Ballymacoda Bay
Special Protection Area

(Site Code 4023)

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Conservation Objectives
Supporting Document

VERSION 1

National Parks & Wildlife Service

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SUMMARY

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

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

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

Part Five provides supporting information that will assist the interpretation of the site-specific conservation objectives. This section includes a review of the ecological characteristics of the SCI species and examines waterbird distribution recorded during the 2010/11 Waterbird Survey Programme, drawing also on data from NPWS monitoring programmes (e.g. benthic surveys) and the Irish Wetland Bird Survey (I-WeBS). Part Five concludes with information on activities and events that occur in and around the site which may interact with waterbirds during the non-breeding season and includes an assessment of those activities that were recorded to cause disturbance to non-breeding waterbirds during the 2010/11 Waterbird Survey Programme.

PART ONE - INTRODUCTION

1.1 Introduction to the designation of Special Protection Areas

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

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

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

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

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

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

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

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

- An Annex I species that occurs at the site in numbers that exceed the all-Ireland 1% population threshold;
- A migratory species that occurs at the site in numbers that exceed the biogeographic 1% population threshold ('internationally important');
- A migratory species that occurs at the site in numbers that exceed the all-Ireland 1% threshold ('all-Ireland importance');

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

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

1.2 Introduction to Ballymacoda Bay Special Protection Area

This coastal site stretches north-east from the village of Ballymacoda to within several kilometers north-east of Youghal, Co. Cork. It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment and which passes through two opposing sand/shingle spits at Ring Point before reaching the sea.

The inner estuary is sheltered by Ring Point and its sediment types vary from muds to muddy sands. The outer estuary, east of Ring Point, has fine rippled sands and the intertidal flats are up to one kilometre wide in places.

Saltmarsh habitat is well developed in several areas of the site including on the landward side of the sand dunes on the eastern side of the estuary, and along the western side of the estuary and northwards into 'The Duck'. There are also several saltmarsh 'islands' within the estuary at Clonpriest East. Newly forming saltmarsh is developing in former agricultural farmland (failed polder) in the north-west corner of the site near Crompaun Bridge (McCorry & Ryle, 2009). Common Cord-grass (*Spartina anglica*) has spread within the estuary since the late 1970s.

A substantial area of the land adjacent to the estuary has resulted from reclamation over the past 150 years (McCorry & Ryle, 2009). These grassland fields are now used by foraging waterbirds.

Ballymacoda Bay SPA is of high ornithological importance and supports over 20,000 waterbirds during the non-breeding season. In addition to the two waterbird species that occur in numbers of international importance (Golden Plover and Black-tailed Godwit), the site supports 14 species in numbers of all-Ireland importance. The Site Synopsis for Ballymacoda 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, 2012). 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*

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].

Where relevant, conservation objectives are defined for attributes[2] relating to non-breeding waterbird species populations, and for attributes related to the maintenance and protection of habitats that support them. These attributes are:

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

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

[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).

PART TWO – SITE DESIGNATION INFORMATION

2.1 Special Conservation Interests of Ballymacoda Bay Special Protection Area

Ballymacoda Bay SPA is selected as a Special Protection Area because it regularly supports over 20,000 waterbirds during the non-breeding season making this a site of international importance.

The **Special Conservation Interest species**[3] for Ballymacoda Bay SPA are listed below and summarised in Table 2.1. This table also shows the importance of the site for these SCI species, relative to the importance of other sites within Ireland, within the South West region[4] and within County Cork.

The Special Conservation Interests listed for Ballymacoda Bay SPA are as follows:-

1. During winter the site regularly supports 1% or more of the all-Ireland population of Wigeon (*Anas penelope*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 907 individuals.

2. During winter the site regularly supports 1% or more of the all-Ireland population of Teal (*Anas crecca*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 887 individuals.

3. During winter the site regularly supports 1% or more of the all-Ireland population of Ringed Plover (*Charadrius hiaticula*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 153 individuals.

4. During winter the site regularly supports 1% or more of the biogeographic population of the Annex I species Golden Plover (*Pluvialis apricaria*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 10,920 individuals.

5. During winter the site regularly supports 1% or more of the all-Ireland population of Grey Plover (*Pluvialis squatarola*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 535 individuals.

6. During winter the site regularly supports 1% or more of the all-Ireland population of Lapwing (*Vanellus vanellus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 4,063 individuals.

7. During winter the site regularly supports 1% or more of the all-Ireland population of Sanderling (*Calidris alba*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 98 individuals.

8. During winter the site regularly supports 1% or more of the all-Ireland population of Dunlin (*Calidris alpina*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 3,192 individuals.

9. During winter the site regularly supports 1% or more of the biogeographical population of Black-tailed Godwit (*Limosa limosa*). The mean peak number of this

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

[4] 'Region' refers to regions as defined by Irish Regions Office and in the case of the South West region takes into account cross-border sites Blackwater Estuary and Blackwater Callows.

species within the SPA during the baseline period (1995/96 – 1999/00) was 765 individuals.

10. During winter the site regularly supports 1% or more of the all-Ireland population of the Annex I species Bar-tailed Godwit (*Limosa lapponica*). The mean peak number within the SPA during the baseline period (1995/96 – 1999/00) was 581 individuals.

11. During winter 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 1,145 individuals.

12. During winter the site regularly supports 1% or more of the all-Ireland population of Redshank (*Tringa totanus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 357 individuals.

13. During winter the site regularly supports 1% or more of the all-Ireland population of Turnstone (*Arenaria interpres*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 137 individuals.

14. During winter the site regularly supports 1% or more of the all-Ireland population of Black-headed Gull (*Chroicocephalus ridibundus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,560 individuals.

15. During winter the site regularly supports 1% or more of the all-Ireland population of Common Gull (*Larus canus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 1,120 individuals.

16. During winter the site regularly supports 1% or more of the all-Ireland population of Lesser Black-backed Gull (*Larus fuscus*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 5,051 individuals.

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

Table 2.1 Site Designation Summary: species listed for Ballymacoda Bay Special Protection Area, plus site importance at national, regional and county scale

Special Conservation Interests	Annex I species	Baseline Population[a]	Population status at baseline	National Importance Rank[1]	Regional Importance Rank[2]	County Importance Rank[3]
Wigeon (*Anas penelope*)		907	All-Ireland Importance	23	7	5
Teal (*Anas crecca*)		887	All-Ireland Importance	11	4	4
Ringed Plover (*Charadrius hiaticula*)		153	All-Ireland Importance	14	4	2
Golden Plover (*Pluvialis apricaria*)	Yes	10,920	International Importance	2	1	1
Grey Plover (*Pluvialis squatarola*)		535	All-Ireland Importance	4	1	1
Lapwing (*Vanellus vanellus*)		4,063	All-Ireland Importance	12	3	2
Sanderling (*Calidris alba*)		98	All-Ireland Importance	13	3	1
Dunlin (*Calidris alpina*)		3,192	All-Ireland Importance	7	2	2
Black-tailed Godwit (*Limosa limosa*)		765	International Importance	9	4	4
Bar-tailed Godwit (*Limosa lapponica*)	Yes	581	All-Ireland Importance	9	2	1
Curlew (*Numenius arquata*)		1,145	All-Ireland Importance	9	5	4
Redshank (*Tringa totanus*)		357	All-Ireland Importance	20	4	3
Turnstone (*Arenaria interpres*)		137	All-Ireland Importance	11	4	1
Black-headed Gull (*Chroicocephalus ridibundus*)		1,560	All-Ireland Importance	11	3	3
Common Gull (*Larus canus*)		1,120	All-Ireland Importance	5	3	3
Lesser Black-backed Gull (*Larus fuscus*)		5,051	All-Ireland Importance	1	1	1
Other conservation designations associated with the site[b]	**SAC**	**RAMSAR SITE**	**IMPORTANT BIRD AREA (IBA)**	**WILDFOWL SANCTUARY**	**OTHER**	**OTHER**
	SAC 000077	Yes	Yes		pNHA	

[a] Baseline data are the 5-year mean peak counts for the period 1995/96 – 1999/00 (I-WeBS).
[b] Note that other designations associated with Ballymacoda Bay may relate to different areas and/or some of these areas may extend outside the SPA boundary.
[1] National importance rank – the number given relates to the importance of the site for the non-breeding populations of the SCI species during the baseline period (1995/96 – 1999/00) relative to other sites in Ireland.
[2] Regional importance rank - the number given relates to the importance of the site for the non-breeding populations of the SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within the South West Region; includes the cross-region sites Blackwater Estuary and Blackwater Callows.
[3] County importance rank - the number given relates to the importance of the site for the non-breeding populations of the SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within Co Cork; includes the cross-county sites Blackwater Estuary and Blackwater Callows.

PART THREE – CONSERVATION OBJECTIVES FOR BALLYMACODA BAY SPA

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

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

Objective 1: *To maintain the favourable conservation condition of the non-breeding waterbird Special Conservation Interest species listed for Ballymacoda 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.[5] Waterbird populations are deemed to be unfavourable when they have declined by 25% or more, as assessed by the most recent population trend analysis.[6]

- To be favourable, there should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest, other than that occurring from natural patterns of variation.[7]

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

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

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

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

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

[7] Waterbird distribution from the 2010/2011 waterbird survey programme is examined in Section 5.

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

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

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

- To be favourable, the permanent **area** occupied by the wetland habitat should be stable and not significantly less than the area of **602 ha**, other than that occurring from natural patterns of variation.

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

Subtidal areas refer to those areas contained within the SPA that lie below the mean low water mark and are predominantly covered by marine water. Tidal rivers, creeks and channels are included in this category. For Ballymacoda Bay SPA this broad category is estimated to be **133 ha**. Subtidal areas are continuously available for benthic and surface feeding waterfowl (e.g. Wigeon) and piscivorous/other waterbirds. Various waterbirds roost in subtidal areas (e.g. Brent Goose).

The intertidal area is defined, in this context, as the area contained between the mean high water mark and the mean low water mark. For Ballymacoda Bay SPA this is estimated to be **395 ha**. This area includes 11 ha of intertidal habitat within an area of failed polder at Ballymacoda Marsh (South of Crompaun Bridge). When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing[8] areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource.

The supratidal category refers to areas that are not frequently inundated by the tide (i.e. occurring above the mean high watermark) but contain shoreline and coastal habitats and can be regarded as an integral part of the shoreline. For Ballymacoda Bay SPA this is estimated to be **74 ha**. This area includes 7 ha of supratidal habitat within an area of failed polder at Ballymacoda Marsh (South of Crompaun Bridge). Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species.

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

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

Table 3.1 Conservation Objectives for the waterbird Special Conservation Interests of Ballymacoda Bay SPA.

Objective 1: *To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Ballymacoda Bay SPA, which is defined by the following list of attributes and targets:*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Population	Population trend	Percentage change as per population trend assessment using waterbird count data collected through the Irish Wetland Bird Survey and other surveys.	The long term population trend should be stable or increasing	Waterbird population trends are presented in Part Four of this document.
Range	Distribution	Range, timing or intensity of use of areas used by waterbirds, as determined by regular low tide and other waterbird surveys.	There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest other than that occurring from natural patterns of variation.	Waterbird distribution from the 2010/11 waterbird survey programme is reviewed in Part Five of this document.
Objective 2: *To maintain the favourable conservation condition of the wetland habitat at Ballymacoda 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	Wetland habitat	Area (ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 602 ha, other than that occurring from natural patterns of variation.	The wetland habitat area was estimated as 602 ha using OSI data and relevant orthophotographs.

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

4.1 Population data for waterbird SCI species of Ballymacoda Bay SPA

Non-breeding waterbirds are counted at Ballymacoda Bay each winter as part of the Irish Wetland Bird Survey (I-WeBS). The dataset spans the period 1995/96 to 2010/11 and there have been six or seven counts in each season with the exception of 2008/09 when no data were collected. I-WeBS counts are undertaken during what is termed the 'core survey period' which covers the main wintering period when many species occur in their largest concentrations, but also the autumn and spring passage periods when total waterbird numbers may be enhanced by staging/stopover birds[9]. During I-WeBS the site is counted as one large count unit. Although the SPA area and the I-WeBS count area are similar, they are not coincident. Information on I-WeBS and other waterbird surveys is given in Appendix 2.

Table 4.1 presents population[10] data for the non-breeding waterbird SCI species of Ballymacoda Bay. Annual maxima were identified and used to calculate the five-year mean peak for each species. The baseline period was 1995/96 – 1999/00 while the recent average relates to the four-year period 2007/08 – 2011/12 (data for 2008/09 missing). When examining waterbird data, it is standard practice to use the mean of peak counts generated for each species because it reflects more accurately the importance of a site for a particular species by helping to account for inconsistencies in data gathering (i.e. differing coverage) or extraordinary fluctuations in numbers. However it is important to note that waterbird counts represent a 'snapshot' of bird numbers during a count session, so in general and taking into account all potential sources of error, resulting data are regarded to be underestimates of population size (Underhill & Prŷs-Jones, 1994).

Table 4.1 indicates where the numbers shown surpass the threshold for all-Ireland or international importance. These thresholds are different for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012), while all-Ireland thresholds are presented within Crowe et al. (2008) and Crowe & Holt (2013) for the baseline and recent site data respectively.

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 (Crowe, 2005).[11]

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

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

[11] Current threshold of significance is 1,000 for Black-headed Gull and 500 for Common Gull and Lesser Black-backed Gull (Crowe, 2005).

Table 4.1 Population data for non-breeding waterbird Special Conservation Interest Species of Ballymacoda Bay SPA

Site Special Conservation Interests (SCIs)	Baseline Period[1] (1995/96 – 1999/00)	Recent Site Data[2] (2007/08 – 2011/12)
Wigeon (*Anas penelope*)	907 (n)	420
Teal (*Anas crecca*)	887 (n)	312
Ringed Plover (*Charadrius hiaticula*)	153 (n)	103 (n)
Golden Plover (*Pluvialis apricaria*)	10,920 (i)	5,720 (n)
Grey Plover (*Pluvialis squatarola*)	535 (n)	240 (n)
Lapwing (*Vanellus vanellus*)	4,063 (n)	771
Sanderling (*Calidris alba*)	98 (n)	129 (n)
Dunlin (*Calidris alpina*)	3,192 (n)	949 (n)
Black-tailed Godwit (*Limosa limosa*)	765 (i)	727 (i)
Bar-tailed Godwit (*Limosa lapponica*)	581 (n)	287 (n)
Curlew (*Numenius arquata*)	1,145 (n)	398 (n)
Redshank (*Tringa totanus*)	357 (n)	195
Turnstone (*Arenaria interpres*)	137 (n)	89
Black-headed Gull (*Chroicocephalus ridibundus*)	1,560 (n)	427
Common Gull (*Larus canus*)	1,120 (n)	257
Lesser Black-backed Gull (*Larus fuscus*)	5,051 (n)	736

[1]Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00;
[2]recent site data is the mean peak for the 4-year period 2007/08 – 2011/12 (I-WeBS) with the exception of gull species which is mean peak for the 3-year period 2009/10 – 2011/12.
(i) denotes numbers of international importance; (n) denotes numbers of all-Ireland importance.
note that thresholds differ for the baseline and recent time periods used; international thresholds are outlined in Wetlands International (2002) and Wetlands International (2012), while all-Ireland thresholds are presented within Crowe et al. (2008) and Crowe & Holt (2013) for the baseline and recent site data respectively.

4.2 Waterbird population trends for Ballymacoda Bay SPA

The calculation and assessment of waterbird population trends at Irish coastal SPA sites follows the UK Wetland Bird Survey 'Alerts System' which provides a standardised technique for monitoring changes in the numbers of non-breeding waterbirds over a range of spatial scales and time periods. The methods include the calculation of annual indices using a standard set of months which excludes passage periods unlike the mean peaks shown in Section 4.1, so it should be borne in mind that waterbird population data presented in Section 4.1 and 4.2 are not directly comparable. A detailed methodology for the trend analysis is provided in Appendix 3.

Annual population indices were calculated for waterbird SCI species for the data period 1994/95 to 2010/11. Trends are given for the 'long-term' 14-year period (1995/96–2009/10) and the recent ('short-term') five-year period (2004/05 – 2009/10) (Table 4.2). The values given represent the percentage change in index (population) values across the specified time period. Positive values equate to increases in population size while negative values reflect a decrease in population size.

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

Population indices were not calculated for Black-headed Gull, Common Gull or Lesser Black-backed Gull because gulls are not counted consistently during I-WeBS. Therefore a measure of population change was calculated using the generic threshold method which compares population size at two time intervals based on five-year means (see Appendix 3 for methods).

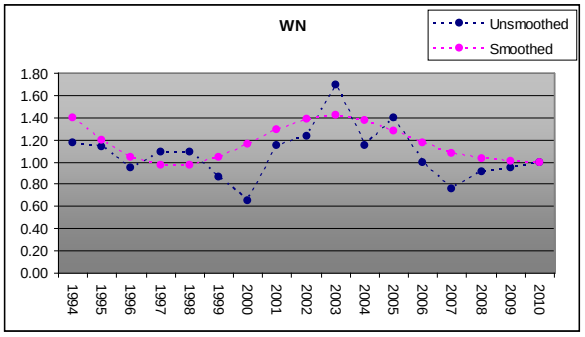
Table 4.2 Site Population trends for waterbird Special Conservation Interest species of Ballymacoda Bay SPA

Site Special Conservation Interests (SCIs)	Site Population Trend[1] 14 Yr	Site Population Trend[2] 5 Yr	Site Population Trend[3]
Wigeon (*Anas penelope*)	- 16	- 27	
Teal (*Anas crecca*)	+ 29	- 16	
Ringed Plover (*Charadrius hiaticula*)	- 7	+ 22	
Golden Plover (*Pluvialis apricaria*)	- 39	- 46	
Grey Plover (*Pluvialis squatarola*)	- 15	+ 3	
Lapwing (*Vanellus vanellus*)	- 61	- 35	
Sanderling (*Calidris alba*)	+ 111	+ 20	
Dunlin (*Calidris alpina*)	- 55	+ 1	
Black-tailed Godwit (*Limosa limosa*)	+ 207	+ 42	
Bar-tailed Godwit (*Limosa lapponica*)	+ 28	+ 26	
Curlew (*Numenius arquata*)	- 51	+ 1	
Redshank (*Tringa totanus*)	+ 1	+ 5	
Turnstone (*Arenaria interpres*)	+ 7	+ 16	
Black-headed Gull (*Chroicocephalus ridibundus*)			- 73
Common Gull (*Larus canus*)			- 91
Lesser Black-backed Gull (*Larus fuscus*)			- 85

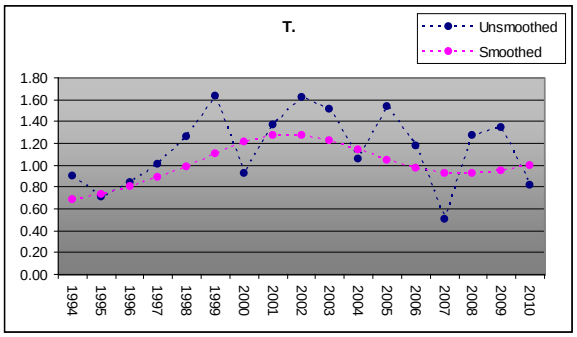
[1]Site population trend analysis: 14-year period = 1995/96–2009/10
[2]Site population trend analysis: 5 yr = 2004/05 – 2009/10.
[3]Site population change based on difference between baseline 5-year mean (1995/96 – 1999/00) and recent 3-year mean (2009/10 – 2011/12).

For selected species, explanatory notes are given below to aid the interpretation of trends. Smoothed and unsmoothed indices are shown graphically. Site trends are compared with national trends (Boland & Crowe, 2012[12]); all-Ireland trends (Crowe & Holt, 2013), and British trends (Holt et al. 2012). Graph headings use waterbird species codes and a list of these is provided in Appendix 4.

Wigeon – shows an undulating long-term trend with a period of increasing numbers in the late 1990's followed by decreasing numbers in the early to mid 2000's. The overall trend for decline is consistent with the national and all-Ireland trends and the decline observed in Northern Ireland. In contrast, numbers in Britain have been increasing since the late 1980's.

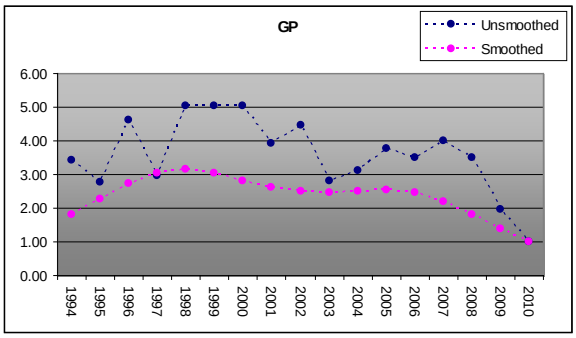


Teal – across the long-term numbers of Teal have increased. This increase was most marked during the period 1994/95 to 2001/02, after which numbers dropped back explaining the short-term trend for decline.

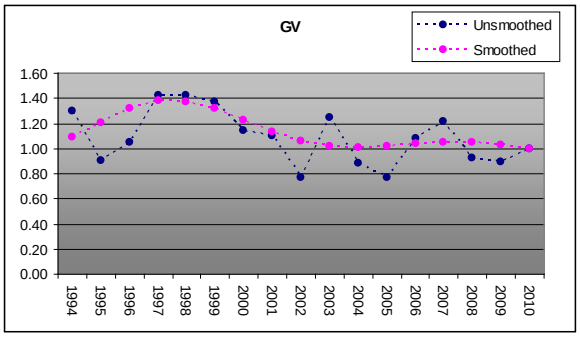


[12] National trends presented in Boland & Crowe (2012) update those previously shown in Crowe (2005).

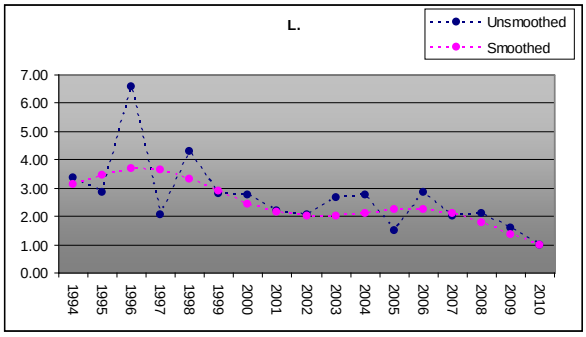
Golden Plover – numbers have declined almost progressively since 1998/99 with the decline most marked in recent seasons and particularly 2009/10, when low numbers can most likely be attributed to the cold weather event that caused many birds to move south. The national trend is for largely stable numbers since the mid 1990's while numbers at the all-Ireland scale have declined during the period 1999-2010.



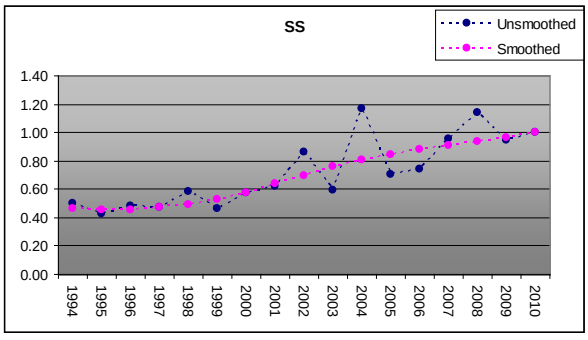
Grey Plover – numbers of Grey Plover decreased during the late 1990's and have since remained largely stable. Nationally, numbers of Grey Plover have declined at an annual rate of 4% since I-WeBS began, becoming stable in recent seasons, while the all-Ireland trend is for decline. In Britain numbers now appear relatively stable after exhibiting a decline during the mid 1990's to mid 2000's.



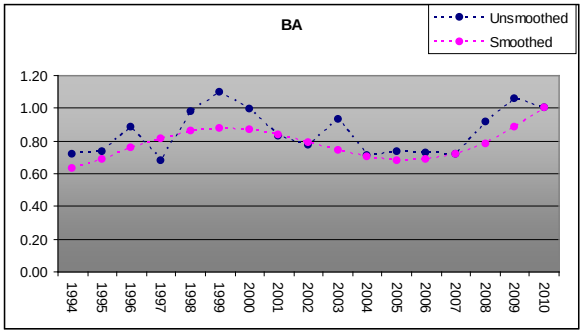
Lapwing – numbers have declined progressively since the mid 1990's, mirrored by the national and all-Ireland long-term trends for decline.



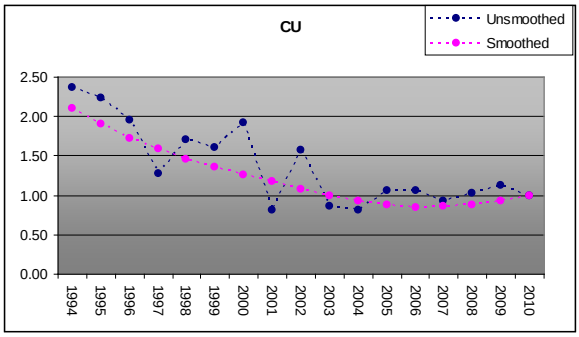
Sanderling – numbers have increased progressively throughout I-WeBS. This is consistent with the national and all-Ireland trend for increase.



Bar-tailed Godwit – this species has increased over the long-term and exhibits a stable trend at national and all-Ireland level. In Britain, numbers declined from the early 2000's but have increased in recent seasons.



Curlew – numbers have declined progressively since the start of I-WeBS but have stabilised since 2004/05. This is consistent with the national trend where numbers have declined throughout I-WeBS by an average *c.*3% per year. In Britain, numbers of Curlew increased from the 1970's until the start of the 2000's but have steadily declined since then.



4.3 Ballymacoda Bay SPA – site conservation condition of waterbird SCI species

Conservation condition of SCI species was determined using a species site trend and therefore relates to Conservation Objective 1 (population trend) only[13]. Conservation condition was assigned using the following criteria:

Favourable population = population is stable/increasing.

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

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

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

The threshold levels of >25.0% and >50.0% follows standard convention used for waterbirds (e.g. Lynas et al. 2007; Leech et al. 2002). The 'Intermediate' range (1.0% - 24.9% decline) allows for natural fluctuations and represents a range within which relatively small population declines have the potential to be reversible and less likely to influence conservation status in the long-term (Leech et al. 2002). Declines of more than 25.0% are deemed of greater ecological significance for the long-term.

[13] Conservation condition in relation to Objective 1 (range, timing or intensity of use of areas by SCI species) has yet to be assigned.

With regards the 16 waterbird species of Special Conservation Interest listed for Ballymacoda Bay SPA, and based on the population trend for the site, it has been determined that (Table 4.3):-

1. 6 species are currently considered as **Highly Unfavourable** (Lapwing, Dunlin, Curlew, Black-headed Gull, Common Gull and Lesser Black-backed Gull);
2. 1 species is currently considered as **Unfavourable** (Golden Plover);
3. 3 species are currently considered as **Intermediate Unfavourable** (Wigeon, Ringed Plover and Grey Plover);
4. 6 species are currently considered as **Favourable** (Teal, Sanderling, Black-tailed Godwit, Bar-tailed Godwit, Redshank and Turnstone).

