Dundalk Bay
Special Protection Area

(Site Code 4026)

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VERSION 1

Conservation Objectives
Supporting Document

National Parks & Wildlife Service

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SUMMARY

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

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

Part Two provides site designation information for Dundalk Bay Special Protection Area.

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

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

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

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

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

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

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

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

Selection species:

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

Additional Conservations Interests:

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

1.2 Introduction to Dundalk Bay Special Protection Area

Dundalk Bay is a large, shallow and east-facing sea bay that extends some 16 km from Castletown River on the Cooley Peninsula, in the north, to Annagassan/Salterstown in the south. The bay is shallow and open to the Irish Sea, being partially sheltered by the Cooley Peninsula along the northern side and Dunany Point in the south.

The site includes a rich diversity of habitats such as marine waters, saltmarshes, estuaries, extensive sand and mud flats, boulder beach and bedrock shore, sandy beach and shingle beach. Extensive intertidal flats occur, mostly sandy in nature - although muddy areas occur in the estuary and along the channels/creeks. The extensive sand and mud flats have a rich fauna of molluscs, polychaetes and crustaceans which provide an important food resource for most of the bay's wintering waterfowl. The site also includes extensive areas of saltmarsh that provide important roosting areas; the main areas are Lurgangreen, Marsh South, Dundalk Harbour and Bellurgan.

The site encompasses the mouths and small muddy estuaries of the Rivers Dee, Glyde, Fane and Castletown and includes Dundalk Harbour and Ballymascanlan Bay to the northwest.

Dundalk Bay SPA is one of the most important wintering waterfowl sites in the country and one of the few that regularly supports more than 20,000 waterbirds. During the baseline data period, four species occurred in numbers of international importance and a further 19 species in numbers of all-Ireland importance.

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

1.3 Introduction to Conservation Objectives

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve '*favourable conservation status'* and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2010). In its broadest sense, favourable conservation status means that an ecological feature is being maintained in a satisfactory condition, and that this status is likely to continue into the future. Definitions as per the EU Habitats Directive are given in Box 1.

Box 1

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

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

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

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

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

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

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

1.4 How Dundalk Bay SPA Conservation Objectives were formulated

This document presents conservation objectives for the non-breeding waterbird Special Conservation Interests of Dundalk Bay SPA.

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

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

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

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

PART TWO – SITE DESIGNATION INFORMATION

2.1 SPA Qualifying Features – Dundalk Bay Special Protection Area

Dundalk Bay is selected for SPA designation as it regularly holds an assemblage of over 20,000 wintering waterbirds making this a site of international importance. The mean peak number of total waterbirds within the site during the baseline period (1995/96 – 1999/00) was 59,271 individuals.[3]

The selection and additional special conservation interests listed for Dundalk Bay SPA are as follows:

1. 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 435 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

2. The site regularly supports 1% or more of the biogeographical population of Light-bellied Brent Goose (*Branta bernicla hrota*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 370 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

3. The site regularly supports 1% or more of the all-Ireland population of Red-breasted Merganser (*Mergus serrator*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 121 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

4. The site regularly supports 1% or more of the all-Ireland population of Great Crested Grebe (*Podiceps cristatus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 303 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

5. The site regularly supports 1% or more of the all-Ireland population of Oystercatcher (*Haematopus ostralegus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 8,746 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

6. The site regularly supports 1% or more of the all-Ireland population of Golden Plover (*Pluvialis apricaria*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 5,967 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

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

7. The site regularly supports 1% or more of the biogeographical population of Knot (*Calidris canutus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 9,710 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

8. The site regularly supports 1% or more of the all-Ireland population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 11,518 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

9. The site regularly supports 1% or more of the biogeographical 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 1,100 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

10. The site regularly supports 1% or more of the biogeographical population of Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 1,950 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

11. The site regularly supports 1% or more of the all-Ireland population of Curlew (*Numenius arquata*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,264 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

12. The site regularly supports 1% or more of the all-Ireland population of Redshank (*Tringa totanus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,659 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

13. The site regularly supports 1% or more of the all-Ireland population of Black-headed Gull (*Chroicocephalus ridibundus*)[4]. The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 6,643 individuals. Further to the species assessment, Dundalk Bay was selected because it is one of the most suitable sites in the country for the conservation of this species.

[4] Formerly *Larus ribibundus.*

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

Shelduck (*Tadorna tadorna*),
Teal (*Anas crecca*),
Mallard (*Anas platyrynchos*),
Pintail (*Anas acuta*),
Common Scoter (*Melanitta nigra*)
Ringed Plover (*Charadrius hiaticula*),
Grey Plover (*Pluvialis squatarola*),
Lapwing (*Vanellus vanellus*),
Common Gull (*Larus canus*)
Herring Gull (*Larus argentatus*).

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

Table 2.1 provides a designation summary for Dundalk Bay SPA.

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

Table 2.1 Designation Summary: Dundalk Bay Special Protection Area

SPA Name	Dundalk Bay					
SPA Site Code	4026					
	Special Conservation Interests	**Annex I species**	**Baseline population**		**Population status at baseline**	
Site Selection Species	Assemblage of over 20,000 waterbirds					
	Greylag Goose		435		All-Ireland Importance	
	Light-bellied Brent Goose		370		International Importance	
	Red-breasted Merganser		121		All-Ireland Importance	
	Great Crested Grebe		303		All-Ireland Importance	
	Oystercatcher		8,746		All-Ireland Importance	
	Golden Plover	Yes	5,967		All-Ireland Importance	
	Knot		9,710		International Importance	
	Dunlin		11,518		All-Ireland Importance	
	Black-tailed Godwit		1,100		International Importance	
	Bar-tailed Godwit	Yes	1,950		International Importance	
	Curlew		1,264		All-Ireland Importance	
	Redshank		1,659		All-Ireland Importance	
	Black-headed Gull		6,643		All-Ireland Importance	
Additional Special Conservation Interests	Shelduck		522		All-Ireland Importance	
	Teal		538		All-Ireland Importance	
	Mallard		765		All-Ireland Importance	
	Pintail		117		All-Ireland Importance	
	Common Scoter		581		All-Ireland Importance	
	Ringed Plover		151		All-Ireland Importance	
	Grey Plover		204		All-Ireland Importance	
	Lapwing		4,892		All-Ireland Importance	
	Common Gull		551		All-Ireland Importance	
	Herring Gull		754		All-Ireland Importance	
Other conservation designations associated with the site[a]		**SAC**	**Ramsar**	**IBA**	**Wildfowl Sanctuary**	**Other**
		Yes	**Yes**	**Yes**	**Yes**	

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

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

The importance of the non-breeding populations of the Special Conservation Interest species of Dundalk Bay SPA relative to national populations, and the species' occurrence at regional and county level is shown in Table 2.2. 'Region' refers to regions as defined by Irish Regions Office and in the case of the border region takes into account cross-border sites Lough Foyle and Carlingford Lough. 'County' refers to wetland sites in County Louth and includes the cross-border site Carlingford Lough.

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

Site Special Conservation Interests (SCIs)	Numbers of International Importance	Numbers of All-Ireland Importance	National Importance Rank[1]	Regional Importance Rank[2]	County Importance Rank[3]
Light-bellied Brent Goose*	370		16	2	1
Greylag Goose*		435	2	2	2
Red-breasted Merganser*		121	4	2	1
Great Crested Grebe*		303	1	1	1
Oystercatcher*		8,746	1	1	1
Golden Plover*		5,967	7	1	1
Knot*	9,710		1	1	1
Dunlin*		11,518	2	1	1
Black-tailed Godwit*	1,100		3	1	1
Bar-tailed Godwit*	1,950		2	2	1
Curlew*		1,264	7	3	1
Redshank*		1,659	3	1	1
Black-headed Gull*		6,643	1	1	1
Shelduck		552	8	2	1
Teal		538	20	3	1
Mallard		765	5	3	1
Pintail		117	5	1	1
Common Scoter		581	5	2	1
Ringed Plover		151	15	1	1
Grey Plover		204	9	1	1
Lapwing		4,892	10	1	1
Common Gull		551	8	3	1
Herring Gull		754	3	2	1

* Denotes site selection species.

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

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

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

PART THREE - CONSERVATION OBJECTIVES FOR DUNDALK BAY SPA

3.1 Conservation Objectives for the non-breeding Special Conservation Interests of Dundalk Bay SPA

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

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

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

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

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

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

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

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

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

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

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

- The permanent **area** occupied by the wetland habitat should be stable and not significantly less than the areas of 8136, 4374 and 649 hectares for subtidal, intertidal, and supratidal habitats respectively, other than that occurring from natural patterns of variation.[8]

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

Table 3.1 Conservation Objectives for the non-breeding waterbird Special Conservation Interests of Dundalk Bay SPA.

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

Objective 2: *To maintain the favourable conservation condition of the wetland habitat at* Dundalk Bay *SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets.*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Area	Subtidal, Intertidal and Supratidal habitat areas	Area (Ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the areas of 8136, 4374 and 649 hectares for subtidal, intertidal, and supratidal habitats respectively, other than that occurring from natural patterns of variation	As defined by SPA boundary to MLWM; MLWM to MHWM; and MHWM to SPA boundary (the latter value is minus Lurgangreen Fields)

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

4.1 Population data for non-breeding waterbird SCI species of Dundalk Bay SPA

Dundalk Bay is a large, shallow and east-facing sea bay that extends some 16 km from Castletown River on the Cooley Peninsula, in the north, to Annagassan/Salterstown in the south. Non-breeding waterbirds have been counted regularly at this site as part of the Irish Wetland Bird Survey (I-WeBS) since the survey commenced in 1994. The total I-WeBS count area is 10,930 ha.

Table 4.1 presents population[9] data for the non-breeding waterbird Special Conservation Interest (SCI) species of Dundalk Bay SPA. For the majority of species, data in Table 4.1 are taken from the I-WeBS database. For the assessment of individual species populations (as shown in Table 4.1), total numbers are calculated from counts summed across all subsites counted in each month surveyed (I-WeBS months: Sept – March). The annual maxima is then identified and used to calculate the five-year mean peak. The baseline period is 1995/96 – 1999/00. The most recent five-year average is 2005/06 – 2009/10. To allow calculation of this recent average, the dataset comprises I-WeBS data for the period 2005/06 – 2008/09 and count data from the high tide survey of the 2009/10 waterbird survey programme.

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

In addition to I-WeBS, special species-specific surveys are also conducted on an annual or regular basis and these data are, where appropriate, integrated into the I-WeBS database. These surveys are described further in Appendix 2.

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

Gull species are not assigned 1% thresholds in Table 4.1. The wintering distributions of gull species are widespread and not monitored routinely during I-WeBS therefore standard methods of population estimation and threshold setting are difficult. SCI selection in relation to gull species therefore relates to the known most important sites for the gull species in question and a 'threshold of significance' is applied which is 1,000 for Black-headed Gulls and 500 for other gull species.

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

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

Site Special Conservation Interests (SCIs)	Baseline Period (1995/96 - 1999/00)	Recent Site Data (2005/06 – 2009/10)
Greylag Goose*	435 (n)	334 (n)
Light-bellied Brent Goose*	370 (i)	1,075 (i)
Red-breasted Merganser*	121 (n)	144 (n)
Great Crested Grebe*	303 (n)	108 (n)
Oystercatcher*	8,746 (n)	11, 057 (i)
Golden Plover*	5,967 (n)	12, 342 (i)
Knot*	9,710 (i)	6,332 (i)
Dunlin*	11,518 (n)	4,297 (n)
Black-tailed Godwit*	1,100 (i)	3,461 (i)
Bar-tailed Godwit*	1,950 (i)	2,337 (i)
Curlew*	1,264 (n)	868 (n)
Redshank*	1,659 (n)	3,154 (n)
Black-headed Gull*	6,643 (n/c)	4, 833 (n/c)
Shelduck	522 (n)	597 (n)
Teal	538 (n)	948 (n)
Mallard	765 (n)	1,049 n)
Pintail	117 (n)	253 (n)
Common Scoter	581 (n)	539 (n)
Ringed Plover	151 (n)	256 (n)
Grey Plover	204 (n)	194 (n)
Lapwing	4,892 (n)	3,548 (n)
Common Gull	551 (n/c)	973 (n/c)
Herring Gull	754 (n/c)	505 (n/c)

* denotes site selection species. n/c = not calculated.
(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance.
Note that international thresholds used for the baseline period are given in Wetlands International (2002). Recent site data uses thresholds as per Wetlands International (2006). All-Ireland thresholds are shown within Crowe et al. (2008).

4.2 Waterbird population trends at Dundalk Bay SPA

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

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

For Dundalk Bay SPA, annual population indices were calculated for each SCI species for the data period 1994/95 to 2008/09. Analysis was undertaken using data from the Irish Wetland Bird Survey (I-WeBS). Details of methodology are provided in Appendix 3.

Table 4.2 presents site population trends for the waterbird Special Conservation Interest species of Dundalk Bay SPA. Trends are given for the 'long-term' 12-year period (1995/96–2007/08) and the recent five-year period (2002/03-2007/08). The values given represent the percentage change in index (population) values across the specified time period. Positive values equate to increases in population size while negative values reflect a decrease in population size across the specified time period.

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

Trend analysis using population indices was not carried out for Common Scoter, Black-headed Gull, Common Gull or Herring Gull. Consistent data for Common Scoter are difficult to attain because this species is essentially marine during winter, often occurring at distances offshore and therefore difficult to monitor from land-based counts. Gull species are not counted routinely during I-WeBS. For these species, a measure of population change was calculated using the generic threshold method (JNCC, 2004) comparing population size at two time intervals, based on five-year means (see Appendix 3 for methods).

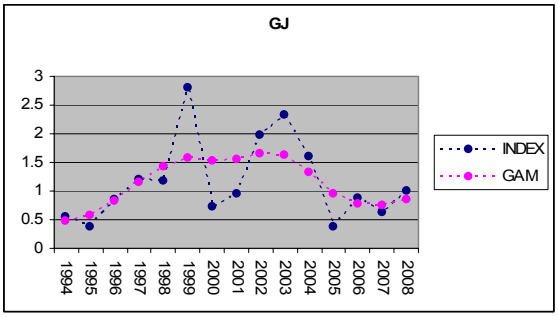
Table 4.2 Site Population Trends for waterbird Special Conservation Interest species of Dundalk Bay SPA

	Special Conservation Interests	Site Population Trend[1] 12 Yr	Site Population Trend[2] 5 Yr	Population Change[3]
Site Selection Species	Greylag Goose	+29.3	- 54	-
	Light-bellied Brent Goose	+ 168.4	+ 156.2	-
	Red-breasted Merganser	+ 29.6	+ 12.6	-
	Great Crested Grebe	- 46.5	- 28.4	-
	Oystercatcher	+ 72	+ 8	-
	Golden Plover	+ 100.7	+ 27	-
	Knot	- 11	+ 1.7	-
	Dunlin	- 40.8	- 36.2	-
	Black-tailed Godwit	+ 230.4	+ 100.9	-
	Bar-tailed Godwit	+ 46.4	- 6.8	-
	Curlew	- 31.4	- 29.4	-
	Redshank	+ 76.7	+ 18	-
	Black-headed Gull	-	-	- 27.3
Additional Special Conservation Interests	Shelduck	+ 40.1	+ 21.1	-
	Teal	+ 112.2	+ 29.4	-
	Mallard	+ 13.1	+ 15.2	-
	Pintail	+ 115.5	+ 67.7	-
	Common Scoter	-	-	- 7.2
	Ringed Plover	+ 117.7	+ 113.2	-
	Grey Plover	- 25.4	+ 14.7	-
	Lapwing	- 6.9	- 9.2	-
	Common Gull	-	-	+ 76.5
	Herring Gull	-	-	- 33.1

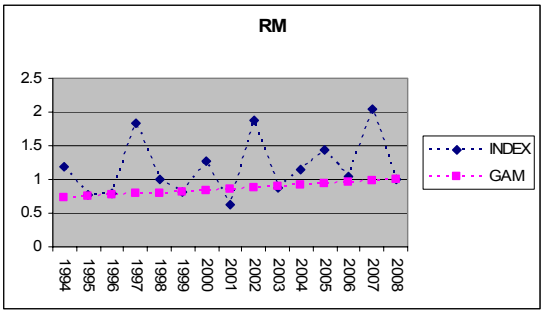
[1]Site population trend analysis: 12 yr = 1995/96–2007/08
[2]Site population trend analysis: 5 yr = 2002/03–2007/08.
[3]Site population change based on two five-year – means (1995/96 – 1999/00 and 2005/06 – 2009/10).

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

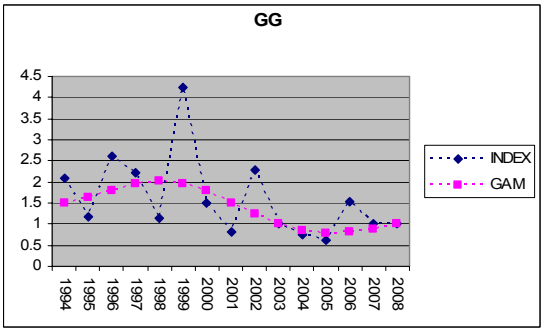
Greylag Goose – the long term (12-year) trend for increase is calculated on the basis of the difference between smoothed indices for 2007/08 and 1995/96. However, the site population over the long-term has exhibited a pattern for increase (up to 2003/04), followed by decline, as highlighted by the smoothed trend line.



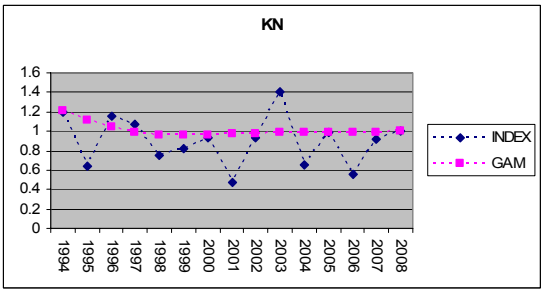
Red-breasted Merganser – the species exhibits variation between years as indicated by the plot of index values. Numbers have been progressively increasing at the site, as highlighted by the smoothed trend line.



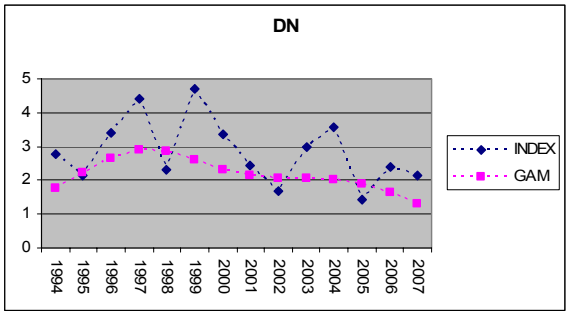
Great Crested Grebe – numbers can fluctuate widely, halving or doubling or more between months which leads to wide variation between annual totals and annual indices. Such variability may result from movements to inland sites along with variations in detectability between surveys because of factors such as weather. Some caution is therefore urged in the interpretation of the observed trend.



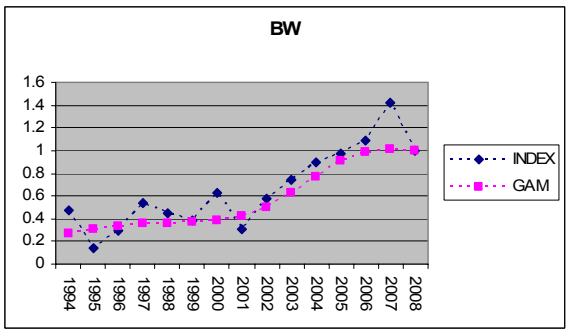
Knot – are considered one of the more mobile species during winter (i.e. less site faithful) a factor linked to the variable nature of its bivalve prey because of spatial and temporal variations in annual reproduction and spat fall. Numbers of Knot can therefore fluctuate widely both within and between winters leading to the fluctuating trend graphed to the right. The overall trend suggests a decline since the start of the dataset but numbers over the past decade have been relatively stable.



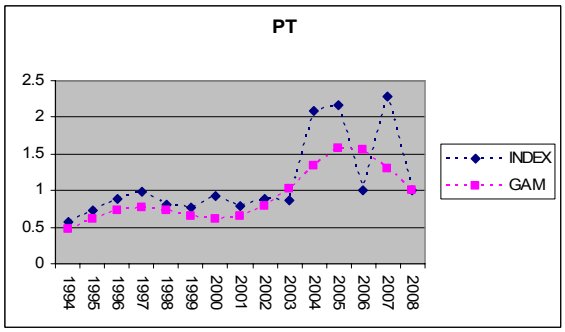
Dunlin – the trend shows a steady decline throughout, and follows the national trend and that evident in Northern Ireland and Britain (Calbrade et al. 2010).



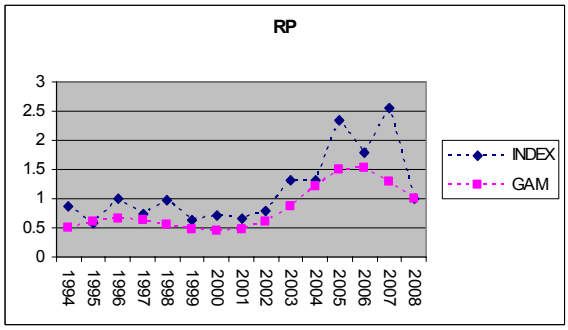
Black-tailed Godwit – shows a trend for progressive increase. The increase has been more marked since 2001/02 as highlighted by the smoothed trend line.



Pintail – steadily increasing numbers 1994/95 to 2002/03. Since 2003/04 the annual numbers have exhibited wide inter-annual variation with all-time site peak numbers in 2004/05, 2005/06 and 2007/08. The short-term trend is also for increase.



Ringed Plover – a relatively stable population in the 1990's has shown a marked increase since 2002/03.



4.3 Dundalk Bay SPA – site conservation condition of non-breeding waterbirds

Conservation condition of waterbird species is determined using the longer-term (12-year) site population trend (Table 4.3). For Common Scoter, Black-headed Gull, Common Gull and Herring Gull, conservation condition has been assigned using % population change (See Section 4.2) but this is tentative given factors (described above) in relation to their coverage during the non-breeding season.

Conservation condition is assigned using the following criteria:

Favourable population = population is stable/increasing.

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

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

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

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

With regards the 23 non-breeding waterbird species of Special Conservation Interest for Dundalk Bay SPA, and based on the long-term (12-year) population trend for the site, it has been determined that:-

1. 6 species are currently considered as **moderately unfavourable** (Great Crested Grebe, Dunlin, Curlew, Black-headed Gull, Grey Plover and Herring Gull);
2. 3 species is considered as **intermediate (unfavourable)** (Knot, Common Scoter and Lapwing);
3. 14 species are currently considered as **favourable** (Greylag Goose, Light-bellied Brent Goose, Red-breasted Merganser, Oystercatcher, Golden Plover, Black-tailed Godwit, Bar-tailed Godwit, Redshank, Shelduck, Teal, Mallard, Pintail, Ringed Plover and Common Gull).

Table 4.3 Non-breeding waterbirds of Dundalk Bay SPA – Current Site Conservation Condition

	Special Conservation Interests	Site Population Trend[1]	Site Conservation Condition
Site Selection Species	Greylag Goose	+ 29.3	Favourable
	Light-bellied Brent Goose	+ 168.4	Favourable
	Red-breasted Merganser	+ 29.6	Favourable
	Great Crested Grebe	- 46.5	Moderately Unfavourable
	Oystercatcher	+ 72	Favourable
	Golden Plover	+ 100.7	Favourable
	Knot	- 11	Intermediate (unfavourable)
	Dunlin	- 40.8	Moderately Unfavourable
	Black-tailed Godwit	+ 230.4	Favourable
	Bar-tailed Godwit	+ 46.4	Favourable
	Curlew	- 31.4	Moderately Unfavourable
	Redshank	+ 76.7	Favourable
	Black-headed Gull	- 27.3	Moderately Unfavourable
Additional Special Conservation Interests	Shelduck	+ 40.1	Favourable
	Teal	+ 112.2	Favourable
	Mallard	+ 13.1	Favourable
	Pintail	+ 115.5	Favourable
	Common Scoter	- 7.2	Intermediate (unfavourable)
	Ringed Plover	+ 117.7	Favourable
	Grey Plover	- 25.4	Moderately Unfavourable
	Lapwing	- 6.9	Intermediate (unfavourable)
	Common Gull	+ 76.5	Favourable
	Herring Gull	- 33.1	Moderately Unfavourable

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

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

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

An additional assessment is carried out in Table 4.6 which examines the relationship between a species' site trend and the current all-Ireland trend for the same time period (1994/95 to 2008/09). The colour coding used represents the following cases:-

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

Pink and red categories, which are not used in the current assessment for Dundalk Bay, highlight where populations are stable at all-Ireland 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).

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

Site Special Conservation Interests (SCIs)	BoCCI Category[a]	Site Conservation Condition	Current Site Trend 12 Yr	Current all-Ireland Trend[d]	Current International Trend[e]
Greylag Goose*	Amber	Favourable	+ 29.3[b]	+ 25	Stable
Light-bellied Brent Goose*	Amber	Favourable	+ 168.4[b]	+ 58	Increase
Red-breasted Merganser*	Green	Favourable	+ 29.6[b]	- 11	n/c
Great Crested Grebe*	Amber	Moderately Unfavourable	- 46.5[b]	- 18	Decline
Oystercatcher*	Amber	Favourable	+ 72[b]	+ 23.5	Decline
Golden Plover*	Red	Favourable	+ 100.7[b]	- 2.2	Decline
Knot*	Red	Intermediate (unfavourable)	- 11[b]	- 2.91	Decline
Dunlin*	Amber	Moderately Unfavourable	- 40.8[b]	- 46.5	Stable (*alpina*)
Black-tailed Godwit*	Amber	Favourable	+ 230.4[b]	+ 70.2	Increase
Bar-tailed Godwit*	Amber	Favourable	+ 46.4[b]	+ 1.5	Stable
Curlew*	Red	Moderately Unfavourable	- 31.4[b]	- 25.7	Decline
Redshank*	Red	Favourable	+ 76.7[b]	+ 22.7	Stable/Decline
Black-headed Gull*	Red	Moderately Unfavourable	- 27.3[c]	n/c	n/c
Shelduck	Amber	Favourable	+ 40.1[b]	+ 4.46	Stable
Teal	Amber	Favourable	+ 112.2[b]	+ 11.28	Increase
Mallard	Green	Favourable	+ 13.1[b]	- 16	Decline/Stable
Pintail	Red	Favourable	+ 115.5	+ 26.8	Stable
Common Scoter	Red	Intermediate (unfavourable)	- 7.2[c]	n/c	Stable
Ringed Plover	Amber	Favourable	+ 117.7[b]	+ 21.8	Decline
Grey Plover	Amber	Moderately Unfavourable	- 25.4[b]	- 33.1	Decline
Lapwing	Red	Intermediate (unfavourable)	- 6.9[b]	- 40.12	Decline
Common Gull	Amber	Favourable	+ 76.5[c]	n/c	n/c
Herring Gull	Red	Moderately Unfavourable	- 33.1[c]	n/c	n/c

*Denotes site selection species; n/c = not calculated.
[a]See Lynas *et al.* (2007) for detailed listing criteria; [b]Site population trend analysis: 12 yr = 1994–2007; [c]based on two five year averages (see Section 4.2); [d]all-Ireland trend calculated for period 1994/95 to 2008/09; [e]International trend after Wetland International (2006).

PART FIVE – SUPPORTING INFORMATION

5.1 Introduction

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

The information provided in Part Five is intended to:-

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

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

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

Part 5 should be reviewed with cognisance of the results of SAC benthic surveying and monitoring programmes (e.g. Aquatic Services, 2008). The reader is also referred to the Dundalk cSAC Marine Advice Notes (NPWS, 2011).

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

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

Waterbirds, defined as *''birds that are ecologically dependent on wetlands''* (Ramsar Convention, 1971), are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. The I-WeBS database shows 69 waterbird species that have been recorded at Dundalk Bay SPA during the period 1999/00 – 2009/10 representing ten families: *Gaviidae* (divers), *Podicipedidae* (grebes), *Anatidae* (swans, geese and ducks), *Rallidae* (Water Rail, Moorhen & Coot), *Haematopodidae* (oystercatchers), *Charadriidae* (plovers and lapwings), *Scolopacidae* (sandpipers and allies) and *Laridae* (gulls and terns) plus *Phalacrocoracidae* (Cormorants) and *Ciconiiformes* (Herons).

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

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

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

Table 5.1 Selected (non SCI) waterbird species that occur at Dundalk Bay SPA during the non-breeding season

Species	Baseline Data Period (1995/96 – 1999/00)	Recent Site Average (2004/05 – 2008/09)
Mute Swan (*Cygnus olor*)	62	49
Wigeon (*Anas penelope*)	407	876 (n)
Red-throated Diver (*Gavia stellata*)	9	24
Great Northern Diver (*Gavia immer*)	6	40
Cormorant (*Phalacrocorax carbo*)	99	424 (n)
Grey Heron (*Ardea cinerea*)	28 (n)	43 (n)
Greenshank (*Tringa nebularia*)	16	30 (n)
Turnstone (*Arenaria interpres*)	56	217
Great Black-backed Gull (*Larus marinus*)	190 (n)	199 (n)

(n) denotes numbers of all-Ireland importance

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

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

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

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

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

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

	Family (group)	Winter distribution[A]	Trophic Guild[B]	Food/Prey Requirements[C]	Principal supporting habitat within site[D]	Ability to utilise other/alternative habitats[E]	Site Fidelity[F]
Greylag Goose *Anser anser*	Anatidae (geese)	Highly restricted	7	Narrower	Saltmarsh – roosting Terrestrial - foraging	2	High
Light-bellied Brent Goose* *Branta bernicla hrota*	Anatidae (geese)	Highly restricted	1, 5	Highly specialised	Intertidal mud and sand flats	2	High
Red-breasted Merganser *Mergus serrator*	Anatidae (sea ducks)	Intermediate	2	Highly specialised	Sheltered & shallow subtidal	1	Unknown
Great Crested Grebe *Podiceps cristatus*	Podicipedidae (grebes)	Widespread	2/3	Narrower	Sheltered & shallow subtidal	3	High
Oystercatcher *Haematopus ostralegus*	Haematopodidae (wading birds)	Intermediate	4	Narrower	Intertidal mud and sand flats	2	High
Golden Plover *Pluvialis apricaria*	Charadriidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate
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
Bar-tailed Godwit *Limosa lapponica*	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	2	Moderate
Curlew *Numenius arquata*	Scolopacidae (wading birds)	Very widespread	4	Wide	Intertidal mud and sand flats	2	High
Redshank *Tringa totanus*	Scolopacidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	Moderate
Black-headed Gull *Chroicocephalus ridibundus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal mud and sand flats & sheltered & shallow subtidal	2	Moderate

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

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

[C] Food/prey requirements - where 1 = species with a wide prey/food range; 2 = species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and 3 = highly specialised foraging requirements (e.g. piscivores). Oystercatchers are classed as 'narrow' because they rely on larger (and more energy–rich) prey items predominantly bivalve molluscs, in comparison with smaller wader species which can achieve sufficient energy gain from a more varied range of smaller prey species.

[D] Principal supporting habitat present within Dundalk Bay SPA. This refers to the main habitat used when foraging, the exception being Greylag Goose whose main use of the site is for roosting.

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

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

Table 5.2b Waterbirds – Ecological characteristics, requirements & specialities – species of Additional Conservation Interest

	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]
Shelduck *Tadorna tadorna*	Anatidae (shelducks)	Intermediate	1, 5	Wide	Intertidal mud and sand flats	3	High
Teal *Anas crecca*	Anatidae (dabbling ducks)	Very widespread	1	Wide	Shallow subtidal and intertidal mud and sandflats	3	Weak
Mallard *Anas platyrynchos*	Anatidae (dabbling ducks)	Very widespread	1	Wide	Shallow subtidal and intertidal mud and sandflats	1	Moderate
Pintail *Anas acuta*	Anatidae (dabbling ducks)	Localised	1	Wide	Sheltered & shallow subtidal over sand flats	1	Weak
Common Scoter *Melanitta nigra*	Anatidae (sea ducks)	Localised	3	Highly specialised	Sheltered & shallow subtidal over sand flats	1	Unknown
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
Lapwing *Vanellus vanellus*	Charadriidae (wading birds)	Very widespread	4	Wide	Intertidal mud and sand flats	2	Moderate
Common Gull *Larus canus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal mud and sand flats & sheltered & shallow subtidal	2	Moderate
Herring Gull *Larus argentatus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal mud and sand flats & sheltered & shallow subtidal	1	Unknown

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

5.3 The 2009/10 waterbird survey programme

5.3.1 Introduction

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

At Dundalk Bay SPA, a survey programme of four low tide counts (Oct, Nov & Dec 2009 and Feb 2010) and a high tide count (Jan 2010) were completed across the site.

Waterbird species were counted within a series of 18 count sections (subsites) (Appendix 6). Behaviour was recorded within two categories (foraging or roosting/other) and position of birds was noted in relation to broad habitat types (Table 5.3). The definitions of the broad habitats were defined specifically for the survey programme and do not follow strict scientific definitions for these habitats.

Table 5.3 Definition of broad habitat types used

Broad Habitat Type	Broad Habitat Description
Intertidal (areas between mean high water and mean low water)	Refers to the area uncovered by the tide and most likely dominated by mudflats and sandflats. It may also include areas of rocky shoreline, areas of mixed sediment and grave/pebbles or shingle and gravel shores.
Subtidal (areas that lie below mean low water)	Refers to areas that are covered by seawater during counts. During low-tide counts it will include offshore water, tidal channels and creeks as well as tidal rivers.
Supratidal/Coastal	This category pertains to the shore area and habitats immediately marginal to and above the mean high-water mark. The supratidal section is an integral part of the shoreline. This broad habitat also includes areas of saltmarsh where the saltmarsh is contiguous with coastal habitats lying above. Note that patches of lower saltmarsh (e.g. *Spartina*) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	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, an additional 'roost survey' was undertaken during the high tide period on 1st March 2010. During this survey, roost sites were located, species and numbers counted and the position of the roosts marked onto field maps.

5.3.2 Waterbird distribution data and analyses

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

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

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

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

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

Subsite Rank Position - Categories

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

Waterbird count data are also presented as species distribution maps ('dot density maps'). Dot-density maps show species distribution divided into 'foraging' birds and 'roosting/other' birds, for low tide and high tide surveys separately. The maps show the number of birds represented by dots; each dot representing one, or a pre-determined number of birds. As the dots are placed in the appropriate subsites and broad habitat types for the birds counted, the resulting map is equivalent to presenting numbers and densities and provides a relatively quick way of assessing species distribution. **Note however, that dot-density maps are not intended to show the actual position of each bird; the dots are placed randomly within subsites so no conclusions can be made at a scale finer than subsite.** This is particularly relevant to the high tide count where dots are placed randomly across subsites although the intertidal habitat was largely submerged.

More detailed information with regards species/flock positioning is presented as separate discussion notes for each SCI species.

Subsite rankings and dot-density maps relate to the distribution of waterbirds at subsite level as recorded within the survey area during the 2009/10 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 further detailed examination of data and understanding of each species' ecology. For instance, while 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 (e.g. Knot). As explained in the discussion notes for each SCI species (Section 5.3.4), some species by their nature aggregate in high numbers (e.g. Golden Plover), while others do not (e.g. Greenshank, Grey Heron). 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 many factors could lead to patterns that may change in different months and years (e.g. temperature/weather effects, direction of prevailing winds, changing prey densities/availabilities and degree of human activity across the site).

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

5.3.3 Summary Results

A total of 50 waterbird species were recorded during the 2009/10 survey programme at Dundalk Bay SPA. Cummins and Crowe (2010) provide a summary of waterbird data collected.

All SCI species were recorded within all counts undertaken with the exception of Common Scoter which was not present during the October low tide count and Greylag Goose, which was recorded within one low tide and the high 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 % occupancy, defined as the average proportion of subsites in which a species occurred during low tide counts, varied greatly and ranged from the restricted distributions of Greylag Goose (2.8%) and Common Scoter (9.7%) to the most widespread species across the site Oystercatcher and Redshank (% occupancy > 80%).

Average % area occupancy is defined as the average proportion of the whole site 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 average % area occupancy was recorded for Greylag Goose; range was also relatively restricted for Common Scoter and Great Crested Grebe. The most widespread species in terms of area occupied was the Oystercatcher, followed by Redshank (Table 5.4). Overall, nearly three-quarters of all species ranged across more than 50% of the total area of the site.

