Rogerstown Estuary Special Protection Area

(Site Code 4015)

≡

Conservation Objectives Supporting Document

VERSION 1

National Parks & Wildlife Service

May 2013

TABLE OF CONTENTS

SUMMARY

This document presents conservation objectives for the Special Conservation Interests of Rogerstown Estuary 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 (SPA) designation process and to the site designated as Rogerstown Estuary Special Protection Area, as well as introducing the concept of conservation objectives and their formulation.

Part Two provides site designation information for Rogerstown Estuary SPA and Part Three presents the conservation objectives for this site.

Part Four reviews the conservation condition of the site Special Conservation Interest (SCI) 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 SCI species.

Part Five provides supporting information that will assist the interpretation of the site-specific conservation objectives. This section includes a review of the ecological characteristics of the SCI species and examines waterbird distribution recorded during the 2011/12 Waterbird Survey Programme, drawing also on data from NPWS monitoring programmes (e.g. benthic surveys) and the Irish Wetland Bird Survey (I-WeBS). Part Five concludes with information on activities and events that occur in and around the site which may interact with waterbirds during the non-breeding season and includes an assessment of those activities that were recorded to cause disturbance to non-breeding waterbirds during the 2011/12 Waterbird Survey Programme.

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 on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended) (Birds Directive). 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), part of the Department of the Arts, Heritage and the Gaeltacht, are responsible for the selection and designation of SPAs in Ireland. NPWS have developed a set of criteria, incorporating information relating to the selection of wetland sites developed under the Ramsar Convention, which are used to identify and designate SPAs. Sites that meet any of the following criteria may be selected as SPAs:

- A site regularly supporting 20,000 waterbirds or 10,000 pairs of seabirds;
- A site regularly supporting 1% or more of the all-Ireland population of an Annex I species;
- A site regularly supporting 1% or more of the biogeographical population of a migratory species;
- A site that is one of the 'n' most suitable sites in Ireland for an Annex I species or a migratory species (where 'n' is a variable which is related to the proportion of the total biogeographic population of a species held by Ireland).

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 meets the relevant criteria for designation and is selected as an SPA, a list of species for which the site is nationally and internationally important is compiled. These species are known as **Special Conservation Interests** and may be one of the following:

- An Annex I species that occurs at the site in numbers that exceed the all-Ireland 1% population threshold;
- A migratory species that occurs at the site in numbers that exceed the biogeographic 1% population threshold (referred to as a species that occurs in numbers of 'international importance');
- A migratory species that occurs at the site in numbers that exceed the all-Ireland 1% threshold (referred to as a species that occurs in numbers of 'all-Ireland importance');

- A species for which the site is considered to be one of the *'n'* most suitable sites in Ireland for the conservation of that species (where *n* is a variable that is related to the proportion of the total biogeographic population held by Ireland).

The wetlands of northwest Europe are a vital resource for millions of northern and boreal nesting waterbird species that overwinter on these wetlands or visit them when migrating further south. To acknowledge the importance of Ireland's wetlands to wintering waterbirds the term Wetland & Waterbirds can be included as a Special Conservation Interest for a Special Protection Area that has been designated for wintering waterbirds, and is or contains a wetland site of significant importance to one or more of the species of Special Conservation Interest.

1.2 Introduction to Rogerstown Estuary Special Protection Area

Rogerstown Estuary is situated approximately 2 km north of Donabate in north County Dublin. It is a relatively small, narrow estuary separated from the sea by a sand and shingle bar and dune system. The designated site also extends along the open coastline north and south of the estuary mouth to include an area of shallow marine water.

The estuary receives the waters of the Ballyboghil and Ballough rivers and has a wide salinity range, from near full seawater at the mouth to near full freshwater at the estuary head. The estuary is divided into two sections by a causeway and narrow bridge, built in the 1840s to carry the Dublin-Belfast railway line. Due to the constriction of tidal flow between the inner and outer sections of the estuary caused by the viaduct, drainage from the inner estuary continues for 2-3 hours after low tide. Saltmarsh in the upper regions of the inner estuary is only covered significantly during higher spring tides.

At low tide extensive intertidal sandflats are exposed with muddier sediments in the inner estuary (west of causeway) and along the southern shore. Associated with these muds are stands of Common Cord-grass (*Spartina anglica*). A bed of *Zostera noltii* is known to occur near Portraine. Macroalgal mats of filamentous *Ulva* spp. (formerly *Enteromorpha*)[1] are widespread, especially in the more sheltered areas. The intertidal vascular plant Beaked Tasselweed (*Ruppia maritima*) grows profusely in places beneath the algal mats and is grazed by herbivorous waterfowl. Saltmarsh fringes parts of the estuary, especially its southern shores. Common plant species of the saltmarsh include Sea Rush (*Juncus maritimus*), Sea Purslane (*Halimione portulacoides*) and Common Saltmarsh-grass (*Puccinellia maritima*).

The site is selected as a Special Protection Area (SPA) and of special conservation interest for the following wintering species: Greylag Goose, Light-bellied Brent Goose, Shelduck, Shoveler, Oystercatcher, Ringed Plover, Grey Plover, Knot, Dunlin, Black-tailed Godwit and Redshank. These species are introduced in greater detail in Part Two of this document. The Site Synopsis for Rogerstown Estuary 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

[1] Hayden et al. (2003), using genetic information, reassigned the genus *Enteromorpha* to the genus *Ulva.*

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*

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[2].

Where relevant, conservation objectives are defined for attributes[3] relating to bird species populations, and for attributes related to the maintenance and protection of habitats that support them. These attributes are:

- Population trend;
- Population distribution;
- Habitat range and area (extent).

Further guidance is given in Section 3.1 (Conservation Objectives for the Special Conservation Interests of Rogerstown Estuary Special Protection Area).

[2] 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).

PART TWO – SITE DESIGNATION INFORMATION

2.1 Special Conservation Interests of Rogerstown Estuary Special Protection Area

The **Special Conservation Interest Species**[4] for Rogerstown Estuary SPA are listed below and summarised in Table 2.1. This table also shows the importance of Rogerstown Estuary for SCI species, relative to the importance of other sites within Ireland and within the Dublin region.

The Special Conservation Interest Species listed for Rogerstown Estuary SPA are as follows:-

1. During winter the site regularly supports 1% or more of the all-Ireland 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 160 individuals.

2. During winter the site regularly supports 1% or more of the biogeographic population of Light-bellied Brent Geese (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,069 individuals.

3. During winter 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 773 individuals.

4. During winter the site regularly supports 1% or more of the all-Ireland population of Shoveler (*Anas clypeata*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 59 individuals.

5. During winter 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 1,345 individuals.

6. During winter the site regularly supports 1% or more of the all-Ireland population of Ringed Plover (*Charadrius hiaticula*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 188 individuals.

7. During winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 229 individuals.

8. During winter the site regularly supports 1% or more of the all-Ireland population of Knot (*Calidris canutus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 2,454 individuals.

9. During winter 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 2,745 individuals.

10. During winter the site regularly supports 1% or more of the all-Ireland population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 195 individuals.

[4] Special Conservation Interest species are listed in taxonomic order.

11. During winter 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 490 individuals.

12. The wetland habitats contained within Rogerstown Estuary SPA are identified of conservation importance for non-breeding (wintering) migratory waterbirds. Therefore the wetland habitats are considered to be an additional Special Conservation Interest.

Table 2.1 Designation Summary: species listed for Rogerstown Estuary Special Protection Area, plus site importance at national and regional scale

Special Conservation Interests	Annex I species	Baseline Population[a]	Population status at baseline	National Importance Rank[1]	Regional Importance Rank[2]
Greylag Goose (*Anser anser*)		160	All-Ireland Importance	7	1
Light-bellied Brent Goose (*Branta bernicla hrota*)		1,069	International Importance	5	3
Shelduck (*Tadorna tadorna*)		773	All-Ireland Importance	5	2
Shoveler (*Anas clypeata*)		59	All-Ireland Importance	14	2
Oystercatcher (*Haematopus ostralegus*)		1,345	All-Ireland Importance	6	2
Ringed Plover (*Charadrius hiaticula*)		188	All-Ireland Importance	9	2
Grey Plover (*Pluvialis squatarola*)		229	All-Ireland Importance	8	2
Knot (*Calidris canutus*)		2,454	All-Ireland Importance	3	2
Dunlin (*Calidris alpina*)		2,745	All-Ireland Importance	11	3
Black-tailed Godwit (*Limosa limosa*)		195	All-Ireland Importance	23	3
Redshank (*Tringa totanus*)		490	All-Ireland Importance	16	3
Other conservation designations associated with the site[b]	**SAC**	**RAMSAR SITE**	**IMPORTANT BIRD AREA (IBA)**	**WILDFOWL SANCTUARY**	**OTHER**
	SAC 00208	Yes	Yes	Yes	pNHA Nature Reserve

[a] Baseline data are the 5-year mean peak counts for the period 1995/96 – 1999/00 (I-WeBS) with the exception of Light-bellied Brent Goose (Robinson et al. 2004).
[b] Note that other designations associated with Rogerstown Estuary may relate to different areas and/or some of these areas may extend outside the SPA boundary.
[1]National importance rank – the number given relates to the importance of the site for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites in Ireland.
[2]Regional importance rank – the number given relates to the importance of the site for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within the Dublin region.

PART THREE – CONSERVATION OBJECTIVES FOR ROGERSTOWN ESTUARY SPA

3.1 Conservation Objectives for the Special Conservation Interests of Rogerstown Estuary SPA

The overarching Conservation Objective for Rogerstown Estuary 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 Rogerstown Estuary Special Protection Area, based on the principles of favourable conservation status, are described below and summarised in Table 3.1. Note that these 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 Rogerstown Estuary 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.[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 range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest, other than that occurring from natural patterns of variation.[7]

Factors that can adversely affect the achievement of Objective 1 include:

- ❖ Habitat modification: activities that modify discrete areas or the overall habitat(s) within the SPA in terms of how one or more of the listed species use the site (e.g. as a feeding resource) could result in the displacement of these species from areas within the SPA and/or a reduction in their numbers (for further discussion on this topic please refer to Section 5.4).

- ❖ Disturbance: anthropogenic disturbance that occurs in or near the site and is either singular or cumulative in nature could result in the displacement of one or more of the listed waterbird species from areas within the SPA, and/or a reduction in their numbers (for further discussion on this topic please refer to Section 5.4).

[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] Waterbird distribution from the 2011/2012 waterbird survey programme is examined in Section 5.

- ❖ Ex-situ factors: several of the listed waterbird species may at times use habitats situated within the immediate hinterland of the SPA or in areas ecologically connected to it. The reliance on these habitats will vary from species to species and from site to site. Significant habitat change or increased levels of disturbance within these areas could result in the displacement of one or more of the listed waterbird species from areas within the SPA, and/or a reduction in their numbers (for further information on this topic please refer to Section 5.2).

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

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

- To be favourable, the permanent **area** occupied by the wetland habitat should be stable and not significantly less than the area of **646 ha**, other than that occurring from natural patterns of variation.

The boundary of Rogerstown Estuary SPA was defined to include the primary wetland habitats of this site. Objective 2 seeks to maintain the permanent extent of these wetland habitats, which constitute an important resource for regularly-occurring migratory waterbirds. The wetland habitats can be categorised into three broad types: subtidal; intertidal; and supratidal. Over time and through natural variation these subcomponents of the overall wetland complex may vary due to factors such as changing rates of sedimentation, erosion etc. Waterbird species may use more than one of the habitat types for different reasons (behaviours) throughout the tidal cycle.

Subtidal areas refer to those areas contained within the SPA that lie below the mean low water mark and are predominantly covered by marine water. Tidal rivers, creeks and channels are included in this category. For Rogerstown Estuary SPA this broad category is estimated to be **164 ha**. Subtidal areas are continuously available for benthic and surface feeding ducks (e.g. Shelduck, Shoveler) and piscivorous/other waterbirds. Various waterbirds roost in subtidal areas.

The intertidal area is defined, in this context, as the area contained between the mean high water mark and the mean low water mark. For Rogerstown Estuary SPA this is estimated to be **375 ha**. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing[8] areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource.

The supratidal category refers to areas that are not frequently inundated by the tide (i.e. occurring above the mean high watermark) but contain shoreline and coastal habitats and can be regarded as an integral part of the shoreline. For Rogerstown Estuary SPA this is estimated to be **107 ha**. Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species.

The maintenance of the 'quality' of wetland habitat lies outside the scope of Objective 2. However, for the species of Special Conservation Interest, the scope of Objective 1 covers the need to maintain, or improve where appropriate, the different properties of the wetland habitats contained within the SPA.

[8] Loafing can be described as any behaviour not connected with breeding or feeding, and includes preening and resting.

Table 3.1 Conservation Objectives for the waterbird Special Conservation Interests of Rogerstown Estuary SPA.

Objective 1: *To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Rogerstown Estuary SPA, which is defined by the following list of attributes and targets:*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Population	Population trend	Percentage change as per population trend assessment using waterbird count data collected through the Irish Wetland Bird Survey and other surveys.	The long term population trend should be stable or increasing	Waterbird population trends are presented in Part Four of this document.
Range	Distribution	Range, timing or intensity of use of areas used by waterbirds, as determined by regular low tide and other waterbird surveys.	There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest other than that occurring from natural patterns of variation.	Waterbird distribution from the 2011/12 waterbird survey programme is reviewed in Part Five of this document.
Objective 2: *To maintain the favourable conservation condition of the wetland habitat at Rogerstown Estuary 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	Wetland habitat	Area (ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 646 ha, other than that occurring from natural patterns of variation.	The wetland habitat area was estimated as 646 ha using OSI data and relevant orthophotographs.

PART FOUR – REVIEW OF THE CONSERVATION CONDITION OF WATERBIRD SPECIAL CONSERVATION INTERESTS

4.1 Population data for waterbird SCI species of Rogerstown Estuary SPA

Wintering waterbirds have been counted regularly at Rogerstown Estuary as part of the Irish Wetland Bird Survey (I-WeBS) since the survey commenced in 1994 (Crowe, 2005). With the exception of a couple of seasons in the early years, the site has been counted across a seven month period in each season, covering the months September to March inclusive. This is known as the core count period of I-WeBS and this timeframe not only covers the main winter period when many species occur in their largest concentrations, but also the autumn and spring passage periods when total waterbird numbers may be enhanced by staging/stopover birds[9]. Light-bellied Brent Geese and Greylag Geese are also the subject of additional species-specific surveys. Further information about I-WeBS and other waterbird surveys is given in Appendix 2.

The I-WeBS count area is divided into a number of count units (subsites) and the total count area is approximately 554 ha (Crowe, 2005). Note that the SPA area and the I-WeBS count area are not coincident, the latter being slightly larger.

Table 4.1 presents population[10] data for non-breeding waterbirds of Rogerstown Estuary. Annual maxima were identified and used to calculate the five-year mean peak for each species. The baseline period was 1995/96 – 1999/00 and the most recent five-year average is for 2005/06 – 2009/10.

When examining waterbird data, it is standard practice to use the mean of peak counts 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 cases where there are inconsistencies in data gathering (e.g. incomplete coverage, bad weather). In general 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).

Table 4.1 highlights where the numbers shown surpass thresholds of International or all-Ireland importance. These thresholds are different for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012) for the baseline and recent site data respectively, while all-Ireland thresholds are presented within Crowe et al. (2008).

[9] The terms 'stopover' and 'staging' are often used interchangeably. A stopover site can be defined as any place where a bird takes a break during migration. Staging areas are stopover sites that attract large numbers of individuals and play an important part in re-fuelling the birds before their onward migration (e.g. Warnock, 2010).

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

Table 4.1 Population data for waterbird Special Conservation Interest Species of Rogerstown Estuary SPA

Site Special Conservation Interests (SCIs)	Baseline Period[1] (1995/96 – 1999/00)	Recent Site Data[2] (2005/06 – 2009/10)
Greylag Goose	160 (n)	108 (n)
Light-bellied Brent Goose	1,069 (i)	2,413 (i)
Shelduck	773 (n)	787 (n)
Shoveler	59 (n)	61 (n)
Oystercatcher	3,345 (n)	2,339 (n)
Ringed Plover	188 (n)	214 (n)
Grey Plover	229 (n)	308 (n)
Knot	2,454 (n)	421 (n)
Dunlin	2,745 (n)	2,520 (n)
Black-tailed Godwit	195 (n)	756 (i)
Redshank	490 (n)	1,108 (n)

[1]Baseline data is the 5-year mean peak count for the period 1995/96 – 1999/00;
[2]recent site data is the 5-year mean for the period 2005/06 – 2009/10 (I-WeBS).
(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance.

4.2 Waterbird population trends for Rogerstown Estuary SPA

The calculation and assessment of waterbird population trends at Irish coastal SPA sites 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 (Appendix 3).

Annual population indices were calculated for waterbird SCI species for the data period 1994/95 to 2008/09. Trends are given for the 'long-term' 12-year period (1995/96–2007/08) and the recent ('short-term') five-year period (2002/03 – 2007/08) (Table 4.2). 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.

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 to assess whether species numbers at the site are remaining stable, showing increase or signs of recovery, or are 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 recent five year period being assessed. Importantly, the short-term trend may detect more rapidly where a species population is beginning to decline.

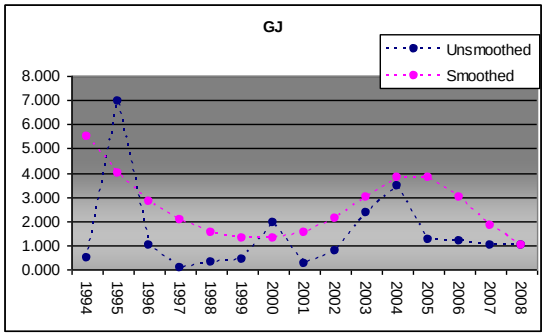
Table 4.2 Site Population Trends for waterbird Special Conservation Interest species of Rogerstown Estuary SPA

Site Special Conservation Interests (SCIs)	Site Population Trend[1] 12 Yr	Site Population Trend[2] 5 Yr
Greylag Goose	- 54.1	- 13.8
Light-bellied Brent Goose	+ 87.4	- 17.8
Shelduck	+ 16.3	- 11.8
Shoveler	+ 65.3	- 27.0
Oystercatcher	+ 99.3	- 16.7
Ringed Plover	+ 78.0	- 37.4
Grey Plover	- 6.4	- 22.2
Knot	- 80.00	- 59.7
Dunlin	+ 10.3	- 43.5
Black-tailed Godwit	+ 209.1	+ 7.5
Redshank	+ 54.7	- 12.3

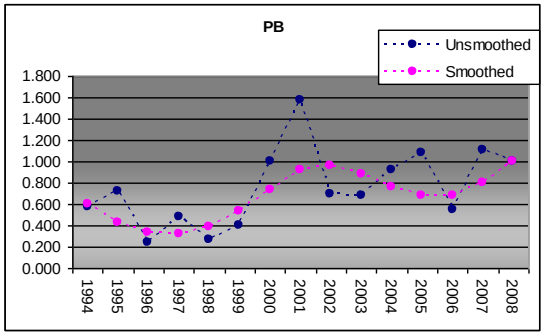
[1]Site population trend analysis: 12 yr = 1995/96 – 2007/08
[2]Site population trend analysis: 5 yr = 2002/03 – 2007/08.

For selected species, explanatory notes are given below to aid the interpretation of trends. Smoothed and unsmoothed indices are shown graphically. Site trends are compared with national trends (Boland & Crowe, 2012[11]); all-Ireland trends (Crowe et al. 2008) and British trends (Calbrade et al. 2010). Graph headings use waterbird species codes and a list of these is provided in Appendix 4.

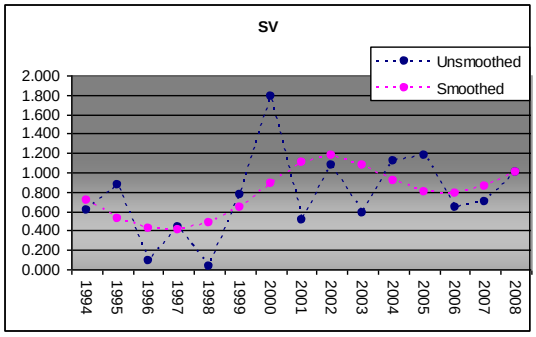
Greylag Goose – the long-term trend is influenced by an exceptionally large count recorded in 1995, without which the trend would have been for increasing numbers up to 2004. Since 2004, numbers have decreased although they have remained largely higher than those recorded in the mid to late 1990's.



Light-bellied Brent Goose – the long-term trend for increasing numbers at Rogerstown Estuary is consistent with the all-Ireland and national trends. Numbers increased most dramatically in the mid part of the dataset and have been relatively stable in recent seasons.

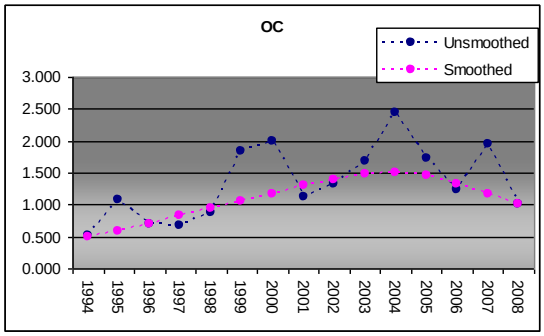


Shoveler – numbers have at times fluctuated greatly between seasons. The smoothed trend highlights that numbers increased from 1997 to 2000 before decreasing once more, although recent indices remain at a higher level than those during the mid to late 1990's. Nationally, numbers decreased up to 2002/03 then increased once more.

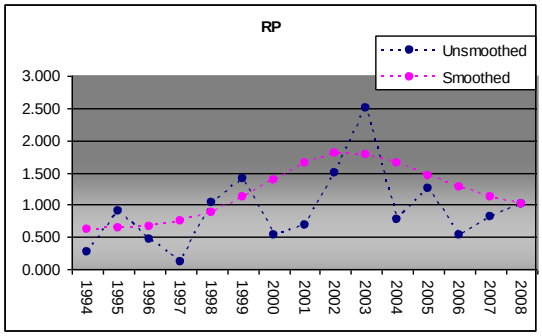


[11] National trends presented in Boland & Crowe (2012) update those previously shown in Crowe (2005).

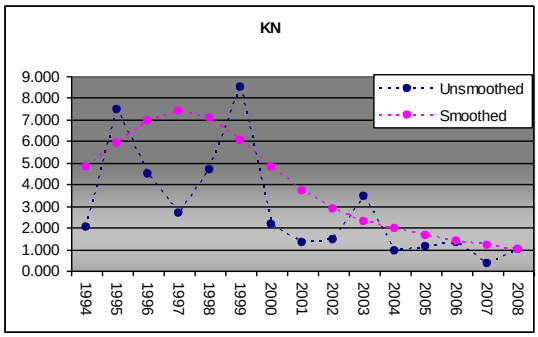
Oystercatcher – a gradual increase in numbers up to the mid 2000's was followed by a decline in recent winters. The most recent index reflects that numbers were on a par with those recorded in 1998 and is also reflected by the short-term decline shown in Table 4.2. Nationally, numbers of Oystercatcher have shown an overall increase since 1994, and have been relatively stable since the early 2000's.



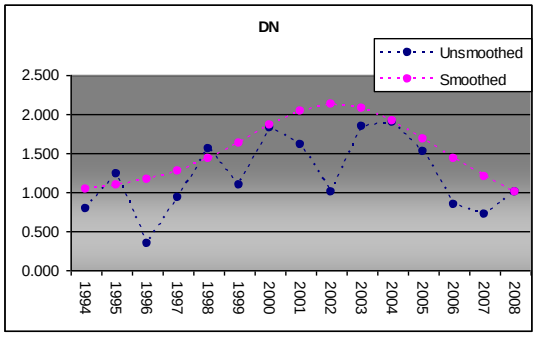
Ringed Plover – numbers have fluctuated widely. The smoothed trend highlights increasing numbers up to 2003 that subsequently decreased, although recent indices remain at a higher level than those during the mid 1990's. The national trend for this species is showing an increase but this contrasts with Northern Ireland and Britain, both of which have shown a long-term decline in numbers.



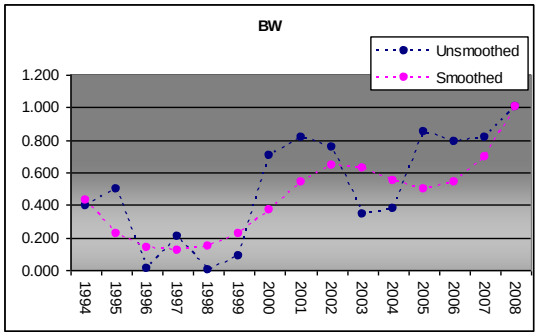
Knot – numbers fluctuated greatly especially in the early seasons. Overall numbers have decreased over time and have been consistently lower in recent seasons in comparison with numbers recorded in the early to mid part of the dataset. Nationally, numbers were broadly stable until 2005/06 and have increased since.



Dunlin – a gradual increase in numbers was followed by a decrease from 2004 to 2007. The trend at national level is for decline and a similar downward trend has been observed in Britain and Northern Ireland.



Black-tailed Godwit – despite fluctuating greatly at times, numbers have steadily increased since the relatively low numbers recorded during the period 1996-1999. The observed increase is consistent with the national trend.



