

**Courtmacsherry Bay**  
**Special Protection Area**

**(Site Code 4219)**



**Conservation Objectives**  
**Supporting Document**

**VERSION 1**

National Parks & Wildlife Service

September 2014

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## SUMMARY

This document presents conservation objectives for the non-breeding Special Conservation Interests of Courtmacsherry 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 Courtmacsherry Bay Special Protection Area, as well as introducing the concept of conservation objectives and their formulation.

Part Two provides site designation information for Courtmacsherry 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 Courtmacsherry Bay Special Protection Area**

Courtmacsherry Bay SPA is located approximately 12 km south of Bandon and immediately east of the village of Timoleague in west Co. Cork. The site, which is largely estuarine in nature, consists of the drowned valley of the Argideen River which opens out at Timoleague into extensive mud and sandflats that extend eastwards. The seaward boundary for the site stretches from Coolmain Point to Barry Point, and the designated site includes both Coolmain Bay and Broadstrand Bay. The site also includes the estuary of the Kilbrittain River in the north-east of the site that supports well-developed saltmarsh.

The site is characterised by a range of littoral sediments, ranging from large expanses of intertidal mudflats characterised by muddy sands, gravelly muds, estuarine type biotopes and areas of saltmarsh in the more sheltered areas of the inner estuary, to slightly more exposed fine sands and mobile sands in areas with greater exposure (MERC, 2012).

The site is of ornithological importance for wintering waders and wildfowl that feed on the mudflats. It supports internationally important numbers of Black-tailed Godwit (*Limosa limosa*) and nationally important numbers of a further eleven species, including three that are listed on Annex I of the E.U. Birds Directive: Great Northern Diver, Golden Plover and Bar-tailed Godwit.

The Site Synopsis for Courtmacsherry 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<sup>1</sup>.

Where relevant, conservation objectives are defined for attributes<sup>2</sup> 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 Courmacsherry Bay Special Protection Area).

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<sup>1</sup> Note that the terms 'conservation condition' and 'conservation status' are used to distinguish between site and the national level objectives respectively.

<sup>2</sup> 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 Courtmacsherry Bay Special Protection Area

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

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

1. During winter the site regularly supports 1% or more of the all-Ireland population of Shelduck (*Tadorna tadorna*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 175 individuals.
2. 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 934 individuals.
3. During winter the site regularly supports 1% or more of the all-Ireland population of Red-breasted Merganser (*Mergus serrator*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 63 individuals.
4. During winter the site regularly supports 1% or more of the all-Ireland population of Great Northern Diver (*Gavia immer*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 27 individuals.
5. During winter the site regularly supports 1% or more of the all-Ireland population of Golden Plover (*Pluvialis apricaria*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 5,759 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 2,713 individuals.
7. 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 1,353 individuals.
8. 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 species within the SPA during the baseline period (1995/96 – 1999/00) was 506 individuals.
9. During winter the site regularly supports 1% or more of the biogeographical population of Bar-tailed Godwit (*Limosa lapponica*). The mean peak number of this Annex I species within the SPA during the baseline period (1995/96 – 1999/00) was 182 individuals.

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<sup>3</sup> Special Conservation Interest species are listed in taxonomic order.

<sup>4</sup> '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.

10. 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 1,357 individuals.
11. During winter the site regularly supports 1% or more of the biogeographical 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 2,727 individuals.
12. During winter the site regularly supports 1% or more of the biogeographical 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 2,226 individuals.
13. The wetland habitats contained within Courtmacsherry 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 Courtmacsherry Bay Special Protection Area, plus site importance at national, regional and county scale**

Special Conservation Interests	Annex I species	Baseline Population <sup>a</sup>	Population status at baseline	National Importance Rank <sup>1</sup>	Regional Importance Rank <sup>2</sup>	County Importance Rank <sup>3</sup>
Shelduck ( <i>Tadorna tadorna</i> )		175	All-Ireland Importance	15	3	2
Wigeon ( <i>Anas penelope</i> )		934	All-Ireland Importance	2	1	1
Red-breasted Merganser ( <i>Mergus serrator</i> )		63	All-Ireland Importance	9	2	2
Great Northern Diver ( <i>Gavia immer</i> )	Yes	27	All-Ireland Importance	4	1	1
Golden Plover ( <i>Pluvialis squatarola</i> )	Yes	5,759	All-Ireland Importance	8	3	2
Lapwing ( <i>Vanellus vanellus</i> )		2,713	All-Ireland Importance	22	6	5
Dunlin ( <i>Calidris alpina</i> )		1,353	All-Ireland Importance	22	5	4
Black-tailed Godwit ( <i>Limosa limosa</i> )		506	International Importance	12	5	5
Bar-tailed Godwit ( <i>Limosa lapponica</i> )		182	All-Ireland Importance	21	5	3
Curlew ( <i>Numenius arquata</i> )		1,357	All-Ireland Importance	4	1	1
Black-headed Gull ( <i>Chroicocephalus ridibundus</i> )		2,727	All-Ireland Importance	5	2	2
Common Gull ( <i>Larus canus</i> )		2,226	All-Ireland Importance	2	1	1
Other conservation designations associated with the site <sup>b</sup>	<b>SAC</b>	<b>RAMSAR SITE</b>	<b>IMPORTANT BIRD AREA (IBA)</b>	<b>WILDFOWL SANCTUARY</b>	<b>OTHER</b>	<b>OTHER</b>
	SAC 001230	Yes	Yes		pNHA	