Table 5.4 Dundalk Bay SPA 2009/2010 waterbird surveys – summary data

Site Special Conservation Interests (SCIs)	Peak number recorded - LT surveys[I]	Peak number recorded - HT survey[II]	Average subsite % occupancy [III]	Average % area occupancy[III]
Greylag Goose*	579 (n)	508 (n)	2.8 (5.6)	1.9 (3.7)
Light-bellied Brent Goose*	1,761 (i)	1,244 (i)	59.7 (22.4)	70.3 (27.3)
Red-breasted Merganser*	73 (n)	233 (n)	33.3 (13.6)	40.4 (24.6)
Great Crested Grebe*	26	161 (n)	20.8 (15.3)	24.8 (21.3)
Oystercatcher*	11,231 (i)	7,572 (n)	84.7 (8.3)	93.5 (4.8)
Golden Plover*	6,770 (n)	9,240 (n)	25.0 (3.2)	38.2 (9.7)
Knot*	8,848 (i)	3,900 (n)	43.0 (10.5)	63.4 (12.4)
Dunlin*	4,409 (n)	3,377 (n)	59.7 (22.4)	73.7 (18.4)
Black-tailed Godwit*	5,376 (i)	2,106 (i)	52.8 (14.0)	64.0 (11.6)
Bar-tailed Godwit*	4,925 (i)	11	48.6 (5.3)	65.8 (8.7)
Curlew*	1,465 (n)	964 (n)	70.8 (11.5)	84.2 (6.6)
Redshank*	6,342 (i)	1,852 (n)	84.7 (5.3)	90.6 (4.2)
Black-headed Gull*	3,130 (n/c)	1,108 (n/c)	72.2 (12.0)	85.0 (7.3)
Shelduck	1,333 (n)	487 (n)	63.9 (5.6)	76.3 (6.7)
Teal	1,243 (n)	808 (n)	47.2 (10.6)	56.2 (12.4)
Mallard	1,306 (n)	909 (n)	54.2 (2.8)	70.2 (9.5)
Pintail	231 (n)	183 (n)	25.0 (16.7)	33.8 (19.8)
Common Scoter	391 (n)	379 (n)	9.7 (8.3)	13.2 (12.0)
Ringed Plover	427 (n)	148	37.5 (16.0)	47.3 (15.9)
Grey Plover	163 (n)	327 (n)	40.3 (17.8)	55.4 (18.7)
Lapwing	2,433 (n)	509	54.2 (26.6)	62.5 (32.4)
Common Gull	3,208 (n/c)	1,424 (n/c)	69.4 (7.2)	86.5 (4.8)
Herring Gull	743 (n/c)	159 (n/c)	59.7 (18.4)	76.6 (18.9)

* site selection species. n/c = not assessed.
(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance (1% thresholds; 1999/00 – 2003/04 Crowe et al. 2008).
[I] 4 low-tide counts undertaken on (27/10/09, 26/11/09, 28/12/09 & 23/02/10);
[II] Single high-tide count undertaken on (18/01/10); [I]
[III] Mean (± s.d.) calculated across low tide counts.

Species richness (total number of species) across the whole site was relatively consistent throughout the survey programme; a total 36, 38, 39 and 32 species recorded during the four low tide counts respectively. 41 species were recorded during the high tide count in January 2010.

Species richness at subsite level varied considerably (Table 5.5). The average across low tide surveys ranged from 1 species (Subsite 0ZS03) to 26 species (0Z473). Species diversity was generally highest during low tide surveys.

Table 5.5 Subsite species richness

Subsite	Subsite Name	Mean (±S.D) (Low Tide Surveys)	High Tide Survey	Peak Overall
0Z460	Salterstown	14 (2.4)	21	21 (H)
0Z461	Dunany	10 (3.5)	15	15 (H)
0Z462	Ballymascanlan North	12 (1.8)	13	14 (L)
0Z463	Ballymascanlan South	14 (3.1)	13	18 (L)
0Z464	Fitzpatrick's - Blue Anchor east	9 (4.1)	7	14 (L)
0Z465	Fitzpatrick's - Blue Anchor west	11 (4.8)	8	17 (L)
0Z466	Giles Quay - Fitzpatrick's east	9 (4.3)	8	15 (L)
0Z467	Giles Quay - Fitzpatrick's mid-east	8 (1.6)	8	15 (L)
0Z468	Giles Quay - Fitzpatrick's mid-west	11 (2.0)	5	14 (L)
0Z469	Giles Quay - Fitzpatrick's west	14 (6.1)	6	20 (L)
0Z472	Lurgangreen South	22 (2.9)	13	24 (L)
0Z473	Annagassan North	26 (2.4)	17	29 (L)
0Z474	Annagassan South	19 (2.2)	18	21 (L)
0Z494	Dundalk Harbour	20 (5.4)	22	27 (L)
0Z495	Marsh South	20 (5.3)	24	24 (H/L)
0Z496	Blackrock Corniche	23 (6.2)	17	28 (L)
0Z497	Lurgangreen North	25 (3.0)	29	29 (H)
0ZS03	Lurgangreen Fields	1 (1.0)	5	5 (H)

5.3.4 Waterbird distribution

Data analyses determined the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the site as a whole. Selected results from these 'subsite assessments' are shown in Tables 5.6 (a–f). The categories L, M, H, V used in the tables relate to final rank positions (see 5.3.2 for methodology). Rank numbers are used in Table 5.6 (c) (rank average foraging density) and Tables 5.6 (e & f) that relate to the single high tide survey. Where boxes are left blank, means simply that a species was not recorded in that particular subsite for the behaviour being assessed.

Ranked assessments relate to the position (zone) that birds were observed in; for example intertidal or subtidal. In some cases data for different habitats have been combined (see superscripts and their description for each table).

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

Waterbird distribution maps ('dot-density maps') are provided in Appendix 7. Summary roost data and a map showing actual[11] locations of roost sites (1st March 2010) are presented in Appendix 8.

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

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

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

Subsite ► / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ																	H	V
PB	L	L	H	H	M	M	M	L	H	H	M	H	V	M	M	V	V	
RM	M	L				H	V		H		M	H	V	M	V	H	H	
GG		V				H	V			H		V	M	M	H	V		
OC	H	H	L	L	H	M	L	M	M	V	H	H	M	L	H	V	V	
GP			V	H							H	H	L	L	L	M	V	
KN	L					L		M	L	V	V	H	H		V	H	H	
DN	L		L	M	M	V	L	H	M	M	V	H	M	M	H	V	H	
BW			L	H	M	V			V	H	V	H	M	M	M	L	V	
BA				M	L	L		L	M	H	V	H	H	M	V	V	H	
CU	L	L	M	M	M	H	L	L	H	V	V	V	M	L	H	H	H	
RK	L	L	M	L	L	H	L	H	H	V	M	H	M	M	H	V	H	
BH	H	M	L	V	L		L	M	H	V	M	V	H	H	H	H		
SU	L		L	V	L	H			M	V	V	H	H	H	V	H	H	
T.	L		M	H	H	M				V	M	H		V	V	M	M	
MA	M		H	M	M				M	M	V	V	H	M	M	H	H	
PT				V	M	L			H	V		H	L		V	V	M	
CX	V						V					L					V	
RP	L			M		M	M	H	H	H	V	V	M	M		H	V	
GV	M	M	L	H	L	M			L	L	H	H	L	M	H	V	V	
L.			V	H	M	M	V			M	H	L	L	H	V	L	V	L
CM	V	M	M	H		L	L	M	H	H	H	H	V	L	L	V	V	
HG	V	H	L			L	H	M	H	V	L	H	V	L	L	M	H	

Table 5.6 (b) Dundalk Bay SPA Subsite assessment – total numbers foraging (LT surveys) (intertidal[I] and subtidal[II])

Subsite ▶ / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ	*Not recorded*																	
PB[I]	L	L	V	H	H	H	M	L	H	V	M	H	V	H	M	V	H	
RM[II]	M	L				H	V		H		L	M	V	L	V	H	V	
GG[II]		V				H	V			H		H	L		H	V		
OC[I]	H	L	L	L	H	H	L	M	M	V	H	H	H	L	H	V	V	
GP[I]			V								V	H	L	L	H		V	
KN[I]	L					L		M	L	V	V	H	H		V	H	H	
DN[I]	L		L	M	M	V	L	H	M	M	V	H	M	H	H	V	H	
BW[I]			L	H	M	V			V	H	V	M	M	H	H	L	H	
BA[I]				M	M	L		L	M	H	V	H	H	M	V	V	H	
CU[I]	L	L	L	M	H	H	L	L	H	V	V	V	M	L	H	H	V	
RK[I]	L	L	M	L	L	H	L	H	H	V	M	H	M	M	H	V	H	
BH[I]	L		M	V	L		L	H	V	V	M	M	L	H	H	H	H	
SU[I]			M	V	H	V			H	V	H	M	M	H	H	H	V	
T.[I]			M	H	H	M				V	L	H		V	V	M	M	
T.[II]											M			V	H		V	
MA[I]	M		V	H	H				H		M	V	H	M	H	M	V	
MA[II]										V	V	V	M	L			H	
PT[I]				V	M	M						V			V	H	H	
CX[II]	V						V					M					V	
RP[I]	L			M		M	M	M	H	H	V	V	M	M		H	V	
GV[I]	L	M	L	H	L	M			L	H	H	H	L	M	H	V	V	
L.[I]			V	H	M	H				H	M	L	M	L	V	H	V	
CM[I]	M		M	V		L	L	M	H	H	V	M	H	L	H	V	V	
HG[I]	V					L	H	H	V	V	L	L	L		L	H	H	

Table 5.6 (c) Dundalk Bay SPA Subsite assessment – ranked average intertidal foraging density for selected species LT surveys)

Subsite ▶ / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497
PB	17	16	1	2	11	4	7	12	3	6	15	8	5	9	14	10	13
OC	4	15	17	13	9	2	11	1	14	5	12	10	8	16	7	6	3
GP			1								4	2	6	5	7		3
KN	10					9		1	11	6	5	8	4		2	3	7
DN	15		12	5	16	1	4	2	9	14	6	7	10	13	11	3	8
BW			4	1	9	3			2	7	6	10	11	5	12	13	8
BA				9	13	10		12	6	2	4	8	7	11	3	1	5
CU	16	15	8	1	6	5	17	14	3	2	10	7	13	12	11	9	4
RK	16	17	3	7	15	5	10	4	1	2	14	11	9	6	13	12	8
SU			5	1	6	2			8	3	10	13	9	4	11	12	7
T.			2	1	4	7				5	11	8		3	6	10	9
MA	11		1	2	3				6		12	5	7	8	10	9	4
PT				3	4	5						6			1	2	7
RP	13			11		12	4	2	8	10	1	6	7	3		5	9
GV	9	4	3	1	14	7			13	15	8	6	12	5	11	2	10
L.			1	2	4	6				7	8	12	11	9	3	10	5

Table 5.6 (d) Dundalk Bay SPA Subsite assessment – total numbers (roosting/other behaviour) within LT surveys
(Intertidal[I], Subtidal[II], Terrestrial[III], Int/Supra combined[IV], all habitats combined[V])

Subsite ▶ / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ[I]																	V	
GJ[III]																		V
PB[I]		M											V			H	V	
RM[II]												V		V				
GG[II]		M												V		H		
OC[I]	M	V	L	L		V			M	H	H	V	M	L		H	M	
GP[I]			H	H							L					M	V	
KN	*Not recorded*																	
DN	*Not recorded*																	
BW[V]				H		M					H		V	M		V	V	
BA[I]										V								
CU[IV]			V	L							H	V		H	V		H	
RK[I]	L	H	M	H							V	V	M	V			V	
BH[I]	H	L	H	M								V	V	V			L	
SU[I]				H							V	H	M	L	V	L	H	
T.[I]			M	V							V			V	V	H	H	
MA[I]				M						M	V	V	H	M	L	H		
MA[II]	V										V	V	L	H	H	V	L	
PT[II]				V									H			V		
CX	*Not recorded*																	
RP[IV]														V			V	
GV[IV]											V			H	V			
L.[V]			H	M						H	M	L	M	V	V		V	
CM[I]	V	H	L								H	V	V	H			M	
CM[II]	V			H							H	H	V				V	
HG[I]	V	H					V				L	H	V	L	L	M	M	

Table 5.6 (e) Dundalk Bay SPA Subsite assessment – total numbers (HT survey); all habitats

Subsite ▶ / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ																	2	1
PB					5	3					7	8		4	2	6	1	
RM	3	6		2			1		5				4		7		7	
GG	3	5		9		5	1		7	9	12	7	4	13	2	13	11	
OC	3	2				7	10	8	6	13	13	9	4	11	12	5	1	
GP			3	2													1	
KN	7					2						6	3		1	4	5	
DN	9						8			4		7	3	5	1	2	6	
BW				1		3					4			6	5		2	
BA						2									1			
CU	9			7		6			9		2		4	5	3	9	1	8
RK	10	9	14	12		2	16	13	5	4	11	8	7	3	6	15	1	
BH	8	4	6	10						1		7	10	3	9	5	2	
SU				6	5						1			4	2		3	
T.	8	10	7	5	6					8	4			3	2		1	
MA	11		9	4	2						3	4	10	7	6	8	1	
PT					3										2	4	1	
CX	1	5										3	4				2	
RP	1						2						5			3	4	
GV	5											4	6	3	1	2	6	
L.		6	5											2	1		4	3
CM	7	2								3	5	8	4	10	8	6	1	
HG	5	1									3	4	5	7		7	2	

Table 5.6 (f) Dundalk Bay SPA Subsite assessment – total numbers (roosting/other behaviour) within HT surveys (Intertidal[I], Subtidal[II], Supratidal[III], Int/Supra combined[IV], all habitats combined[V]).

Subsite ▶ / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ	*Not recorded*																	
PB[III]					3	1									2		4	
RM[II]				1											2			
GG[II]				1										2				
OC[I]	1												3				2	
OC[III]		1				5	8	6	4			7			9	3	2	
GP[I]																	1	
KN[V]	7					2						6	3		1	4	5	
DN[V]	9						8			4		6	3	5	1	2	7	
BW[IV]				1		3					4			6	5		2	
BA[III]						1												
CU[I]	3												2				1	
CU[III]				4		3			4		1				2			
RK[IV]	12	8	14	10		1		11	4	3	9	6	12	5	6	15	2	
BH[I]	2												3				1	
SU[I]																	1	
SU[II]				3										1	2			
T.[I]				2							4				1		3	
T.[II]	4	5	3	1						4				2			4	
MA[I]			6	7							4	2		4	3		1	
MA[II]	8		7	3								2	6	5		4	1	
PT[II]																1		
CX	*Not recorded*																	
RP[IV]	1						2									3		
GV[IV]	5											4	6	3	1	2	6	
L.[V]		5	4											1	6		3	2
CM[I]	3	2											3				1	
CM[II]	9	5								1	3	7	2	10	7	4	6	
HG[III]		1									2	3	4	5		5		
HG[IV]		1															2	

Dundalk Bay SPA (4026) - Waterbird Survey Programme 2009/10

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) (Aquatic Services Unit, 2008). The reader is also referred to the Dundalk cSAC Marine Advice Notes (NPWS, 2011).

Bird Usage Mapping refers to data collected as part of the NPWS 'Bird Usage Surveys' for the period 1997 to 2003.

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

Greylag Goose *Anser anser* - Family (group): Anatidae (geese)
Greylag Geese occur throughout the mid-latitudes of Europe and Asia and are 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). Greylag Geese at Dundalk Bay belong to the Stabannan-Braganstown-Dundalk flock that forage within grasslands of the Stabannan-Braganstown floodplain in northeast Co Louth and within arable land, including that within the SPA referred to as 'Lurgangreen Fields' (0ZS03) during the 2009/10 waterbird survey programme. These geese roost at Dundalk Bay. During winter, migratory Greylag Geese often mix with resident (feral) populations. However, all Greylag Geese present at Dundalk Bay site are considered to be Icelandic in origin (Hearn & Mitchell, 2004).
Numbers
Greylag Geese were recorded in one low tide survey (26/11/09) and the high tide survey (18/01/10) with 579 and 508 individuals respectively, representing numbers of all-Ireland importance. Greylag Geese were recorded exclusively within two subsites: 0Z497 (Lurgangreen North) and 0ZS03 (Lurgangreen Fields); numbers greatest in this latter subsite.
Foraging Distribution
Greylag Geese are herbivorous, foraging typically within agricultural habitats during daylight hours and roosting within communal roost sites close to water at night. The coastal site that is Dundalk Bay SPA is used primarily as a roosting site by Greylag Geese. Foraging individuals were recorded on one occasion – 508 individuals foraging within 0ZS03 (Lurgangreen Fields) during the high tide survey of 18th January 2010.
Roosting Distribution
As Greylag Geese roost primarily at night, diurnal waterbird surveys were not suited to counting roosting flocks. However, roosting behaviour was observed during the November low tide count (26/11/09) when 71 individuals roosted/rested within 0Z497 (Lurgangreen North) and 508 within 0ZS03 (Lurgangreen Fields).

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 spend 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

Internationally-important numbers of Brent Geese were recorded in all survey months at Dundalk Bay SPA. The peak count of 1,761 was recorded on 27th October 2009.

Brent Geese were recorded in a total of 17 subsites throughout the entire survey programme but only three subsites (0Z465, 0Z474 and 0Z497) supported this species during all four low-tide surveys, with several subsites supporting relatively few individuals on few or single occasions.

Highest proportions of Brent Geese were recorded within the following subsites: 0Z496 (Blackrock Corniche), 0Z474 (Annagassan South), 0Z497 (Lurgangreen North) and 0Z497 (Lurgangreen North) for the four low tide survey dates respectively; all counts surpassing the threshold of international importance.

The overall peak subsite count of 825 individuals was recorded within 0Z497 (Lurgangreen North) (28/12/09).

Foraging Distribution

Brent Geese are grazers and are known for their preference for foraging in intertidal areas with Eelgrass *Zostera* sp (Robinson et al. 2004). Where this food source is absent the birds feed upon algae, saltmarsh plants and may move to terrestrial grazing, especially as the winter season progresses.

During low tide surveys the majority of Brent Geese were recorded foraging intertidally; this activity recorded within 17 subsites across the entire survey period. Use of the site was therefore extensive – the only subsite not used by foraging Brent Geese being the terrestrial subsite 0ZS03. Flock size varied greatly however, from major concentrations foraging within certain subsites (see below) to 0Z472 (Lurgangreen south) or 0Z494 (Dundalk Harbour) which regularly supported smaller numbers.

The highest proportions of foraging Brent Geese were recorded within different subsites for each of the low tide surveys - 0Z496 (Blackrock Corniche), 0Z474 (Annagassan South), 0Z469 (Giles Quay - Fitzpatrick's west) and 0Z462 (Ballymascanlan North) for the four low tide surveys respectively. 0Z473 (Annagassan North) was notable in supporting high proportions of total numbers on two survey occasions. 0Z497 (Lurgangreen North) supported good numbers (463) foraging intertidally during the high tide survey (18/01/10).

Brent distribution was not necessarily related to saltmarsh or vegetated areas. In November 2009, the highest site numbers foraging within 0Z474 (Annagassan South) were foraging along the tideline. Across other subsites, the species adopted a widespread distribution that ranged from inner areas close to channels or saltmarsh, to open areas of tidal flat. They were possibly foraging upon seaweed, which if washed up by the tides is ephemeral and varying in location, perhaps explaining the lack of pattern in Brent foraging distribution observed. Eelgrass *Zostera* sp is present at the site (NPWS, 2005) but no information is available as to its distribution.

Previous site reporting (bird usage mapping & NPWS (2005)) has indicated that the estuaries of the Rivers Fane and Glyde are important areas for Brent Geese along with the northern arm of the site. These areas correspond to subsites 0Z497/0Z496 (Fane) and 0Z473/0Z474 (Glyde) and 0Z464 – 0Z469.

The greatest intertidal foraging density within a single subsite was 13 Brent Geese ha^{-1} (0Z462 Ballymascanlan North, 23/02/10). Average subsite foraging density was highest in 0Z462 (3.2 individuals ha^{-1}). The whole site mean feeding density (intertidal habitat) was 0.19 Brent Geese ha^{-1}.

Roosting Distribution

During low tide surveys the majority of Brent Geese were foraging. Roosting behaviour was recorded within four subsites: 0Z461 (Dunany), 0Z474 (Annagassan South), (0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen north). Peak concentrations of roosting/other individuals were recorded within 0Z474 (131 individuals - 27/10/09) and 0Z497 (220 individuals - 23/02/10); representing 14% and 19% of the total Brent Geese recorded on the respective survey dates.

During the high tide survey, Brent Geese roosted within saltmarsh habitat predominantly within three subsites: 0Z465 (Fitzpatrick's - Blue Anchor west), which held the greatest number (162), plus 0Z495 (Marsh South) and 0Z464 (Fitzpatrick's - Blue Anchor east). Saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 is also known as the Bellurgan-Jenkinstown saltmarsh. This saltmarsh is dominated by *Spartina* swards and is used extensively by not only Brent Geese but also Black-tailed Godwits, Oystercatcher, Knot, Curlew and other waders. During the roost survey (01/03/10), c700 Brent Geese roosted within this saltmarsh. Also during the roost survey, *c* 455 Brent Geese roosted in several different locations within saltmarsh (*Spartina*) in 0Z495 (Marsh South). Smaller numbers were recorded roosting within 0Z466 (Giles Quay - Fitzpatricks east), 0Z472 (Lurgangreen south) and 0Z497 (Lurgangreen north). The data recorded during the 2009/10 waterbird survey programme compares well with previous roost records for the site (I-WeBS, unpublished data) which indicates that the following subsites support regular roosting sites for Brent Geese: (seen on 75% or more of I-WeBS counts undertaken):- 0Z473 (Annagassan North), 0Z497 (Lurgangreen north), 0Z472 (Lurgangreen south) and 0Z495 (Marsh South).

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

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

Numbers

The all-Ireland wintering population of Red-breasted Mergansers is estimated at 3,390 individuals (Crowe et al. 2008); reflected by the relatively small all-Ireland 1% threshold of 35 individuals.

At Dundalk Bay, numbers of Red-breasted Merganser of all-Ireland importance were recorded on three survey occasions; 73 and 70 individuals during the first two low tide surveys respectively (27/10/09 and 26/11/09) and 233 during the high tide survey (18/01/10).

Red-breasted Mergansers were recorded in a total 13 subsites across the survey period. The species was most widespread during the October survey (nine subsites) in contrast to only four subsites for the latter two low tide surveys. The species was recorded within eight subsites during the high tide survey.

The subsite peak of 112 individuals was recorded in 0Z466 (Giles Quay - Fitzpatrick's east) during the high tide survey (18/01/10). A low tide subsite peak of 33 individuals was recorded for 0Z495 (Marsh South) on 26/11/09.

0Z466 (Giles Quay - Fitzpatrick's east) was notable in supporting highest numbers on three separate survey occasions.

Foraging Distribution

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

Red-breasted Mergansers were recorded foraging subtidally within a total 12 subsites across the survey period. Subsite use during individual low tide surveys varied from seven subsites (27/10/09) to one subsite (23/02/10).

Although some subsites supported only a few individuals, some aggregation of individuals did occur. Peak concentrations occurred in different subsites across the low tide surveys. 0Z474, 0Z495 and 0Z466 supported the greatest numbers during the first three low tide surveys (24, 33 and 12 individuals respectively), representing 82–100% of the whole site numbers on the respective days. Only two individuals were recorded foraging (0Z497) during the final low tide survey (23/02/10).

No pattern of subsite usage occurred throughout the survey programme, rather a pattern for aggregation in certain subsites on differing days, likely related to the species moving in response to their mobile prey.

It should be noted that the survey areas extend as far as practicable from land-based vantage points. Sea ducks such as Red-breasted Mergansers may therefore be under recorded due to the species occurring further offshore, and beyond observation range, but still within the SPA site and within an ideal depth-range for diving (i.e. the offshore area marked grey in dot-density maps).

Roosting Distribution

During low tide surveys, the majority of Red-breasted Mergansers were recorded foraging. Very small numbers of individuals were recorded roosting/other within 0Z494 (Dundalk Harbour) and 0Z473 (Annagassan North). During the high tide survey, 40 individuals were recorded within roosting behaviour within 0Z463 (Ballymascanlan South) and 2 individuals within 0Z495 (Marsh South).

Great Crested Grebe *Podiceps cristatus* - Family (group): Podicipedidae (grebes)
Great Crested Grebes are a widespread breeding species; one population of the nominate subspecies breeds and winters in north and west Europe (Wetlands International, 2006). It is thought likely that the majority that breed within Ireland are resident, with individuals breeding at inland wetlands (lakes) moving to coastal sites for the winter period. Some immigration of individuals due to cold weather movements is likely (Crowe, 2005) but the true nature of this species' movements is poorly known (Wernham et al. 2002).
Numbers
The peak number (whole site) of Great Crested Grebes was recorded during the high tide count (161 individuals on 18/01/10). This number surpasses the threshold for all-Ireland importance. Far fewer numbers were recorded during low tide surveys, most likely due to the birds being located further from the shore. The whole site low tide peak was 26 Great Crested Grebes on 27/10/09. Throughout the survey period, Great Crested Grebes were recorded within 14 subsites. Between one and seven subsites were used during low tide surveys and the species was recorded within 14 subsites during the high tide survey. The low tide peak subsite count was 12 individuals (12 within 0Z473, Annagassan North on 23/02/10). The high tide peak subsite count was 60 individuals within 0Z466 (Giles Quay - Fitzpatrick's east).
Foraging Distribution
Great Crested Grebes are largely piscivorous and make short dives for their prey in the average depth range of 2-4m although they can go much deeper (BWPi, 2004). During the survey programme of 2009/10, the majority of Great Crested Grebes at Dundalk Bay were recorded foraging. The greatest total number were recorded during the high tide survey (18/01/10) when 156 individuals foraged across 12 subsites; 60 of which foraged within 0Z466 (Giles Quay - Fitzpatrick's east). Significant proportions also foraged within 0Z460 (Salterstown) and 0Z495 (Marsh South). Smaller numbers foraged within the survey area during low tide surveys. The maximum was 26 individuals on 27/10/09; these birds across three subsites: 0Z461 (Dunany), 0Z473 (Annagassan North) and 0Z474 (Annagassan South).
Roosting Distribution
Relatively few Great Crested Grebes were recorded in roosting/other behaviour. A notable exception was 40 individuals within 0Z463 (Ballymascanlan South) during the high tide survey (18/01/10). It should be noted that the survey areas extend as far as practicable from land-based vantage points. Species such as Great Crested Grebes may therefore be under recorded due to the species occurring further offshore, and beyond observation range, but still within the SPA site and within an ideal depth-range for diving or utilising the sheltered nature of the site for roosting/loafing (i.e. the area marked grey in dot-density maps).

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

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

Numbers

During the 2009/10 surveys at Dundalk Bay, Oystercatchers were recorded in numbers of all-Ireland importance in all months. The site peak of 11,231 individuals on 26th November 2009 surpassed the international threshold of importance.

Oystercatchers were widespread across the site occurring in 17 subsites with an average subsite occupancy (% subsites) of 84.7%. They occurred in 12 subsites across all four low tide surveys.

0Z496 (Blackrock Corniche) supported the greatest proportions of Oystercatchers on two low tide survey occasions (27/10/09 & 28/12/09) with 0Z497 (Lurgangreen North) and 0Z469 (Giles Quay - Fitzpatrick's west) supporting peak proportions on 26/11/09 and 23/02/10 respectively. The peak proportions were around 20% of the total numbers of Oystercatchers present on the day, highlighting the species' widespread distribution across the site. Nevertheless, some patterns of subsite preference were evident with the following subsites supporting peak or significant numbers in all low tide surveys: 0Z496 (Blackrock Corniche), 0Z497 (Lurgangreen North), 0Z473 (Annagassan North), 0Z469 (Giles Quay - Fitzpatrick's west), 0Z461 (Dunany) and 0Z495 (Marsh South). This latter subsite also supported 45% of all Oystercatchers present on the additional high tide survey (01/03/10).

The subsite peak count was 2,713 Oystercatchers within 0Z497 (Lurgangreen North) on 26/11/09.

Foraging Distribution

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

Oystercatchers were recorded foraging within 12 subsites during all four low tide counts (0Z460, 0Z463, 0Z465, 0Z466, 0Z467, 0Z469, 0Z472, 0Z473, 0Z474, 0Z495, 0Z496, 0Z497). Some patterns of subsite preference are evident in the dataset as follows: 0Z496 (Blackrock Corniche) supported the greatest proportions of foraging Oystercatchers on two low tide survey occasions (27/10/09 & 28/12/09). 0Z497 (Lurgangreen North) supported peak proportions of foraging individuals on 26/11/09 and during the high tide survey (18/01/10), the latter accounting for 66% of the total numbers of foraging Oystercatchers counted on that day. 0Z469 (Giles Quay - Fitzpatrick's west) supported the peak proportion on 23/02/10 and the second highest number of individuals on 27/10/09. 0Z473 (Annagassan North) and 0Z474 (Annagassan South) held good numbers during all low tide surveys.

Within 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North), Oystercatchers foraged at a range of shore heights within the broad zone assigned to the community 'fine sand community complex'; the greatest proportion of these birds were often positioned at the tide edge. Similarly, the main numbers of Oystercatchers foraging within 0Z469 (Giles Quay - Fitzpatrick's west) were spread out along the channel edge. The preference for foraging at the tide edge is also evident from NPWS bird usage mapping.

Dominant invertebrate species of the intertidal benthic community 'Fine sand community complex' include bivalve molluscs Common Cockle (*Cerastoderma* edule) and Baltic Tellin (*Macoma balthica*). These bivalves are widespread across Dundalk Bay as a whole. However, the 'fine sand community complex' consists of more than one community, one of which is restricted exclusively to the lower shore and is characterised by the bivalve molluscs *Fabulina fabula* and *Angulus tenuis* as well as several large polychaete worms.

Oystercatchers are likely to occur at higher densities where their prey abundance and profitability is higher, but various factors will contribute to the widespread distribution recorded, including interference competition,[12] competitive differences between adults and juveniles (first-winter birds), differences in prey exploitation/specialisation between the sexes, seasonal differences in the accessibility of prey (e.g. *Macoma balthica* and *Scrobicularia plana* being able to burrow deeper during winter) and prey depletion during the course of the wintering period (e.g. Zwarts & Wanink, 1993; Blomert et al. 1996).

Cockle size generally increases with decreasing shore level, smaller individuals at the top of the shore and larger individuals on the lower shore due to better feeding conditions for Cockles on the lower shore associated with longer immersion times (Wanink & Zwarts, 1993). At Dundalk, lower cockle densities (0 – 0.1 cockles/m^2) of individuals larger than 22mm were generally found on the upper shore. Higher density patches of individuals > 22mm however, were not associated with the lower shore but rather dispersed mainly in the mid shore zone (results from a Marine Institute Survey, June 2009 and reported in Dundalk LAC, BIM & MI, 2009). Examination of Oystercatcher flock position maps relating to the zones described above, reveals remarkably close agreement between the positions of major flocks of foraging Oystercatchers (high proportions during LT surveys) and patches with higher densities of Cockles >22m in size (as mapped in Dundalk LAC, BIM & MI (2009).

The highest average intertidal foraging density within a single subsite was recorded for 0Z465 (2.8 Oystercatcher ha^{-1}), this subsite on one

[12] Interference competition is defined as the reduction in intake rate as a result of a high density of other predators in the area (density-dependent effect).

occasion supporting 4 Oystercatchers ha^{-1}. The average whole site foraging density was 1.9 individuals ha^{-1}.

Roosting Distribution

Across the survey programme, Oystercatchers were recorded undertaking roosting/other behaviour within intertidal habitat in 13 subsites. During low tide surveys, significant numbers were recorded roosting/other within 0Z461 (Dunany) (1,290 and 961 individuals on 27/10/09 & 26/11/09 respectively) and 0Z473 (Annagassan north) (1088 individuals 27/10/09).

2,889 Oystercatchers were recorded roosting within three subsites during the high tide survey (18/01/10). 0Z460 (Salterstown) recorded the highest numbers (1,180) followed by 0Z497 (Lurgangreen North) (920 individuals) and 0Z474 (Annagassan South).

During the roost survey (01/03/10), over 10,000 Oystercatchers were observed roosting across 14 subsites. 3,000 Oystercatchers roosted within two main locations within the saltmarsh of 0Z495 (Marsh South). The number of Oystercatchers was classed as an underestimate due to some birds being obscured from view. Marsh South is an important roost site for many waterbird species with their positions changing as birds shuffle in response to the moving tide. Just under 2,000 Oystercatchers roosted within 0Z497 (Lurgangreen North), half of these were on a rocky outcrop in the northern part of the subsite (locally known as Carrig Cultra). This rock remains exposed at high tide and is a roost site favoured by Oystercatchers. The other half roosted along the edge of saltmarsh. A further 1,178 Oystercatchers roosted within 0Z460 (Salterstown) at various locations along the mixed substrata and shingle and gravel shoreline. Saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh) is also an important roosting location for Oystercatchers as is the shingle shoreline of 0Z467 (Giles Quay – Fitzpatrick's mid-east) where 860 roosted during this survey.

Previous roost recording for the site (I-WeBS, unpublished data) indicates the following subsites support regular roosting sites for Oystercatchers: (seen on 75% or more of I-WeBS counts undertaken):- 0Z473 (Annagassan North) (c3,000 birds), 0Z497 (Lurgangreen North) (c 3,000 birds), 0Z472 (Lurgangreen South) (c 2,00 birds), 0Z495 (Marsh South) (c 1,500 birds), 0Z460 (Salterstown), 0Z496 (Blackrock Cornich) and 0Z474 (Annagassan South).

Golden Plover *Pluvialis apricaria* - Family (group): Charadridae (wading birds)

The Eurasian Golden Plover is a Palearctic species, occurring mainly at higher latitudes of Western Europe to north-central Siberia and wintering south in Europe, north Africa and parts of Asia. Two subspecies are currently described. *P. a. altifrons* is the 'northern' form and breeds at high latitudes in Western Eurasia from Iceland and the Faeroes across northern Scandinavia to 125^{0}E in the north Siberia lowlands south of Taymyr (Delaney et al. 2009). The nominate *P. a apricaria* breeds at more southerly latitudes including Ireland and Britain and migrates south for winter. The Golden Plover that winter in Ireland are thought to be mostly Icelandic-breeding birds *P. a. altifrons* (Wernham et al. 2002).

Numbers

Golden Plovers were recorded in numbers of all-Ireland importance in all months. The site peak of 9,240 individuals was recorded during the high tide survey (18/01/10). During low tide surveys, Golden Plovers were recorded within 4-5 subsites, representing on average, 38% of the total survey area.

Significant numbers of Golden Plover were recorded within six subsites overall: 0Z462 (Ballymascanlan North), 0Z463 (Ballymascanlan South), 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North). The subsite peak of 5,040 was recorded for 0Z497 (Lurgangreen North) on 18/01/10 (HT Count). This subsite supported peak proportions of Golden Plover on four survey occasions: 27/10/09, 26/11/09, 28/12/09 and 18/01/10. 0Z462 (Ballymascanlan North) recorded the peak proportion of Golden Plovers on the final low tide survey on 23/02/10.

Foraging Distribution

During winter, Golden Plovers feed primarily within agricultural grassland and arable land. Tidal flats are also used but more so as a roosting/resting habitat. As a consequence, Golden Plovers tend to be in large aggregations when observed upon tidal flats. Intertidal feeding is observed to a greater degree during cold weather periods when grassland feeding areas are frozen over. Although Golden Plovers eat a wide range of invertebrate species, relatively little is known about intertidal feeding patterns (Gillings et al. 2006).

During low tide surveys the majority of Golden Plovers foraging intertidally were observed within one or two subsites only. Peak proportions (99% and 83%) were recorded within 0Z472 (Lurgangreen South) on 27/10/09 and 26/11/09; 0Z497 (Lurgangreen North) on 28/12/09 and 0Z462 (Ballymascanlan North) on 23/02/10. These results compare favourably with previous low tide data collected at Dundalk Bay – bird usage mapping (NPWS) suggests that Golden Plovers are concentrated at the Fane River estuary (0Z497), south of Lurgangreen (0Z472) and in the Ballymascanlan Estuary (0Z462/0Z463).