4.3 Rogerstown Estuary SPA – site conservation condition of waterbird SCI species

Conservation condition of waterbird species is determined using the long-term site population trend and is assigned using the following criteria:

Favourable population = population is stable/increasing.

Intermediate (unfavourable) = Population decline in the range 1.0 – 24.9%.

Unfavourable population = populations that have declined between 25.0 – 49.9% from the baseline reference value.

Highly Unfavourable population = populations that have declined > 50.0% from the baseline reference value.

The threshold levels of >25.0% and >50.0% follows standard convention used for waterbirds (e.g. Lynas et al. 2007; Leech et al. 2002). The 'Intermediate' range (1.0% - 24.9% 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 25.0% are deemed of greater ecological significance for the long-term.

With regards the 11 waterbird species of Special Conservation Interest listed for Rogerstown Estuary SPA, and based on the long-term population trend for the site, it has been determined that (Table 4.3):-

1. 2 species are currently considered as **Highly Unfavourable** (Greylag Goose & Knot);

2. 1 species is considered as **Intermediate unfavourable** (Grey Plover);

3. 8 species are currently considered as **Favourable** (Light-bellied Brent Goose, Shelduck, Shoveler, Oystercatcher, Ringed Plover, Dunlin, Black-tailed Godwit & Redshank).

Site conservation condition and population trends were also reviewed in light of species' national and international trends (Table 4.3). National trends were provided by the I-WeBS Office while International trends follow Wetlands International (2012).

Table 4.3 SCI species of Rogerstown Estuary SPA – Current Site Conservation Condition

Special Conservation Interests	BoCCI Category[a]	Site Population Trend[b]	Site Conservation Condition	Current National Trend[c]	Current International Trend[d]
Greylag Goose	Amber	- 54.1	Highly Unfavourable	- 27.4	Increase
Light-bellied Brent Goose	Amber	+ 87.4	Favourable	+ 62.3	Increase
Shelduck	Amber	+ 16.3	Favourable	- 25.1	Increase
Shoveler	Red	+ 65.3	Favourable	+ 2.6	Increase
Oystercatcher	Amber	+ 99.3	Favourable	+ 14.5	Decline
Ringed Plover	Amber	+ 78	Favourable	+ 10.5	Fluctuating
Grey Plover	Amber	- 6.4	Intermediate Unfavourable	- 22.2	Decline
Knot	Red	- 80.00	Highly Unfavourable	+ 83.0	Fluctuating
Dunlin		+ 10.3	Favourable	- 43.4	Stable (*alpina*)
Black-tailed Godwit	Amber	+ 209.1	Favourable	+ 67.7	Increase
Redshank	Red	+ 54.7	Favourable	- 4.8	Stable/Inc

[a]After Lynas *et al.* (2007); [b] Site population trend analysis; see Table 4.2; [c]recent national trend is for the 12 year period 1998/99 to 2010/11; [d]international trend after Wetland International (2012).

Table 4.3 also shows the relationship between a species' long-term site trend and the current national trend for the 12-year period 1998/99 to 2010/11. The colour coding used represents the following cases:-

- Green – species whose populations are stable or increasing at both site level and national level.
- Beige – species whose populations are declining at both site level and national 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 a 1 – 24.9% decline at site level but are stable or increasing at national level.
- Pink - species whose populations are exhibiting a 25.0 – 49.9% decline at site level but are stable or increasing at national level.
- Red - species whose populations are exhibiting a decline of >50.0% at site level but are stable or increasing at a national level.

The pink and red categories listed above highlight where populations are stable at national level, but where significant declines are seen at site level. In these cases it would be reasonable to suggest that site-based management issues may be responsible for the observed declining site population trends (Leech et al. 2002).

Of note for Rogerstown Estuary is that ten out of the total list of 11 SCI species are exhibiting short-term declines in numbers (across the recent five-year period).

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 Rogerstown Estuary SPA.

Section 5.2 provides selected ecological summary information for the non-breeding waterbirds of the site. Section 5.3 presents results from the 2011/12 Waterbird Survey Programme. Finally, Section 5.4 provides summary information on the activities and events that occur in and around Rogerstown Estuary that may either act upon the habitats within the site, or may interact with waterbirds using the site.

The information provided is intended 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.

Note however, that the information does not aim to provide a comprehensive assessment on which to assess plans and projects as required under the Habitats Directive, but rather should inform the scope of these assessments and help direct where further detailed examinations are required. The information presented in this report was compiled in November 2012.

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. During the data period 1994/95 – 2009/10, I-WeBS recorded a total of 79 waterbird species within the Rogerstown Estuary count area. These species represent eleven waterbird 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), *Ardeidae* (Herons) and *Alcedinidae* (Kingfisher).

As described in Section 1.1, the wetland habitats contained within this SPA are considered to be a Special Conservation Interest in their own right. The wetland habitat is an important resource for listed SCI species and for other waterbird species included in the total waterbird assemblage. These species may include those that utilise the site during passage, those that are present in months of the year outside of the non-breeding season[12] or species that use the site at certain times only (e.g. as a cold weather refuge).

30 waterbird species occurred on a regular basis within the Rogerstown Estuary I-WeBS count area during the period 1994/95 – 2009/10.[13] Eleven of these species are listed as SCIs for the SPA, and the additional 19 non-SCI species are listed in Table 5.1.

[12] Non-breeding season is defined as September – March inclusive

[13] Regular is defined as a species that has occurred in 13 out of the 16-year data period.

Table 5.1 Regularly-occurring non SCI waterbird species that occur at Rogerstown Estuary during the non-breeding season

Species	Baseline Data Period[1] (1995/96 – 1999/00)	Recent Site Average[2] (2005/06 – 2009/10)
Wigeon (*Anas penelope*)	402	808
Teal (*Anas crecca*)	401	1,202 (n)
Mallard (*Anas platyrhynchos*)	205	219
Goldeneye (*Bucephala clangula*)	6	2
Red-breasted Merganser (*Melanitta nigra*)	26	24
Little Grebe (*Tachybaptus ruficollis*)	6	15
Great Crested Grebe (*Podiceps cristatus*)	5	11
Cormorant (*Phalacrocorax carbo*)	26	47
Grey Heron (*Ardea cinerea*)	17	27
Golden Plover (*Pluvialis apricaria*)	1,251	3,393 (n)
Lapwing (*Vanellus vanellus*)	3,066 (n)	4,307 (n)
Sanderling (*Calidris alba*)	84 (n)	31
Purple Sandpiper (*Calidris maritima*)	3	24
Snipe (*Gallinago gallinago*)	50	26
Bar-tailed Godwit (*Limosa lapponica*)	18	55
Curlew (*Numenius arquata*)	527	1,232 (n)
Greenshank (*Tringa nebularia*)	24	56 (n)
Turnstone (*Arenaria interpres*)	141 (n)	165 (n)
Sandwich Tern (*Sterna sandvicensis*)	6 (n/c)	51 (n/c)

Grey shading denotes an Annex I species; [1] Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00 (I-WeBS); [2] Recent site data is the five-year mean peak for 2005/06 – 2009/10 (I-WeBS); (n) denotes numbers of all-Ireland importance; n/c = not assessed.

Although waterbirds may be 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 Rogerstown Estuary SPA. Information is provided for the following categories[14]:-

- waterbird family (group);
- winter distribution – species distribution range during winter (based on the period 2001/02 – 2008/09 (after Boland & Crowe, 2012);
- 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).

It should be borne in mind that a single wetland site is unlikely to meet all of the ecological requirements of a diverse assemblage of waterbirds (Ma et al. 2010). Although some waterbird species will be faithful to specific habitats within the SPA, many will at times also use habitats situated within the immediate hinterland of the site or in areas ecologically connected to the SPA. These areas may be used as alternative high tide roosts, as a foraging resource or, be simply flown over, either on migration or on a more frequent basis throughout the non-breeding season as waterbirds move between different areas used (e.g. commuting corridors between feeding and roosting areas).

Reliance on alternative habitats will vary from site to site, and between species. Use of alternative habitats is also likely to vary through time, from seasonally through to daily, and

[14] Notes to aid the understanding of categories and codes used in Table 5.2 are provided in the table sub text.

different habitats may be used by day and night (Shepherd et al. 2003). Different waterbirds may utilise wetland habitats in different ways. For example, while the majority of wading birds forage across exposed tidal flats, species such as Lapwing and Golden Plover are considered to be 'terrestrial waders' typically foraging across grassland and using tidal flats primarily for roosting. When tidal flats are covered at high water, intertidally-foraging waterbirds are excluded and many species then move to nearby fields to feed. Terrestrial foraging is also important when environmental factors (e.g. low temperature) reduce the profitability of intertidal foraging (e.g. Zwarts & Wanink, 1993). Some waterbird species are simply generalists, and make use of a range of habitats, for example the Black-tailed Godwit that forages across intertidal mudflats and grassland habitats. Other waterbird species such as Greenland White-fronted Goose (*Anser albifrons flavirostris*) or Bewick's Swan (*Cygnus columbianus bewickii*) are herbivores and are reliant on terrestrial areas, often outside of the SPA boundary, and use the wetland site primarily for roosting. Some species switch their habitat preference as food supplies become depleted; an example being Light-bellied Brent Geese that exploit grasslands increasingly when intertidal seagrass and algae become depleted.

The topic of alternative habitat use is also applicable to benthic-foraging seaducks and divers whose foraging distribution is highly influenced by water depth and tidal conditions. Many of these species however (e.g. Great Northern Diver, Common Scoter) exhibit a widespread coastal distribution during winter utilising shallow nearshore waters to a greater degree at certain times (e.g. storms, driving onshore winds).

Thus the area designated as a SPA can represent a variable portion of the overall range of the listed waterbird species. To this end, data on waterbird use of areas adjacent to or ecologically connected to the SPA are often collected. Indeed for some species a mix of site-related and wider countryside measures are needed to ensure their effective conservation management (Kushlan, 2006). Furthermore, it is recommended that assessments that are examining factors that have the potential to affect the achievement of the site's conservation objectives should also consider the use of these '*ex-situ'* habitats, and their significance to the listed bird species.

.

Table 5.2 Waterbirds – Ecological characteristics, requirements & specialities

	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]
Greylag Goose *Anser anser*	Anatidae (geese)	Highly restricted	7	Narrower	Saltmarsh, Agricultural habitats	2	High
Light-bellied Brent Goose *Branta bernicla hrota*	Anatidae (geese)	Localised	1, 5	Highly specialised	Intertidal mud and sand flats, *Zostera* beds, terrestrial grasslands	2	High
Shelduck *Tadorna tadorna*	Anatidae (shelducks)	Localised	1, 5	Wide	Intertidal mud and sand flats, shallow subtidal	3	High
Shoveler *Anas clypeata*	Anatidae (diving ducks)	Intermediate	1	Wide	Sheltered & shallow subtidal and lagoons	3	Moderate
Oystercatcher *Haematopus ostralegus*	Haematopodidae (wading birds)	Intermediate	4	Narrower	Intertidal mud and sand flats	2	High
Ringed Plover *Charadrius hiaticula*	Charadriidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	High
Grey Plover *Pluvialis squatarola*	Charadriidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	High
Knot *Calidris canutus*	Scolopacidae (wading birds)	Localised	4	Narrower	Intertidal mud and sand flats	3	Moderate
Dunlin *Calidris alpina*	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	3	Moderate
Black-tailed Godwit *Limosa limosa*	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	2	High
Redshank *Tringa totanus*	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate

[A] Winter distribution: Very widespread (>300 sites); Widespread (200 – 300 sites); Intermediate (100 – 200 sites); Localised (50-100 sites); Highly restricted (<50 sites) (based on Boland & Crowe, 2012).
[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 - species with a wide prey/food range; species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and species with highly specialised foraging requirements (e.g. piscivores).
[D] Principal supporting habitat present within Rogerstown Estuary. This is the main habitat used when foraging.
[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.
[F] Site fidelity on non-breeding grounds: Unknown; Weak; Moderate; or High (based on published literature).

5.3 The 2011/12 waterbird survey programme

5.3.1 Introduction

The 2011/12 waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide.

At Rogerstown Estuary, a standard survey programme of four low tide counts (October, November & December 2011 and February 2012) and a high tide count (January 2012) were completed across the site.[15] Waterbirds were counted within a series of 15 count sections (subsites) (Appendix 6). These subsites were based on I-WeBS subsites and while covering the SPA in its entirety, are not exactly coincident with its boundary.

The behaviour of waterbirds during counts was attributed to one of two categories (foraging or roosting/other) while the position of birds was recorded in relation to one of four broad habitat types (intertidal, subtidal, supratidal and terrestrial). Note that these broad habitats (Table 5.3) were defined specifically for the survey programme and do not follow strict habitat-based definitions for these areas, nor follow the definitions used in relation to conservation objectives outlined in Section 3.1. For a detailed survey methodology, please refer to NPWS (2011).

Table 5.3 Definition of broad habitat types used

Broad Habitat Type	Broad Habitat Description
Intertidal (area 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 gravel/pebbles or shingle and gravel shores.
Subtidal (area that lies 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	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* sp.) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	Used where birds were recorded within habitats close to the shoreline but were above the intertidal and supratidal levels.

In addition to the main survey programme described above, two high tide roost surveys were completed on 26th November 2011 and 6th February 2012. These dates were chosen to reflect roosting distribution during a spring tide and neap tide (4.6m and 3.9m respectively). During these surveys waterbird roost sites were located, species and numbers of waterbirds counted and the position of the roosts marked onto field maps.

5.3.2 Waterbird data, analyses and presentation

The aim of data analyses was to understand how waterbirds are distributed across the site of Rogerstown Estuary 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 are the most important for foraging and roosting on a species by species basis.

[15] Low tide surveys: 04/10/11, 03/11/11, 06/12/11 & 03/02/12 plus a high tide survey on 09/01/12.

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

- Total numbers (low tide surveys);
- Total numbers (high tide survey);
- Total numbers of foraging birds (low tide surveys);
- Total numbers of roosting birds (low tide and high tide surveys).
- Foraging densities (low tide surveys).

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 all subsites surveyed. Rank positions were then converted to categories (see below) with the exception of those relating to the single high tide survey that are presented simply as rank numbers. The highest rank position/category for each subsite across any of the low tide count dates is presented in a subsite by species matrix.

Subsite Rank Position - Categories

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

Intertidal foraging density was calculated for selected species and for each low tide survey, by dividing the number of the species within a subsite by the area of intertidal habitat within the same subsite. Subsites were ranked based on the peak foraging density recorded. Whole site intertidal foraging density was calculated by summing the mean subsite counts for each species and dividing by the total area of intertidal habitat.

Waterbird count data for low tide surveys are also presented as species distribution maps ('dot density maps'). Dot-density maps show waterbird species distribution within intertidal or subtidal habitat[16] divided into 'foraging' birds and 'roosting/other' birds. These 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.

In contrast to dot-density maps, roost maps produced from roost survey data show the mapped locations of waterbird roosts, but note the limitations in relation to field mapping discussed below.

Notes on data interpretation and methodological limitations

Subsite rankings and dot-density maps relate to the distribution of waterbirds at subsite level as recorded within the survey area during the 2011/12 waterbird survey programme. Care must be taken 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

[16] Note that birds within supratidal or terrestrial habitat are not included within these maps.

some species are known to be highly site-faithful, both at site level and within-site level (e.g. Dunlin), other species may range more widely across a site(s). While some species by their nature may aggregate in high numbers, others such as Greenshank or 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 tide (e.g. spring/neap), 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.

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. Dots are placed in the appropriate subsites and broad habitat types for the birds counted but given that the broad habitats are based on OS mapping, there are various cases where the mapping does not accurately portray where a bird was, e.g. in the case of birds associated with freshwater flows, or small creeks that are not shown on OS maps. These associations are discussed as necessary in the individual species text tables.

The mapping of flock positions or roost locations over large distances in intertidal habitats (i.e. mapping by eye) is inherently difficult and prone to error. Flock or roost positions should therefore be viewed as indicative only.

5.3.3 Summary Results

A total of 43 waterbird species were recorded during the 2011/12 survey programme at Rogerstown Estuary (see Appendix 6 for a map of subsites). Cummins and Crowe (2012) provide a summary of waterbird data collected.

All SCI species were recorded within all counts undertaken with the exception of Dunlin that was absent from the final low tide survey, and Greylag Goose, that was recorded during the December low tide survey only. Table 5.4 shows peak numbers (whole site) for SCI species recorded during the low tide (LT) and high tide (HT) surveys.

Average percentage occupancy (Table 5.4) defined as the average proportion of subsites in which a species occurred during low tide counts, was lowest for Shoveler (8%) and Knot (12%) and highest for Redshank (73%) and Oystercatcher (62%); the latter being the only two species to occur, on average, in over half of the count subsites. (Note that Greylag Goose was not included in this analysis as it occurred in one subsite only on one occasion during the survey programme).

Average percentage area occupancy is defined as the average proportion of the total count area that a species occurred in during low tide counts. Although this is a broad calculation across all habitat zones it presents some indication of the range of a species across the site as a whole. The lowest occupancy was recorded for Shoveler (3%) while only two species occurred, on average, across 50% or more of the area surveyed (Oystercatcher and Redshank) (Table 5.4).

Table 5.4 Rogerstown Estuary 2011/2012 waterbird surveys – summary data

Site Special Conservation Interests (SCIs)	Peak number - LT surveys[I]	Peak number - HT survey[II]	Average subsite % occupancy [III]	Average % area occupancy [III]
Greylag Goose	70	-	-	-
Light-bellied Brent Goose	1,162	331	31 (21)	42 (23)
Shelduck	501	643	40 (12)	34 (6)
Shoveler	30	11	8 (3)	3 (3)
Oystercatcher	793	1,108	62 (13)	80 (7)
Ringed Plover	93	6	20 (8)	27 (15)
Grey Plover	147	26	28 (14)	32 (11)
Knot	86	60	12 (6)	13 (9)
Dunlin	1,271	31	36 (8)	45 (13)
Black-tailed Godwit	187	256	40 (13)	36 (12)
Redshank	633	280	73 (5)	74 (5)

(n) denotes numbers of all-Ireland importance (1% thresholds; 1999/00 – 2003/04 Crowe et al. 2008); [I] 4 low-tide counts undertaken on 04/10/11, 03/11/11, 06/12/11 & 03/02/12; [II] High-tide count undertaken on 09/01/12; [III] Mean (± s.d.) averaged across low tide surveys in which the species occurred.

Species richness (total number of species) across the whole site varied between 31 species (03/02/12) and 37 species (03/11/11) during low tide counts, with 34 species recorded during the high tide survey.

Low tide subsite species richness ranged from an average five species (0UL07) to 20 species (0UL10 and 0UL11) (Table 5.5). The small subsite 0UL05 (Tip Corner) did not support any waterbirds during the survey programme. Eight subsites supported on average, ten species or more. In general, a greater number of species were recorded during low tide surveys, as opposed to the high tide survey.

Table 5.5 Subsite species richness

Subsite	Subsite Name	Mean (±S.D) LT Survey	HT Survey	Peak Overall
0UL02	Turvey	10 (3.4)	8	L
0UL03	Turvey Hide	10 (1.5)	12	L/H
0UL04	New Haggard	6 (3.4)	8	L
0UL05	Tip Corner	0	0	-
0UL06	Beaverstown	19 (3.3)	22	L
0UL07	Rogerstown viaduct	5 (3)	7	L/H
0UL08	Portraine	7 (3.3)	5	L
0UL09	Railway	13 (4.4)	9	L
0UL10	Rogerstown Estuary	20 (0.5)	6	L
0UL11	Rogerstown Pier	20 (1.6)	8	L
0UL12	Rush-Martello Tower	7 (3)	4	L
0UL13	Rush Beach	8 (1.4)	6	L
0UL14	Portraine Beach	14 (5)	18	L
0UL15	Portraine Quay	10 (1.7)	10	L
0U455	Inner: S Channel Roost (RI)	9 (2.2)	10	L

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 during both low tide and high tide surveys. Selected results from these 'subsite assessments' are shown in Tables 5.6 (a–f). The relative importance of each subsite is based on the final rank positions (see 5.3.2 for methodology). Where a box is left blank, it simply means that a species was not recorded in that subsite.

The fact that different subsites may be ranked as 'Very High' for the same species highlights the fact that several subsites may be equally important for the species being analysed. 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.

Tables 5.6 (a–f) are followed by species discussion notes which provide additional information on the distribution of each SCI species, drawing upon the full extent of the data collected and analysed for Rogerstown Estuary. Waterbird distribution dot-density maps are provided in Appendix 7; summary roost data are presented in Appendix 8.

Table 5.6 (a) Rogerstown Estuary 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). (Greylag Goose not included)

Species ► / Subsites ▼	PB	SU	SV	OC	RP	GV	KN	DN	BW	RK
0U455				H	V		V	L		M
OUL02		L	H	L				M	M	M
OUL03	H	M	V	M					H	M
OUL04	V	M							L	L
OUL05										
OUL06	M	H		M		H	M	M	V	V
OUL07		M		L		M			H	H
OUL08	H	V		H		V		V	M	H
OUL09	M	V	V	L	H	M	V	H	M	H
OUL10	V	V		V	V	V	V	V	V	H
OUL11	V	L		V	M	L		M	H	M
OUL12	L			L		L				M
0UL13	M			M	L					L
0UL14	L			H	M	H		M	M	M
0UL15	L			H	H	L			M	M

Table 5.6 (b) Rogerstown Estuary Subsite assessment – ranked total numbers HT Survey (across all habitats) (Greylag Goose not included)

Species ► / Subsites ▼	PB	SU	SV	OC	RP	GV	KN	DN	BW	RK
0U455							1			
OUL02		8								5
OUL03	1	5	2			4				6
OUL04	2	4							4	3
OUL05										
OUL06	4	2				4	3	3	1	1
OUL07	6	7				3				
OUL08	7	1	1							
OUL09		3							2	2
OUL10	8					4				11
OUL11	3	6								3
OUL12				4						7
0UL13	5			2						9
0UL14	8			1	1	2	2	1	3	9
0UL15				3		1		2		8

Table 5.6 (c) Rogerstown Estuary Subsite assessment – total numbers foraging intertidally (LT surveys) Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods) (Greylag Goose not included).

Species ► / Subsites ▼	PB	SU	SV	OC	RP	GV	KN	DN	BW	RK
0U455				H	V		V	L		M
OUL02		L		L				M	M	M
OUL03		M		M					L	H
OUL04									L	L
OUL05										
OUL06		H		M				M	V	V
OUL07		M		L					V	H
OUL08	M	V		H		V		V	M	H
OUL09	M	V	V	L	H	H	V	H	M	H
OUL10	V	H		V	V	V		V	V	V
OUL11	V	L		V	M	M		M	V	M
OUL12				L		L				M
0UL13	M			M	L					L
0UL14	L			H	M				M	M
0UL15	V			H	M				M	M

Table 5.6 (d) Rogerstown Estuary Subsite assessment – ranked peak intertidal foraging density; top ten subsites for selected species (LT surveys)

Species ► / Subsites ▼	PB	SU	OC	RP	GV	KN	DN	BW	RK
0U455			4	2		2	6		
OUL02		7	8				5	5	4
OUL03		3	6					3	2
OUL04								4	5
OUL05									
OUL06		4					4	2	1
OUL07		5	10					1	3
OUL08	3	2	5		1		1	9	8
OUL09	4	1		3	3	1	2	7	6
OUL10	2	6	3	1	2	3	3	10	7
OUL11	1	8	2	4	4		7	6	9
OUL12			9		5				
0UL13	6			7					
0UL14	7		7	6					
0UL15	5		1	5				8	10

Table 5.6 (e) Rogerstown Estuary Subsite assessment – total numbers (roosting/other behaviour) intertidally[I] and subtidally[II] during LT surveys Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods).

Species ► / Subsites ▼	GJ[I]	PB[I]	PB[II]	SU[I]	SV[I]	OC[I]	RP[I]	GV	KN[I]	DN	BW	RK
0U455							*not recorded*		*not recorded*			
OUL02				L	H							H
OUL03		V	V	L	V						V	H
OUL04												V
OUL05												
OUL06		H		H				H		H	V	V
OUL07				M				H				
OUL08	V			V		M						
OUL09				H	V							
OUL10		V	V	V		V		V		V		V
OUL11		V		M		V					V	
OUL12												
0UL13												
0UL14		M				V		V		V		
0UL15						H		M				

Table 5.6 (f) Rogerstown Estuary Subsite assessment – ranked total numbers (roosting/other behaviour) during HT survey (Intertidal,[I] Subtidal,[II] and supratidal[III] and all habitats combined[IV]). (Greylag Goose (GJ) not included)

Species ► / Subsites ▼	PB[I]	PB[II]	SU[II]	SV[I]	SV[II]	OC[I]	OC[III]	RP[I]	GV	KN[IV]	DN	BW[I]	RK[I]	RK[III]
0U455										1				
OUL02													4	
OUL03		1		1					3					
OUL04													2	
OUL05														
OUL06	1								3	3	3	3	2	
OUL07		2	4											
OUL08		3	1		1									
OUL09			2									1	1	
OUL10		5												4
OUL11		3	3											1
OUL12							2							2
0UL13						3	1							3
0UL14	2					1		1	2	2	1	2		
0UL15						2			1		2		5	

Rogerstown Estuary - Waterbird Survey Programme 2011/12

Waterbird distribution - discussion notes

Where mentioned, information on benthic communities or sediment is from the intertidal and subtidal sampling programme commissioned by the National Parks & Wildlife Service (NPWS) and Marine Institute and reported in NPWS (2012).

