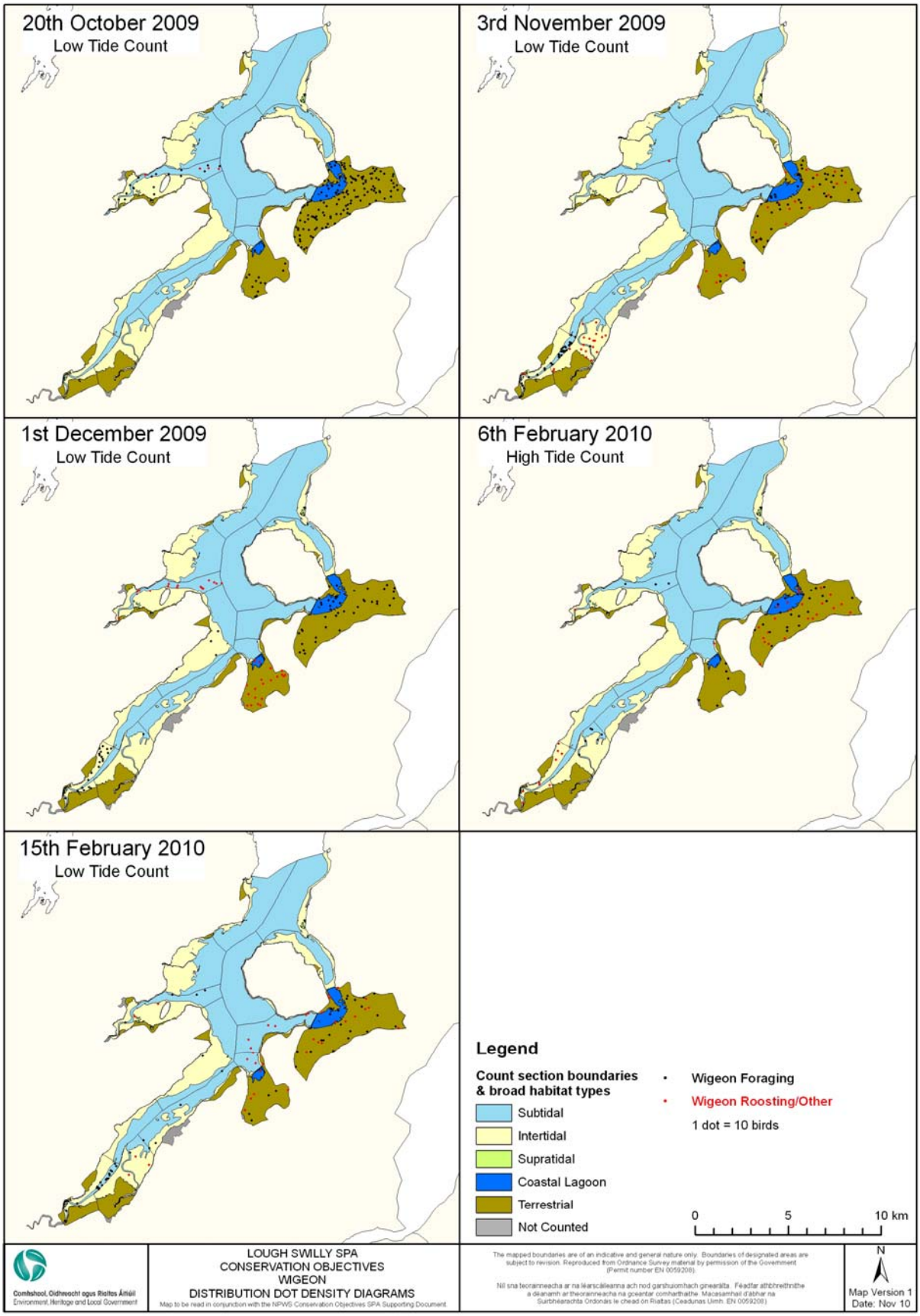
Date: Nov 10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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Wigeon Foraging
Wigeon Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
WIGEON
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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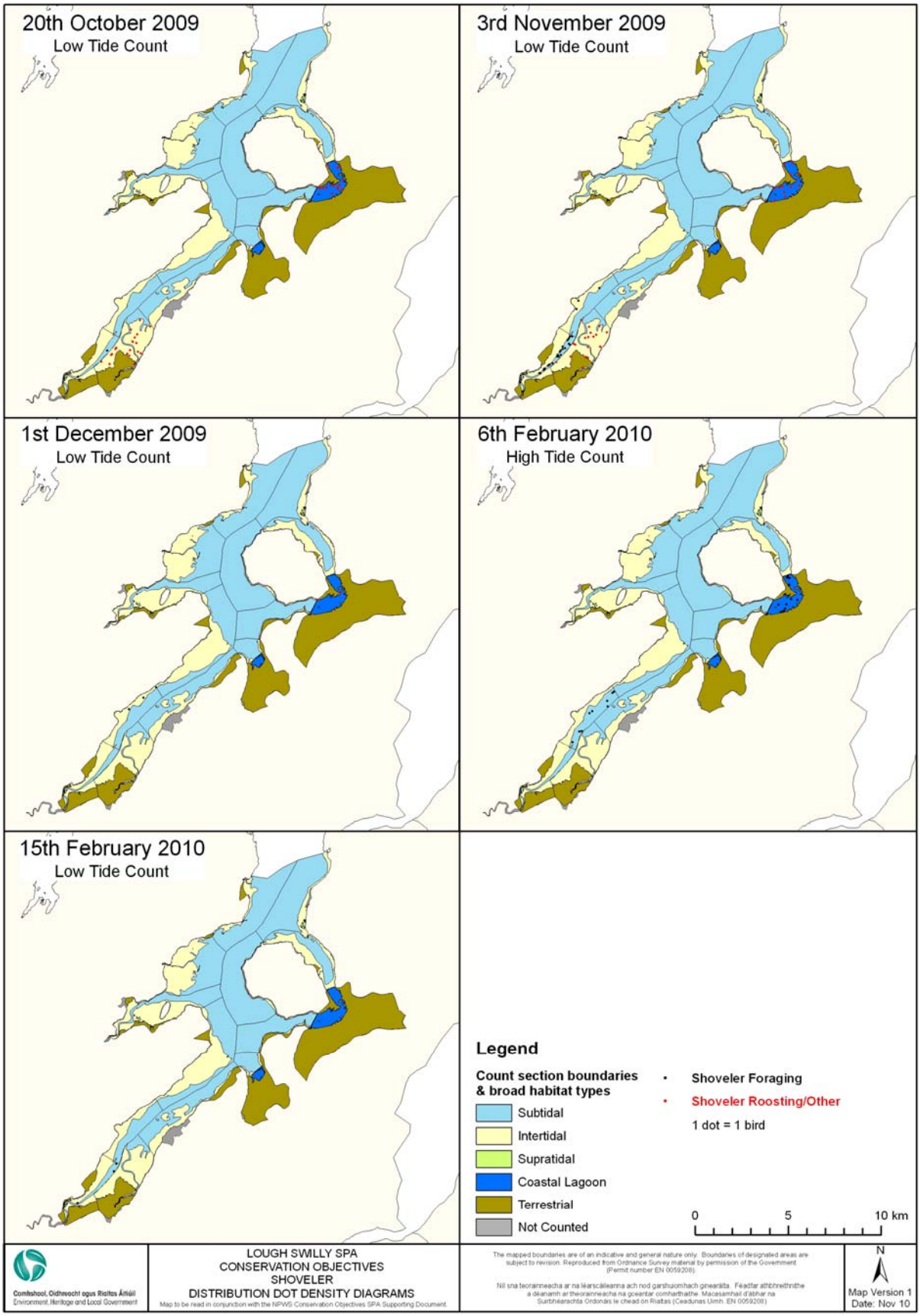
Date: Nov 10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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Shoveler Foraging