In 0Z472 (Lurgangreen South), flock position maps reveal that Golden Plovers foraged within a similar mid-shore position during the first three low-tide surveys. Mid to lower shore areas were favoured within 0Z497 (Lurgangreen North). These areas are classified during benthic community mapping as 'fine sand community complex.' As visual foragers, Golden Plovers peck their prey from the surface of the sandflat. A species which occurs within this community (although not a characterising species) is the small mollusc *Hydrobia ulvae*, which can occur in high densities. Other surface-dwelling invertebrates present that may have been taken by Golden Plover are amphipods *Gammarus locusta*. Worms may also be taken and a diversity of polychaetes occurred within the fine sand community including spionids *Spio martinensis* and *Pygospio elegans*.

Although not recorded foraging terrestrially during the 2009/10 waterbird survey programme, it is highly likely that Golden Plovers utilise grassland habitats around Dundalk Bay for foraging.

Roosting Distribution

During the first two low tide surveys (27/10/09 and 26/11/09) the majority of Golden Plovers were recorded roosting. By contrast, all Golden Plovers were recorded foraging during the latter two low tide surveys, likely due to the cold weather experienced at the time.

On 27/10/09, significant numbers (>2,000) of Golden Plover roosted upon tidal flats within 0Z497 (Lurgangreen North) and 0Z463 (Ballymascanlan South). On 26/11/09, significant numbers (>2,000) of Golden Plover roosted upon tidal flats within 0Z497 (Lurgangreen North) and 0Z462 (Ballymascanlan North).

5,000 Golden Plovers roosted intertidally as part of a mixed flock within the southern part of 0Z497 (Lurgangreen North) during the high tide survey (18/01/10). During the roost survey (01/03/10), 630 Golden Plovers were observed roosting within two subsites; 340 were within the saltmarsh habitat of 0Z497 (Lurgangreen North) and 290 within saltmarsh habitat at the northern extent of 0Z462 (Ballymascanlan North).

Previous roost records for the site compares well with the data collected during the 2009/10 waterbird survey programme. Unpublished I-WeBS data indicates the following subsites are regular roosting areas for Golden Plover: 0Z494 (Dundalk Harbour) (c 5,000 birds), 0Z497 (Lurgangreen North) (c 10,000 birds), 0Z472 (Lurgangreen South) (c 1,500 birds) and 0Z462/0Z463 (Ballymascanlan Bay) (c 5,000 birds).

Knot *Calidris canutus* - Family (group): Scolopacidae (wading birds)

The Knot is a high Arctic breeding species. Two populations are recognised in Western Eurasia and Africa - *C. c canutus* and *C. c. islandica*. The latter breeds in north and east Greenland and northern Canada and winters in north-west Europe. Ireland supports a relatively small proportion of the total population during winter (c5%). The Wadden Sea is an important staging ground for the species after a non-stop flight from the breeding grounds (van der Kam, 2004).

Numbers

Whole-site numbers of Knot varied considerably across the survey period from a minimum 3,199 individuals (28/12/09) to a site peak of 8,848 individuals on 23/02/10. Three of the five surveys recorded numbers that surpassed the threshold of international importance.

Knot were recorded within 11 subsites overall. They occurred with regularity (three LT survey or more) in seven subsites: 0Z467 (Giles Quay - Fitzpatrick's mid-east), 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z474 (Annagassan South), 0Z495 (Marsh South), 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North).

Peak proportions were recorded in 0Z495 (Marsh South) on 27/10/09, 26/11/09 & 18/01/10), 0Z469 (Giles Quay - Fitzpatrick's west) (28/12/09) and 0Z472 (Lurgangreen South) on 23/02/10.

The subsite peak of 4,460 Knot was recorded on 26/11/09.

Foraging Distribution

Knots are mud and sandflat foragers; pecking visible items off the surface or probing to the depth that their bill (3.5cm) allows. The preferred prey items are bivalve molluscs including *Scrobicularia plana, Macoma balthica, Angulus tenuis* and *Mytilus edulis* of smaller size-classes that are able to be swallowed (shell length in the range 6 – 16mm depending on bivalve species and shape of shell) (Dekinga & Pierma, 1993). *Hydrobia ulvae* may also be an important prey at some sites (Moreira, 1994).

Knot foraged within between five and nine subsites on each low tide survey occasion. 0Z495 (Marsh South) supported the greatest numbers of foraging individuals during the first two low tide surveys. 0Z469 (Giles Quay - Fitzpatrick's west) and 0Z472 (Lurgangreen South) recorded the greatest number of foraging Knot on 28/12/09 and 23/02/10 respectively. 0Z496 (Blackrock Corniche) held significant numbers during all low tide surveys. Apart from these patterns the species use of the site for foraging was quite variable but both 0Z472 (Lurgangreen South) and 0Z496 (Blackrock Corniche) have previously been recorded as important areas for foraging Knot (NPWS bird usage data).

Knot at Dundalk Bay foraged within areas classified as the benthic community 'fine sand community complex' which is by far the largest invertebrate community type across the intertidal habitats of the site and is dominated by high abundances of bivalve molluscs and polychaete worms. The bivalve *Angulus tenuis* and the polychaetes *Capitella capitata* and *Spio martinensis* are the main biological components of this complex (NPWS, 2011). Knot often foraged along the tide edge and when on the lower shore at low tide would have been within the sub-community 'fine sand with *Fabulina fabula'* which is characterised by bivalve molluscs *Fabulina fabula* and *Angulus tenuis* as well as several polychaete worms.

The variability in distribution noted above is not unexpected. Knot are considered a mobile species during winter, both within and sometimes between sites; a factor linked to the variable nature of its prey items (linked to spatial variations in annual spat fall) and because the wader moves in search of more profitable areas as patches of prey become depleted.

The highest average intertidal foraging density within a single subsite was recorded for 0Z467 (3.8 Knot ha^{-1}), this subsite on one occasion supporting 7 Knot ha^{-1}. The average whole site foraging density (intertidal habitat) was 1.5 Knot ha^{-1}.

Roosting Distribution

Knot were not recorded roosting during low tide surveys.

During the high tide survey (18/01/10) 3,900 Knot were observed roosting/other within seven subsites. 1,100 were within 0Z495 (Marsh South); 800 within 0Z465 (Fitzpatrick's - Blue Anchor west) and 711 within 0Z474 (Annagassan South). 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North) also supported significant numbers (>600).

During the roost survey (01/03/10), 7,335 Knot were observed roosting within seven subsites. A flock of 3,500 roosted with saltmarsh of 0Z495 (Marsh South) along with a further 220 in a different position. 2,000 Knot roosted within saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh). This saltmarsh is dominated by *Spartina* swards and is used extensively by a range of waterbird species including Light-bellied Brent Geese, Black-tailed Godwits, Oystercatcher and Curlew. A further 1,500 Knot roosted at various positions within the expansive saltmarsh of 0Z497 (Lurgangreen North). Previous roost records for the site (unpublished I-WeBS data) shows that 0Z497 (Lurgangreen North) is a regular and important roosting area for Knot (c 11,000 birds). Also used regularly are 0Z472 (Lurgangreen South) (c 5,000 birds) and 0Z460 (Salterstown).

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

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

Numbers

Dunlin were recorded in numbers of all-Ireland importance in all months. The site peak of 4,409 individuals was recorded during the December 2009 low tide survey.

Overall, Dunlin were recorded within 16 subsites but subsite usage between surveys varied with, on average, 60% of subsites used by Dunlin during low tide surveys.

Five subsites held Dunlin in all four low tide surveys: 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z474 (Annagassan South), 0Z494 (Dundalk Harbour), 0Z495 (Marsh South) and 0Z496 (Blackrock Corniche). Peak proportions during low tide surveys were recorded within 0Z496 (Blackrock Corniche) (27/10/09 & 28/12/09), 0Z472 (Lurgangreen South) (26/11/09) and 0Z465 (Fitzpatrick's - Blue Anchor west) (23/02/10). Significant proportions were also recorded within 0Z473 (Annagassan North).

The subsite peak of 1,750 Dunlin was recorded for 0Z496 (Blackrock Corniche) on 27/10/09.

Foraging Distribution

The majority of Dunlin were recorded foraging. On 27/10/09, Dunlin were recorded within three subsites only and 0Z496 (Blackrock Corniche) held the greatest proportion representing 97% of all Dunlin recorded on that day. On 26/11/09, Dunlin were recorded foraging within 11 subsites but significant numbers (>100) were present within only five subsites; 1,213 (44% of total) on this day within 0Z472 (Lurgangreen South). Foraging distribution was more widespread during the December survey (14 subsites) and the birds more evenly distributed – the peak proportion on this day (851 birds – 19% of total) recorded for 0Z496 (Blackrock Corniche). A similar distribution was recorded on 23/02/10 (13 subsites) but the main concentration of Dunlin (1,300) were recorded foraging within 0Z465 (Fitzpatrick's - Blue Anchor west).

The following subsites stand out in supporting foraging Dunlin in numbers ranked in the top five subsites in all low tide surveys: 0Z472 (Lurgangreen South), 0Z473 (Annagassan North) and 0Z496 (Blackrock Corniche). 0Z465 (Fitzpatrick's - Blue Anchor west) supported significant numbers (ranked first or second) on two survey occasions, but held no foraging Dunlin during any of the other surveys.

Dunlin are a wader species generally considered to prefer muddier estuaries (e.g. Hill et al. 1993; Summers et al. 2002). As Dundalk Bay is predominantly a sandy site, the long-term occurrence of such large numbers of Dunlin is perhaps unexpected but the species is fairly adaptable with a wide prey range including small size-classes of bivalves, gastropod molluscs (e.g. *Hydrobia ulvae*) and crustaceans such as *Corophium volutator* and Gammarid amphipods, although polychaete worms are the most preferred prey items. Dunlin also prefer open and wide intertidal areas as opposed to enclosed narrow estuaries, which perhaps together with the large site and varied prey base, results in Dundalk Bay being favoured as a wintering ground by this species.

At Dundalk Bay, Dunlin had a relatively widespread distribution across the upper and mid to lower shore within zones classified as 'muddy fine sand community' and 'fine sand community complex.' Within 0Z472 (Lurgangreen South), flocks of foraging Dunlin foraged within the same general area of this subsite during all four low tide surveys, the largest number usually in the mid to lower shore and at the tide edge but smaller, discrete flocks towards the upper shore within muddy fine sand. The muddy community is characterised by the invertebrate species *Pygospio elegans*, *Corophium volutator* and *Macoma balthica*. Polychaetes *Hediste diversicolor* and *Eteone longa* also occur.

The same general pattern of foraging distribution was found in 0Z496 (Blackrock Corniche) where Dunlin foraged either at the tide edge or towards the upper shore where more silty sediment occurs in association with the saltmarsh. The pattern was less obvious within 0Z473 (Annagassan North) but the presence of a low tide channel likely exerts an influence on the distribution of both benthic invertebrates and wading birds there - Aquatic Services Unit (2008) noting that the influence of freshwater on the distribution of estuarine communities was evident from the presence of the biotope *Hediste diversicolor*, *Macoma balthica* and *Scrobicularia plana* in littoral sandy mud (LS.LMu.MEst.HedMacScr).

The highest intertidal foraging density within a single subsite was 10 Dunlin ha^{-1} recorded within 0Z467 on 28/12/09 and within 0Z465 on 23/02/10. Average subsite foraging density was highest in 0Z465 (4 Dunlin ha^{-1}). The whole site mean feeding density was 0.7 Dunlin ha^{-1}.

Roosting Distribution

During low tide surveys almost all Dunlin were recorded foraging. During the high tide survey (18/01/10) Dunlin roosted within nine subsites. 0Z495 (Marsh South) held the largest number of roosting individuals (1,625) representing 49% of all Dunlin recorded on the survey day. Significant numbers (>100) were also recorded within: 0Z469 (Giles Quay - Fitzpatrick's west), 0Z474 (Annagassan South), 0Z494 (Dundalk Harbour) and 0Z496 (Blackrock Corniche).

During the roost survey (01/03/10), 3,854 Dunlin were observed roosting within ten subsites. 0Z495 (Marsh South) supported the greatest number (1,230) of Dunlin which were roosting within the saltmarsh habitat. 750 Dunlin roosted as part of a mixed flock along the supratidal cobble shore of 0Z473 (Annagassan North). A further 471 roosted within 0Z496 (Blackrock Corniche), 450 of these roosting upon a jetty. The inner part of Ballymascanlan Bay (0Z462) also supported 450 Dunlin that were roosting within saltmarsh. Smaller numbers also roosted within 0Z497, 0Z469, 0Z466, 0Z464, 0Z472 and 0Z474.

The results from the 2009/10 waterbird survey programme compare favourably with previous roost data for the site (I-WeBS, unpublished data) which classifies the following subsites as regular roosts for Dunlin: (seen on 75% or more of I-WeBS counts undertaken):- 0Z473 (Annagassan North), 0Z474 (Annagassan South), 0Z496 (Blackrock Corniche), 0Z494 (Dundalk Harbour), 0Z497 (Lurgangreen North) (c 3,000 birds), 0Z472 (Lurgangreen South) (c 2,000 birds), 0Z495 (Marsh South) and 0Z460 (Salterstown).

Previous data from NPWS bird usage mapping confirms the regular use of 0Z495 (Marsh South) by roosting Dunlin (e.g. 840 on 17/01/99, 7,850 on 26/10/00; 1,015 on 07/01/01; 450 on 13/01/02).

Previous research suggests a link between foraging grounds and available roost sites based on distance, greater numbers of Dunlin generally foraging closer to roost sites, and the majority foraging within 5km of a roost site (Dias et al. 2006). Data from the 2009/10 waterbird programme suggests that Dunlin have a variety of foraging and roosting options across Dundalk Bay but a relationship between the subsites used as foraging areas and roosting areas is evident.

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).

Numbers

Black-tailed Godwits were recorded in numbers of international importance in all months. The site peak of 5,376 individuals was recorded during the November 2009 low tide survey. Peak proportions during low tide surveys were recorded within 0Z472 (Lurgangreen South), 0Z497 (Lurgangreen North), 0Z465 (Fitzpatrick's - Blue Anchor west) and 0Z468 (Giles Quay - Fitzpatrick's mid-west) for the four low tide survey dates respectively. Significant numbers were recorded regularly within 0Z463 (Ballymascanlan South).

0Z472 (Lurgangreen South) and 0Z497 (Lurgangreen North) both supported numbers of Black-tailed Godwits of international importance on two separate survey occasions. The subsite peak of 4,035 Black-tailed Godwits was recorded within 0Z497 (Lurgangreen North) on 26/11/09.

Foraging Distribution

Black-tailed Godwits are 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 as Black-tailed Godwits are relatively adaptive, utilising other habitats for foraging where available, such as terrestrial grassland, coastal marshes, freshwater callows etc.

At Dundalk Bay, Black-tailed Godwits foraged within 13 subsites. Peak proportions were recorded within 0Z468 (Giles Quay - Fitzpatrick's mid-west), 0Z472 (Lurgangreen South), 0Z465 (Fitzpatrick's - Blue Anchor west) and 0Z468 (Giles Quay - Fitzpatrick's mid-west) for the four low tide surveys respectively and representing between 40 and 65% of the Black-tailed Godwits recorded foraging on each survey day. Significant numbers and high proportions were recorded foraging on two occasions within 0Z494 (Dundalk Harbour) and 0Z463 (Ballymascanlan South).

Black-tailed Godwits were distributed widely across both muddy and sandy sediments within Dundalk Bay, these zones classified as 'muddy fine sand community' and 'fine sand community complex.' *Macoma balthica,* a favoured prey item of Black-tailed Godwits, is a dominant species of the muddy sand community. *Scrobicularia plana* is also present in this broad community. The community type 'fine sand community complex' also supports various invertebrates which would be preyed upon by Black-tailed Godwits including polychaetes *Nephtys* sp.

In 0Z472 (Lurgangreen South) large flocks of Black-tailed Godwits usually foraged along the tide edge together with Oystercatchers, Knots and Bar-tailed Godwits. At low tide, godwits on the tide edge would have been within the sub-community 'fine sand with *Fabulina fabula'* which is characterised by bivalve molluscs *Fabulina fabula* and *Angulus tenuis* as well as several polychaete worms.

Smaller, discrete flocks were often located towards the upper shore within the zone classified as muddy fine sand. Aquatic Services Unit (2008) classified the upper shore, muddier habitat of this subsite as the biotope *Hediste diversicolor*, *Macoma balthica* and *Eteone longa* in littoral muddy sand (LS.LSa.MuSa.HedMacEte). Within 0Z465 (Fitzpatrick's - Blue Anchor west) flock position maps reveal Black-tailed Godwits to be positioned within muddier sediments but large numbers occurred across both muddier and sandier zones of 0Z468 (Giles Quay - Fitzpatrick's mid-west).

Although not recorded foraging terrestrially during the 2009/10 waterbird survey programme, it is highly likely that Black-tailed Godwits utilise grassland habitats around Dundalk Bay for foraging at certain times (e.g. high tide).

The highest average intertidal foraging density within a single subsite was recorded for 0Z463 (3.5 Black-tailed Godwits ha^{-1}), this subsite on one occasion supporting 10 Black-tailed Godwits ha^{-1}.

Roosting Distribution

During low tide surveys, significant numbers of Black-tailed Godwits were occasionally recorded roosting intertidally within 0Z497 (Lurgangreen North) and 0Z463 (Ballymascanlan South); the latter recorded 3,807 roosting individuals on 26/11/09. 795 Black-tailed Godwits roosted with their feet in water (classed as subtidal) within 0Z472 (Lurgangreen South) on 27/10/09.

During the high tide survey (18/01/10) the main concentrations of roosting Black-tailed Godwits were recorded within 0Z497 (Lurgangreen North) and 0Z463 (Ballymascanlan South) with 9760 and 980 individuals respectively.

During the roost survey (01/03/10), 5,192 Black-tailed Godwits roosted within ten subsites. 36% of these birds roosted in various positions within saltmarsh habitat of 0Z497 (Lurgangreen North). 1,512 roosted within 0Z495 (Marsh South) where 1,000 were packed tightly together with Oystercatchers, Bar-tailed Godwits and other species in the northern part of the saltmarsh. A further 1,560 roosted within saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh).

Previous roost data for the site (I-WeBS, unpublished data) classifies the following subsites as regular roosts for Black-tailed Godwits:- 0Z462/0Z463 (Ballymascanlan Bay), 0Z494 (Dundalk Harbour), 0Z497 (Lurgangreen North) and 0Z472 (Lurgangreen South).

Bar-tailed Godwit *Limosa lapponica* - Family (group): Scolopacidae (wading birds)

The Bar-tailed Godwit has a widespread breeding distribution across the sub-arctic and low Arctic zones of the Palearctic and extending into western Alaska (Delaney et al. 2009). The taxonomy of the species is complex but five subspecies are generally recognised. The nominate subspecies *L. l. lapponica* breeds across the higher latitudes of Northern Europe, Russia and Siberia and west and winters mainly in Western Europe. The Wadden Sea is used by *L. l. lapponica* and other populations as a staging and moulting area in autumn and spring.

Numbers

Numbers of international importance were recorded in three of the low tide surveys (27/10/09, 28/12/09 & 23/02/10). The peak count of 4,925 Bar-tailed godwits was recorded on 23/02/10. Of note was the very low number (11) recorded during the high tide survey on 18/01/10.

Across the entire survey period, Bar-tailed Godwits were recorded in 13 count subsites, subsite occurrence during individual low tide surveys ranging from eight to ten subsites. The species was recorded during all four low tide surveys within only four subsites: 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z495 (Marsh South) and 0Z496 (Blackrock Corniche). The latter subsite is notable for supporting peak or second highest numbers of total numbers of Bar-tailed Godwits on all four low tide survey dates.

The subsite peak number (1,945) was recorded within 0Z496 (Blackrock Corniche) on 23/02/10.

Foraging Distribution

Bar-tailed godwits are a wader species considered characteristic of coastal wetland sites dominated by sand. The birds forage by probing within the sediment for invertebrate species such as Lugworm *Arenicola marina* or Catworm *Nephtys* sp. The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993).

Peak proportions of foraging Bar-tailed Godwits were recorded in 0Z495 (Marsh South) (27/10/09), 0Z496 (Blackrock Corniche) (26/11/09 & 23/02/10) and 0Z472 (Lurgangreen South) (28/12/09). 0Z496 (Blackrock Corniche) is notable for supporting peak or second highest proportions of total numbers of foraging Bar-tailed Godwits on all four low tide survey dates.

In 0Z496 (Blackrock Corniche) Bar-tailed Godwits were usually foraging at the tide edge together with Knots. These flocks often spanned across the boundary into 0Z495 (Marsh South) where the birds foraged close to the low tide channel (Castletown River). The preference for foraging at the tide edge was also observed within 0Z472 (Lurgangreen South). The species foraged almost exclusively within the broad community type 'fine sand community complex' where a range of invertebrate species that are potential prey items of Bar-tailed Godwits occur including *Angulus tenuis*, *Macoma balthica* and several large polychaete worm species. At low tide, godwits on the tide edge would have been within the sub-community 'fine sand with *Fabulina fabula'* which is characterised by bivalve molluscs *Fabulina fabula* and *Angulus tenuis* as well as several polychaete worms.

Significant numbers foraged within 0Z468 (Giles Quay - Fitzpatrick's west) and 0Z497 (Lurgangreen North) on two separate survey occasions each, but neither recorded the species in all four low tide surveys. These birds were again positioned in long linear flocks along the tide edge.

Foraging density (foraging intertidal) peaked within 0Z496 (Blackrock Corniche) which recorded up to 3 godwits ha^{-1}. The average whole site foraging density was (0.7 Bar-tailed Godwits ha^{-1}).

Roosting Distribution

During low tide counts, very few Bar-tailed Godwits were recorded roosting, the exception being 150 individuals roosting within 0Z469 (Giles Quay - Fitzpatrick's west) on 28/12/09.

During the high tide survey a total of 11 Bar-tailed Godwits were counted (both roosting and foraging), suggesting either that the birds had moved around the site with movements that had gone unobserved by fieldworkers or, that the birds had moved to another site during the high tide period. It is possible that the latter is the case - although Bar-tailed Godwits are considered to be highly site-faithful they do make short-term movements and are perhaps more mobile during winter than previously considered.

The roost survey (01/03/120) recorded 6,358 Bar-tailed Godwits roosting within six subsites. 72% of these birds roosted within 0Z495 (Marsh South) within two main positions although the birds where observed to move and re-shuffle as the tide rose – the birds were observed to fly into the saltmarsh at the southern end and shuffle position on the rising tide before they moved (along with Knot) to a final roosting position in the northern section of the saltmarsh. 1,622 Bar-tailed Godwits also roosted within saltmarsh of 0Z497 (Lurgangreen North). The final main concentration of roosting Bar-tailed Godwits was within saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh).

0Z497 (Lurgangreen North) has been identified as an important roosting area for Bar-tailed Godwits previously (I-WeBS, unpublished data) along with 0Z472 (Lurgangreen South) and 0Z495 (Marsh South).

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

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

Numbers

Numbers of Curlew of all-Ireland importance were recorded in all surveys completed for the 2009/10 waterbird survey programme. Numbers peaked early during October 2009 (1,465 Curlew), the following three surveys recorded very consistent numbers (range 933 – 966), thereafter numbers declined to 835 for the final low tide survey on 23/02/10. The numbers recorded follow the general pattern described by Crowe (2005) whereby numbers at a site peak early but decline as the season progresses as birds move inland. However for the main winter period, numbers at Dundalk remained largely consistent, this is likely due to the freezing weather conditions precluding the use of terrestrial habitats for foraging.

Curlews had a widespread distribution across the site, occurring in 18 subsites across all surveys, with an average % occupancy (no. subsites) of 71% representing 84% of the total site area. Seven subsites supported Curlew in all four low tide surveys.

The peak subsite count of 407 was recorded for 0Z497 (Lurgangreen North) during the high tide survey (18/01/10) representing 42% of the total site numbers on that survey date. 0Z473 (Annagassan North) recorded peak numbers on two survey occasions (26/11/09 & 28/12/09). 0Z469 (Giles Quay - Fitzpatrick's west) recorded peak numbers on 27/10/09 and 0Z472 (Lurgangreen South) recorded peak numbers on 23/02/10.

Foraging Distribution

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

During low tide surveys, Curlews were recorded foraging intertidally within 17 subsites. Of these, six subsites supported foraging Curlews in all four low tide surveys (0Z4645, 0Z472, 0Z473, 0Z474, 0Z496, 0Z497). Peak foraging proportions were recorded within the following subsites: 0Z469 (Giles Quay - Fitzpatrick's west) (27/10/09), 0Z497 (Lurgangreen North), 0Z473 (Annagassan North) and 0Z472 (Lurgangreen South) for the four low tide surveys respectively; peak proportions accounting for between 23% and 37% of the Curlew present on the respective dates.

Of note was 0Z497 (Lurgangreen North) which supported the greatest numbers of foraging Curlew during a low tide survey (26/11/09) and during the high tide survey (18/01/09); the latter representing 90% of the Curlews present foraging on that survey date. Other subsites which recorded significant numbers of foraging Curlew are 0Z468 (Giles Quay - Fitzpatrick's mid-west), 0Z495 (Marsh South) and 0Z496 (Blackrock Corniche).

Curlews rely on large prey that takes more time to handle in contrast to many other wader species that swallow prey relatively quickly upon finding it. As a consequence, Curlews are territorial foragers and tend to occur widely spaced from each other to avoid competitive conflicts. In 0Z497 (Lurgangreen North), Curlews foraged either as part of larger loosely-spaced mixed species flocks at the tide edge or were widely dispersed across the mid-shore area. The same general pattern was observed within 0Z469 (Giles Quay - Fitzpatrick's west) and 0Z472 (Lurgangreen South). In 0Z473 (Annagassan North) and 0Z495 (Marsh South) the foraging distribution was more variable with lower, mid and upper shore areas used. However the majority of Curlews foraged within areas classified as the broad community type 'fine sand community complex' where a range of invertebrate species including large polychaete worms *Nepthys* sp. were likely to have been preyed upon. In 0Z496 (Blackrock Corniche) widely spaced flocks of Curlew foraged within the mid-lower shore.

The highest intertidal foraging density within a single subsite was 1.5 Curlews ha^{-1} recorded within 0Z469 on 27/10/09. Average subsite foraging density was highest in 0Z463 (0.5 Curlews ha^{-1}). The whole site mean feeding density was 0.2 Curlews ha^{-1}. As a territorial species, high foraging densities are perhaps unlikely for Curlew but by way of comparison, UK low tide surveys recorded the greatest mean feeding densities per count section of 1.38 Curlews ha^{-1} (Breydon Water), 0.66 Curlews ha^{-1} (The Deben) and 0.5 Curlews ha^{-1} (Ythan Estuary) (Holloway et al. 1996) and a mean site density of 0.57 Curlews ha^{-1} (Southampton Water) (Musgrove et al. 2003).

Roosting Distribution

During the high tide survey (18/01/10), 713 Curlews were recorded roosting across intertidal, terrestrial and supratidal habitats. 0Z472 (Lurgangreen South) recorded the greatest numbers where 363 roosted within saltmarsh. A further 246 Curlews roosted intertidally within 0Z497 (Lurgangreen North).

The roost survey (01/03/120) recorded 2,224 Curlews roosting within nine subsites. Nearly half of these birds roosted within saltmarsh of 0Z495 (Marsh South). 600 roosted within saltmarsh habitat which spans the two adjacent subsites 0Z465 and 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh). 161 roosted in four different locations within the saltmarsh of 0Z464 (Dundalk Harbour).

Previous roost data for the site (I-WeBS, unpublished data) highlights the regular use and importance of the following subsites as roosting areas for Curlews: 0Z497 (Lurgangreen North), 0Z472 (Lurgangreen South), 0Z495 (Marsh South) and to a lesser extent 0Z462/0Z463 (Ballymascanlan Bay) and 0Z494 Dundalk Harbour.

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

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

Numbers

Total numbers of Redshanks were variable across the survey months. Numbers peaked at 6,342 on 27/10/09, which surpasses the threshold of international importance. Thereafter numbers during low tide survey ranged from 2,364 to 3,504.

1,852 Redshanks were present during the high tide survey (18/01/10).

Redshanks were widespread and recorded within 17 subsites overall. They occurred within 12 subsites during all four low tide surveys.

0Z469 (Giles Quay - Fitzpatrick's west) supported peak numbers of Redshanks on three low tide survey occasions, representing 27% - 43% of the total numbers present on the respective dates. 0Z496 (Blackrock Corniche) recorded peak numbers on 26/11/09, with 449 Redshanks representing 19% of the total present. Significant numbers were also recorded within 0Z465 (Fitzpatrick's - Blue Anchor west) and 0Z468 (Giles Quay - Fitzpatrick's mid-west).

The peak subsite count of 2,700 Redshanks was recorded within 0Z469 (Giles Quay - Fitzpatrick's west) on 27/10/09.

Foraging Distribution

Redshanks forage mainly by pecking at the surface or probing within intertidal mudflats; favouring the muddier sections of sites (e.g. Rehfisch et al. 2000) where they prey upon species such as the ragworm *Hediste diversicolor* or mud snail *Hydrobia ulvae.* A particularly favoured prey is the burrowing amphipod *Corophium volutator.*

At Dundalk Bay, Redshanks foraged regularly (3 low tide counts or more) within 15 subsites. Peak foraging proportions during low tide surveys were recorded for two subsites: 0Z469 (Giles Quay - Fitzpatrick's west) (27/10/09, 28/12/09 & 23/02/10) and 0Z496 (Blackrock Corniche) (26/11/09). Significant numbers were also recorded within 0Z465 (Fitzpatrick's - Blue Anchor west), 0Z468 (Giles Quay - Fitzpatrick's mid-west) and 0Z497 (Lurgangreen North).

In October 2009, 2700 Redshanks foraged within 0Z469 (Giles Quay - Fitzpatrick's west) close to the river channel where the benthic community is the estuarine 'muddy fine sand community.' This community is characterised by the polychaete *Pygospio elegans* as well as by high abundances of *Corophium volutator*, this latter species likely explaining the noted distribution of Redshanks.

In 0Z496 (Blackrock Corniche) the same preference for habitat was recorded via flock position mapping. In 0Z497 (Lurgangreen North) and 0Z472 (Lurgangreen South) Redshanks foraged within the mid to upper shore, often close to low tide channels and within sediment containing a higher percentage of silt (mud). *Corophium volutator* and *Hydrobia ulvae* often have higher densities within upper shore levels (Van de Kam, 2004) and both are associated with a degree of silt (mud) within the sediment.

The highest subsite foraging density (foraging intertidal) was 7.7 Redshanks ha^{-1} (0Z469 27/10/09). 0Z462 (Ballymascanlan North) supported 6.9 Redshanks ha^{-1} on 23/02/10. The whole site mean feeding density was 0.8 Redshanks ha^{-1}.

Roosting Distribution

During low tide surveys the majority of Redshanks were observed foraging. During the high tide survey (18/01/10) 1,360 Redshanks were recorded roosting across 14 subsites. Of these, 29% were roosting within saltmarsh of 0Z465 (Fitzpatrick's - Blue Anchor west). This saltmarsh also extends into 0Z464 (also known as the Bellurgan-Jenkinstown saltmarsh) as is predominantly *Spartina* sp. Significant numbers (363) were also roosting within 0Z497 (Lurgangreen North). 70 Redshanks roosted within saltmarsh of 0Z494 (Dundalk Harbour) with smaller numbers of individuals distributed across 11 other subsites within intertidal or supratidal habitat.

The roost survey (01/03/120) recorded 4,988 Redshanks roosting within 11 subsites. 2,935 were packed together tightly within saltmarsh at the northern extent of 0Z495 (Marsh South). 719 Redshanks roosted within the Bellurgan-Jenkinstown saltmarsh (in 0Z469) and 281 roosted within the upper extent of saltmarsh along with Teal and Black-tailed Godwit within 0Z472 (Lurgangreen South). 189 Redshanks roosted in 0Z473 (Annagassan North) in a mixed flock on shingle/mixed substrata shore along with Oystercatchers, Dunlin and Knot plus other waders.

Previous roost data for the site (I-WeBS, unpublished data) also highlights the regular use of the following subsites as roosting areas for Redshanks: 0Z473 (Annagassan North), 0Z474 (Annagassan South), Ballymascanlan Bay (0Z462/0Z463), 0Z496 (Blackrock Corniche), 0Z494 (Dundalk Harbour), 0Z472 (Lurgangreen South), 0Z497 (Lurgangreen North), 0Z495 (Marsh South) and 0Z460 (Salterstown).

Black-headed Gull *Chroicocephalus ridibundus* - Family (group): Laridae (gulls)
Black-headed Gulls breed widely throughout the middle latitudes of the Palearctic and in north-eastern North America (Mitchell et al. 2004). It is the most widespread breeding seabird within Ireland, breeding both inland and on the coast. Winter numbers are boosted by birds arriving from northern and eastern Europe (Wernham et al. 2002). There is some evidence that gulls from Iceland also move into Ireland for the winter (BWPi, 2004).
Numbers
Numbers of Black-headed Gulls occurred in the range 1,069 (26/11/09) to a peak of 3,130 (28/12/09). Black-headed Gulls were recorded within 16 subsites. The subsite peak of 865 individuals was recorded for 0Z469 (Giles Quay - Fitzpatrick's west) on 28/12/09. The second highest count of 720 was recorded for 0Z473 (Annagassan North) on 27/10/09. The species ranged widely across the site but some patterns are evident in the dataset. In particular, 0Z473 (Annagassan North) held peak numbers during two low tide surveys (27/10/09 & 26/11/09) and 0Z469 (Giles Quay - Fitzpatrick's west) held peak numbers on 28/12/09 and during the high tide survey (18/01/10). 0Z463 (Ballymascanlan South) did not consistently support high numbers but the peak concentration recorded there on 23/02/10 represented 37% of all the Black-headed Gulls recorded on that day.
Foraging Distribution
Black-headed Gulls foraged regularly (three LT surveys or more) within seven subsites. 0Z468 (Giles Quay - Fitzpatrick's mid-west) supported peak proportions on 27/10/09 and 26/11/09, representing 47% and 27% of the total numbers foraging across the site on the respective days. On 28/12/09, 0Z469 (Giles Quay - Fitzpatrick's west) supported 30% of the total numbers foraging, 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North) supporting *c* 22% each. A peak proportion of 65% (860 individuals) was recorded for 0Z463 (Ballymascanlan South) on the final low tide survey (23/02/10), although this subsite had been used little by this species during previous surveys. 0Z495 (Marsh South) recorded significant numbers during the first three low tide surveys. 0Z497 (Lurgangreen North) recorded significant numbers during the latter two low tide surveys.
Roosting Distribution
Black-headed Gulls were recorded roosting/other within 12 subsites overall. Peak proportions during individual surveys (all habitats combined) centred upon three subsites: 0Z473 (Annagassan North), 0Z469 (Giles Quay - Fitzpatrick's west), and 0Z474 (Annagassan South). Significant numbers were also recorded within 0Z494 (Dundalk Harbour) and 0Z497 (Lurgangreen North) and to a lesser extent 0Z462 (Ballymascanlan North). 2,987 Black-headed Gulls were recorded roosting/other during the roost survey (01/03/10). 1,000 (33%) of these were within 0Z469 (Giles Quay - Fitzpatrick's west), where the birds were loafing along the tideline. 840 were observed within 0Z497 (Lurgangreen North) where the majority were located within saltmarsh. A further 542 Black-headed Gulls roosted/loafed subtidally within 0Z474 (Annagassan North). Previous roost data for the site (I-WeBS, unpublished data) highlights the regular use of the following subsites as roosting areas for Black-headed Gulls: 0Z469 (Giles Quay - Fitzpatrick's west), 0Z497 (Lurgangreen North) and 0Z460 (Salterstown).

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 to the Helgoland Bight area of the Wadden Sea (Prater, 1981). Following the moult, the ducks then migrate to wintering areas.

Numbers

Numbers of Shelduck of all-Ireland importance were recorded in all surveys completed for the 2009/10 waterbird survey programme. The site peak of 1,333 birds was recorded on 28/12/09 (LT count).