'I-WeBS' refers to count data recorded at Rogerstown Estuary as part of the Irish Wetland Bird Survey.

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. Icelandic birds are known to congregate in up to seven main flocks in the Republic of Ireland (Boland & Crowe, 2012), Rogerstown Estuary one of these.
Numbers
Greylag Geese that occur at Rogerstown Estuary are considered as the 'north County Dublin flock'. This flock frequents Rogerstown Estuary, and nearby terrestrial grasslands (e.g. Skerries village). This flock was once thought to roost on Lambay Island (e.g. Madden et al. 2004) and the current status of this activity is unclear (Boland & Crowe, 2012). During the survey period Greylag Goose were recorded once: 70 individuals were recorded on 06/12/11 located within 0UL08 (Portraine).
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. No foraging Greylag Geese were recorded during the survey programme.
Roosting Distribution
70 Greylag Geese were recorded roosting within 0UL08 (Portraine) on 06/12/11.

Light-bellied Brent Goose *Branta bernicla hrota* - Family (group): Anatidae (geese)
Migratory Light-bellied Brent Geese (hereafter called 'Brent Geese') that spend winter within Ireland belong to the East Canadian High Arctic population. Almost all of this population spends winter within Ireland. Brent Geese begin to arrive in Ireland in late August when almost three-quarters of the biogeographic population congregate at Strangford Lough in Northern Ireland before dispersing to other sites (Robinson et al. 2004).
Numbers
Numbers of Brent Goose rose from just two in October 2011 to a site peak of 1,162 the following month (03/11/11). 331 were counted during the high tide survey. All counts except October 2011 surpassed the threshold of international importance. Brent Geese were recorded in twelve subsites across the survey period and regularly (three surveys or more) within six subsites (0UL03, 0UL04, 0UL06, 0UL10, 0UL11 and 0UL14). 0UL10 (Rogerstown estuary) held peak numbers on two low tide survey occasions and numbers ranked as 'high' on all other surveys dates. 0UL04 and 0UL11 each held peak numbers on one survey occasion each. The subsite peak count of 468 Brent Geese was recorded for 0UL04 (New Haggard) on 03/11/11.
Foraging Distribution
Brent Geese are grazers and are known for their preference for foraging in intertidal areas with the Eelgrass *Zostera* sp. (Robinson et al. 2004). Where this food source is absent or becomes depleted, the birds feed upon algae species, saltmarsh plants and may also undertake terrestrial grazing. Across the survey period Brent Geese were recorded foraging intertidally across a total seven subsites (0UL08, 0UL09, 0UL10, 0UL11, 0UL13, 0UL14 and 0UL15). Intertidal foraging was recorded most frequently and with largest numbers for 0UL10 (Rogerstown estuary) and 0UL11 (Rogerstown pier). 0UL08 (Portraine) held good numbers (76) on one survey occasion. 0UL15 (Portraine Quay) held peak numbers foraging intertidally (10) on 03/02/12. A bed of *Zostera noltii* is known to occur near Portraine (subsite 0UL08) (NPWS, 2012). Brent Geese are also likely to regularly utilise the abundant mats of *Ulva* spp. for foraging. These mats occur widely within 0UL08 and along the northern shore east of the railway bridge (0UL09, 0UL10, 0UL11). Brent Geese were recorded foraging within saltmarsh of 0UL04 (New Haggard) on a regular basis; maximum number 468 on 03/11/11. Subtidal foraging was recorded relatively little, a notable exception being 220 Brent recorded within 0UL10 (Rogerstown estuary) on 03/02/12. Terrestrial foraging was recorded in areas adjacent to the SPA but this is likely to occur regularly. Visser et al. (2004) reported that Brent Geese forage in fields on the north shore just east of the railway line, to the north of the BirdWatch Ireland reserve, and in fields on the western edge of Portrane Peninsula.
Roosting Distribution
Relatively little roosting/other behaviour was recorded in intertidal habitat during low or high tide surveys with the exception of 03/02/12 when 244 Brent Geese were recorded across four subsites, the majority within 0UL03 (Turvey Hide) (165). Subtidal roosting/other behaviour was also recorded rarely, apart from the high tide survey when 174 Brent Geese roosted within five subsites, the majority within 0UL03 (Turvey Hide) (161). During the November 2011 roost survey (spring tide), Brent Geese were recorded roosting within five subsites: 0UL03, 0UL04, 0UL06, 0UL08 and 0UL11. The largest single roost of 387 individuals roosted intertidally within 0UL03 (Turvey Hide). 121 individuals roosted intertidally as one flock in 0UL06 (Beaverstown), a further 11 subtidally. The largest single roost recorded during the February 2012 roost survey (neap tide) was again located within 0UL03 (Turvey Hide) (240 birds) and in largely the same position (linearly alongside the channel). 125 individuals roosted subtidally as one flock in 0UL09 (Railway). A further 22 and two individuals roosted subtidally within 0UL11 and 0UL15 respectively. Previous roost records for the site show that several subsites support roosting Brent Geese (0UL02, 0UL03, 0UL04, 0UL06, 0UL08, 0UL09, 0UL11, 0UL12 and 0UL15) with largest numbers recorded in 0UL04 (BirdWatch Ireland unpublished data). Brent geese roost communally at night; often close to water. At Rogerstown Estuary the flooded grassland areas close to the site are known to support roosting Brent Geese. Portraine and Rush beaches are also known roosting areas (Visser et al. 2004).

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. Although a breeding species in Ireland, Shelducks undertake a moult migration each autumn. Large moult gatherings occur along traditionally used areas of the north German coast of the Wadden Sea although several sites in Britain have also become recognised as important moulting areas such as Bridgewater Bay (Severn Estuary), the Humber Estuary, the Wash, and the Firth of Forth. Following the moult, the ducks then migrate to wintering areas.

Numbers

Numbers of Shelduck rose from 72 in October 2011 to a low tide peak count of 501 on 03/02/12. A total 643 Shelduck were counted during the high tide survey (09/01/12). All site counts, except the first in October 2011, surpassed the threshold of all-Ireland importance.

Shelduck were recorded in nine subsites overall (0UL02, 0UL03, 0UL04, 0UL06, 0UL07, 0UL08, 0UL09, 0UL10 and 0UL11). Three of these recorded Shelduck in all four low tide surveys: 0UL06, 0UL09 and 0UL10. Subsite peak numbers were held by 0UL08 (Portraine) (04/10/11 & 06/12/11), 0UL09 (Railway) (03/11/11) and 0UL10 (Rogerstown estuary) (03/02/11), the latter recording the subsite peak count of 270 individuals.

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.

Shelducks were recorded foraging intertidally in eight subsites overall (0UL02, 0UL03, 0UL06, 0UL07, 0UL08, 0UL09, 0UL10 and 0UL11) but numbers and regularity were highest for 0UL06, 0UL07, 0UL08, 0UL09 and 0UL10.

0UL08 (Portraine) held peak numbers of Shelduck foraging intertidally on 04/10/11, 06/12/11 and 06/12/11. 0UL09 (Railway) held peak numbers (184) on 03/11/11. 0UL10 (Rogerstown estuary) was notable for supporting numbers ranked in the top five in all low tide surveys.
These subsites are classified as the benthic community 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae*, the latter a favoured prey of Shelduck (Olney, 1965, Bryant & Leng, 1975; Viain et al. 2011). Intertidal survey work found *Peringia* (*Hydrobia*) *ulvae* to be a relatively widespread species, found in core samples from 0UL06, 0UL08, 0UL09, 0UL10.

Only one record of subtidal foraging was made – 35 individuals in 0UL06 (Beaverstown) on 06/12/11.

The highest average intertidal foraging density within a single subsite was recorded for 0UL09 (Railway) (6.4 Shelduck ha^{-1}). The average whole site foraging density was 0.6 individuals ha^{-1}.

Roosting Distribution

Relatively irregular records were made of Shelduck in roosting/other behaviour during low tide surveys; the majority of individuals were foraging. One notable exception was 237 Shelducks that roosted within 0UL10 (Rogerstown estuary) on 03/02/12.
Subtidal roosting/other behaviour was only recorded during the high tide survey when 423 Shelducks were counted across four subsites, the majority (308) within 0UL08 (Portraine).

During the November 2011 roost survey (spring tide), Shelducks roosted across a total of five subsites: 0UL03, 0UL04, 0UL06, 0UL08 and 0UL09. The largest roost was recorded subtidally within 0UL08 (Portraine) (327 birds). 154 Shelducks roosted supratidally within 0UL04 (New Haggard); these birds had been feeding previously within 0UL06 but were pushed into 0UL04 as the tide rose.

The February 2012 high tide survey (neap tide) recorded roosting individuals in the same set of subsites as in November 2011 (0UL03, 0UL04, 0UL06, 0UL08 and 0UL09) with the addition of five Shelducks within 0UL02 (Turvey). The largest roost was again recorded subtidally within 0UL08 (Portraine) (311 birds). 0UL09 (Railway) also held significant proportions; the largest flock recorded being 216 roosting subtidally. A greater overall proportion roosted subtidally during this survey (as opposed to intertidally or supratidally).

Previous data for the site confirm that 0UL08 and 0UL09 support roosting Shelducks on a regular basis (BirdWatch Ireland unpublished data).

Shoveler *Anas clypeata* - Family (group): Anatidae (dabbling ducks)
The 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 are supplemented during winter by migratory birds from northwest and central Europe. The wintering population is relatively small (c2500 individuals) (Crowe et al. 2008).
Numbers
Numbers of Shoveler rose from just two in October 2011 to a low tide peak of 30 on 06/12/11; the only count to surpass the threshold of all-Ireland importance. 11 individuals were recorded on the high tide count date (09/01/12). These count totals are lower than site peaks recorded by I-WeBS in recent years (2005/06 – 2009/10). Shovelers were recorded in just four subsites during the survey programme: 0UL02, 0UL03, 0UL08 and 0UL09. 0UL03 (Turvey Hide) held all Shovelers recorded on 04/10/11 and 03/11/11. 0UL09 (Railway) held peak numbers on 06/12/11 and 03/02/12. The subsite peak count was 24 Shoveler (0UL09 (Railway) on 06/12/11).
Foraging Distribution
Shovelers are omnivorous, taking a range of items from planktonic crustaceans and small molluscs, to insects, larvae, plant material and seeds. A true dabbling duck, Shovelers feed by surface-feeding, swimming with head and neck immersed, up-ending, and less often, by shallow dives (BWPi, 2004). Only one record was made of foraging Shoveler during low tide surveys; 15 individuals foraged intertidally within 0UL09 (Railway) on 03/02/11.
Roosting Distribution
During low tide surveys, Shovelers were recorded in roosting/other behaviour in three subsites: 0UL02, 0UL03, and 0UL09. 0UL02 and 0UL09 recorded individuals roosting intertidally on a single occasion (six and 24 individuals respectively on 06/12/11). 0UL03 (Turvey Hide) recorded two and 14 individuals roosting intertidally on 04/10/11 and 03/11/11, and 2 individuals during the high tide survey. Nine individuals roosted subtidally within 0UL08 (Portraine) during the high tide survey (09/01/12). During the November 2011 roost survey (spring tide), Shoveler were recorded roosting in three subsites: 0UL02, 0UL03 and 0UL04 with two (subtidal), seven (intertidal) and three (supratidal) individuals respectively. With the exception of the latter, the roosting birds were part of much larger mixed-species flocks. The February 2012 roost survey (neap tide) recorded one and five individuals respectively roosting subtidally within 0UL08 and 0UL09. Previous surveys have noted 0UL02 as a regularly-used roosting area (BirdWatch Ireland unpublished data).

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

Whole-site numbers ranged from 597 (06/12/11) to 943 (03/02/12) during low tide surveys and 1,108 were recorded during the January 2012 high tide survey. With the exception of 06/12/11, all counts surpassed the threshold of all-Ireland importance.

Oystercatchers were relatively widespread and occurred in 13 subsites overall and within seven subsites during all four low tide surveys – 0U455, 0UL09, 0UL10, 0UL11, 0UL13, 0UL14 and 0UL15.

0UL11 (Rogerstown pier) recorded peak numbers in three low tide surveys (Oct, Nov, Dec 2011) while 0UL10 (Rogerstown estuary) held peak numbers (405) on 03/02/12, the subsite peak count.

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 known that individual birds are specialised by way of their morphology with regards choosing one or the other of these prey items, and their means of handling them.

Over 90% of all Oystercatchers recorded during low tide surveys were foraging. Overall a total of 13 subsites were used with between eight and 12 subsites used during individual low tide surveys. Oystercatchers foraged intertidally in seven subsites during all four low tide surveys: 0U455, 0UL09, 0UL10, 0UL11, 0UL13, 0UL14 and 0UL15.

0UL11 (Rogerstown pier) recorded peak numbers in three low tide surveys (Oct, Nov, Dec 2011). 0UL10 (Rogerstown estuary) held peak numbers on 03/02/12 and numbers ranked as second or third during all other low tide surveys. The preference for foraging within 0UL11 and 0UL10 is almost certainly related to the benthic intertidal community recorded across these subsites. This community is dominated by *Mytilus edulis*; dense beds of the bivalve recorded on the lower intertidal at the narrows between Rogerstown and the Burrow; overlaying a substrate of muddy sand. But Oystercatchers were recorded foraging widely across the site so they must avail of a much wider prey base. Of note were numbers recorded within the outer coastline subsite OU455 (Inner: S Channel Roost (RI)) which supported a peak number of 137 Oystercatchers. This subsite has a mixture of rock (reef), sandy and mixed sediment substratum. Similarly, 0UL15 (Portraine Quay) that supported numbers of foraging individuals ranked within the top five in all low tide surveys, has a rocky (reef) substratum that has been previously classified as the biotope ERL.MytB (*Mytilus edulis* and barnacles on very exposed eulittoral rock) (Fingal County Council, 2005).

The highest average intertidal foraging density within a single subsite was recorded for 0UL15 (Portraine Quay) (14.7 Oystercatcher ha^{-1}), this subsite never supporting less than 4 Oystercatchers ha^{-1} on any low tide survey occasion. 0UL12 (Rogerstown pier) also recorded good densities (range 4 – 12 Oystercatchers ha^{-1}). The average whole site foraging density was 1.8 individuals ha^{-1}.

Oystercatchers regularly forage terrestrially for prey such as earthworms, and although not recorded during the 2011/12 surveys this activity is likely to take place around Rogerstown Estuary and outside of the SPA boundary.

Roosting Distribution

Relatively few Oystercatchers were recorded roosting/other during low tide surveys, records were of an irregular nature and the peak number recorded was 35 individuals within 0UL14 (Portraine Beach) on 03/11/11. During the January 2012 high tide survey, 916 Oystercatchers roosted intertidally across three subsites (0UL13, 0UL14 and 0UL15), the greatest number (760: 82%) within 0UL14 (Portraine Beach). A further 155 roosted supratidally within 0UL13 (Rush Beach).

During the November roost survey Oystercatchers were recorded roosting within four subsites (0UL03, 0UL12, 0UL14 and 0UL15). The largest flock of 630 individuals roosted in the northern part of 0UL14 (Portaine Beach). Further south, the subsite 0UL15 (Portraine quay) supported four separate roosts (intertidally and supratidally) the largest of which comprised 97 Oystercatchers, the combined total of birds being 228 individuals.

0UL14 (Portaine Beach) also held the greatest numbers during the February neap high tide survey (990 individuals). 0UL11 (Rogerstown pier) held a single intertidal roost of 165, positioned along the southern boundary. 0U455 and 0UL15 also held good numbers, the largest flocks being 78 and 98 individuals respectively.

Previous data for the site confirm that the outer subsites (0UL13, 0UL14 and 0UL15) are the most important regularly-used roosting areas in terms of numbers supported (BirdWatch Ireland unpublished data).

Ringed Plover *Charadrius hiaticula* - Family (group): Charadriidae (wading birds)

The Ringed Plover breeds across Arctic and temperate zones from the east coast of Baffin Island, Greenland, across northern Europe and the Russian tundra to the coasts of the Bering Sea. Three subspecies are generally recognised of which the nominate subspecies, *C. h. hiaticula,* breeds in northern Europe (including Ireland) and winters in Europe and north-west Africa.

Numbers

Total site numbers of Ringed Plovers rose from 33 in October 2011 to a site peak of 93 on 03/02/12. Just six individuals were recorded during the high tide survey. No count surpassed the threshold of all-Ireland importance. These count totals are lower than site peaks recorded by I-WeBS in recent years (2005/06 – 2009/10).

Ringed Plovers were recorded in a total of seven subsites throughout the survey programme (0U455, 0UL09, 0UL10, 0UL11, 0UL13, 0UL14 and 0UL15). Only one of these recorded the wader in all four low tide surveys (0U455). Besides 0UL10 (Rogerstown estuary), all other subsites recorded the species only once.

0U455 (Inner: S Channel Roost (RI)) recorded peak numbers on 04/10/11 and 0UL10 (Rogerstown estuary) held peak numbers in all other survey. The subsite peak count was 90 Ringed Plover, recorded in 0UL10 on 03/02/12.

Ringed Plovers are known to breed on Portraine Beach (0UL14) (Visser et al. 2004).

Foraging Distribution

Ringed Plovers are 'visual foragers' searching the sediment surface for the visible signs of prey such as worms, crustaceans and insects.

During low tide surveys all recorded Ringed Plovers were foraging. Foraging was recorded in seven subsites: 0U455, 0UL09, 0UL10, 0UL11, 0UL13, 0UL14 and 0UL15.

0U455 (Inner: S Channel Roost (RI)) recorded peak numbers foraging intertidally on 04/10/11; these birds within the very south of the subsite just beyond the breakwater that forms the dividing line between subsites. 0UL10 (Rogerstown estuary) held peak numbers in all other surveys. 0UL09 (Railway) held relatively good numbers (21) foraging on one occasion only (06/12/11). All other subsites held low numbers (<5 individuals) on a single occasion each.

Ringed Plovers therefore distribute across both the estuarine and open coast intertidal habitats at this site, although all subsites used during the survey programme were east of the railway line indicating an avoidance of the inner estuarine muddy and sandy mud biotopes.

0UL09, 0UL10, 0UL11 are classified as the benthic community 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae.* The substratum of 0U455 has a mixture of rock (reef), sandy and mixed sediment, while 0UL13 and 0UL14 are classified as 'sand to coarse sand with *Nephtys cirrosa* and *Scolelepis squamata* community complex.

The Ringed Plover diet is relatively broad and consists of small crustaceans, molluscs and polychaete worms, plus isopods, amphipods and insects (e.g. fly larvae).

The peak intertidal foraging density was 1.5 Ringed Plover ha^{-1} recorded for both 0U455 (Inner: S Channel Roost (RI)) and 0UL10 (Rogerstown estuary). The whole site average intertidal foraging density was 0.2 Ringed Plover ha^{-1}.

Roosting Distribution

During low tide surveys no Ringed Plovers were recorded in roosting/other behaviour. Six individuals roosted intertidally within 0UL14 (Portraine Beach) during the high tide survey. No other roosting behaviour was recorded.

Ringed Plovers were not recorded roosting or foraging during the November 2011 spring high tide survey. The February 2012 neap high tide survey recorded two roosts (maximum size 11 individuals) within 0UL14 (Portraine Beach). Roosts within this subsite are likely to be highly transient as the birds are readily (and observed to be frequently) disturbed by walkers and loose dogs. Ringed Plovers are known to be highly faithful to roost sites (e.g. Rehfisch et al. 2003) and indeed, previous data for the site confirm that 0UL14 is a regularly-used roosting area (BirdWatch Ireland unpublished data). However, given the relatively small number of roosting records for the site there is still some uncertainty as to where foraging Ringed Plovers roost at high tide. It is likely that many seek opportunities outside of the SPA such as rocky spits and shingle to the north and south of the designated area.

Grey Plover *Pluvialis squatarola* - Family (group): Charadriidae (wading birds)

The Grey Plover is generally considered a monotypic species and has a holarctic breeding distribution across the tundra of Eurasia and North America (Delaney et al. 2009). The species migrates from breeding areas to a very wide wintering range extending to the coastlines of Africa, south and east Asia, Australasia and South America (BWPi, 2004). In Ireland, Grey Plovers occur as both passage and wintering birds and are thought to originate from Russian breeding populations (Wernham et al. 2002).

Numbers

Grey Plovers were recorded in all five surveys. Low tide numbers rose from 16 in October 2011 to a low tide peak count of 147 on 03/02/11. Low tide counts on 03/11/11, 06/12/11 and 03/02/12 surpassed the threshold of all-Ireland importance. 26 individuals were counted during the high tide survey.

Grey Plovers were recorded in a total ten subsites throughout the entire survey programme (0UL03, 0UL06, 0UL07, 0UL08, 0UL09, 0UL10, 0UL11, 0UL12, 0UL14 and 0UL15). 0UL10 (Rogerstown estuary) recorded individuals in all four low tide surveys and the peak number in the first three low tide surveys. The low tide subsite peak count was 108 individuals held by 0UL08 (Portraine) during the final low tide count (03/02/11).

Foraging Distribution

During winter Grey Plovers mainly forage intertidally and have a characteristic mode of foraging whereby they stand motionless watching the mudflat surface before snatching a prey item (often a worm) from the sediment surface. Grey Plovers take a wide range of prey species including Lugworms (*Arenicola marina*), Ragworms (*Hediste diversicolor*), amphipod crustaceans and small bivalves (e.g. *Macoma balthica and Scrobicularia plana*) (Dit Durrell & Kelly, 1990).

Grey Plovers foraged in five subsites overall (0UL08, 0UL09, 0UL10, 0UL11 and 0UL12). 0UL10 (Rogerstown estuary) held peak numbers on 04/10/11 and 03/11/11. On both occasions these birds were positioned south of the water channel and part of a loose flock/aggregation of waders including Dunlin and Redshank. 0UL08 (Portraine) held peak numbers on 06/12/11 and 03/02/12 the latter with a count of 108 individuals. Relatively good numbers were held on three occasions by 0UL09 (Railway) (maximum number 13). All of these subsites are in the outer estuary (east of the railway causeway) and have benthic communities classified as 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae*. The polychaetes *Pygospio elegans* and *Arenicola marina* are additional distinguishing species of this community.

The peak intertidal foraging density was 2.2 Grey Plover ha^{-1} recorded for 0UL08 (Portraine) on 03/02/12. The whole site average intertidal foraging density was 0.2 Grey Plover ha^{-1}.

Roosting Distribution

During low tide surveys, relatively few Grey Plovers were recorded in roosting/other behaviour. 0UL14 (Portraine Beach) recorded 48 roosting Grey Plover (intertidal habitat) on 03/11/11. 0UL10 (Rogerstown estuary) held reasonable numbers on three low tide survey occasions (max number 35). Thereafter three subsites (0UL06, 0UL07 and 0UL15) held one or two individuals on single occasions only.

During the high tide survey, a total 23 Grey Plovers roosted intertidally within four subsites the majority, 11 and 10 respectively, within two subsites (0UL15 and 0UL14). A further two roosted supratidally within 0UL07 (Rogerstown viaduct) and one supratidally within 0UL10 (Rogerstown estuary).

During the November 2011 roost survey (spring tide) 23 Grey Plover roosted supratidally within 0UL14 (Portraine Beach); these birds part of a mixed-species flock that were positioned in the northern extent of the subsite beside the main out-flowing channel.

A greater number of roosting Grey Plovers were recorded during the February 2012 neap high tide survey. The largest flock of 65 individuals were positioned within 0UL14 in the northern extent of the subsite relatively close to the flock position recorded in November 2011. 0UL06 (Beaverstown) supported 46 individuals at four different intertidal positions; the largest flock of 35 part of a large (566 individuals-strong) mixed species flock that roosted south of the channel. Smaller numbers (maximum number five) were recorded within 0UL04, 0UL07, 0UL10 and 0UL11.

Previous data for the site confirm that 0UL12 and 0UL14 are regularly-used roosting areas (BirdWatch Ireland unpublished data).

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. Knot that winter in Ireland are almost entirely from the *islandica* population. 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

Numbers of Knot rose from eight and nine respectively for October and November 2011 to a site low tide peak count of 86 (03/02/12).
60 Knot were counted during the high tide survey on 09/01/12. These count totals are substantially lower than site peaks recorded by I-WeBS in recent years (2005/06 – 2009/10).

Knot were recorded in four subsites overall (0U455, 0UL06, 0UL09, 0UL10) during low tide surveys. 0UL09 (Railway) held the largest flocks recorded; 33 and 86 individuals respectively on 06/12/11 and 03/02/12. 0U455 (Inner: S Channel Roost (RI)) recorded peak numbers on 03/11/11 (9) and 0UL10 (Rogerstown estuary) held peak numbers (4) on 04/10/11.

0U455 (Inner: S Channel Roost (RI)) recorded peak numbers during the high tide survey (45).

Foraging Distribution

Knots are specialist intertidal foragers; pecking visible items off the sediment 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 (shell length in the range 6 – 16mm depending on bivalve species and shape of shell) (Dekinga & Piersma, 1993).