Shoveler Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
SHOVELER
DISTRIBUTION DOT DENSITY DIAGRAMS
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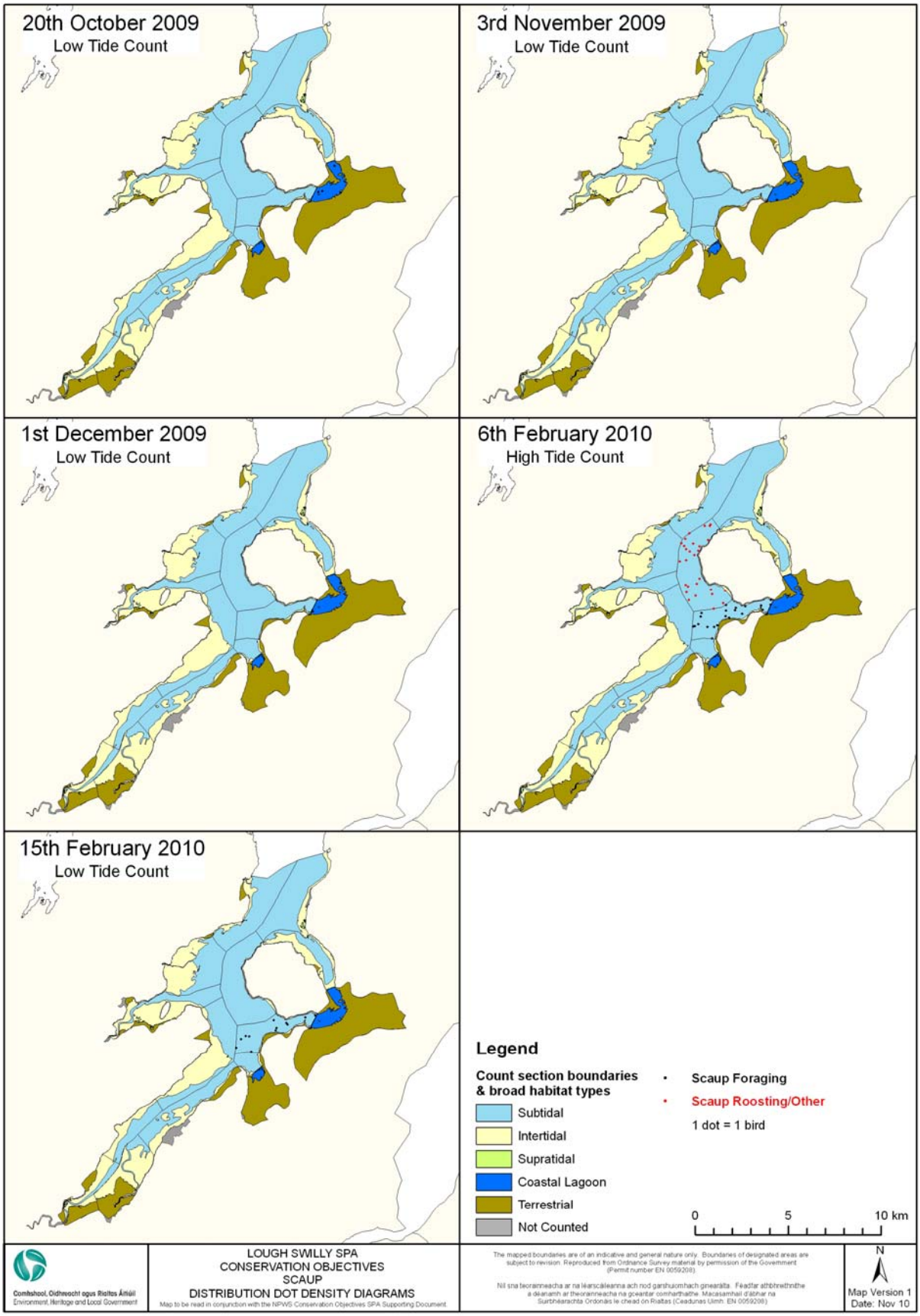
Map Version 1
Date: Nov 10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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Scaup Foraging
Scaup Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
SCAUP
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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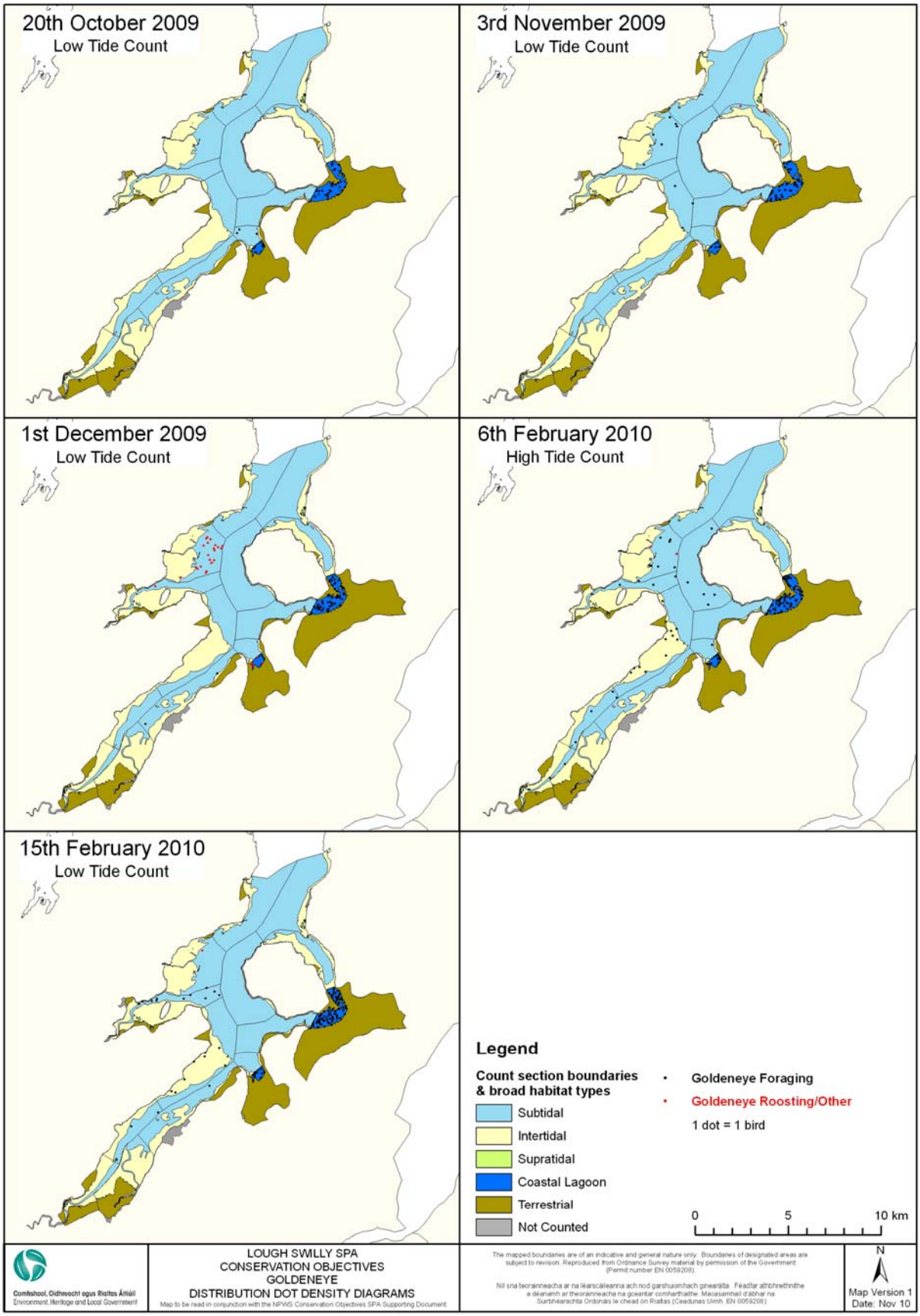