Shelducks were recorded with regularity (three surveys or more) within 12 subsites. The peak subsite count of 865 individuals was recorded for 0Z469 (Giles Quay - Fitzpatrick's west) on 28/12/09, representing 65% of all Shelducks counted on that day. The following subsites each supported numbers of Shelduck of all-Ireland importance during surveys: 0Z463 (Ballymascanlan South), 0Z465 (Fitzpatrick's - Blue Anchor west), 0Z469 (Giles Quay - Fitzpatrick's west), 0Z472 (Lurgangreen South) and 0Z495 (Marsh South).

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.

During low tide surveys at Dundalk Bay, the majority of foraging Shelducks were within intertidal habitat. They foraged with regularity (three surveys or more) within ten subsites: 0Z463, 0Z464, 0Z465, 0Z468, 0Z469, 0Z472, 0Z473, 0Z474, 0Z495 and 0Z497. Peak proportions of Shelduck foraging intertidally occurred in different subsites on each low tide survey – 0Z465 (Fitzpatrick's - Blue Anchor west) (256 birds on 27/10/09), 0Z497 (Lurgangreen North) (32 birds on 26/11/09), 0Z469 (Giles Quay - Fitzpatrick's west) (865 birds on 28/12/09) and 0Z463 (Ballymascanlan South) (163 birds on 23/02/10).

No strong distributional pattern is evident from the dataset, although subsites which supported peak proportions in one month were generally also important on other survey dates, although not necessarily all. 0Z497 (Lurgangreen North) is notable in supporting peak or very high numbers on three separate survey days although on one occasion recorded no Shelduck at all. Similarly, 0Z465 (Fitzpatrick's - Blue Anchor west) supported peak or very high numbers during two low tide surveys but recorded few Shelduck during the remaining survey programme.

Foraging distribution of Shelduck is most likely related to the distribution of their favoured prey *Hydrobia ulvae* (Bryant & Leng; Murphy et al. 2006) which can be preyed upon by a variety of feeding methods depending on whether the tidal flats are exposed (e.g. scything) or covered with shallow water (head dipping) or deeper water (upending).

The highest foraging density (foraging intertidal) recorded was 4 Shelducks ha^{-1} (0Z463 23/02/10). Average subsite foraging density was also greatest for this subsite (average 1.3 birds ha^{-1}). The whole site mean feeding density was 0.13 Shelducks ha^{-1}.

Roosting Distribution

Shelducks were recorded in roosting/other behaviour within intertidal, supratidal and subtidal habitats. Strong subsite preference was shown for intertidal roosting – 0Z472 (Lurgangreen South) supporting the greatest number on three separate survey occasions. 0Z473 (Annagassan North), 0Z495 (Marsh South) and 0Z497 (Lurgangreen North) were also used to a greater extent than other subsites. Supratidal roosting was largely concentrated upon 0Z464 (Fitzpatrick's - Blue Anchor east).

During the roost survey (01/03/10), over a quarter of all Shelducks roosted within 0Z494 (Dundalk Harbour), these birds roosting along with individuals of other species within the expanse of saltmarsh along the northern shoreline of the subsite. 96 Shelducks roosted in various locations within saltmarsh of 0Z495 (Marsh South). Good numbers were also observed roosting subtidally and within saltmarsh habitats of 0Z464, 0Z472 and 0Z462.

0Z497 (Lurgangreen North) has been identified as a regular roosting area for Shelducks previously (I-WeBS unpublished data) as well as 0Z472 (Lurgangreen South) and 0Z495 (Marsh South).

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

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

Numbers

Across the whole site, numbers of Teal were above the threshold of all-Ireland importance during all survey months. A peak count of 1,243 individuals was recorded during the low tide count on 28/12/09.

Teal were recorded with regularity (three surveys or more) within eight subsites: 0Z462, 0Z463, 0Z464, 0Z469, 0Z472, 0Z494, 0Z495, and 0Z497. 0Z494 (Dundalk Harbour) and 0Z495 (Marsh South) were notable in supporting peak numbers or numbers ranked in the top three subsites during all five surveys. The peak subsite count (495 Teal) were recorded within 0Z495 (Marsh South) on 26/11/09.

Foraging Distribution

Teal are omnivores and have a variety of foraging methods (e.g. dabbling and up-ending) within differing habitats and water depths. During the survey programme, Teal foraged within intertidal, subtidal and supratidal habitats. During low tide surveys intertidal foraging was more commonly recorded.

Teal foraged intertidally with regularity (three surveys or more) within six subsites: 0Z462 (Ballymascanlan North), 0Z463 (Ballymascanlan South), 0Z464 (Fitzpatrick's - Blue Anchor east), 0Z469 (Giles Quay - Fitzpatrick's west), 0Z494 (Dundalk Harbour) and 0Z495 (Marsh South).

Dundalk Harbour and Marsh South were notable in supporting peak numbers or numbers ranked in the top five subsites during all surveys. 0Z469 (Giles Quay - Fitzpatrick's west) supported high numbers on three survey occasions including 361 individuals (43% of total) on 23/02/10. 0Z494 (Dundalk Harbour) was also used by good numbers of Teal foraging subtidally.

The recorded distribution is during low tide is still likely related to the occurrence of water, especially freshwater flows entering the site (e.g. 0Z494, 0Z462/0Z463, 0Z495) or the main estuarine channel (0Z464) which would enable 'dabbling; together with the proximity of saltmarsh habitat where the birds would both feed and gain safe resting areas. Dabbling ducks are known to be abundant around freshwater flows (Ravenscroft & Beardall, 2003). The distribution also coincides with muddier sediments with a variety of invertebrates that would form part of the Teal diet.

Roosting Distribution

0Z463 (Ballymascanlan South), 0Z494 (Dundalk Harbour) and 0Z495 (Marsh South) were used by good numbers of Teal that roosted intertidally. 55% of all roosting Teal during the high tide survey were recorded within saltmarsh in 0Z495 (Marsh South).

53% of all Teal recorded during the roost survey (01/03/10) were located within 0Z472 (Lurgangreen South), the majority positioned subtidally. Good numbers were also recorded within 0Z494 (Dundalk Harbour) (281) and 0Z495 (Marsh South) (175) where all the birds were roosting/loafing subtidally. These data compare favourably with previous roost data for the site (I-WeBS, unpublished data) which shows regular use of the following subsites by roosting Teal: 0Z462/0Z463 (Ballymascanlan Bay), 0Z472 (Lurgangreen South), 0Z495 (Marsh South).

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

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

Numbers

Across the whole site, numbers of Mallard rose from 823 in October 2009 to a peak in November (1,306) and thereafter declined from 989 (28/12/09) to 629 on 23/02/10. All whole-site counts surpassed the threshold of all-Ireland importance. The early peak in numbers is consistent with the pattern described in Crowe (2005) in that Mallards congregate early at some of the larger sites, with a subsequent reduction in numbers attributable to both the start of the hunting season and the re-distribution of some ducks to other suitable smaller wetland sites.

Mallards were recorded in 13 subsites overall but occurred with regularity (three surveys or more) within nine subsites: 0Z463, 0Z464, 0Z472, 0Z473, 0Z474, 0Z494, 0Z495, 0Z496 and 0Z497. 0Z473 (Annagassan North) was notable in recording peak numbers on three survey occasions plus high numbers during all other surveys. 0Z472 (Lurgangreen South) also supported peak or high numbers in all surveys. The peak subsite count of 700 Mallard was recorded within 0Z473 (Annagassan North) on 26/11/09 which accounted for over half of the total number recorded on that date.

Foraging Distribution

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

At Dundalk Bay, Mallards foraged within intertidal, subtidal, and supratidal habitats. During low tide surveys, the majority foraged within intertidal habitats. Peak concentrations of foraging Mallards (intertidal) were recorded within 0Z473 (Annagassan North) (27/10/09 & 26/11/09), 0Z497 (Lurgangreen North) (28/12/09) and 0Z462 (Ballymascanlan North) (23/02/10) although the ducks were observed foraging within this latter subsite on only the one occasion. 0Z473 (Annagassan North) is notable in supporting peak or high numbers on three survey occasions (foraging intertidal) while also recording high numbers foraging subtidally on one occasion (26/11/09). 0Z464 (Fitzpatrick's - Blue Anchor east) supported high numbers foraging intertidally on two separate low tide survey occasions.

Mallard distribution was nearly always associated with water and although many flocks were associated with freshwater flows and low tide channels, some flocks were observed foraging at the tide edge (e.g. 0Z497 (Lurgangreen North). Mallard ducks were observed often in mixed species flocks particularly with Wigeon.

Roosting Distribution

The main concentrations of Mallards roosting intertidally were recorded in 0Z472 (Lurgangreen South) and 0Z473 (Annagassan North). During the high tide survey (18/01/10), 73% of all roosting Mallards were recorded within 0Z497 (Lurgangreen North). Both Lurgangreen North and Lurgangreen South have been identified previously as regular roosting areas for Mallards (I-WeBS, unpublished data).

0Z472 (Lurgangreen South) supported the main concentration of roosting Mallards during the roost survey (01/03/10) when 241 roosted/loafed subtidally in several separate flocks, the largest of which comprised 180 Mallards together with 80 Teal and 10 Wigeon. Mallards where also recorded roosting/other during this survey in 0Z462, 0Z463, 0Z464, 0Z473, 0Z473 and 0Z495 (numbers ranging from 2–44).

Pintail *Anas acuta* - Family (group): Anatidae (ducks)
The Pintail has a Holarctic distribution breeding widely over northern temperate and arctic zones. Although there is a small, irregular population breeding within Ireland, the main numbers that winter in Ireland come from breeding grounds from Iceland eastwards through Fennoscandia to western Russia (Wernham et al. 2002). Although breeding within inland/freshwater wetlands, wintering takes places primarily within estuaries or coastal brackish lagoons.
Numbers
Numbers of Pintail peaked during November 2009 (231 individuals), numbers remaining relatively stable across December 2009 and January 2010 but declining to only four individuals on 23/02/10, likely due to the start of outward migration. Pintail were recorded in 10 subsites overall but occurred with regularity (three surveys or more) within only four subsites: 0Z473, 0Z495, 0Z496 and 0Z497. Subsite usage varied from two subsites (27/10/09 & 23/02/10) to eight subsites (28/12/09). Notable concentrations of Pintail occurred within 0Z495 (Marsh South), 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North).
Foraging Distribution
Largest numbers foraging intertidally occurred within 0Z495 (Marsh South), 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North), the latter recording 144 during the high tide survey (18/01/10). The largest concentrations observed foraging subtidally were within 0Z468 (Giles Quay - Fitzpatrick's mid-west) and 0Z469 (Giles Quay - Fitzpatrick's west) (40 and 61 ducks respectively) but on one survey occasion only (28/12/09). Pintail feed on a variety of plant and animal material most often obtained from the substratum by upending in shallow water. A preference for sheltered parts of estuaries, muddy substratum, adjacent saltmarsh and freshwater flows in which to loaf or drink, may explain the preferred distribution of Pintail within subsites 0Z495, 0Z496 and 0Z497.
Roosting Distribution
The main concentrations of Pintail recorded roosting/other were within 0Z496 (Blackrock Corniche) (subtidal and intertidal). 0Z497 (Lurgangreen North) supported fewer numbers of roosting individuals on three survey occasions. 0Z463 and 0Z464 were also used to a lesser extent. 38 Pintail were recorded roosting across five subsites during the roost survey (01/03/10); unfortunately by March 2010, fewer Pintail were present at the site. The majority were observed subtidally within 0Z472 (Lurgangreen South) and 0Z495 (Marsh South).

Common Scoter *Melanitta nigra* - Family (group): Anatidae (sea ducks)

The Common Scoter is polytypic with a northerly breeding distribution that extends across northwest and northern Europe, Siberia and parts of North America (Wernham et al. 2002). There is a relatively small Irish breeding population that breed at inland lakes. During winter, these birds occur off the coast joined by other wintering individuals from Iceland and Scandinavia (Wernham et al. 2002).

Numbers

Common Scoters were recorded in all surveys with the exception of the first low tide survey (27/10/09). The peak whole-site count of 391 was recorded on 28/12/09. 379 were present during the high tide survey on 18/01/10.

Common Scoters were recorded in six subsites overall. On individual survey days, subsite occurrence varied from one subsite (23/02/10) to five subsites during the high tide survey (18/01/10). They were recorded with most regularity (four surveys) within 0Z460 (Salterstown); this subsite also recording the peak subsite count of 220 individuals on 18/01/10. Good numbers occurred within 0Z497 (Lurgangreen North) on three survey occasions including 170 Common Scoters on 28/12/09. A one-off large count of 220 individuals was recorded within 0Z466 (Giles Quay - Fitzpatrick's east) on 28/12/09.

Foraging Distribution

During winter and when feeding, Common Scoters are generally distributed in shallow coastal waters with a depth of no more than 20m (BWPi, 2004). They are most often found in areas where there is a sandy substratum, linked to the distribution of their favoured prey of bivalve molluscs. Previous research varies somewhat in the range of dive depths undertaken by scoters; examples include a range 2.2 – 3.7m (BWPi, 2004) and a mean of 6.85m and 11.42m (Kaiser et al. 2006). Water depth is therefore an important parameter and the distribution of foraging scoters is likely to change in relation to the tidal state (low or high water) (Kaiser et al. 2006). As deeper dives are more costly in terms of dive duration and energy expenditure required, it follows that scoters are likely to maximise their energy intake by foraging where prey items are abundant and where the energy required obtaining the prey is minimised.

The main observations of foraging Common Scoters were recorded within 0Z460 (Salterstown), 0Z497 (Lurgangreen North) and 0Z466 (Giles Quay - Fitzpatrick's east), the latter on one occasion only. Smaller numbers were also recorded foraging within 0Z461, 0Z473 and 0Z474. The relatively low overall number of observations therefore precludes a detailed examination of the species distribution. However the following associations are noted. The largest number of Common Scoters observed during a low tide survey was on 28/12/09 when 220 foraged within 0Z466 (Giles Quay - Fitzpatrick's east) (c1.5 km offshore) and 170 foraged within 0Z497 (Lurgangreen North) at just over 2km offshore. Subtidal sampling of Dundalk Bay was undertaken in 2009. The area immediately below the intertidal of Dundalk Bay is dominated by muddy sands and was classified by Aquatic Services Unit (2010) as the marine biotope SS.SSa.IMuSa (Infralittoral muddy sand) and assigned the broad habitat classification of 'shallow very fine sand with *Owenia fusiformis* and *Nephtys hombergii* community' by NPWS (2011). Furthermore, the results of multivariate analysis suggest the presence of two distinct community type variants, differentiated by depth and an associated variation in mud content. Of note in relation to Common Scoters is that in water shallower than 5m, the polychaete *Scoloplos armiger* and bivalve mollusc *Fabulina fabula* are increasingly more common (NPWS, 2011), the latter an important prey species for Common Scoters. This broad habitat can be applied to the area where Common Scoters foraged within 0Z497 (Lurgangreen North) (see above).
Deeper than 5m, the polychaete *Spiophanes bombyx* is more often encountered, together with the horseshoe worm *Phoronis* sp. and the bivalve molluscs *Mysella bidentata*, *Thyasira flexuosa* and *Abra alba* (NPWS, 2011).

During the high tide survey (18/01/10), 50 Common Scoters foraged subtidally over the intertidal broad habitat 'fine sand community complex,' the broad habitat that supports bivalves *Angulus tenuis Cerastoderma edule, Mytilus edulis* and *Macoma balthica*. 70 Common Scoters foraged within 0Z497 (Lurgangreen North) (position not known) but the largest number foraged within 0Z460 (Salterstown) spanning both intertidal and infralittoral habitats.

It should be noted that the survey areas extend as far as practicable from land-based vantage points. Species such as Common Scoters may therefore be under recorded due to the species occurring further offshore, and beyond observation range, but still within the SPA site and within an ideal depth-range for diving or utilising the sheltered nature of the site for roosting/loafing (i.e. the area marked grey in dot-density maps).

Roosting Distribution

Common Scoters were not recorded undertaking roosting/other behaviour during the 2009/10 waterbird surveys at Dundalk Bay.

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, *(C. h. hiaticula),* breeds in northern Europe including Ireland, and winters in Europe and north-west Africa.

Numbers

Peak whole-site numbers of Ringed Plovers occurred on the first low tide count (27/10/09) when 427 individuals were present, numbers surpassing the threshold of all-Ireland importance. This early peak is likely due to the presence of passage birds. In November 2009 through to January 2010 numbers remained largely stable (121 – 148 individuals) before declining to 67 birds during the final low tide survey (23/02/10).

Ringed Plovers were recorded in a total of 14 subsites throughout the entire survey programme but subsite use during individual surveys ranged from five subsites (26/11/09, 18/01/10 & 23/02/10) to 11 subsites on 28/12/09. The following subsites were used by Ringed Plovers with the most regularity (three surveys or more): 0Z466 (Giles Quay - Fitzpatrick's east), 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z474 (Annagassan South), 0Z496 (Blackrock Corniche) and 0Z497 (Lurgangreen North). The peak subsite count of 223 Ringed Plovers was recorded for 0Z472 (Lurgangreen South) on 27/10/09, accounting for over 50% of the total recorded on that date. Peak numbers during low tide surveys were recorded within 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z497 (Lurgangreen North) and 0Z473 (Annagassan North) for the four low tide surveys respectively.

Foraging Distribution

The Ringed Plover is a wader species considered characteristic of coastal wetland sites dominated by sand but may also be found in areas with a varying degree of mud content. Understanding patterns of distribution across a site can therefore be difficult but foraging distribution is likely related to the abundance and availability of their prey species (various shallow depth or surface dwelling benthic polychaetes and molluscs) and distance to their roost sites (i.e. feeding grounds and roosting sites being reasonably close to one another).

During the 2009/10 surveys, Ringed Plovers were recorded foraging intertidally within 13 subsites overall. Some patterns of subsite preference are evident from the survey data. 0Z472 (Lurgangreen South) supported peak numbers on one occasion (223 birds on 27/10/09) and relatively high proportions of total numbers on two other survey occasions. 0Z473 (Annagassan North) recorded peak numbers foraging intertidally during two low tide surveys (26/11/09 & 23/02/10). 0Z496 (Blackrock Corniche) recorded relatively high numbers early in the season (October and November surveys) and 0Z497 (Lurgangreen North) supported peak numbers on two survey occasions (28/12/09 (LT) and 18/01/10 (HT).

Ringed Plovers foraging intertidally within 0Z473 (Annagassan North) and 0Z472 (Lurgangreen South) were always positioned within the mid to upper shore, sometimes close to freshwater flows. In 0Z496 (Blackrock Corniche), the birds exhibited remarkably similar foraging positions during successive low tide counts and were always within the upper shore muddy fine sand benthic community. The same habitat preference for muddy sand was also found for 0Z497 (Lurgangreen North).

The highest foraging density (foraging intertidal) recorded was 0.4 Ringed Plovers ha^{-1} (0Z467 28/12/09). The highest average subsite foraging density was 0.12 Ringed Plovers ha^{-1}) (0Z472). The whole site mean feeding density was 0.04 Ringed Plovers ha^{-1}.

Roosting Distribution

During low tide surveys, few Ringed Plovers were recorded in roosting/other behaviour. During the high tide survey (18/01/10), 121 Ringed Plovers were recorded roosting within three subsites: 0Z460 (Salterstown), 0Z466 (Giles Quay - Fitzpatrick's east) and 0Z496 (Blackrock Corniche) with 71, 31 and 19 individuals respectively.

61 Ringed Plovers were recorded roosting across three subsites during the roost survey (01/03/10) - 0Z466 (Giles Quay – Fitzpatrick's east), 0Z474 (Annagassan South) and 0Z496 (Blackrock Corniche), positioned characteristically on supratidal mixed substrata/shingle or gravel shorelines.

Previous roost data for the site (I-WeBS, unpublished data) compares favourably with that collected during the 2009/10 survey programme and highlights the regular use of the following subsites as roosting areas for Ringed Plover: 0Z473 (Annagassan North) (c 100 birds), 0Z474 (Annagassan South) (c 175 birds) and 0Z496 (Blackrock Corniche) (c 50 birds).

Ringed Plovers are known to be highly faithful to roost sites (e.g. Rehfisch et al. 2003).

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

Whole site numbers of Grey Plovers rose from 64 individuals during October 2009 to a peak of 327 individuals during the high tide survey (18/01/10). Apart from the first survey, all whole site counts passed the threshold of all-Ireland importance (65).

Grey Plovers were recorded in a total 16 subsites throughout the entire survey programme but subsite use during individual surveys ranged from four subsites (23/02/10) to 10 subsites on 26/11/09 and 28/12/09. Seven subsites were used by Grey Plovers with the most regularity (three surveys or more): 0Z460 (Salterstown), 0Z472 (Lurgangreen South), 0Z473 (Annagassan North), 0Z474 (Annagassan South), 0Z494 (Dundalk Harbour), 0Z495 (Marsh South) and 0Z496 (Blackrock Corniche).

0Z496 (Blackrock Corniche) was notable in recording peak numbers on three low tide survey occasions. This subsite also recorded the peak low tide count (104 individuals on 26/11/09) although the peak subsite count was recorded during the high tide survey (237 individuals within 0Z495 (Marsh South).

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).

At Dundalk, Grey Plovers showed a clear preference for foraging within 0Z496 (Blackrock Corniche), this subsite recording peak numbers on four survey occasions, including the high tide survey. Numbers ranged from 10 individuals (18/01/01 HT) to 104 individuals on 26/11/09, the latter accounting for 64% of all Grey Plovers recorded foraging on that date. Grey Plovers usually forage within widely-spaced flocks and in 0Z496 they occurred mainly within the broad habitat 'fine sand community complex' where the bivalve *Angulus tenuis* is a major component, as well as a range of polychaete worms that could be potential prey items.

0Z473 (Annagassan North) was notable in being the only other subsite (besides 0Z496) to record foraging Grey Plovers during all low tide surveys (numbers ranging from 8 – 22 individuals). 0Z497 (Lurgangreen North) recorded peak numbers (18 individuals) during the December 2009 low tide survey but this was the only survey to record the species foraging. 0Z472 (Lurgangreen South) supported relatively high numbers of foraging individuals (12 & 13) on two survey occasions (28/12/09 & 23/02/10).

The highest foraging density (foraging intertidal) recorded was 0.3 Grey Plovers ha^{-1} (0Z463 28/12/09). The highest average subsite foraging density was 0.11 Grey Plovers ha^{-1}) (0Z463). The whole site mean feeding density was 0.02 Grey Plovers ha^{-1}.

Roosting Distribution

During low tide surveys, relatively few Grey Plovers were recorded in roosting/other behaviour.

During the high tide survey (18/01/10), 313 Grey Plovers were recorded roosting across intertidal and supratidal habitats. 74% of these individuals were recorded roosting within saltmarsh within 0Z495 (Marsh South). 25 individuals roosted within saltmarsh within 0Z496 (Blackrock Corniche) and 20 within saltmarsh of 0Z494 (Dundalk Harbour). Fewer numbers roosted within 0Z473, 0Z460, 0Z474 and 0Z497.

Lapwing *Vanellus vanellus* - Family (group): Charadriidae (wading birds)
The Lapwing is a monotypic species and has a wide Palearctic breeding distribution from Britain and Ireland in the west to Eastern and southern Siberia in the east with a southern limit extending into Spain (Delaney et al. 2009). Birds breeding in Britain and Ireland are partial migrants with some residing over winter and some migrating south. The wintering population is mostly comprised of Lapwings from continental Europe and northern and western Britain (Wernham et al. 2002). Cold weather movements can result in a greater influx of Lapwings to Ireland's estuaries.
Numbers
Whole site numbers of Lapwing peaked in October 2009 (2,433 individuals) which represents numbers of all-Ireland importance. 1,800 were present on 26/11/09 and 1,551 present on 28/12/09; thereafter numbers declined to 370 individuals on 23/02/10. Across the whole survey programme, Lapwings were recorded within 15 subsites. Subsite use during individual surveys varied considerably with 10 -14 subsites used during October – December, six during the high tide survey (18/01/10) and only three during the final low tide survey on 23/02/10. Nine subsites were used with regularity (three surveys or more) as follows: 0Z462, 0Z463, 0Z469, 0Z472, 0Z473, 0Z474, 0Z494, 0Z495 and 0Z497. Only three subsites were used during all low tide surveys: 0Z462 (Ballymascanlan North), 0Z463 (Ballymascanlan North) and 0Z497 (Lurgangreen North). The peak subsite count (985 Lapwings) was recorded for 0Z495 (Marsh South).
Foraging Distribution
Lapwings are traditionally 'inland' waders. During winter they can be observed across a wide variety of habitats, principally using lowland farmland and freshwater wetlands (e.g. turloughs and callows) but also coastal wetlands where they feed on a variety of soil and surface-living invertebrates. They are opportunistic and mobile birds and will readily exploit temporary food sources such as newly-ploughed fields. Estuaries are typically used as roosting areas where large flocks may be observed roosting upon the tidal flats but coastal areas will also be used to a greater degree during cold weather events when farmland and freshwater habitats freeze over. There is evidence in the UK that utilisation of coastal habitats has increased, coupled with an increase in intertidal feeding (Gillings et al. 2006). At Dundalk, Lapwings foraged intertidally within 12 subsites overall, ranging between two subsites (23/02/10) and eleven subsites (28/12/09) during low tide surveys. 0Z495 (Marsh South) supported peak numbers during the first low tide survey (27/10/09) with 985 Lapwings representing 74% of the total number foraging on that day. 0Z497 (Lurgangreen North) recorded peak numbers on two low tide survey occasions (26/11/09 & 28/12/09) supporting 32% and 39% of total numbers foraging. During the final low tide survey (23/02/10), 247 Lapwings foraged across two subsites (0Z462, 0Z463) with the majority (75%) within 0Z462 (Ballymascanlan North). Lapwings were observed to forage within grassland habitats adjacent to the SPA site as well as within the terrestrial element of the designated site known as Lurgangreen Fields (0ZS03).
Roosting Distribution
During low tide surveys, on average 50% of Lapwings counted were involved in roosting/other behaviour. These birds were largely concentrated within 0Z494 (Dundalk Harbour), 0Z495 (Marsh South) and 0Z497 (Lurgangreen North). Good-sized flocks were also observed on two occasions within 0Z462 (Ballymascanlan North) and on one occasion within 0Z469 (Giles Quay - Fitzpatrick's west). During the high tide survey (18/01/10), the largest flock of Lapwings roosted with saltmarsh of 0Z494 (Dundalk Harbour). 79 Lapwings roosted/rested within the terrestrial habitat of 0ZS03 (Lurgangreen Fields). 66 roosted within saltmarsh of 0Z497 (Lurgangreen North). 960 Lapwings were recorded roosting during the roost survey (01/03/10). 420 of these roosted within saltmarsh of 0Z497 (Lurgangreen North), forming part of large mixed-species flocks. A further 213 Lapwings roosted within saltmarsh at the very northern tip of 0Z462 (Ballymascanlan North) and 155 were roosting within saltmarsh of 0Z495 (Marsh South). Previous roost recorded for the site (I-WeBS unpublished data) confirms Ballymascanlan Bay as an important and regular roosting area for Lapwings, along with 0Z494 (Dundalk Harbour), 0Z497 (Lurgangreen North), 0Z495 (Marsh South), and to a lesser extent 0Z496 (Blackrock Corniche).

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

The Common Gull breeds widely across the Palearctic and in North America (Mitchell et al. 2004). In Ireland, the species is most widely seen during winter when wintering birds arrive from Scotland and continental Europe (Wernham et al. 2002).

Numbers

Numbers of Common Gull across the whole site peaked in November 2009 (3,208 individuals). Thereafter between 12 and 14 hundred gulls were present on each survey day.

Common Gulls were widespread across the site and recorded within 16 subsites overall. The subsite peak of 1,364 individuals was recorded for 0Z460 (Salterstown) on 26/11/09. Numbers were consistently high within 0Z497 (Lurgangreen North).

Foraging Distribution

Common Gulls foraged across 15 subsites overall. Peak numbers were supported by different subsites for the four low tide surveys as follows: 0Z496 (Blackrock Corniche), 0Z472 (Lurgangreen South), 0Z497 (Lurgangreen North) and 0Z463 (Ballymascanlan South) for the four dates respectively. 0Z472 (Lurgangreen South), 0Z496 (Blackrock Corniche), 0Z497 (Lurgangreen North) and 0Z469 (Giles Quay - Fitzpatrick's west) supported relatively high numbers throughout the low tide survey programme.

Roosting Distribution

Large widely-spaced flocks of Common Gulls were observed roosting subtidally on several occasions; significant numbers included 1,345 within 0Z460 (Salterstown) on 26/11/09 and 250 within 0Z473 (Annagassan North) on the same date. Apart from the 26/11/09, the greater majority of Common Gulls within low tide surveys were observed roosting/other intertidally. The following subsites were utilised to a greater extent than others: 0Z460 (Salterstown), 0Z474 (Annagassan South), 0Z473 (Annagassan North), 0Z497 (Lurgangreen North) and 0Z461 (Dunany).

During the high tide survey, 901 Common Gulls roosted intertidally, 72% within 0Z497 (Lurgangreen North). During the same survey 411 Common Gulls roosted subtidally across 10 subsites, the majority within 0Z469 (Giles Quay - Fitzpatrick's west) and 0Z474 (Annagassan South) which collectively accounted for 79% of the total.

3,903 Common Gulls were recorded roosting/resting during the roost survey (01/03/10). A large flock of 1,800 roosted as part of a large, linear and mixed species flock, intertidally between patches of saltmarsh within 0Z497 (Lurgangreen North). 522 were recorded within 0Z496 (Giles Quay - Fitzpatrick's east) where the majority loafed along the tideline. The majority of other counts were of Common Gulls resting subtidally, an activity recorded across ten subsites.

Giles Quay - Fitzpatrick's (0Z466 – 0Z469), 0Z497 (Lurgangreen North) and 0Z472 (Lurgangreen south) have been identified as regular roosting/resting places for Common Gulls previously (I-WeBS unpublished data).

Herring Gull *Larus argentatus* - Family (group): Laridae (gulls)

The Herring Gull has a Holarctic breeding distribution, nesting at boreal and middle latitudes; absent from high arctic zones apart from in Siberia (Wernham et al. 2002). The nominate *L. a. argentatus* breeds in north-west Europe of which the race *argenteus* breeds in Britain and Ireland and is largely resident and seen throughout the year. Outside of the breeding season, Herring Gulls have a widespread distribution and are found along much of the coastline as well as inland.

Numbers

Numbers of Herring Gull across the whole site peaked in October 2009 (743 individuals). Thereafter numbers declined during low tide counts to 202 individuals on 23/02/10. A whole-site count of 159 was recorded during the high tide survey (18/01/10).

Herring Gulls were widespread across the site and recorded within 15 subsites overall. The subsite peak of 346 individuals was recorded for 0Z460 (Salterstown) on 26/11/09.

Foraging Distribution

The majority of Herring Gulls foraged intertidally during low tide surveys. They foraged with regularity (three surveys or more) within six subsites: 0Z460 (Salterstown), 0Z466 (Giles Quay - Fitzpatrick's east), 0Z468 (Giles Quay - Fitzpatrick's mid-west), 0Z469 (Giles Quay - Fitzpatrick's west), 0Z474 (Annagassan South) and 0Z497 (Lurgangreen North). 0Z468 (Giles Quay - Fitzpatrick's mid-west) recorded peak numbers during two low tide surveys (27/10/09 & 26/11/09).

Roosting Distribution

Herring Gulls were observed in roosting/other behaviour during low tide surveys. Peak numbers during the four low tide surveys occurred within: 0Z474 (Annagassan South), 0Z460 (Salterstown), 0Z466 (Giles Quay - Fitzpatrick's east) and 0Z474 (Annagassan South) for the four dates respectively. 0Z461 (Dunany) recorded good numbers (200) on 27/10/09.
During the high tide survey, 303 Herring Gulls were observed in roosting/other behaviour across seven subsites. 29% were recorded within 0Z460 (Salterstown), the majority roosting supratidally (saltmarsh). 0Z497 (Lurgangreen North) supported 50 individuals roosting intertidally.

412 Herring Gulls were roosting/resting during the roost survey (01/03/10). 35% of these were within 0Z461 (Dunany) positioned on supratidal rocks together with Oystercatchers, Redshank, Turnstone and Great Black-backed Gulls. The largest other concentration of Herring Gulls was within 0Z474 (Annagassan South) where the birds were loafing subtidally.

Giles Quay - Fitzpatrick's (0Z466 – 0Z469), 0Z497 (Lurgangreen North) and 0Z472 (Lurgangreen south) have been identified as regular roosting/resting places for Herring Gulls previously (I-WeBS unpublished data).

5.4 Dundalk Bay - Activities and Events

5.4.1 Introduction

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

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

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

5.4.2 Assessment Methods

An information review was undertaken which included NPWS site reporting files, Dundalk Local Development Plan (Dundalk Town Council, 2008), relevant Local Area Plans and other documents relevant to the ecology of the site.

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

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

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

Table 5.7 Scoring system for disturbance assessment

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

Table 5.8 Scoring system - definitions & rationale

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

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

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

As more detailed information becomes available the disturbance assessment can be updated. The methodology could be progressed further by producing a subsite/activity matrix on a species by species basis, thus furthering the identification of subsites that support critical waterbird functions and which are subject to more pressure or disturbance than others.

5.4.3 Overview of activities at Dundalk Bay

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

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

Dundalk Bay is a large, shallow and east-facing sea bay that extends some 16 km from Castletown River on the Cooley Peninsula, in the north, to Annagassan/Salterstown in the south. The bay is shallow and open to the Irish Sea, being partially sheltered by the Cooley Peninsula along the northern side and Dunany Point in the south. The site encompasses the mouths and estuaries of the Rivers Dee, Glyde, Fane, Flurry and Castletown. The Rivers Castletown, Fane and Glyde form the main estuarine channels through the bay. The large town of Dundalk, together with smaller satellite towns Blackrock and Annagassan are present along the western edge of the site. The landscape around the bay is mainly mixed agriculture and urban land use. Housing developments along the site's boundaries have increased in recent years (NPWS, 2005).

The Castletown River, which flows through the town of Dundalk, enters Dundalk Bay between Tippings Point on the eastern shore and Soldiers Point to the south. The southern edge of the river channel is defined by the port wall of Dundalk Harbour (Dundalk Port Company). The location of this deep-water port necessitates routine dredging of the channel for navigation purposes. The Dundalk Landfill and Civic Amenity Waste Facility lies just north of the Castletown Estuary (N1 Dundalk to Newry road). Annual ecological monitoring is required as per Condition 8.10 of the Landfill Waste Licence (34-2).

Various inshore fishery activities occur within the site although their spatial extent is largely unknown. Fishing methods include mobile gear (e.g. bottom trawls) dredges (related to a cockle fishery) and static gear (pots and creels). Dundalk Bay is a classified Bivalve Mollusc Production Area; the area bounded to the East by 6^0 W, to the South by 53^0 49' N, and to the North by 54^0 N. The latest classification is Grade B for Cockles and Grade A for Razor Clams (as per 15th June 2010).[13]

Dundalk Bay has supported a commercial dredge Cockle (*Cerastoderma edule*) fishery since 2001 (Hervas et al. 2008). The Cockle fishery operates by two methods – (1) suction and non-suction hydraulic dredges and (2) hand gathering. The fishery was closed by agreement in 2006 and by legislation in 2007 (SI 02/2007, 269/2007) following discussions between Dundalk Bay Cockle Local Advisory Committee (LAC) and Bord Iascaigh Mhara (BIM). The LAC is facilitated by BIM and is comprised of a number of fishermen who represent the local fleets. During the

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

closure, a stock assessment was undertaken so that the fishery could re-open under a management regime to ensure measures were taken to protect the recruitment potential of the cockle population and the conservation requirements of the site (Hervas et al. 2008). Cockle survey data, which provided estimates of the biomass of cockles in Dundalk Bay plus data on distribution and size and age of cockles, was used to formulate a fishery management plan for 2007. In autumn 2007, commercial dredgers landed 652 tonnes as part of the agreed management plan; the fishery then closed in October 2007 by voluntary agreement of the LAC. Although the fishery opened in 2009 (under the Dundalk Cockle Fishery Management Plan, 2009) it has since remained closed.

Traditionally there was a mussel seed (*Mytilus edulis*) fishery within the bay. This fishery is now closed but unlicensed seed mussel harvesting occurs in many areas across the site. Winkle picking and bait digging are also regular activities at low tide.