Knot foraged intertidally across three subsites during the survey programme (0U455, 0UL09, 0UL10). 0UL09 (Railway) held the largest flocks recorded (33 and 86 individuals respectively on 06/12/11 and 03/02/12). The benthic communities of 0UL09 and 0UL10 are classified as 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae.* The bivalve *Macoma balthica* was recorded in core samples taken in subsite 0UL11, while *Scrobicularia plana* was recorded from 0UL06, 0UL10 and 0UL11. The substratum of 0U455 has a mixture of rock (reef), sandy and mixed sediment (benthic community not described).

The peak intertidal foraging density was 3 Knot ha^{-1} recorded for 0UL09 (Railway) on 03/02/12. The whole site average intertidal foraging density was 0.09 Knot ha^{-1}.

Roosting Distribution

With the exception of one individual within 0UL06 (Beaverstown) on 04/10/11, no roosting Knot were recorded during low tide surveys.

During the January 2012 high tide survey, 45 Knot roosted supratidally within 0U455 (Inner: S Channel Roost (RI)). A further 12 roosted intertidally within 0UL14 (Portraine Beach) and three roosted intertidally within 0UL06 (Beaverstown).

Knot were not recorded roosting or foraging during the November 2011 spring high tide survey. The February 2012 neap high tide survey recorded roosting individuals within intertidal habitat of two subsites: 0UL06 (Beaverstown) and 0UL14 (Portraine Beach) (ten and seven individuals respectively). Previous surveys have recorded regular roosts within 0UL12, 0UL13 and 0UL14 (BirdWatch Ireland unpublished data). As noted for Ringed Plover above, it is likely that many Knot seek roosting opportunities outside of the SPA such as rocky spits and shingle to the north and south of the designated area.

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.

The majority of Dunlin wintering in Ireland are *C. a. alpina* that originate from the western part of their breeding range and moult mainly in the Wadden Sea before starting 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

Numbers of Dunlin rose from 254 in October 2011 to a peak of 1,271 recorded on 06/12/11; only this latter count surpassed the threshold for all-Ireland importance. No Dunlins were recorded on 03/02/12. 31 Dunlin were recorded during the high tide survey (10/01/12). These count totals are substantially lower than site peaks recorded by I-WeBS in recent years (2005/06 – 2009/10).

Overall, Dunlin were recorded within nine subsites (0U455, 0UL02, 0UL06, 0UL08, 0UL09, 0UL10, 0UL11, 0UL14 and 0UL15). 0UL15 recorded the species only during the high tide survey. Low tide peak counts were held by 0UL10 (Rogerstown estuary) (04/10/11 & 03/11/11) and by 0UL08 (Portraine) (06/12/11), the latter also the subsite peak count (891 Dunlin).

31 Dunlin recorded during the high tide survey were recorded from three subsites, the majority of individuals (25) within 0UL14 (Portraine Beach).

Foraging Distribution

The Dunlin diet is relatively wide (e.g. Hill et al. 1993; Santos et al. 2005) and may comprise polychaete worms (e.g. *Hediste diversicolor*), amphipod crustaceans and small bivalves (e.g. *Macoma balthica and Scrobicularia plana*) as well as isopods and insects. The Mud Snail *Peringia* (*Hydrobia*) *ulvae* has been shown to be favoured at some sites (Santos et al. 2005).

At Rogerstown Estuary the majority of Dunlin were recorded foraging during surveys (over 80% averaged over three LT surveys). Foraging was recorded in intertidal habitat only and within seven subsites overall (0U455, 0UL02, 0UL06, 0UL08, 0UL09, 0UL10 and 0UL11), although three subsites were used most regularly and by the largest numbers: 0UL08, 0UL09 and 0UL10.

Peak numbers foraging intertidally were recorded for 0UL10 (Rogerstown estuary) (04/10/11 & 03/11/11) (maximum number 307), the largest flocks generally positioned south of the water channel and often part of larger loose, mixed-species flocks that included Redshank and Grey Plover. 0UL08 (Portraine) held peak numbers on 06/12/11 (891 Dunlin). These birds were in the north of the subsite and close to the boundary with 0UL10 and therefore in a relatively similar position on the tidal flat to those Dunlin recorded in 0UL10 the two months previously. 0UL09 (Railway) held a maximum number of 290 Dunlin on 06/12/11.

These three subsites are in the outer estuary (east of the railway causeway) and have benthic communities classified as 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae.* The polychaetes *Pygospio elegans* and *Arenicola marina* are additional distinguishing species of this community.

The peak intertidal foraging density was 18.2 Dunlin ha^{-1} recorded for 0UL14 (Portraine) on 06/12/11. 0UL09 (Railway) recorded the second highest foraging density of 10 individuals ha^{-1} on 06/12/11. The whole site average intertidal foraging density was 2 Dunlin ha^{-1}.

Roosting Distribution

Relatively few Dunlin were recorded in roosting/other behaviour during low tide surveys, individuals recorded in 0UL06 (Beaverstown), 0UL10 (Rogerstown estuary) and 0UL14 (Portraine beach) on one occasion only.

The total count of 31 Dunlin recorded during the high tide survey roosted intertidally within three subsites (0UL06, 0UL14, 0UL15), the majority of individuals (25) within 0UL14 (Portraine Beach).

The November spring high tide survey recorded just one individual within each of 0UL06 (Beaverstown) and 0UL14 (Portraine beach). In February 2012 a flock of 750 Dunlin roosted within 0UL14 (Portraine beach). These Dunlin formed the largest proportion of a large mixed-species roost beside the channel in the north of the subsite (other species were Grey Plover (65), Knot (7), Turnstone (4) and Ringed Plover (3)).

Previous surveys have recorded roosts within 0UL02, 0UL09, 0UL11, 0UL12, 0UL13 and 0UL14; greatest numbers within 0UL13 and 0UL14 (BirdWatch Ireland unpublished data).

Black-tailed Godwit *Limosa limosa* - Family (group): Scolopacidae (wading birds)

Black-tailed Godwits *Limosa limosa* have a widespread Palearctic breeding distribution. Four populations are recognised – three populations of the nominate *L. l. limosa* and one *L. l. islandica*, the latter of which breeds almost exclusively in Iceland and winters in Britain, Ireland, Spain, Portugal and Morocco (Delaney et al. 1999). Recoveries and sightings confirm that Black-tailed Godwits wintering in Ireland are of the *islandica* race, whereas further south (e.g. Spain and Portugal) some mixing of *limosa and islandica* occurs in the non-breeding season (Wernham et al. 2002).

Numbers

Numbers of Black-tailed Godwits during low tide surveys ranged from 96 (03/02/12) to a peak of 187 (03/11/11). 256 were counted during the high tide survey. All counts except that on 03/02/11 surpassed the threshold of all-Ireland importance.

Black-tailed Godwits were recorded in 11 subsites overall (0UL02, 0UL03, 0UL04, 0UL06, 0UL07, 0UL08, 0UL09, 0UL10, 0UL11, 0UL14 and 0UL15). 0UL06 (Beaverstown) and 0UL11 (Rogerstown pier) recorded this wader during all four low tide surveys. 0UL06 (Beaverstown) held peak numbers on 04/10/11, 03/11/11 and 06/12/11 and 0UL10 (Rogerstown estuary) held peak numbers on 03/02/12.
The subsite peak of 172 individuals was recorded within 0UL06 on 03/11/11.

Foraging Distribution

Black-tailed Godwits are relatively large long-billed wading birds that forage within intertidal flats for their preferred prey of bivalves such as *Macoma balthica*, *Scrobicularia plana* and *Mya arenaria*. At some sites, polychaete worms may form a larger proportion of the diet and the species is relatively adaptable, utilising other habitats for foraging where available, such as terrestrial grassland, coastal marshes or freshwater callows.

Black-tailed Godwits foraged widely across the site and in 11 subsites overall: 0UL02, 0UL03, 0UL04, 0UL06, 0UL07, 0UL08, 0UL09, 0UL10, 0UL11, 0UL14 and 0UL15. Only five individuals were recorded foraging on 04/10/11.

On 03/11/11, peak numbers were supported by 0UL06 (Beaverstown) (93), these birds positioned at the tide edge in two positions both north and south of the main channel. 240 individuals foraged within 0UL06 during the high tide survey, again positioned both north and south of the main channel. 0UL07 (Rogerstown viaduct) recorded peak numbers on 06/12/11 (27). These birds were loosely distributed across the intertidal flat, south of the channel. 0UL11 (Rogerstown pier) held peak numbers on 03/02/12 (18).

The benthic communities of the estuarine subsites of Rogerstown Estuary are classified as 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae.* The polychaetes *Pygospio elegans* and *Arenicola marina* are additional distinguishing species of this community. The bivalve *Macoma balthica* was recorded in core samples taken in subsite 0UL11, while *Scrobicularia plana* was recorded from 0UL06, 0UL10 and 0UL11.

No terrestrial foraging was recorded during the survey programme but Black-tailed Godwits are likely to utilise grass fields around the site for foraging (outside the SPA boundary).

The peak intertidal foraging density was 4.9 Black-tailed Godwits ha^{-1} recorded for 0UL07 (Rogerstown viaduct) on 06/12/11. The second highest was 3.6 individuals ha^{-1} recorded for 0UL06 (Beaverstown). The whole site average intertidal foraging density was 0.1 Black-tailed Godwits ha^{-1}.

Roosting Distribution

Irregular records were made of individuals in roosting/other behaviour in 0UL03 (Turvey Hide) and 0UL11 (Rogerstown pier). However 0UL06 (Beaverstown) supported roosting individuals during all four low tide surveys with a peak number of 130 on 04/10/11.

Black-tailed Godwits were not recorded roosting during the November 2011 spring high tide survey. The February neap high tide survey recorded roosting individuals across five subsites: 0UL02, 0UL03, 0UL04, 0UL06 and 0UL09. The largest flock of 100 individuals (part of a larger mixed species roost) was recorded in 0UL06 (Beaverstown), positioned along the southern edge of the channel. A flock of 60 roosted supratidally (saltmarsh) within 0UL04. 21 individuals roosted alongside the channel in 0UL03 (part of a larger mixed species roost). All other flocks comprised 20 or less individuals.

Previous surveys have recorded roosts within 0UL02, 0UL04, 0UL07 and 0UL09 with largest numbers within 0UL04 (BirdWatch Ireland unpublished data).

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, from Iceland through continental Europe and Russia to eastern Siberia, China and Mongolia. The taxonomy of the species has proved complex but five populations are recognised currently 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

Numbers of Redshank during low tide ranged from 381 (03/02/120 to a peak of 633 (03/11/11). All counts surpassed the threshold of all-Ireland importance. 280 Redshanks were recorded during the high tide survey (09/01/12).

Redshanks were widespread and recorded within 14 subsites overall (all except 0UL05). 0UL06 (Beaverstown) held peak numbers during all four low tide surveys. 0UL09 (Railway) and 0UL10 (Rogerstown estuary) were notable in supporting numbers ranked second or third highest in most surveys. The peak subsite count of 399 Redshank was recorded for 0UL06 (Beaverstown) on 03/11/11.

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 *Peringia* (*Hydrobia*) *ulvae.* A particularly favoured prey is the burrowing amphipod *Corophium volutator.*

Redshanks foraged widely across the site and within 14 subsites overall (all except 0UL05). Ten subsites recorded foraging individuals regularly: 0U455, 0UL02, 0UL03, 0UL06, 0UL07, 0UL08, 0UL09, 0UL010, 0UL11 and 0UL14.

0UL10 (Rogerstown estuary) recorded peak numbers in October 2011 (131 individuals); a loose flock of 69 Redshanks foraged alongside 32 Dunlin just north of the channel; the remaining birds were positioned in two main areas south of the main water channel.

0UL06 (Beaverstown) held peak numbers in all remaining low tide surveys plus during the high tide survey (178 individuals), the latter accounting for 93% of all foraging individuals on that date. On 03/11/11 almost all Redshanks within this subsite were in the south-eastern corner of the subsite. On 06/12/11 106 Redshanks foraged loosely across the open tidal flat north of the channel with a further 63 along the south-eastern corner of the subsite; relatively similar foraging positions were recorded on 03/02/12.

0UL09 (Railway) and 0UL07 (Rogerstown viaduct) were notable in supporting numbers ranked second or third highest in most surveys.

The benthic communities of the estuarine subsites of Rogerstown Estuary are classified as 'estuarine sandy mud to mixed sediment with *Tubificoides benedii, Hediste diversicolor* and *Peringia* (*Hydrobia*) *ulvae.* The polychaetes *Pygospio elegans* and *Arenicola marina* are additional distinguishing species of this community. *Peringia* (*Hydrobia*) *ulvae* is a relatively widespread species and was found in core samples from 0UL06, 0UL08, 0UL09, 0UL10.

The peak intertidal foraging density was 14.9 Redshanks ha^{-1} recorded for 0UL06 (Beaverstown) on 05/11/11. One other subsite recorded a foraging density of greater than 10 Redshanks ha^{-1} (0UL03 Turvey Hide). The whole site average intertidal foraging density was 1.0 Redshank ha^{-1}.

Roosting Distribution

Roosting individuals were recorded within five subsites overall during low tide surveys (0UL02, 0UL03, 0UL04, 0UL06, 0UL10). Most records were of single birds. Of note was a count of 153 that roosted intertidally within 0UL06 (Beaverstown) on 04/10/11.

69 Redshanks roosted intertidally during the high tide survey, the largest proportion (51%) within 0UL09 (Railway). 12 Redshanks roosted supratidally within 0UL11 (Rogerstown pier); small numbers (<5) roosted supratidally within 0UL10, 0UL12 and 0UL13.

The November 2011 spring tide roost survey recorded roosting Redshanks within seven subsites: 0UL02, 0UL04, 0UL06, 0UL11, 0UL12, 0UL13 and 0UL15. The largest roost was recorded within 0UL02 (102 individuals), these birds roosting intertidally beside the channel/saltmarsh in the north-eastern section of the subsite. Two flocks of 48 and 41 Redshanks roosted within 0UL06 (Beaverstown). A flock of 27 roosted within 0UL04 (New Haggard). Thereafter flocks were small, comprising four or less individuals (subsites 0UL11, 0Ul12, 0UL13 and 0UL15).

The February 2012 neap tide survey recorded good numbers of roosting Redshanks across nine subsites (0UL02, 0UL04, 0UL06, 0UL07, 0UL09, 0UL10, 0UL11, 0UL14 and 0UL15). The largest roost was 33 individuals that roosted within saltmarsh of 0UL04 (New Haggard). 0UL06 (Beaverstown) supported four roosts (24, 13, 10 and one individual); all in intertidal habitat and all mixed-species roosts positioned close to the main channel. 18 Redshanks roosted intertidally within 0UL09, alongside Black-headed Gulls (18) and Greenshanks (7). 0UL11 recorded roosting individuals at several different times during the survey (observed more than once) the maximum roost size was 14 individuals that roosted together with Greenshanks (16) and Turnstones (2).

Previous surveys have recorded roosts within 0UL02, 0UL03, 0UL04, 0UL06, 0UL07, 0UL08, 0UL09 and 0UL11 (BirdWatch Ireland unpublished data).

5.4 Rogerstown Estuary - 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 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 'conservation condition.' This can relate 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 an 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 are fundamental to the achievement of site conservation objectives.

Section 5 of the Supporting Document provides information on activities and events that occur in and around Rogerstown Estuary 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

Information on 'activities' and 'events' across the site was collected during a desk-top review which included NPWS site reporting files, County Development and other plans (e.g. Fingal County Council, 2011a; 2011b), Eastern River Basin District documents (e.g. ERBD, 2010a, b) and other available documents relevant to the ecology of the site.

In addition, information was collected during the 2011/12 waterbird survey programme (NPWS, 2011) as field workers recorded activities or events that occurred at the site during their survey work. This information, together with results from a 'site activity questionnaire' provides valuable information gained from 80+ hours of surveyor effort across the site. All data collected were entered into a database but as the dataset will be subject to change over time, the assessment should be viewed as a working and evolving process.

The 'activities' and 'events' information collected were categorised using the standard EU list of pressures and threats as used in Article 17 reporting under the EU Habitats Directive. Only factors likely to directly or indirectly affect waterbirds were included but the resulting list is broad and includes built elements (e.g. man-made structures such as roads and bridges that are adjacent to the site), factors associated with pollution (e.g. discharges from waste water treatment plants), various recreational and non-recreational activities as well as biological factors such as the growth of the invasive plant species *Spartina anglica*.

Data are presented in three ways:-

1. Activities and events identified to occur in and around Rogerstown Estuary (through either the desk-top review or field survey programme) are listed in relation to the subsite within which they were observed or are known to occur. The activities/events are classified as follows:

   O observed or known to occur within Rogerstown Estuary;
   U known to occur but unknown spatial area 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.

2. Of the activities and events identified to occur in and around Rogerstown Estuary, those that have the potential to cause disturbance to waterbird species are highlighted.

3. Data from the 2011/12 waterbird survey programme were used to inform an assessment which examined the level of disturbance caused by activities recorded during field surveys. The methodology was adapted from that used for monitoring Important Bird Areas (IBAs) (Birdlife International, 2006) and involved assigning scores which ranged between 0 and 3, to three selected attributes of each disturbance event (1) frequency/duration; (2) intensity and (3) likely response of waterbirds (after Hill et al. 1997) (Table 5.7). The rationale for scoring is provided in Appendix 10.

Table 5.7 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

The scores assigned to the three attributes were then added together to give an overall 'disturbance score' which is used to define the extent of the impact as follows:-

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

The attributes (1) frequency/duration and (3) response were scored based on field survey observations. Attribute (2) intensity was scored based on a combination of field survey observations and best expert opinion.

5.4.3 Overview of activities at the Rogerstown Estuary

Activities and events identified as occurring in and around Rogerstown Estuary are shown in Appendix 9, listed in terms of the subsites surveyed during the 2011/12 Waterbird Survey Programme. Activities highlighted in grey are those that have the potential to cause disturbance to waterbirds (see Section 5.4.4). For a map of count subsites, please refer to Appendix 6.

The following pages outline the range of activities and events that occur across the site using the following headings: (1) habitat loss, modification and adjacent landuse; (2) water quality; (3) fisheries and aquaculture; (4) recreational disturbance; and (5) others.

Habitat loss and modification and adjacent landuse

Rogerstown Estuary is a relatively small estuary that flows in a general west to east direction and flows out to sea through a narrow mouth created by a sand and shingle bar known as Portraine Burrow. The margins of the site are not highly developed; the built area of Rush lies to the north-east and Donabate lies 2km to the south. The surrounding landscape is generally low-lying agricultural land including arable crops, market gardening and horticulture. Beaverstown Golf Course lies directly south of count subsites 0UL06 and 0UL07 while Rush Golf Course lies adjacent to 0UL13.

The estuary is divided into two sections (inner and outer) by a causeway and narrow bridge that were built in the 1840s to carry the Dublin-Belfast railway line. There is a large opening in the embankment that allows the tide to flood the inner section although not all tides do (e.g. low neaps) (McCorry & Ryle, 2009).

A large part of the north-east corner of the inner estuarine mudflats (directly north of subsite 0UL06) was infilled and used for a landfill site (Ballealy Landfill) which opened in 1971 and was the largest landfill in the Dublin region (Fingal County Council, 2003a). The landfill was designed on a 'dilute and disperse' principle with no leachate containment measures put in place; typical of landfills developed at that time. Despite this potential environmental hazard, environmental monitoring and water quality testing in the estuary has indicated that there were only minor impacts on the estuary as a result (Fingal County Council, 2003a). The landfill closed in 2004. A subsequent licence for an engineered landfill was granted and following a further extension the landfill finally closed at full capacity in May 2012 (www.fingalcoco.ie). The landfill restoration and aftercare plan (Fingal County Council, 2003a) proposes to restore the site and to create a public amenity area that includes a visitor centre with viewing points overlooking the estuary. Screen planting along the southern and western boundaries of the site are proposed so as to minimise disturbance to waterbirds.

Further land reclamation (saltmarsh) occurred historically in the inner estuary as indicated by the presence of berms, many of which have fallen into various states of disrepair and have been breached or are eroding (McCorry & Ryle, 2009).

EirGrid has recently completed the development of an electricity cable link called the East-West Interconnector between the electricity grids of Ireland and Britain. Planning permission was granted by An Bord Pleanála in September 2009 for a route that comes to shore at North beach in Rush and passes adjacent to Rogerstown estuary (adjacent 0UL09, 0UL10 and 0UL11).

Birdwatch Ireland (BWI) owns 45 ha of land along the northern side of the inner estuary which is managed to benefit wintering waders and wildfowl. BWI also has a management agreement with land owners to the west of this area so land there is also managed sensitively. A bird hide is located on the north side (accessed off Ballyealy lane), with one also on the south side of the inner estuary (accessed off Turvey Lane) (within 0UL03 and 0UL04 respectively). These hides are wardened at weekends from September to March by the Fingal Branch of BirdWatch Ireland (www.birdwatchireland.ie). Turvey Parklands on the south side of the estuary (directly south of 0UL02) have been opened to the public and various habitat management measures implemented including the provision of bird hides, wader scrapes, freshwater ponds, planting of winter seed crops for birds and construction of new public pathways.

Saltmarsh extends along the southern shore of most of the inner estuary and Common Cord-grass (*Spartina anglica)* is dominant throughout. *Spartina* is also extensive on the northern shore from Ballyealy landfill eastwards (McCorry & Ryle, 2009), for example, dominating the subsite 0UL05 and the western boundary of 0UL06. In the outer estuary, it occurs along the southern shore of 0UL08 and dominates the south-east corner of this subsite. A few other smaller patches occur. Since the 1950's the spread of Common Cord-grass at the site has

been significant but recent assessments suggest that this spread has slowed and there are some signs of die-back in a few places (McCorry & Ryle, 2009)

Saltmarsh is largely un-grazed at this site although some grazing occurs in the inner estuary.

Water quality

Rogerstown Estuary has a history of pollution and water quality issues including eutrophication (e.g. Fahy et al. 1975) and heavy metal pollution attributed to emissions from Ballyealy Landfill. Furthermore, the estuary catchment includes a large market gardening area and as the soils are sandy, they are conducive to substantial run-off from fields (Fingal County Council, 2003b). More recently, the water quality of Rogerstown Estuary has been classified as moderate as per the Eastern River Basin District Management Plan (transitional waters) (ERBD, 2010c); the largest contributory factor identified as wastewater. Physical modifications and water abstraction are also identified as pressures on the system (ERBD, 2010c). Coastal waters are categorised as part of the Northwestern Irish Sea (HA 08) water management unit (ERBD, 2010b) which has a current status of 'high' with an undetermined chemical status.

A new purpose built 65,000 PE (population equivalent) Waste Water Treatment Plant (WWTP) was opened at Portraine in June 2012. It serves the communities of Portraine, Donabate, Rush and Lusk. Prior to its completion the four communities had separate waste water schemes including combinations of treatment, septic tanks and discharges of effluent to Rogerstown Estuary plus untreated marine discharge to the Irish Sea. The new WWTP has a new 600m long marine outfall from Portraine (www.fingalcoco.ie) (outside the SPA boundary).

While improvements in WWTP treatment and cessation of point discharges are aimed at meeting objectives of the Urban Waste Water Treatment Regulations (EU Council Directive 91/271/EEC, as transposed by S.I. No. 254 of 2001 as amended by S.I. 48 of 2010) and the Water Framework Directive (2000/20/EC as transposed by the European Communities (Water Policy) (Amendment) Regulations, 2010)), it should be borne in mind that there may be various consequences for the ecology of the estuarine system with knock-on effects upon waterbirds. For example, a reduction in organic and nutrient loading to an estuary could lead to reduced abundances of benthic invertebrate prey species (e.g. Burton et al. 2002) particularly those invertebrates that thrive (proliferate) in organically-enriched sediments. This could have effects upon waterbird foraging distribution, prey intake rates, and ultimately upon survival and fitness.

'Nuisance' blooms of green macroalgae such as *Ulva* species are attributed to nutrient enrichment. However, their presence can have both negative and positive effects upon waterbird foraging ecology; some species avoiding them or being negatively affected by lowered invertebrate abundances beneath them (Lewis & Kelly, 2001), while herbivores such as Light-bellied Brent Geese and Wigeon benefit from the algae as a source of food. Given the link with organic enrichment, there is therefore a potential for changes in macroalgal abundance as a result of cessation of wastewater discharges. However, nutrient cycling, together with riverine inputs, may support current levels for a number of years before a decline is evident.

Fisheries & aquaculture

An area of 36.3 km^2 to the south-east of Rogerstown Estuary (coastal waters from Lambay Island to Portmarnock) is designated as a Shellfish Water under the EU Shellfish Waters Directive[17] (No. 32) (DoEHLG, 2009). The designation relates to the fishing of Razor Clams (*Ensis siliqua*) that are harvested by hydraulic dredging. The Sea Fisheries Protection Authority (SFPA) is responsible for classifying shellfish production areas and the current

[17] European Communities (Quality of Shellfish Waters) (Amendment) Regulation 2009 (SI 55 of 2009).

classification of the Malahide Bivalve Mollusc Production Area is Class B, as of 20th July 2012 (www.sfpa.ie). This means that shellfish may be placed on the market for human consumption only after treatment in a purification centre or after relaying, so as to meet the health standards for live bivalve molluscs laid down in EC Regulations on food safety[18]. Mussel seed was taken from the site on a commercial scale in the 1980's but this has now ceased (NPWS, 2000).