Site conservation condition and population trends were also reviewed in light of species' all-Ireland and international trends (Table 4.3). All-Ireland tends follow Crowe & Holt (2013) while International trends follow Wetlands International (2012).

Table 4.3 SCI species of Ballymacoda Bay SPA – Current Site Conservation Condition

Special Conservation Interests	BoCCI Category[a]	Site Population Trend[b]	Site Conservation Condition	Current all-Ireland Trend[c]	Current International Trend[d]
Wigeon	Red	- 16	Intermediate (Unfavourable)	Declining	Stable
Teal	Amber	+ 29	Favourable	Stable	Increasing
Ringed Plover	Green	- 7	Intermediate (Unfavourable)	Stable	Fluctuating
Golden Plover	Red	- 39	Unfavourable	Declining	Declining
Grey Plover	Amber	- 15	Intermediate (Unfavourable)	Declining	Declining?
Lapwing	Red	- 61	Highly Unfavourable	Declining	Stable
Sanderling	Green	+ 111	Favourable	Stable	Increasing
Dunlin	Red	- 55	Highly Unfavourable	Declining	Stable
Black-tailed Godwit	Amber	+ 207	Favourable	Increasing	Increasing
Bar-tailed Godwit	Amber	+ 28	Favourable	Stable	Increasing
Curlew	Red	- 51	Highly Unfavourable	Declining	Declining
Redshank	Red	+ 1	Favourable	Stable	Stable/Increase
Turnstone	Green	+ 7	Favourable	Increasing	Increasing ?
Black-headed Gull	Red	-73	Highly Unfavourable	n/c	n/c
Common Gull	Amber	-91	Highly Unfavourable	n/c	n/c
Lesser Black-backed Gull	Amber	-85	Highly Unfavourable	n/c	n/c

[a]After Colhoun & Cummins, 2013; [b] Site population trend analysis; see Table 4.2; [c]all-Ireland trend - where a species is deemed to be increasing or declining if the annual rate of change is equal to or greater than 1.2% (after Crowe & Holt, 2013); [d] current international trend after Wetlands International, 2012.

Table 4.3 also shows the relationship between a species' long-term site trend and the current all-Ireland trend for the period 1999/00 to 2010/11. The colour coding used represents the following cases:-

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

The pink and red categories listed above and not found for this site, 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).

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 Ballymacoda Bay SPA.

Section 5.2 provides selected ecological summary information for non-breeding waterbirds of Ballymacoda Bay. Section 5.3 presents results from the 2010/11 Waterbird Survey Programme. Finally, Section 5.4 provides summary information on activities and events that occur in and around Ballymacoda Bay that may either act upon the habitats within the site, or may interact with waterbirds using the site.

The information provided is intended to:-

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

Note however, that the information does not aim to provide a comprehensive assessment on which to assess plans and projects as required under the Habitats Directive, but rather should inform the scope of these assessments and help direct where further detailed examinations are required. The information presented in this report was compiled in November 2013 and updated in April 2014.

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

Waterbirds, defined as '*birds that are ecologically dependent on wetlands'* (Ramsar Convention, 1971), are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. During the data period 1995/96 – 2010/11, the I-WeBS database shows a total of 80 waterbird species that have been recorded at Ballymacoda Bay. These species represent eleven waterbird families: *Gaviidae* (divers), *Podicipedidae* (grebes), *Anatidae* (swans, geese and ducks), *Rallidae* (Water Rail, Moorhen and Coot), *Haematopodidae* (oystercatchers), *Charadriidae* (plovers and lapwings), *Scolopacidae* (sandpipers and allies) and *Laridae* (gulls and terns) plus *Phalacrocoracidae* (Cormorants), *Ardeidae* (Herons) and *Alcedinidae* (Kingfisher).

As described in Section 1.1, the wetland habitats contained within this SPA are considered to be a Special Conservation Interest in their own right. The wetland habitat is an important resource for listed SCI species and for other waterbird species included in the total waterbird assemblage. These species may include those that utilise the site during passage, those that are present in months of the year outside of the non-breeding season[14] or species that use the site at certain times only (e.g. as a cold weather refuge).

During the I-WeBS period 1995/96 – 2011/12, 17 waterbird species occurred on a regular basis[15] at Ballymacoda Bay in addition to the listed SCI species. These additional regularly-occurring species are listed in Table 5.1.

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

[15] Regular is defined as a species that has occurred in 13 out of the 16-year data period (data for 2008/09 missing).

Table 5.1 Regularly-occurring non SCI waterbird species of Ballymacoda Bay during the non-breeding season

Species	Baseline Data Period[1] (1995/96 – 1999/00)	Recent Site Average[2] (2007/08 – 2011/12)
Light-bellied Brent Goose (*Branta bernicla hrota*)	67	252
Shelduck (*Tadorna tadorna*)	126	37
Mallard (*Anas platyrhynchos*)	89	61
Pintail (*Anas acuta*)	4	1
Shoveler (*Anas clypeata*)	20	7
Red-breasted Merganser (*Mergus serrator*)	6	2
Cormorant (*Phalacrocorax carbo*)	29	22
Grey Heron (*Ardea cinerea*)	12	13
Little Egret (*Egretta garzetta*)	6	28
Oystercatcher (*Haematopus ostralegus*)	470	445
Knot (*Calidris canutus*)	241 (n)	171
Snipe (*Gallinago gallinago*)	150	49
Whimbrel (*Numenius phaeopus*)	1	2
Greenshank (*Tringa nebularia*)	17	14
Herring Gull (*Larus argentatus*)	68	74
Great Black-backed Gull (*Larus marinus*)	302	141

Grey shading denotes an Annex I species; (n) = numbers of all-Ireland importance for the baseline period (after Crowe et al. 2008).
[1] Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00 (I-WeBS); [2]recent data is the 4-year mean peak for the period 2007/08 – 2011/12 (data for 2008/09 missing) (I-WeBS).

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

Table 5.2 provides selected ecological information for waterbird SCI species of Ballymacoda Bay SPA. Information is provided for the following categories[16]:-

- waterbird family (group);
- winter distribution – species distribution range during winter (based on the period 2001/02 – 2008/09 (after Boland & Crowe, 2012);
- trophic (foraging) guild (after Weller, 1999; see Appendix 5);
- food/prey requirements;
- principal supporting habitat within the site;
- ability to utilise other/alternative habitat in/around the site;
- site fidelity (species 'faithfulness' to wintering sites).

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

Reliance on alternative habitats will vary between species and from site to site. Use of alternative habitats is also likely to vary through time, from seasonally through to daily, and different habitats may be used by day and night (Shepherd et al. 2003). Different waterbirds may utilise wetland habitats in different ways. For example, while the majority of wading birds forage across exposed tidal flats, species such as Lapwing and Golden Plover are considered

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

to be 'terrestrial waders,' typically foraging across grassland and using tidal flats primarily for roosting. When tidal flats are covered at high water, intertidally-foraging waterbirds are excluded and many will move to nearby fields to feed. Terrestrial foraging is also important when environmental factors (e.g. low temperature) reduce the profitability of intertidal foraging (e.g. Zwarts & Wanink, 1993). Some waterbird species are simply generalists, and make use of a range of habitats, for example the Black-tailed Godwit that forages across intertidal mudflats and grassland habitats. Other waterbird species such as Greenland White-fronted Goose or Bewick's Swan are herbivores and are therefore reliant on terrestrial areas, often outside of the SPA boundary, and use the wetland site primarily for roosting. Some species switch their habitat preference as food supplies become depleted; an example being Light-bellied Brent Geese that exploit grasslands increasingly when intertidal seagrass and algae become depleted.

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

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

Table 5.2 Waterbirds – Ecological characteristics, requirements & specialities

Special Conservation Interests	Family (group)	Winter distribution[A]	Trophic Guild[B]	Food/Prey Requirements[C]	Principal supporting habitat within site[D]	Ability to utilise other/alternative habitats[E]	Site Fidelity[F]
Wigeon *Anas penelope*	Anatidae (dabbling ducks)	Widespread	1, 5	Narrower	Intertidal mud and sand flats	1	Weak
Teal *Anas crecca*	Anatidae (dabbling ducks)	Very widespread	1	Wide	Intertidal mud and sand flats	3	Weak
Ringed Plover *Charadrius hiaticula*	Charadriidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	High
Golden Plover *Pluvialis apricaria*	Charadriidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate
Grey Plover *Pluvialis squatarola*	Charadriidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	High
Lapwing *Vanellus vanellus*	Charadriidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	Moderate
Sanderling *Calidris alba*	Scolopacidae (wading birds)	Localised	4, 6	Wide	Intertidal sand flats	3	High
Dunlin *Calidris alpina*	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	3	High
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	3	Moderate
Curlew *Numenius arquata*	Scolopacidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	High
Redshank *Tringa totanus*	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate
Turnstone *Arenaria interpres*	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	2	High
Black-headed Gull *Chroicocephalus ridibundus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal flats & sheltered & shallow subtidal	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
Lesser Black-backed Gull *Larus fuscus*	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal flats & sheltered & shallow subtidal	1	Unknown

[A] Winter distribution: Very widespread (>300 sites); Widespread (200 – 300 sites); Intermediate (100 – 200 sites); Localised (50-100 sites); Highly restricted (<50 sites) (based on Boland & Crowe, 2012).

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

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

[D] Principal supporting habitat present within Ballymacoda Bay. Note that this is the main habitat used when foraging with the exception of Golden Plover and Lapwing (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.

[F] Site fidelity on non-breeding grounds: Unknown; Weak; Moderate; or High (based on published literature).

5.3 The 2010/11 waterbird survey programme

5.3.1 Introduction

The 2010/11 waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide.

At Ballymacoda Bay, a standard survey programme of four low tide counts (October, November and December 2010 and February 2011) and one high tide counts (January 2011) was undertaken.[17] Waterbirds were counted within a series of 11 count subsites (refer to Appendix 6). It should be noted that the count boundaries and SPA boundaries are not coincident; the count area being larger.

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

Table 5.3 Definition of broad habitat types used

Broad Habitat Type	Broad Habitat Description
Intertidal (area between mean high water and mean low water)	Refers to the area uncovered by the tide and most likely dominated by mudflats and sandflats. It may also include areas of rocky shoreline, areas of mixed sediment and grave/pebbles or shingle and gravel shores.
Subtidal (area that lies below mean low water)	Refers to areas that are covered by seawater during counts. During low-tide counts it will include offshore water, tidal channels and creeks as well as tidal rivers.
Supratidal	This category pertains to the shore area and habitats immediately marginal to and above the mean high-water mark. The supratidal section is an integral part of the shoreline. This broad habitat also includes areas of saltmarsh where the saltmarsh is contiguous with coastal habitats lying above. Note that patches of lower saltmarsh (e.g. *Spartina* sp.) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	Used where birds were recorded within habitats close to the shoreline but were above the intertidal and supratidal levels e.g. terrestrial grassland.

In addition to the main survey programme described above, a high tide roost survey was undertaken on 01/11/10. During this survey waterbird roost sites were located, species and numbers of waterbirds counted and the position of roosts marked onto field maps.

5.3.2 Waterbird data, analyses and presentation

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

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

[17] Low tide counts on 12/10/10, 10/11/10, 09/12/10 & 07/02/11 plus a high tide count on 17/01/11.

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

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

Subsite Rank Position - Categories

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

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

Waterbird count data for low tide surveys are also presented as species distribution maps ('dot density maps'). Dot-density maps show waterbird species distribution within intertidal or subtidal habitat[18] divided into 'foraging' birds and 'roosting/other' birds. These maps show the number of birds represented by dots; each dot representing one, or a pre-determined number of birds. As the dots are placed in the appropriate subsites and broad habitat types for the birds counted, the resulting map is equivalent to presenting numbers and densities and provides a relatively quick way of assessing species distribution.

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

Notes on data interpretation and methodological limitations

Weather conditions during the winter of 2010/11 proved extremely challenging for fieldworkers, December 2010 being the coldest on record (Met Éireann, 2010). It should be borne in mind that the cold weather is likely to have affected the numbers and distribution of waterbirds at the site, as well as nationally, as was the case in the previous cold winter of 2009/10 (Crowe et al. 2011).

Subsite rankings and dot-density maps relate to the distribution of waterbirds at subsite level as recorded within the survey area during the 2010/11 waterbird survey programme. Care must be taken in the interpretation of these data, and subsite rankings in isolation should not be used to infer a higher level of conservation importance to one area over another without a

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

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(s). While some species by their nature may aggregate in high numbers, other species such as Greenshank or Grey Heron may not. It is also important to consider that distribution maps and data refer to a single season of low tide surveys. Although important patterns of distribution will emerge, these distributions should not be considered absolute; waterbirds by their nature are highly mobile and various factors including tide (e.g. spring/neap), temperature, direction of prevailing winds, changing prey densities/availabilities and degree of human activity across the site, could lead to patterns that may change in different months and years.

Dot-density maps are not intended to show the actual position of each bird; the dots are placed randomly within subsites so no conclusions can be made at a scale finer than subsite. Dots are placed in the appropriate subsites and broad habitat types for the birds counted but given that the broad habitats are based on OS mapping, there are various cases where the mapping does not accurately portray where a bird was e.g. in the case of birds associated with freshwater flows, or small creeks that are not shown on OS maps. These associations are discussed as necessary in the individual species text tables.

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

5.3.3 Summary Results

A total of 46 waterbird species were recorded during the 2010/11 survey programme at Ballymacoda Bay. Cummins and Crowe (2011) provide a summary of waterbird data collected. Note that the total count area and SPA area are not exactly coincident and a map showing count subsites is provided in Appendix 6.

All SCI species were recorded within all counts of the main survey programme with the exception of Golden Plover that were not recorded during the December 2010 low tide survey. Table 5.4 shows peak numbers (whole site) for SCI species recorded during the low tide (LT) and high tide (HT) surveys.

Average subsite occupancy, the average proportion of subsites in which a species occurred during low tide counts, ranged from 18% (Golden Plover and Sanderling) to 95% (Redshank). 11 of the total 16 SCI species occurred on average, in over half of the count subsites.

Average percentage area occupancy is defined as the average proportion of the whole count area that a species occurred in during low tide counts. Although this is a broad calculation across all habitat zones it presents some indication of the range of a species across the site as a whole. Average percentage area occupancy ranged from 27% (Golden Plover) to 94% (Redshank) and ten SCI species distributed on average, across more than half of the count area (Table 5.4).

Table 5.4 Ballymacoda Bay 2010/2011 waterbird surveys – summary data

Site Special Conservation Interests (SCIs)	Peak number - LT surveys[I]	Peak number - HT survey[II]	Average subsite % occupancy [III]	Average % area occupancy [III]
Wigeon (*Anas penelope*)	1,037 (n)	1,100 (n)	61 (24)	64 (25)
Teal (*Anas crecca*)	1,011 (n)	855 (n)	64 (15)	45 (22)
Ringed Plover (*Charadrius hiaticula*)	64	36	27 (7)	44 (19)
Golden Plover (*Pluvialis apricaria*)	5,750 (n)	1,233 (n)	18 (9)	27 (12)
Grey Plover (*Pluvialis squatarola*)	212 (n)	381 (n)	84 (11)	93 (7)
Lapwing (*Vanellus vanellus*)	1,492 (n)	1,298 (n)	59 (5)	52 (21)
Sanderling (*Calidris alba*)	158 (n)	85 (n)	18 (7)	38 (18)
Dunlin (*Calidris alpina*)	1,005 (n)	1,365 (n)	73 (13)	84 (9)
Black-tailed Godwit (*Limosa limosa*)	1,945 (i)	552 (n)	75 (9)	64 (20)
Bar-tailed Godwit (*Limosa lapponica*)	651 (n)	788 (n)	68 (16)	88 (8)
Curlew (*Numenius arquata*)	638 (n)	570 (n)	91 (10)	91 (11)
Redshank (*Tringa totanus*)	371 (n)	187	95 (5)	94 (7)
Turnstone (*Arenaria interpres*)	27	124 (n)	32 (9)	47 (22)
Black-headed Gull (*Chroicocephalus ridibundus*)	629	76	70 (11)	80 (9)
Common Gull (*Larus canus*)	418	91	59 (5)	85 (7)
Lesser Black-backed Gull (*Larus fuscus*)	329	42	30 (11)	43 (22)

(i) denotes numbers of international importance (after Wetlands International, 2012); (n) denotes numbers of all-Ireland importance (after Crowe & Holt, 2013); [I] 4 low-tide counts undertaken on 12/10/10, 10/11/10, 09/12/10 & 07/02/11; [II] High-tide count undertaken on 17/01/11; [III] Mean (± s.d.) averaged across the four low tide surveys with the exception of Golden Plover that was averaged across three (not present on 09/12/10).

Whole site species richness (total number of species) ranged between 32 species and 37 species during low tide surveys and 35 species were recorded during the high tide survey on 17/01/11.

During low tide surveys, all subsites supported, on average ten or more species. Average subsite species richness ranged from 11 species (0L569 and 0L810) to 22 species (0L574 Clonpriest East to Ring Point). All but one of the 11 subsites recorded a greater number of species during low tide surveys, as opposed to the high tide survey (Table 5.5).

Table 5.5 Subsite species richness

Subsite Code	Subsite name	Mean (±S.D) LT Survey	HT Survey	Peak Overall (H/L)
0L350	Crompaun South (Womanagh River)	13 (3)	7	16 (L)
0L553	Crompaun Bridge	12 (4)	8	18 (L)
0L555	Ballykineely	20 (2)	17	21 (L)
0L556	The Duck	12 (3)	15	15 (H)
0L569	Pilmore (Back Strand)	11 (2)	9	13 (L)
0L570	Clonard East	16 (3)	3	20 (L)
0L571	Pilmore (Barrel Rocks)	14 (2)	9	17 (L)
0L572	Ring Strand	21 (4)	20	26 (L)
0L573	Pilmore (Black Rock)	18 (4)	11	22 (L)
0L574	Clonpriest East to Ring Point	22 (2)	22	24 (L)
0L810	Ballymacoda Marsh (South of Crompaun Bridge)	11 (1)	11	12 (L)

5.3.4 Waterbird distribution

Data analyses determined the proportional use of subsites by each Special Conservation Interest (SCI) species, relative to the site as a whole during both low tide and high tide surveys. Selected results from these 'subsite assessments' are shown in Tables 5.6 (a–f). The relative importance of each subsite is based on the final rank positions (see 5.3.2 for methodology). Where a box is left blank, simply means that a species was not recorded in that subsite.

Ranked assessments relate to the broad habitat that birds were observed in. In some cases, data for different broad habitats have been combined, for example, in the case of wading birds and intertidal/subtidal habitat which were combined in order to include those individuals that had their feet in water and were recorded as subtidal.

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

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

Table 5.6 (a) Ballymacoda Bay 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).

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN	H	H	M	M	L			H	H	V	M
T.	V	V	H	H	M			L	L	V	M
RP						V	H	V	V	H	
GP			V	H			H	V		M	
GV	L	M	V	M	H	M	V	V	H	V	L
L.	M	H	V	H	M		L	L		M	V
SS						V		V	V		
DN	L	H	V	H	M	M	M	V	H	V	H
BW	H	V	V	H	M			V	H	V	H
BA	L		M	L	M	V	V	H	H	H	L
CU	H	V	V	V	L	M	M	H	L	H	M
RK	M	H	V	H	M	H	L	V	M	H	H
TT				H		V	V	H	V	V	
BH	H	M	V	H	L	M	M	V	M	V	M
CM	H		V	L		M	M	H	H	V	L
LB	M		V	M		M	L	V	H	V	

Table 5.6 (b) Ballymacoda Bay Subsite assessment – highest rank based on total numbers obtained during the high tide survey

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN			6	2	7		8	3	5	1	4
T.	8	9	2	3	7		6		5	1	4
RP								1			
GP			1	2				3			
GV				3				1		2	
L.	5	7	4	3	6					1	2
SS								1			
DN			2	4				3		1	5
BW	3		2	6	7		3			5	1
BA				2	4			1		3	
CU	1	6	4	2		8	5			3	7
RK	5	9	4	7	6	3		8	9	1	2
TT								1	2	2	
BH				2			4	3		1	
CM			1					1		3	
LB								2		1	

Table 5.6 (c) Ballymacoda Bay Subsite assessment – total numbers foraging intertidally[I] and subtidally[II] LT surveys (L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods)

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN[I]		H	V	H						V	V
WN[II]			L		L			V	H	V	
T.[I]	M	M	H	V					L	V	V
T.[II]		H	L	V					M	V	
RP[I]						V	H	V	V	H	
GP[I]			V	V							
GV[I]	L	M	V	M	M	M	V	V	H	V	L
L.[I]	M	V	M	H				V		V	H
SS[I]						V		V	V		
DN[I]	L	H	V	H	M	M	M	V	H	V	H
BW[I]	M	H	V	M	L			V	V	H	V
BA[I]	L		H	L	L	V	V	H	M	M	L
CU[I]	L	M	H	V	M	H	M	V	M	H	H
RK[I]	M	H	V	M	L	M	M	V	L	H	H
TT[I]				H		V	V	H	V	V	
BH[I]				H		H	H	V	M	H	
CM[I]				L		H	V	V	V		
LB[I]							V				

Table 5.6 (d) Ballymacoda Bay Subsite assessment – ranked top-ten peak low tide intertidal foraging densities - selected species, LT surveys

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
RP						2	4	5	1	3	
GV	3	1	4	8	2		6	5	9	7	10
SS						1		2	3		
DN	8	1	4	2	6	10	7	9		5	3
BW	3	1	5	9	7			8	10	6	4
BA	2		4	5	9	1	3	8	6	7	10
CU	6	1	7	2	3	9	10	8		5	4
RK	1	2	6	5	3	8	10	9		7	4

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

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN[I]	V	M	H		L					V	
WN[II]	V		L	H	M				V	V	
T.[I]	V	V	H	M	H			L	M	V	M
T.[II]	V	H	H	V	H				M	V	
RP[I]								V			
GP[I]			V				H	V	M		
GV[I]				V	V			H	M	V	
L.[I]	H		V	V	M			V		H	M
SS[I]								V			
DN[I]			V								
BW[I]	H	V		V				V	L	V	M
BA[I]					H	H	V	V	M	V	
CU[I]	H	L	H	V	L		L	H		H	V
RK[I]	V	H			V			V		H	
TT	*not recorded*										
BH[I]	M	L	V	M				V		V	H
BH[II]			H			H		H	M	V	
CM[I]	M		V	M				H	H	V	M
CM[II]			H					M		V	
LB[I]	L		V	M		M		V	H	V	
LB[II]			H							V	

Table 5.6 (f) Ballymacoda Bay Subsite assessment – highest rank obtained (roosting/other behaviour) during the HT survey (Intertidal[I], Subtidal[II])

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN[I]				3	4			2		1	
WN[II]					4			1	2		3
T[I]	3		2		4					1	
T[II]			2	1	4				3		5
RP[I]								1			
GP[I]			1	2				3			
GV[I]								1		2	
L.[I]				2	3					1	
SS[I]								1			
DN[I]				2				1			
BW[I]				2						1	
BA[I]				2				1		3	
CU[I]				1							
RK[I]				3	2			4	5		1
TT	*not recorded*										
BH[I]				2						1	
BH[II]				1				2			
CM[I]								2		1	
CM[II]			1					2			
LB[I]										1	
LB[II]								1			

Ballymacoda Bay - Waterbird Survey Programme 2010/11

Waterbird distribution - discussion notes

Where mentioned, information on benthic communities or sediment is from the intertidal and subtidal sampling programme commissioned by the National Parks & Wildlife Service (NPWS) and Marine Institute and reported in Merc/ERM (2012) and NPWS (2014).

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

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

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

Numbers

Whole site numbers of Wigeon rose from 441 on 12/10/10 to a low tide peak count of 1,037 on 09/12/10. However the peak site count of 1,110 individuals was recorded during the high tide count on 17/01/11. The latter three counts (December, January and February) recorded numbers that exceeded the all-Ireland threshold.

The peak I-WeBS count recorded for Wigeon in the 2010/11 season was 82 individuals, recorded in September 2010, but only one count was completed during that season.

Wigeon was a widespread species, occurring in ten of the total 11 subsites. During individual surveys they were present in between three (12/10/10) and nine (07/02/11) subsites. Two subsites recorded the species during all five counts: 0L573 (Pilmore (Black Rock)) and 0L574 (Clonpriest East to Ring Point) while seven subsites recorded the species in three or more low tide surveys: 0L350, 0L553, 0L555, 0L556, 0L572, 0L573 and 0L574.

The peak subsite count (424 Wigeon) was recorded within 0L574 (Clonpriest East to Ring Point) on 12/10/10.

Foraging Distribution

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

Wigeon were recorded foraging in intertidal, subtidal, supratidal and terrestrial habitats.

Intertidal foraging was recorded across seven subsites (0L553, 0L555, 0L556, 0L572, 0L573, 0L574 and 0L810) but all of these with the exception of 0L574, recorded foraging individuals just once during low tide surveys. 0L574 (Clonpriest East to Ring Point) supported foraging Wigeon in all surveys and peak numbers in two low tide surveys, plus the peak number (accounting for 83% of the total recorded) during the high tide survey and was therefore the clearly favoured subsite.

With the exception of low numbers (four) recorded on single occasions in the outer subsites 0L572 and 0L573, foraging Wigeon were therefore distributed across inner estuarine subsites.

0L574 (Clonpriest East to Ring Point) and all other inner and mid estuary subsites are characterised by a sandy mud substratum with saltmarsh forming a fringe or mosaic with the intertidal sediments. The benthic community is classified as 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community' (NPWS, 2014).

A greater number of Wigeon foraged subtidally in all low tide surveys. 0L574 (Clonpriest East to Ring Point) again supported peak numbers in two of the four low tide surveys and peak numbers during the high tide survey. The outer subsite 0L572 (Ring Strand) recorded peak numbers in two low tide surveys and 0L573 (Pilmore (Black Rock)) was notable in supporting numbers ranked in the top three during three low tide surveys.

Supratidal foraging was recorded in four subsites (0L350, 0L555, 0L556 and 0L810), all inner estuary subsites. Largest numbers were recorded in 0L350 (Crompaun South (Womanagh River)) during low tide surveys while 0L556 (The Duck) supported peak numbers of 75 Wigeon during the high tide survey.

Terrestrial foraging was recorded in association with 0L553 and 0L571 (outside the SPA boundary) and 0L810 (inside the SPA boundary).

Roosting Distribution

Good numbers of Wigeon were recorded in roosting/other behaviour in all surveys with the exception of 12/10/10 when the majority of birds were foraging.

Intertidal roosting was recorded for seven subsites overall (0L350, 0L553, 0L555, 0L556, 0L569, 0L572 and 0L574); 0L572 only recording individuals during the high tide survey.