<sup>a</sup> Baseline data are the 5-year mean peak counts for the period 1995/96 – 1999/00 (I-WeBS).

<sup>b</sup> Note that other designations associated with Courtmacsherry Bay may relate to different areas and/or some of these areas may extend outside the SPA boundary.

<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> 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 COURTMACSHERRY BAY SPA

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

The overarching Conservation Objective for Courtmacsherry 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 Courtmacsherry 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 Courtmacsherry 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.<sup>5</sup> Waterbird populations are deemed to be unfavourable when they have declined by 25% or more, as assessed by the most recent population trend analysis.<sup>6</sup>
- 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.<sup>7</sup>

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).

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<sup>5</sup> Note that 'population' refers to site population (numbers wintering at the site) rather than the species biogeographic population.

<sup>6</sup> Population trend analysis is presented in Section 4.

<sup>7</sup> 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 Courtmacsherry 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 **1,299 ha**, other than that occurring from natural patterns of variation.

The boundary of Courtmacsherry 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 Courtmacsherry Bay SPA this broad category is estimated to be **749 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.

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 Courtmacsherry Bay SPA this is estimated to be **443 ha**. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing<sup>8</sup> 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 Courtmacsherry Bay SPA this is estimated to be **107 ha**. Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species.

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

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<sup>8</sup> Loafing can be described as any behaviour not connected with breeding or feeding, and includes preening and resting.

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

<b>Objective 1:</b>				
<i>To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Courtmacsherry Bay SPA, which is defined by the following list of attributes and targets:</i>				
<b>Parameter</b>	<b>Attribute</b>	<b>Measure</b>	<b>Target</b>	<b>Notes</b>
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.
<b>Objective 2:</b>				
<i>To maintain the favourable conservation condition of the wetland habitat at Courtmacsherry Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets:</i>				
<b>Parameter</b>	<b>Attribute</b>	<b>Measure</b>	<b>Target</b>	<b>Notes</b>
Area	Wetland habitat	Area (ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1,299 ha, other than that occurring from natural patterns of variation.	The wetland habitat area was estimated as 1,299 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 Courtmacsherry Bay SPA

Non-breeding waterbirds are counted at Courtmacsherry Bay each winter as part of the Irish Wetland Bird Survey (I-WeBS). The dataset spans the period 1994/95 to 2010/11 and with the exception of 1994/95 the site has been covered in six or seven months of each season. 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, and also the autumn and spring passage periods when total waterbird numbers may be enhanced by staging/stopover birds<sup>9</sup>.

During I-WeBS, the site is subdivided into three count areas: Courtmacsherry Estuary, Broadstrand Bay, and Dunworley Bay, and all are within the SPA. Note however that the SPA area and the I-WeBS count area are not coincident. Information on I-WeBS and other waterbird surveys is given in Appendix 2.

Table 4.1 presents population<sup>10</sup> data for the non-breeding waterbird SCI species of Courtmacsherry Bay. Annual maxima were identified and used to calculate a mean peak for each species. The baseline period was 1995/96 – 1999/00 while the recent average relates to the five-year period 2006/07 – 2010/11. 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 & Prÿs-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).<sup>11</sup>

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<sup>9</sup> 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).

<sup>10</sup> Note that 'population' refers to site population (numbers wintering at the site) rather than a species' biogeographic population.

<sup>11</sup> Current threshold of significance is 1,000 for Black-headed Gull and 500 for Common Gull (Crowe, 2005).