Map Version 1
Date: Nov 10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Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Goldeneye Foraging
Goldeneye Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GOLDENEYE
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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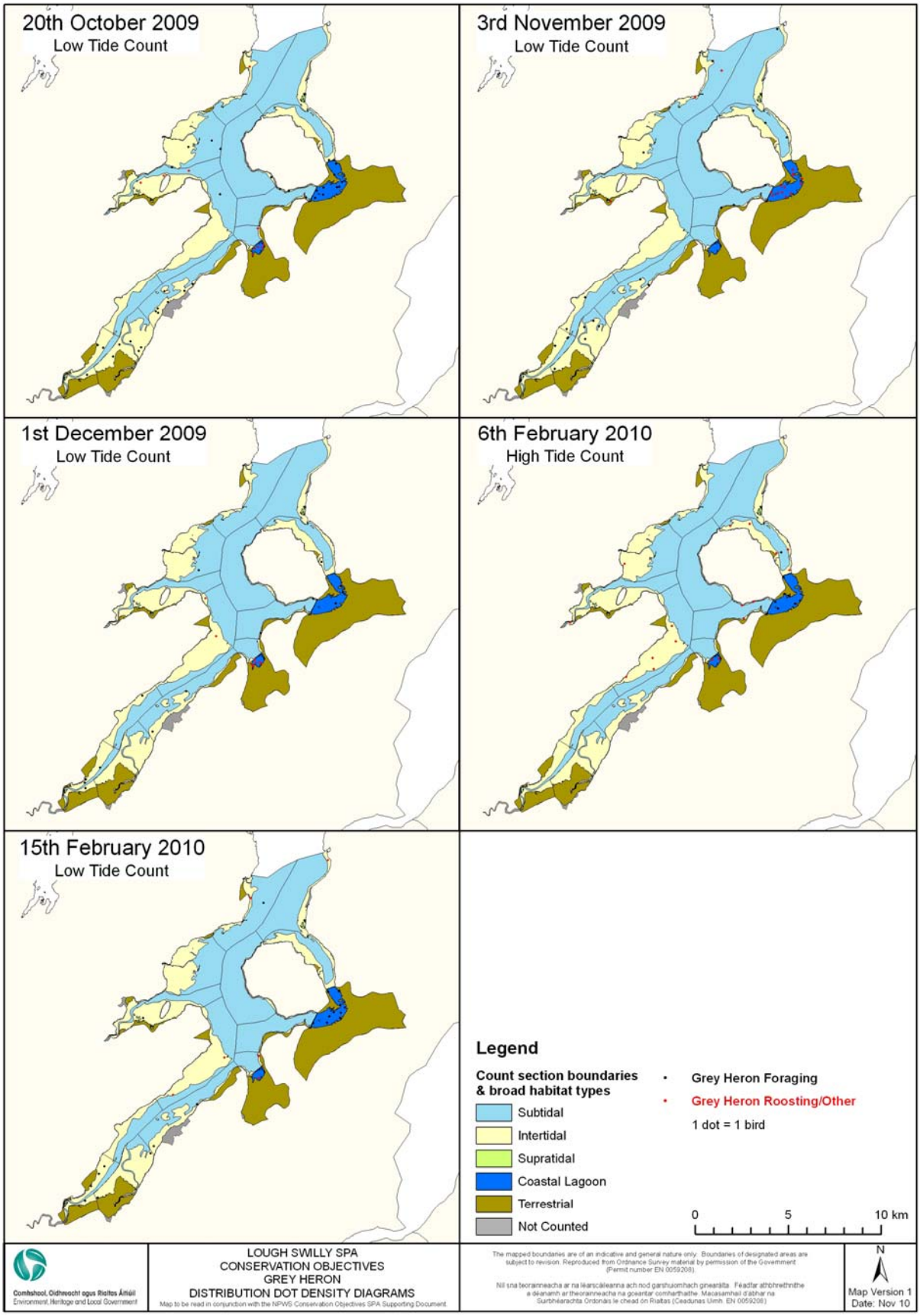
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Grey Heron Foraging
Grey Heron Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GREY HERON