Leisure fishing is undertaken within Dundalk Bay, the main access points at Blackrock, Annagassan and Giles Quay. Fish species encountered in this area include Mackerel (*Scomber scombrus*), Codling (*Gadus morhua*), Tope (*Galeorhinus galeus*) and Spurdog (*Squalas* sp.). In deeper water, outside the bay, other species become available including Whiting (*Merlangius merlangus*), Ling (*Molva molva*), Wrasse (*Lubrus*) and Pollack (*Pollachius pollachius*). Charter boat services are available from Bellurgan. Shore fishing at high tide from quay walls (e.g. Annagassan) yields mackerel (in season), flounder (*Platicthys flesus*), eel (*Anguilla anguilla*), mullet (*Chelon labrosus*) and occasional bass (*Dicentrarchus labrax*) (ERFB, 2009).

Dundalk and environs has a rich and diverse natural heritage (Dundalk Town Council, 2008). The backdrop to the town is the picturesque Cooley Mountains. The wide expanse of Dundalk Bay offers a great deal in terms of coastal and marine leisure and tourism. Although sandy beaches are relatively limited (e.g. Giles Quay), shingle beaches are numerous, especially from Salterstown to Lurgangreen in the southern part of the site and from Jenkinstown to east of Giles Quay along the northern perimeter of the site. Bathing occurs at Gyles Quay, Blackrock, Annagassan and Salterstown during the summer. While all these beach areas are popular and easily accessible, they are rarely crowded. Other activities recorded include wind-surfing, jet-skiing and sailing. A range of small boats and cruisers may be moored along the northern shore at Blue Anchor; periodically at Bellurgan, in the vicinity of Blackrock and at the mouth of the River Glyde River at Annagassan.

Walking is a popular activity and is widespread across the site. There is a proposal to construct a coastal walkway along the flood defence embankment at Rockview (0Z496 Blackrock Corniche). This walkway would form part of a longer route that links Soldier's Point at the mouth of Dundalk Harbour with the village of Blackrock (Tobin Consulting Engineers, 2007). There is potential, depending on mitigation measures implemented, that this could lead to increased disturbance to waterbirds using the adjacent saltmarsh ('Marsh South') as a high tide roost (BES, 2007). The current status of this proposal is unknown.

Horse-riding is a regular feature across the sand flats, as is the training of grey hounds. There is a rifle range south east of Dundalk and west of Marsh South (adjacent to 0Z495). There is a small private airstrip south of Lurgangreen at Mooretown, Dromiskin. This is used infrequently during the winter months.

Hunting in the form of wildfowling has been a long tradition at the site and is widespread (recorded within 12 subsites). There are two No-Shooting Areas within the SPA - Ballymascanlon Wildfowl Sanctuary (0Z462/463) and Lurgangreen Wildfowl Sanctuary (0Z472) (S.I. 243 of 1977 (Wild Birds Open Season Order 1977), however the 2009/10 waterbird survey programme did record shooting within/close to these areas.

January 2010 was the coldest January for 25 years (Met Éireann (2010)) and in response to the freezing conditions, the Department of the Environment, Heritage and Local Government extended a temporary closure of the hunting season for wild birds (6th January 2010 to 20th January 2010).

5.4.4 Disturbance Assessment

Potential disturbance-causing activities were recorded within 15 subsites during the 2009/10 waterbird survey programme (all subsites except 0Z465, 0Z472 and 0Z495). The categories represented were: human (on-foot, shoreline), human (on-foot, intertidal aquaculture), bait diggers, un-powered watercraft, powered watercraft, horse riding, dogs, shooting and vehicles.

Summary results from the disturbance assessment are presented in Table 5.9 and a full assessment is given in Appendix 10. Note that insufficient information was available to undertake the disturbance assessment for fishery and aquaculture activities within the site.

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

It is clear that all 18 subsites are subject to a variety of activities that have the potential to cause disturbance to waterbirds. Although some high-intensity activities were recorded (jet skis, motorised vehicles) their frequency was not continuous so an overall 'high' disturbance score was never attained. Shooting (wildfowling) however, did occur on a 'frequent' basis within several subsites and together with a high-level intensity and short-term displacement of birds led to an overall high score within these subsites.

0Z474 (Annagassan South) recorded the greatest number of activities and events, linked to tourism and recreation and harbour/pier activities. Annagassan South together with Dundalk Harbour (0Z494) recorded the greatest number of activities that scored 6 or more (moderate). The most regularly-occurring and highly-scoring activity that occurs across the site is shooting (wildfowling).

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

Another important consideration is whether birds have alternative habitat to move to during a disturbance event. Birds that show the greatest response to disturbance and fly away (traditionally seen to be the ones that 'respond' the most to disturbance) may do so because they have alternative habitats to go to. In contrast, birds that are apparently less-disturbed and do not move away from a patch may be forced to behave in this way because they do not have

alternative disturbance-free sites to go to. In terms of impacts at population level, the species most affected will be the ones whose fitness[14] is reduced by individuals being constrained to stay and 'cope' with the disturbance as opposed to species that can move to an alternative habitat of similar quality (Gill et al. 2001a).

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

- Timing (birds may be more vulnerable pre- and post- migration) or at the end of the winter when food resources are lower;
- Age of birds - for example, immature (first winter) birds may be marginalised by older more dominant flocks and be already under pressure to gain their required daily energy intake before any disturbance occurs;
- Weather - birds being more vulnerable during periods of severe cold weather, for example, extreme cold weather may result in birds being unable to fly away due to insufficient energy;
- 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 than range more widely;
- Predation forces - increased competition may force some waterbirds to move into areas where they are subject to increased predation – i.e. indirect impact is an increased predation risk.

As a final review, Table 5.10 shows peak disturbance scores overlaid on the subsite assessment table (total waterbird numbers, LT surveys). Where a species distribution and activity responsible for the peak score are not likely to coincide, the table is left unshaded. An example is 0Z460 where hand-gathering of molluscs in exposed intertidal areas might affect Curlews or Oystercatchers but will have no direct disturbance effect on Common Scoters when feeding in the same area when inundated by the tide.

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

Table 5.9 Disturbance Assessment – Summary Table
Scores 0 – 3 = Low; Scores 4 – 6 = Moderate; Scores 7 – 9 = High (see text for explanation).

Subsite Code	Subsite Name	Total Number Activities	No. activities that scored 6 or more	Peak Disturbance Score	Activity Responsible
0Z460	Salterstown	10	1	6	• Molluscs (hand gathering)
0Z461	Dunany	9	1	6	• Molluscs (hand gathering)
0Z462	Ballymascanlan North	1	1	7	• Wildfowling
0Z463	Ballymascanlan South	2	1	6	• Wildfowling
0Z464	Fitzpatrick's - Blue Anchor east	10	1	7	• Wildfowling
0Z465	Fitzpatrick's - Blue Anchor west	10	3	6	• Jet skiing • 4WD, trial & quad bikes
0Z466	Giles Quay - Fitzpatrick's east	9	2	7	• Wildfowling
0Z467	Giles Quay - Fitzpatrick's mid-east	5	1	6	• Power boating
0Z468	Giles Quay - Fitzpatrick's mid-west	7	3	7	• Wildfowling
0Z469	Giles Quay - Fitzpatrick's west	9	3	7	• Wildfowling
0Z472	Lurgangreen South	8	1	6	• Wildfowling
0Z473	Annagassan North	12	2	6	• Fishing harbour (assoc. disturbance) • Pier (associated disturbance)
0Z474	Annagassan South	13	5	6	• Fishing harbour (assoc. disturbance) • Pier (associated disturbance) • Bathing & general beach recreation • Walking (incl. dogs) • Molluscs (hand gathering)
0Z494	Dundalk Harbour	9	4	7	• Wildfowling
0Z495	Marsh South	6	0	5	• Firing range
0Z496	Blackrock Corniche	10	2	6	• Bathing & general beach recreation • Wildfowling
0Z497	Lurgangreen North	9	1	6	• Wildfowling
0ZS03	Lurgangreen Fields	3	1	6	• Wildfowling

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

Note that where a species distribution and activity responsible for the peak score are unlikely to coincide, the table is left unshaded. Note 0A484 was un-assessed (grey shading) in relation to fisheries and aquaculture.

Subsite ► / Species ▼	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
GJ																	H	V
PB	H	M	H	H	H	H	M	M	H	H	H	H	V	H	M	V	V	
RM	H	M				H	V		H		M	H	V	H	V	H	H	
GG		V				H	V			H		V	H	M	H	V		
OC	H	H	L	L	H	H	L	M	M	V	H	H	M	L	H	V	V	
GP			V	H							H	H	M	M	M	M	V	
KN	V					M		H	M	V	V	H	H		V	H	H	
DN	L		L	M	M	V	M	H	M	M	V	H	M	H	H	V	H	
BW			L	H	M	V			V	H	V	H	H	H	H	L	V	
BA				M	M	M		M	M	H	V	H	H	M	V	V	H	
CU	M	L	M	H	H	H	L	L	H	V	V	V	M	M	H	H	H	
RK	L	L	M	M	L	H	L	H	H	V	M	H	H	H	H	V	H	
BH	H	M	M	V	L		L	M	H	V	M	V	H	H	H	H		
SU	L		M	V	H	H			M	V	V	H	H	H	V	H	H	
T.	L		M	H	H	M				V	M	H		V	V	H	M	
MA	M		H	H	H				M	H	V	V	H	M	H	H	H	
PT				V	M	M			H	V		H	L		V	V	H	
CX	V						V					M					V	
RP	L			H		M	H	H	H	H	V	V	H	H		H	V	
GV	M	H	M	H	M	H			M	H	H	H	H	H	H	V	V	
L.			V	H	M	M	V			H	H	M	M	H	V	M	V	L
CM	V	M	M	H		L	L	M	H	H	H	H	V	M	M	V	V	
HG	V	H	L			L	H	H	H	V	M	H	V	L	M	M	H	

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APPENDIX 1

SITE NAME: DUNDALK BAY SPA

SITE CODE: 004026

Dundalk Bay is a large open shallow sea bay with extensive saltmarshes and intertidal sand/mudflats, extending some 16 km from Castletown River on the Cooley Peninsula, in the north, to Annagassan/Salterstown in the south.

The extensive sand flats and mud flats have a rich fauna of bivalves, molluscs, marine worms and crustaceans which provides the food resource for most of the wintering waterfowl. The outer part of the bay provides excellent shallow-water habitat for divers, grebes and sea duck. In summer, it is thought to be a major feeding area for auks from the Dublin breeding colonies. The bay is used at night for roosting by wintering flocks of Greylag Goose, Greenland White-fronted Goose and Whooper Swan from Stabannan/Braganstown (inland of Castlebelligham) and other inland sites.

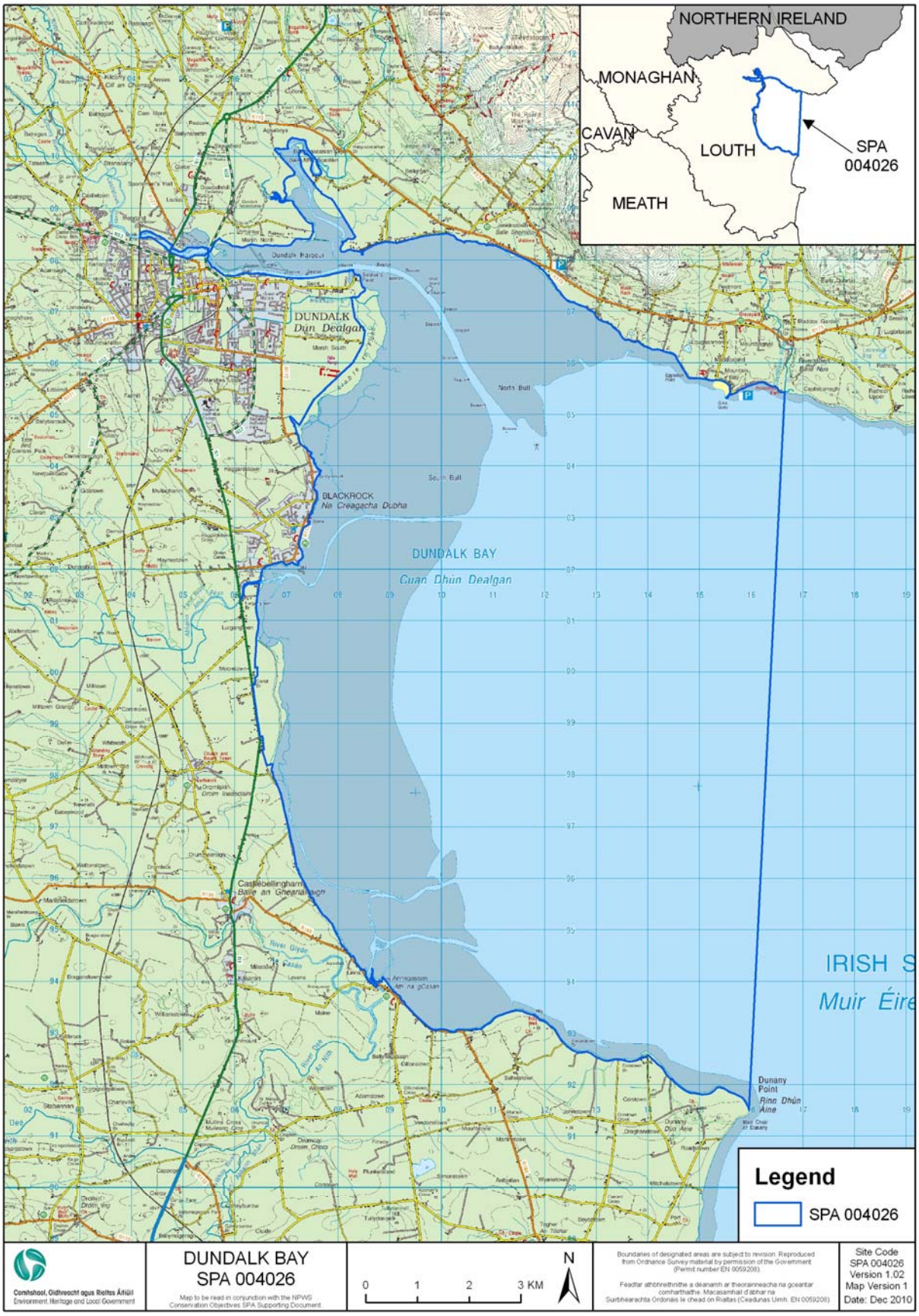
The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Great Crested Grebe, Greylag Goose, Light-bellied Brent Goose, Shelduck, Teal, Mallard, Pintail, Common Scoter, Red-breasted Merganser, Oystercatcher, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull and Herring Gull. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is of international importance because it regularly supports an assemblage of over 20,000 wintering waterbirds. It also qualifies as a site of international importance for supporting populations of Light-bellied Brent Goose (370), Knot (9,710), Black-tailed Godwit (1,100) and Bar-tailed Godwit (1,950) - all figures are five year mean peaks for the period 1995/96 to 1999/2000. A variety of other species occur in numbers of national importance, i.e. Great Crested Grebe (303), Greylag Goose (435), Shelduck (522), Teal (538), Mallard (765), Pintail (117), Common Scoter (581), Red-breasted Merganser (121), Oystercatcher (8,746), Ringed Plover (151), Golden Plover (5,967), Grey Plover (204), Lapwing (4,892), Dunlin (11,518), Curlew (1,264) and Redshank (1,569). Other wintering species which occur include Red-throated Diver, Great Northern Diver, Cormorant, Grey Heron, Mute Swan, Wigeon, Goldeneye, Greenshank and Turnstone.

The site also supports nationally important populations of three wintering gull species - Black-headed Gull (6,643), Common Gull (551) and Herring Gull (754).

In spring and autumn the site attracts a range of passage migrants, including Little Stint, Curlew Sandpiper and Ruff.

Dundalk Bay SPA is one of the most important wintering waterfowl sites in the country and one of the few that regularly supports more than 20,000 waterbirds. Four species occur in numbers of international importance and a further 19 species in numbers of national importance. The regular occurrence of Golden Plover, Bar-tailed Godwit, Red-throated Diver and Great Northern Diver is of particular note as these species are listed on Annex I of the E.U. Birds Directive. Dundalk Bay is a Ramsar Convention site.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Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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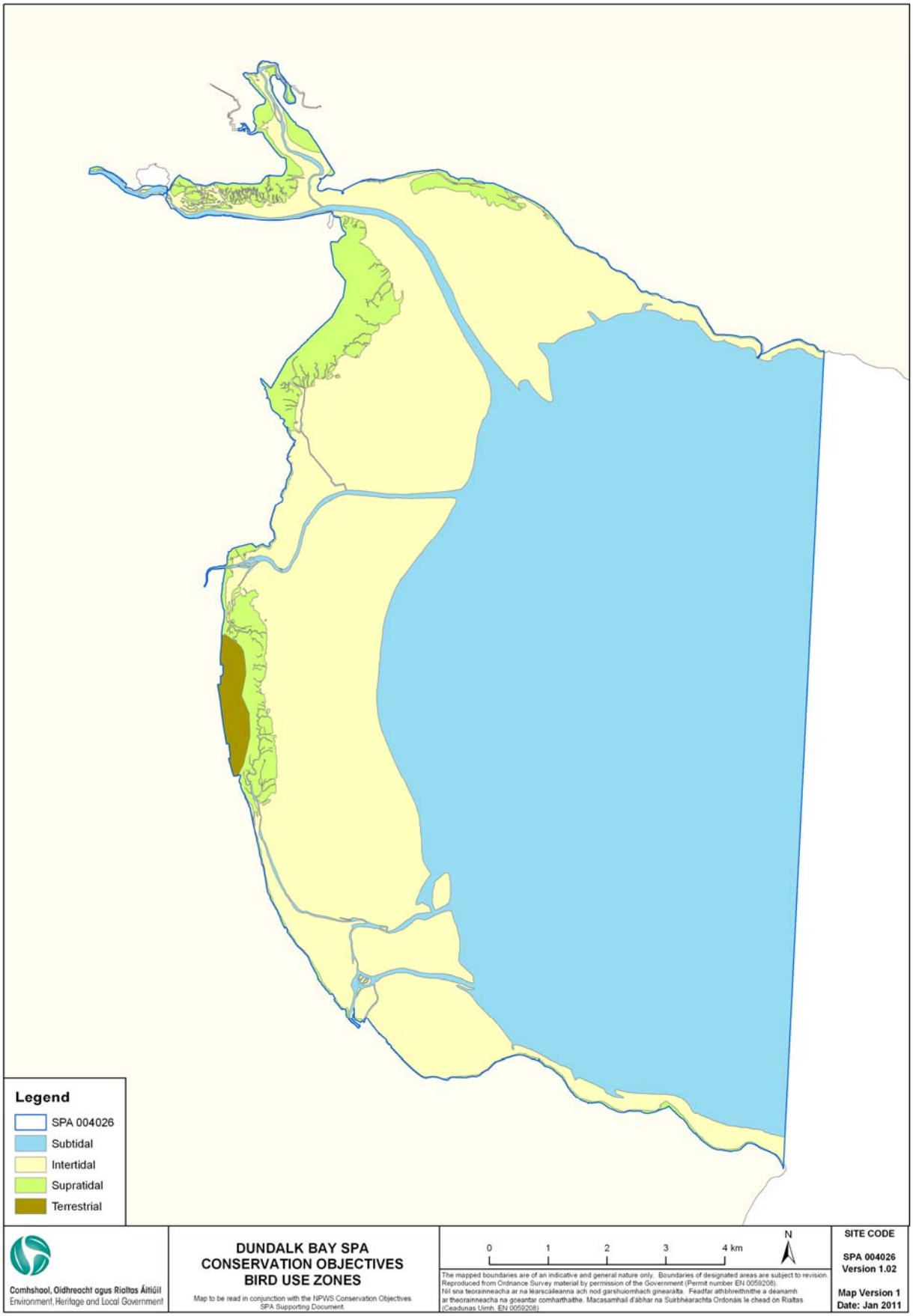
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DUNDALK BAY SPA
CONSERVATION OBJECTIVES
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Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document
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The mapped 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
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SITE CODE
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Version 1.02
Map Version 1
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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.

Greylag Geese at Dundalk belong to the Stabannan-Braganstown/Dundalk flock that forage in grasslands of the Stabannan-Braganstown floodplain in northeast Co Louth, and roost at Dundalk Bay. All Greylag Geese present at this site are considered to be Icelandic in origin (Hearn & Mitchell, 2004).

- Barnacle Goose (*Branta leucopsis*)

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

- Light-bellied Brent Geese

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

APPENDIX 3

Population Indexing and Trend Analysis: a synopsis

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

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

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

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

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

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

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

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

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

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

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

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

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

Limitations

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

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

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

Population Indexing and Trend Analysis: hypothetical example

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

Example

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

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

APPENDIX 4

Waterbird species codes

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

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

APPENDIX 5

Waterbird foraging guilds (after Weller, 1999)

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

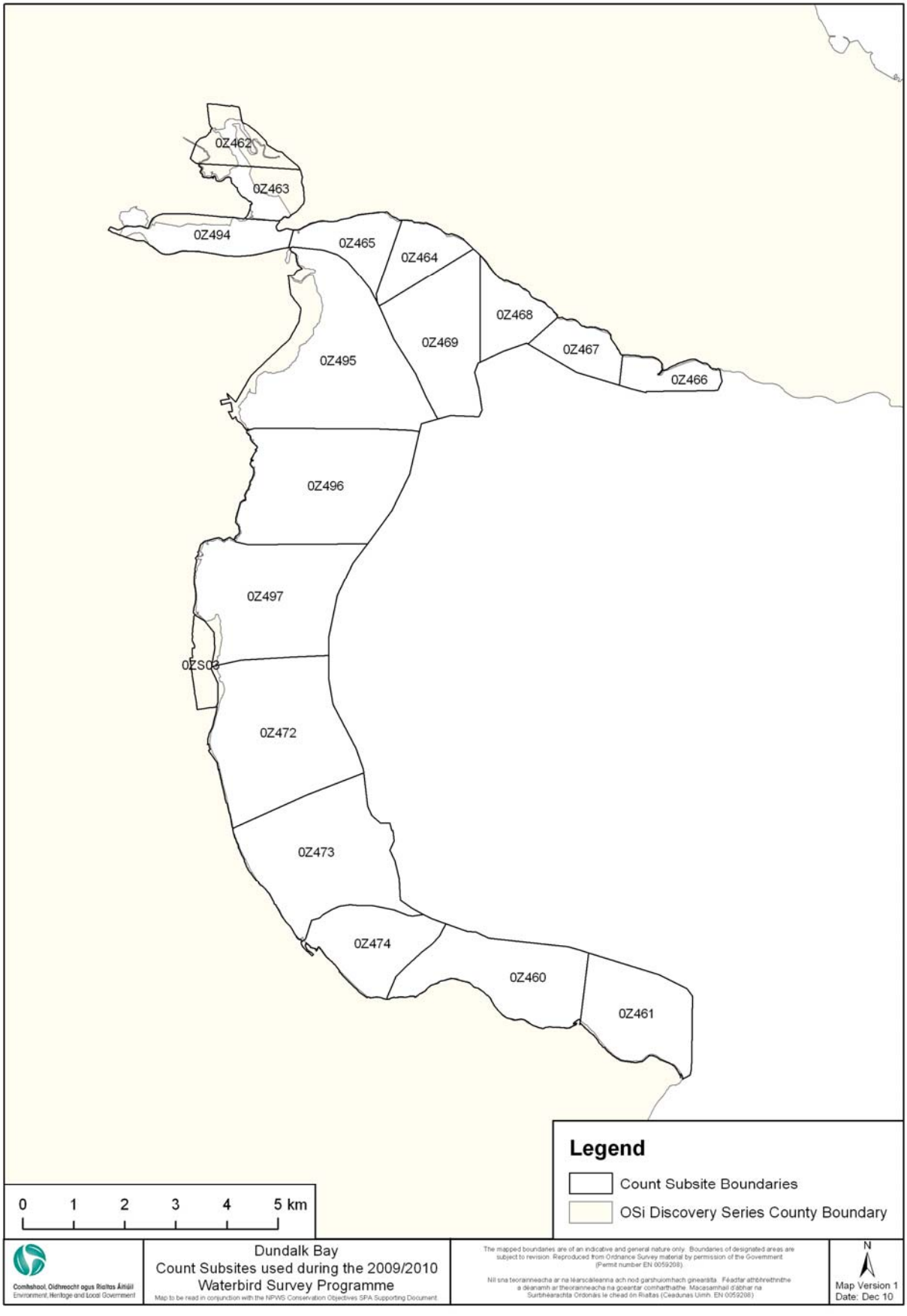
[a] dives <3m.

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

APPENDIX 6

Dundalk Bay SPA (4026) – Waterbird survey programme 2009/10 – Count Subsites

Subsite	Name
0Z460	Salterstown
0Z461	Dunany
0Z462	Ballymascanlan North
0Z463	Ballymascanlan South
0Z464	Fitzpatrick's - Blue Anchor east
0Z465	Fitzpatrick's - Blue Anchor west
0Z466	Giles Quay - Fitzpatrick's east
0Z467	Giles Quay - Fitzpatrick's mid-east
0Z468	Giles Quay - Fitzpatrick's mid-west
0Z469	Giles Quay - Fitzpatrick's west
0Z472	Lurgangreen South
0Z473	Annagassan North
0Z474	Annagassan South
0Z494	Dundalk Harbour
0Z495	Marsh South
0Z496	Blackrock Corniche
0Z497	Lurgangreen North
0ZS03	Lurgangreen Fields


0Z462
0Z463
0Z494
0Z465
0Z464
0Z468
0Z469
0Z467
0Z495
0Z466
0Z496
0Z497
0ZS03
0Z472
0Z473
0Z474
0Z460
0Z461
Legend
Count Subsite Boundaries
OSi Discovery Series County Boundary
0 1 2 3 4 5 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
Dundalk Bay
Count Subsites used during the 2009/2010
Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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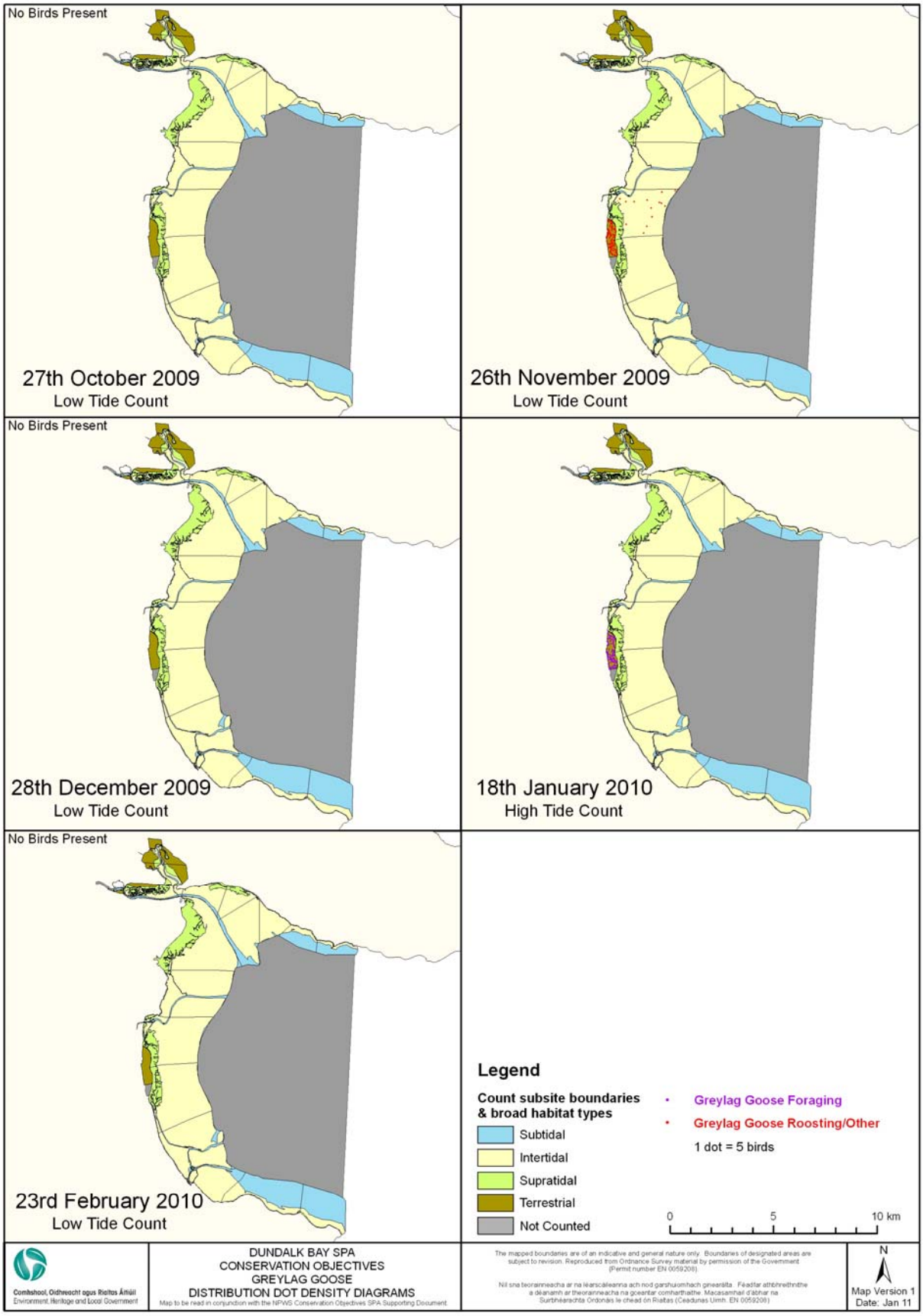
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Dec 10

APPENDIX 7

Dundalk Bay (4026)