0L574 (Clonpriest East to Ring Point) held peak numbers during three low tide surveys. Good numbers were also supported by 0L350 (Crompaun South (Womanagh River)) on two occasions (peak number 174 Wigeon), and by 0L555 (Ballykineely) on three occasions (peak number 101 Wigeon). During the high tide survey 73% of intertidally roosting Wigeon were located within 0L574.

0L573 (Pilmore (Black Rock)) held subtidally roosting Wigeon with most regularity and supported peak numbers on 12/10/10 and 10/11/10. 0L574 (Clonpriest East to Ring Point) held peak numbers on one occasion (07/02/11) while 0L350 (Crompaun South (Womanagh River)) held peak numbers (42) on 09/12/10 and good numbers during the final low tide survey (07/02/11). Peak numbers roosting subtidally during the high tide survey were recorded for 0L572 (Ring Strand), others recorded in 0L569, 0L573 and 0L810.

The high tide roost survey (01/11/10) recorded nine flocks of roosting Wigeon across four subsites (0L555, 0L556, 0L574 and 0L810). The largest single roost of 94 individuals comprised a subtidal and intertidal flock in 0L574 (Clonpriest East to Ring Point). 0L555 (Ballykineely) held three different flocks, the largest being a flock of 74 that were positioned subtidally and two other flocks that roosted intertidally.

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

Numbers of Teal rose from 344 on 12/10/10 to a low tide peak count of 1,011 on 09/12/10. 855 Teal were counted during the high tide survey. All counts exceeded the threshold of all-Ireland importance.

The peak I-WeBS count recorded for Teal in the 2010/11 season was 107 individuals, recorded in September 2010, but only one count was completed during that season.

Teal was a widespread species, occurring in ten subsites overall across the survey programme (all except 0L570). Five subsites recorded this species during all five surveys completed: 0L350, 0L555, 0L556, 0L574 and 0L810. Peak numbers were held by 0L350 (Crompaun South (Womanagh River)), 0L574 (Clonpriest East to Ring Point), 0L574 and 0L553 (Crompaun Bridge) for the four low tide surveys. 0L574 also held peak numbers during the high tide survey.

The overall peak subsite count was 531 individuals within 0L574 (Clonpriest East to Ring Point) on 09/12/10, surpassing the threshold for all-Ireland importance.

Foraging Distribution

Non-breeding Teal are widely distributed throughout Ireland, favouring areas of shallow water on estuarine coastal lagoons, coastal and inland marshes, and flooded pastures and ponds. Teal are omnivores and have a variety of foraging methods (e.g. dabbling and up-ending) within differing habitats and water depths.

The majority of foraging Teal were recorded in intertidal or subtidal habitat. More Teal foraged intertidally than subtidally during all surveys. Intertidal foraging was recorded in eight subsites (0L350, 0L553, 0L555, 0L556, 0L569, 0L573, 0L574 and 0L810) and most regularly in two (0L574 and 0L810) that recorded individuals in all surveys. Peak numbers were held by 0L810 (Ballymacoda Marsh (South of Crompaun Bridge), 0L556 (The Duck), 0L556 and 0L574 (Clonpriest East to Ring Point) for the four respective low tide survey dates; these three inner estuary subsites generally holding the greatest numbers of Teal during all low tide surveys. From these data we can conclude that Teal generally distribute within the shallow and sheltered channels and creeks of inner estuary subsites which have associated saltmarsh and supratidal habitats (marshes). The freshwater influence of these inner estuary subsites is also important; this species of dabbling duck readily occupying inland freshwater habitats as well as coastal/estuarine sites.

Subtidal foraging was most regularly recorded for 0L574 (Clonpriest East to Ring Point) that held peak numbers during the first three low tide surveys. Peak numbers on 07/02/11 were held by 0L556 (The Duck).

Supratidal foraging was recorded on two occasions in 0L574 (Clonpriest East to Ring Point).

Terrestrial foraging was recorded in association with three subsites: 0L350 (Crompaun South (Womanagh River)), 0L553 (Crompaun bridge) and 0L555 (Ballykineely); outside of the SPA boundary.

Roosting Distribution

Good numbers of Teal were recorded in roosting/other behaviour in intertidal habitat in all low tide surveys. Peak numbers were held by 0L350 (Crompaun South (Womanagh River)) on 12/10/10 when a single flock of 203 Teal roosted intertidally alongside the channel. During the following two low tide surveys 0L574 (Clonpriest East to Ring Point) held peak numbers; these birds again largely alongside the channel in varying sized flocks. 0L553 (Crompaun Bridge) held peak numbers (183) on 07/02/11. 0L555 (Ballykineely) was notable for supporting numbers ranked second or third highest in all low tide surveys.

0L574 (Clonpriest East to Ring Point) held peak numbers roosting intertidally during the high tide survey while 0L556 (The Duck) held peak numbers roosting/other subtidally with a count (146) more than three times higher than the peak count roosting intertidally, and representing 70% of all Teal roosting subtidally across the site. Intertidal roosting was also recorded for 0L350, 0L555 and 0L569 while subtidal roosting occurred across a total five subsites with <21 individuals held by 0L555, 0L569, 0L573 and 0L80 in addition to 146 recorded by 0L556 (The Duck).

Supratidal and terrestrial roosting/other behaviour were recorded rarely.

The high tide roost survey (01/11/10) recorded three flocks of roosting Teal across three subsites (0L555, 0L572 and 0L810). The largest single roost of 52 individuals comprised a subtidal and supratidal flock in 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)); the mixed-species roost also comprising Lapwing, Wigeon, Redshank and Black-tailed Godwit.

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

The Ringed Plover breeds across Arctic and temperate zones from the east coast of Baffin Island, Greenland, across northern Europe and the Russian tundra to the coasts of the Bering Sea. Three subspecies are generally recognised of which the nominate subspecies, *C. h. hiaticula,* breeds in Britain and Ireland, southern Scandinavia and northern and eastern Europe and winters in Europe and north-west and west Africa (Thorisson et al. 2012). The Irish breeding population is thought to be largely sedentary; wintering numbers enhanced by birds that breed further north, but Ireland also provides important passage sites for birds breeding in east Canada, Greenland and Iceland *en route* to wintering areas in Africa (Delany et al. 2009; Thorisson et al. 2012).

Numbers

Total site numbers of Ringed Plovers were variable across the survey programme and peaked early during the low tide survey on 12/10/10 (64). Numbers were stable across the next two low tide surveys then dropped down to just four individuals on 07/02/11. This drop in numbers is possibly related to the cold weather, with December 2010 reported as the coldest since 1963 (Met Éireann, 2010). No count exceeded the threshold of all-Ireland importance.

No total site counts exceeded the threshold of all-Ireland importance, including the high tide survey (17/01/11) when 36 Ringed Plovers were recorded

The peak I-WeBS count recorded for Ringed Plover in the 2010/11 season was 103 individuals, recorded in September 2010, but only one count was completed during that season. This count exceeds the threshold of all-Ireland importance (100).

Ringed Plovers were recorded in a total of five subsites throughout the survey programme (0L570, 0L571, 0L572, 0L573 and 0L574), but subsite use during individual surveys ranged from two to four subsites. 0L571 (Pilmore (Barrel Rocks)) was the only subsite to record this wader in all low tide surveys but held low numbers (maximum five individuals). Peak numbers were held by 0L573 (Pilmore (Black Rock)), 0L570 (Clonard East), 0L572 (Ring Strand) and 0L570 for the four respective low tide survey dates. 0L572 (Ring Strand) recorded 36 Ringed Plover during the high tide survey. The peak subsite count was 47 individuals recorded for 0L573 (Pilmore (Black Rock) on 12/10/10.

Foraging Distribution

Ringed Plovers are 'visual foragers' searching the sediment surface for the visible signs of prey such as worms, crustaceans and insects. They forage in a variety of habitats including sand and mudflats, shingle shores and sandbanks, as well as saltmarshes, short grassland, flooded fields and artificial habitats.

Ringed Plovers foraged intertidally across five subsites (0L570, 0L571, 0L572, 0L573 and 0L574); predominately outer bay subsites.

Peak numbers were recorded within 0L573 (Pilmore (Black Rock) (12/10/10 and 09/12/10), 0L572 (Ring Strand) (jointly on 09/12/10) and 0L570 (Clonard East) (10/11/10 and 07/02/11). These subsites are characterised by the community complex sand with polychaetes and bivalves (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans*, *Nephtys cirrosa* and *Scoloplos* (*Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata*. The marine biotope *Polychaete/amphipod dominated fine sand shores* (LS.LSa.FiSa) was assigned by Merc/ERM (2012).

Low numbers foraged in all four low tide surveys in 0L571 (Pilmore (Barrel Rocks)).

Recorded foraging densities were low with no subsite recording a density of greater than 1 Ringed Plover ha^{-1}. The peak intertidal foraging density was 0.8 Ringed Plover ha^{-1} recorded for 0L573 (Pilmore (Black Rock)). The whole site average intertidal foraging density was 0.1 Ringed Plover ha^{-1}.

Roosting Distribution

Ringed Plovers often roost on rocky shores and are known to be highly faithful to roost sites (e.g. Rehfisch et al. 2003).

During low tide surveys, few Ringed Plovers were recorded in roosting/other behaviour. Two individuals roosted within 0L572 (Ring Strand) on 09/12/10 and 36 roosted within this subsite during the high tide survey (17/01/11).

The high tide roost survey (01/11/10) recorded just one flock of 54 intertidally roosting Ringed Plovers in 0L572 (Ring Strand). These birds were positioned in the north of the subsite alongside the main channel.

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. Golden Plovers that winter in Ireland are thought to be mostly Icelandic-breeding birds *P. a. altifrons* (Wernham et al. 2002).

Numbers

Whole site numbers of Golden Plover peaked on 10/11/10 when 5,750 were recorded. This species was absent on 09/12/10 likely related to the cold weather spell, with December 2010 reported as the coldest since 1963 (Met Éireann, 2010). Numbers had returned to 1,436 on 07/02/11 and 1,233 were recorded during the high tide count on 07/01/11. All counts with the exception of October 2010 exceeded the threshold of all-Ireland importance set at 1,200 individuals (Crowe & Holt, 2013).

The peak I-WeBS count recorded for Golden Plover in the 2010/11 season was 98 individuals, recorded in September 2010, but only one count was completed during that season.

Golden Plovers were recorded in five subsites overall: 0L555, 0L556, 0L571, 0L572 and 0L574 but apart from 0L555 (Ballykineely) these subsites recorded this species only once during low tide surveys. 0L555 recorded peak numbers on 10/11/10 and 07/02/11 and 0L572 (Ring Strand) held peak numbers on 12/10/10. The peak subsite count of 5,750 was recorded for 0L555 (Ballykineely) on 10/11/10.

Foraging Distribution

During winter, Golden Plovers feed primarily within agricultural grassland and arable land. Tidal flats are used more as a roosting/resting habitat and the birds tend to favour large, open tidal flats. 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, predominantly insects, as well as earthworms, spiders, millipedes, snails, polycheate worms and some plant material (e.g. berries, seeds and grass) (del Hoyo et al. 1996), relatively little is known about their intertidal feeding patterns (Gillings et al. 2006).

Two observations of intertidally foraging individuals were made. Three individuals foraged within 0L556 (The Duck) on 12/10/10 and 100 individuals foraged intertidally within 0L555 (Ballykineely) on 10/11/10. On the same date, 1,650 forged terrestrially adjacent to 0L555 (Ballykineely) along with 18 Lapwing. Situated in a field to the north of the count subsite, these flocks were outside the SPA boundary.

Roosting Distribution

As to be expected, the majority of records were of roosting Golden Plovers. Intertidal roosting was recorded within 0L555, 0L556, 0L571, 0L572 and 0L574. The peak number recorded were 4,000 within 0L555 (Ballykineely) on 10/11/10 (see above that large numbers also foraged terrestrially adjacent to this subsite). This large flock had been observed earlier in the survey roosting intertidally in the south of 0L572 (Ring Strand).

0L555 also recorded 1,190 intertidally-roosting individuals on 07/02/11 and 1,200 during the high tide count on 17/01/11. 0L572 (Ring Strand) held 700 roosting individuals on 12/10/10 accounting for 99% of all Golden Plovers recorded on this date.

The high tide roost survey (01/11/10) recorded one flock of 5,000 roosting Golden Plover in the grassland of 0L350 (Crompaun South (Womanagh River)); outside of the SPA boundary.

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 counts of Grey Plover rose on each survey occasion to a site peak count of 212 on 07/02/11. All counts surpassed the threshold of all-Ireland importance. The highest number was recorded during the high tide survey (17/01/11) when 381 were counted in total.

The peak I-WeBS count recorded for Grey Plover in the 2010/11 season was 52 individuals, recorded in September 2010, but only one count was completed during that season.

Grey Plovers were recorded widely and in all 11 subsites. Peak counts were recorded for 0L571 (Pilmore (Barrel Rocks)), 0L574 (Clonpriest East to Ring Point), 0L555 (Ballykineely) and 0L572 (Ring Strand) for the four respective low tide survey dates. The subsite peak count was 141 individuals (0L572 (Ring Strand) on 07/02/11) and this subsite also held peak numbers during the high tide survey when 345 individuals accounted for 91% of all Grey Plovers recorded on that date.

Foraging Distribution

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

Grey Plovers foraged in all 11 subsites and six subsites recorded this species during all four low tide surveys: 0L569, 0L570, 0L571, 0L572, 0L573 and 0L574. All foraging was in intertidal habitat.

0L571 (Pilmore (Barrel Rocks)) held peak numbers on 12/10/10 and numbers ranked as second highest during all other low tide surveys. This outer estuary subsite is characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans*, *Nephtys cirrosa* and *Scoloplos* (*Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata*. The marine biotope *Polychaete/amphipod dominated fine sand shores* (LS.LSa.FiSa) was assigned by Merc/ERM (2012).

0L574 (Clonpriest East to Ring Point) held peak numbers on 10/11/10 and numbers ranked in the top four subsites during all other low tide surveys. In contrast to 0L571, this is a mid-estuarine subsite characterised by the community complex 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community.' 0L556 (The Duck) held peak numbers on 09/12/10 and 0L572 (Ring Strand) held peak numbers on 07/02/11.

The peak intertidal foraging density was 1.6 Grey Plovers ha^{-1} recorded for 0L553 (Crompaun Bridge) and relating to very few individuals recorded in the small area of intertidal habitat that occurs. Across the wider site, 0L569 recorded peak densities and together with 0L350, 0L555, 0L571 and 0L572 supported in excess of 1 individuals ha^{-1} on occasion. The whole site average intertidal foraging density was 0.3 Grey Plover ha^{-1}.

Roosting Distribution

During low tide surveys, relatively few Grey Plovers were recorded in roosting/other behaviour. Low numbers (<4) were recorded on irregular occasions in 0L556, 0L569, 0L572, 0L573 and 0L574.

During the high tide survey 344 Grey Plovers roosted intertidally within 0L572 (Ring Strand) and a further seven individuals within 0L574 (Clonpriest East to Ring Point).

The high tide roost survey (01/11/10) recorded three flocks of roosting Grey Plover in 0L556, 0L569 and 0L574 (three, two and 68 individuals respectively). All roosts were intertidal and the flock of 68 in 0L574 (Clonpriest East to Ring Point) were part of a larger mixed-species roost that also included Curlew, Lapwing, Oystercatcher and Bar-tailed Godwit.

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 enhanced by Lapwings moving in from continental Europe and northern and western Britain (Wernham et al. 2002). Cold weather movements can result in a greater flux of birds to Ireland's estuaries.

Numbers

Whole site numbers of Lapwing were relatively low during the first two low tide surveys and dropped back to just 41 individuals during December 2010, likely related to the cold weather spell, with December 2010 reported as the coldest since 1963 (Met Éireann, 2010). Numbers rose to a low tide peak of 1,492 on 07/02/11 and 1,298 were recorded during the high tide survey; these two counts exceeding the threshold of all-Ireland importance.

The peak I-WeBS count recorded for Lapwing in the 2010/11 season was just four individuals, recorded in September 2010, but only one count was completed during that season.

Across the survey programme, Lapwings were recorded within nine subsites (0L350, 0L553, 0L555, 0L556, 0L569, 0L571, 0L572, 0L574 and 0L810). 0L555 (Ballykineely) supported peak numbers during three low tide surveys and the peak subsite count of 519 Lapwings on 07/02/11. 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) held peak numbers (323) on 12/10/10.

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 Ballymacoda Bay, small numbers of Lapwings were recorded foraging intertidally across seven subsites (0L350, 0L553, 0L555, 0L556, 0L572, 0L574 and 0L810). The peak number was 17 individuals within 0L572 (Ring Strand) on 07/02/11.

Terrestrial foraging was recorded widely and in association with seven subsites: 0L350, 0L553, 0L555, 0L556, 0L571, 0L574 and 0L810. The largest numbers were recorded in the terrestrial habitat (grassland) of 0L555 (outside the SPA boundary). 225 Lapwing foraged along with 71 roosting individuals in grassland to the east of 0L810 on 12/10/1/0; these birds outside of both the count area and the SPA.

Roosting Distribution

Lapwings were recorded roosting intertidally within seven subsites: (0L350, 0L555, 0L556, 0L569, 0L572, 0L574 and 0L810) during low tide surveys. Peak numbers were recorded for 0L555, 0L556, 0L572 and 0L556 for the four respective low tide survey dates.

Terrestrial roosting during low tide surveys was recorded in association with 0L350, 0L553, 0L555 and 0L810, the largest number recorded being 275 individuals that were to the west of the channel in 0L350 (Crompaun South (Womanagh River)) on 07/02/11, and outside of the SPA boundary. On the same date a further 265 Lapwing roosted to the west of the channel of 0L555 (Ballykineely); again outside of the SPA boundary.

During the high tide survey 477 Lapwings roosted intertidally across a total three subsites, the majority of birds within 0L574 (Clonpriest East to Ring Point) that held 93% of the total number (444 individuals). A larger total number roosted supratidally (769) and 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) held the peak number (318) with a further 270 located within 0L556 (The Duck). 0L555 and 0L574 held 119 and 62 individuals respectively.

51 individuals roosted terrestrially adjacent 0L350 (Crompaun South (Womanagh River)) during the high tide survey (outside SPA boundary).

The high tide roost survey (01/11/10) recorded eight flocks of roosting Lapwing across five subsites (0L555, 0L556, 0L574, 0L569 and 0L810). The largest single roost was of 164 individuals that roosted intertidally in the south of 0L555 (Ballykineely); the birds part of a larger mixed-species roost. A second mixed-species roost in the middle of the subsite also held 44 Lapwing. 0L574 (Clonpriest East to Ring Point) recorded two roosts, the largest comprising 125 intertidally roosting Lapwing. All recorded roosts were intertidal or supratidal with no terrestrial roosting recorded during the survey, although terrestrial foraging was recorded adjacent 0L553 and 0L555 (total 206 individuals).

Sanderling *Calidris alba* - Family (group): Scolopacidae (wading birds)

Sanderling are one of the most northerly of all Arctic-breeding waders with a circumpolar breeding range that includes Alaska, Northern Canada, Greenland and Svalbard. The species is a long-distance migrant with a wide wintering distribution that includes coastlines of much of the tropics and the Southern Hemisphere as well as northwest Europe. There is evidence for two subspecies, with the nominate form *C. a. alba* occurring on passage and during winter in Western Eurasia and Africa. It was thought that most Sanderling wintering in Ireland and Britain were of Siberian origin, but there is now thought to be considerable overlap in the wintering range of Siberian and Greenland-breeding populations (Delaney et al. 2009).

Numbers

Numbers of Sanderling peaked early (October 2010) when 158 individuals were recorded across the whole site, surpassing the threshold for all-Ireland importance. Numbers were stable for the following two months (129 and 126 respectively) and then dropped to just six individuals during the final low tide survey in February 2011. 85 Sanderling were recorded during the high tide survey (17/01/11).

The peak I-WeBS count recorded for Sanderling in the 2010/11 season was 114 individuals, recorded in September 2010, but only one count was completed during that season.

Sanderlings had a relatively restricted distribution, recorded in just three subsites (0L570, 0L572 and 0L573). Each of these supported peak numbers on different survey dates but the highest numbers on two occasions were recorded in 0L572 (Ring Strand).

Foraging Distribution

Often foraging along the tide line where they rush in and out with the waves searching for small prey such as sandhoppers, Sanderlings are shorebirds characteristic of sandy shorelines, indeed significant proportions are found along non-estuarine coastlines (Crowe, 2005) or outer parts of estuaries (Musgrove et al. 2003). The species has a flexible foraging strategy however, with diet very much related to the local conditions at a site (Reneerkens et al. 2009).

Sanderlings were recorded foraging intertidally in three subsites: 0L570 (Clonard East), 0L572 (Ring Strand) and 0L573 (Pilmore (Black Rock)). These are all outer bay subsites that face the open sea and have a tide edge.

Peak numbers for the four low tide surveys were held by 0L572, 0L570, 0L572 and 0L573, the latter however relating to just six individuals that were recorded foraging on that date. Overall 0L572 (Ring Strand) and 0L573 (Pilmore (Black Rock)) held Sanderlings with most regularity and were the clearly favoured subsites, with 0L572 holding larger numbers overall.

0L572 Ring Strand supported the highest numbers recorded with 106 and 122 individuals on 12/10/10 and 09/12/10; both of these counts exceeding the threshold for all-Ireland importance. The birds were positioned largely on the mid to lower shore; sometimes as in February 2011, they were on the tideline. In October 2010 the birds foraged amongst an area of washed-up seaweed (wrack) on the mid shore of 0L572. Sanderlings were not recorded in association/near the aquaculture trestles that occur on the lower shore in this subsite.

The outer estuary subsites are characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata*. The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex as well as amphipods *Deshayesorchestia deshayesii* and *Talitrus saltator* and oligochaetes of the family *Enchytraeidae*. The marine biotope Polychaete/amphipod dominated fine sand shores (LS.LSa.FiSa) was assigned by Merc/ERM (2012).

The peak intertidal foraging density was 2 Sanderlings ha^{-1} recorded for 0L570 (Clonard East) on 10/11/10, although this was the only survey date that 0L570 recorded foraging individuals. 0L572 (Ring Strand) and 0L573 (Pilmore (Black Rock)) both supported peak densities of 0.8 Sanderling ha^{-1}. The whole site average intertidal foraging density was 0.3 Sanderling ha^{-1}.

Roosting Distribution

Sanderlings were not recorded roosting during low tide surveys.

82 individuals roosted intertidally in 0L572 (Ring Strand) during the high tide survey (17/01/11).

The high tide roost survey (01/11/10) recorded a single flock of 77 intertidally roosting Sanderling in 0L572 (Ring Strand); these birds were positioned in the north of the subsite near the main tidal channel and were part of a larger-mixed-species roost.

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

The Dunlin is a Holarctic and highly migratory wader, breeding widely in Arctic zones across Europe, Asia and North America. The nominate form *alpina* breeds from northern Scandinavia eastwards across European Russia and western Siberia to 85^0 E (Delaney et al. 2009). This race migrates southwest to winter along the coasts of Western Europe, south to Iberia, western Mediterranean and beyond.

The majority of Dunlin wintering in Ireland are *C. a. alpina* that originate from the western part of their breeding range and moult mainly in the Wadden Sea before starting to arrive in Ireland during October (Crowe, 2005). Ireland has a small and declining breeding population of *Calidris alpina schinzii* which are believed to winter mainly in west Africa (Delaney et al. 2009).

Numbers

Low tide numbers of Dunlin peaked on 10/11/10 when 1,005 individuals were counted across the whole site. 1,365 Dunlin were counted during the high tide survey (17/01/11). The November and December low tide counts plus the high tide count exceeded the threshold of all-Ireland importance set at 570 individuals (Crowe & Holt, 2013).

The peak I-WeBS count recorded for Dunlin in the 2010/11 season was 868 individuals, recorded in September 2010, but only one count was completed during that season.

Dunlin were recorded within all 11 subsites during the survey programme. Three subsites recorded this wader in all five surveys (0L555, 0L572 and 0L574).

Peak numbers during low tide surveys were recorded within 0L574 (Clonpriest East to Ring Point), 0L555 (Ballykineely), 0L572 (Ring Strand) and 0L555, for the four respective survey dates. The low tide subsite peak count of 316 Dunlin was recorded for 0L572 on 09/12/10. However a higher subsite peak count was recorded by 0L572 (753 Dunlin) during the high tide survey (17/01/11).

Foraging Distribution

The Dunlin diet is relatively wide and although this versatile species often shows a preference for muddier areas within sites (e.g. Hill et al. 1993; Santos et al. 2005), their distribution can often be widespread with no clear patterns.

The majority of Dunlin were recorded foraging during surveys. Peak numbers foraging intertidally during low tide surveys were recorded within 0L574 (Clonpriest East to Ring Point), 0L555 (Ballykineely), 0L572 (Ring Strand) and 0L555, for the four respective survey dates. 0L574 (Clonpriest East to Ring Point) also recorded the large number of 753 foraging Dunlin during the high tide survey including a single flock of 680 individuals that foraged in the south of the subsite along with a large number of other species. When the tide rose the Dunlin flew off and landed in 0L572 (Ring Strand).

0L574 (Clonpriest East to Ring Point) and 0L555 (Ballykineely) are mid-estuarine subsites characterised by the community complex 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community.' The distinguishing species for this community are the polychaete *Hediste diversicolor,* the oligochaete *Tubificoides benedii,* the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Scrobicularia plana*.
In contrast, 0L572 (Ring Strand) is a sandier outer bay subsite characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata.* The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex as well as amphipods *Deshayesorchestia deshayesii* and *Talitrus saltator* and oligochaetes of the family Enchytraeidae.

0L553 (Crompaun Bridge) held good numbers on occasion, for example 96 individuals on 12/10/10. 0L556 (The Duck) supported numbers ranked as second highest on two survey occasions with a subsite peak number of 190 Dunlin recorded on 10/11/10. 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) also held good numbers on occasion with a subsite peak count of 86 foraging Dunlin on 10/11/10.

The peak intertidal foraging density was 39 Dunlin ha^{-1} recorded for 0L553 (Crompaun Bridge) and relating to the relatively large number (96) that were recorded foraging in the small area of intertidal habitat that occurs there. The second highest recorded density was 16 Dunlin ha^{-1} recorded for 0L556 (The Duck). 0L555, 0L574 and 0L810 also supported densities in excess of 5 individuals ha^{-1}. The whole site average intertidal foraging density was 2 Dunlin ha^{-1}.

Roosting Distribution

Relatively few Dunlin were recorded in roosting/other behaviour during low tide surveys. Two observations of roosting Dunlin were made within 0L555 (Ballykineely) (12 and two individuals on 10/11/10 and 09/12/10).

During the high tide survey a total 261 Dunlin were recorded roosting intertidally. 200 of these were located within 0L572 (Ring Strand), a further 61 individuals within 0L556 (The Duck).