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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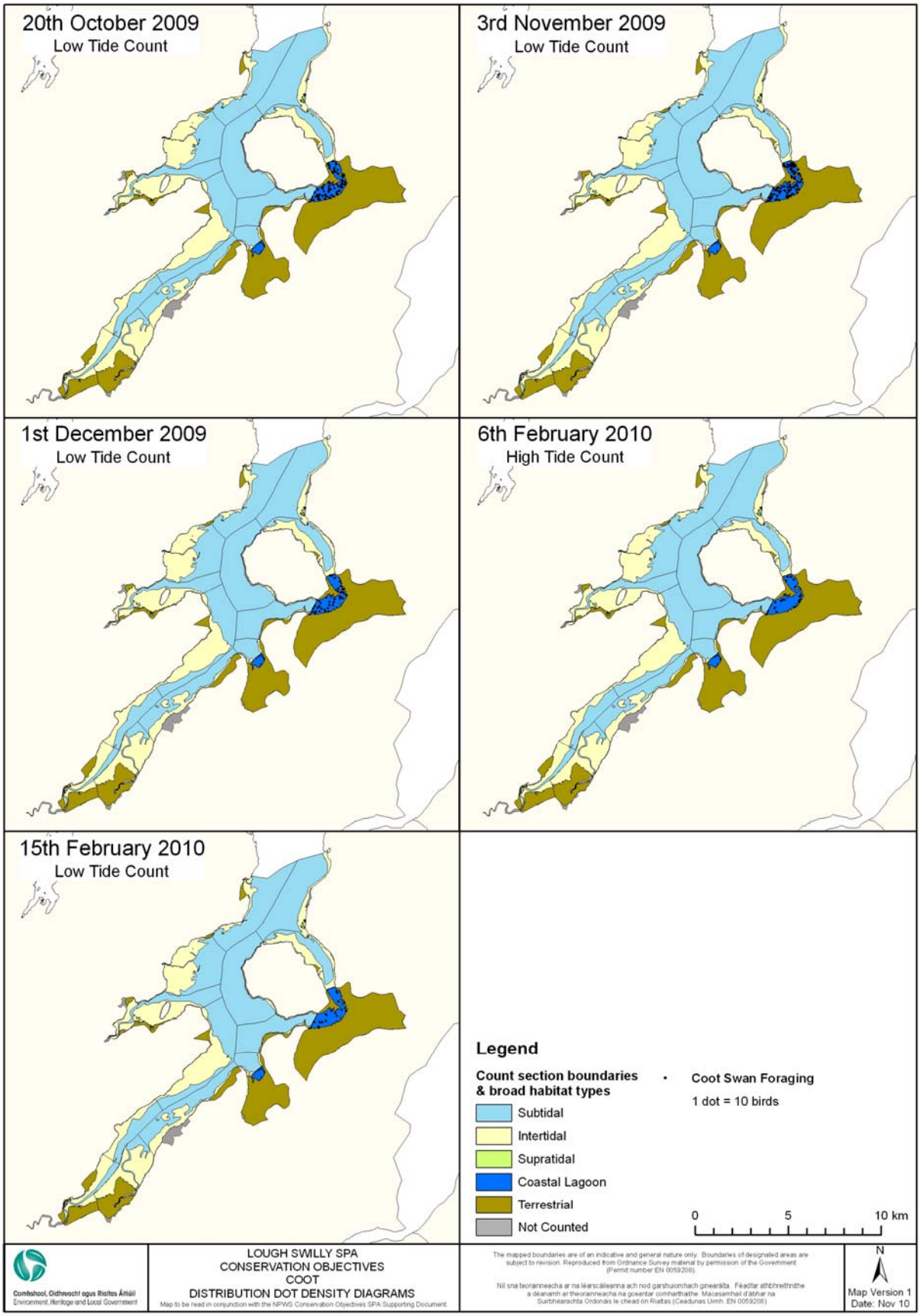
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Coot Swan Foraging
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
COOT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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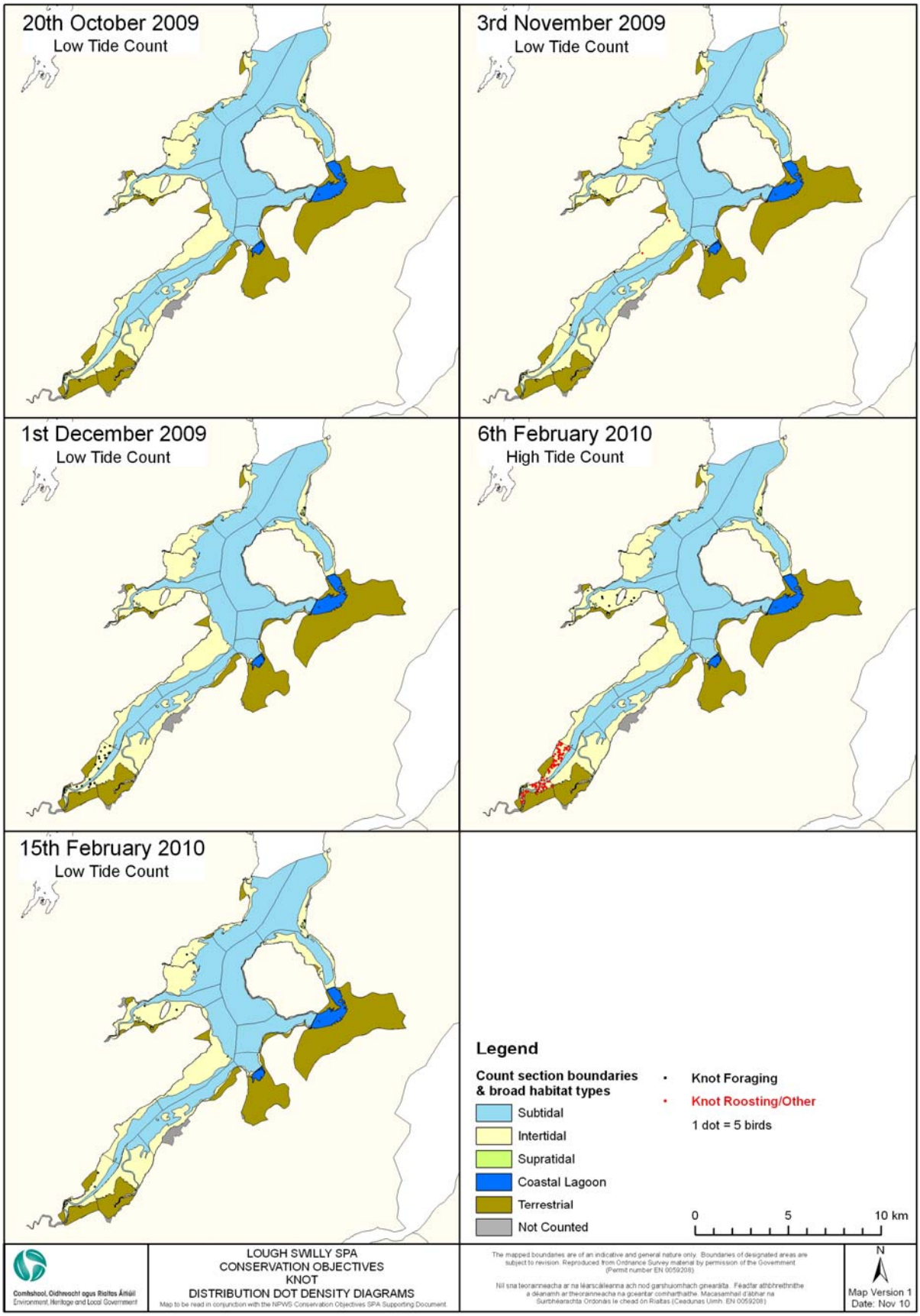
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Knot Foraging