Various inshore fishing activities are likely to occur adjacent to the site (detail and spatial scale unknown). Static fishing gear activity in the site includes hook and line fishing and the use of pots (bated traps set on the seabed targeting crustaceans) (DoEHLG, 2009). The use of mobile gear (e.g. of oyster and hydraulic dredges) plus otter trawls occur in coastal waters outside of the SPA. There are three active fishing harbours in the area: Howth, Balbriggan and Skerries Harbour.

Fish recorded in Rogerstown Estuary include Sprat (*Sprattus sprattus*), Flounder (*Platichthys flesus)* and Sea Bass (*Dicentrarchus labrax*), and a total of 15 species were recorded during sampling for Water Framework Directive monitoring (CRFB, 2008). Records of juvenile bass in Rogerstown estuary highlights the importance of the estuary as a nursery ground for this species.

Rogerstown Pier facilitates sea-anglers (recreational fishing); boat fishing is mainly concentrated around Lambay Island which lies some three miles (4.8 km) to the south east (ERFB, 2009). Shore-angling occurs at the mouth of the estuary (e.g. Sea Trout *Salmo trutta*).

The estuary is used for bait-digging, this activity recorded at five subsites during the 2011/12 Waterbird Survey Programme. The hand-gathering of edible molluscs (e.g. Periwinkles *Littorina littorea*) was recorded in four subsites (0UL10, 0UL12, 0UL14 and 0UL15).

Recreational disturbance

Recreational activities at the site are largely centered upon Rush north beach, Rush south beach and Portraine beach, the latter two being inside the SPA boundary (count subsites 0UL13 and 0UL14 respectively). Portraine beach is a valuable and popular amenity with residents and visitors alike including a significant population of summer residents who stay in the caravan parks and beach houses dotted along that part of the peninsula and separated from the beach by the sand dunes (Fingal County Council, 2007). Both Rush south beach and Portraine beach have held Blue Flag awards in previous years but were not awarded in 2012 (www.beachawards.ie). All three aforementioned beaches are protected by beach bye-laws (Fingal County Council 2006) which prohibits the use of motorised vehicles along them although cars do park in the saltmarsh by Portraine beach (McCorry & Ryle, 2009). The presence of dogs and horses along the beach is controlled during the summer period, but both animals are allowed at any time during the winter months although within the SPA, dogs should be kept on leads and horses should be controlled and ridden along permitted paths only, these features aimed at reducing the impacts of disturbance upon birds. The use of jet-skis is prohibited within the SPA. A beach management plan was developed for Portraine (Burrow) beach in 2007 (Fingal County Council, 2007).

The Lambay Island Ferry operates from Rogerstown Pier, which is located on the boundary between subsites 0UL11 and 0UL13. Rush Sailing Club is located just east of Rogerstown Pier.

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

Other

Wildfowling was recorded at the site during the 2011/12 Waterbird Survey Programme (subsite 0UL07). A large part of the site is protected by the designations of Nature Reserve and Wildfowl Sanctuary and are therefore no-shooting areas.

5.4.4 Disturbance Assessment

Four activities were recorded during 2011/12 survey work that had the potential to cause disturbance to waterbirds. These activities were: walking (including with dogs), bait-digging, hand gathering of molluscs and agricultural crop-scarers (bangers) (Table 5.8).

Walking was the most regular and widespread activity, centred largely upon the outer subsites 0UL13 (Rush beach), 0UL14 (Portraine beach) and 0UL15 (Portraine quay). Walking of humans and dogs are assessed together although in some cases dogs were observed without accompanying humans. Over 70% of observations that involved dogs recorded a noticeable disturbance to waterbirds. In 0UL13 (Rush beach) and 0UL14 (Portraine beach) the frequency and regular presence of dogs resulted in an overall '*high*' peak disturbance score being assigned. However, this score may be slightly conservative given that at peak times of activity, waterbirds may be displaced for long periods of time. Fieldworkers noted loose dogs running at wader roosts during the high tide surveys and the disturbances caused were noted to almost continuously result in birds moving their positions during the survey period.

Waterbirds appear to have habituated to the noise produced by agricultural crop-scarers (bangers) as no response by waterbirds was recorded.

Full results of the disturbance assessment are shown in Appendix 10. Individual activities/events 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. As a final review, Table 5.9 shows the peak disturbance scores overlaid on the subsite assessment table (total waterbird numbers, LT surveys).

Table 5.8 Disturbance Assessment – Summary Table

Number of activities recorded during field surveys (2011/12 waterbird survey programme) observed to cause disturbance to waterbirds. The calculated peak disturbance score is shown (see text for explanation).
Scores 0 – 3 = Low Scores 4 – 6 = Moderate Scores 7 – 9 = High. Grey shading = no activity recorded.

Subsite Code	Subsite Name	Number of Activities	Peak Disturbance Score	Activity Responsible
0UL02	Turvey	1	5	• Walking (incl. dogs)
0UL03	Turvey Hide			
0UL04	New Haggard			
0UL05	Tip Corner			
0UL06	Beaverstown			
0UL07	Rogerstown viaduct			
0UL08	Portraine			
0UL09	Railway	1	5	• Bait digging
0UL10	Rogerstown Estuary	4	5	• Bait digging
0UL11	Rogerstown Pier			
0UL12	Rush-Martello tower	1	5	• Bait digging
0UL13	Rush Beach	1	7	• Walking (incl. dogs)
0UL14	Portraine Beach	2	7	• Walking (incl. dogs)
0UL15	Portraine Quay	2	6	• Walking (incl. dogs)
0U455	Inner: S Channel Roost			

Table 5.9 Rogerstown Estuary - subsite rankings based on total numbers of waterbirds (LT surveys) by peak disturbance score

Species ► / Subsites ▼	GJ	PB	SU	SV	OC	RP	DN	KN	GV	BW	RK
OUL02			L	H	L		M			M	M
OUL03		H	M	V	M					H	M
OUL04		V	M							L	L
OUL05											
OUL06		M	H		M		M	M	H	V	V
OUL07			M		L				M	H	H
OUL08	V	H	V		H		V		V	M	H
OUL09		M	V	V	L	H	H	V	M	M	H
OUL10		V	V		V	V	V	V	V	V	H
OUL11		V	L		V	M	M		L	H	M
OUL12		L			L				L		M
0UL13		M			M	L					L
0UL14		L			H	M	M		H	M	M
0UL15		L			H	H			L	M	M
0U455					H	V	L	V			M

5.4.5 Discussion

This review has highlighted that many 'activities and events' occur across the site, while the disturbance assessment represents a 'snap-shot' record of the level of disturbance-causing activities that can occur during the non-breeding season.

Many of the 'activities' identified may act so as to modify wetland habitats of the site. While physical loss might be considered more historic in nature (e.g. land claim, the construction of piers, slipways etc.), on-going modifications to intertidal habitats may occur due to changes in natural processes (e.g. sedimentation or erosion rates) as a result of former physical events.

The most obvious on-going activity is human recreational disturbance in the form of walking, with or without dogs. It is clear that this activity is displacing waterbirds. The significance of the impact that results from even a short-term displacement should not be underestimated. In terms of foraging habitat, displacement from feeding opportunities not only reduces a bird's energy intake but also leads to an increase in energy expenditure as a result of the energetic costs of flying to an alternative foraging area. Displacement also has knock-on ecological effects such as increased competition within and/or between different species for a common food source. In areas subject to heavy or on-going disturbance, waterbirds may be disturbed so frequently that their displacement is equivalent to habitat loss. When disturbance effects reduce species fitness[19] (reduced survival or reproductive success) consequences at population level may result.

Whilst the nature and the frequency of disturbance-causing activities are key factors when assessing likely impacts, many aspects of waterbird behaviour and ecology will influence a species response. Waterbird responses are likely to vary with each individual event and to be species-specific. The significance of a disturbance event upon waterbirds will vary according to a range of factors including:-

- Frequency/duration of disturbance event;

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

- Intensity of activity;
- Response of waterbirds.

and be influenced by:-

- Temporal availability – whether waterbirds have the opportunity to exploit the food resources in a disturbed area at times when the disturbance does not occur;
- Availability of compensatory habitat - whether there is suitable alternative habitat to move to during disturbance events;
- Behavioural changes as a result of a disturbance - e.g. degree of habituation;
- Time available for acclimatisation - whether there is time available for habituation to the disturbance. (there may be a lack of time for waterbirds during the staging period);
- Age - for example when feeding, immature (1st winter birds) may be marginalised by older more dominant flocks so that their access to the optimal prey resources is limited. These individuals may already therefore be under pressure to gain their required daily energy intake before the effects of any disturbance event are taken into account;
- Timing/seasonality - birds may be more vulnerable at certain times e.g. pre- and post-migration, at the end of the winter when food resources are lower;
- Weather - birds are more vulnerable during periods of severe cold weather or strong winds;
- Site fidelity – some species are highly site faithful at site or within-site level and will therefore be affected to a greater degree than species that range more widely;
- Predation and competition – a knock-on effect of disturbance is that waterbirds may move into areas where they are subject to increased competition for prey resources, or increased predation – i.e. the disturbance results in an indirect impact which is an increased predation risk.

Knowledge of site activities and events is important when examining waterbird distribution and understanding the many factors that might influence a species' distribution across a site. The above points also highlight the complex nature of waterbird behaviour and species specificity, as well as the need for careful consideration of the impacts of disturbance upon waterbird species when undertaking Appropriate Assessments or other environmental assessments. This review could therefore form the starting point for any future study aiming to quantify the effects of activities/disturbance events across the site, as well as to help identify the extent to which existing use and management of the site are consistent with the achievement of the conservation objectives described in Part Three of this document.

REFERENCES

Atkinson, P. W., Austin, G. E., Rehfisch, M. M., Baker, H., Cranswick, P., Kershaw, M., Robinson, J., Langston, R. H. W., Stroud, D. A., Turnhout, C. van. & Maclean, I. M. D. (2006) Identifying declines in waterbirds: the effects of missing data, population variability and count period on the interpretation of long-term survey data. *Biological Conservation* 130, 549-559.

Birdlife International (2006) *Monitoring Important Bird Areas: a global framework.* Cambridge, UK.

Boland, H. and Crowe, O. (2012) *Irish wetland bird survey: waterbird status and distribution 2001/02 – 2008/09.* BirdWatch Ireland, Kilcoole, Co. Wicklow.

Bryant, D.M. & Leng, J. (1975) Feeding distribution and behaviour of Shelduck in relation to food supply. *Wildfowl* 26, 20–30.

Burton, N.H.K., Paipai, E., Armitage, M.J.S., Maskell, J.M., Jones, E.T., Struve, J., Hutchings, C.J. & Rehfisch, M.M. (2002) Effects of reductions in organic and nutrient loading on bird populations in estuaries and coastal waters of England and Wales. Phase 1 Report. BTO Research Report, No. 267 to English Nature, the Countryside Council for Wales and the Environment Agency. BTO. Thetford, UK.

BWPi (2004) *Birds of the Western Palearctic Interactive*. BirdGuides Ltd. 2004.

Calbrade, N.A., Holt, C.A., Austin, G.E., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. & Musgrove, A.J. (2010) *Waterbirds in the UK 2008/09: The Wetland Bird Survey.*
BTO/RSPB/JNCC in association with WWT. Thetford. UK.

CRFB (2008) *Rogerstown Estuary. Sampling fish for the Water Framework Directive.* Transitional waters Central & Regional Fisheries Boards. 2008.

Crowe, O. (2005) *Ireland's Wetlands and their waterbirds: status and distribution*. BirdWatch Ireland.

Crowe, O., Boland, H. & Walsh. A. (2011) Irish Wetland Bird Survey: results of waterbird monitoring in Ireland in 2009/10. *Irish Birds* 9, 229-240.

Crowe, O., Austin, G, E., Colhoun, K., Cranswick, P., Kershaw, M. & Musgrove, A. J. (2008) Estimates and trends of waterbird numbers wintering in Ireland, 1994/95-2003/04. *Bird Study* 55, 66-77.

Cummins, S. & Crowe, O. (2012) *Collection of baseline waterbird data for Irish coastal Special Protection Areas 2011/ 2012.* Report to National Parks & Wildlife Service. June 2012.

Dekinga, A. & Piersma, T. (1993) Reconstructing the diet composition on the basis of faeces in a mollusc-eating wader, the Knot *Calidris canutus. Bird Study* 40, 144-156.

Delaney, S., Scott, D., Dodman, T. & Stroud, D. (2009) (eds) *An atlas of wader populations in Africa and Western Eurasia*. Wetlands International, Wageningen, The Netherlands.

Dit Durell, S. E. A. Le V. & Kelly, C. P. (1990) Diets of Dunlin *Calidris alpina* and Grey Plover *Pluvialis squatarola* on the Wash as determined by dropping analysis. *Bird Study* 37, 44-47.

DoEHLG (2009) *Shellfish Pollution Reduction Programme. As required by Article 5 of the Shellfish Water Directive 2006/113/EC and Section 6 of the Quality of Shellfish Waters Regulations, 2006 (S.I. No. 268 of 2006). Characterisation Report Number 32. Malahide Shellfish Area. County Dublin* Department of The Environment, Heritage and Local Government.

ERBD Eastern River Basin District (2010a) River Basin Management Plan 2009-2015. 6th July 2010.

ERBD Eastern River Basin District (2010b) *Eastern River Basin Management Plan 2009-2015 – Coastal waters Programme of measures Summary Report.* For download. www.erbd.ie

ERBD Eastern River Basin District (2010c) *Eastern River Basin Management Plan 2009-2015 – Transitional water bodies. Programme of measures. Summary Report.* For download. www.erbd.ie

ERFB (2009) *A Guide to sea angling in the eastern fisheries region.* Report by N Dunlop. 2009. Eastern Region Fisheries Board. Dublin.

EU Commission (2010) *Setting Conservation Objectives for Natura 2000 sites.* Document of the Expert Group on the Management of Natura 2000 sites. Meeting 22.02.2010.

Fahy, E., Goodwillie, R., Rochford, J., and Kelly, D. (19750 Eutrophication of a partially enclosed estuarine mudflat. *Marine Pollution Bulletin* 6, 29-31.

Fingal County Council (2003a) *Balleally Landfill Restoration & Aftercare Plan*. Report by MCOS and RPS Group PLC to Fingal County Council. July 2003.

Fingal County Council (2003b) *Ecological monitoring of Rogerstown Estuary.* Report to Fingal County Council by Marenco Environmental Consultants. June 2003. www.fingalcoco.ie

Fingal County Council (2005) *Ecological Study of the Coastal Habitats in County Fingal. Phase IV: Intertidal Habitats.* Report by ecological Consultancy Services (EcoServe) to Fingal County Council. December 2005.

Fingal County Council (2006) *Fingal County Council Beach/Foreshore Bye-Laws* 2006. www.fingalcoco.ie

Fingal County Council (2007) *Development of a Beach Management Plan for the Burrow, Portrane, Co. Dublin.* An Action of the Fingal Heritage Plan, 2005-2010. January 2007.

Fingal County Council (2011a) *Fingal Development Plan 2011 – 2017.* 2011.

Fingal County Council (2011b) *Fingal Development Plan 2011 – 2017. Natura Impact Statement.* April 2011.

Gill, J. A., Norris, K. & Sutherland, W. J. (2001a) Why behavioural responses to disturbance may not reflect the population consequences of human disturbance. *Biological Conservation* 97, 265-268.

Gill, J. A., Sutherland, W. J. & Norris, K. (2001b) Depletion models can predict shorebird distribution at different spatial scales. *Proceedings of the Royal Society B* 267, 369-376.

Gregory, R. D., van Strien, A., Vorisek, P., Gmelig Meyling, A. W., Noble, D. G., Foppen, R. P. B. & Gibbons D. W. (2005) Developing indicators for European birds. *Philosophical Transactions of the Royal Society B* 360, 269-288

Hayden, H.S., Blomster, J., Maggs, C.A., Silva, P.C., Stanhope, M.J., Waaland, J.R. (2003) Linnaeus was right all along: Enteromorpha and Ulva are not distinct genera. *European Journal of Phycology* 38, 277–293.

Hearn, R., D. & Mitchell, C. R. (2004) *Greylag Goose Anser anser (Iceland population) in Britain and Ireland 1960/61 –1999/2000. Waterbird Review Series.* The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee, Slimbridge.

Hill, D., Hockin, D., Price, D., Tucker, G., Morris, R & Treweek, J. (1997) Bird disturbance: improving the quality and utility of disturbance research. *Journal of Applied Ecology* 34, 275-288.

Hill, D., Rushton, S. P., Clark, N., Green, P & Prys-Jones, R. (1993) Shorebird communities on British estuaries: factors affecting community composition. *Journal of Applied Ecology* 30, 220-234.

Houlahan, J. E., Findlay, C. S., Schmidt, B. R., Meyer, A. H. & Kuzmin. S. L. (2000) Quantitive evidence for global amphibian population declines. *Nature* 404, 752-755.

JNCC (1998) *Statement on common standards monitoring*. Joint Nature Conservation Committee.

JNCC (2004) *Common standards monitoring for birds.* Version August 2004. Joint Nature Conservation Committee. ISSN 1743-8160 (online).

Kushlan, J. (2006) Integrating waterbird conservation: populations, habitats and landscapes. Workshop Introduction. In: *Waterbirds around the world (*Eds. G.C. Boere, C.A. Galbraith & D.A. Stroud.). The Stationery Office, Edinburgh, UK.

Leech, D. I., Rehfisch, M. M. & Atkinson, P. W. (2002) *A Guide to Waterbird Alerts.* BTO Research Report No. 281.

Lewis, L.J. and Kelly, T.C. (2001) A short-term study of the effects of algal mats on the distribution and behavioral ecology of estuarine birds. *Bird Study* 48, 354-360.

Lynas, P., Newton, S. F. & Robinson, J. (2007) The status of birds in Ireland: an analysis of conservation concern 2008-2013. *Irish Birds* 8, 149-166.

Ma, Z., Cai Y., Li, B. & Chen, J. (2010) Managing Wetland Habitats for Waterbirds: An International Perspective. *Wetlands* 30, 15-27.

Madden, B., Merne, O., McNally, J., Newton, S. & Murphy, D. (2004) Wintering waterbirds at Lambay, County Dublin. *Irish Birds* 7, 337-346.

McCorry, M & Ryle, T. (2009) *Saltmarsh Monitoring Project 2007-2008.* Volume 2. Final Report 2009. Report for Research Branch, National Parks & Wildlife Service.

Musgrove, A. J., Langston, R. H. W., Baker, H. & Ward, R. M. (eds) (2003) *Estuarine waterbirds at Low Tide: the WeBS Low Tide Counts 1992/93 to 1998/99.* WSG/BTO.RSPB/JNCC, Thetford.

NPWS (2000) Conservation Plan for a Natura 2000 site. Rogerstown Estuary cSAC and Rogerstown Estuary SPA. Draft 2. June 2002.

NPWS (2011) *Waterbird surveys within Irish coastal Special Protection Areas. Survey methods and guidance notes.* Unpublished Report. National Parks & Wildlife Service June 2011.

NPWS (2012) *Rogerstown Estuary SAC (Site Code 0208). Conservation Objectives Supporting Document - marine habitats.* Version 1. October 2012.

Olney, P.J.S. (1965) The food and feeding habits of Shelduck *Tadorna tadorna*. *Ibis* 107, 527–532.

Ramsar Convention Bureau (1971) Convention on wetlands of international importance especially as waterfowl habitat. Ramsar Convention Bureau, Gland, Switzerland.

Rehfisch M.M., Insley, H. & Swann, B. (2003) Fidelity of overwintering shorebirds to roosts on the Moray Basin, Scotland: implications for predicting impacts of habitat loss. *Ardea* 91, 53-70.

Robinson, J. A., Colhoun, K., Gudmundsson, K. A., Boertman, D., Merne, O. J., O'Briain, M., Portig, A. A., Mackey, K. & Boyd, H. (2004) *Light-bellied Brent Goose Branta bernicla hrota (East Canadian High Arctic population) in Canada, Ireland, Iceland, France, Greenland, Scotland, Wales, England, the Channel Islands and Spain. 1960/61 – 1999/2000.* Waterbird Review Series. The Wildfowl & Wetlands Trust/Joint Nature Conservation Committee. Slimbridge. UK.

Santos, C. D., Granadeiro, J. P. & Palmeirim, J. M. (2005) Feeding ecology of Dunlin (*Calidris alpina*) in a southern European estuary. *Ardeola* 52, 235-252.

Shepherd, P. C. F., Evans Ogden, L. J. & Lank, D. B. (2003) Integrating marine and coastal terrestrial habitats in shorebird conservation planning. *Wader Study Group Bulletin* 100, 40-42.

Thaxter, C. B., Sansom, A., Thewlis, R. M., Calbrade, N. A. & Austin, G. E. (2010) *Wetland Bird Survey Alerts 2006/2007: Changes in numbers of wintering waterbirds in the Constituent Countries of the United Kingdom, Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs).* BTO Research Report 556.

Underhill, L. G. & Prŷs-Jones, R. P. (1994) Index numbers for waterbird populations. I. Review and methodology. *Journal of Applied Ecology* 31, 463-480.

Van der Kam, J., Ens, B., Piersma, T & Zwarts, L (2004) *Shorebirds: an illustrated behavioural ecology.* KNNV Publishers, Utrecht, The Netherlands.

Viain, A., Corre, F., Delaporte, P., Joyeux, E. & Bocher, P. (2011) Numbers, diet and feeding methods of Common Shelduck *Tadorna tadorna* wintering in the estuarine bays of Aiguillon and Marennes-Oléron, western France. *Wildfowl* 61, 121-141.

Visser, H., Coveney, J., Kelly, D. McManus, F., Pierce, S. & Dillon, D. (2004) *Coastal habitats in County Fingal. Phase II – Birds.* A report supported by the Heritage Council and Fingal County Council. November 2004.

Warnock, N. (2010) Stopping vs. staging: the difference between a hop and jump. *Journal of Avian Biology* 41, 621-626.

Weller, M. W. (1999) *Wetland Birds: habitat resources and conservation implications*. Cambridge University Press. UK.

Wernham, V. V., Toms, M. P., Marchant, J. H., Clark, J. A., Siriwardena, G. M. & Baillie, S. R. (eds) (2002) *The Migration Atlas: movements of birds of Britain and Ireland*. T & A D Poyser. London.

Wetlands International (2002) *Waterfowl Population Estimates – Third Edition*. Wetlands International, Wageningen, The Netherlands.

Wetlands International (2006) *Waterfowl Population Estimates – Fourth Edition*. Wetlands International, Wageningen, The Netherlands.

Zwarts, L. & Wanink, J. H. (1993) How the food supply harvestable by waders in the Wadden sea depends on the variation in energy, density, bodyweight, biomass, burying depth and behaviour of tidal-flat invertebrates. *Netherlands Journal of Sea Research* 31, 441-476.

Zwarts, L. Ens, B., Goss-Custard, J. D., Hulscher, J. B. & Dit Durrell, S. E. A. le vit (1996) Causes of variation in prey profitability and its consequences for the intake rate of the Oystercatcher *Haematopus ostralegus. Ardea* 84A, 229-268.

APPENDIX 1

SITE NAME: ROGERSTOWN ESTUARY SPA

SITE CODE: 004015

Rogerstown Estuary is situated about 2 km north of Donabate in north County Dublin. It is a relatively small, funnel shaped estuary separated from the sea by a sand and shingle peninsula; the site extends eastwards to include an area of shallow marine water. The estuary receives the waters of the Ballyboghil and Ballough rivers and has a wide salinity range, from near full seawater to near full freshwater. The estuary is divided by a causeway and narrow bridge, built in the 1840s to carry the Dublin-Belfast railway line. At low tide extensive intertidal sand and mud flats are exposed and these provide the main food resource for the wintering waterfowl that use the site. The intertidal flats of the estuary are mainly of sands, with soft muds in the north-west sector and along the southern shore. Associated with these muds are stands of Common Cord-grass (*Spartina anglica*). Green algae (mainly *Enteromorpha* spp. and *Ulva lactuca*) are widespread and form dense mats in the more sheltered areas. The intertidal vascular plant Beaked Tasselweed (*Ruppia maritima*) grows profusely in places beneath the algal mats and is grazed by herbivorous waterfowl (notably Light-bellied Brent Goose and Wigeon). Salt marsh fringes parts of the estuary, especially its southern shores. Common plant species of the saltmarsh include Sea Rush (*Juncus maritimus*), Sea Purslane (*Halimione portulacoides*) and Common Saltmarsh-grass (*Puccinellia maritima*).