The high tide roost survey (01/11/10) recorded single flocks of intertidally roosting Dunlin in 0L572 (Ring Strand) and 0L574 (Clonpriest East to Ring Point). The roost in 0L574 was in the north of the subsite close to the main tidal channel and was a large-mixed-species roost also comprising Sanderling and gull species. The roost in 0L574 was along the upper shore in the south of the subsite and also comprised roosting Lapwing, Curlew and Black-headed Gulls.

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

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

Numbers

Numbers of Black-tailed Godwits peaked in November 2010 when a site total of 1,945 was recorded. Numbers dropped down to 327 in December 2010, likely as a result of the cold weather spell (December 2010 reported as the coldest since 1963 (Met Éireann, 2010)) which saw many birds move south in Europe to warmer climes. All counts with the exception of those in December 2010 and January 2011 exceeded the threshold for international importance.

The peak I-WeBS count recorded for Black-tailed Godwit in the 2010/11 season was 398 individuals, recorded in September 2010, but only one count was completed during that season.

Black-tailed Godwits were recorded in ten subsites overall (all except 0L570). Seven subsites held this species during all five surveys: 0L350, 0L553, 0L555, 0L556, 0L569, 0L574 and 0L810.
Peak numbers during low tide surveys were held by 0L572 (Ring Strand), 0L555 (Ballykineely), 0L574 (Clonpriest East to Ring Point) and 0L553 (Crompaun Bridge) for the four respective survey dates. The subsite peak count was 961 individuals recorded for 0L555 on 10/11/10, exceeding the threshold of international importance.

Foraging Distribution

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

Black-tailed Godwits were recorded foraging intertidally in nine subsites (0L350, 0L553, 0L555, 0L556, 0L569, 0L572, 0L573, 0L574 and 0L810).

Peak numbers were held by 0L572 (Ring Strand) in the outer bay during October 2010 when a count of 172 individuals was recorded; the largest subsite count recorded throughout the survey programme. The majority of these birds were located in the south of the subsite either side of a channel that ran from the open sea inwards (westwards) then along the western boundary of the subsite between piled seaweed and the beach. Only very low numbers (maximum five) Black-tailed Godwits were recorded in this subsite again. Similarly, the outer bay subsite 0L573 (Pilmore (Black Rock)) held peak numbers (50) on 09/12/10, the birds located on the lower shore, with very low numbers on one other occasion. The outer bay subsites are characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata.* The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex.

On the other two low tide survey occasions peak numbers were recorded by the subsite 0L555 (Ballykineely) which is a mid-estuarine subsite characterised by the community complex 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community.' The distinguishing species for this community are the polychaete *Hediste diversicolor,* the oligochaete *Tubificoides benedii,* the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Scrobicularia plana*.

0L574 (Clonpriest East to Ring Point), also a mid estuary subsite, was notable for always supporting numbers ranked in the top three and recording peak numbers foraging intertidally during the high tide survey (23).

Terrestrial foraging was a regular occurrence, and in most low tide surveys more individuals foraged terrestrially than intertidally. Large numbers were recorded on 10/11/10 when 923 individuals foraged in 0L555 (Ballykineely) (outside of the SPA boundary) and a further 600 foraged adjacent 0L556 (The Duck) (also outside of the SPA boundary). 0L553 (Crompaun Bridge) recorded 525 individuals on 07/02/11 (outside of the SPA boundary).

Terrestrial foraging was the main behaviour during the high tide survey (17/01/11) when 475 Black-tailed Godwits foraged in association with five subsites (0L350, 0L555, 0L556, 0L571 and 0L810).

The peak intertidal foraging density was 12 Black-tailed Godwits ha^{-1} recorded for 0L553 (Crompaun Bridge) and relating to the relatively large number (26) that were recorded foraging in the small area of intertidal habitat that occurs there. An additional six subsites recorded densities that exceeded 1 Black-tailed Godwits ha^{-1} (0L350, 0L555, 0L569, 0L572, 0L574 and 0L810). The whole site average intertidal foraging density was 0.4 Black-tailed Godwits ha^{-1}.

Roosting Distribution

Good numbers of Black-tailed Godwits were recorded roosting during low tide surveys. 329 were recorded on 12/10/10 the majority within 0L572 (Ring Strand) (179) where most were positioned close to the foraging flocks in the south of the subsite (see above). 0L574 (Clonpriest East to Ring Point) supported a further 134 individuals in one flock that roosted close to the main channel in the west of the subsite along with 54 individuals that foraged. The following month 289 individuals roosted divided across 0L350 (Crompaun South (Womanagh River)) and 0L556 (The Duck); the latter comprising a flock of 156 that roosted adjacent a channel in the north-east of the subsite.
On 09/12/10, 74 Black-tailed Godwits roosted within 0L574 with an additional 32 individuals within 0L350. Lower numbers (58) roosted in February 2011, the majority (64%) in 0L553 (Crompaun Bridge).

The high tide survey recorded relatively low numbers roosting intertidally, just 14 individuals in 0L474 and seven in 0L556. 32 Black-tailed Godwits also roosted supratidally within 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)). The majority of birds were recorded foraging terrestrially on this day (see above).

The high tide roost survey (01/11/10) recorded single flocks of roosting Black-tailed Godwits in 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) and 0L555 (Ballykineely) (20 and 21 individuals respectively). The birds in 0L810 were part of a larger mixed-species roost that also held Wigeon, Teal and Redshank. The roost in 0L555 was in the south of the subsite and was again part of a larger mixed-species roost that also held Lapwing, Redshank, Curlew, Snipe, Greenshank and Mute Swan. Of note was a flock of 1,330 foraging Black-tailed Godwits that foraged terrestrially in 0L555, outside of the SPA boundary.

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 in northern Fennoscandia and Northern European Russia, east to the Kanin Peninsula, and winters mainly in Western Europe, including Ireland. The Wadden Sea is used by *L. l. lapponica* and other populations as a staging and moulting area in autumn and spring.

Numbers

Whole site numbers of Bar-tailed Godwits rose each month from 181 birds in October 2010 to a low tide peak of 651 birds on 07/02/11. 788 individuals were recorded during the high tide survey on 17/01/11. All counts exceeded the threshold of all-Ireland importance.

The peak I-WeBS count recorded for Bar-tailed Godwit in the 2010/11 season was 44 individuals, recorded in September 2010, but only one count was completed during that season.

Bar-tailed Godwits were relatively widespread and recorded in ten subsites overall (all except 0L553). Six subsites recorded the species in all four low tide surveys: 0L555, 0L569, 0L570, 0L571, 0L572 and 0L574. 0L571 (Pilmore (Barrel Rocks)) held peak numbers on 12/10/10, thereafter 0L570 (Clonard East) held peak numbers in all low tide surveys and recorded the subsite peak count of 345 individuals on 07/02/11.

Foraging Distribution

Bar-tailed Godwits are a wader species considered characteristic of coastal wetland sites dominated by sand. The birds forage by probing within intertidal sediment for invertebrate species, predominantly large polychaete worms such as *Arenicola marina* and *Nepthys* sp. The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993) and the birds often feed on the tide edge.

Bar-tailed Godwits were recorded foraging within ten subsites overall (all except 0L553) so both outer and inner estuarine subsites were utilised. However peak numbers of foraging individuals were held by outer bay subsites in all four low tide surveys with 0L570 and 0L571 appearing to be most favoured as follows: 0L571 (Pilmore (Barrel Rocks)) held peak numbers on 12/10/10 and numbers ranked as second highest in all other low tide surveys. 0L570 (Clonard East) held peak numbers on 10/11/10, 09/12/10 and 07/02/11, and recorded the subsite peak count of 345 individuals on 07/02/11. 0L572 (Ring Strand) was notable for supporting good numbers in all surveys while 0L573 (Pilmore (Black Rock)) held numbers ranked in the top four in three surveys. The birds often foraged at the tide edge.

The outer bay subsites are characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata.* The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex. All aforementioned polychaetes could form part of the Bar-tailed Godwit diet (e.g. Scheiffarth, 2001).

The highest intertidal foraging density recorded for a single subsite was 7 Bar-tailed Godwits ha^{-1} recorded for 0L570 (Clonard East) on 07/02/11. 0L350 and 0L571 recorded densities that exceeded 2 Bar-tailed Godwits ha^{-1}. The whole site mean feeding density (intertidal habitat) was 0.9 Bar-tailed Godwits ha^{-1}.

Roosting Distribution

Relatively few Bar-tailed Godwits were recorded roosting intertidally during low tide surveys with the exception of 07/02/11 when 209 were recorded, the majority (174) in 0L571 (Pilmore (Barrel Rocks)).

During the high tide survey a total 770 Bar-tailed Godwits were recorded roosting intertidally. The largest number (648) was in 0L472 (Ring Strand). 0L556 (The Duck) supported 86 individuals while 0L574 (Clonpriest East to Ring Point) recorded 36 individuals.

The high tide roost survey (01/11/10) recorded single flocks of intertidally roosting Bar-tailed Godwits in 0L555, 0L556 and 0L574. The largest single flock of 176 individuals roosted intertidally in 0L574 (Clonpriest East to Ring Point), a mixed species roost that also comprised four other wader species. 0L555 and 0L556 held five and 17 roosting individuals respectively and both were part of larger mixed-species roosts.

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 and be mainly 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) and Britain (Wernham et a. 2002).

Numbers

Whole-site numbers of Curlew peaked early in October 2010 when a total 638 individuals were counted. All counts with the exception of December 2010 exceeded the threshold of all-Ireland importance.

The peak I-WeBS count recorded for Curlew in the 2010/11 season was 393 individuals, recorded in September 2010, but only one count was completed during that season.

Curlews were widespread and occurred in all 11 subsites overall. Subsite use during individual low tide surveys ranged from nine subsites to 11 subsites. Six subsites recorded Curlews in all five surveys undertaken: 0L350, 0L553, 0L555, 0L556, 0L574 and 0L810. Peak numbers in October 2010 were held by 0L556 (The Duck) and this subsite recorded numbers ranked as second highest in all other surveys (including the high tide survey). 0L555 (Ballykineely) supported peak numbers on 10/11/10 and 07/02/11 while 0L553 (Crompaun Bridge) held peak numbers on 09/12/10. 0L555 (Ballykineely) recorded the subsite peak count of 263 Curlew (10/11/10).

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 rely on large prey that takes more time to handle (long handling time) in contrast to many other wader species that swallow prey relatively quickly upon finding it (short handling time). As a consequence, Curlews are territorial foragers and tend to occur widely spaced from each other to avoid competitive conflicts.

Intertidally foraging Curlews were recorded in all 11 subsites. 0L572 (Ring Strand) held peak numbers foraging intertidally in all low tide surveys with birds reasonably well distributed across the subsite. This outer bay subsite is characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata.* The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex.

0L556 (The Duck) held joint peak numbers on 07/02/11. 0L555 (Ballykineely) and 0L574 (Clonpriest East to Ring Point) recorded good numbers in all surveys, with numbers ranked in the top five in all. These three subsites occur in the inner/mid estuary and are characterised by the community complex 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community.' The distinguishing species for this community are the polychaete *Hediste diversicolor,* the oligochaete *Tubificoides benedii,* the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Scrobicularia plana*.

Terrestrial foraging was recorded widely and in association with five subsites: 0L350, 0L553, 0L555, 0L556 and 0L571; often outside of the SPA boundary. 293 Curlew foraged terrestrially during the high tide survey, the largest number (195) in 0L350 (Crompaun South (Womanagh River)) (outside of the SPA boundary).

The peak intertidal foraging density was 5 Curlew ha^{-1} recorded for 0L553 (Crompaun Bridge) and relating to the relatively large number (13) that were recorded foraging on 07/02/11 in the small area of intertidal habitat that occurs there. 0L556 and 0L569 recorded densities that exceeded 2 Curlews ha^{-1}. 0L350, 0L574 and 0L810 recorded densities that exceeded 1 Curlew ha^{-1}. The whole site mean feeding density (intertidal habitat) was 0.4 Curlew ha^{-1}.

Roosting Distribution

Intertidal roosting/other behaviour was recorded widely across the site. A peak number of 294 Curlew roosted intertidally across seven subsites on 12/10/10. 0L556 (The Duck) held peak numbers in three low tide surveys while 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) held peak numbers on 09/12/10.

81 Curlew roosted intertidally within 0L556 (The Duck) during the high tide survey (17/01/11). A further 82 Curlew roosted supratidally across three subsites: 0L555, 0L556 and 0L574. Terrestrial roosting was recorded in association with 0L556 (40 individuals) and 0L553 (six individuals) (both outside the SPA boundary).

The high tide roost survey (01/11/10) recorded two flocks of roosting Curlew in both 0L555 and 0L574. All flocks were part of larger mixed-species roosts and the largest numbers of Curlew were in 0L574 (103 individuals divided across two roost positions). 0L555 held flocks of 19 and seven individuals.

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

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

Numbers

Whole site numbers of Redshank ranged from 202 (07/02/11) to a low tide peak count of 371 on 12/10/10. Only whole site counts in October and November 2010 surpassed the threshold of all-Ireland importance. The high tide survey recorded 187 Redshank (17/01/11).

The peak I-WeBS count recorded for Redshank in the 2010/11 season was 258 individuals, recorded in September 2010, but only one count was completed during that season.

Redshanks were widespread and recorded within all 11 subsites and all except two of these recorded this wader in all five surveys undertaken.

0L555 (Ballykineely) held peak numbers in three low tide surveys (12/10/10, 10/11/10 and 07/02/11) and 0L572 (Ring Strand) held peak numbers on 09/12/10, plus numbers ranked as second highest in two other low tide surveys.

0L555 (Ballykineely) recorded the subsite peak count of 82 Redshank (12/10/10).

Foraging Distribution

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

Redshanks foraged intertidally across all 11 subsites and all bar 0L573 (Pilmore (Black Rock)) recorded foraging individuals during all four low tide surveys. 0L555 (Ballykineely) held peak numbers in three low tide surveys (12/10/10, 10/11/10 and 07/02/11). This subsite is in the inner estuary and is characterised by the community complex 'sandy mud with *Hediste diversicolor* and *Tubificoides benedii* community.' The distinguishing species for this community are the polychaete *Hediste diversicolor,* the oligochaete *Tubificoides benedii,* the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Scrobicularia plana*.

0L572 (Ring Strand) held peak numbers on 09/12/10, plus numbers ranked as second highest in two other low tide surveys. This outer bay subsite is characterised by the community complex 'sand with polychaetes and bivalves' (NPWS, 2014). The distinguishing species of this community complex are the bivalves *Angulus tenuis* and *Cerastoderma edule* and the polychaetes *Pygospio elegans, Nephtys cirrosa* and *Scoloplos (Scoloplos) armiger* and *Scolelepis (Scolelepis) squamata.* The polychaetes *Arenicola marina* and *Lanice conchilega* also occur within this community complex. Redshank tended to occur in the inner (shoreward) areas of this subsite and to be widely distributed.

Also of note was 0L574 (Clonpriest East to Ring Point) that supported numbers ranked in the top three during three low tide surveys, plus the peak number foraging intertidally during the high tide survey (17/01/11). 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)) also supported numbers ranked in the top three during three low tide surveys.

Terrestrial foraging was recorded irregularly, the largest number of birds being 26 Redshanks adjacent 0L570 (Clonard East) during the high tide survey (17/01/11) (outside SPA boundary).

The peak intertidal foraging density was 13 Redshanks ha^{-1} recorded for 0L350 (Crompaun South (Womanagh River)) on 10/11/10. 0L553 held consistently high densities within its narrow intertidal area, peaking at 9 Redshanks ha^{-1}. 0L555, 0L556, 0L569, 0L574 and 0L810 all held densities that exceeded 1.0 Redshank ha^{-1} throughout the survey programme. The whole site average intertidal foraging density was 0.7 Redshanks ha^{-1}.

Roosting Distribution

Almost all Redshanks recorded during low tide surveys were foraging, irregular records of small numbers of Redshank were recorded roosting/other.

During the high tide survey, 23 Redshanks roosted intertidally across five subsites, the majority (43%) within 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)).

56 Redshanks roosted supratidally during the high tide survey. 20 were located within 0L555 (Ballykineely), 18 were in 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)), 16 were within 0L350 (Crompaun South (Womanagh River)) and two were in 0L556 (The Duck).

Terrestrial roosting was recorded once with just two individuals recorded in 0L555 (and outside the SPA boundary) during the high tide survey.

The high tide roost survey (01/11/10) recorded six flocks of roosting Redshank across five subsites: 0L555, 0L569, 0L572, 0L574 and 0L810. The largest flock (54 Redshank) was part of a larger mixed-species roost that were positioned supratidally to the east of the channel in 0L810 (Ballymacoda Marsh (South of Crompaun Bridge)). All other flocks were relatively small (11 or less individuals) and all were positioned intertidally with the exception of one in 0L569 that was supratidal.

Turnstone - Family (group): Family (group): Scolopacidae (wading birds)
Turnstones breed widely in both the high and low arctic zones. Two subspecies are recognised. The nominate subspecies is divided into three recognised populations that occur in Western Eurasia and Africa, one of which breeds in north-eastern Canada and northern and eastern Greenland and winters mainly in Western Europe and West Africa (Delaney et al. 2009). Iceland is used as a staging post. Wintering birds in Ireland have a widespread distribution and are a familiar species of open, non-estuarine, rocky shorelines although they also occur within estuaries.
Numbers
Whole site numbers of Turnstone ranged from 14 (07/02/11) to a low tide peak count of 27 (10/11/10). 124 Turnstones were recorded in total during the high tide survey. Only the high tide count surpassed the threshold of all-Ireland importance. The peak I-WeBS count recorded for Turnstone in the 2010/11 season was 73 individuals, recorded in September 2010, but only one count was completed during that season. Across the entire survey period, Turnstones were recorded in six count subsites (0L556, 0L570, 0L571, 0L572, 0L573 and 0L574). Peak numbers were recorded for 0L571 (Pilmore (Barrel Rocks)), 0L570 (Clonard East), 0L573 (Pilmore (Black Rock)) and 0L574 (Clonpriest East to Ring Point) for the four low tide survey dates. The peak subsite count was 16 Turnstone recorded in 0L570 (Clonard East) on 10/11/10.
Foraging Distribution
Turnstones are generally associated with shorelines with rocky substratum, particularly those with algal wrack zones within which the birds forage for prey species such as amphipod crustaceans, insects and small molluscs. A wrack zone is found on the upper shore in many locations around the site, therefore a widespread distribution is to be expected and it is difficult to link this species' distribution to any specific factors. All observations of Turnstones were of foraging individuals. Foraging occurred in six subsites overall (0L556, 0L570, 0L571, 0L572, 0L573 and 0L574). Peak numbers were recorded for 0L571 (Pilmore (Barrel Rocks)), 0L570 (Clonard East), 0L573 (Pilmore (Black Rock)) and 0L574 (Clonpriest East to Ring Point) for the four low tide survey dates. During the high tide survey 124 Turnstones foraged within three subsites (0L572, 0L573 and 0L574), the majority (87%) within 0L572 (Ring Strand) and positioned on the upper shore where seaweed/kelp had accumulated.
Roosting Distribution
Turnstones were not recorded in roosting/other behaviour during low or high tide surveys or the high tide roost survey.

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. 2004). There is some evidence that gulls from Iceland also move into Ireland for the winter (BWPi, 2004).

Numbers

Whole site numbers of Black-headed Gulls peaked in October 2010 when 629 were counted. Thereafter numbers dropped each month to just 73 in December 2010 and 52 in February 2011. 76 Black-headed Gulls were counted during the high tide survey.

The peak I-WeBS count recorded for Black-headed Gull in the 2010/11 season was 286 individuals, recorded in September 2010, but only one count was completed during that season.

Black-headed Gulls were recorded in all 11 subsites. Peak numbers were recorded by 0L555 (Ballykineely), 0L572 (Ring Strand), 0L574 (Clonpriest East to Ring Point) and 0L572, for the four respective low tide survey dates. The peak subsite count was 385 Black-headed Gulls recorded by 0L555 (Ballykineely) on 12/10/10.

Foraging Distribution

Black-headed Gulls were recorded foraging intertidally in six subsites (0L556, 0L570, 0L571, 0L572, 0L573 and 0L574). Peak numbers foraging intertidally in all four low tide surveys were held by 0L572 (Ring Strand) and this subsite recorded the species with most regularity. The gulls were generally positioned on the lower shore close to the tide edge and often in/around the area of aquaculture trestles.

0L570 (Clonard East) held foraging individuals in all four low tide surveys and numbers ranked in the top three in three of these.

Subtidal foraging was recorded irregularly with one-off records of less than five birds with the exception of 50 Black-headed Gulls that foraged subtidally in 0L573 (Pilmore (Black Rock)) on 12/10/10.

Roosting Distribution

Good numbers of Black-headed Gulls were recorded roosting intertidally in most surveys. 0L555 (Ballykineely) recorded peak numbers on 12/10/10 and 10/11/10; the count in October 2010 being of 385 individuals. 0L574 and 0L572 recorded peak numbers (17 and 30 birds) during the final two low tide surveys.

Subtidal roosting/other behaviour was recorded less often; smaller numbers of gulls recorded across six subsites: 0L555, 0L556, 0L570, 0L572, 0L573 and 0L574.

During the high tide survey a total of 56 Black-headed Gulls were recorded roosting intertidally; 75% of these in 0L574 (Clonpriest East to Ring Point). 18 individuals roosted subtidally, 12 in 0L556 (The Duck) and six gulls in 0L572 (Ring Strand). Supratidal and terrestrial roosting were recorded rarely.

The high tide roost survey (01/11/10) recorded nine flocks of roosting Black-headed Gulls across four subsites: 0L553, 0L555, 0L572 and 0L574. Subtidal flocks were recorded in 0L555 and 0L572 (maximum flock size 144 gulls). The largest numbers however roosted terrestrially in three flocks in the west of 0L555 (Ballykineely) and outside of the SPA boundary. Intertidal roosts were recorded in 0L553, 0L555 and 0L574.

Common Gull *Larus canus* - Family (group): Laridae (gulls)
The Common Gull breeds widely across the Palearctic and in North America (Mitchell et al. 2004). In Ireland, the species is most widely seen during winter when wintering birds arrive from Scotland and continental Europe (Wernham et al. 2004).
Numbers
Numbers of Common Gull ranged from 57 individuals (09/12/10) to a peak 418 individuals (10/11/10). 91 Common Gulls were recorded during the high tide survey. The peak I-WeBS count recorded for Common Gull in the 2010/11 season was 170 individuals, recorded in September 2010, but only one count was completed during that season. Common Gulls were widespread across the site and recorded in nine subsites overall. They occurred with most regularity (all four low tide surveys) within five subsites: 0L570, 0L571, 0L572, 0L573 and 0L574. 0L574 (Clonpriest East to Ring Point) held peak numbers in three low tide surveys and numbers ranked as second highest in another. 0L555 (Ballykineely) held peak numbers in one low tide survey and numbers ranked as second highest in another, plus peak numbers during the high tide survey. The subsite peak of 144 individuals was recorded for 0L574 (Clonpriest East to Ring Point) on 10/11/10.
Foraging Distribution
Common Gulls foraged intertidally across five subsites: 0L556, 0L570, 0L571, 0L572 and 0L573. 0L573 (Pilmore (Black Rock)) held peak numbers on 12/10/10 and 09/12/10. 0L572 (Ring Strand) held peak numbers on 10/11/10 and 0L571 (Pilmore (Barrel Rocks)) held peak numbers on 07/02/11. These three subsites dominated in terms of total numbers held. Subtidal foraging was rarely recorded; just two individuals in 0L572 (Ring Strand) on 12/10/10 and one in 0L573 (Pilmore (Black Rock)) on 09/12/10.
Roosting Distribution
Good numbers of Common Gulls were recorded roosting intertidally in most surveys, however 0L574 (Clonpriest East to Ring Point) was the clearly favoured subsite recording peak numbers in three low tide surveys and the high tide survey. All subsites that recorded this activity however recorded good numbers on occasion (0L350, 0L555, 0L556, 0L572, 0L573, 0L574 and 0L810). Subtidal roosting/other behaviour was recorded less often; smaller numbers of gulls recorded across three subsites: 0L555, 0L572 and 0L574. During the high tide survey a total of 26 Common Gulls were recorded roosting intertidally; 73% of these in 0L574 (Clonpriest East to Ring Point). 65 individuals roosted subtidally, 36 in 0L555 (Ballykineely) and 29 in 0L572 (Ring Strand). The high tide roost survey (01/11/10) recorded seven flocks of roosting Common Gulls across three subsites (0L553, 0L555 and 0L572). The largest numbers roosted terrestrially along with Black-headed Gulls in two flocks in the west of 0L555 (Ballykineely). Single intertidal roosts were recorded in 0L553, 0L555 and 0L572. Subtidal roosts (maximum flock size 22 gulls) were recorded in 0L555 and 0L572.

Lesser Black-backed Gull *Larus fuscus* - Family (group): Laridae (gulls)

Lesser Black-backed Gulls that occur as breeding and wintering birds in Britain and Ireland belong to the race *graellsii,* which also breeds across western Europe, Iceland, the Faeroes and Greenland. Smaller numbers of the race *intermedius* also occur at times and numbers during winter are increased by gulls from the Netherlands and Germany, thought to be an intergrade between *graellsii* and *intermedius* (Wernham et al. 2002).

Numbers

Total numbers of Lesser Black-backed Gulls were variable across the survey months. Numbers peaked at 329 on 12/10/10. Thereafter numbers dropped back to just 30 during the December 2010 survey, this low number possibly as a result of the severe cold weather experienced that month. Numbers rose to 110 individuals for the final low tide survey (07/02/11). 42 Lesser Black-backed Gulls were counted during the high tide survey (17/01/11).

The peak I-WeBS count recorded for Lesser Black-backed Gull in the 2010/11 season was 367 individuals, recorded in September 2010, but only one count was completed during that season.

Lesser Black-backed Gulls were widespread and recorded within eight subsites overall: 0L350, 0L555, 0L556, 0L570, 0L571, 0L572, 0L573 and 0L574. Subsite use during low tide surveys ranged from two subsites to five subsites with the species recorded in just two subsites during the high tide survey. 0L555 (Ballykineely) recorded the subsite peak of 210 on 12/10/10.

Foraging Distribution

The majority of Lesser Black-backed Gulls were recorded in roosting/other behaviour. One record of intertidal foraging was made: three individuals in 0L571 (Pilmore (Barrel Rocks) on 12/10/10.

Roosting Distribution

Lesser Black-backed Gulls were recorded in roosting/other behaviour (intertidal habitat) in seven subsites: 0L350, 0L555, 0L556, 0L570, 0L572, 0L573 and 0L574. 0L555 (Ballykineely) recorded peak numbers on 12/10/10 and 10/11/10, the peak number being 210 individuals on 12/10/10. 0L574 (Clonpriest East to Ring Point) held peak numbers on 09/12/10 (27 individuals) and numbers ranked as second highest in every other low tide survey. 0L572 (Ring Strand) held peak numbers on 07/02/11 (93 individuals).