Knot Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
KNOT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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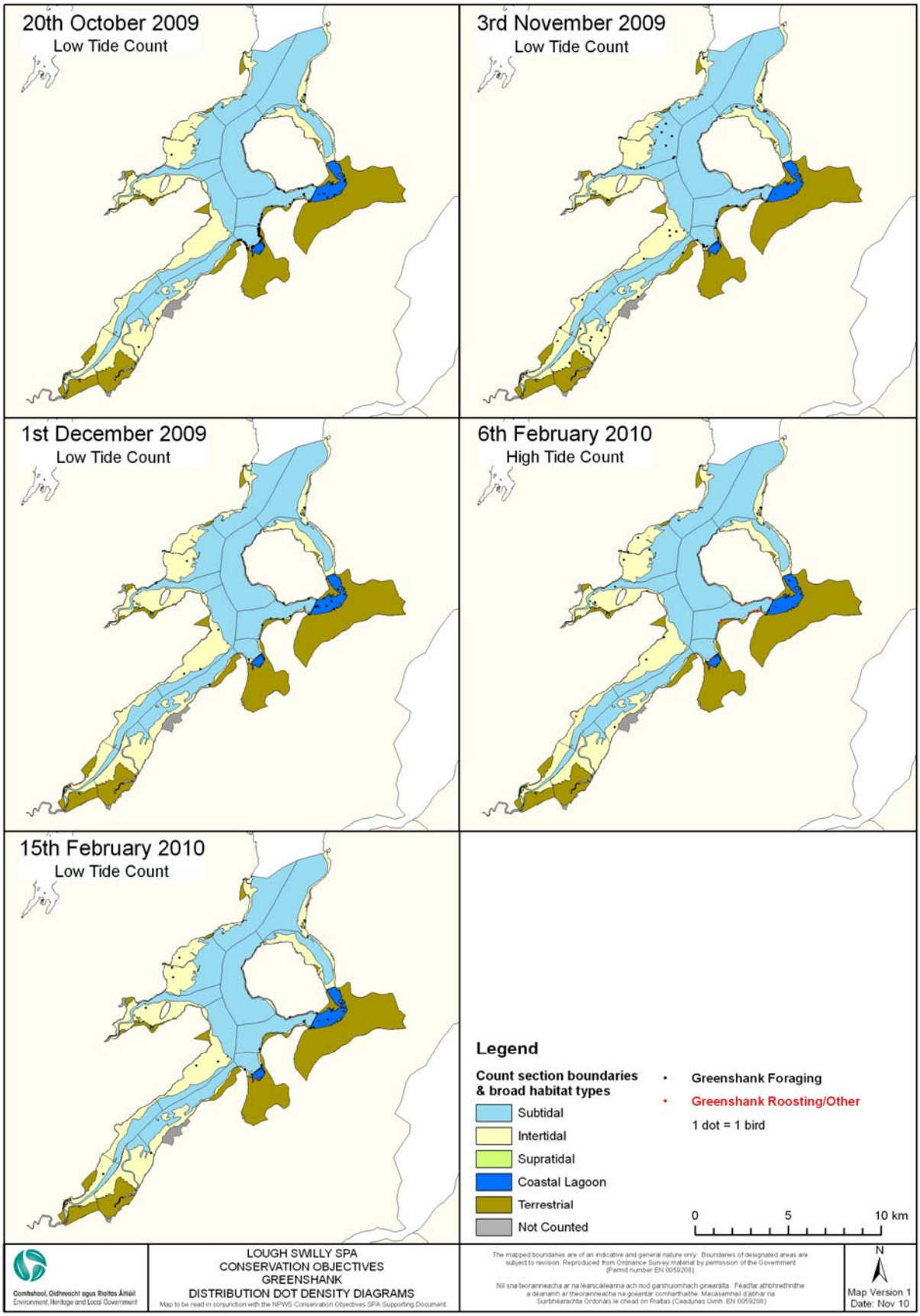
N
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Greenshank Foraging
Greenshank Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
GREENSHANK
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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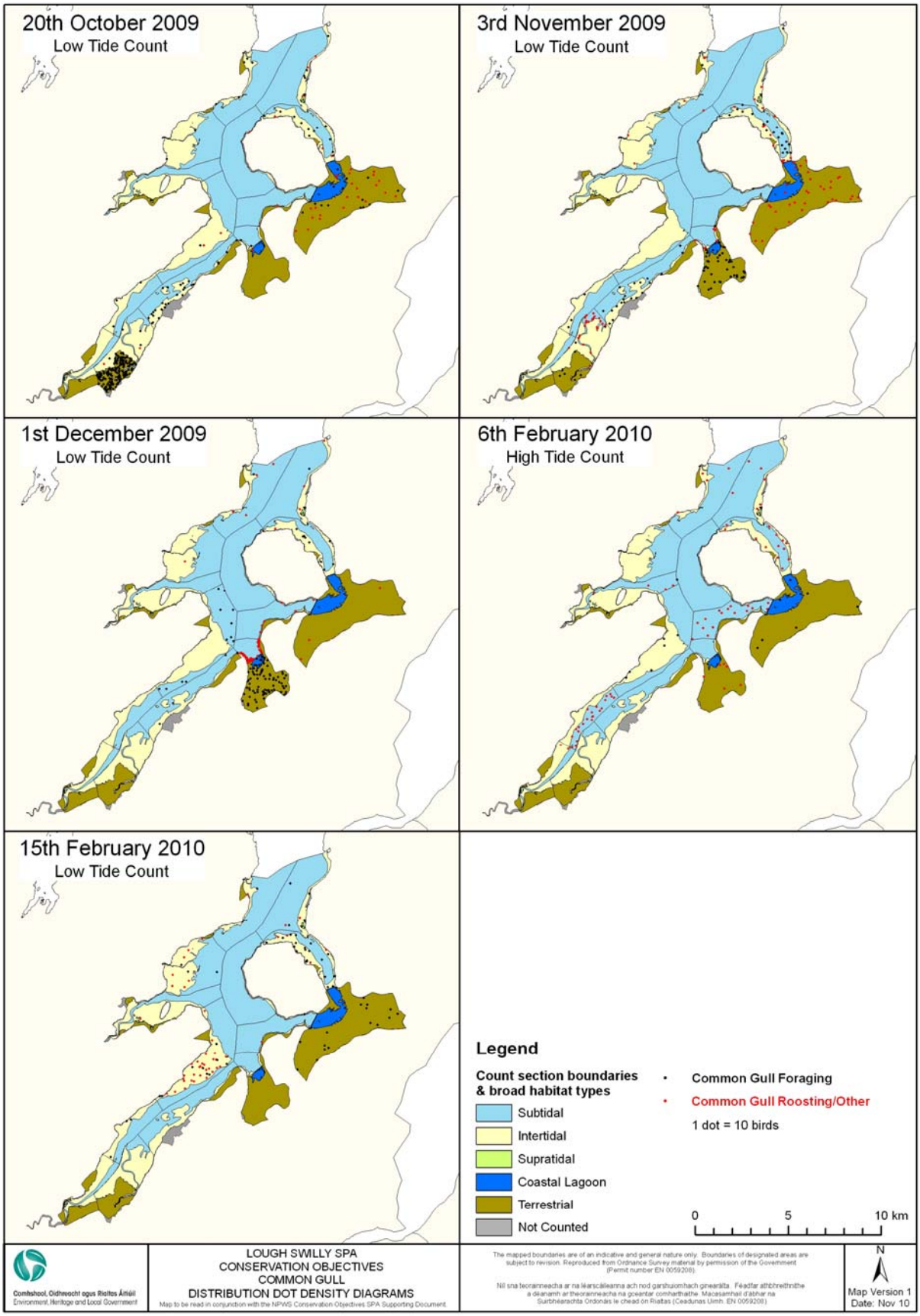
Map Version 1
Date: Nov 10