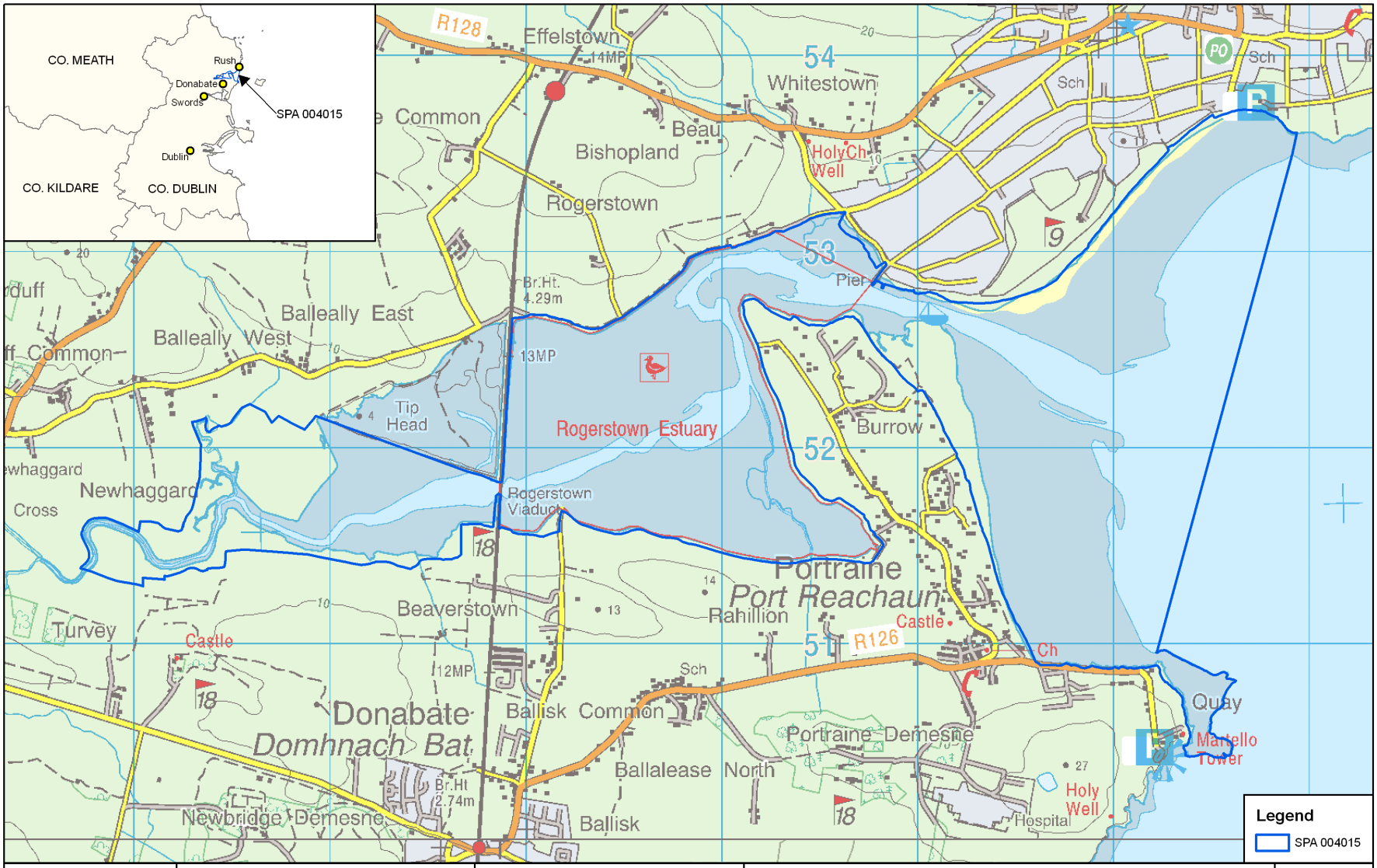
The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greylag Goose, Light-bellied Brent Goose, Shelduck, Shoveler, Oystercatcher, Ringed Plover, Grey Plover, Knot, Dunlin, Black-tailed Godwit and Redshank. The E.U. Birds 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.

Rogerstown Estuary is an important winter waterfowl site and supports a population of Light-bellied Brent Goose of international importance (1,069) - all counts are mean peaks over the five winters 1995/96 – 1999/2000. A further 10 species have populations of national importance as follows: Greylag Goose (160), Shelduck (773), Shoveler (59), Oystercatcher (1,345), Ringed Plover (188), Grey Plover (229), Knot (2,454), Dunlin (2,745), Black-tailed Godwit (195) and Redshank (490). The Greylag Geese are part of a larger population which spends most of the winter on Lambay Island. Other species which occur regularly include Wigeon (358), Teal (346), Mallard (214), Red-breasted Merganser (30), Golden Plover (1,059) Lapwing (2,129), Sanderling (50), Curlew (505) and Turnstone (77). Large numbers of gulls including Herring Gull, Great Black-backed Gull and Black-headed Gull are attracted to the area, partly due to the presence of an adjacent local authority landfill site.

Some of the wader species also occur on passage, notably Black-tailed Godwit with numbers often exceeding 300 in April. The estuary is a regular staging post for scarce migrants, especially in autumn when Green Sandpiper, Ruff, Little Stint, Curlew Sandpiper and Spotted Redshank may be seen. Shelduck breed within the site.

Rogerstown Estuary SPA is an important link in the chain of estuaries on the east coast. It supports an internationally important population of Light-bellied Brent Goose and nationally important populations of a further 10 species. The presence of Golden Plover is of note as this species is listed on Annex I of the E.U. Birds Directive.

2.9.2009


CO. MEATH
Rush
Donabate
Swords
SPA 004015
Dublin
CO. KILDARE
CO. DUBLIN
R128
Effelstown
14MP
Common
Beau
Bishopland
Rogerstown
54
Whitestown
Holy Ch
Well
Sch
PO
53
Pier
9
Br.Ht.
4.29m
Balleally East
Balleally West
13MP
Tip
Head
Rogerstown Estuary
Burrow
52
Newhaggard
Cross
Rogerstown
Viaduct
18
Portraine
Port Reachaun
Rahillion
Castle
R126
Ch
Beaverstown
Turvey
Castle
12MP
Sch
Donabate
Domhnach Bat
Ballisk Common
Portraine Demesne
Quay
Martello
Tower
Ballalease North
Br.Ht
2.74m
Newbridge Demesne
Ballisk
Holy
Well
Hospital
Legend
SPA 004015
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
SITE CODE: SPA 004015
CO. DUBLIN; version 1.02
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Dec 2012

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

Analysing population trends: a synopsis

Monitoring of non-breeding waterbirds has been undertaken by the Irish Wetland Bird Survey (I-WeBS) and its partner, WeBS in Northern Ireland, since the mid 1990's. For such long-term count data, there is clearly a need to assess long-term trends in a consistent and objective manner (Atkinson et al. 2006).

The first stage in the analytical process involves the use of the Underhill Program (Underhill & Prŷs-Jones, 1994) which models the raw monthly counts using a Generalised Linear Model (GLM). As part of this process, it accounts for changes in numbers at the site and the timing of the count (month, year) while also taking into account completed counts and trends at other sites. When counts at a site are flagged as poor quality (e.g. due to poor visibility) or where there are missing values in a given month, then the modelled values are used. This imputation process 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). The resulting dataset is therefore complete for all months and seasons and comprises a combination of actual count data and imputed count data.

This complete dataset is then modelled using a Generalised Additive Models (GAM) which fits a smoothed curve to the counts. 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 application of GAMs to analyse population trends was applied to UK farmland birds by Fewster et al. (2000) and has since been adopted for modelling waterbird trends elsewhere, for example, the UK WeBS Alert system (Leech et al. 2002).

Smoothed count data for a site are then indexed to assess population trends over time. 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).

Annual indices are calculated separately for each species at a site. 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 of totals is then scaled to equal 100 (please see example in table). Index values in any given year therefore represent the number of individuals relative to those present in the final year. As this process is the same across all species and all sites analysed it allows for some useful comparisons.

Count Data	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

Un-smoothed indices are also calculated and provide a means of examining ('eye-balling') the variation across time and can also be used to provide a measure of the mean annual change over the entire period. However, the GAM extension to the methodology and resultant smoothed indices allows for the calculation of proportional change in population size between one season and another. This latter calculation is used in Section 4.2 whereby trends are 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 (see example below)

The reference year is the penultimate year in the time series 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.

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.

Worked example

Year	Unsmoothed Index	Smoothed Index
1994	0.715	0.753
1995	0.604	0.804
1996	0.739	0.835
1997	0.594	0.826
1998	0.711	0.782
1999	0.745	0.727
2000	0.618	0.691
2001	0.694	0.692
2002	0.300	0.739
2003	0.530	0.827
2004	1.348	0.936
2005	0.836	1.028
2006	0.773	1.069
2007	0.734	1.051
2008	1	1.000

Term	Change
5YR	**+ 42.80**
10YR	**+ 27.24**
ALL YR	**+ 30.72**

Further information on population indexing and trend analysis 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 (e.g. 12-year, 10-year and 5-year periods) to assess more effectively how the population has fared over time.

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 alpine*
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 maritime*
RM	Red-breasted Merganser	*Mergus serrator*
RH	Red-throated Diver	*Gavia stellata*
RK	Redshank	*Tringa tetanus*
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

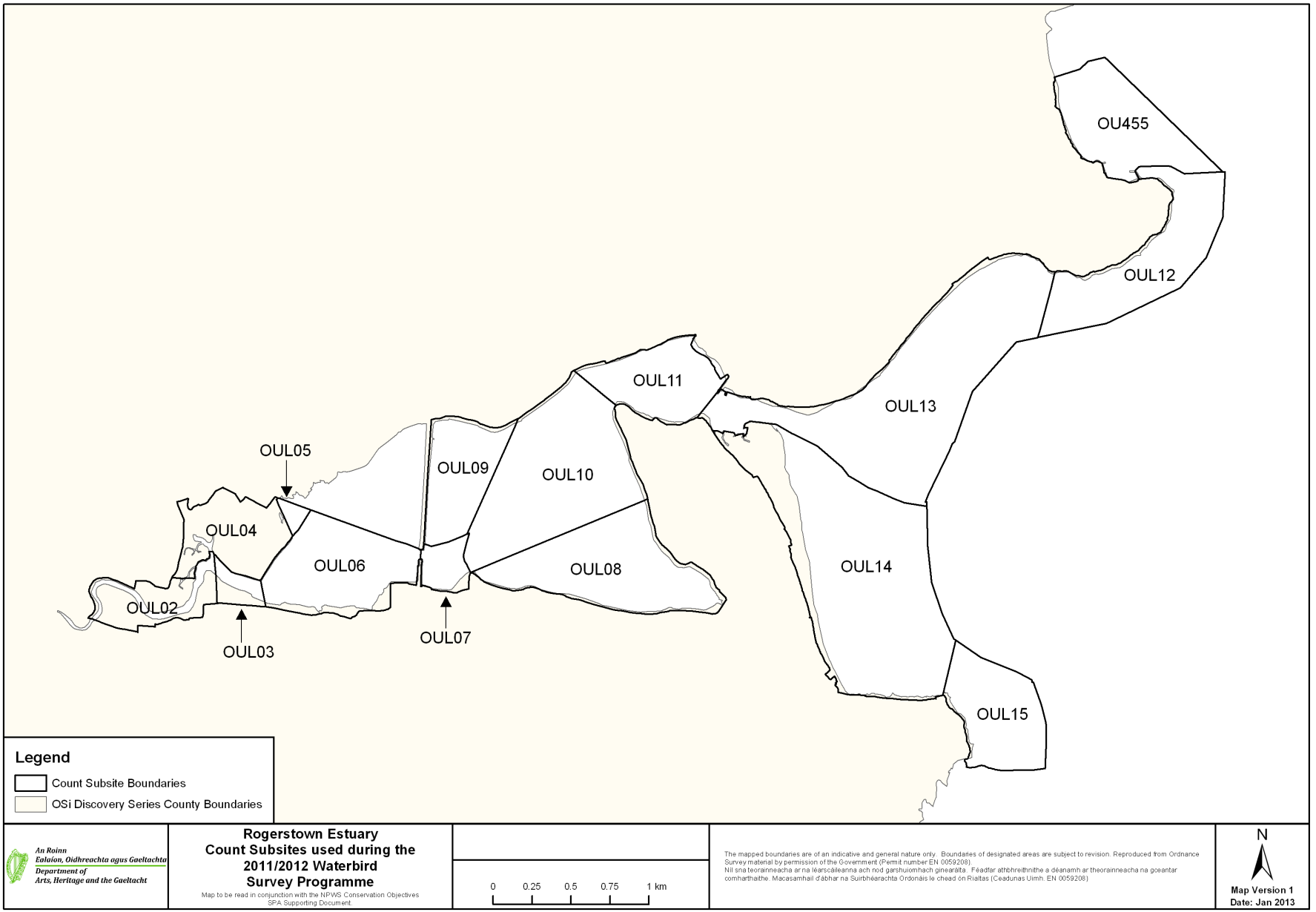
[a] dives <3m.

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

Rogerstown Estuary – Waterbird Survey Programme 2011/12 – Count Subsites

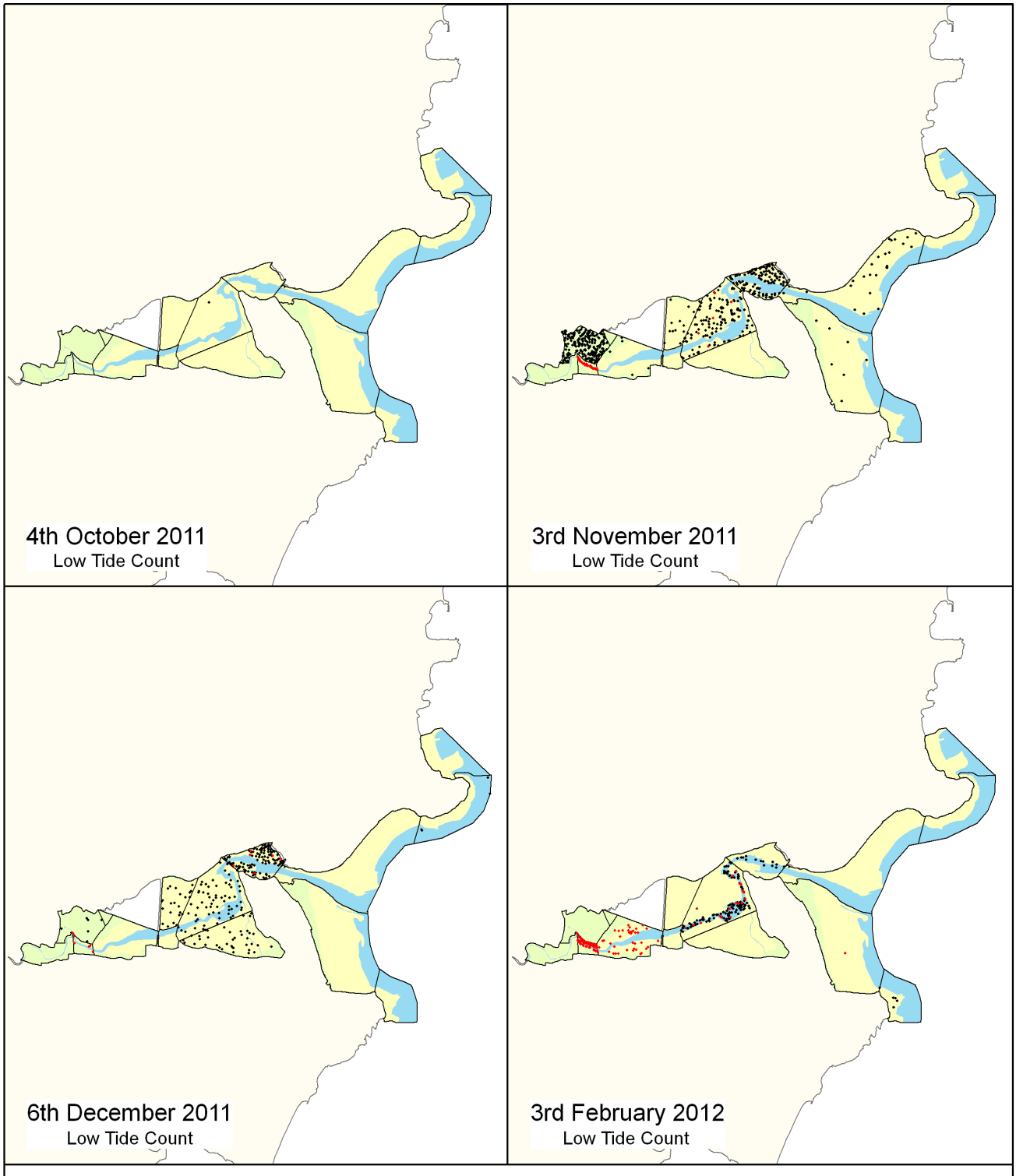
Subsite Code	Subsite Name	Area (ha)
0UL02	Turvey	22
0UL03	Turvey Hide	6
0UL04	New Haggard	29
0UL05	Tip Corner	2
0UL06	Beaverstown	47
0UL07	Rogerstown viaduct	9
0UL08	Portraine	61
0UL09	Railway	31
0UL10	Rogerstown estuary	80
0UL11	Rogerstown pier	32
0UL12	Rush-Martello tower	52
0UL13	Rush Beach	125
0UL14	Portraine Beach	136
0UL15	Portraine Quay	37
0U455	Inner: S Channel Roost (RI)	45
	Total Count Area	**717 ha**


OU455
OUL12
OUL11
OUL13
OUL05
OUL09
OUL10
OUL04
OUL06
OUL08
OUL14
OUL02
OUL03
OUL07
OUL15
Legend
Count Subsite Boundaries
OSi Discovery Series County Boundaries
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Rogerstown Estuary
Count Subsites used during the 2011/2012 Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Nil sna teorainneacha ar na téarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 2013

APPENDIX 7

Rogerstown Estuary

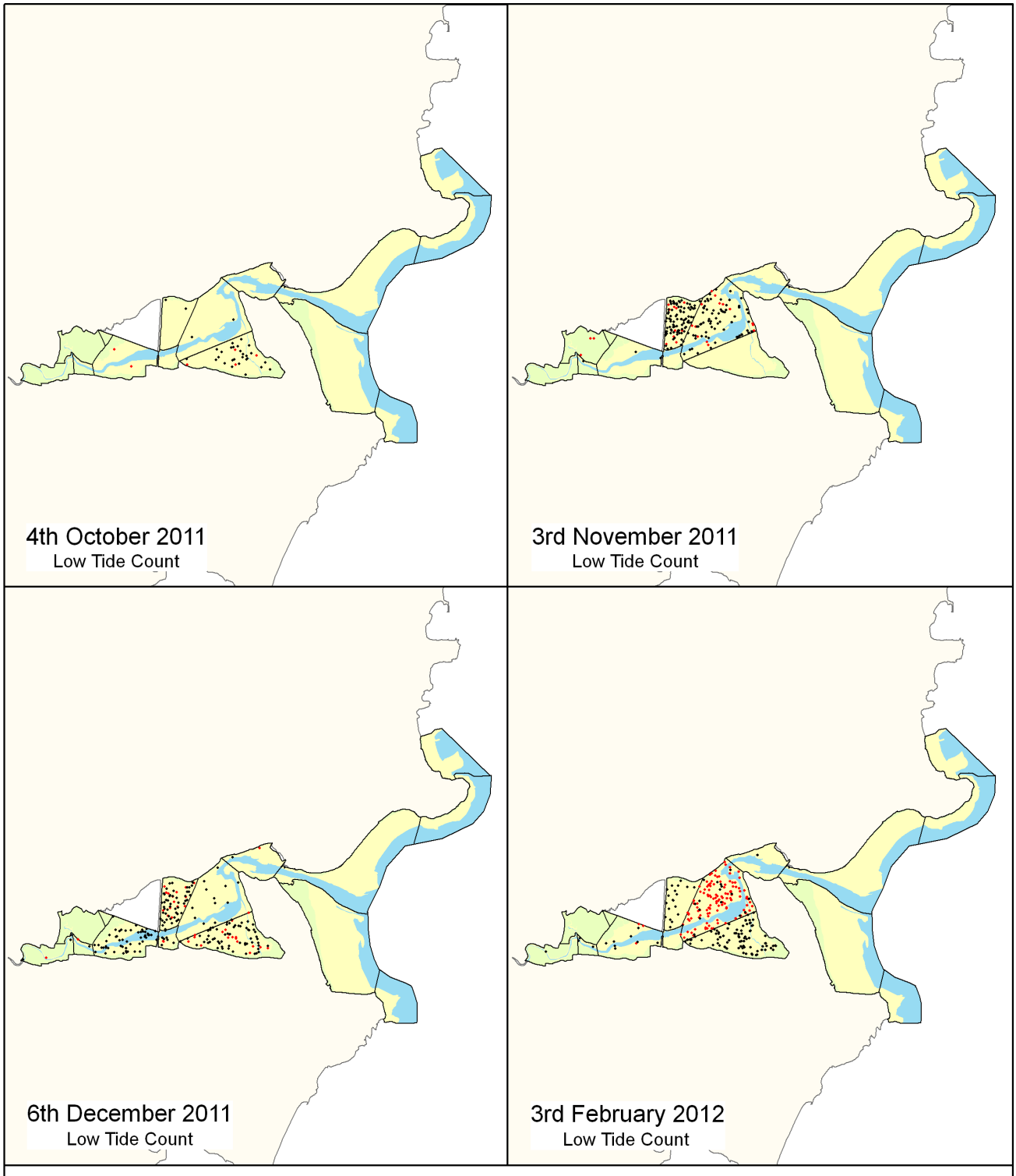
Waterbird distribution (dot-density diagrams) recorded during low tide surveys (October 2011 – February 2012)



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
LIGHT-BELLIED BRENT GOOSE
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.

N
Map Version 1
Date: Jan 13



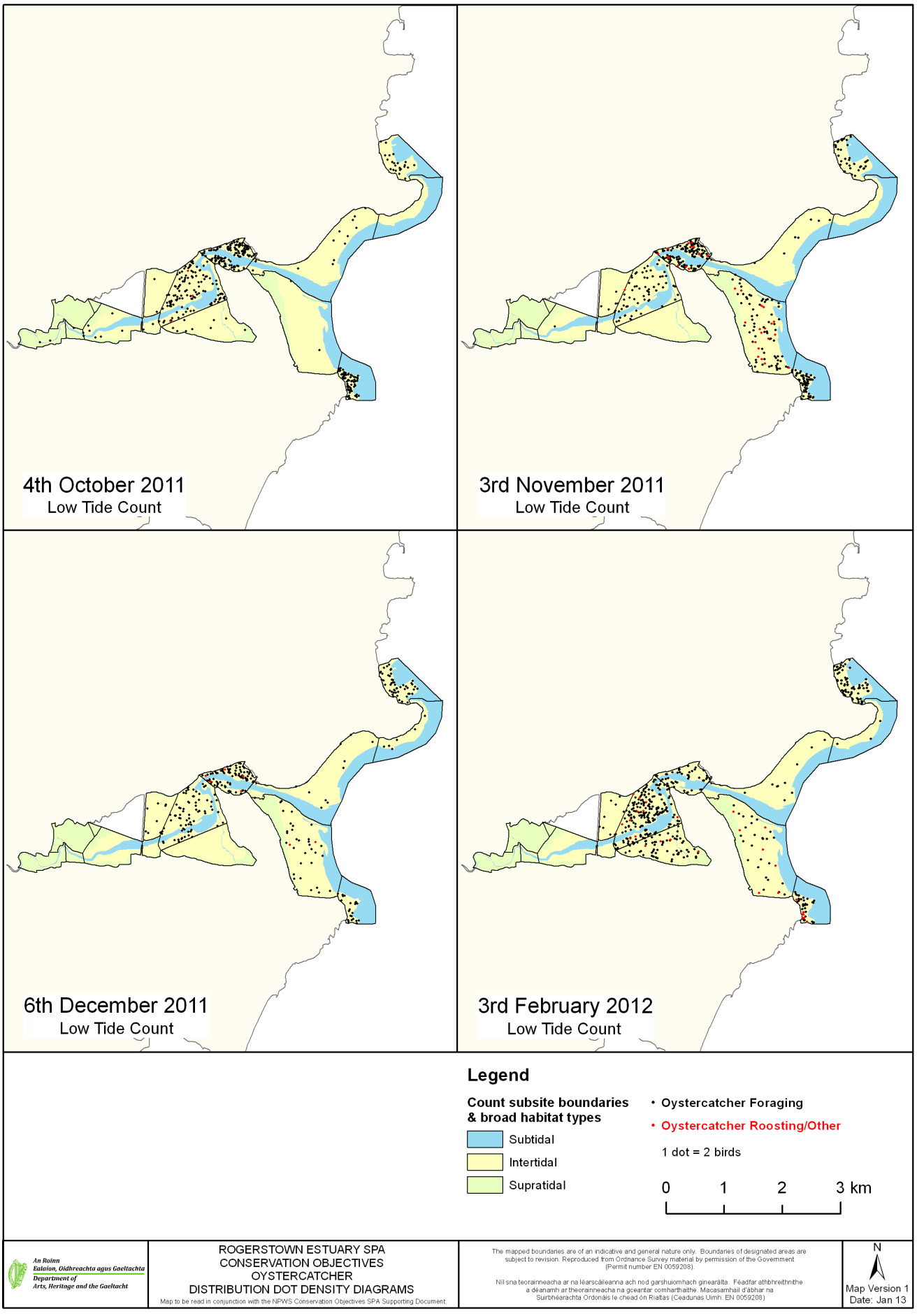
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