Subtidal roosting/other behaviour was recorded in just three subsites: 0L555, 0L572 and 0L574; the same subsites that held peak numbers roosting/other intertidally. 0L574 (Clonpriest East to Ring Point) held peak numbers throughout with a maximum number of seven individuals.

During the high tide survey (17/01/11) 22 Lesser Black-backed Gulls were recorded in roosting/other behaviour (intertidal habitat) in 0L574. 0L572 (Ring Strand) held a further 20 individuals roosting/other subtidally.

The high tide roost survey (01/11/10) recorded four flocks of roosting Lesser Black-backed Gulls across two subsites (0L555 and 0L572). The largest numbers (210) roosted terrestrially along with Black-headed Gulls and Common Gulls in a flock in the west of 0L555 (Ballykineely). Single intertidal roosts of 31 and six individuals were recorded in 0L555 and 0L572. Subtidal roosts (maximum flock size 46 gulls) were recorded in 0L555 and 0L572.

5.4 Ballymacoda Bay - Activities and Events

5.4.1 Introduction

The overriding objective of the Habitats Directive is to ensure that the habitats and species covered achieve *'favourable conservation status'* and that their long-term survival is secured across their entire natural range within the EU (EU Commission, 2012). In its broadest sense, favourable conservation status means that an ecological feature is in a satisfactory condition, and that this status is likely to continue into the future.

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

Section 5.4 provides information on activities and events that occur in and around Ballymacoda Bay that may either act upon the habitats within the site, or may interact with the Special Conservation Interest species and other waterbirds using the site.

5.4.2 Assessment Methods

Information on 'activities' and 'events' across the site was collected during a desk-top review which included NPWS site reporting files, County Development and other plans (e.g. Cork County Council, 2013), South Western River Basin District documents (e.g. SWRBD, 2010a) and other available documents relevant to the ecology of the site.

In addition, information was collected during the 2010/11 waterbird survey programme (NPWS, 2011) as field workers recorded activities or events that occurred at the site during their survey work. This information, together with results from a 'site activity questionnaire' provides valuable information gained from 60+ hours of surveyor effort across the site. All data collected were entered into a database but as the dataset will be subject to change over time, the assessment should be viewed as a working and evolving process.

The 'activities' and 'events' were categorised using the standard EU list of pressures and threats as used in Article 12 reporting under the EU Bird's Directive. Only factors likely to directly or indirectly affect waterbirds were included but the resulting list is broad and includes built elements (e.g. man-made structures such as roads and bridges that are adjacent to the site), factors associated with pollution (e.g. discharges from waste water treatment plants), various recreational and non-recreational activities as well as biological factors such as the growth of the invasive plant species *Spartina anglica*.

Data are presented in three ways:-

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

   O observed or known to occur within Ballymacoda Bay;
   U known to occur but unknown spatial area hence all potential subsites are included (e.g. fisheries activities);
   H historic, known to have occurred in the past.
   P potential to occur in the future.

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

3. Data from the 2010/11 waterbird survey programme were used to inform an assessment which examined the level of disturbance caused by activities recorded during field surveys. The methodology was adapted from that used for monitoring Important Bird Areas (IBAs) (Birdlife International, 2006) and involved assigning scores which ranged between 0 and 3, to three selected attributes of each disturbance event (1) frequency/duration; (2) intensity and (3) likely response of waterbirds (after Hill et al. 1997) (Table 5.7). The rationale for scoring is provided in Appendix 10.

Table 5.7 Scoring system for disturbance assessment

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

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

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

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

5.4.3 Overview of activities at Ballymacoda Bay

Activities and events identified to occur in and around Ballymacoda Bay are shown in Appendix 9, listed in terms of the subsites surveyed during the 2010/11 Waterbird Survey Programme. Activities highlighted in grey are those that have the potential to cause disturbance to waterbirds (see Section 5.4.4).

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

Habitat loss, modification and adjacent landuse

The site stretches north-east from Ballymacoda to within several kilometers north-east of Youghal, Co. Cork. It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment which flows into the wider Youghal Bay. Several other smaller rivers and streams flow into the estuary. The landscape around the site is low

lying and dominated by farmland. There is scattered habitation around this area and Ballymacoda Village is located to the south of the estuary.

A substantial area of the land adjacent to the estuary has resulted from reclamation over the past 150 years and this has resulted in significant modifications to saltmarsh habitat within the site (McCorry & Ryle, 2009). Tall berms line the estuary shoreline and these berms extend along the Womanagh River. These may have contributed to changes in the shoreline profile of the estuary within the past 150 years as well as changes in sediment deposition, accretion and saltmarsh growth (McCorry & Ryle, 2009).

Former land reclamation is most notable near Crompaun Bridge. Land to the east and west of the river channel were formerly reclaimed for agriculture and contained improved grassland (subsites 0L350 and 0L810). The berm was breached during storms around 2000 and attempts at repairs failed. This has allowed the low-lying area to the east to be inundated by the tide and now the habitat has reverted to mudflats and saltmarsh and is used highly by wintering waterfowl. Land to the east of the river is grassland but is used extensively by feeding waders, especially in wet weather. These habitats could change in the future if the berm is repaired and the land is again claimed for agricultural use.

Some of the smaller rivers flowing into the estuary were once tidal for some distance upstream, but this tidal influence has been reduced by the creation of sluices (McCorry & Ryle, 2009).

The alien invasive saltmarsh species Common Cordgrass (*Spartina* sp.) occurs at the site. In subsite 0L569 (Pilmore), a large part of the intertidal flats has been infilled with *Spartina* swards. This has created a mosaic of dense *Spartina* sward and *Spartina* sward/Atlantic Salt Marsh mosaic (McCorry & Ryle, 2009). *Spartina* further occurs in subsites 0L574 (Clonpriest east to Ring Point), 0L555 (Ballykineely), 0L556 (The Duck) and 0L810 (Ballymacoda Marsh). Evidence reported in McCorry & Ryle (2009) suggests that the *Spartina* swards are increasing at this site and this will be at the loss of mudflat habitat.

Water quality

The South Western River Basin District (SWRBD) River Basin Management Plan 2011 – 2015 covers the implementation of the Water Framework Directive (WFD) (2000/60/EEC) for the south-west coast of Ireland and covers Ballymacoda Bay and its inflowing rivers and streams (SWRBD, 2010a).

The current water quality status of Ballymacoda Estuary is 'moderate' according to the South Western River Basin Transitional and Coastal Waters Action Programme (SWRBD, 2010b) and therefore fails to meet the required standards as set by the Water Framework Directive. The coastal waters of Youghal Bay are classified as of 'good' status (unpolluted) (O'Boyle et al. 2010).

Some insight to causative factors is given in the Womanagh Water Management Unit Action Plan (SWRBD, 2010c) where the Womanagh River itself was assigned a poor status in its lower reaches based on EPA water quality monitoring (Q-Index). The principal suspected causes of the less than satisfactory water in the catchment are discharges, principally of nutrients, from agricultural activities (diffuse pressures), septic tanks (diffuse source), and from waste water treatment plants (WWTP) (point source pressures). However, the results of the WFD monitoring programme do not indicate any water quality issues within the immediate area of the site.

Fisheries & aquaculture

An area of 0.8 km^2 in Ballymacoda Bay is designated as the Ballymacoda Shellfish Area under the EU Shellfish Waters Directive[19] (No. 37) (DoEHLG, 2009). The designated area is located just south of Ring Point and north of Ring (subsites 0L572 and 0L573). The designation relates predominantly to the cultivation of Oysters (*Crassostrea gigas*) and Clams (*Tapes semidecussatus*).

The Sea Fisheries Protection Authority (SFPA) is responsible for classifying shellfish production areas and the current classification of the Knockadoon Head to Knockaverry Bivalve Mollusc Production Area is Class B (2012, www.sfpa.ie).

Various commercial inshore fishing activities are likely to occur adjacent to the site (detail and spatial scale unknown). Line fishing and other static methods (e.g. pots) are widespread within the bay (DoEHLG, 2009).

A small amount of bait-digging and the collection of molluscs by hand-gathering is known at the site.

Recreational activities

The sandy outer subsites of Ballymacoda Bay are used widely for recreational walking particularly 0L573 and 0L571 which are located relatively close to a shoreline car park. A small amount of horse-riding occurs.

Recreational shore angling is a popular pursuit at a number of locations around Ballymacoda Bay. A guide to sea angling in the south-west (Dunlop, 2009) describes the suitable locations within the site for sea-angling as Pilmore Strand (0L573), Pilmore Back Strand (0L569) and Ring Strand (0L572) for species such as Bass (*Dicentrarchus labrax*) and Sea trout (*Salmo trutta*).

Marine Tourism policies of the Draft County Development Plan (Cork County Council, 2013) have the potential to increase pressure for development of walking, cycling and fishing facilities within this SPA. Intensification of these activities within the SPA increases the risk of deterioration of coastal habitat quality or of causing disturbance to birds (Cork County Council, 2013b).

Other

Wildfowling was not recorded at the site during the 2010/11 Waterbird Survey Programme but has occurred historically at the site. In response to the freezing conditions experienced in the winter of 2010, the Department of the Environment, Heritage and Local Government extended a temporary closure of the hunting season for wild birds (8^{th} – 30^{th} December 2010 inclusive).

5.4.4 Disturbance Assessment

During 2010/11 survey work eight categories of activity/event were recorded that had the potential to cause disturbance to waterbirds. These were aircraft, aquaculture machinery (and activities associated with intertidal aquaculture), horse riding, bait-diggers, vehicles, shooting, and walking (including with dogs) and 'other' the latter relating to observations where disturbance was recorded as a result of the presence of foxes or raptors (Table 5.8).

The peak disturbance score assigned was for 'walking (including with dogs) which was also the most widespread activity, occurring in five subsites overall. Aquaculture activities were

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

frequent but confined to one subsite only (0L572). The response of birds was difficult to determine as very often the activities had started before the count had commenced.

Activities in 0L555 were infrequent and the peak disturbance score recorded there was for a hunting Peregrine Falcon that caused a noticeable disturbance to waders on one occasion.

The shooting disturbance recorded for 0L572 was caused by shots fired much further inland but this still had the ability to disturb roosting wader flocks during the high tide survey.

A summary of the disturbance assessment is shown in Table 5.8 and full results are shown in Appendix 10. As a final review, Table 5.9 shows the peak disturbance scores overlaid on the subsite assessment table (total waterbird numbers, LT surveys).

Table 5.8 Disturbance Assessment Summary Table
Number of activities recorded during field surveys (2010/11 waterbird survey programme) observed to cause disturbance to waterbirds. The calculated peak disturbance score is shown (see text for explanation).
Scores 0 – 3 = Low Scores 4 – 6 = Moderate Scores 7 – 9 = High. Grey shading = no activity recorded.

Subsite Code	Subsite Name	Number Activities	Peak Disturbance Score	Activity Responsible
0L350	Crompaun South (Womanagh River)	1	5	- 'Other' (Fox presence)
0L553	Crompaun Bridge	2	4	- Motorised vehicles - 'Other' (Fox presence)
0L555	Ballykineely	2	6	- 'Other' (Peregrine presence)
0L556	The Duck	1	6	- Aircraft
0L569	Pilmore (Back Strand)	0	-	
0L570	Clonard East	2	5	- Walking (incl. with dogs)
0L571	Pilmore (Barrel Rocks)	3	5	- Walking (incl. with dogs)
0L572	Ring Strand	2	6	- Walking (incl. with dogs) - Shooting
0L573	Pilmore (Black Rock)	2	7	- Walking (incl. with dogs)
0L574	Clonpriest East to Ring Point	1	4	- Walking (incl. with dogs)
0L810	Ballymacoda Marsh (South of Crompaun Bridge)	0	-	

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

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN	H	H	M	M	L			H	H	V	M
T.	V	V	H	H	M			L	L	V	M
RP						V	H	V	V	H	
GP			V	H			H	V		M	
GV	L	M	V	M	H	M	V	V	H	V	L
L.	M	H	V	H	M		L	L		M	V
SS						V		V	V		
DN	L	H	V	H	M	M	M	V	H	V	H
BW	H	V	V	H	M			V	H	V	H
BA	L		M	L	M	V	V	H	H	H	L
CU	H	V	V	V	L	M	M	H	L	H	M
RK	M	H	V	H	M	H	L	V	M	H	H
TT				H		V	V	H	V	V	
BH	H	M	V	H	L	M	M	V	M	V	M
CM	H		V	L		M	M	H	H	V	L
LB	M		V	M		M	L	V	H	V	

5.4.5 Discussion

It is clear that historical events at Ballymacoda Bay such as the building of berms and land reclamation have acted so as to modify the wetland habitats. However, such past events can still act currently in terms of on-going modifications to intertidal and coastal habitats as a result of changes to natural processes (e.g. sedimentation or erosion rates).

Human recreational activities at coastal sites occur less frequently during winter months and the range of activities is much reduced. Nevertheless, a range of activities and events were recorded at the site that resulted in disturbance to waterbirds, and recreational activity in the form of walkers (with/without dogs) was a regular occurrence in several subsites.

Any activity that causes disturbance can lead to the displacement of waterbirds. The significance of the impact that results from even a short-term displacement should not be underestimated. In terms of foraging habitat, displacement from feeding opportunities not only reduces a bird's energy intake but also leads to an increase in energy expenditure as a result of the energetic costs of flying to an alternative foraging area. Displacement also has knock-on ecological effects such as increased competition (within and/or between different species) for a common food source. In areas subject to heavy or on-going disturbance, waterbirds may be disturbed so frequently that their displacement is equivalent to habitat loss. When disturbance effects reduce species fitness[20] (reduced survival or reproductive success) consequences at population level may result.

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

- Frequency/duration of disturbance event;
- Intensity of activity;
- Response of waterbirds.

and be influenced by:-

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

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

increased predation – i.e. the disturbance results in an indirect impact which is an increased predation risk.

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

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APPENDIX 1

SITE NAME: BALLYMACODA BAY SPA

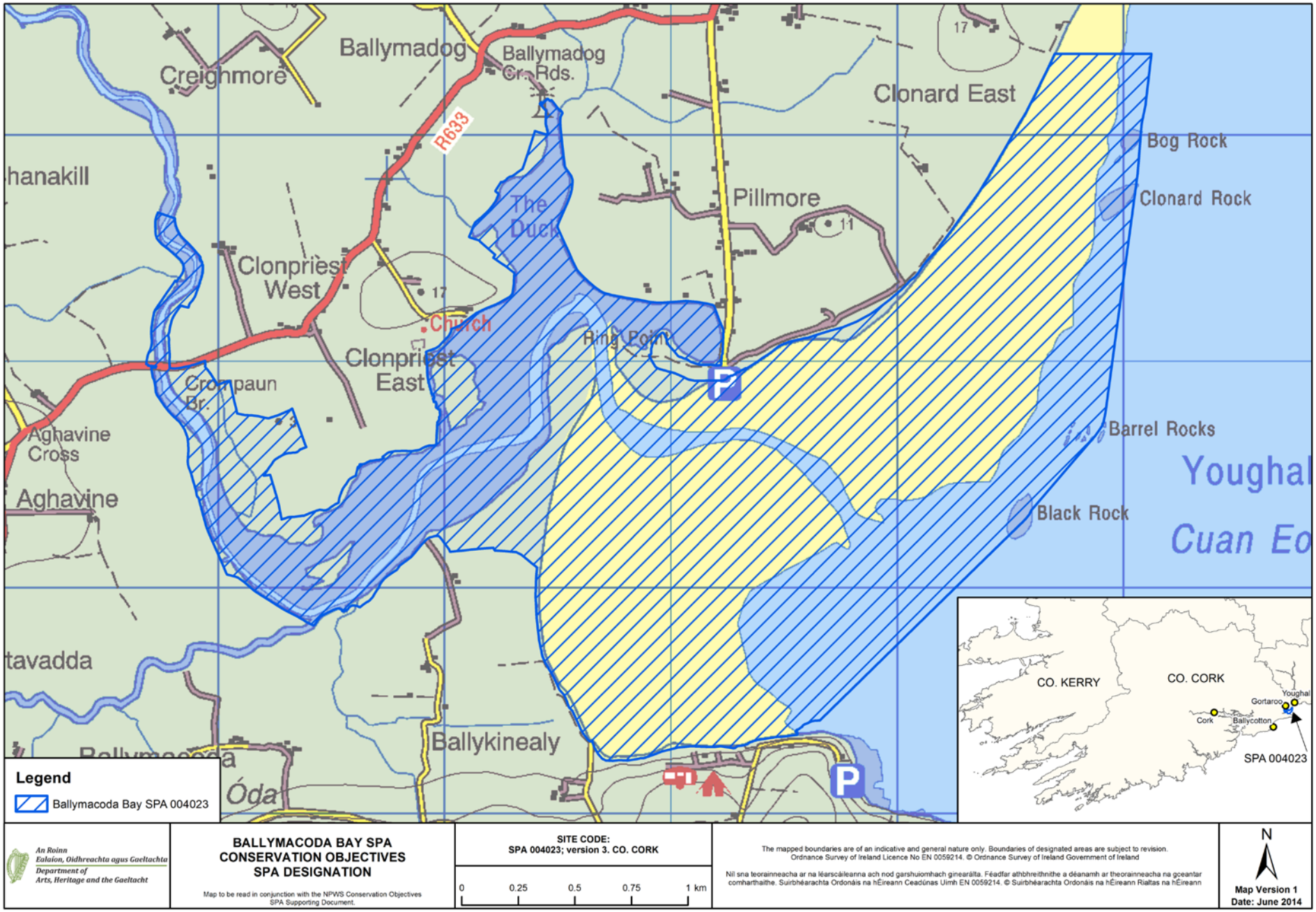
SITE CODE: 004023

This coastal site stretches north-east from Ballymacoda to within several kilometres of Youghal, Co. Cork. It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment. Part of the tidal section of the river is included in the site and on the seaward side the boundary extends to, and includes, Bog Rock, Barrel Rocks and Black Rock. The inner part of the estuary is well sheltered by the Ring peninsula, a stabilised sand spit with sand dunes at its northern end and salt marshes on the landward side. Sediment types vary from muds to muddy sands in the inner part to fine rippled sands in the outer exposed part. The macro-invertebrate fauna of the intertidal flats is well-developed, with the following species occurring: Ragworm (*Hediste diversicolor*), the crustacean *Corophium volutator*, Lugworm (*Arenicola marina*), Baltic Tellin (*Macoma balthica*), Peppery Furrow-shell (*Scrobicularia plana*), Common Cockle (*Cerastoderma edule*) and the tubeworm *Lanice conchilega*. In the more sheltered areas the intertidal flats are colonised by mats of green algae (mostly *Enteromorpha* spp.), with brown seaweeds occurring on the rocky shores of the shingle spits. Common Cord-grass (*Spartina anglica*) has spread within the estuary since the late 1970s. The main channel is flanked by salt marshes and wet fields, much of the latter being improved for agriculture.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Wigeon, Teal, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Black-headed Gull, Common Gull and Lesser Black-backed Gull. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Ballymacoda Bay is of high ornithological importance for supporting an excellent diversity and large number of wintering waterbirds – it is of international importance because it regularly supports an assemblage of over 20,000 birds. The site provides both feeding and roosting areas for the birds. Furthermore, both Golden Plover (10,920) and Black-tailed Godwit (765) occur here in internationally important numbers (all counts given are mean peaks for the five year period 1995/96-1999/2000). A further eleven species of waders and ducks occur here in nationally important numbers, i.e. Wigeon (907), Teal (887), Ringed Plover (153), Grey Plover (535), Lapwing (4,063), Sanderling (98), Dunlin (3,192), Bar-tailed Godwit (581), Curlew (1,145), Redshank (357) and Turnstone (137). The site is also notable for supporting significantly large numbers of some gull species in autumn and winter: Black-headed Gull (1,560), Common Gull (1,120) and Lesser Black-backed Gull (5,051). A total of 107 species were recorded from the site between 1971 and 1988.

Ballymacoda Bay SPA is one of the most important sites in the country for wintering waterfowl. It qualifies for international importance on the basis of regularly exceeding 20,000 wintering birds but also for its Golden Plover, Black-tailed Godwit and Lesser Black-backed Gull populations. In addition, it supports nationally important populations of a further thirteen species. Two of the species which occur, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive.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Clonard East
Bog Rock
Clonard Rock
Pillmore
The Duck
Clonpriest West
Church
Ring Point
Clonpriest East
Crompaun Br.
Aghavine Cross
Aghavine
Barrel Rocks
Black Rock
Ballykinealy
Legend
Ballymacoda Bay SPA 004023
CO. KERRY
CO. CORK
Gortaroo
Youghal
Cork
Ballycotton
SPA 004023
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
BALLYMACODA BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
SITE CODE:
SPA 004023; version 3. CO. CORK
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059214. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann
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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) and Boland & Crowe (2012).

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 and agricultural land). When calculating population estimates of the Icelandic birds, data collected are adjusted to account for feral flocks that also occur within Ireland.

- Barnacle Goose (*Branta leucopsis*)

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

- Light-bellied Brent Geese

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

APPENDIX 3

Analysing population trends: a synopsis

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

The first stage in the analytical process involves the use of the Underhill Program (Underhill & Prŷs-Jones, 1994) which models the raw monthly counts using a Generalised Linear Model (GLM). As part of this process, it accounts for changes in numbers at the site and the timing of the count (month, year) while also taking into account completed counts and trends at other sites. When counts at a site are flagged as poor quality (e.g. due to poor visibility) or where there are missing values in a given month, then the modelled values are used. This imputation process is used widely to replace missing data points (e.g. Houlahan et al. 2000; Atkinson et al. 2006; Leech et al. 2002; Gregory et al. 2005; Crowe et al. 2008). The resulting dataset is therefore complete for all months and seasons and comprises a combination of actual count data and imputed count data.

This complete dataset is then modelled using a Generalised Additive Models (GAM) which fits a smoothed curve to the counts. GAMs are non-parametric and flexible extensions of the generalised linear model where the linear predictor of the GLM is replaced by a general additive predictor which allows mean abundance to vary as a smooth function of time. Count data are assumed to follow independent Poisson distribution with 0.3T degrees of freedom (e.g. after Atkinson et al. 2006). The application of GAMs to analyse population trends was applied to UK farmland birds by Fewster et al. (2000) and has since been adopted for modelling waterbird trends elsewhere, for example, the UK WeBS Alert system (Leech et al. 2002).

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

Annual indices are calculated separately for each species at a site. For each year included in an analysis, a total is obtained by summing the number of birds present in a predetermined number of months. The final year in the series of totals is then scaled to equal 100 (please see example in table). Index values in any given year therefore represent the number of individuals relative to those present in the final year. As this process is the same across all species and all sites analysed it allows for some useful comparisons.

Count Data	Index
264.41	128.11
262.21	127.04
234.0	113.37
126.0	61.05
197.23	95.56
206.4	100.00

Un-smoothed indices are also calculated and provide a means of examining ('eye-balling') the variation across time and can also be used to provide a measure of the mean annual change over the entire period. However, the GAM extension to the methodology and resultant smoothed indices allows for the calculation of proportional change in population size between one season and another. This latter calculation is used in Section 4.2 whereby trends are calculated for the 'long-term' 14-year period (1995/96–2009/10) and the recent five-year period (2004/05-2009/10). 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 (2009):-

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

where I_y is the index from the current year and I_x is the index value at the start of the selected time period (see example below)

The reference year is the penultimate year in the time series because, when smoothing, the GAM takes into account values from both the preceding and following year. The last value in the smoothed dataset (2010) is therefore likely to be the least robust because it has no following year.

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

Worked example

Year	Unsmoothed	Smoothed
1994	0.36	0.46
1995	0.81	0.53
1996	0.57	0.60
1997	0.67	0.67
1998	0.64	0.74
1999	0.91	0.79
2000	0.93	0.83
2001	0.87	0.86
2002	1.05	0.87
2003	1.00	0.87
2004	0.67	0.87
2005	0.92	0.88
2006	0.87	0.89
2007	1.24	0.91
2008	0.84	0.93
2009	1.10	0.96
2010	1.00	1.00

Term	Change
5YR	**10.51**
10YR	**21.56**
ALL YR	**83.57**

Further information on population indexing and trend analysis can be found in various references; for particular reference to waterbirds see Leech et al (2002) and Atkinson et al. (2006). For information on the UK WeBS Alerts system, please see Thaxter et al. (2010) and Cook et al. (2013).