20th October 2009
Low Tide Count
3rd November 2009
Low Tide Count
1st December 2009
Low Tide Count
6th February 2010
High Tide Count
15th February 2010
Low Tide Count
Legend
Count section boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Coastal Lagoon
Terrestrial
Not Counted
Common Gull Foraging
Common Gull Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY SPA
CONSERVATION OBJECTIVES
COMMON GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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Map Version 1
Date: Nov 10

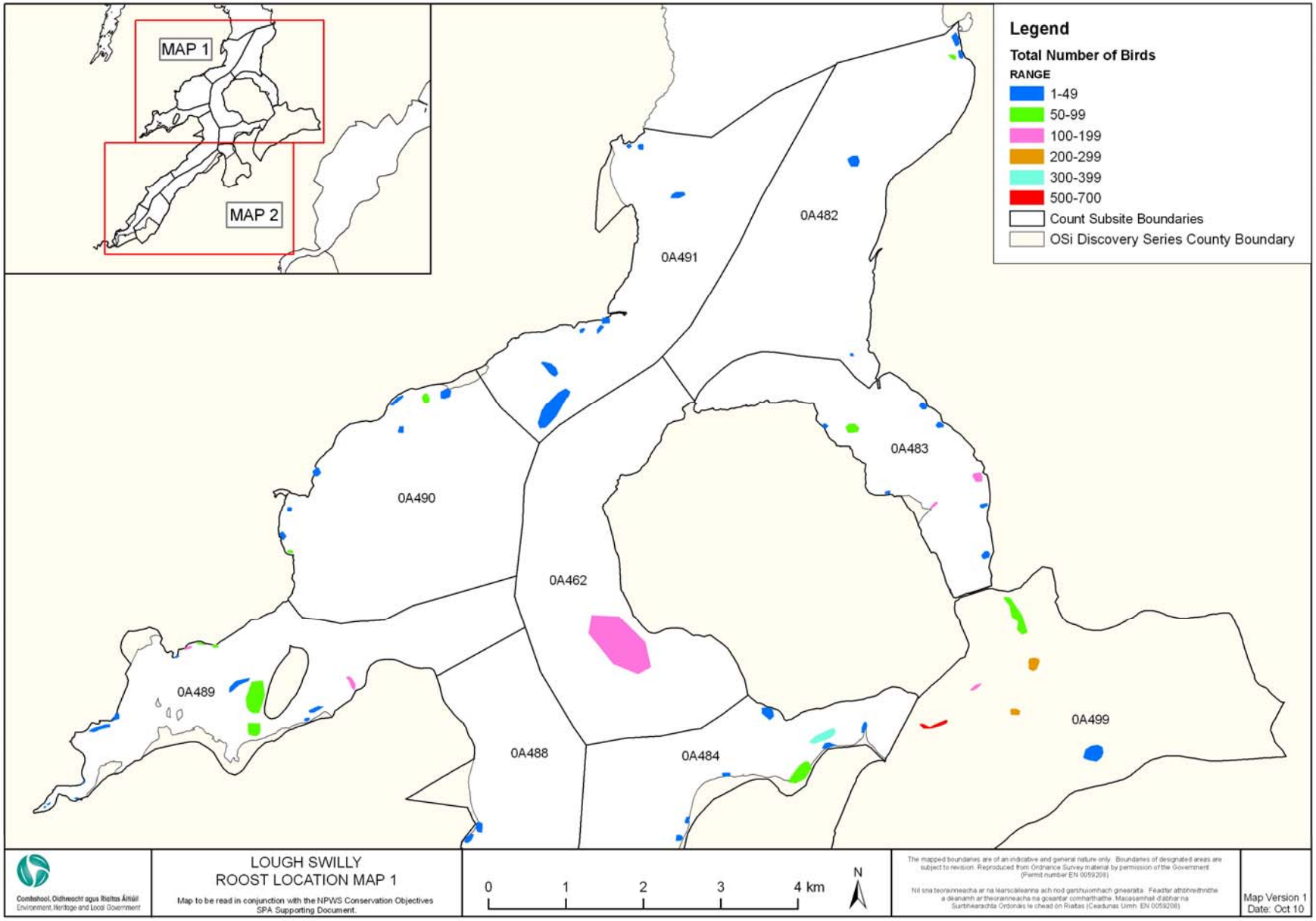
APPENDIX 8

Lough Swilly SPA (4075)