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


No Birds Present
27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
No Birds Present
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
No Birds Present
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Greylag Goose Foraging
Greylag Goose Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
GREYLAG GOOSE
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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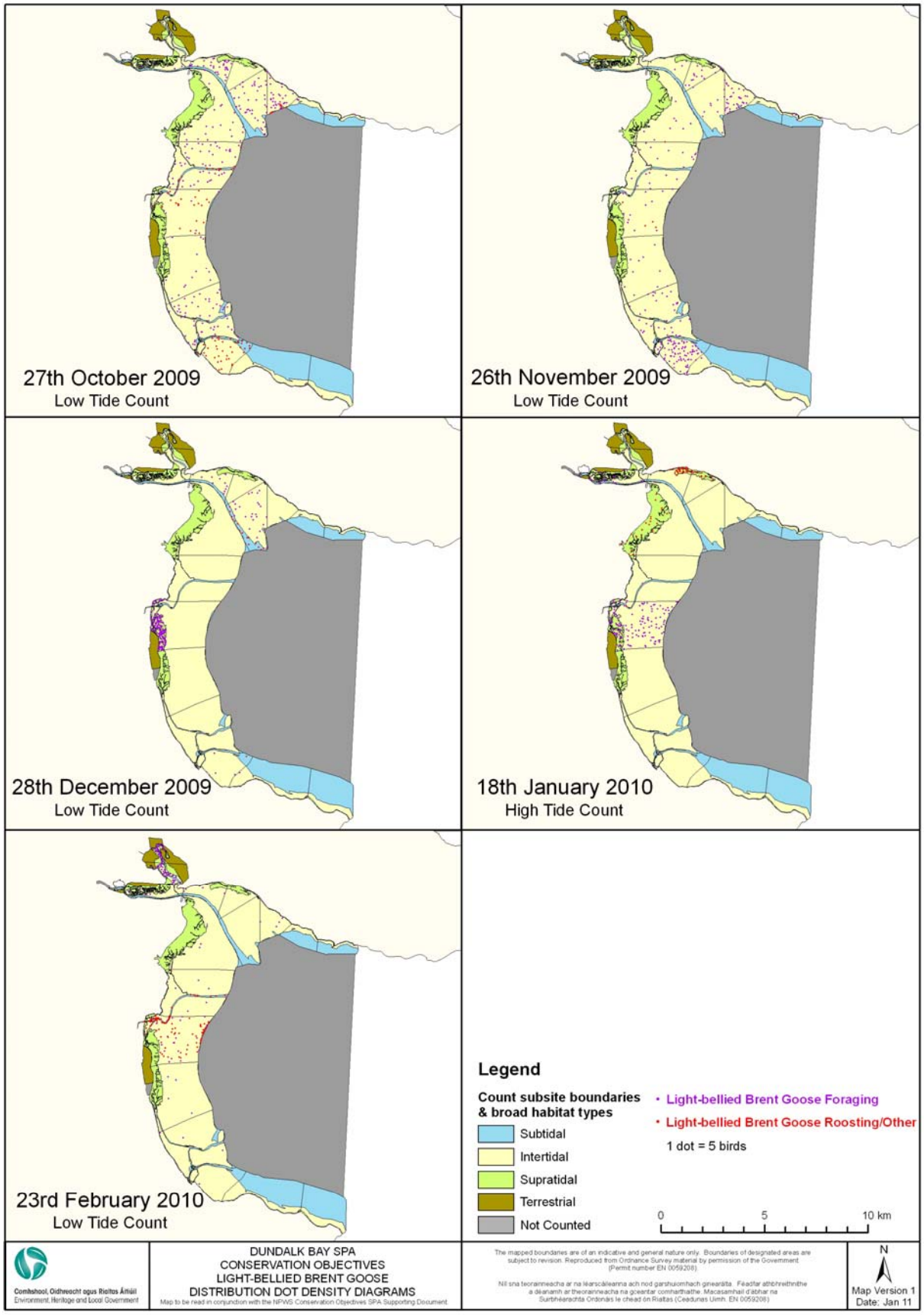
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Light-bellied Brent Goose Foraging
Light-bellied Brent Goose Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY 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
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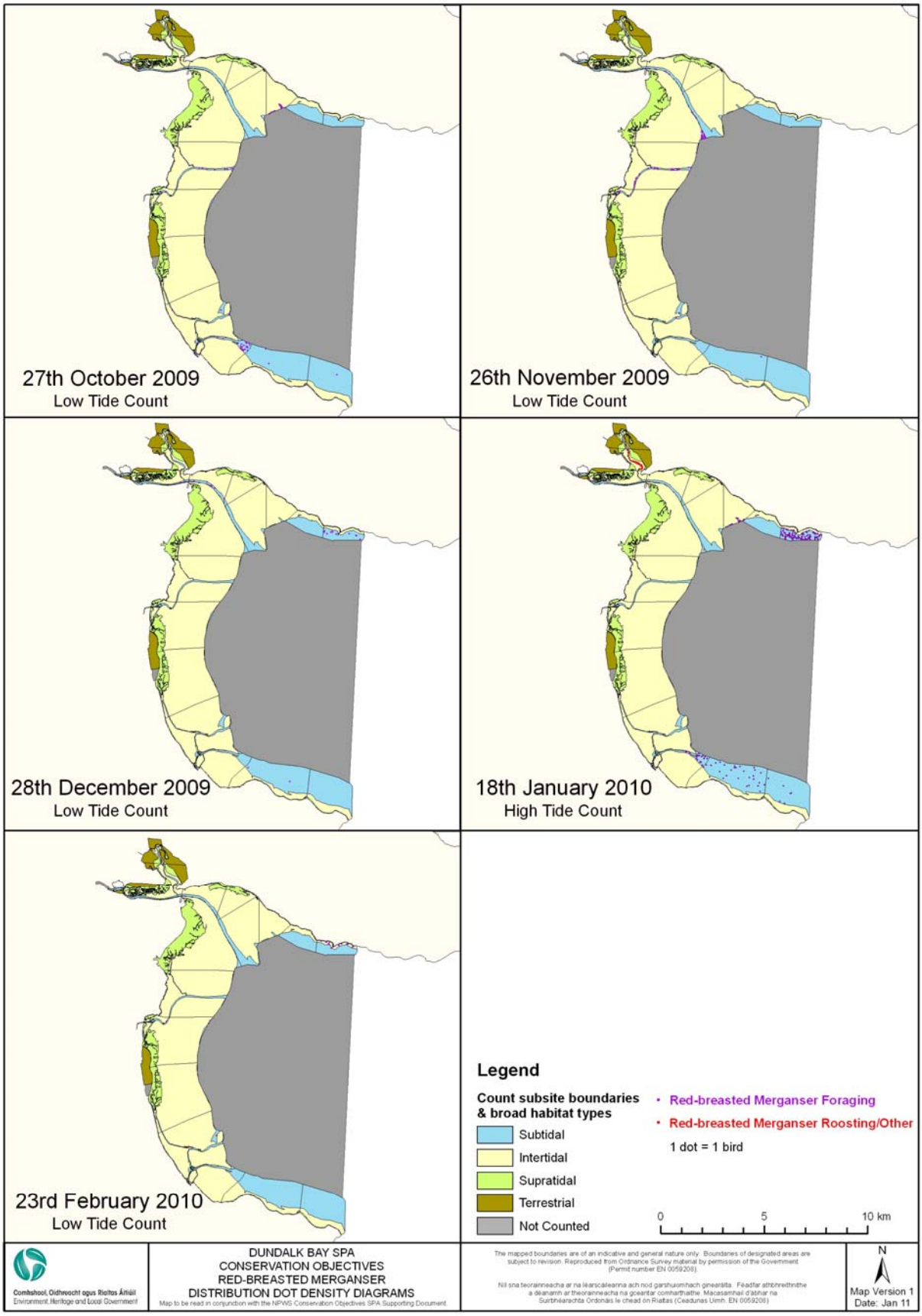
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Red-breasted Merganser Foraging
Red-breasted Merganser Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
RED-BREASTED MERGANSER
DISTRIBUTION DOT DENSITY DIAGRAMS
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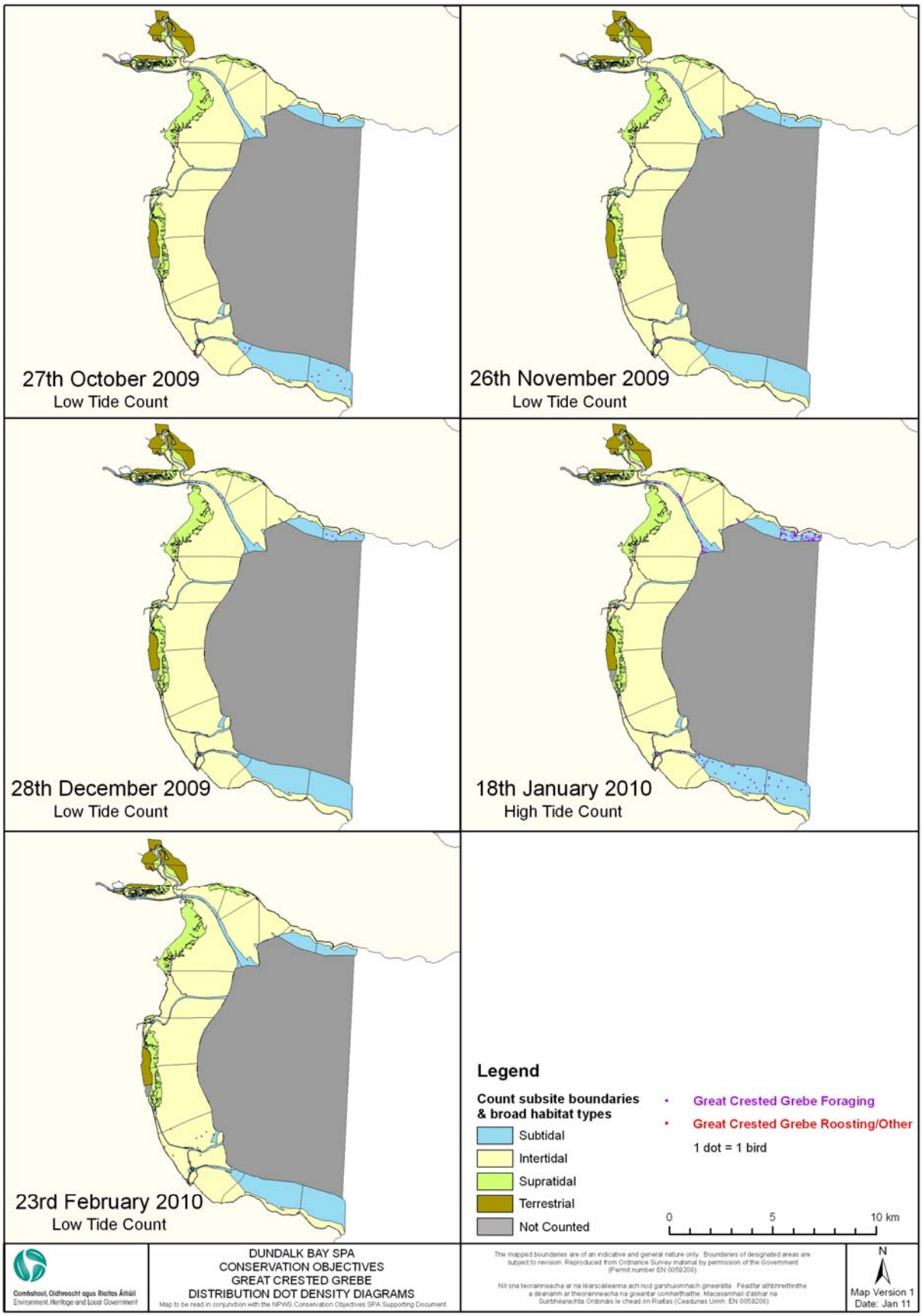
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Low Tide Count
26th November 2009
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28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Great Crested Grebe Foraging
Great Crested Grebe Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
GREAT CRESTED GREBE
DISTRIBUTION DOT DENSITY DIAGRAMS
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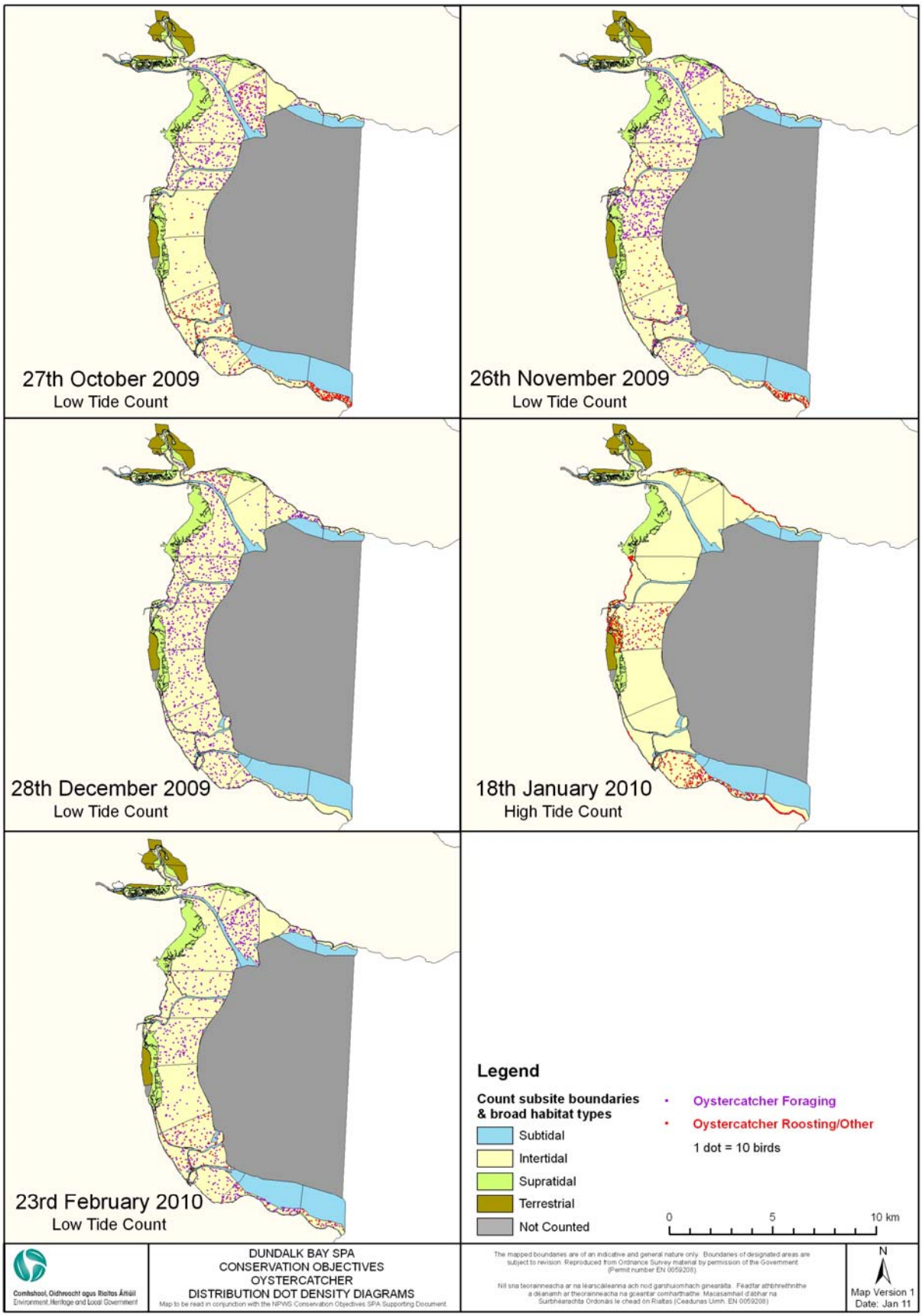
27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Oystercatcher Foraging
Oystercatcher Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
OYSTERCATCHER
DISTRIBUTION DOT DENSITY DIAGRAMS
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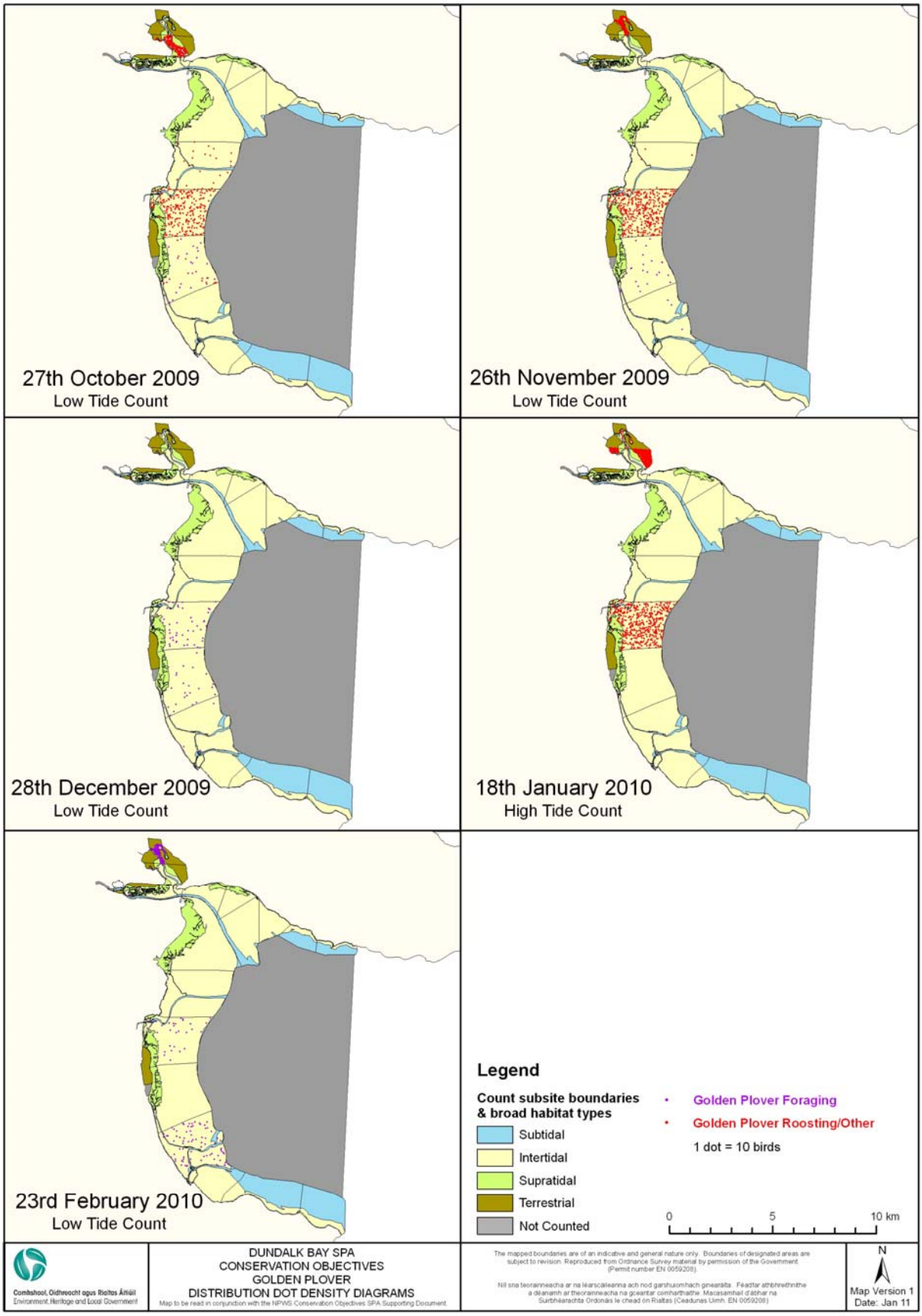
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Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
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Intertidal
Supratidal
Terrestrial
Not Counted
Golden Plover Foraging
Golden Plover Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
GOLDEN PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
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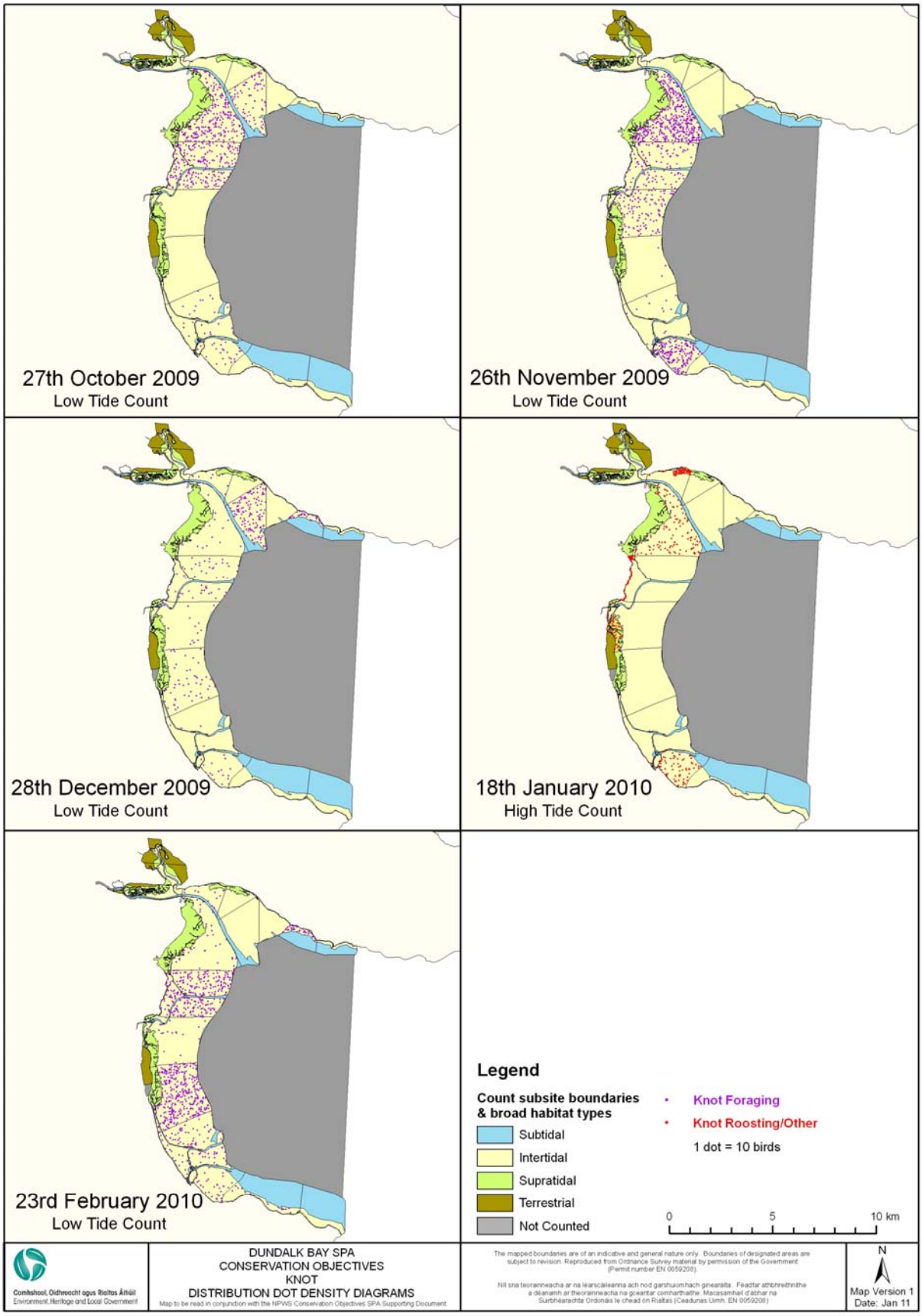
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Terrestrial
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Knot Foraging
Knot Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
KNOT
DISTRIBUTION DOT DENSITY DIAGRAMS
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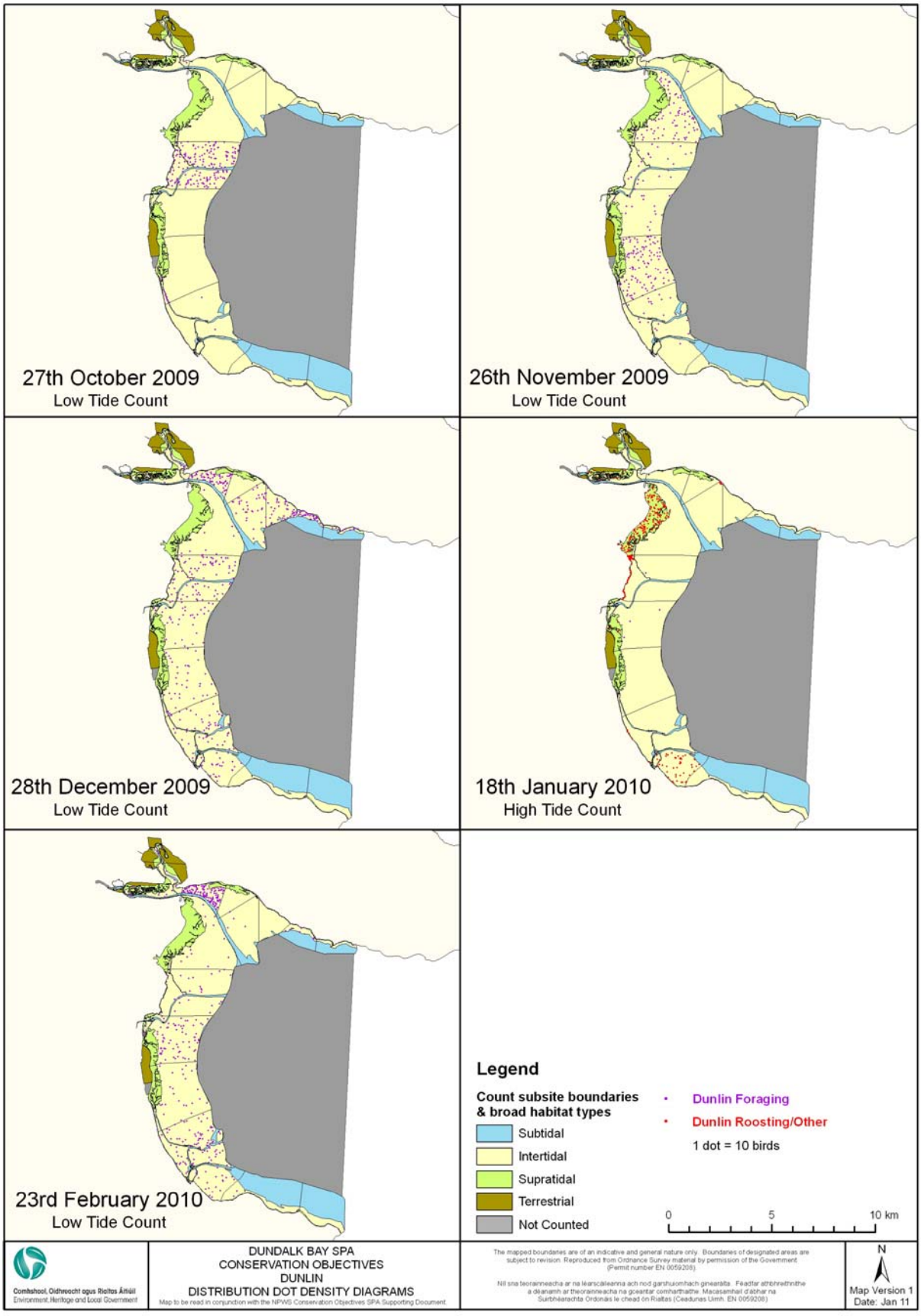
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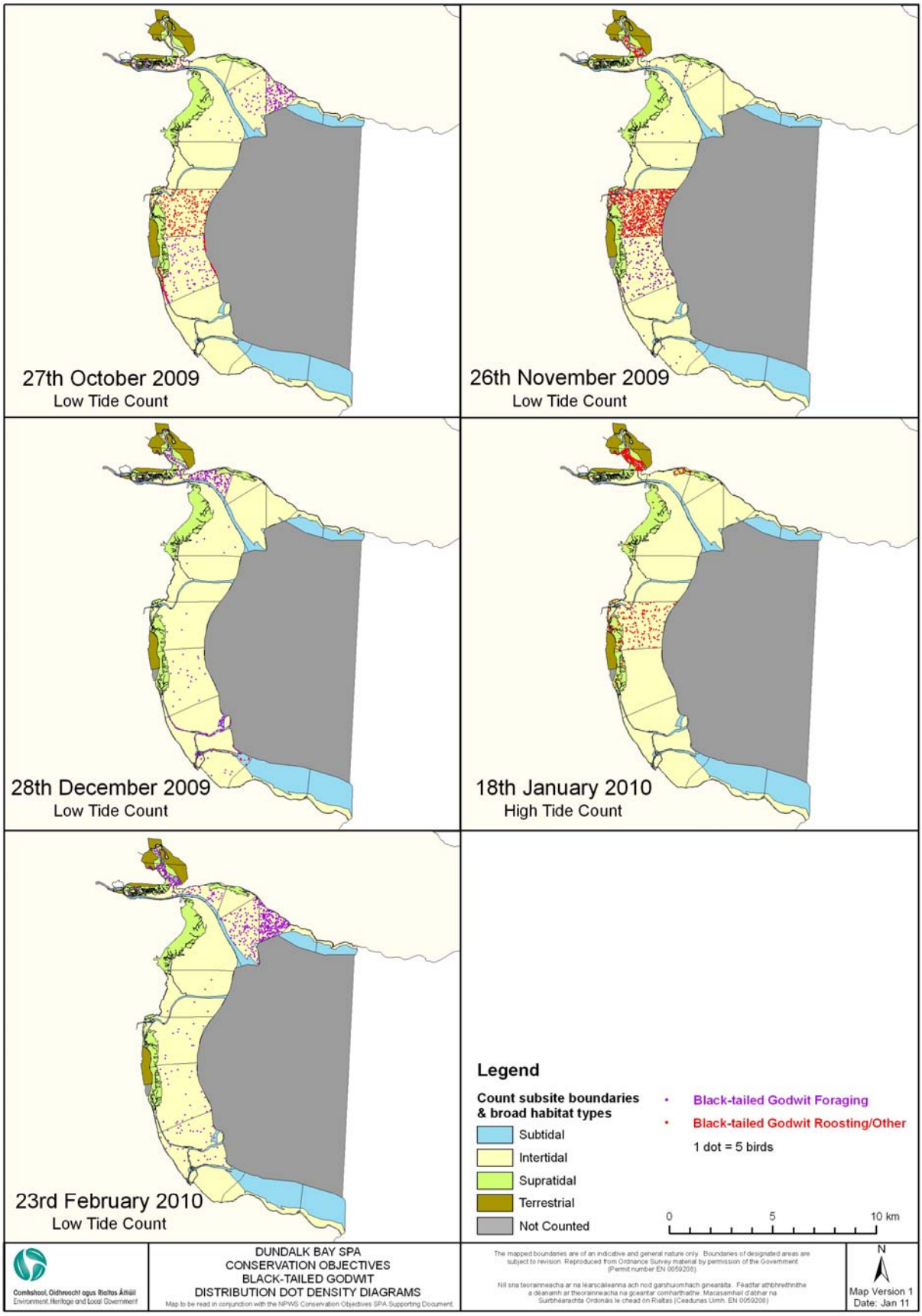
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Dunlin Foraging
Dunlin Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY 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 Suirbhéireachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Black-tailed Godwit Foraging
Black-tailed Godwit Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
BLACK-TAILED GODWIT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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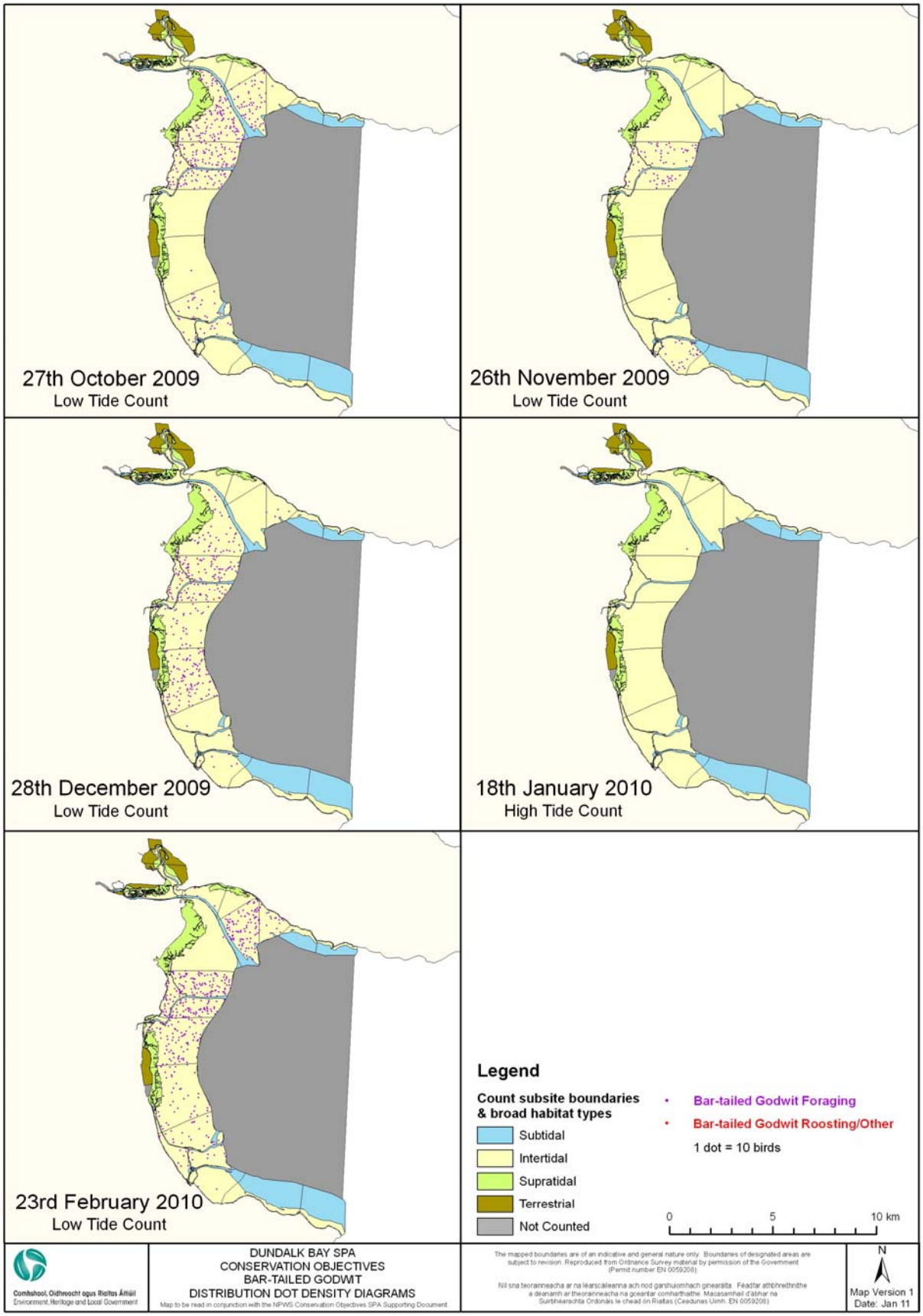
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Bar-tailed Godwit Foraging
Bar-tailed Godwit Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
BAR-TAILED GODWIT
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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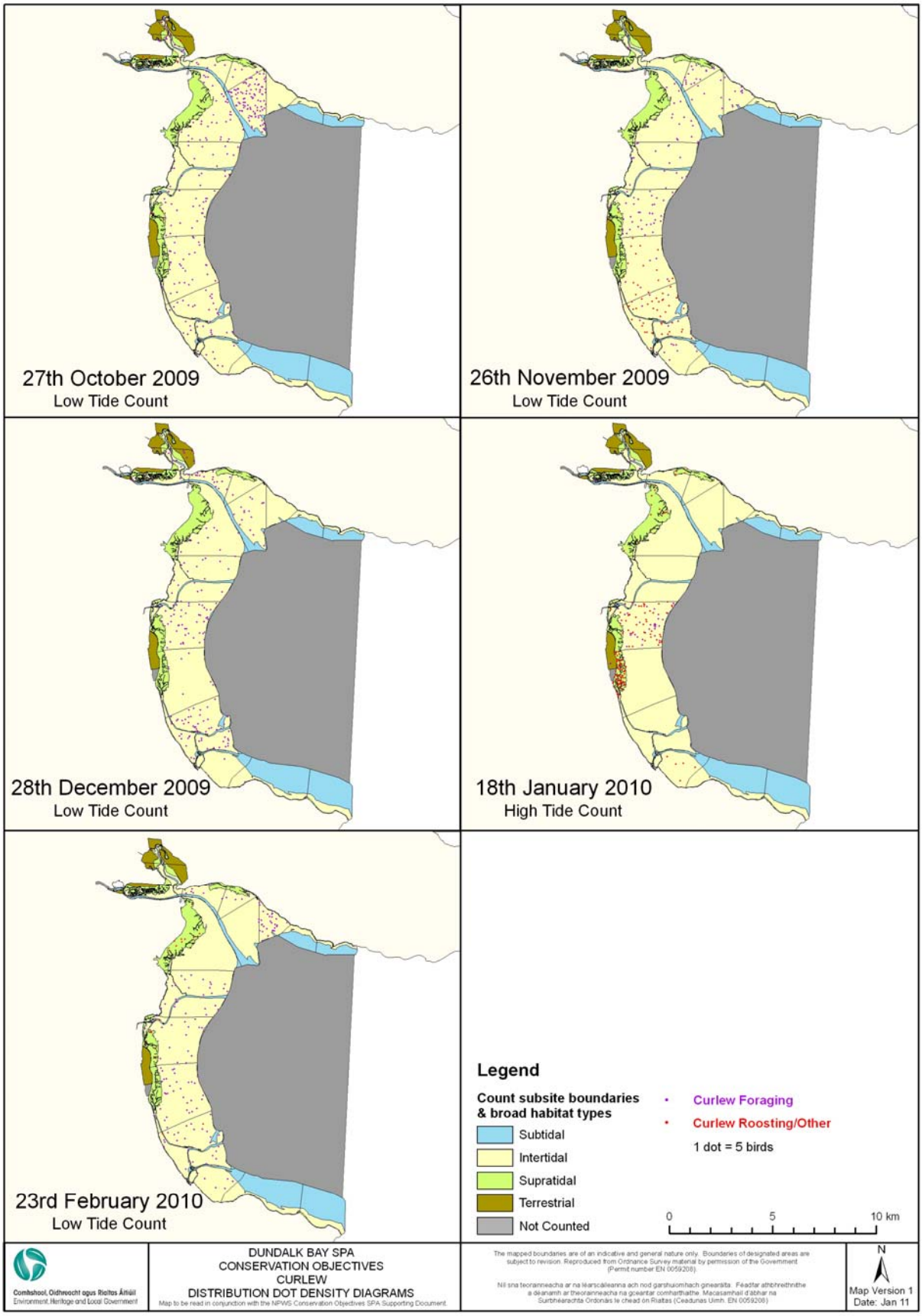
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Curlew Foraging
Curlew Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
CURLEW
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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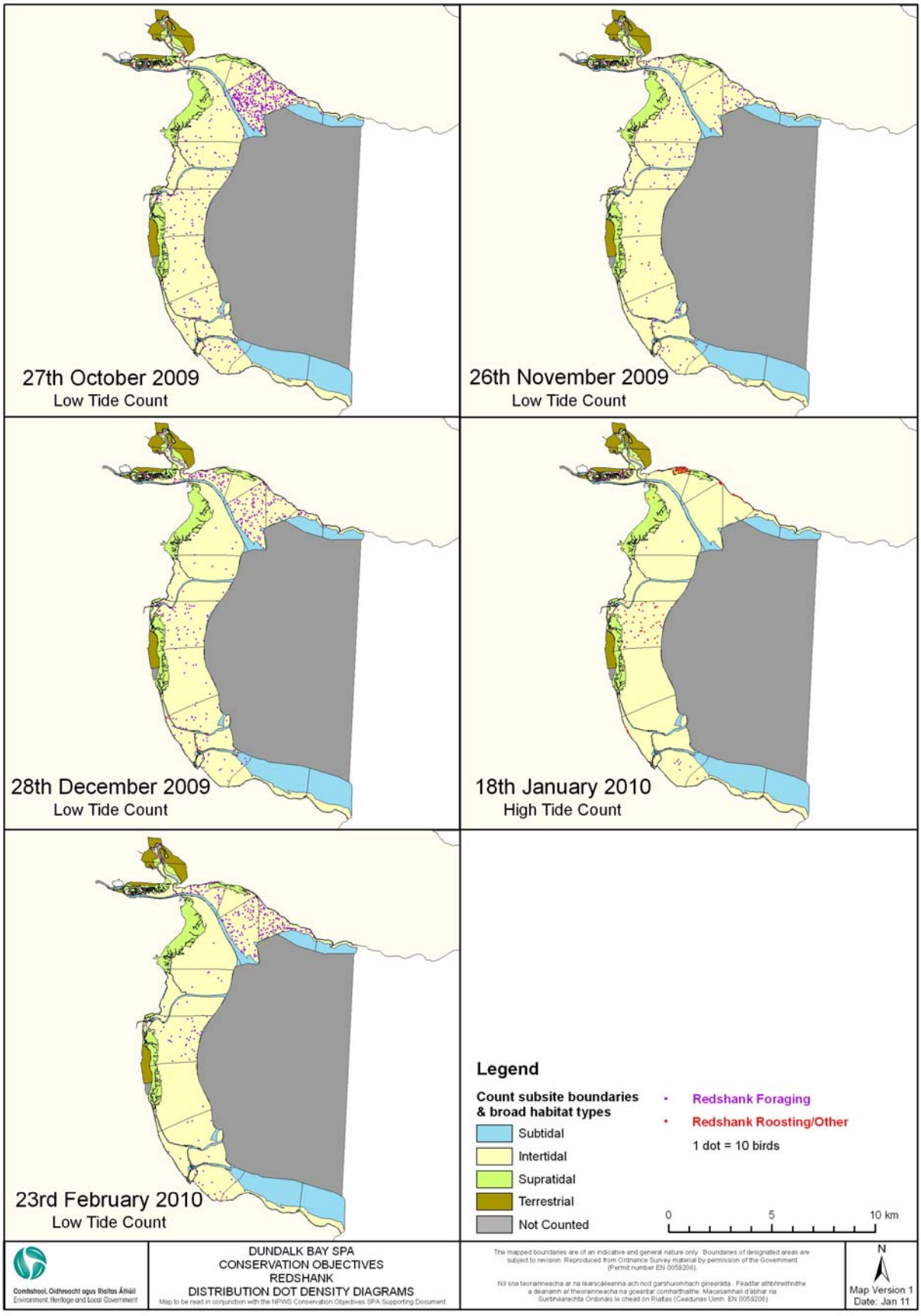
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Redshank Foraging
Redshank Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
REDSHANK
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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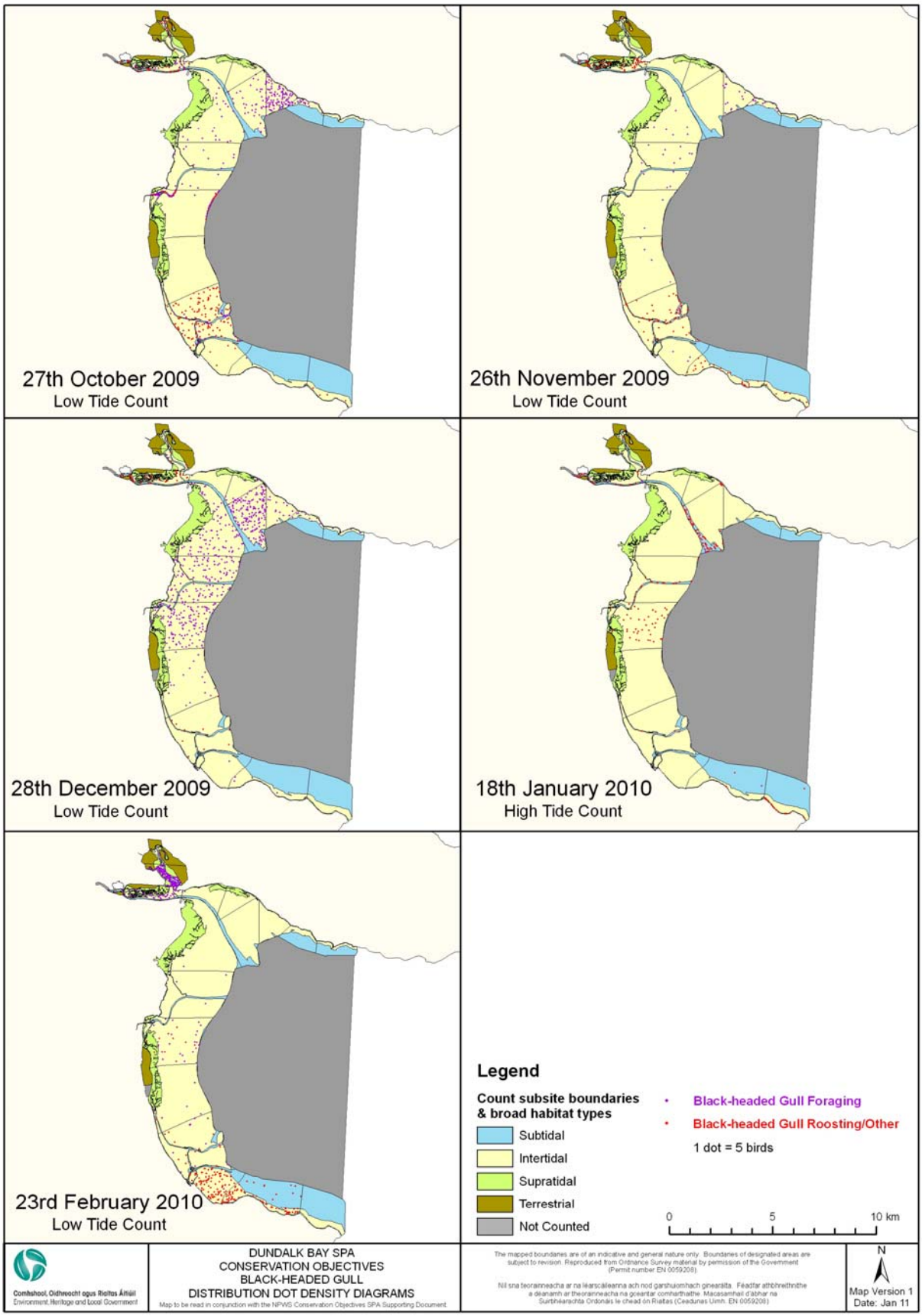
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach gineartha. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead on Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Black-headed Gull Foraging
Black-headed Gull Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
BLACK-HEADED GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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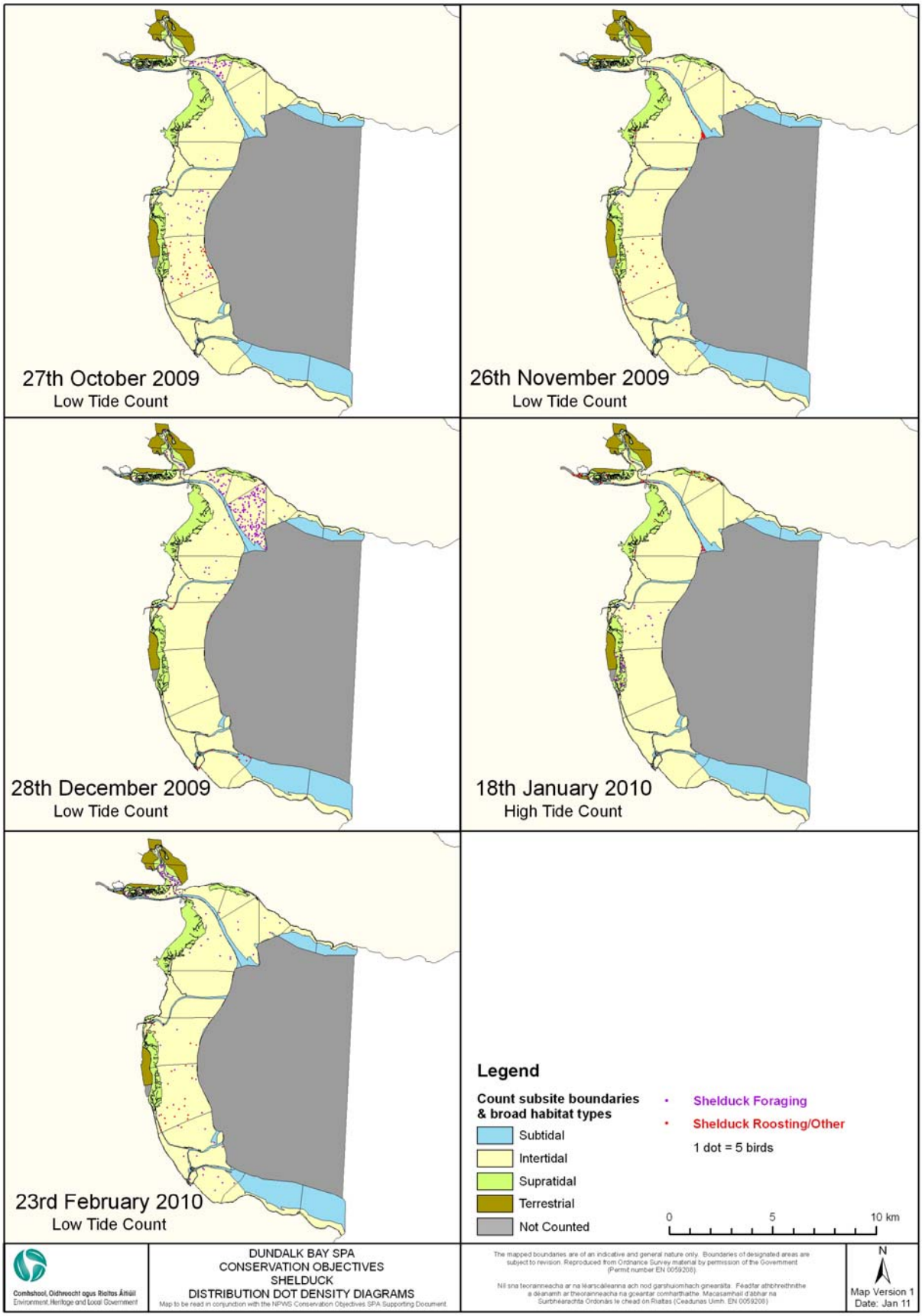
Nil sna teorainneacha ar na léarscáileanna ach nod ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéireachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Shelduck Foraging
Shelduck Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
SHELDUCK
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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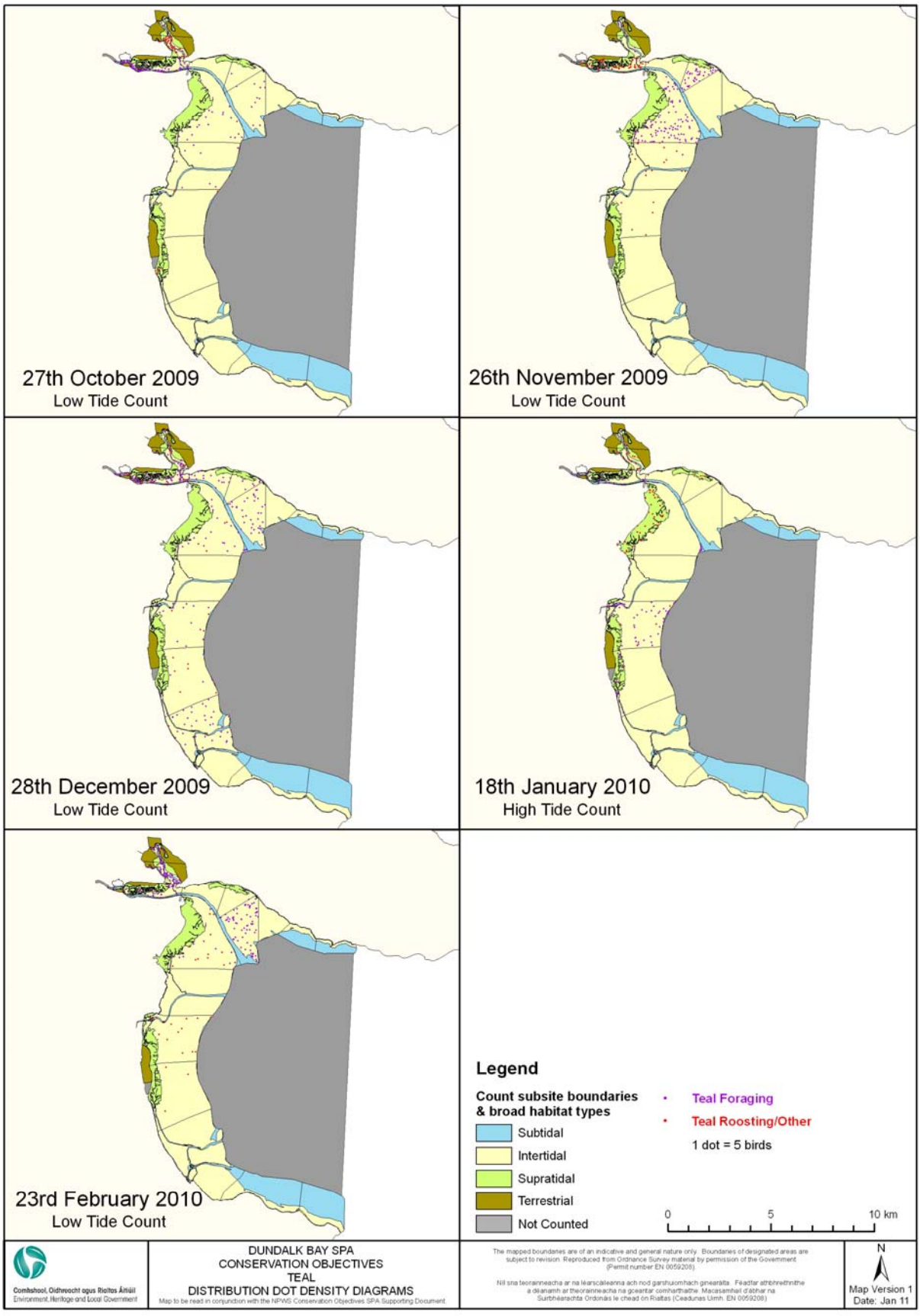
Nil sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadtar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéireachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Teal Foraging
Teal Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
TEAL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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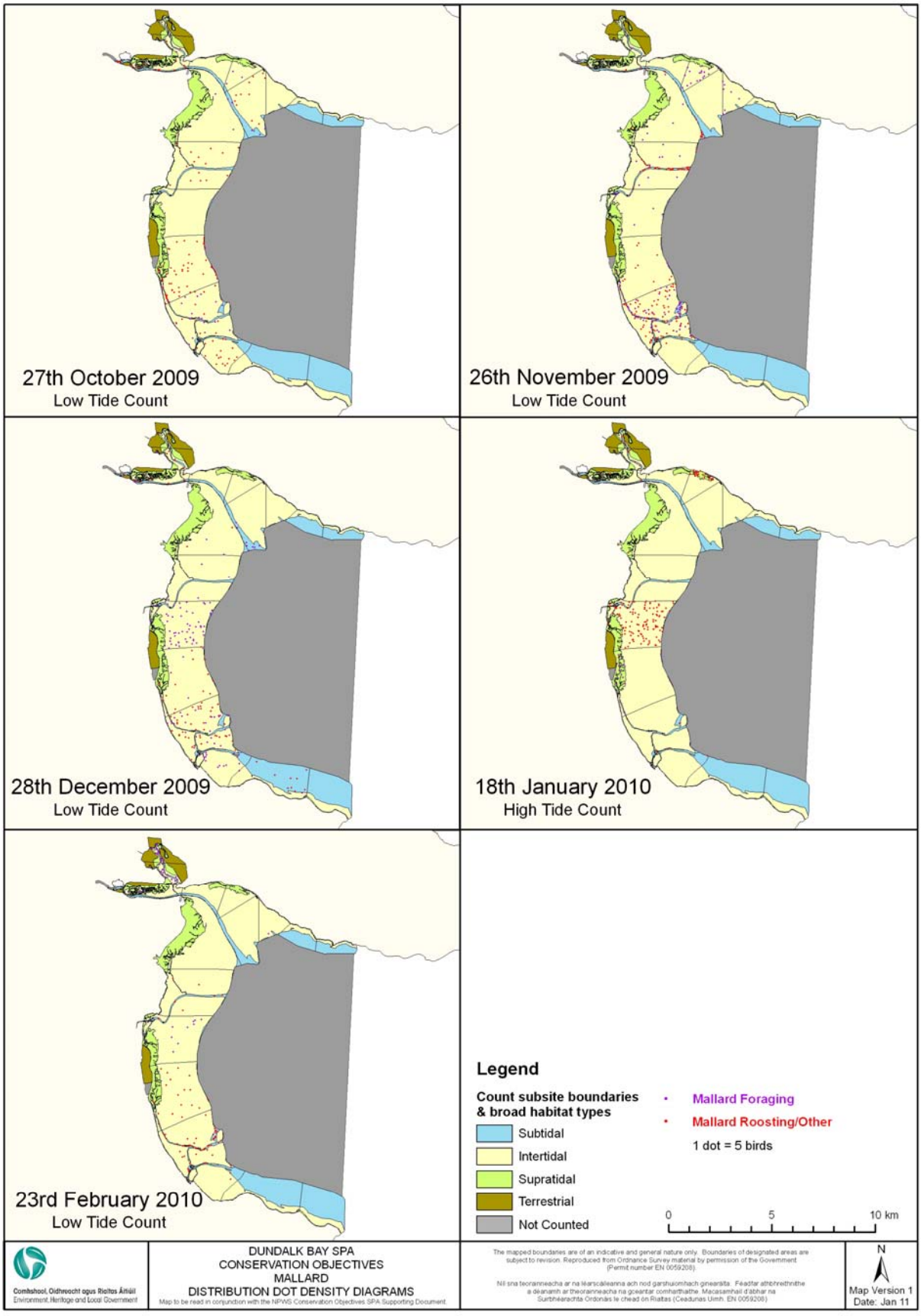
Nil sna teorainneacha ar na léarscáileanna ach nod ginearálta. Féadtar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comhartha'the. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Mallard Foraging
Mallard Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
MALLARD
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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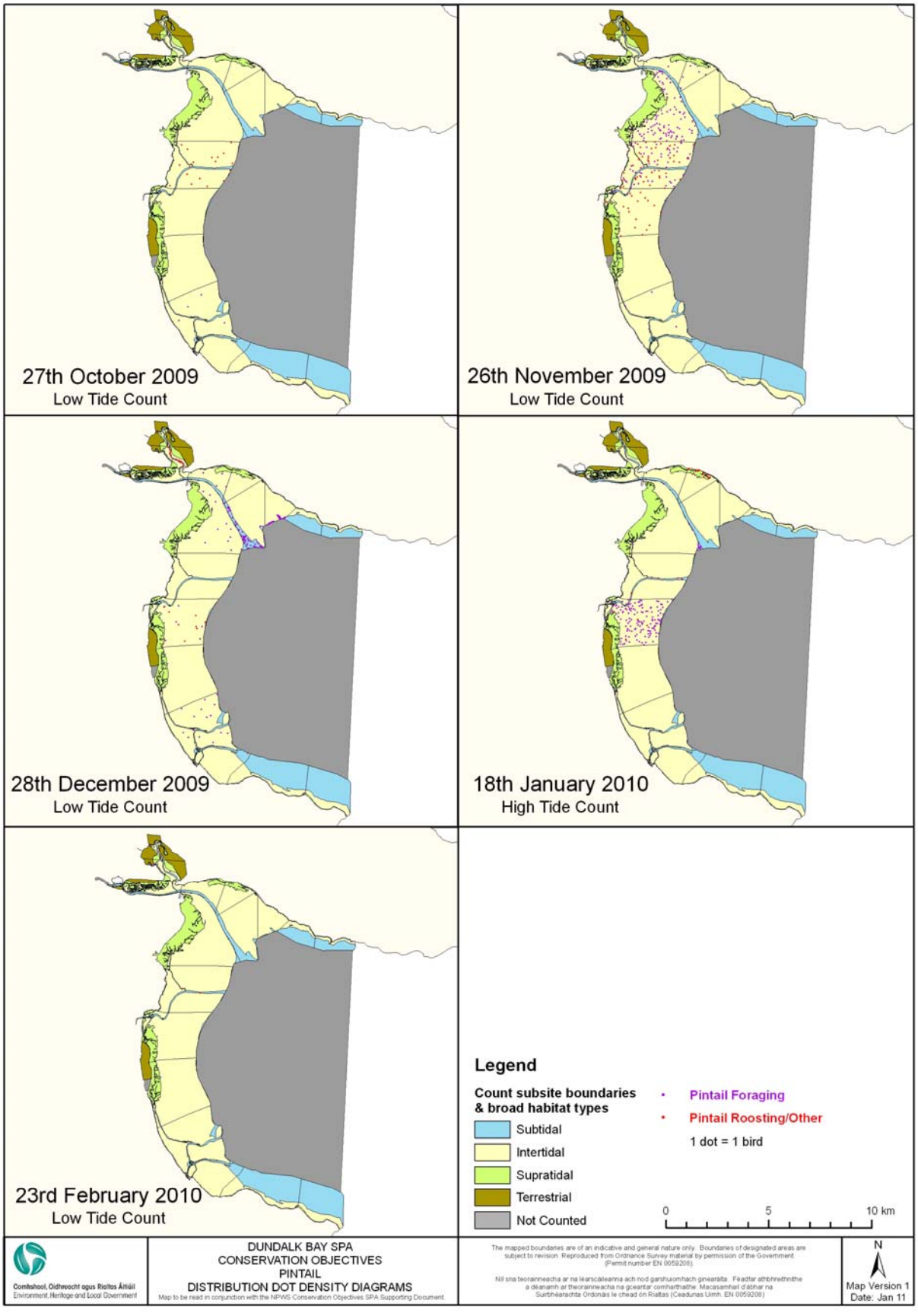
Nil sna teorainneacha ar na léarscáileanna ach nod garshuíomhach gineartha. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'athar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Pintail Foraging
Pintail Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
PINTAIL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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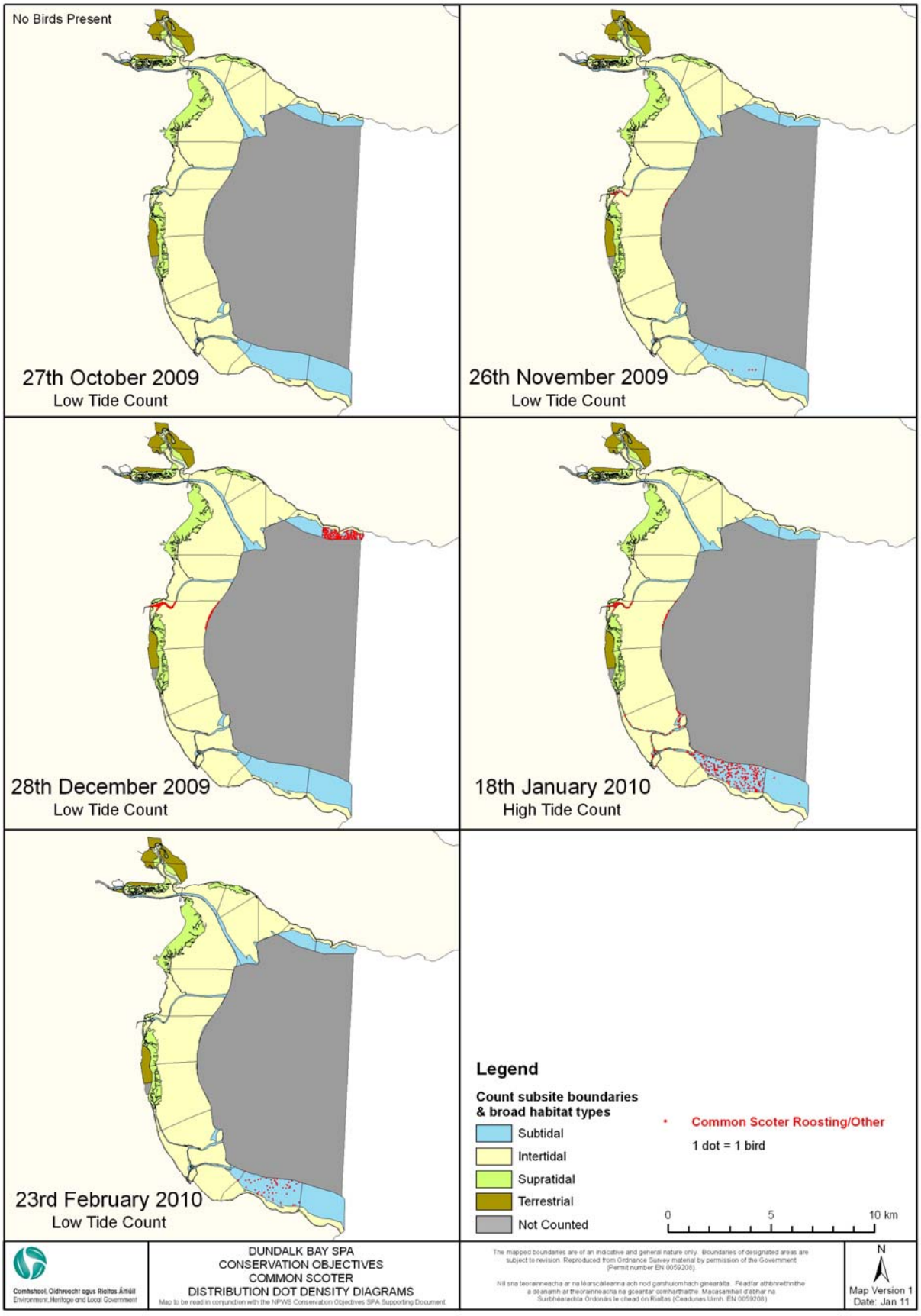
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comhaltaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