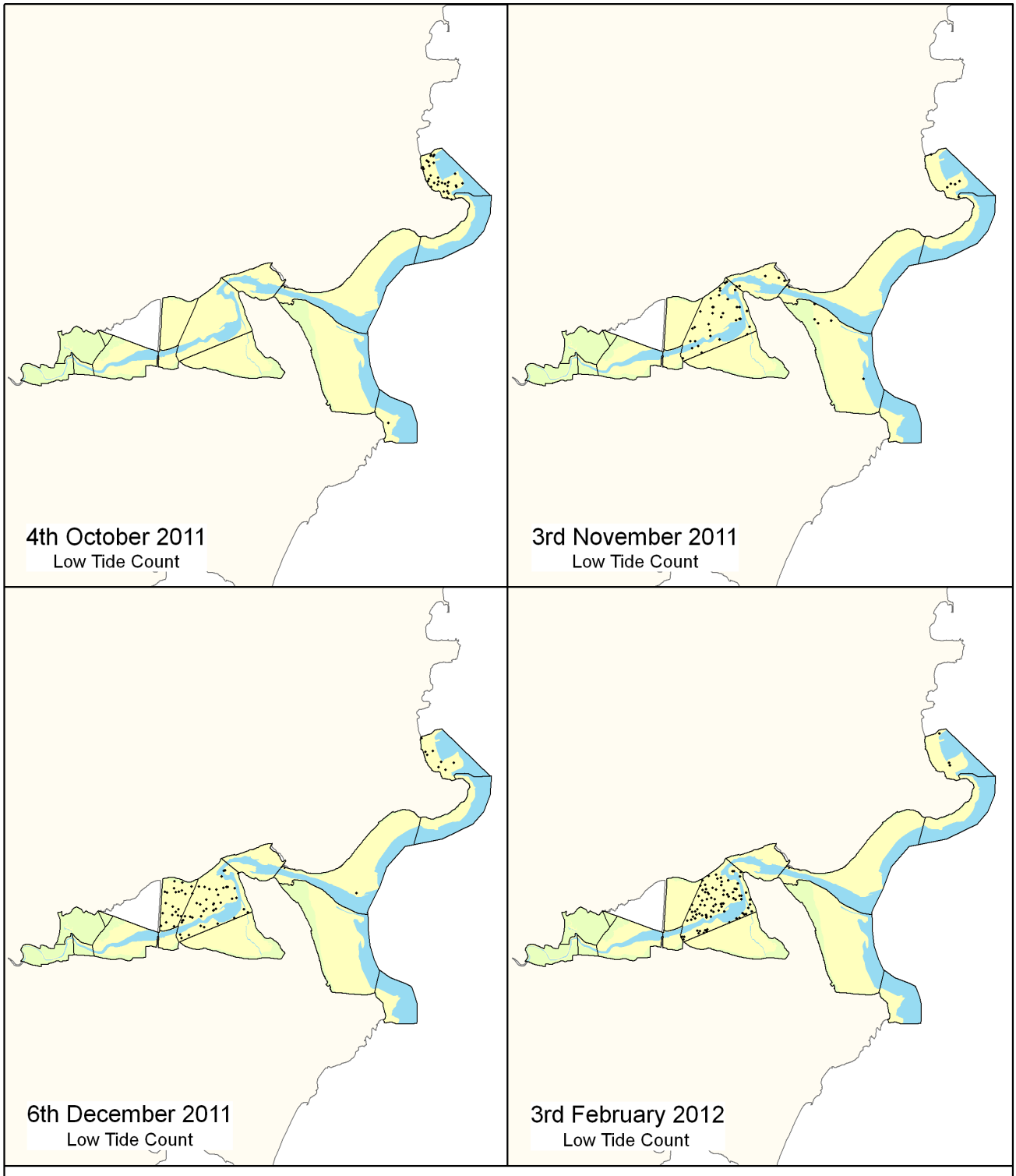
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
SHELDUCK
DISTRIBUTION DOT DENSITY DIAGRAMS

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

N

Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
• Oystercatcher Foraging
• Oystercatcher Roosting/Other
1 dot = 2 birds
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
OYSTERCATCHER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 13



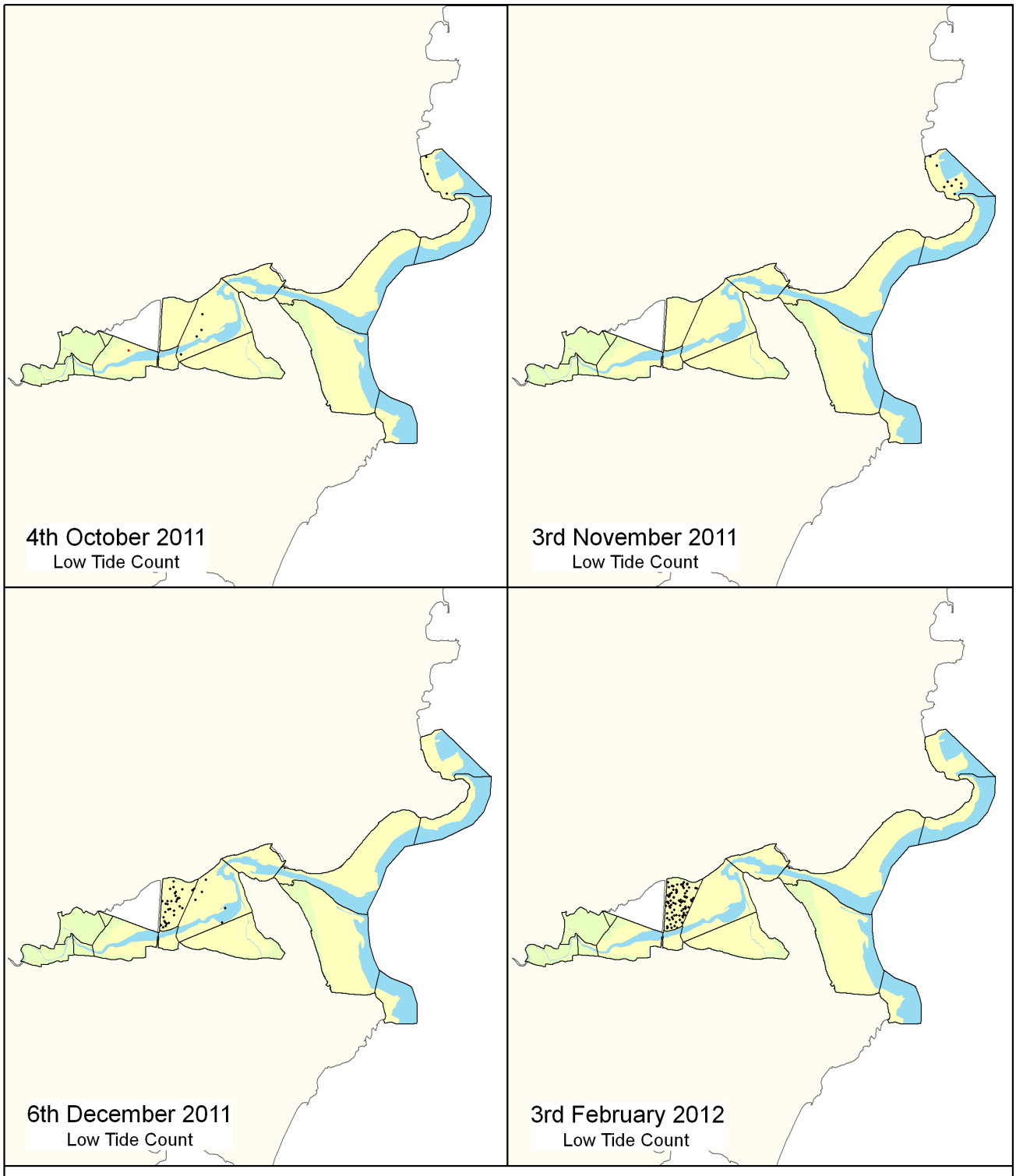
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

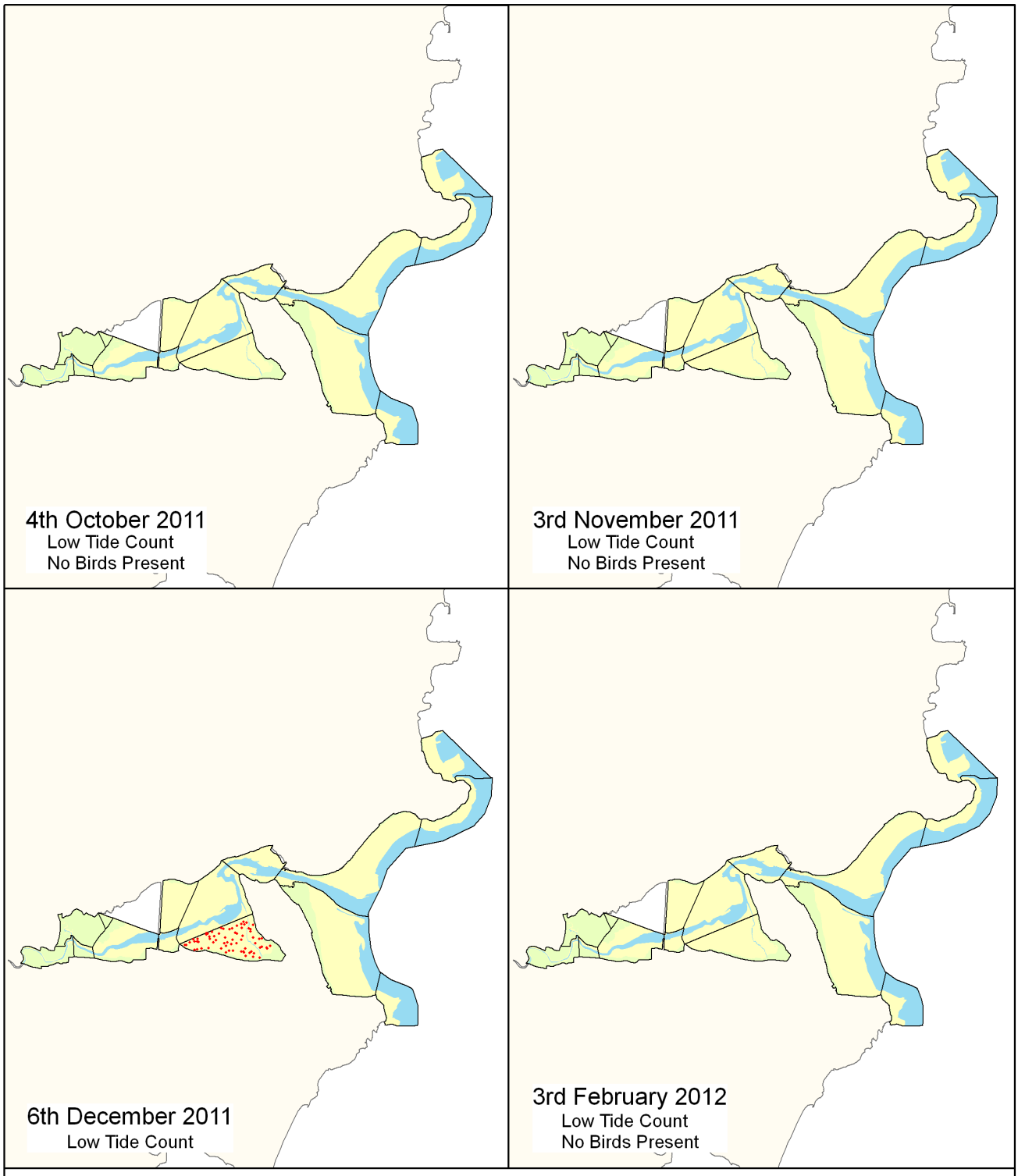
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
RINGED PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS

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

N

Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
• Knot Foraging
• Knot Roosting/Other
1 dot = 1 bird
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
KNOT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordanáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 13



Legend

Count subsite boundaries & broad habitat types

- Subtidal
- Intertidal
- Supratidal

• **Greylag Goose Roosting/Other**

1 dot = 1 bird

0 1 2 3 km

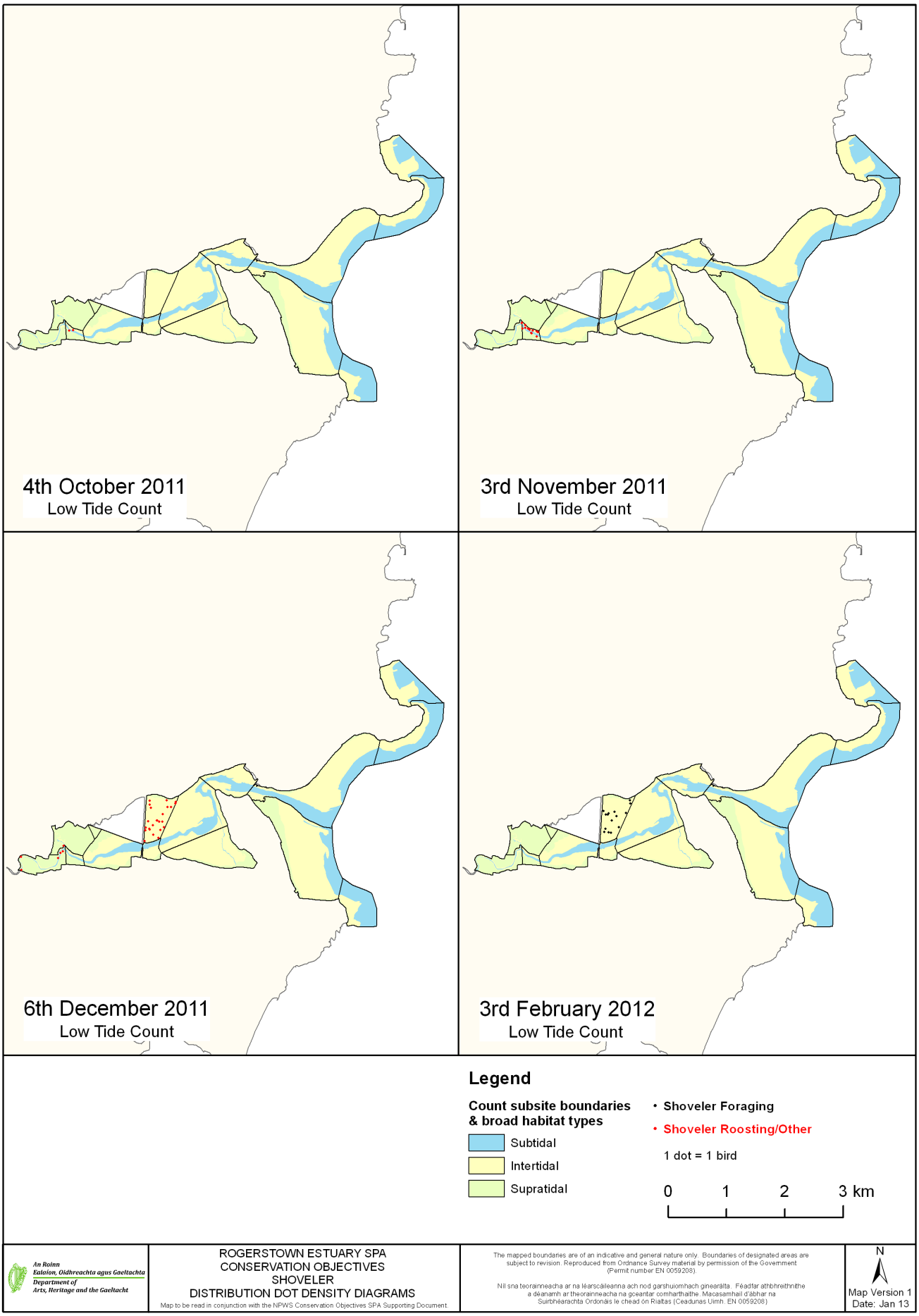
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

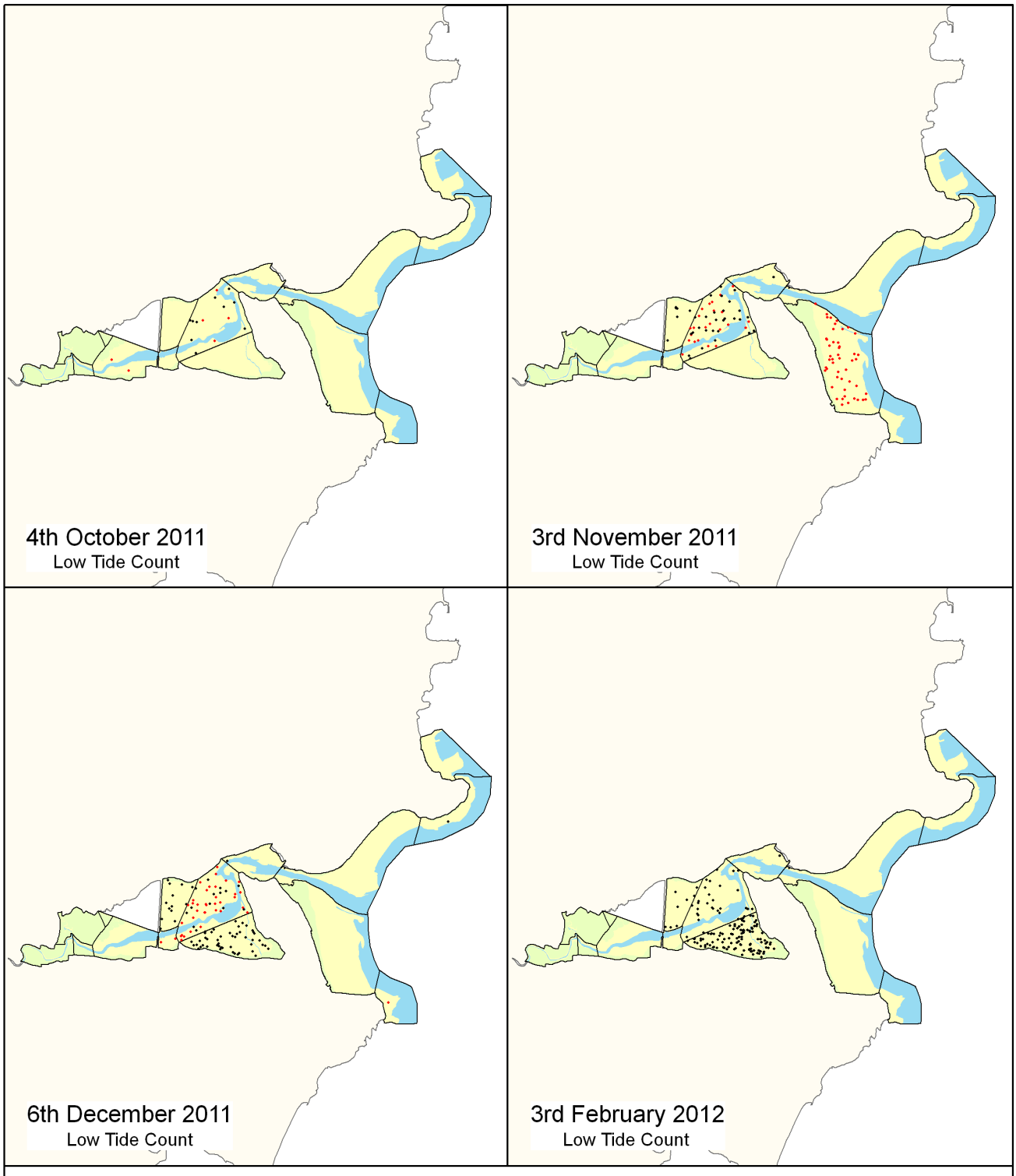
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
GREYLAG GOOSE
DISTRIBUTION DOT DENSITY DIAGRAMS

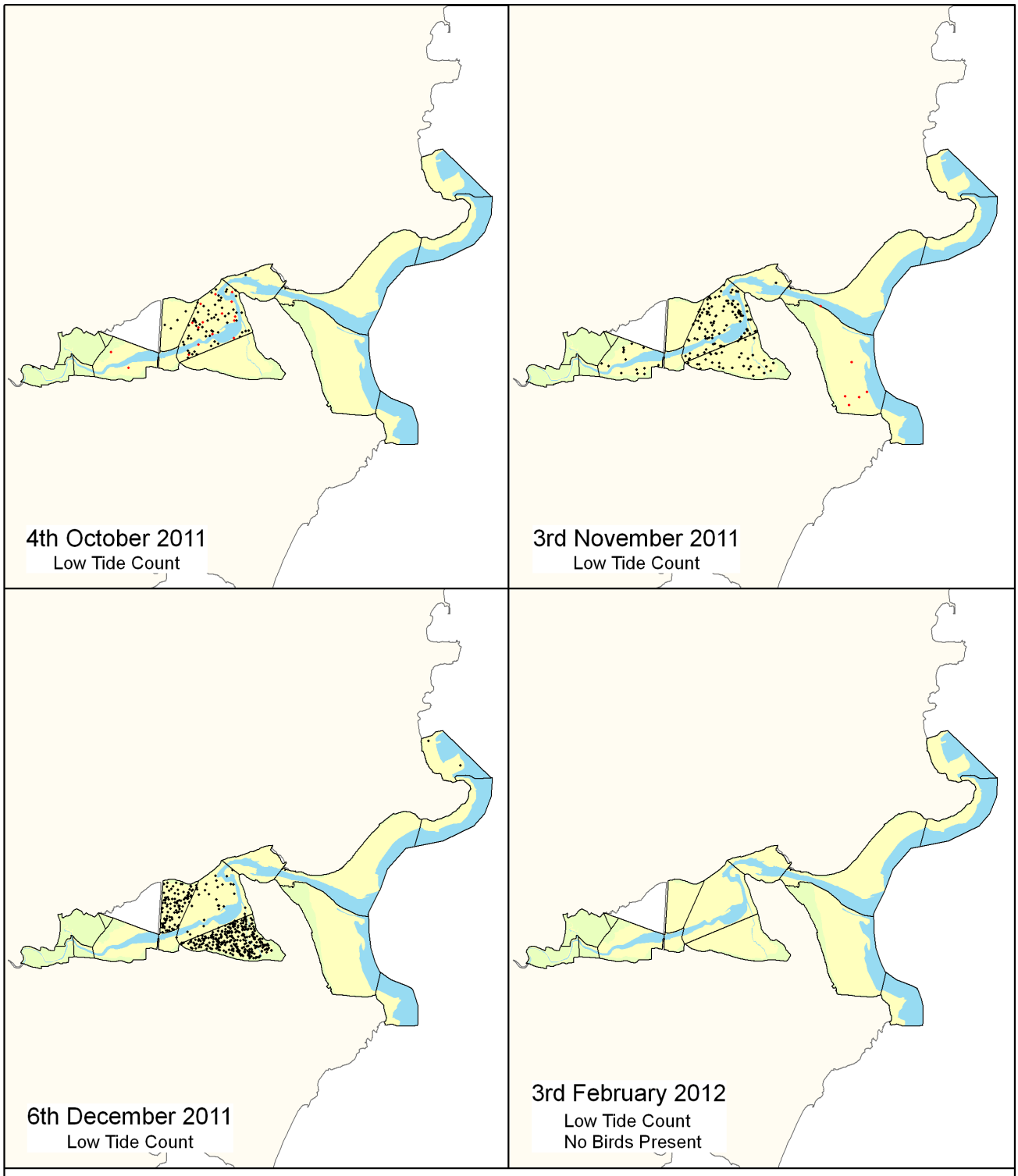
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.