Summary information and roost location maps from the roost survey (10th March 2010)

Lough Swilly SPA (4075) Roost Summary Table

Subsite	Number individual roost locations	No. Species	Total No. birds	Species (alphabetical order)
OA399	3	9	435	BH, CM, CU, GK, MA, RK, T., WN, WS
OA462	1	7	150	CX, GG, ND, RH, RM, SP, SZ
OA482	3	9	136	BH, CA, CM, GB, DN, OC, RK, SA, TT,
OA483	9	10	376	CA, CU, DN, GB, GK, MA, OC, RK, SU, WN,
OA484	8	10	561	BH, CM, CU, GK, MA, OC, RK, T., TT, WN
OA485	2	1	27	PB
OA486	-	-	-	-
OA487	2	2	242	CU, OC
OA488	7	8	205	CU, H. MA, OC, PB, RK, RP, TT.
OA489	17	8	678	BW, CU, GP, MA, OC, RK, SU, T.
OA490	9	7	173	CA, CU, GN, MA, OC, RM, TT
OA491	8	8	177	BH, CM, DN, HG, ND, OC, RP, RM
OA494	3	2	380	PB, WN
OA499	9	11	1,248	BH, CA, CM, GJ, MA, MS, SU, T., TU, WN, WS


MAP 1
MAP 2
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
500-700
Count Subsite Boundaries
OSi Discovery Series County Boundary
0A491
0A482
0A483
0A490
0A462
0A489
0A488
0A484
0A499
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY
ROOST LOCATION MAP 1
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
0 1 2 3 4 km
N
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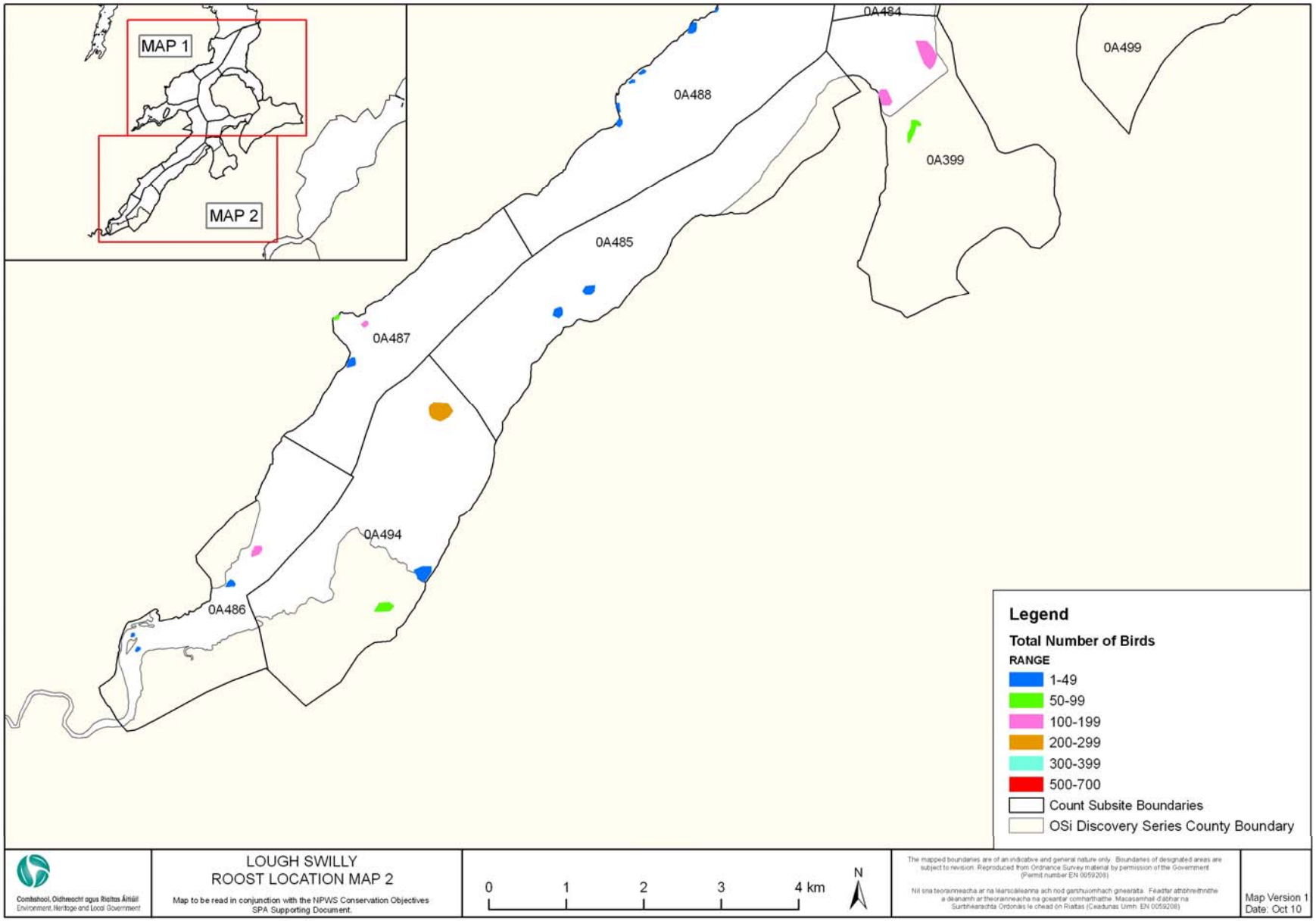
Map Version 1
Date: Oct 10


MAP 1
MAP 2
0A484
0A499
0A488
0A399
0A485
0A487
0A494
0A486
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
500-700
Count Subsite Boundaries
OSi Discovery Series County Boundary
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
LOUGH SWILLY
ROOST LOCATION MAP 2
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
0 1 2 3 4 km
N
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Map Version 1
Date: Oct 10

APPENDIX 9

Lough Swilly SPA (4075) - Activities & Events

Activities and events are listed as per standard EU Natura pressure and threat categories. Please note that this list is based on the current review process and is not exhaustive.

Activity & Events Legend:	
O	observed or known to occur within Lough Swilly SPA
U	known to occur but unknown area (subsites)/spatial extent; hence all potential subsites are included (e.g. fisheries activities).
H	historic, known to have occurred in the past.
P	potential to occur in the future.