No Birds Present
27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Common Scoter Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
COMMON SCOTER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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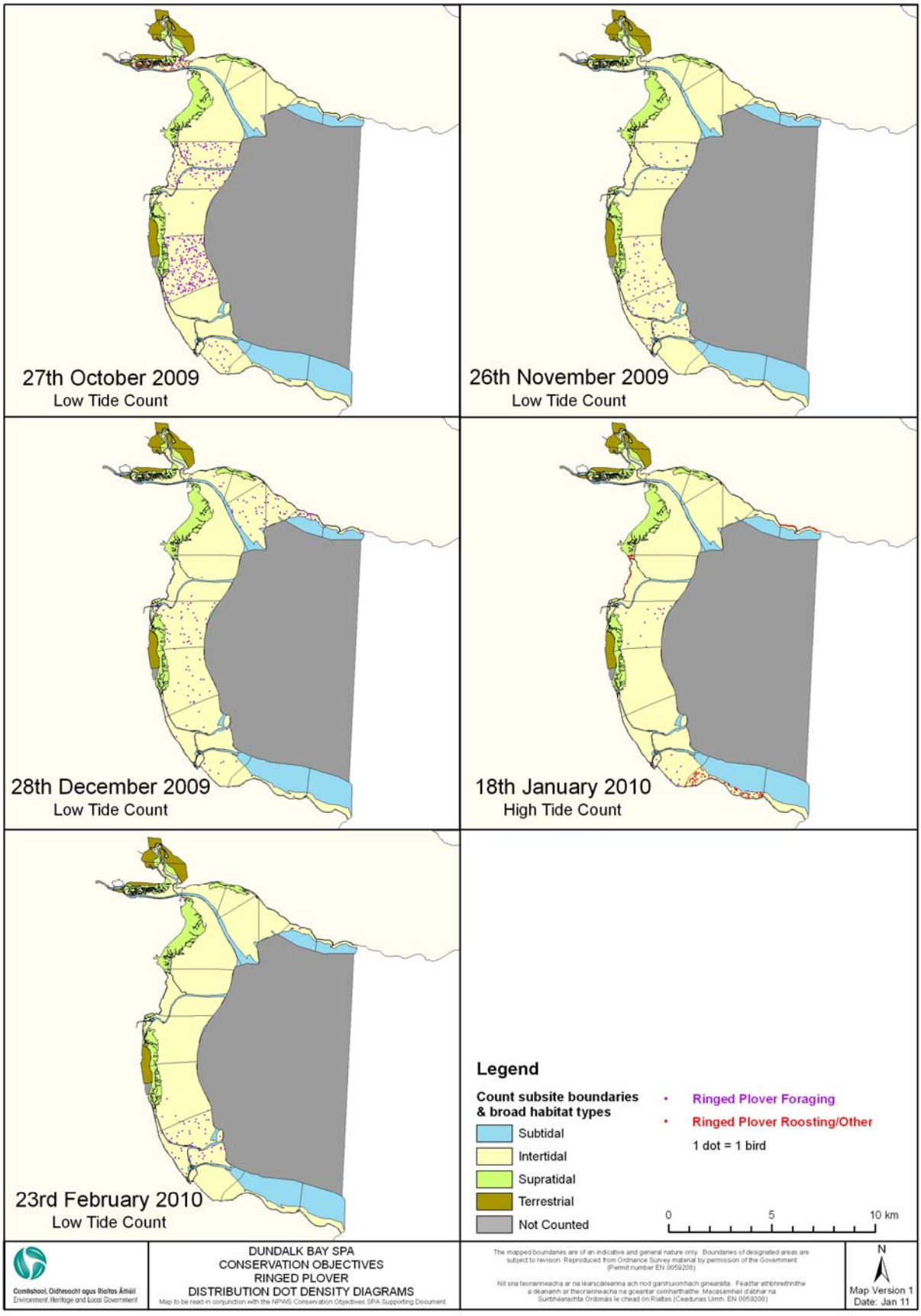
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Ringed Plover Foraging
Ringed Plover Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
RINGED PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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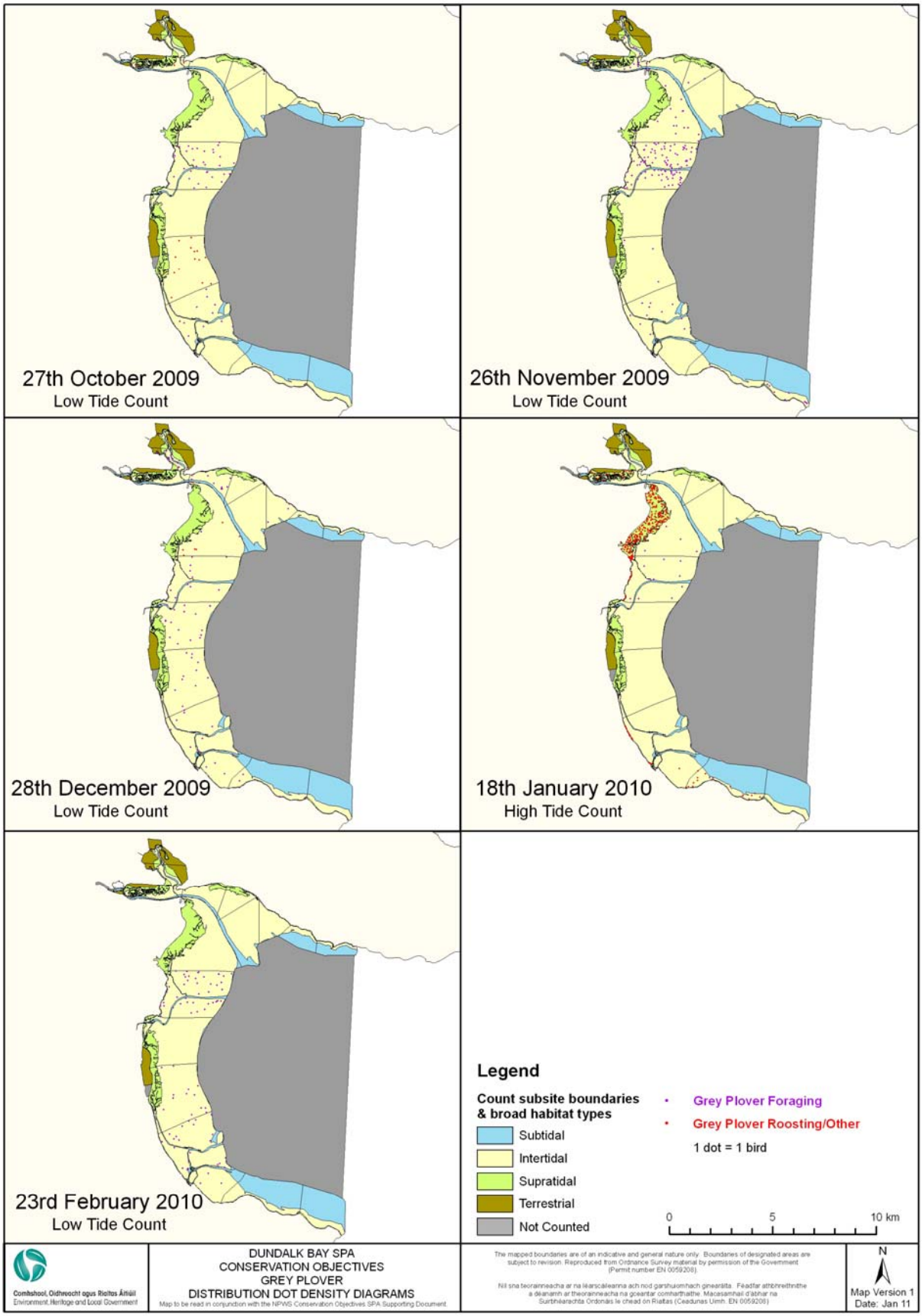
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadtar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Grey Plover Foraging
Grey Plover Roosting/Other
1 dot = 1 bird
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
GREY PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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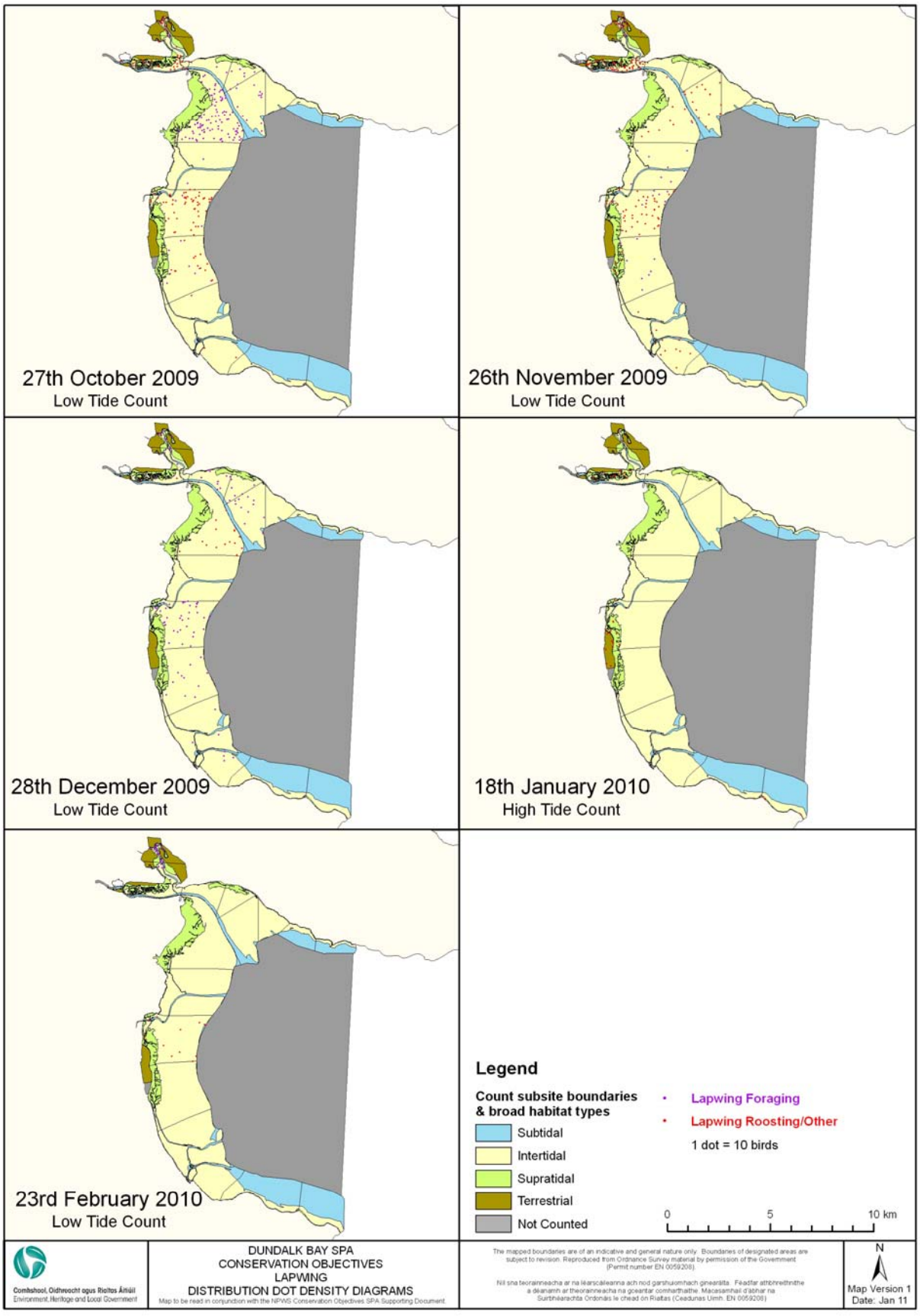
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Lapwing Foraging
Lapwing Roosting/Other
1 dot = 10 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
LAPWING
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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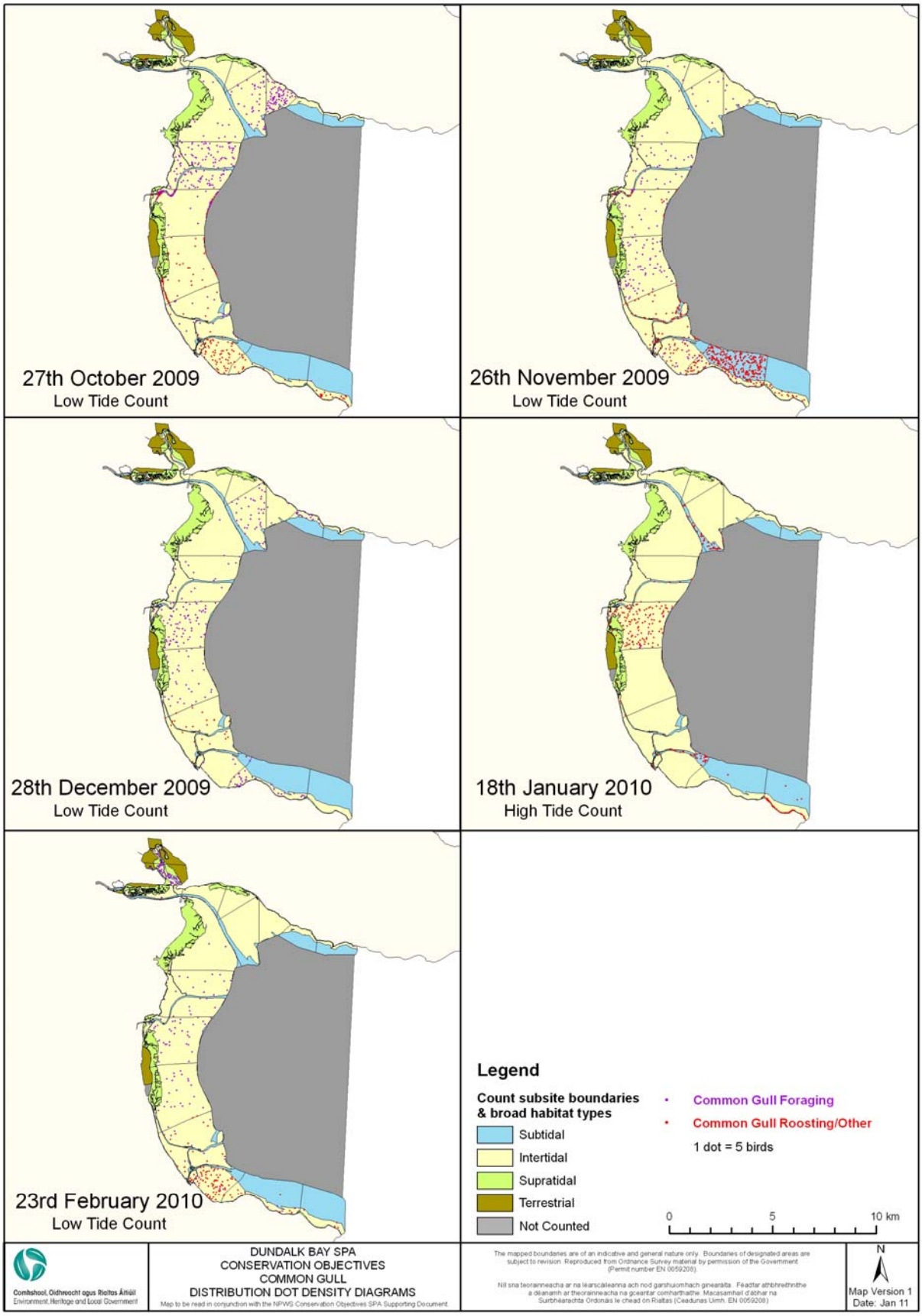
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'abhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Common Gull Foraging
Common Gull Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
COMMON GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
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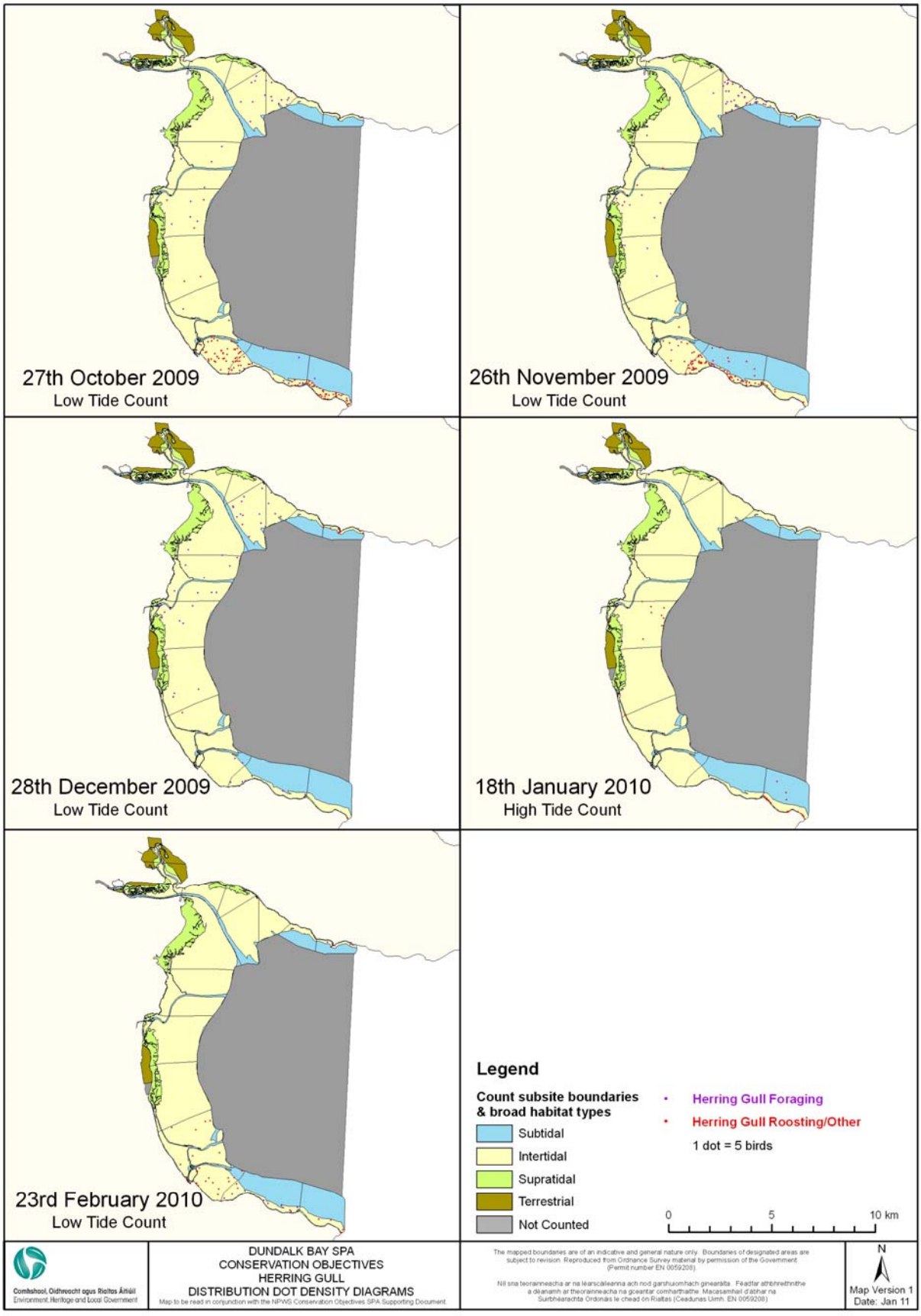
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'athar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
N
Map Version 1
Date: Jan 11