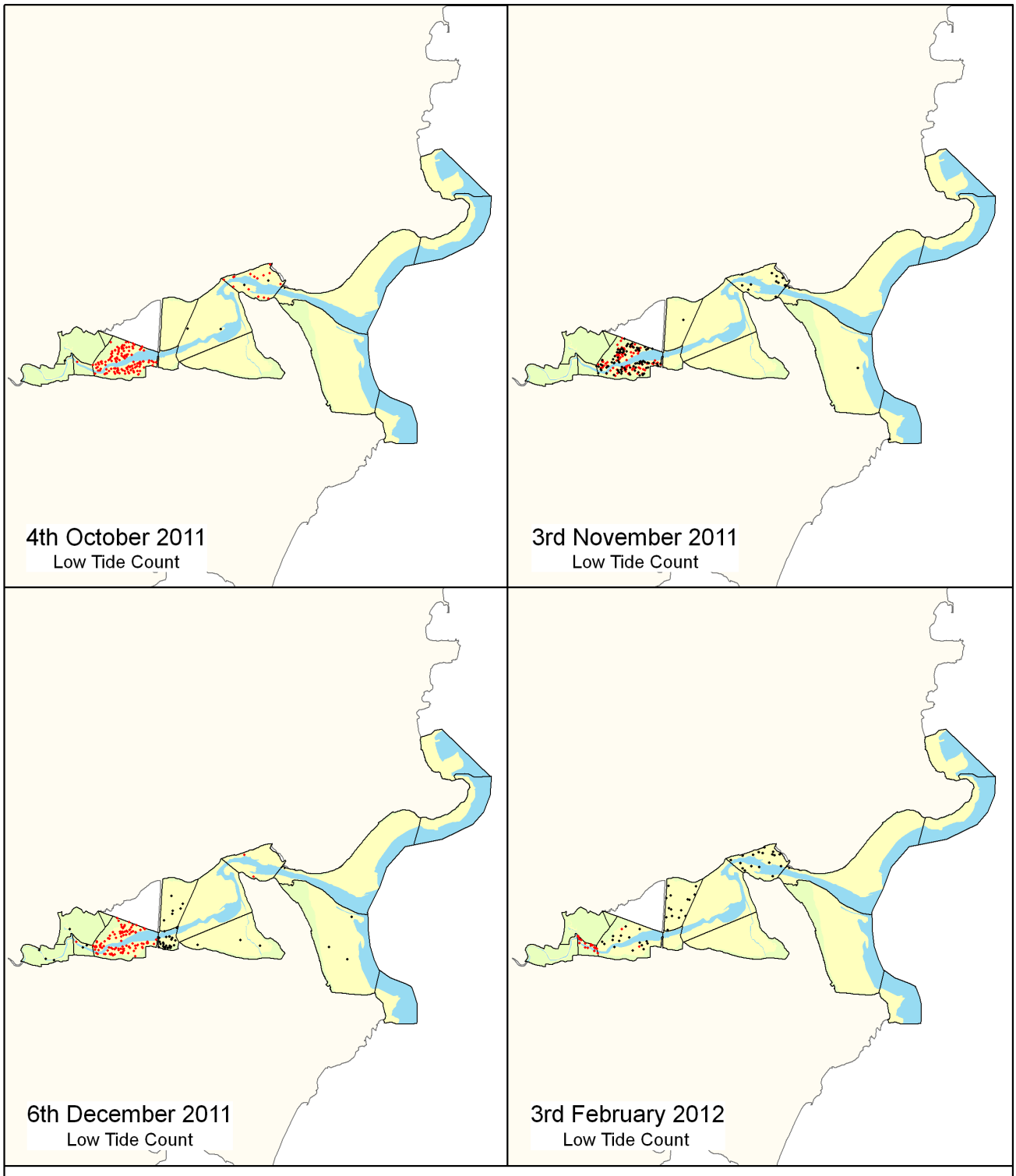
N

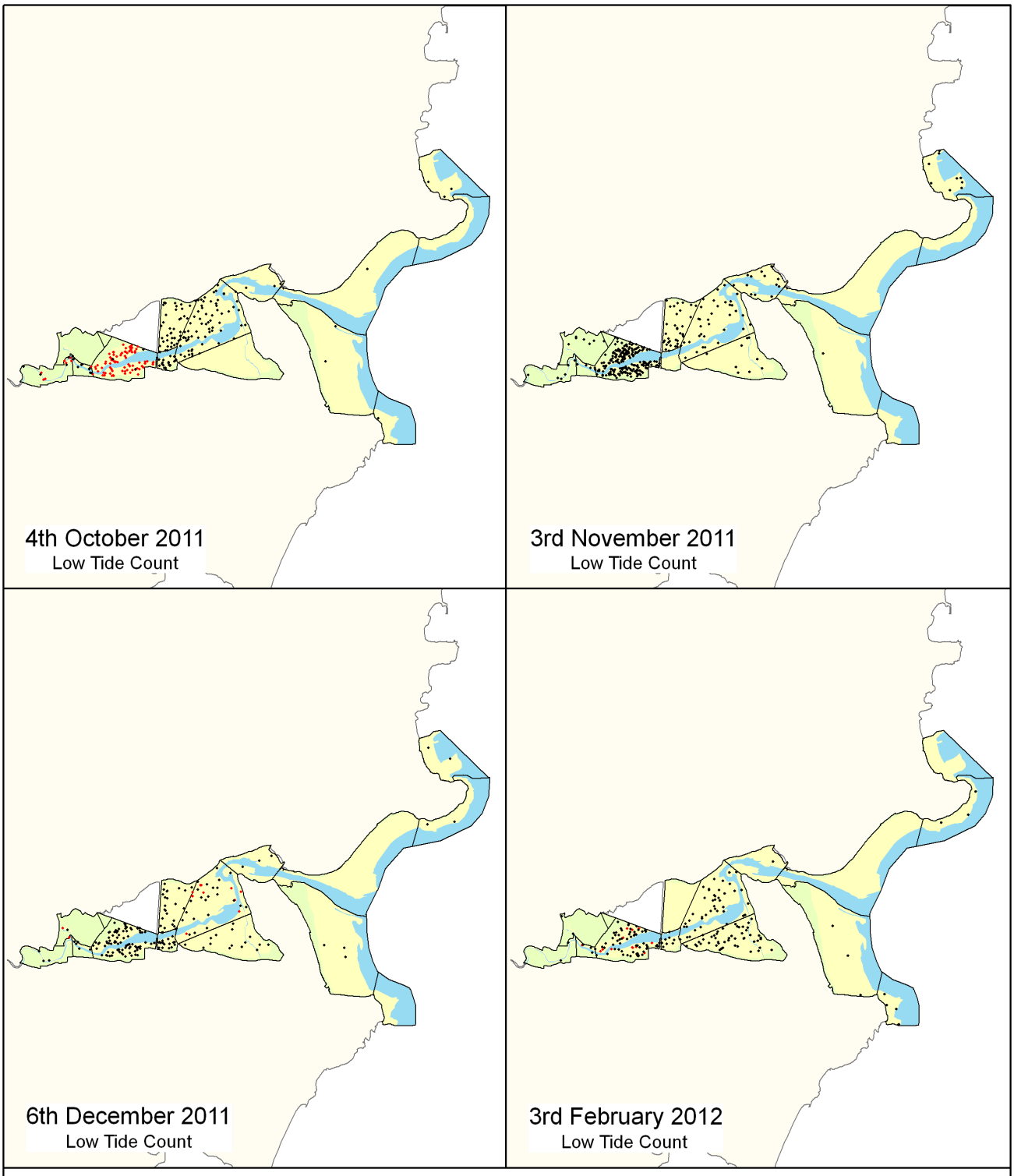
Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
• Shoveler Foraging
• Shoveler Roosting/Other
1 dot = 1 bird
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
SHOVELER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208).
N
Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
• Grey Plover Foraging
• Grey Plover Roosting/Other
1 dot = 1 bird
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
GREY PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
No Birds Present
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Dunlin Foraging
Dunlin Roosting/Other
1 dot = 3 birds
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
DUNLIN
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 13


4th October 2011
Low Tide Count
3rd November 2011
Low Tide Count
6th December 2011
Low Tide Count
3rd February 2012
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
• Black-tailed Godwit Foraging
• Black-tailed Godwit Roosting/Other
1 dot = 1 bird
0 1 2 3 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
BLACK-TAILED GODWIT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 13



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

ROGERSTOWN ESTUARY SPA
CONSERVATION OBJECTIVES
REDSHANK
DISTRIBUTION DOT DENSITY DIAGRAMS

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

N

Map Version 1
Date: Jan 13

APPENDIX 8

Rogerstown Estuary

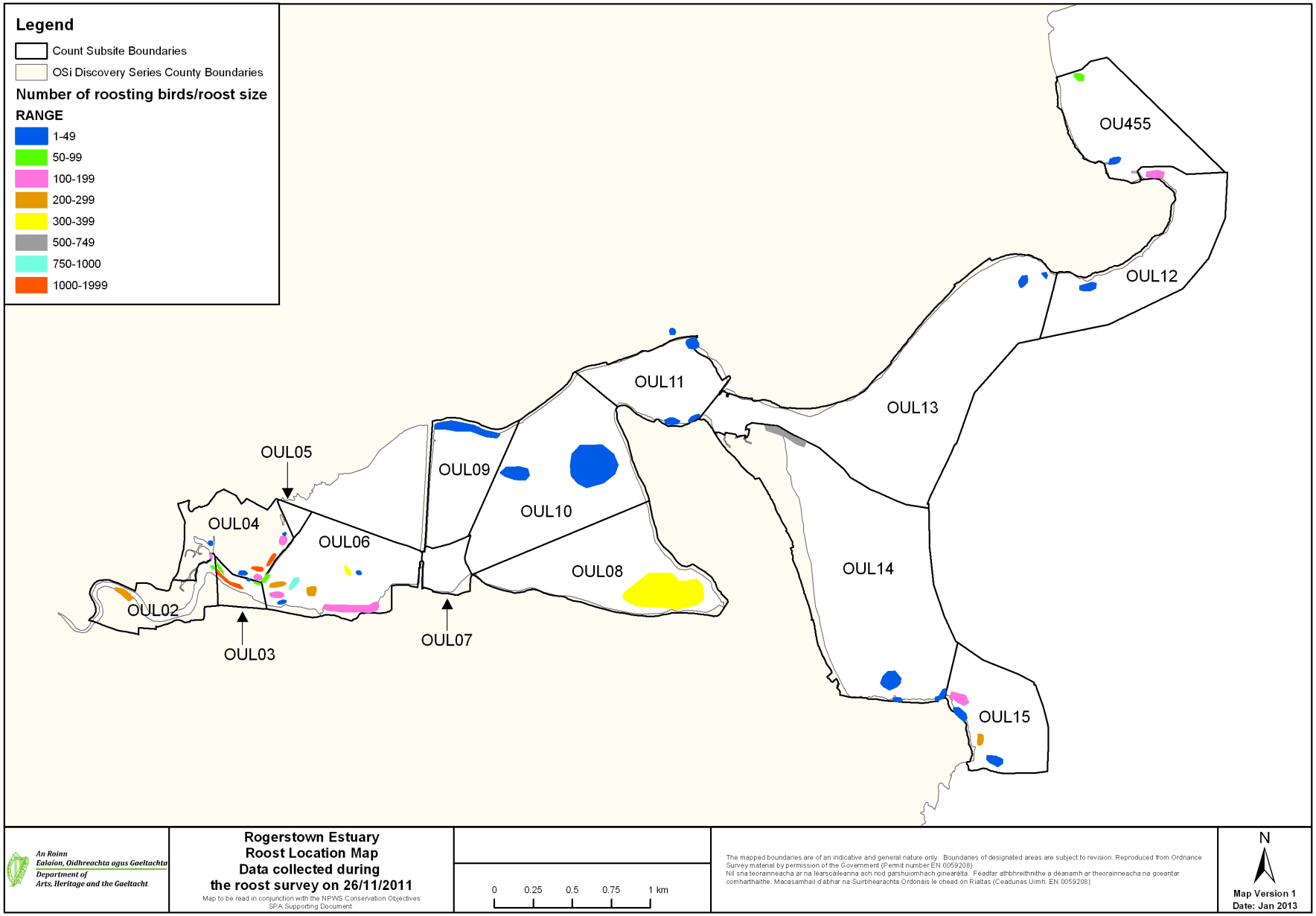
(1a) Summary data and roost location maps from the roost survey 26th November 2011
(Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite	Subsite Name	Number individual roost locations	No. Species	Species (alphabetical order)
0UL02	Turvey	3	6	L., MA, RK, SV, T., WN
0UL03	Turvey Hide	4	10	CU, GB, HG, L., OC, PB, SU, SV, T., WN
0UL04	New Haggard	7	10	BH, CU, GB, HG, L., PB, RK, SU, SV, T.
0UL05	Tip Corner	-	-	
0UL06	Beaverstown	9	13	BH, CM, CU, DN, GB, HG, L., MA, MU, PB, RK, SU, WN
0UL07	Rogerstown viaduct	-	-	
0UL08	Portraine	1	2	PB, SU
0UL09	Railway	1	1	SU
0UL10	Rogerstown estuary	2	2	GB, RM
0UL11	Rogerstown pier	4	6	H., MA, MO, PB, RK, WN
0UL12	Rush-Martello tower	2	8	BH, CM, GB, HG, OC, RK, RH, TT
0UL13	Rush Beach	2	3	BH, LB, RK
0UL14	Portraine Beach	4	8	BA, BH, CM, DN, GV, HG, LB, OC
0UL15	Portraine Quay	4	5	H., HG, OC, RK, TT
0U455	Inner: S Channel Roost	2	4	CA, GB, HG, SS

* note that numbers of birds are not totalled for each subsite because some subsites were visited more than once and the same birds may have been counted more than once.

(1b) Rogerstown Estuary SPA (4015) SCI species and recorded roosts 26/11/11: shows number of roost locations within the subsite and in brackets, the peak number recorded at a single roost location

Subsite Code	PB	SU	OC	SV	GV	DN	RK
0UL02				1 (2)			3 (102)
0UL03	2 (387)	1 (4)	1 (1)	1 (5)			
0UL04	1 (29)	3 (154)		1 (3)			1 (27)
0UL05							
0UL06	2 (121)	1 (5)				1 (1)	1 (48)
0UL07							
0UL08	1 (4)	1 (327)					
0UL09		1 (44)					
0UL10							
0UL11	1 (16)						2 (2)
0UL12			2 (76)				1 (4)
0UL13							1 (3)
0UL14			3 (630)		1 (23)	1 (1)	
0UL15			4 (97)				3 (2)
0U455							


Legend
Count Subsite Boundaries
OSi Discovery Series County Boundaries
Number of roosting birds/roost size
RANGE
1-49
50-99
100-199
200-299
300-399
500-749
750-1000
1000-1999
OU455
OUL12
OUL11
OUL13
OUL05
OUL09
OUL10
OUL04
OUL06
OUL08
OUL14
OUL02
OUL03
OUL07
OUL15
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Rogerstown Estuary
Roost Location Map
Data collected during
the roost survey on 26/11/2011
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 2013

(2a) Summary data and roost location maps from the roost survey 7th February 2012

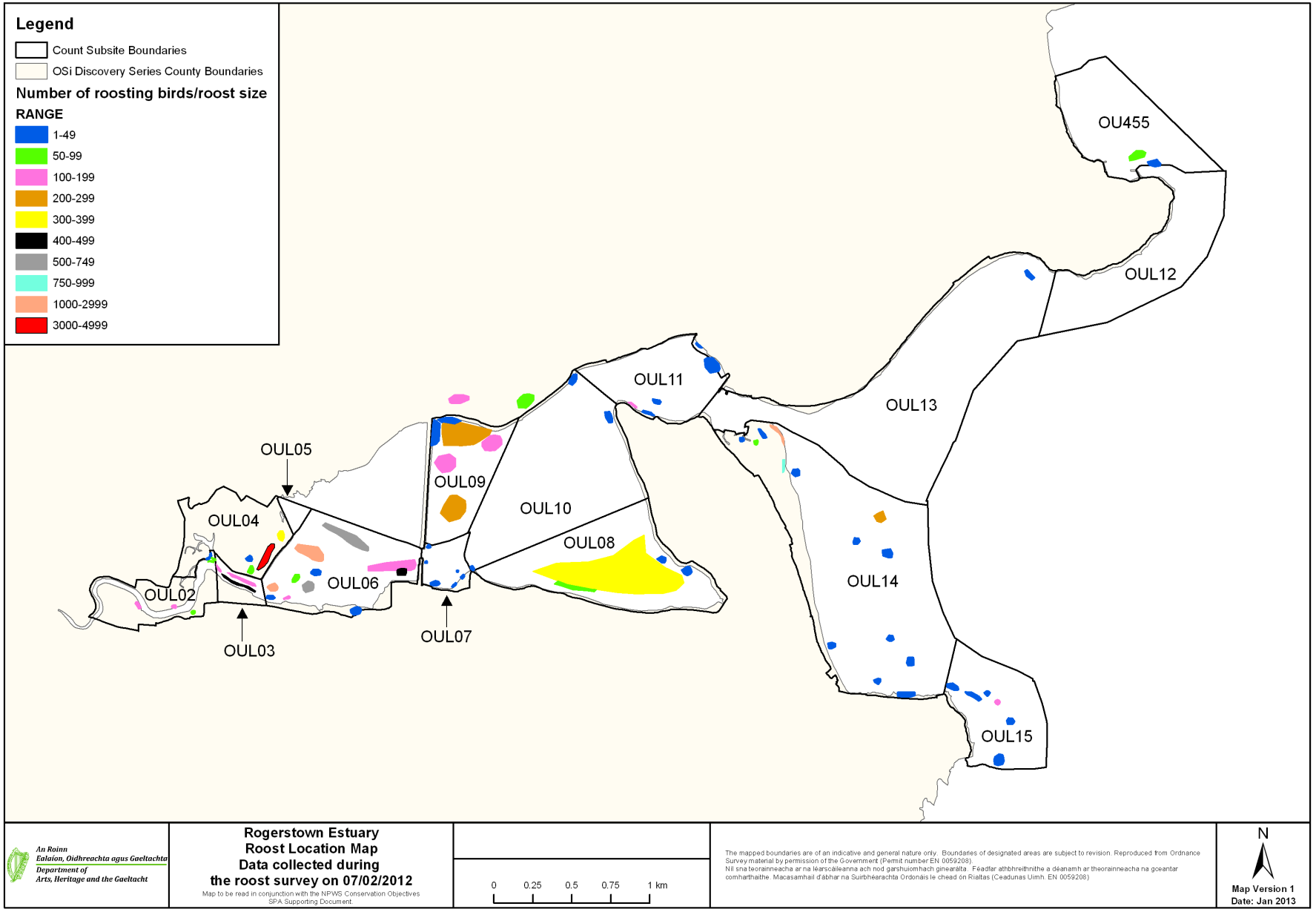
(Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite	Subsite Name	Number individual roost locations	No. Species	Species (alphabetical order)
0UL02	Turvey	6	9	BH, BW, GK, L., MA, RK, SU, T., WN
0UL03	Turvey Hide	3	8	BW, L., MA, PB, RU, SU, T., WN
0UL04	New Haggard	4	12	BW, CU, GB, H., GV, L., PB, RK, RU, SU, T., WN
0UL05	Tip Corner	-	-	
0UL06	Beaverstown	11	21	BA, BH, BW, CM, CU, ET, GB, GP, GV, HG, IG, KN, L., LB, LG, MA, MU, RK, SU, T., WN
0UL07	Rogerstown viaduct	6	6	BH, GV, LG, RK, T., WN
0UL08	Portraine	4	6	BH, MA, SU, SV, T., WN
0UL09	Railway	7	14	BH, BW, CM, CU, GB, GK, HG, L., PB, RK, SU, SV, WB, WN
0UL10	Rogerstown estuary	3	4	H., GV, RK, TT
0UL11	Rogerstown pier	5	9	BH, CM, GK, GV, OC, PB, RM, RK, TT
0UL12	Rush-Martello tower	-	-	
0UL13	Rush Beach	1	1	HG
0UL14	Portraine Beach	14	14	BH, CM, DN, ET, GG, GV, HG, KN, OC, RK, RP, SA, TT, WN
0UL15	Portraine Quay	6	10	BH, CA, CM, CU, DN, HG, OC, PB, RK, TT
0U455	Inner: S Channel Roost	2	3	BH, CM, OC

* note that numbers of birds are not totalled for each subsite because some subsites were visited more than once and the same birds may have been counted more than once.

(2b) Rogerstown Estuary SPA (4015) SCI species and recorded roosts 07/02/12: shows number of roost locations within the subsite and in brackets, the peak number recorded at a single roost location

Subsite Code	PB	SU	OC	RP	KN	SV	GV	DN	BW	RK
0UL02		1 (5)							1 (2)	3 (10)
0UL03	1 (240)	1 (1)							3 (21)	
0UL04		1 (17)					1 (5)		1 (60)	1 (33)
0UL05										
0UL06		2 (31)			1 (10)		4 (35)		3 (100)	4 (24)
0UL07							1 (1)			2 (4)
0UL08		2 (311)				1 (1)				
0UL09	1 (125)	3 (216)				1 (5)			1 (18)	1 (18)
0UL10							1 (1)			1 (1)
0UL11	1 (22)		1 (165)				1 (5)			3 (14)
0UL12										
0UL13										
0UL14			2 (990)	2 (11)	1 (7)		1 (65)	1 (750)		1 (1)
0UL15	1 (2)		2 (94)					1 (2)		1 (1)
0U455			1 (78)							


Legend
Count Subsite Boundaries
OSi Discovery Series County Boundaries
Number of roosting birds/roost size
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-749
750-999
1000-2999
3000-4999
OU455
OUL12
OUL11
OUL13
OUL05
OUL09
OUL10
OUL04
OUL08
OUL14
OUL06
OUL02
OUL07
OUL03
OUL15
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Rogerstown Estuary
Roost Location Map
Data collected during
the roost survey on 07/02/2012
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).
Nil sna teorainneacha ar na learscaileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail dábhar na Suirbhéarachta Ordanáis le chead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 2013

APPENDIX 9

Rogerstown Estuary - Activities & Events

Please note that this list is based on the current review process and is not exhaustive.

Legend:	
O	observed or known to occur in or around Rogerstown Estuary.
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.
	Grey highlighting refers to activities that have the potential to cause disturbance to waterbirds.

Activities/Events	0UL02	0UL03	0UL04	0UL05	0UL06	0UL07	0UL08	0UL09	0UL10	0UL11	0UL12	0UL13	0UL14	0UL15	0U455
1. Coastal protection, sea defences & stabilisation															
1.1 Linear defences	O	O	O		O	O	O	O	O	O			O		
1.2 Training walls											O				
1.4 *Spartina* growing/planted	O	O	O	O	O		O	O	O	O			O		
1.5 Marram grass													O		
4. Industrial, port & related development															
4.2 Fishing harbour										O	O				O
4.3 Slipway										O	O	O			O
4.4 Pier										O	O	O		O	O
6. Pollution															
6.1 Domestic & urban waste water					H			H							
6.3 Landfill			O	O	O										
6.4 Agricultural & forestry effluents	O	O	O		O	O	O	H	O						
6.7 Solid waste incl. fly-tipping			O		O	O		O	O				O		
8. Transport & communications															
8.3 Bridges & aqueducts					O	O		O							
8.5 Road schemes						O	O	O	O				O	O	
8.6 Car parks											O	O	O	O	
8.8 Rail lines						O		O							
9. Urbanisation															
9.1 Urbanised areas, housing						O	O	O	O	O	O	O	O	O	
11. Education & scientific research															
11.2 Nature trails	O	O	O												
12. Tourism & recreation															
12.2 Non-marina moorings										O					
12.3 Dinghy & boat parks												O			
12.4 Caravan parks & chalets													O	O	

12.8 Sailing											O	O	O			
12.15 Angling										O	O	O				
12.17 Bathing & general beach recreation										O	O	O	O			
12.18 Walking, incl. dog walking	O								O	O	O	O	O	O	O	
12.19 Birdwatching	O	O	O		O	O	O	O	O	O	O	O	O	O		
12.20 Sand-yachting												O				
12.22 Motorised vehicles											O		O			
12.23 Horse-riding												O	O			
12.25 Golf courses					O	O						O				
13. Wildfowl & hunting																
13.1 Wildfowling						O		H	H							
13.2 Other hunting-related activities	O															
14. Bait-collecting																
14.1 Digging for lugworms/ragworms						O		O	O		O	O			O	
15. Fisheries & Aquaculture																
15.5 Leisure fishing										O	O	O				
15.6 Molluscs - hand-gathering									O		O		O	O		
16. Agriculture & forestry																
16.1 Saltmarsh grazing/harvesting			O													
16.3 Grazing: non-intensive (terrestrial)	O	O	O													
16.4 Sand dune grazing													H			
16.6 Crop production: intensive	O					O	O	O	O							
16.9 Removal of hedges, scrub	H					O		O								
16.10 Mowing/grassland cutting	H		H													
16.13 Agricultural land-claim	H		H		H											
16.14 In-filling of ditches, ponds, pools, marshes	H		H													
16.20 Others						O		O	O				O			
18. Wildlife habitat management																

18.1 Control of *Spartina* or other vegetation					F										
18.2 Habitat creation & restoration - intertidal	F		F												
18.4 Habitat management	O		O												
19. Natural events															
19.1 Storms, floods and storm surges	H	H	H		O	H	H	H	H				H		
19.2 Severe cold weather						H	H	H	O				H		

APPENDIX 10

Disturbance Assessment

Scoring system - definitions & rationale

Frequency/Duration	Score	Rationale
Continuous	3	Continuous motion or noise; not necessarily 24-hours per day but zones of fairly continuous activity such as a port or marina.
Frequent	2	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	1	Observed only once or twice during the survey programme and known/considered likely to be infrequent.
Rare	0	Known to occur but not observed during the survey programme and considered likely to be rare in occurrence.
Intensity	**Score**	**Rationale**
Active, high-level	3	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	2	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	1	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	0	Any activities considered to impart little effect upon waterbirds.
Response	**Score**	**Rationale**
Most birds disturbed all of the time	3	Birds do not return - therefore equivalent to habitat loss.
Most birds displaced for short periods	2	Birds return once disturbance has ceased.
Most species tolerate disturbance	1	Weak response, birds may move slightly away from disturbance source.
Most birds successfully habituate to the disturbance	0	Little determinable effects.

The scores assigned to the three attributes were then added together to give an overall 'disturbance score' which is used to define the extent of the impact as follows:-

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

Scoring system – worked example

Disturbance event – humans walking along a beach; the beach is a popular recreational area and this activity was recorded frequently during surveys.		
Attribute	**Score**	**Rationale**
Frequency/Duration	2	Recorded frequently during the survey period; known area of beach recreation.
Intensity	2	Medium level - considered likely to result in waterbirds moving away from the source of disturbance although response will be species-specific and some species may even habituate to the activity.
Response	2	Most birds are displaced for short periods and therefore will resume their previous behaviour in the area when the activity ceases.
TOTAL SCORE	**6**	**MODERATE**

Results - based on data from the 2011/12 Waterbird Survey Programme

Activity/Event	0UL02	0UL03	0UL04	0UL05	0UL06	0UL07	0UL08	0UL09	0UL10	0UL11	0UL12	0UL13	0UL14	0UL15	0U455
12. Tourism & recreation															
12.18 Walking, incl. dog walking	5								3			7	7	6	
14. Bait-collecting															
14.1 Bait-digging								5	5		5				
15. Fisheries & Aquaculture															
15.6 Molluscs - hand-gathering									3					4	
16. Agriculture & forestry															
16.20 Other (crop scarer)									4				4		