Limitations

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

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

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

APPENDIX 4

Waterbird species codes

AE	Arctic Tern	*Sterna paradisaea*
BY	Barnacle Goose	*Branta leucopsis*
BA	Bar-tailed Godwit	*Limosa lapponica*
BE	Bean Goose	*Anser fabalis*
BS	Bewick's Swan	*Cygnus columbianus*
AS	Black Swan	*Cygnus atratus*
BH	Black-headed Gull	*Chroicocephalus ridibundus*
BN	Black-necked Grebe	*Podiceps nigricollis*
BW	Black-tailed Godwit	*Limosa limosa*
BV	Black-throated Diver	*Gavia arctica*
BG	Brent Goose	*Branta bernicla*
CG	Canada Goose	*Branta canadensis*
CM	Common Gull	*Larus canus*
CS	Common Sandpiper	*Actitis hypoleucos*
CX	Common Scoter	*Melanitta nigra*
CN	Common Tern	*Sterna hirundo*
CO	Coot	*Fulica atra*
CA	Cormorant	*Phalacrocorax carbo*
CU	Curlew	*Numenius arquata*
CV	Curlew Sandpiper	*Calidris ferruginea*
DN	Dunlin	*Calidris 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

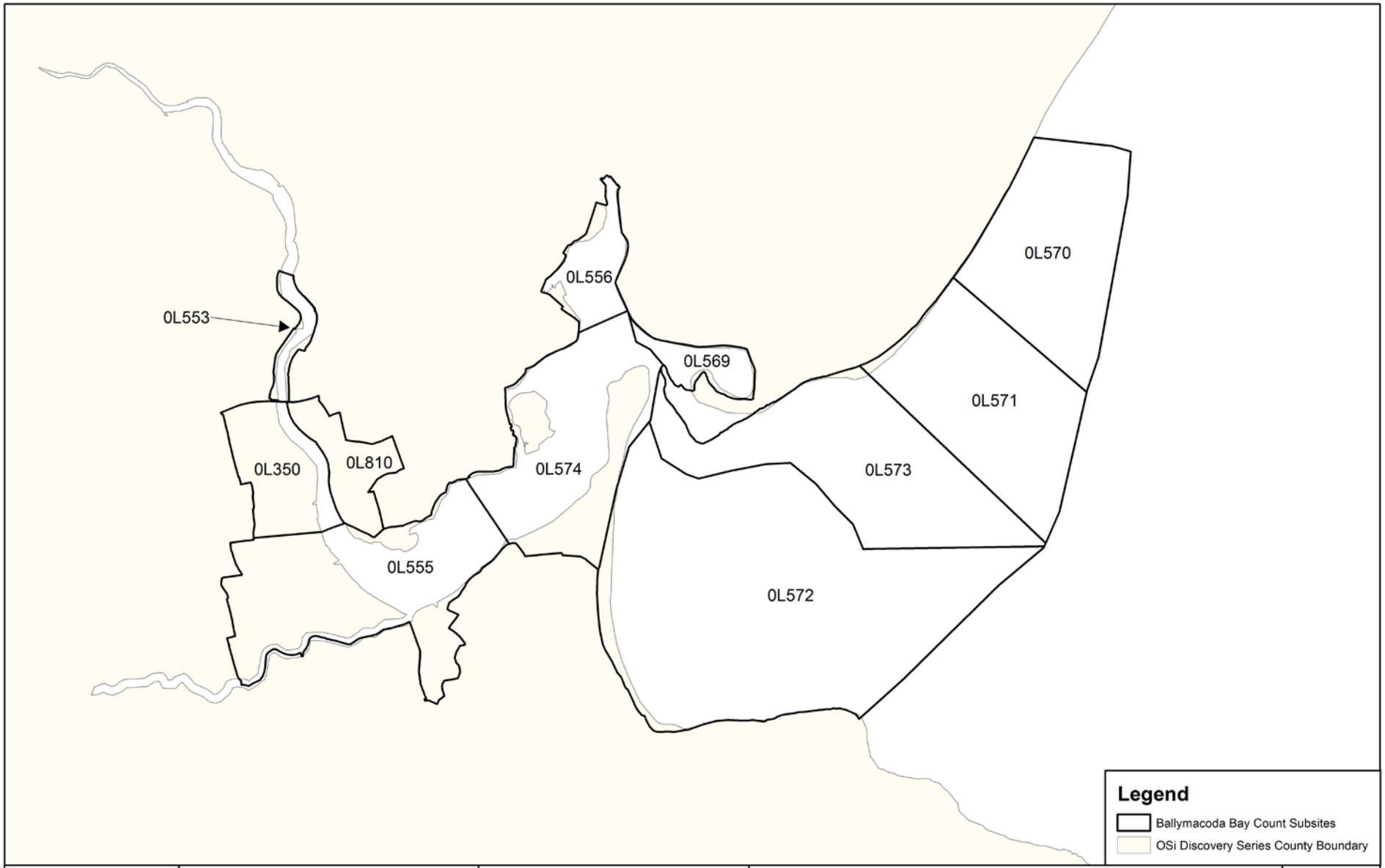
[a] dives <3m.

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

Ballymacoda Bay – Waterbird Survey Programme 2010/11 – Count Subsites

Subsite Code	Subsite Name	Subsite Area (ha)
0L350	Crompaun South (Womanagh River)	29
0L553	Crompaun Bridge	7
0L555	Ballykineely	88
0L556	The Duck	19
0L569	Pilmore (Back Strand)	12
0L570	Clonard East	74
0L571	Pilmore (Barrel Rocks)	79
0L572	Ring Strand	213
0L573	Pilmore (Black Rock)	91
0L574	Clonpriest East to Ring Point	77
0L810	Ballymacoda Marsh (South of Crompaun Bridge)	18
	TOTAL COUNT AREA	**707 ha**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0L570
0L569
0L571
0L350
0L810
0L574
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Legend
Ballymacoda Bay Count Subsites
OSi Discovery Series County Boundary
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Count Subsites used during the 2010/2011 Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
COUNTY CORK
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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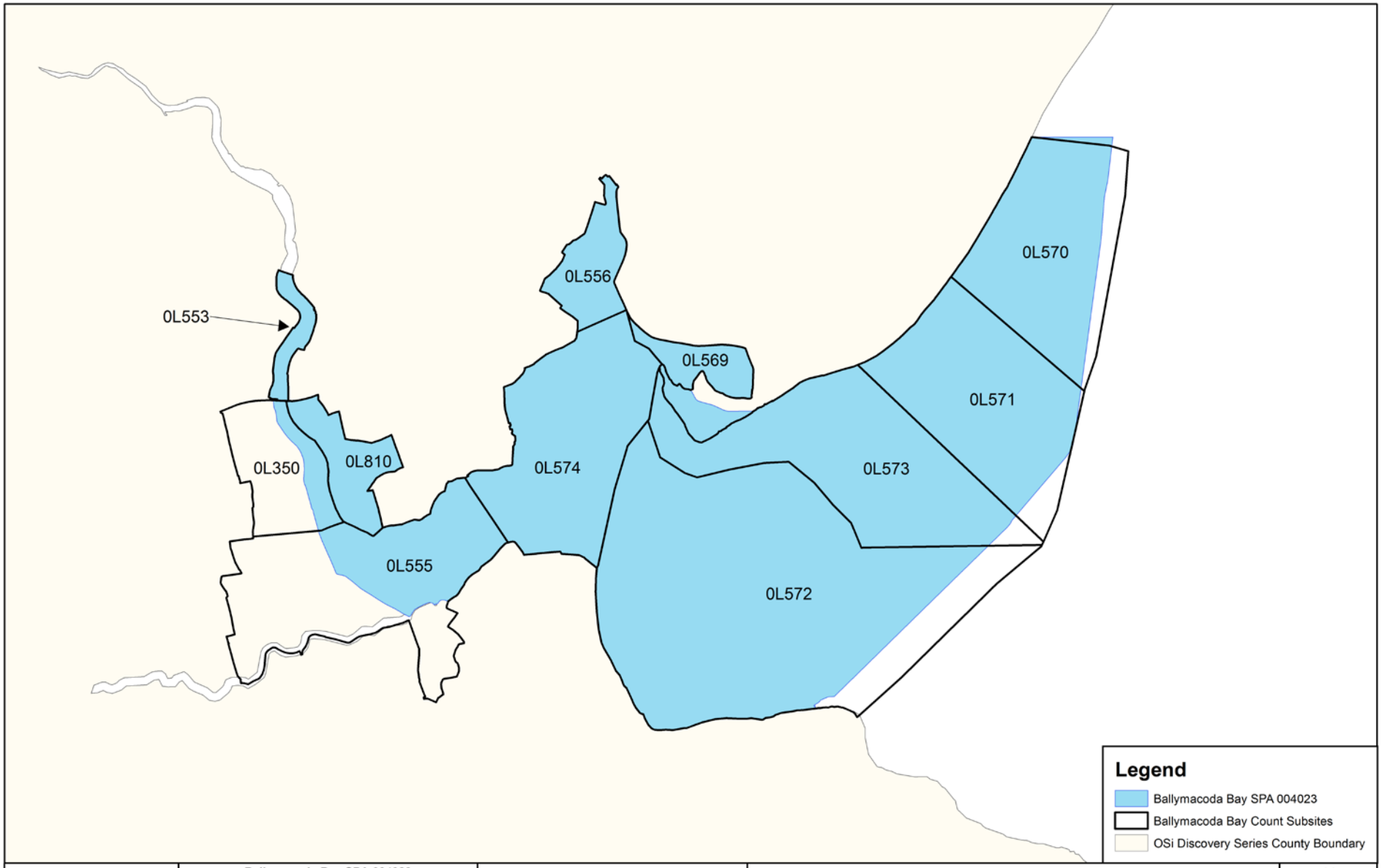
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Legend
Ballymacoda Bay SPA 004023
Ballymacoda Bay Count Subsites
OSi Discovery Series County Boundary
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Ballymacoda Bay SPA 004023
&
Count Subsites used during the 2010/2011 Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
SITE CODE:
SPA 004023; version 3. CO. CORK
0 0.25 0.5 0.75 1 km
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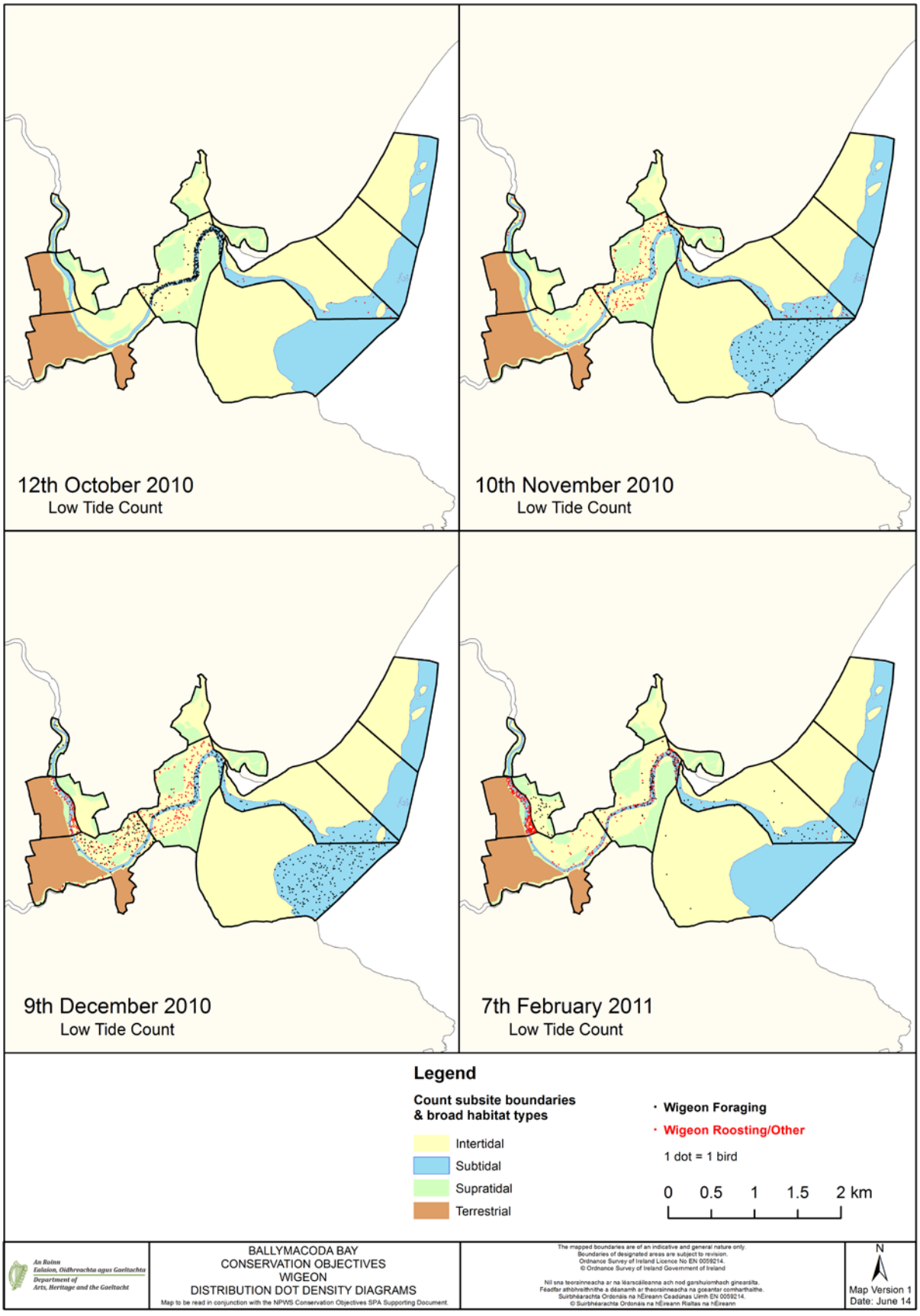
Date: June 2014

APPENDIX 7

Ballymacoda Bay

Waterbird distribution (dot-density diagrams) recorded during low tide surveys (October 2010 – February 2011)

(NB data are presented for birds located in intertidal and subtidal habitats only)