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

Site Special Conservation Interests (SCIs)	Baseline Period <sup>1</sup> (1995/96 – 1999/00)	Recent Site Data <sup>2</sup> (2006/07 – 2010/11)
Shelduck ( <i>Tadorna tadorna</i> )	175 (n)	165 (n)
Wigeon ( <i>Anas penelope</i> )	934 (n)	1,075 (n)
Red-breasted Merganser ( <i>Mergus serrator</i> )	63 (n)	19
Great Northern Diver ( <i>Gavia immer</i> )	27 (n)	23 (n)
Golden Plover ( <i>Pluvialis squatarola</i> )	5,759 (n)	528
Lapwing ( <i>Vanellus vanellus</i> )	2,713 (n)	740
Dunlin ( <i>Calidris alpina</i> )	1,353 (n)	870 (n)
Black-tailed Godwit ( <i>Limosa limosa</i> )	506 (i)	625 (i)
Bar-tailed Godwit ( <i>Limosa lapponica</i> )	182 (n)	86
Curlew ( <i>Numenius arquata</i> )	1,357 (n)	496 (n)
Black-headed Gull ( <i>Chroicocephalus ridibundus</i> )	2,727 (n)	1,048 (n)
Common Gull ( <i>Larus canus</i> )	2,226 (n)	631 (n)

<sup>1</sup>Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00;

<sup>2</sup>recent site data is the 5-year mean peak for the period 2006/07 – 2010/11 (I-WeBS).

(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 Courtmacsherry 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 which include data across a longer time period; 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 and Common Gull because gulls are not monitored routinely during I-WeBS. Similarly, indices were not calculated for Great Northern Diver because this species is difficult to monitor effectively from land-based vantage points; being detected only when located sufficiently close to shore and/or during suitable weather conditions. For these species 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 Courtmacsherry Bay SPA**

Special Conservation Interests (SCIs)	Site Population Trend <sup>1</sup> 14 Yr	Site Population Trend <sup>2</sup> 5 Yr	Population change <sup>3</sup>
Shelduck ( <i>Tadorna tadorna</i> )	- 11	+ 46	
Wigeon ( <i>Anas penelope</i> )	+ 24	+ 3	
Red-breasted Merganser ( <i>Mergus serrator</i> )	- 44	+ 25	
Great Northern Diver ( <i>Gavia immer</i> )	-	-	- 16
Golden Plover ( <i>Pluvialis squatarola</i> )	- 92	- 81	
Lapwing ( <i>Vanellus vanellus</i> )	- 78	- 59	
Dunlin ( <i>Calidris alpina</i> )	- 29	- 12	
Black-tailed Godwit ( <i>Limosa limosa</i> )	+ 76	+ 24	
Bar-tailed Godwit ( <i>Limosa lapponica</i> )	- 40	- 18	
Curlew ( <i>Numenius arquata</i> )	- 70	- 23	
Black-headed Gull ( <i>Chroicocephalus ridibundus</i> )	-	-	- 62
Common Gull ( <i>Larus canus</i> )	-	-	- 72

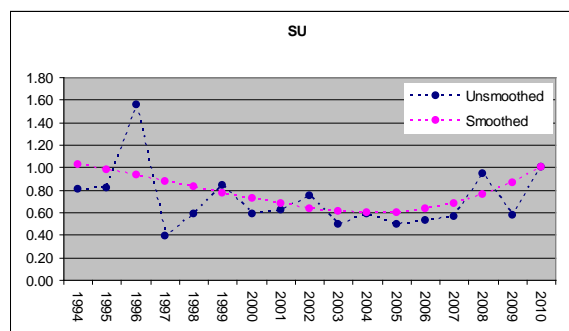
<sup>1</sup>Site population trend analysis: 14-year period = 1995/96–2009/10

<sup>2</sup>Site population trend analysis: 5 yr = 2004/05 – 2009/10.

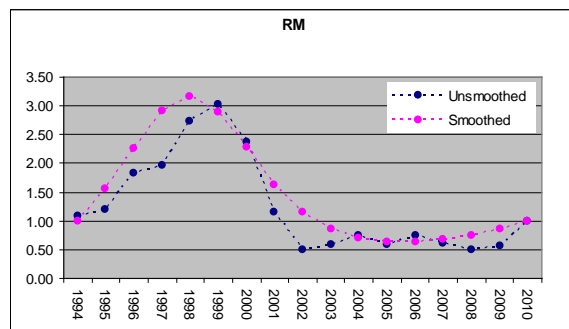
<sup>3</sup>Site population change based on two five-year – means (1995/96 – 1999/00 and 2006/07 – 2010/11).

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<sup>12</sup>); 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.