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Coastal protection, sea defences & stabilisation														
1.1 Linear defences	H		H	H			H			H			H	H
1.4 *Spartina* planting/growing							O	O		O			O	
1.5 Marram grass planting												H		
1.6 Other modifications							O							
Barrage schemes/drainage														
2.1 Weirs and barrages for river management							P							
2.2 Altered drainage/river channel							H							H
2.3 Other channel modifications										H				
2.4 Tidal barrages	H			H										H
2.5 Other														O
Industrial, port & related development														
4.1 Industrial port										O				
4.2 Fishing harbour			O									O		
4.3 Slipway			O			O					O			O
4.4 Pier			O	O	O		O			O		O		
4.7 Ship & boat building/repair										Y				
Pollution														
6.1 Domestic & urban waste water	O		O				O			O		O	O	
6.2 Industrial							O							
6.4 Agricultural & forestry effluents	U				U		U			U	U	U		
Sediment extraction (marine & terrestrial)														
7.1 Channel dredging (maintenance & navigation)			O				H							
7.3 Sand and gravel extraction				O										
7.4 Removal of beach materials												O		

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Transport & communications														
8.1 Airports							O							
8.2 Flight path							O						O	
8.3 Bridges & aqueducts										O				
8.5 Road schemes			O						O	O	O			
8.6 Car parks			O							O	O	O		
8.7 Shipping channel, shipping lanes			O				H					O		
Urbanisation														
9.1 Urbanised areas, housing			O	O			O			O		O	H	
9.2 Commercial & industrial areas										O				
9.3 Hotel & leisure complex												P		
Education & scientific research														
11.2 Nature trails														O
Tourism & recreation														
12.1 Marinas				O						P		P		
12.2 Non-marina moorings				H								O		
12.6 Power boating & water-skiing				O		O								
12.7 Jet-skiing			O	O										
12.8 Sailing			O							O	O	O		
12.14 Tourist boat trips			O											
12.15 Angling	O		O									O		
12.17 Bathing & general beach recreation			O									O		
12.18 Walking, incl. dog walking		O	O			O			O	O	O	O	O	O
12.19 Birdwatching	O		O	O						O	O	O		O
12.22 Motorised vehicles											O	O		O
12.23 Horse-riding		O						P				O		
12.25 Golf courses			O	O			O							

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Wildfowl & hunting														
13.1 Wildfowling	O						O	O						O
Bait-collecting														
14.1 Digging for lugworms/ragworms	O		O	O				O						
Fisheries & Aquaculture														
15.2 Professional active fishing		U	U	U	U	U		U	U	U	U	U	U	
15.3 Bottom (benthic) dredging	U		U	U		U		U	U	U	U			
15.4 Fish traps & other fixed devices & nets		U	U	U	U	U		U	U	U	U	U	U	
15.5 Leisure fishing				U						O				
15.6 Molluscs - hand-gathering	O	O		O	H	O		O	O	O	O	O	O	O
15.7 Hand raking						O								
15.8 Fish-farming												O		
15.9 Intertidal aquaculture e.g trestles	U	U	U	U	U				U		U	U		
15.10 Suspended cultivation (subtidal)												U		
15.11 Bottom culture	U		U	U		U		U	U	U	U			
Agriculture & forestry														
16.2 Grazing: intensive (terrestrial)	O				O	O							O	O
16.3 Grazing: non-intensive (terrestrial)	O				O		O			H	H	H	O	
16.5 Stock feeding														O
16.6 Crop production: intensive	O				O								O	O
16.7 Crop production: non-intensive	O													
16.9 Removal of hedges, scrub										H	H	H		O
16.10 Mowing/grassland cutting														O
16.12 Polderisation	H												O	O
16.13 Agricultural land-claim	H													

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Agriculture & forestry														
16.14 In-filling (ditches, ponds, pools, marshes, pits)	H													
16.15 Removal of stone walls/embankments										O				
16.17 Forest planting on open ground												H		
16.18 Forest and plantation management & use												H		
Wildlife habitat management														
18.2 Habitat creation & restoration - intertidal										O				
18.4 Habitat management														O
Natural events														
19.1 Storms, floods and storm surges										O	O	O		O
19.2 Severe cold weather	O	O	O	O	O	O	O	O	O	O	O	O	O	O
19.3 Eutrophication														U

APPENDIX 10

Lough Swilly SPA (4075) – Disturbance Assessment

Scoring system for disturbance assessment

Frequency/Duration	(A) Timing Score	Intensity	(B) Scope Score	Response	(C) Severity Score	TOTAL SCORE A + B + C
Continuous	3	Active, high-level	3	Most birds disturbed all of the time	3	9
Frequent	2	Medium level	2	Most birds displaced for short periods	2	6
Infrequent	1	Low-level	1	Most species tolerate disturbance	1	3
Rare	0	Very low-level	0	Most birds successfully habituate to the disturbance	0	0

TOTAL SCORE	SCORE	COLOUR CODING
7 - 9	High	
4 - 6	Moderate	
0 - 3	Low	

- Note that grey shading = unassessed due to unknown area or frequency.
- Where scores fall between two categories (e.g. 3/4) the score is shown as well as the colour code.

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Transport & communications														
8.2 Flight path							5						5	
8.6 Car parks			6							4	4	4		
8.7 Shipping channel, shipping lanes			U				U					U		
Tourism & recreation														
12.2 Non-marina moorings				U								U		
12.6 Power boating & water-skiing				6		6								
12.7 Jet-skiing			6	6										
12.8 Sailing			6								5	5		
12.14 Tourist boat trips			5											
12.15 Angling	4		4									4		
12.17 Bathing & general beach recreation			5									6		
12.18 Walking, incl. dog walking		5	5			6			5	4	4	6	4	6
12.19 Birdwatching	3/4		3/4	3/4						3/4	3/4	3/4		4
12.22 Motorised vehicles											5	5		5
12.23 Horse-riding		5										6		
12.25 Golf courses			2/3	2/3			6							
Wildfowl & hunting														
13.1 Wildfowling	6						6	6						6
Bait-collecting														
14.1 Digging for lugworms/ragworms	5		4	4				5						

	0A399	0A462	0A482	0A483	0A484	0A485	0A486	0A487	0A488	0A489	0A490	0A491	0A494	0A499
Fisheries & Aquaculture														
15.2 Professional active fishing		U	U	U	U	U		U	U	U	U	U	U	
15.3 Bottom (benthic) dredging	U		U	U		U		U	U	U	U			
15.4 Fish traps & other fixed devices & nets		U	U	U	U	U		U	U	U	U	U	U	
15.5 Leisure fishing				U						U				
15.6 Molluscs - hand-gathering	4	5		5		4		4	4	4	5	5	4	4
15.7 Hand raking						4								
15.9 Intertidal aquaculture e.g. trestles	U	U	U	U	U				U		U	U		
15.10 Suspended cultivation (subtidal)												U		
15.11 Bottom culture	U		U	U		U		U	U	U	U			