12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Wigeon Foraging
Wigeon Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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Department of Arts, Heritage and the Gaeltacht
BALLYMACODA BAY
CONSERVATION OBJECTIVES
WIGEON
DISTRIBUTION DOT DENSITY DIAGRAMS
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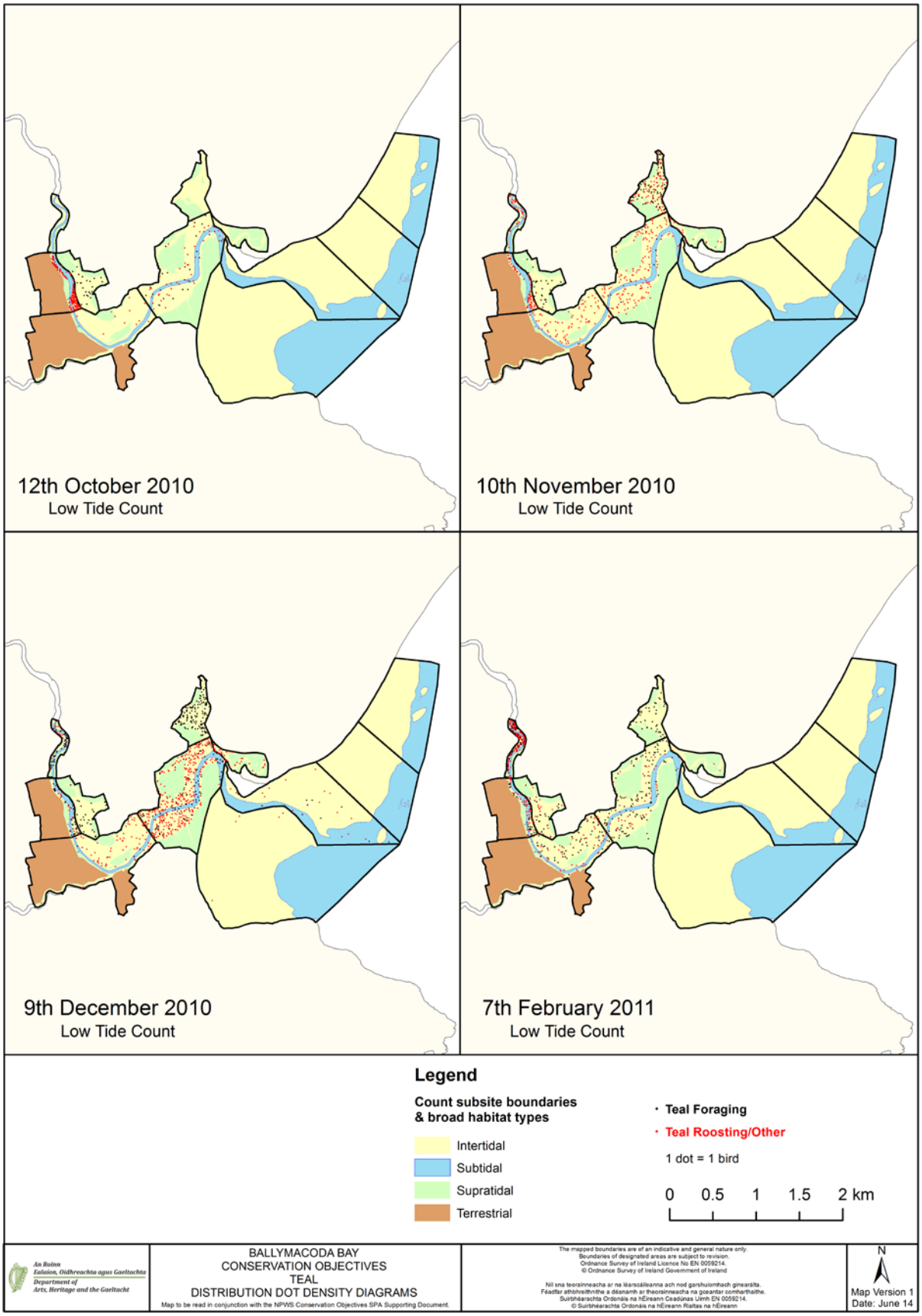
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Teal Foraging
Teal Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
TEAL
DISTRIBUTION DOT DENSITY DIAGRAMS
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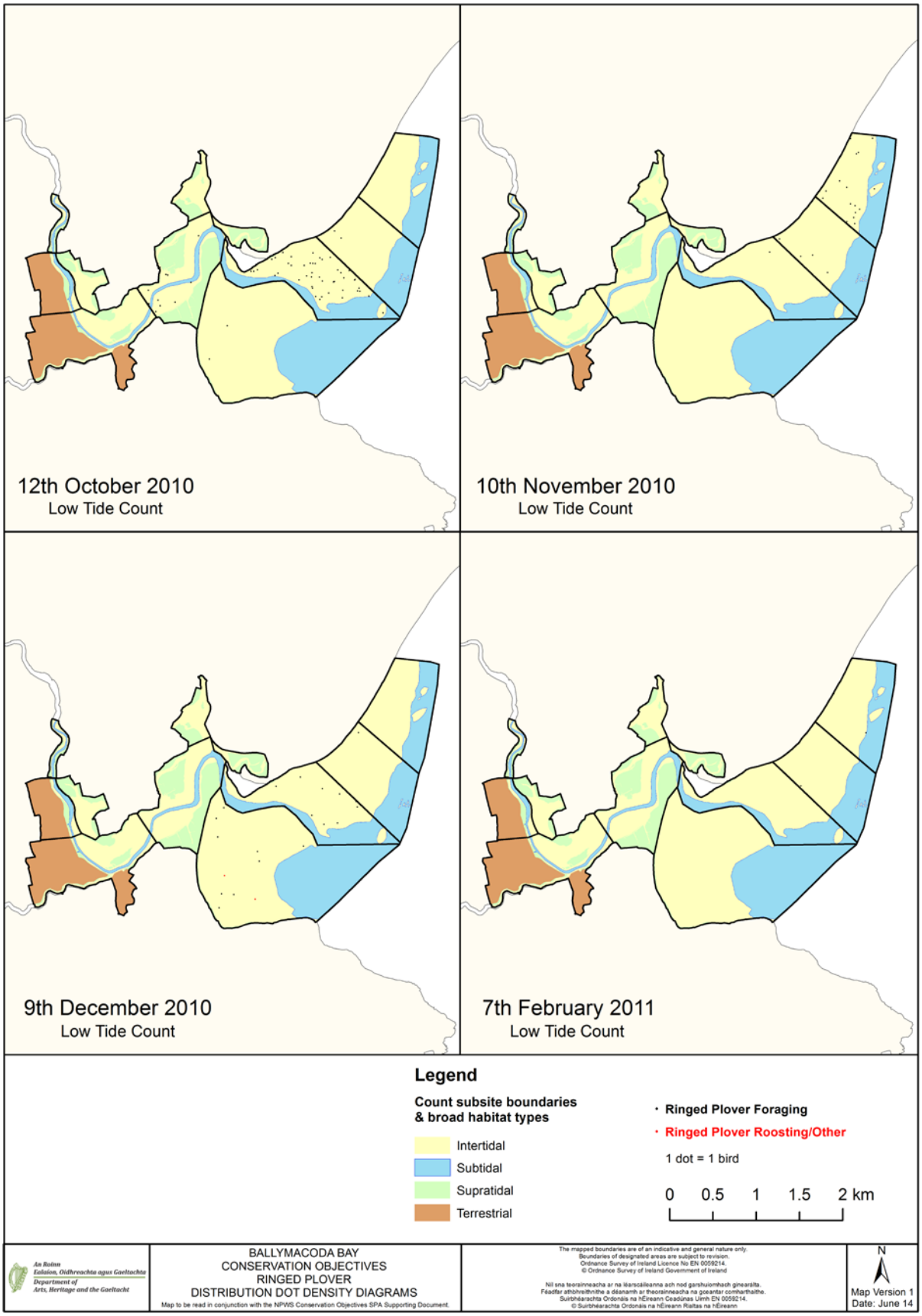
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Ringed Plover Foraging
Ringed Plover Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
RINGED PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
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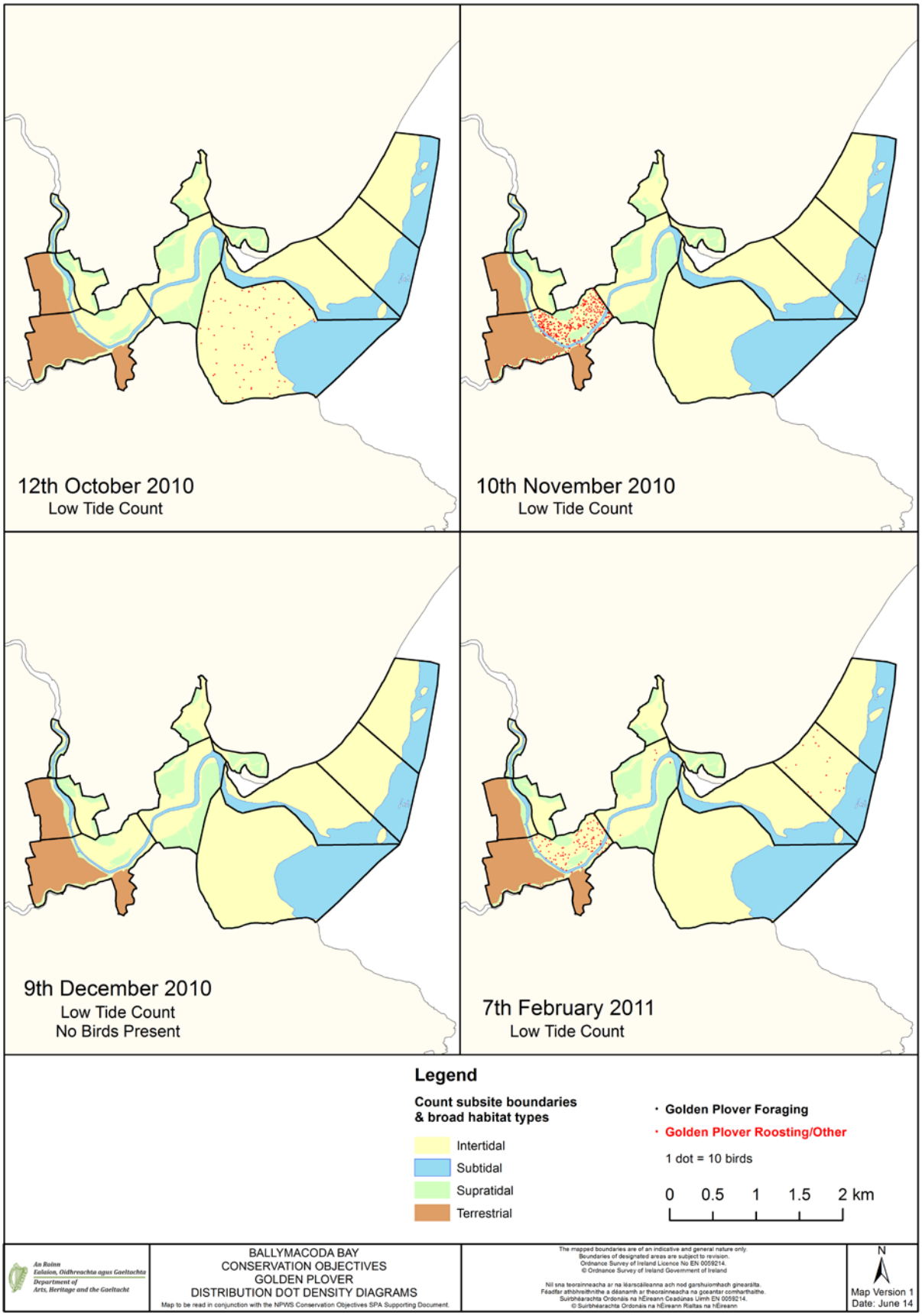
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
No Birds Present
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Golden Plover Foraging
Golden Plover Roosting/Other
1 dot = 10 birds
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
GOLDEN PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
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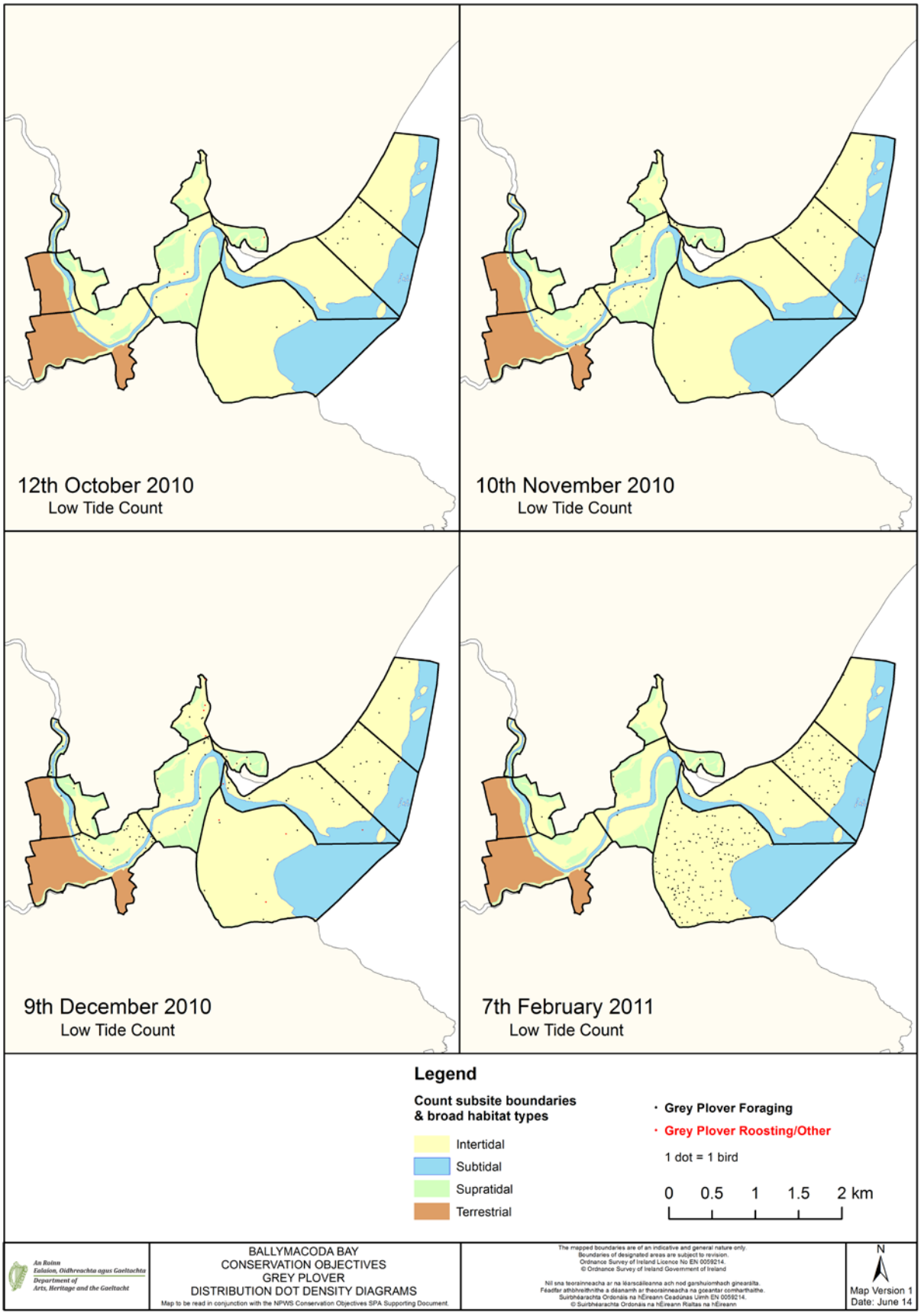
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Grey Plover Foraging
Grey Plover Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
GREY PLOVER
DISTRIBUTION DOT DENSITY DIAGRAMS
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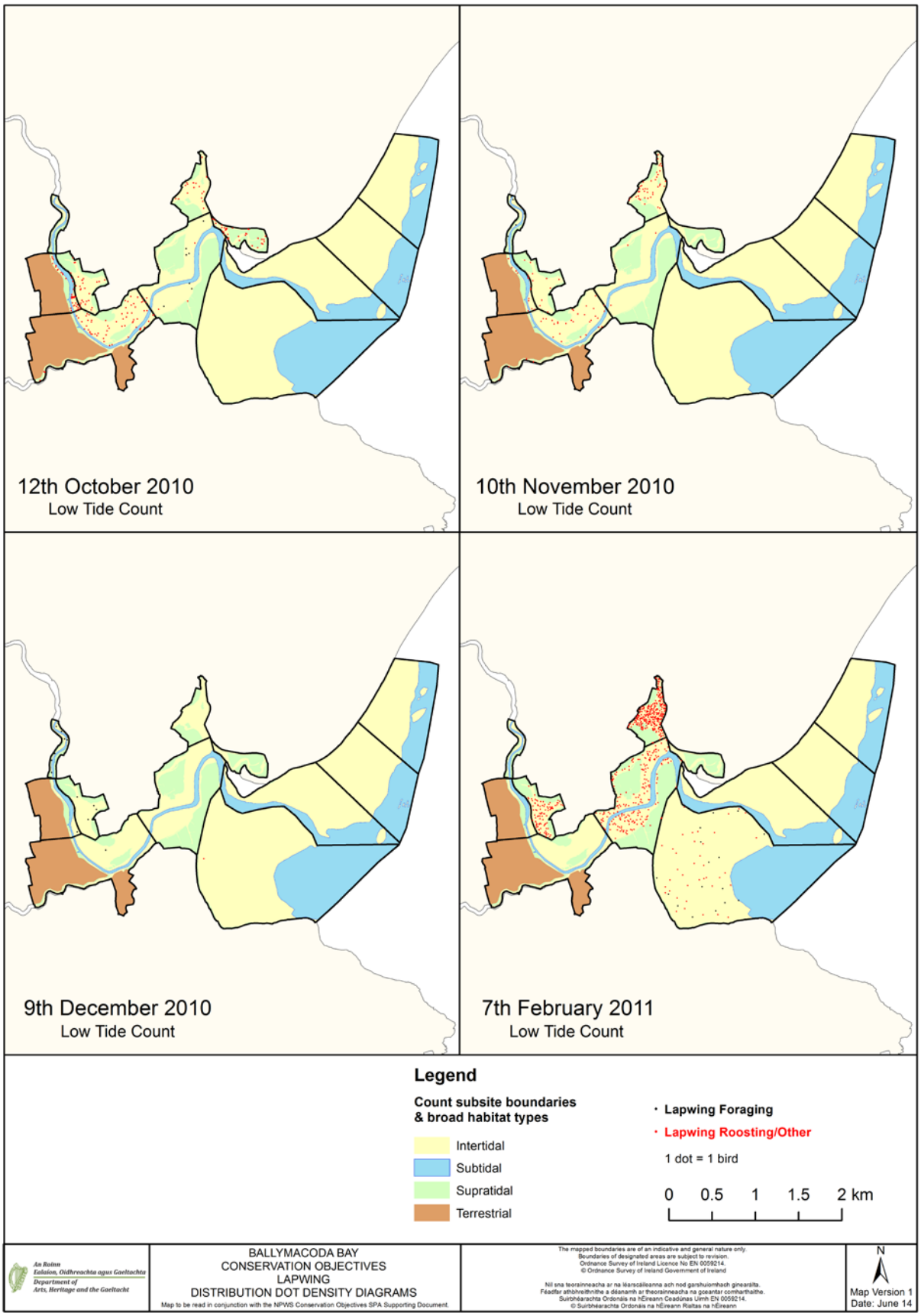
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Lapwing Foraging
Lapwing Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
LAPWING
DISTRIBUTION DOT DENSITY DIAGRAMS
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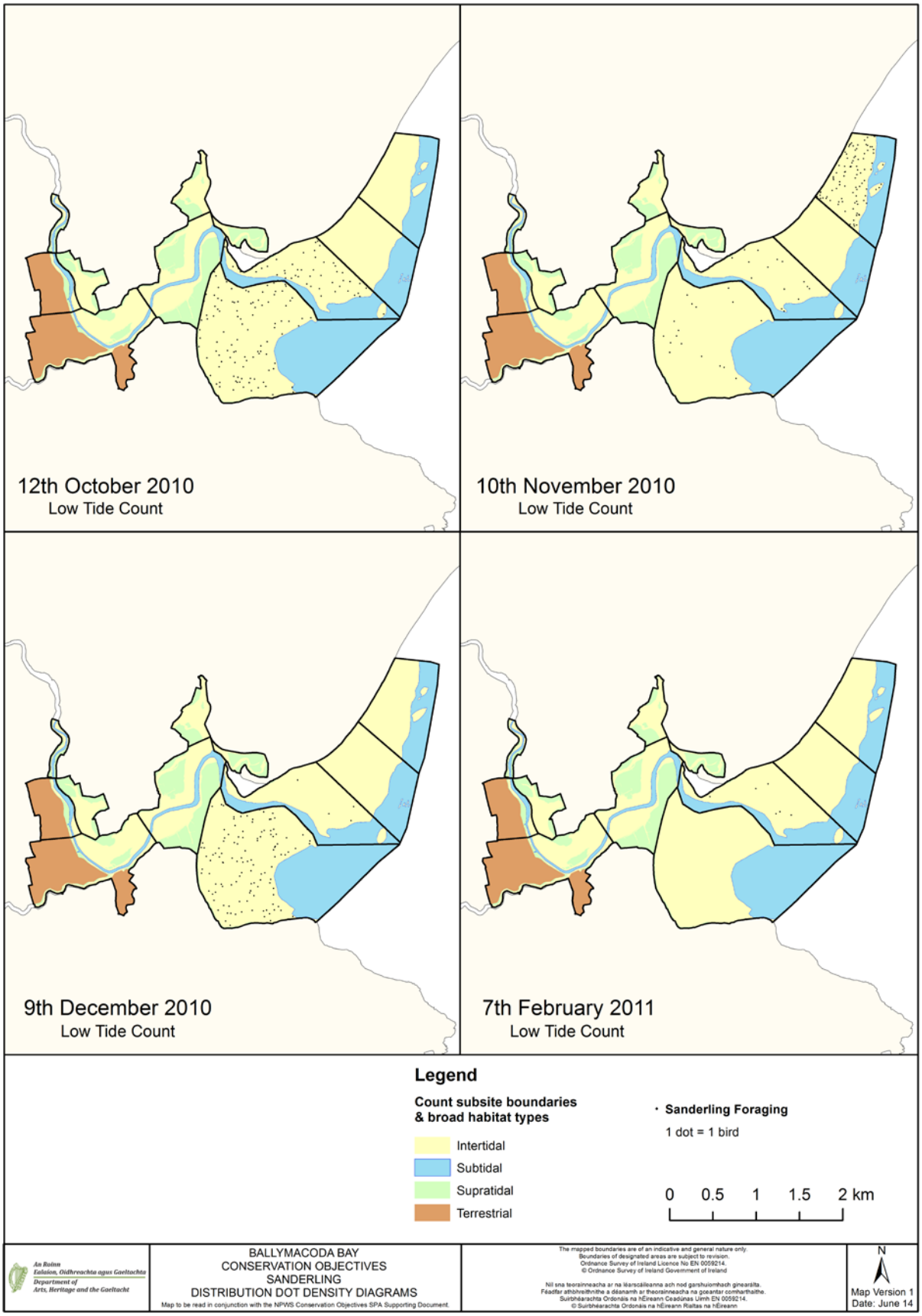
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Sanderling Foraging
1 dot = 1 bird
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
SANDERLING
DISTRIBUTION DOT DENSITY DIAGRAMS
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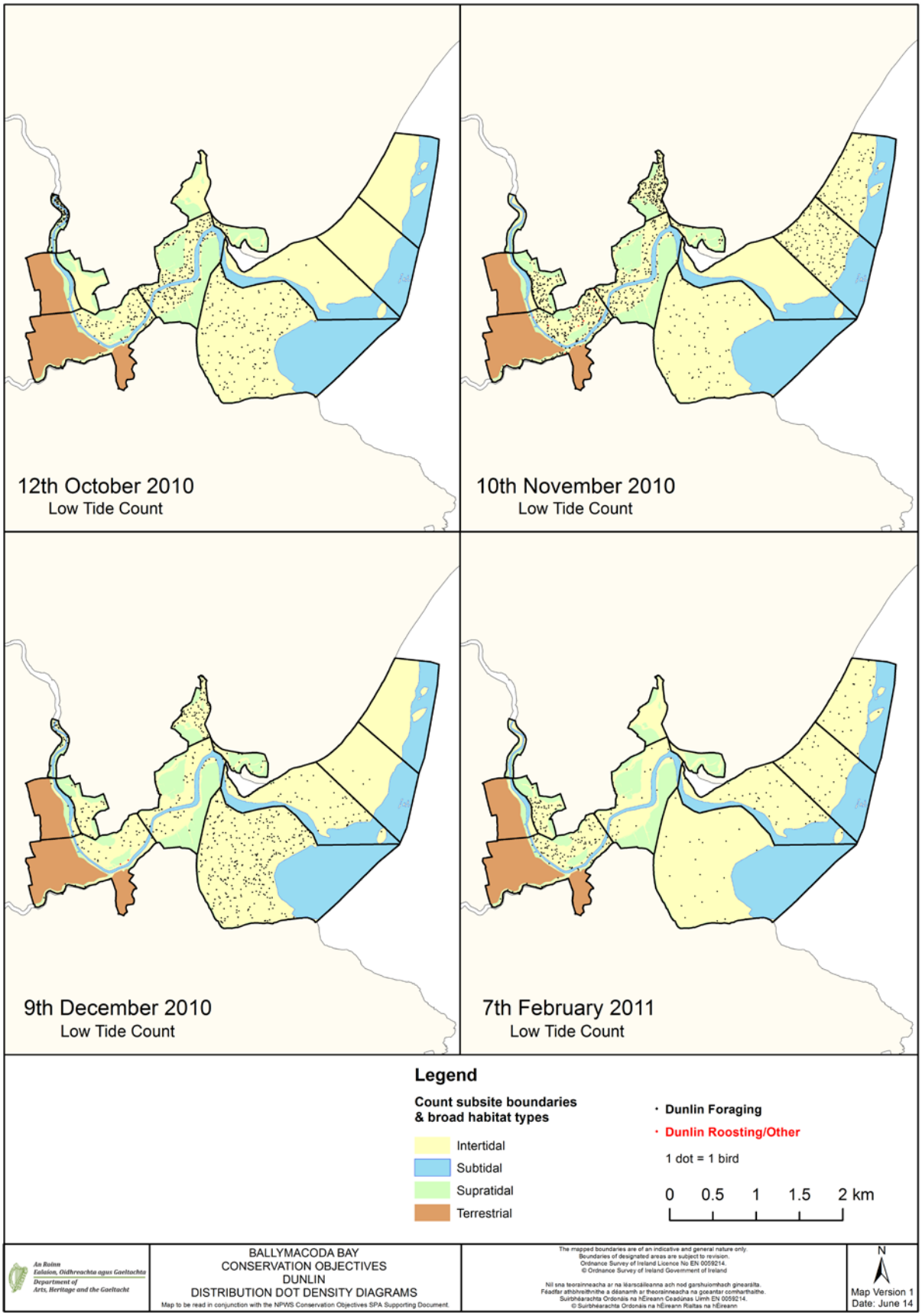
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Dunlin Foraging
Dunlin Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
DUNLIN
DISTRIBUTION DOT DENSITY DIAGRAMS
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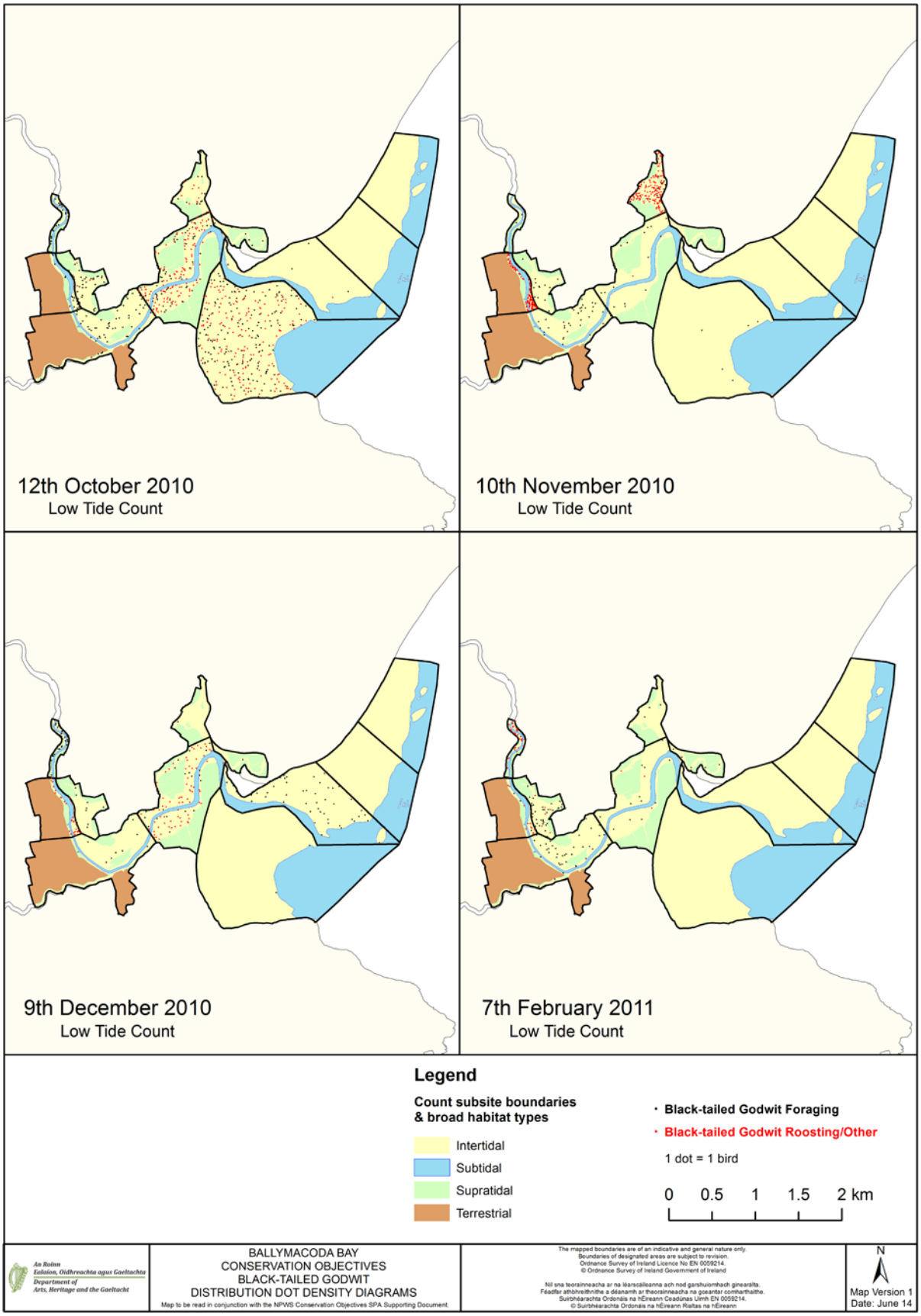
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Black-tailed Godwit Foraging
Black-tailed Godwit Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
BLACK-TAILED GODWIT
DISTRIBUTION DOT DENSITY DIAGRAMS
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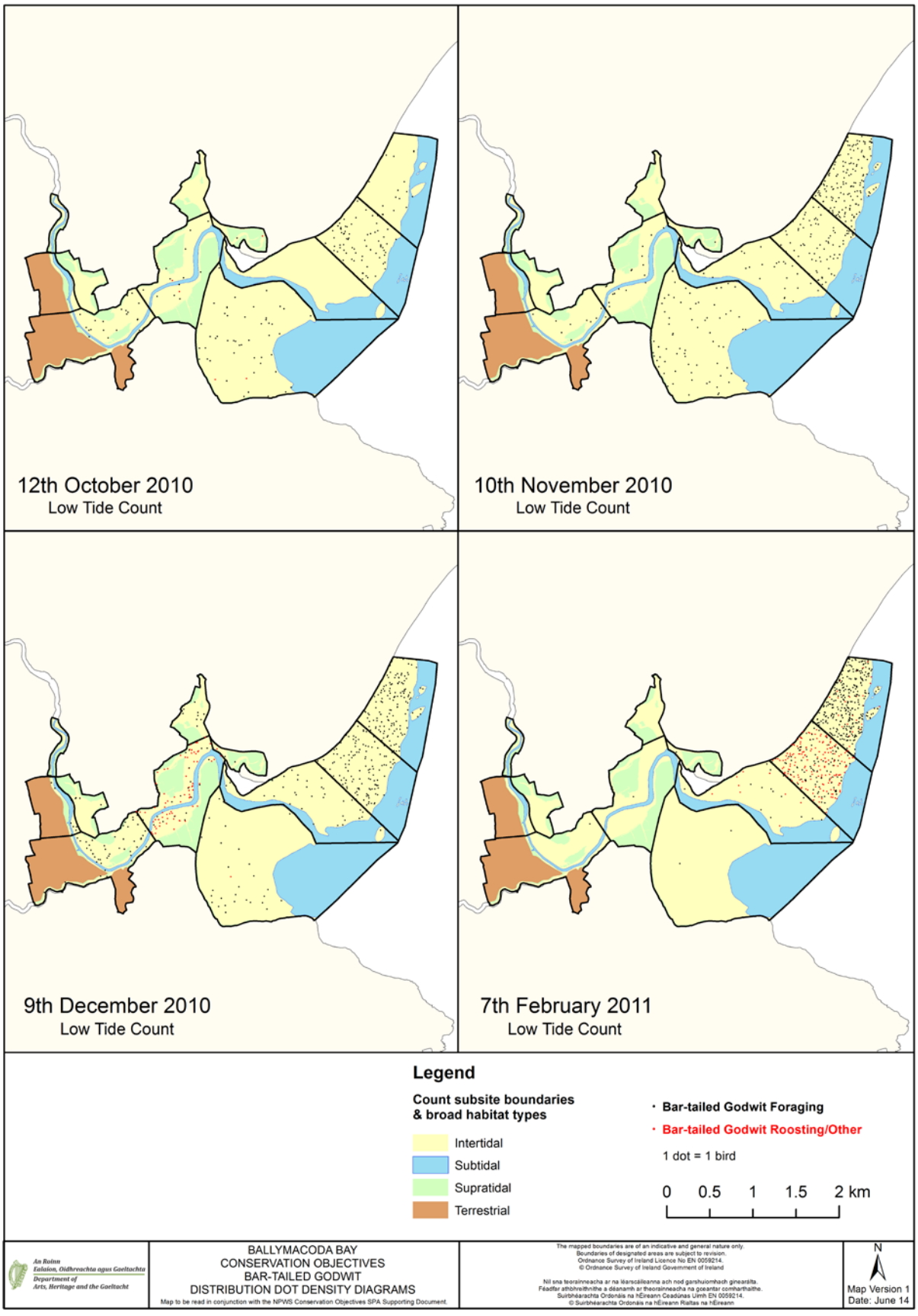
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Bar-tailed Godwit Foraging
Bar-tailed Godwit Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
BAR-TAILED GODWIT
DISTRIBUTION DOT DENSITY DIAGRAMS
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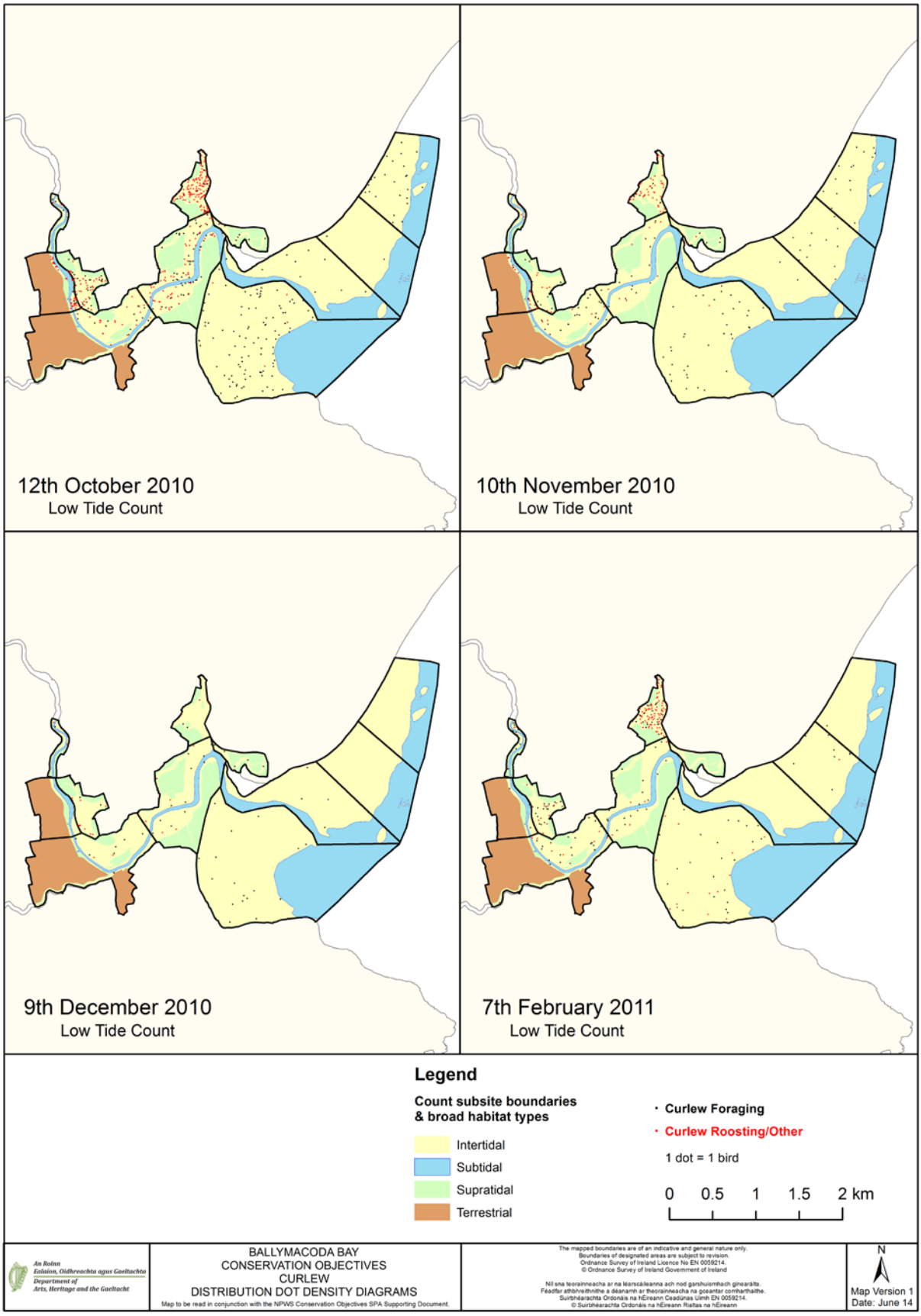
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Curlew Foraging
Curlew Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
CURLEW
DISTRIBUTION DOT DENSITY DIAGRAMS
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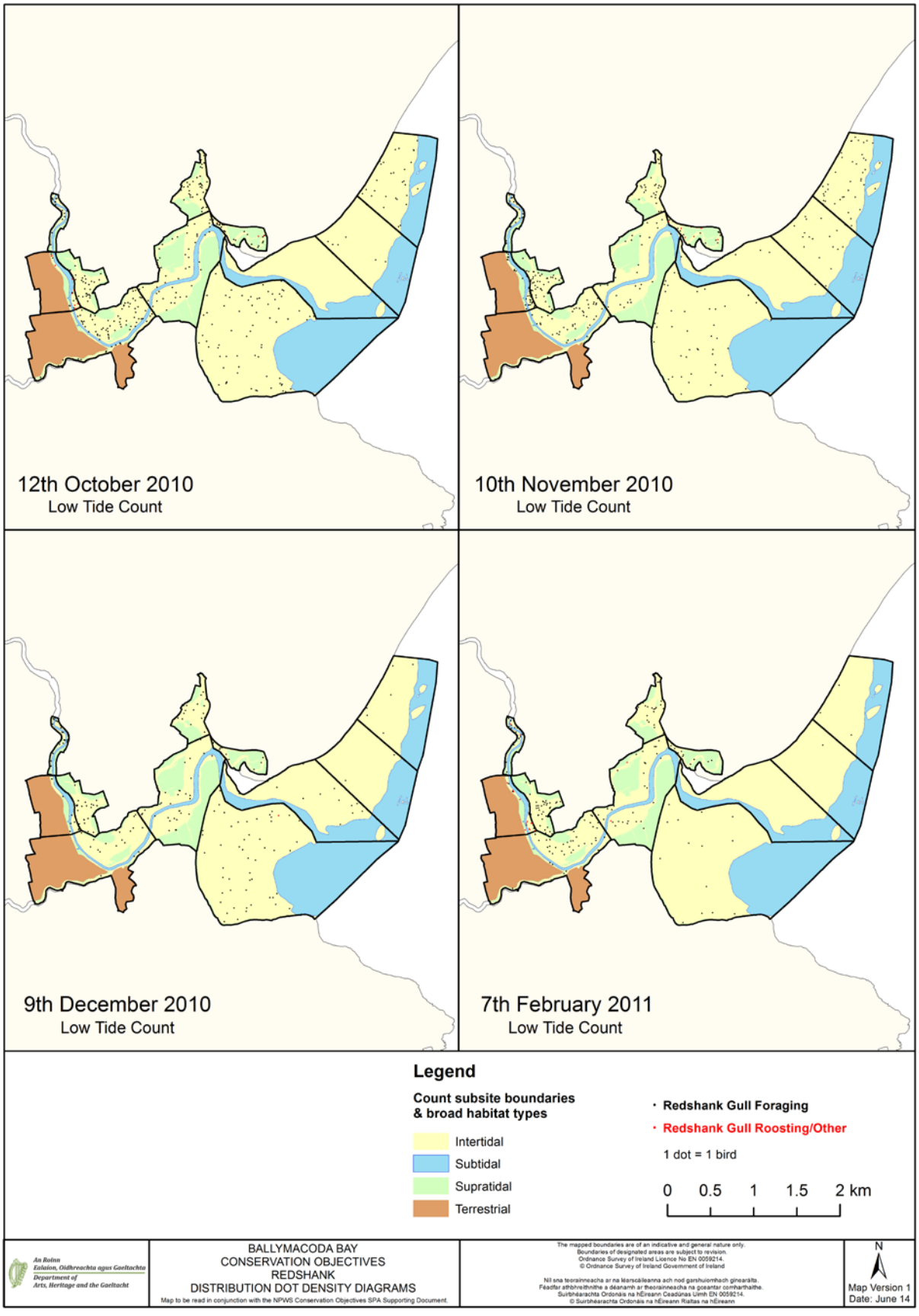
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Redshank Gull Foraging
Redshank Gull Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
REDSHANK
DISTRIBUTION DOT DENSITY DIAGRAMS
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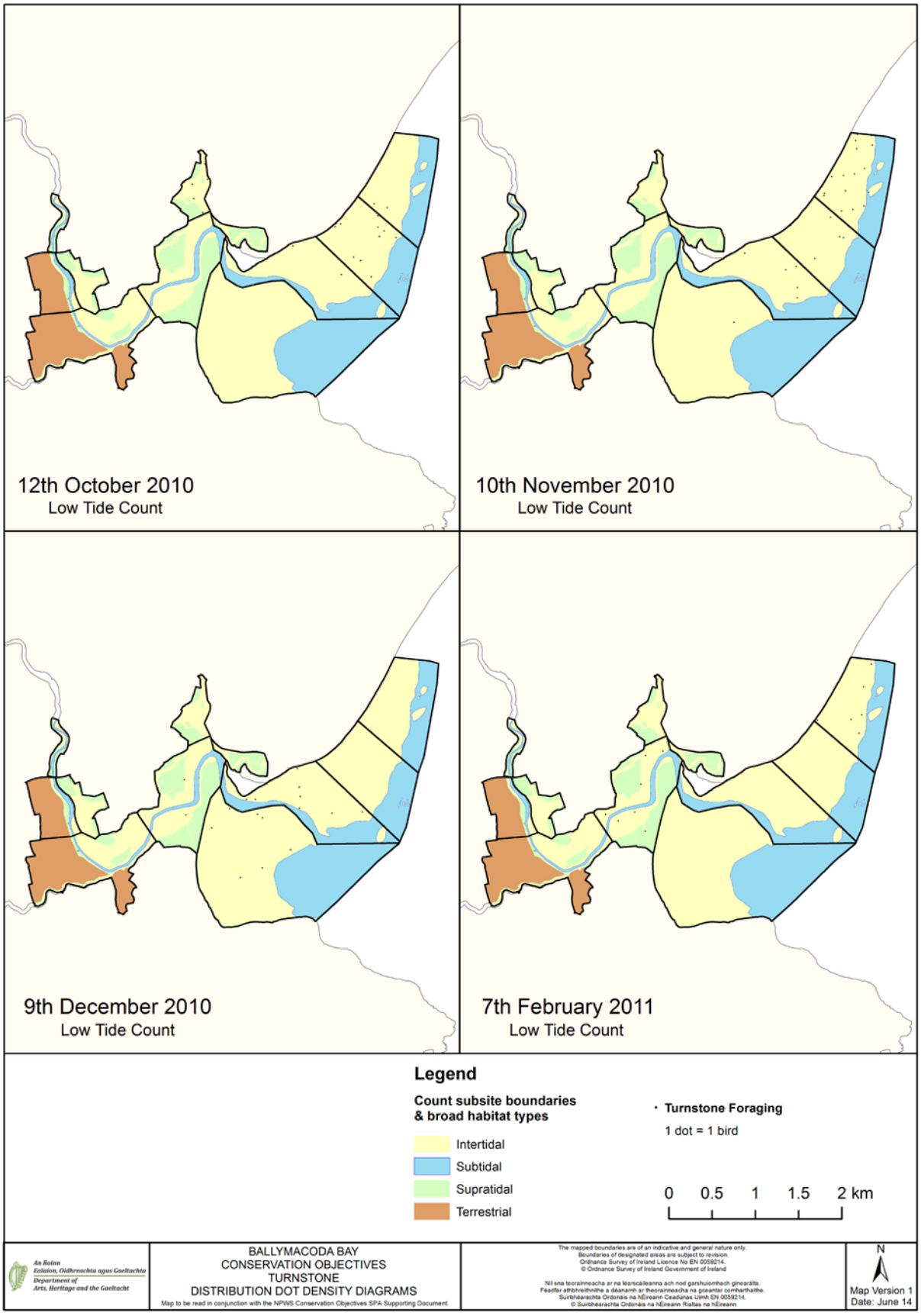
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Turnstone Foraging
1 dot = 1 bird
0 0.5 1 1.5 2 km
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CONSERVATION OBJECTIVES
TURNSTONE
DISTRIBUTION DOT DENSITY DIAGRAMS
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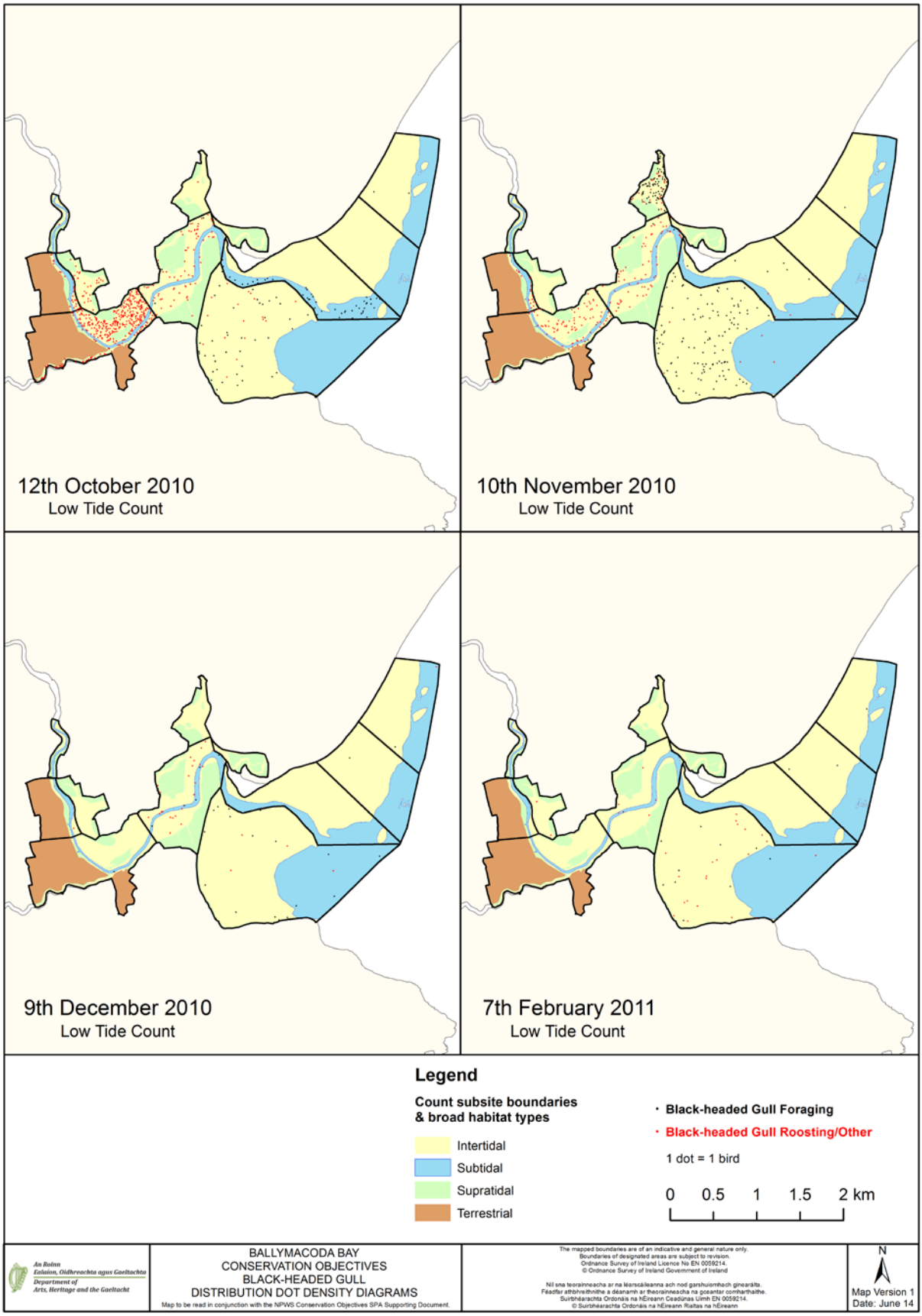
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Black-headed Gull Foraging
Black-headed Gull Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
BLACK-HEADED GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
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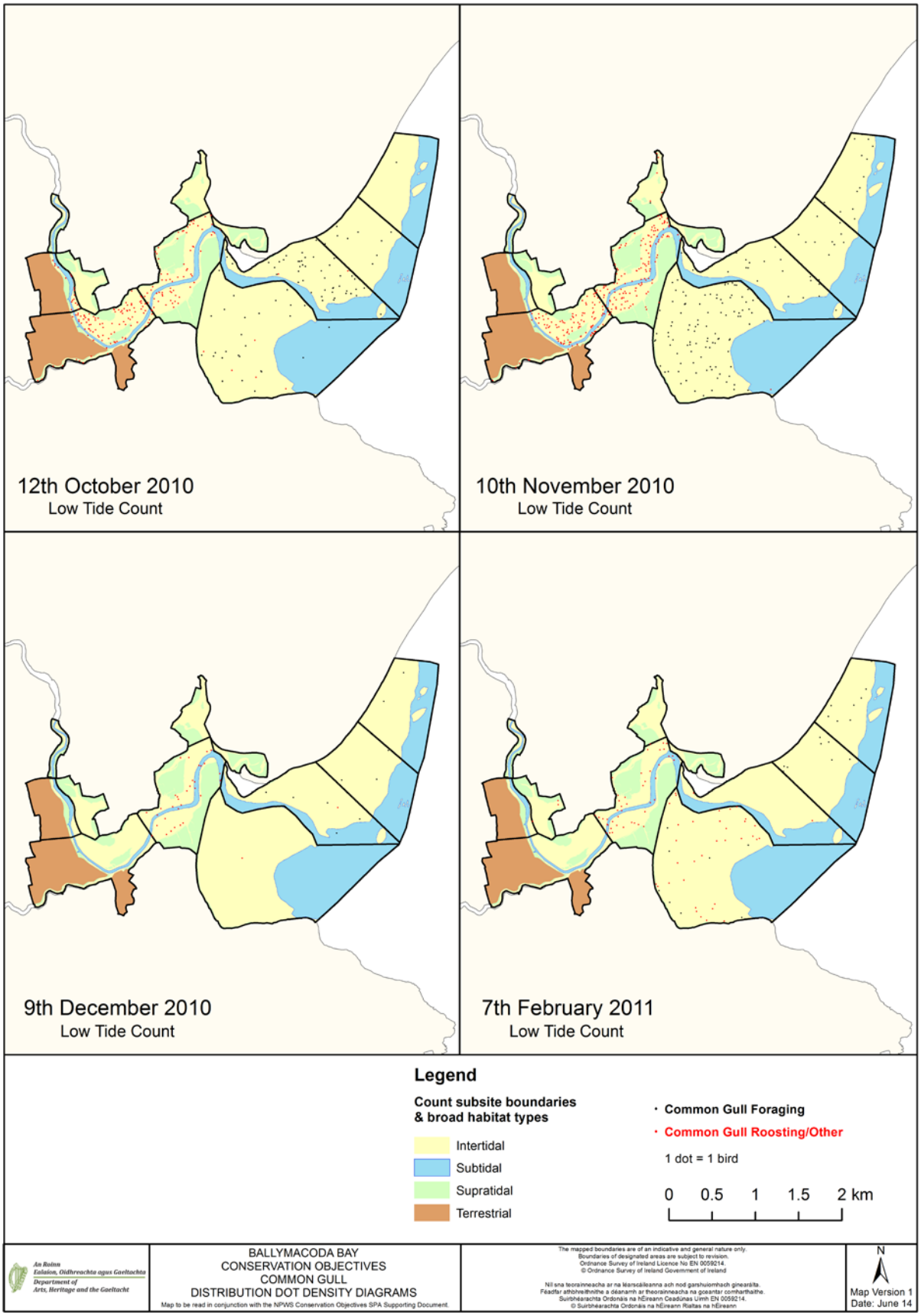
Date: June 14