27th October 2009
Low Tide Count
26th November 2009
Low Tide Count
28th December 2009
Low Tide Count
18th January 2010
High Tide Count
23rd February 2010
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Subtidal
Intertidal
Supratidal
Terrestrial
Not Counted
Herring Gull Foraging
Herring Gull Roosting/Other
1 dot = 5 birds
0
5
10 km
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY SPA
CONSERVATION OBJECTIVES
HERRING GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
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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 11

APPENDIX 8

Dundalk Bay SPA (4026)

Summary data and roost location maps from the roost survey (1st March 2010)

Dundalk Bay contains the most extensive saltmarshes found in Ireland (McCorry & Ryle, 2009). Four main areas of saltmarsh habitat mostly comprising Atlantic Sea Meadows and variable amounts of Common Cordgrass (*Spartina anglica*), provide important roosting sites for waterbirds:-

- Lurgangreen (north and south) (0Z497/0Z472) – this saltmarsh extends from Castlebellingham in the south, northwards towards Lurgangreen and the inflow point of the River Fane.

- Blackrock – Marsh South (0Z496/0Z495) – saltmarsh extends from the northern section of 0Z496 Blackrock Corniche ('also known as the loakers') northwards towards the estuary channel at Soldier's Point and encompassing a large area of 0Z495 (Marsh South).

- Dundalk Harbour (0Z494) – extensive saltmarsh along the northern shore.

- 0Z465 (Fitzpatricks-Blue Anchor West) & (0Z464 Fitzpatricks-Blue Anchor East) - a large saltmarsh has developed along the northern shoreline adjacent to Bellurgan and Jenkinstown.

Saltmarsh is also present within Ballymascanlan Bay.

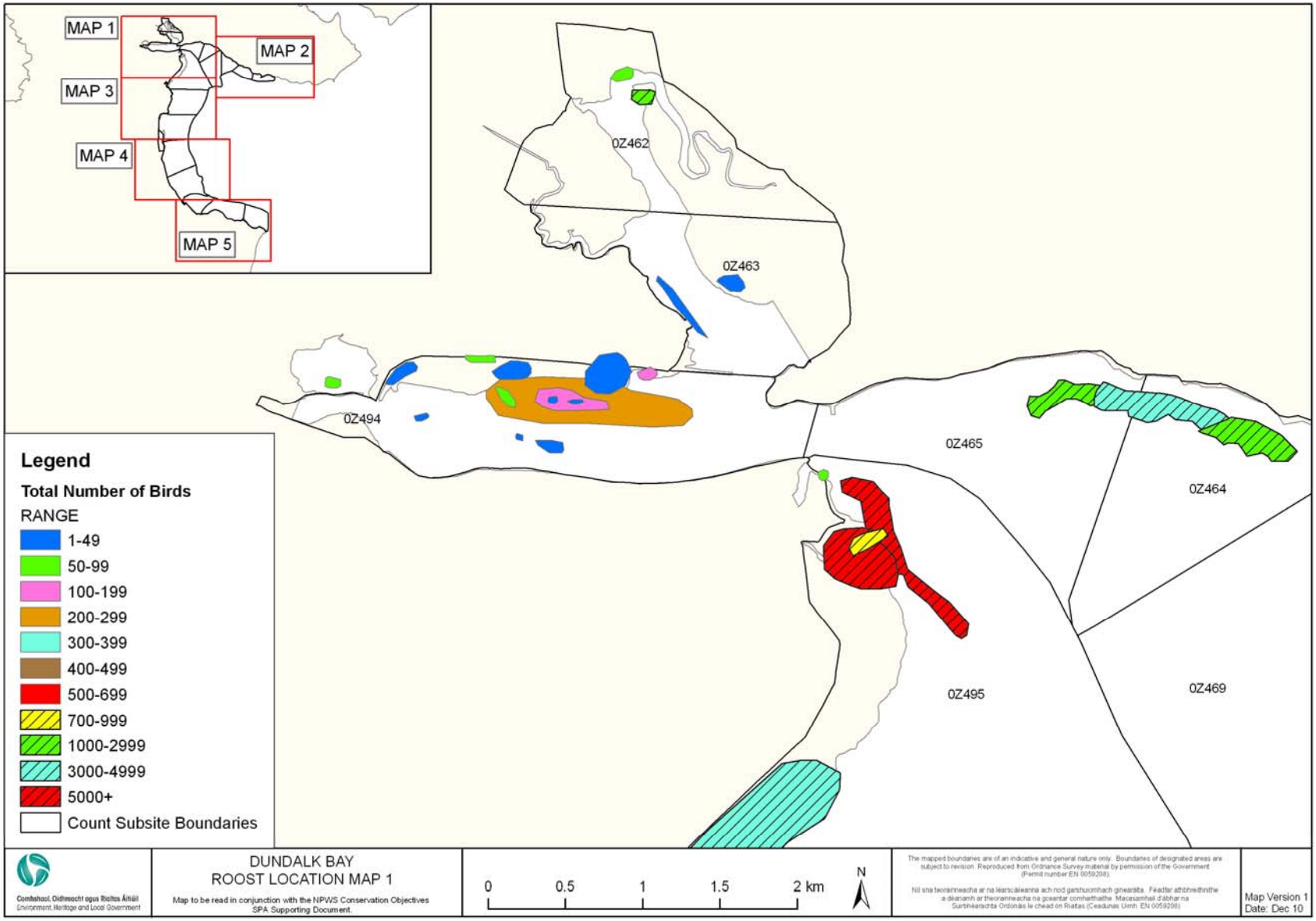
Please see McCorry & Ryle (2009) for further detailed information on saltmarsh habitats of Dundalk Bay.

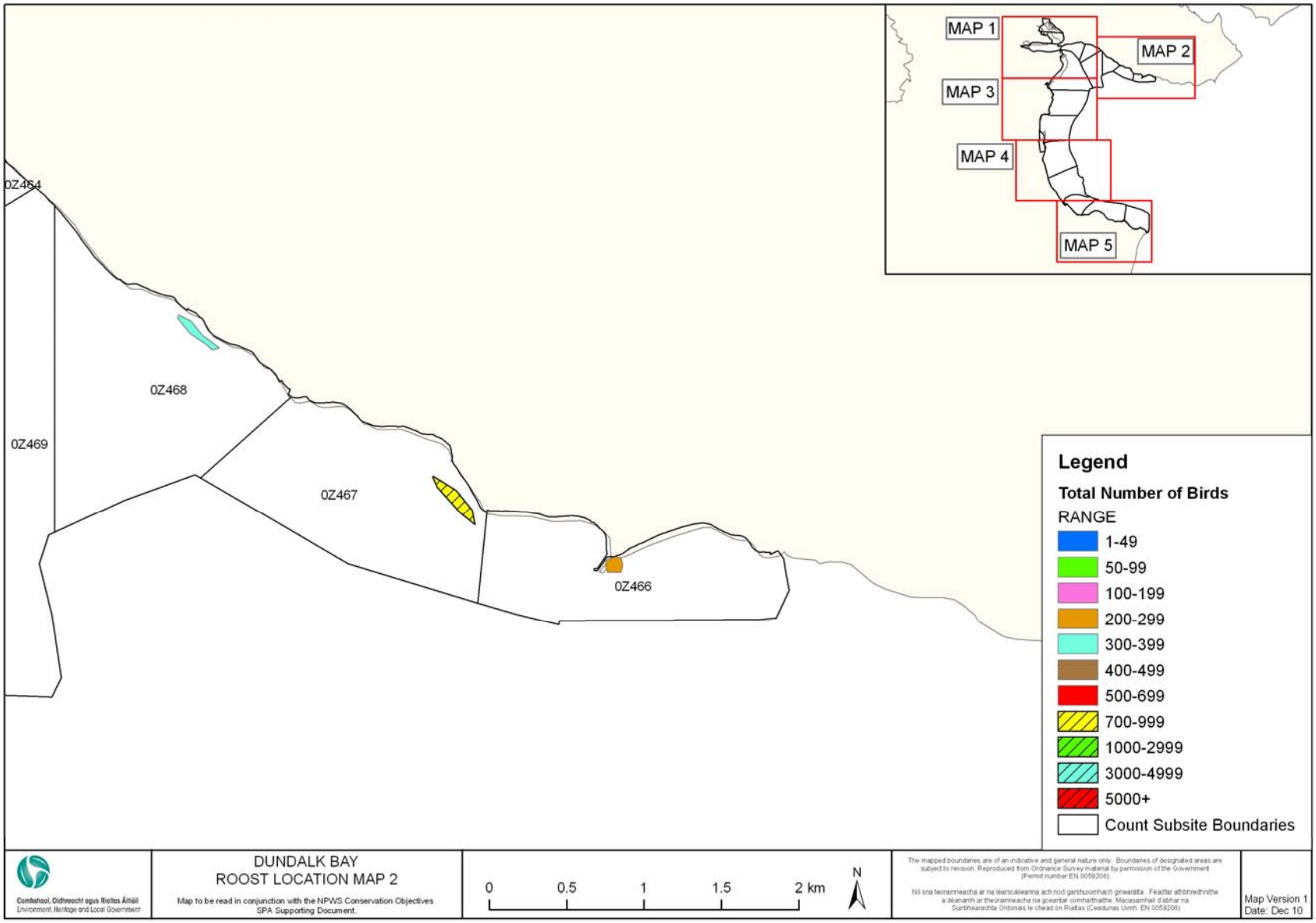
The table below summarises the results from the roost survey undertaken on 1st March 2010. This information is intended to provide an indication of species distribution across roost sites of Dundalk Bay. The total numbers of waterbirds and number of roost locations should not be regarded as absolute - gaining accurate counts was difficult because some waterbirds were likely underestimated by being obscured by saltmarsh vegetation while others made frequent movements during the survey.

0Z495 (Marsh South) in particular is difficult to count as waterbirds re-shuffle their positions as the tide advances. This large saltmarsh has two main roosting areas at the northern and southern extents, and birds move from the main southern area to the northern area as the tide moves higher through the saltmarsh.

Dundalk Bay SPA (4026) Roost Summary Table (n/c – not calculated)

Subsite	Number individual roost locations	No. Species	Total No. Waterbirds	Species Codes
0Z460	11	13	1,603	BH, CM, CU, CX, GV, HG, KN, OC, ND, RK, RM, SN, TT
0Z461	2	6	725	CM, GB, HG, OC, RK, TT
0Z462	2	13	1,129	BH, BW, CM, CU, DN, GP. L., ET, MA, RK, SN, SU, T.
0Z463	2	4	28	MA, SU, T., WN,
0Z464	5+	9	2.688	BW, CU, DN, MA, OC, PB, PT, RT, SU
0Z465	n/c	6	4,470	BA, BW, CU,KN, OC, PB,
0Z466	11+	10	373	BH, CA, CM, DN, GB, HG, L., OC, PB, RP,
0Z467	n/c	1	860	OC
0Z468	n/c	4	371	GV, OC, RK, TT
0Z469	5+	4	1,806	BH, CM, HG, DN,
0Z472	15	20	2,539	BA, BH, BW, CM, CU, DN, GB, GJ, GK, HG, L., MA, PB, PT, RK, SN, SU, T., TT, WN
0Z473	6	13	1,744	BA, BW, CM, DN, GB, GV, HG, KN, MA, OC, RK, TT, WN
0Z474	13	19	1,581	BH, BW, CA, CM, CU, DN, GB, GG, GV, H., HG, KN, MA, MS, OC, RK, RP, TT, WN
0Z494	14	12	918	BH, BW, CA, CM, CU, L., MS, OC, RK, PG, SU, T.,
0Z495	3+	7	6,120	BA, BW, OC, PB, RK, T., WN
0Z496	4+	15	1,316	BA, BW, BH, CM, DN, GV, HG, KN, MS, OC, PT, RP, SU, T., TT
0Z497	10	22	11,960	BA, BH, BW, CM, CU, DN, GB, GP, GK, HG, KN, L., LB, PB, MA, OC, PT, RK, SN, SU, T., WN
0ZS03	-	-	-	-


MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
0Z462
0Z463
0Z494
0Z465
0Z464
0Z495
0Z469
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-699
700-999
1000-2999
3000-4999
5000+
Count Subsite Boundaries
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY
ROOST LOCATION MAP 1
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0
0.5
1
1.5
2 km
N
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).
Map Version 1
Date: Dec 10


MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
0Z464
0Z468
0Z469
0Z467
0Z466
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-699
700-999
1000-2999
3000-4999
5000+
Count Subsite Boundaries
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY
ROOST LOCATION MAP 2
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
0
0.5
1
1.5
2 km
N
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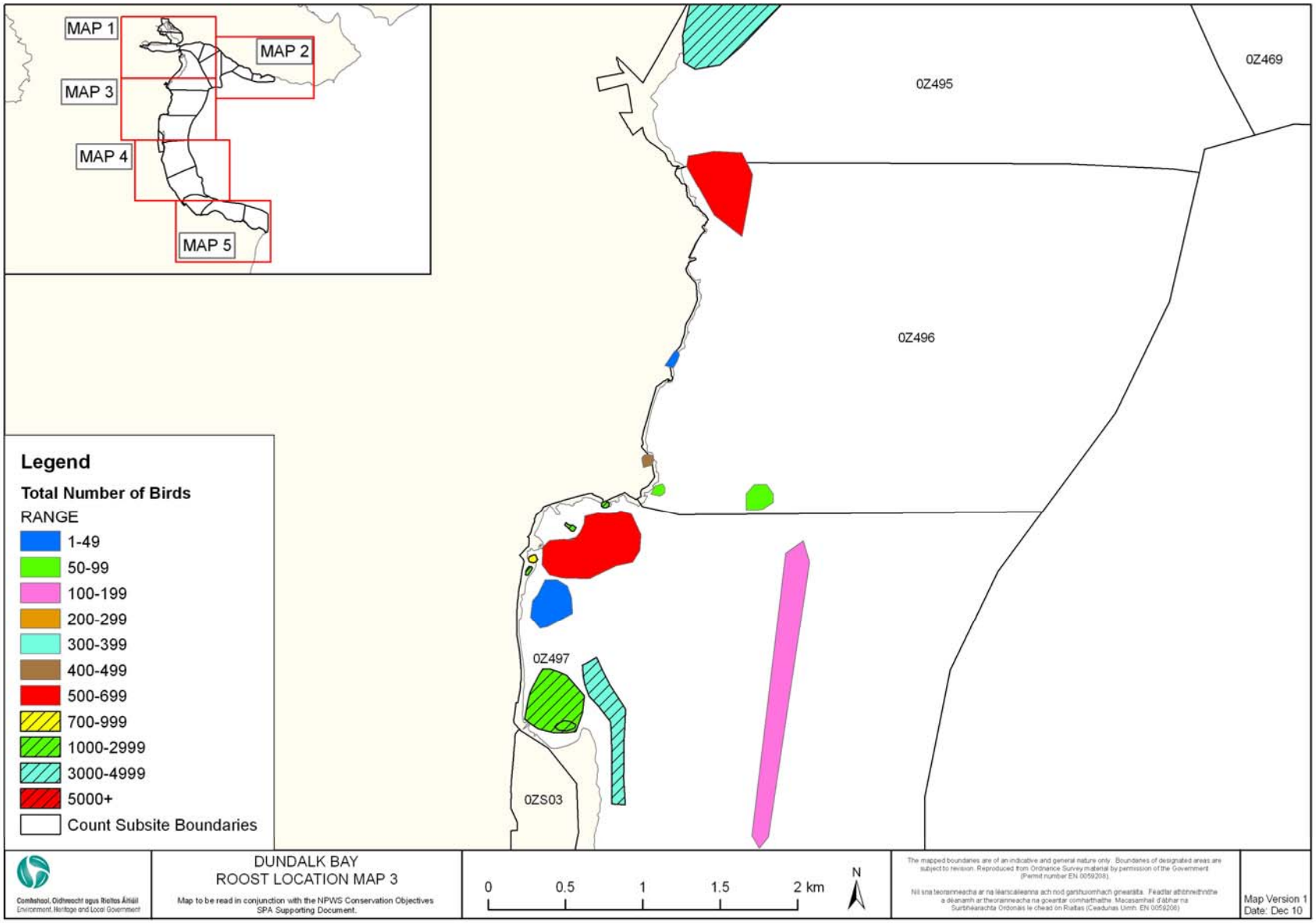
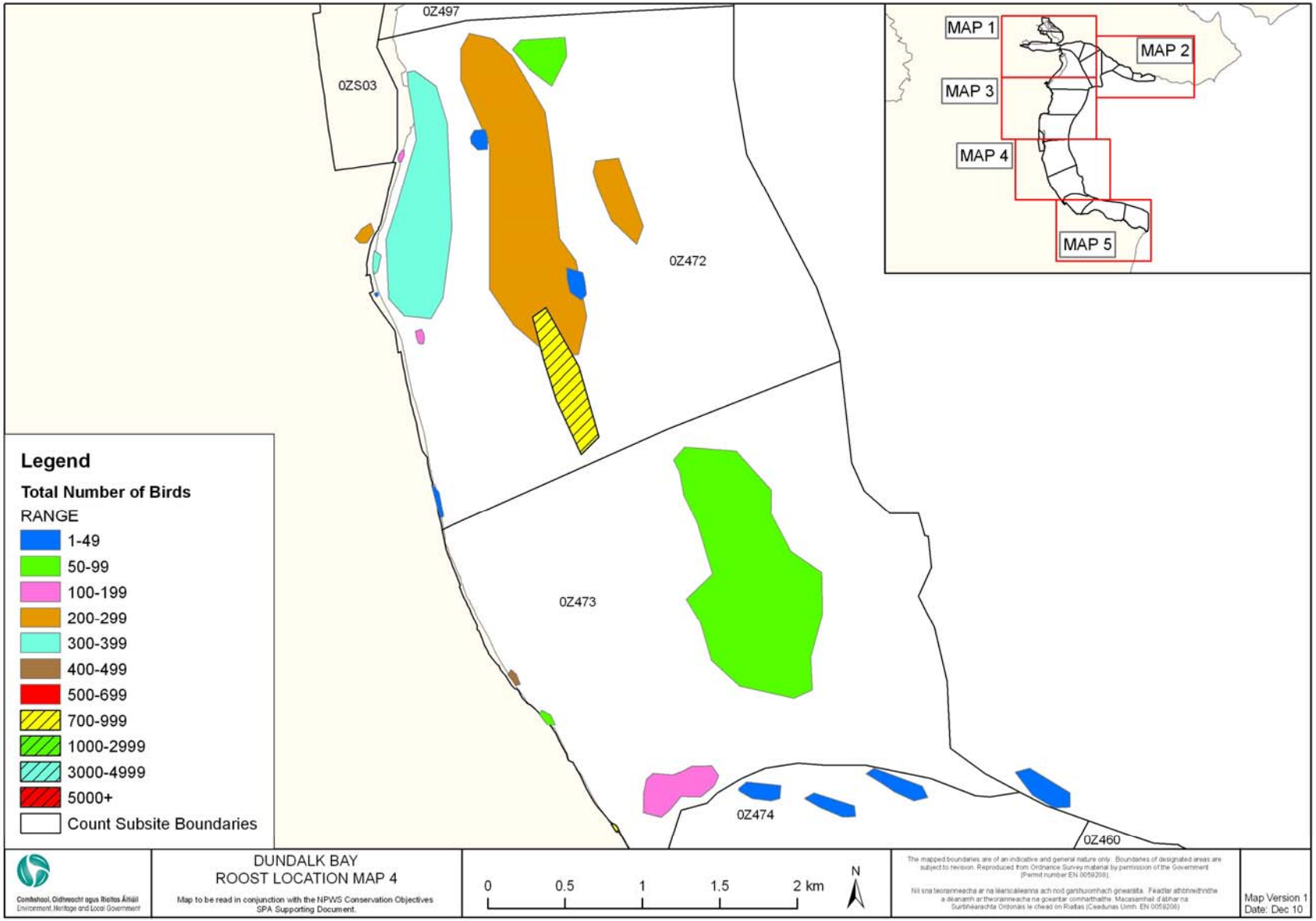
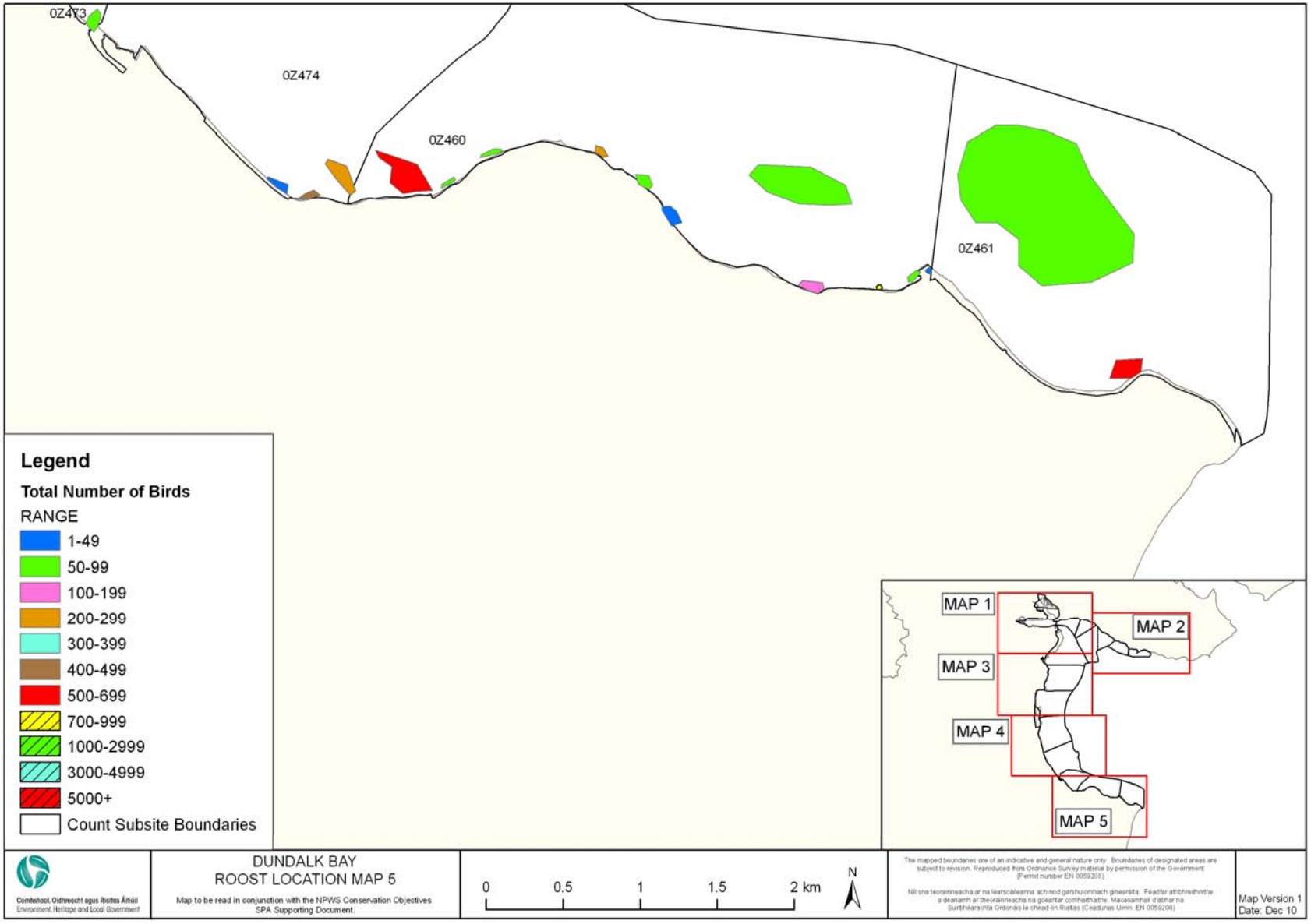
Map Version 1
Date: Dec 10


MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
0Z469
0Z495
0Z496
0Z497
0ZS03
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-699
700-999
1000-2999
3000-4999
5000+
Count Subsite Boundaries
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY
ROOST LOCATION MAP 3
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
0
0.5
1
1.5
2 km
N
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).
Map Version 1
Date: Dec 10


0Z497
0ZS03
0Z472
0Z473
0Z474
0Z460
MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-699
700-999
1000-2999
3000-4999
5000+
Count Subsite Boundaries
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY
ROOST LOCATION MAP 4
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
0
0.5
1
1.5
2 km
N
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 athbhreithniú a dhéanamh ar theorainneacha na gceantar comhardhaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059208)
Map Version 1
Date: Dec 10


0Z473
0Z474
0Z460
0Z461
Legend
Total Number of Birds
RANGE
1-49
50-99
100-199
200-299
300-399
400-499
500-699
700-999
1000-2999
3000-4999
5000+
Count Subsite Boundaries
MAP 1
MAP 2
MAP 3
MAP 4
MAP 5
Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
DUNDALK BAY
ROOST LOCATION MAP 5
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
0
0.5
1
1.5
2 km
N
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)
Map Version 1
Date: Dec 10

APPENDIX 9

Dundalk Bay SPA (4026) - Activities & Events

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

Activity & Events Legend:	
O	observed or known to occur within Dundalk Bay SPA
U	known to occur but unknown area (subsites)/spatial extent; 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.

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
1. Coastal protection, sea defences & stabilisation																		
1.1 Linear defences				O	O	O				O	O	O	O	O	O	O	O	O
1.2 Training walls														H				
1.3 Groynes	O	O										O	O			O		
1.4 *Spartina* planting/growing			O	O	O	O					O	O		O	O		O	
1.6 Other modifications														O				
2. Barrage schemes/drainage																		
2.2 Altered drainage/river channel			H															
2.3 Other channel modifications														O				
4. Industrial, port & related development																		
4.1 Industrial port														O				
4.2 Fishing harbour												O	O	O				
4.3 Slipway	O				O							O		O		O		
4.4 Pier		O				O	O					O	O					
4.7 Ship & boat building/repair														H				
5. Military activities																		
5.1 Overflying of military aircraft											O	O					O	O
5.2 Firing range															O			
6. Pollution																		
6.1 Domestic & urban waste water					U	U	U	U	U	U		P	P	O		O	O	
6.2 Industrial														P				
6.3 Landfill														O				
6.4 Agricultural & forestry effluents												O				O		
6.7 Solid waste incl. fly-tipping		O		O	O	O	O	O	O	O	O			O			O	

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
7. Sediment extraction (marine & terrestrial)																		
7.1 Channel dredging (maintenance & navigation)					O	O							O	O				
8. Transport & communications																		
8.3 Bridges & aqueducts				H										O				
8.5 Road schemes														H	P	P		
8.6 Car parks		O				O					O		O	O		O		
8.7 Shipping channel, shipping lanes														O				
8.8 Rail lines					H	H								H				
9. Urbanisation																		
9.1 Urbanised areas, housing												O	O	O		O	O	
9.2 Commercial & industrial areas														O				
11. Education & scientific research																		
11.1 Scientific sampling, specimen collection											O		O				O	
12. Tourism & recreation																		
12.2 Non-marina moorings												O				O		
12.5 Leisure centres, sports ground														O				
12.6 Power boating & water-skiing								O	O	O				O				
12.7 Jet-skiing					O	O												
12.13 Rowing			P											P				
12.15 Angling												P	P	P			P	
12.17 Bathing & general beach recreation	O						O	O					O			O		
12.18 Walking, incl. dog walking	O	O					O			O	O	O	O	O	O	O	O	
12.19 Birdwatching	O	O									O	O	O	O			O	O

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
12.20 Sand-yachting							O											
12.21 4WD, trial & quad bikes					O	O	O										O	
12.23 Horse-riding	O												O					
12.26 Clay-pigeon shooting										O								
12.27 Others															O			
13. Wildfowl & hunting																		
13.1 Wildfowling			U	U	O	O	O		O	O	U			O		O	O	O
14. Bait-collecting																		
14.1 Digging for lugworms/ragworms	O	O		O	O	O			O	O						O		
15. Fisheries & Aquaculture																		
15.2 Professional active fishing	U	U			U	U	U	U	U	U	U	U	U		U	U	U	
15.3 Bottom (benthic) dredging											U	U	U		U	U	U	
15.4 Fish traps & other fixed devices & nets	U	U			U	U	U	U	U	U	U	U	U		U	U	U	
15.5 Leisure fishing	U	U			U	U	U	U	U	U	U	U	U	U	U	U	U	
15.6 Molluscs - hand-gathering	O	O											O					
15.7 Hand raking					O	O			O	O		O	O					
15.9 Intertidal aquaculture e.g. trestles		U																

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
16. Agriculture & forestry																		
16.1 Saltmarsh grazing/harvesting			H		O	O					O				O		O	
16.2 Grazing: intensive (terrestrial)			O															
16.3 Grazing: non-intensive (terrestrial)			O															
16.6 Crop production: intensive																		O
16.9 Removal of hedges, scrub			H	H										H				
16.10 Mowing/grassland cutting			O	O														
16.12 Polderisation											H						H	H
16.13 Agricultural land-claim															H			
19. Natural events																		
19.1 Storms, floods and storm surges	O	O									O	O	O				O	
19.2 Severe cold weather	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
19.3 Eutrophication												O					O	

APPENDIX 10

Dundalk Bay SPA (4037) – Disturbance Assessment

Scoring system for disturbance assessment

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

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

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

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
4. Industrial, port & related development																		
4.1 Industrial port																		
4.2 Fishing harbour																		
4.3 Slipway																		
4.4 Pier																		
5. Military activities																		
5.1 Overflying of military aircraft																		
5.2 Firing range																		
7. Sediment extraction																		
7.1 Channel dredging (maintenance & navigation)																		
12. Tourism & recreation																		
12.2 Non-marina moorings																		
12.6 Power boating & water-skiing																		
12.7 Jet-skiing																		
12.17 Bathing & general beach recreation																		
12.18 Walking, incl. dog walking																		
12.19 Birdwatching	3/4	3/4									3/4	3/4	3/4	3/4			3/4	3/4
12.20 Sand-yachting																		
12.21 4WD, trial & quad bikes																		
12.23 Horse-riding																		
12.26 Clay-pigeon shooting																		
13. Wildfowl & hunting																		
13.1 Wildfowling																		

	0Z460	0Z461	0Z462	0Z463	0Z464	0Z465	0Z466	0Z467	0Z468	0Z469	0Z472	0Z473	0Z474	0Z494	0Z495	0Z496	0Z497	0ZS03
14. Bait-collecting																		
14.1 Digging for lugworms/ragworms																		
15. Fisheries & Aquaculture																		
15.2 Professional active fishing																		
15.3 Bottom (benthic) dredging																		
15.4 Fish traps & other fixed devices																		
15.5 Leisure fishing																		
15.6 Molluscs - hand-gathering																		
15.7 Hand raking																		
15.9 Intertidal aquaculture e.g trestles																		