**Shelduck** – the smoothed trend highlights that numbers of Shelduck at Courtmacsherry Bay have declined steadily since I-WeBS began, but with a recovery evident since 2006/07. Nationally, numbers have shown a slight but steady decline since the mid 1990's, consistent with the trend observed in Britain. The all-Ireland trend is stable.

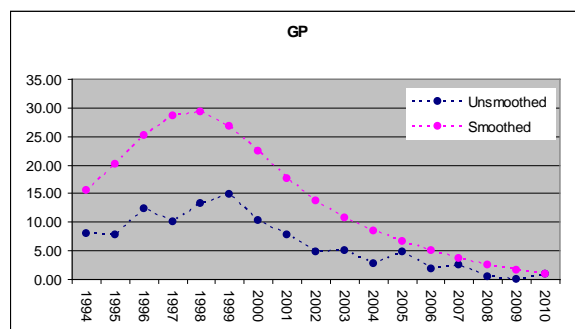


**Red-breasted Merganser** – after increasing markedly in the early part of the data period, numbers fell sharply to a low in 2002/03. Since then numbers have remained relatively stable. This trend somewhat reflects that seen at national level while in Britain and Northern Ireland a decline has been evident since the mid 1990's although this has slowed in recent seasons.

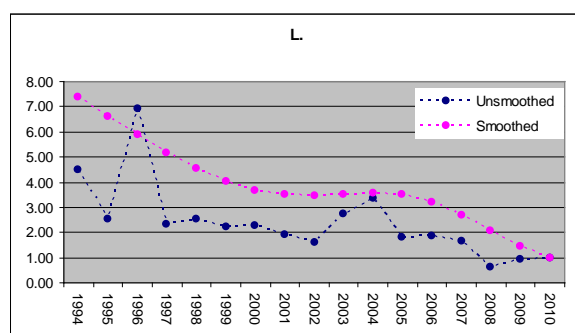


<sup>12</sup> National trends presented in Boland & Crowe (2012) update those previously shown in Crowe (2005).

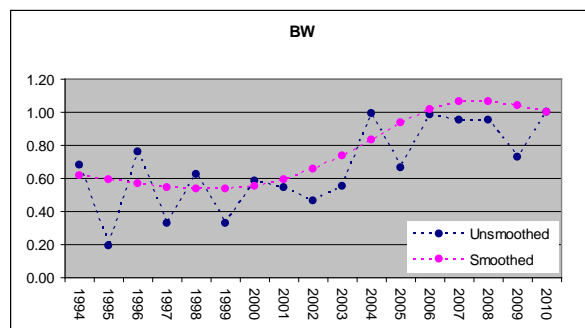
**Golden Plover** – similar to Red-breasted Merganser, numbers of Golden Plover at Courtmacsherry Bay increased during early seasons. However this was followed by a steady decline. This trend is at variance with the national trend, numbers having been largely stable since the mid 1990's. The all-Ireland trend however is for decline.



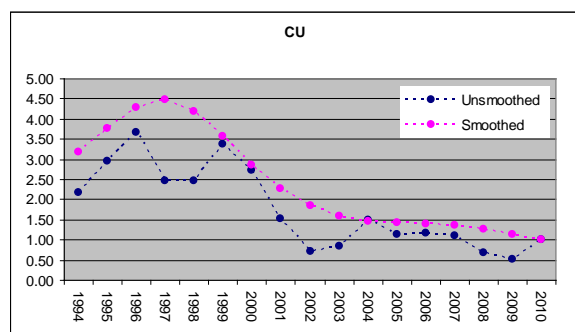
**Lapwing** – the smoothed trend highlights a progressive decrease in numbers throughout I-WeBS, consistent with the long-term national and all-Ireland trends for decline.



**Black-tailed Godwit** – a trend for increasing numbers at Courtmacsherry Bay is consistent with that observed at national and all-Ireland level, and in Britain and Northern Ireland.



**Curlew** – numbers have declined at Courtmacsherry Bay since the mid to late 1990's. Nationally, 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 since shown a trend for steady decline.



### 4.3 Courtmacsherry 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<sup>13</sup>. 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.

For Black-headed Gull, Common Gull and Great Northern Diver, conservation condition has been assigned using % population change (See Section 4.2).

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

With regards the 12 waterbird species of Special Conservation Interest listed for Courtmacsherry Bay SPA, and based on the population trend for the site, it has been determined that (Table 4.3):-

1. 5 species are currently considered as **Highly Unfavourable** (Golden Plover, Lapwing, Curlew, Black-headed Gull and Common Gull);
2. 3 species are currently considered as **Unfavourable** (Red-breasted Merganser, Dunlin and Bar-tailed Godwit);
3. 2 species are currently considered as **Intermediate Unfavourable** (Shelduck and Great Northern Diver);
4. 2 species are currently considered as **Favourable** (Wigeon and Black-tailed Godwit).