12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Common Gull Foraging
Common Gull Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
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BALLYMACODA BAY
CONSERVATION OBJECTIVES
COMMON GULL
DISTRIBUTION DOT DENSITY DIAGRAMS
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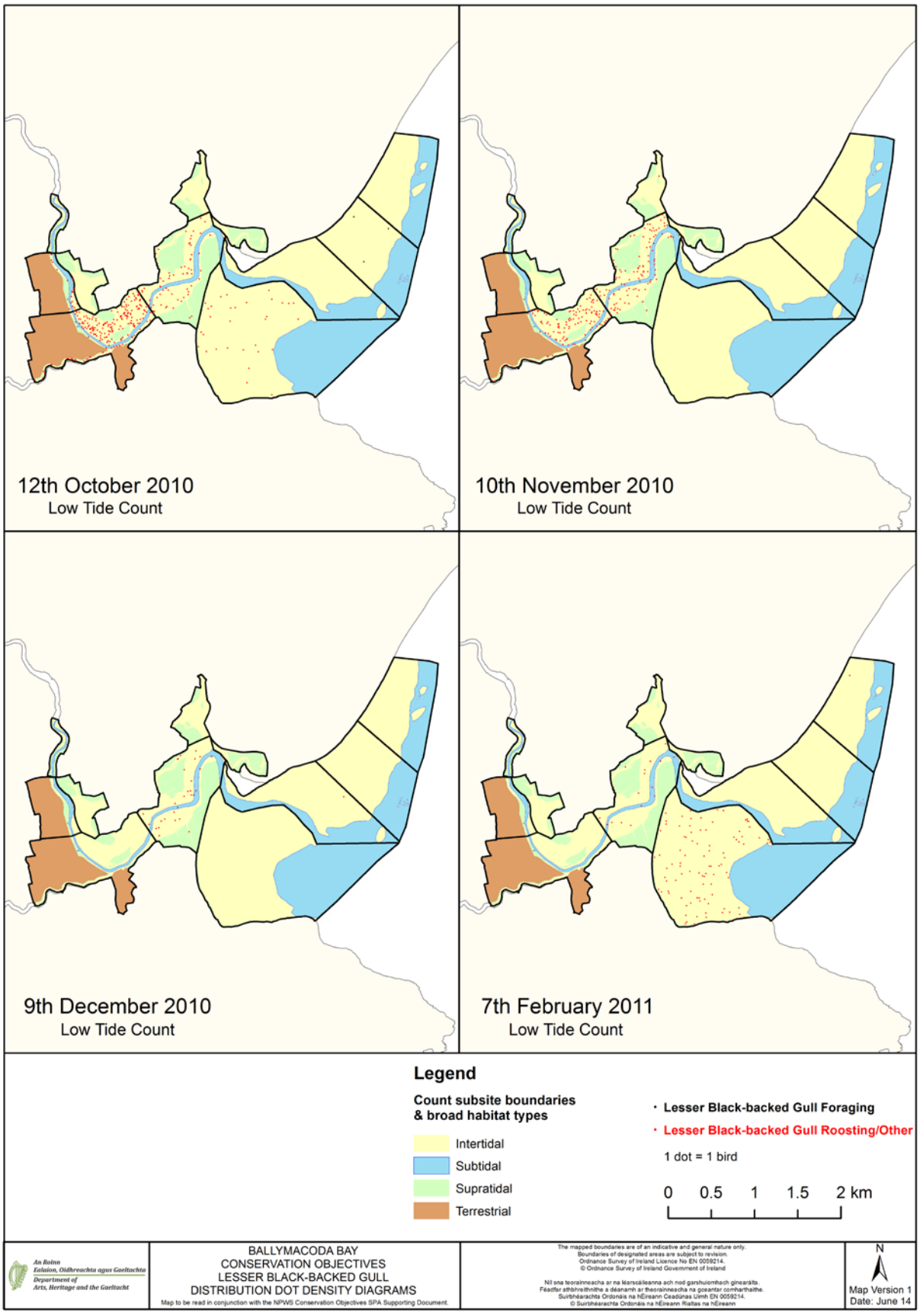
12th October 2010
Low Tide Count
10th November 2010
Low Tide Count
9th December 2010
Low Tide Count
7th February 2011
Low Tide Count
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Lesser Black-backed Gull Foraging
Lesser Black-backed Gull Roosting/Other
1 dot = 1 bird
0 0.5 1 1.5 2 km
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
BALLYMACODA BAY
CONSERVATION OBJECTIVES
LESSER BLACK-BACKED GULL
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.
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Map Version 1
Date: June 14

APPENDIX 8

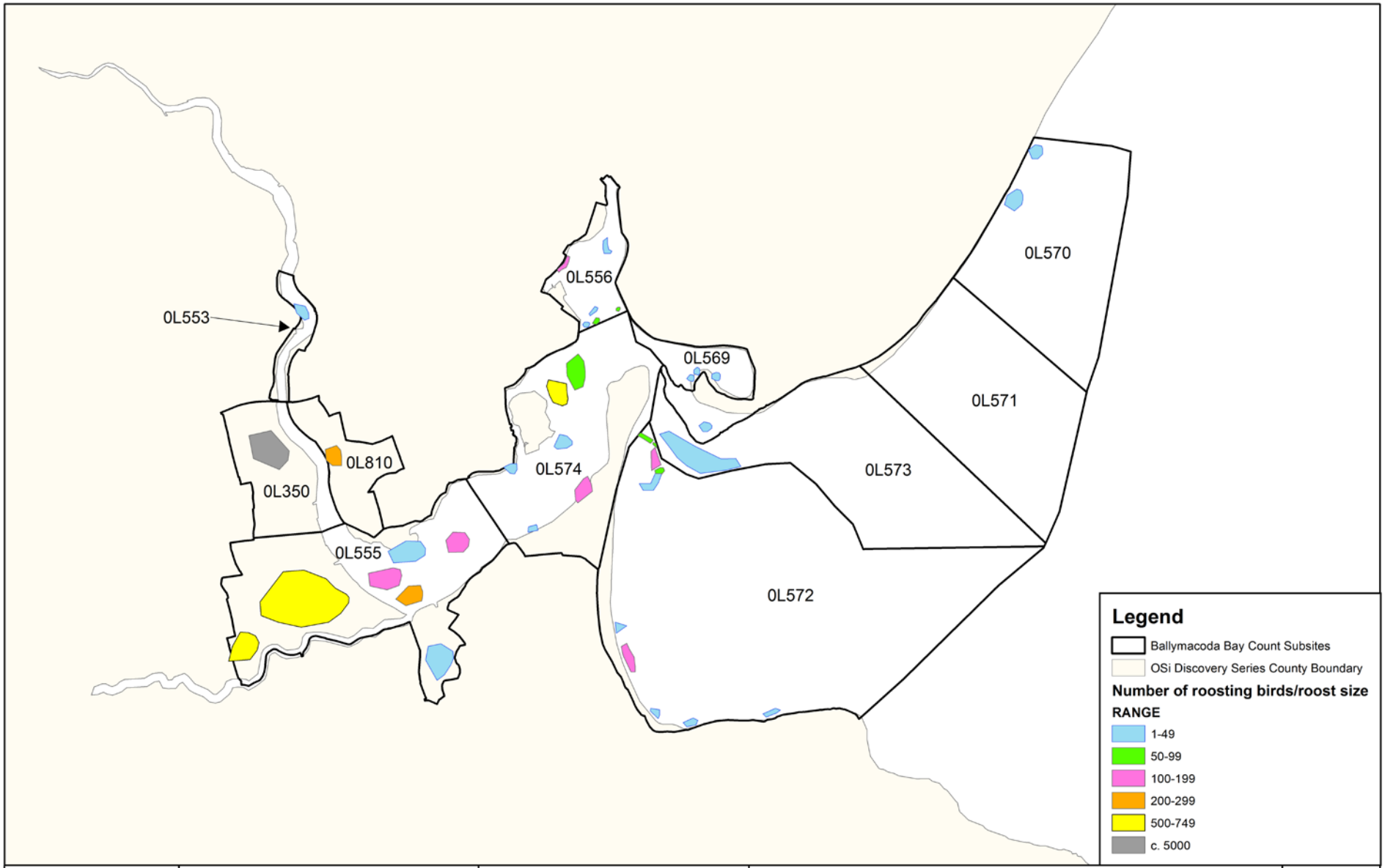
Ballymacoda Bay

(1a) Summary data and roost location maps from the roost survey 1st November 2010
(Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite Code	Subsite Name	No. roost locations	No. species	Species
0L350	Crompaun South (Womanagh River)	1	1	GP
0L553	Crompaun Bridge	1	2	BH, CM
0L555	Ballykineely	7	16	BA, BH, BW, CM, CU, GB, GK, HG, L., LB, MS, OC, RK, SN, T., WN
0L556	The Duck	6	6	BA GV, KN, L., OC, WN
0L569	Pilmore (Back Strand)	3	5	GV, L., OC, RK. SN
0L570	Clonard East	2	1	OC
0L571	Pilmore (Barrel Rocks)	-	-	
0L572	Ring Strand	10	13	BH, CA, CM, DN, GB, GK, HG, LB, OC, RK, RP, SS, T.
0L573	Pilmore (Black Rock)	2	2	CA, OC
0L574	Clonpriest East to Ring Point	6	13	BA, BH, CU, DN, ET, GK, GV, HG, L., OC, RK, SV, WN
0L810	Ballymacoda Marsh (South of Crompaun Bridge)	1	5	BW, L., RK, T., WN

(1b) Ballymacoda Bay SPA (4023) SCI species and recorded roosts 01/11/10 - shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsites ► Species ▼	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
WN			3 (74)	4 (54)						1 (94)	1 (30)
T.			1 (8)					1 (22)			1 (52)
RP								1 (54)			
GP	1 (5,000)										
GV				1 (3)	1 (2)					1 (68)	
L.			2 (164)	1 (105)	2 (9)					2 (125)	1 (70)
SS								1 (77)			
DN								1 (10)		1 (35)	
BW			1 (21)								1 (20)
BA			1 (5)	1 (17)						1 (178)	
CU			2 (19)							2 (76)	
RK			2 (11)		1 (9)			1 93)		1 (2)	1 (54)
BH		1 (28)	1 (440)					2 (145)		1 (21)	
CM		1 (6)	4 (105)					2 (22)			
LB			3 (210)					1 (20)			


0L553
0L556
0L569
0L570
0L571
0L573
0L574
0L810
0L350
0L555
0L572
Legend
Ballymacoda Bay Count Subsites
OSi Discovery Series County Boundary
Number of roosting birds/roost size
RANGE
1-49
50-99
100-199
200-299
500-749
c. 5000
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Ballymacoda Bay
Roost Location Map
Data collected during
the roost survey on 01/11/2010
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
COUNTY CORK
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Map Version 1
Date: June 2014

APPENDIX 9

Ballymacoda Bay - Activities & Events

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

Legend:	
O	observed or known to occur in or around Ballymacoda Bay.
U	known to occur but unknown area (subsites)/spatial extent; hence all potential subsites are included (e.g. fisheries activities).
H	historic, known to have occurred in the past.
P	potential to occur in the future.
	Grey highlighting refers to activities that have the potential to cause disturbance to waterbirds.

Activity/Event	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
1 Coastal protection, sea defences & stabilisation											
1.1 Linear defences	O	O	O	O	O			O		O	O
1.4 *Spartina* planting/growing			O	O	O					O	O
1.5 Marram grass planting								O			
2. Barrage schemes/drainage											
2.2 Altered drainage/river channel	H		H							H	
6.Pollution											
6.4 Agricultural & forestry effluents	O	O	O	O						O	O
6.7 Solid waste incl. fly-tipping				O							
7. Sediment extraction (marine & terrestial)											
7.4 Removal of beach materials								H		H	
8. Transport & communications											
8.2 Flight path				O				O			
8.3 Bridges & aqueducts	O	O									
8.5 Roads								O	O		
8.6 Car parks					O			O			
12. Tourism & recreation											
12.2 Non-marina moorings			O								
12.4 Caravan parks & chalets								O			
12.15 Angling	O	O	O					O		O	
12.17 Bathing & general beach recreation								O		O	
12.18 Walking, incl. dog walking			O			O	O	O	O	O	
12.19 Birdwatching	O	O	O	O				O		O	O
12.21 4WD, trial & quad bikes								O		O	
12.22 Motorised vehicles	O	O	O	O		O				O	H
12.23 Horse-riding			O				O	O		O	
12.27 Others								O			

Activity/Event	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
13. Wildfowl & hunting											
13.1 Wildfowling	O	O	O	O/H						O	O
13.2 Other hunting-related activities	O	O	O							O	
14. Bait-collecting											
14.1 Digging for lugworms/ragworms							O	O	O	O	
15. Fisheries & Aquaculture											
15.1 Professional passive fishing (e.g. long lining)						U	U	U	U		
15.4 Fish traps & other fixed devices & nets						U	U	U	U		
15.5 Leisure fishing						U	U	U	U		
15.6 Molluscs - hand-gathering								O		O	
15.9 Intertidal aquaculture e.g. trestles								O	O		
16. Agriculture & forestry											
16.1 Saltmarsh grazing/harvesting				H						H	H
16.2 Grazing: intensive (terrestrial)	O	O	O	O				O			
16.3 Grazing: non-intensive (terrestrial)											H
16.4 Sand dune grazing								H		H	
16.5 Stock feeding			O								
16.9 Removal of hedges, scrub				H				H			
16.10 Mowing/grassland cutting	O	O						H			O
16.13 Agricultural land-claim	H				H					H	H
19. Natural events											
19.1 Storms, floods and storm surges	O	O	O	H				O		O	O
19.2 Severe cold weather	O	O	O	O				O		O	O
19.4 Other natural catastrophes										O	

APPENDIX 10

Disturbance Assessment

Scoring system - definitions & rationale

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

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

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

Scoring system – worked example

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

Results - based on records from the 2010/11 Waterbird Survey Programme

Activity/Event	0L350	0L553	0L555	0L556	0L569	0L570	0L571	0L572	0L573	0L574	0L810
8. Transport & communications											
8.2 Flight path				6							
12. Tourism & recreation											
12.18 Walking, incl. dog walking						5	5	6	7	4	
12.22 Motorised vehicles		4	4			4					
12.23 Horse-riding							4				
13. Wildfowl & hunting											
13.2 Shooting								6			
14. Bait-collecting											
14.1 Digging for lugworms/ragworms							3		4		
15. Fisheries & Aquaculture											
15.9 Intertidal aquaculture								5			
19. Natural events											
19.5 Other	5	4	6								