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

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

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

Special Conservation Interests	BoCCI Category <sup>a</sup>	Site Population Trend <sup>b</sup>	Site Conservation Condition	Current all-Ireland Trend <sup>c</sup>	Current International Trend <sup>d</sup>
Shelduck	Amber	- 11	(Intermediate) Unfavourable	Stable	Increasing
Wigeon	Red	+ 24	Favourable	Declining	Stable
Red-breasted Merganser	Green	- 44	Unfavourable	Stable	n/c
Great Northern Diver	Amber	- 16	(Intermediate) Unfavourable	-	n/c
Golden Plover	Red	- 92	Highly Unfavourable	Declining	Decline
Lapwing	Red	- 78	Highly Unfavourable	Declining	Stable
Dunlin	Red	- 29	Unfavourable	Declining	Stable
Black-tailed Godwit	Amber	+ 76	Favourable	Increasing	Increasing
Bar-tailed Godwit	Amber	- 40	Unfavourable	Stable	Increasing
Curlew	Red	- 70	Highly Unfavourable	Declining	Declining
Black-headed Gull	Red	- 62	Highly Unfavourable	-	n/c
Common Gull	Amber	- 72	Highly Unfavourable	-	Decline?

<sup>a</sup>After Colhoun & Cummins, 2013; <sup>b</sup> Site population trend analysis; see Table 4.2; <sup>c</sup>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); <sup>d</sup> 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 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 Courtmacsherry Bay SPA.

Section 5.2 provides selected ecological summary information for non-breeding waterbirds of Courtmacsherry 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 Courtmacsherry 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 May 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 78 waterbird species that were recorded at Courtmacsherry 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<sup>14</sup> or species that use the site at certain times only (e.g. as a cold weather refuge).

During the I-WeBS period 1995/96 – 2010/11, 19 waterbird species occurred on a regular basis<sup>15</sup> at Courtmacsherry Bay in addition to the listed SCI species. These additional regularly-occurring species are listed in Table 5.1.

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<sup>14</sup> Non-breeding season is defined as September – March inclusive.

<sup>15</sup> Regular is defined as a species that has occurred in 14 out of the 16-year data period.

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

Species*	Baseline Data Period <sup>1</sup> (1995/96 – 1998/99)	Recent Site Average <sup>2</sup> (2006/07 – 2010/11)
Mute Swan ( <i>Cygnus olor</i> )	28	23
Teal ( <i>Anas crecca</i> )	380	368 (n)
Mallard ( <i>Anas platyrhynchos</i> )	112	89
Red-throated Diver ( <i>Gavia stellata</i> )	17	3
Cormorant ( <i>Phalacrocorax carbo</i> )	71	33
Grey Heron ( <i>Ardea cinerea</i> )	16	10
Little Egret ( <i>Egretta garzetta</i> )	4	27 (n)
Oystercatcher ( <i>Haematopus ostralegus</i> )	610	430
Ringed Plover ( <i>Charadrius hiaticula</i> )	44	86
Grey Plover ( <i>Pluvialis squatarola</i> )	60	24
Knot ( <i>Calidris canutus</i> )	48	161
Snipe ( <i>Gallinago gallinago</i> )	20	8
Greenshank ( <i>Tringa nebularia</i> )	26 (n)	25 (n)
Redshank ( <i>Tringa totanus</i> )	227	248
Turnstone ( <i>Arenaria interpres</i> )	25	29
Lesser Black-backed Gull ( <i>Larus fuscus</i> )	199	384
Herring Gull ( <i>Larus argentatus</i> )	181	294
Great Black-backed Gull ( <i>Larus marinus</i> )	155	102

Grey shading denotes an Annex I species; (n) = numbers of all-Ireland importance (as per Crowe et al. (2008) (baseline period) and Crowe & Holt (2013) (recent time period).

<sup>1</sup> Baseline data is the 5-year mean peak for the period 1995/96 – 1999/00 (I-WeBS); <sup>2</sup> recent data is the 5-year mean peak for the period 2006/07 – 2010/11 (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 Courtmacsherry Bay SPA. Information is provided for the following categories<sup>16</sup>:-

- 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

<sup>16</sup> Notes to aid the understanding of categories and codes used in Table 5.2 are provided in the table sub text.



may utilise wetland habitats in different ways. For example, while the majority of wading birds forage across exposed tidal flats, species such as Lapwing and Golden Plover are considered to be 'terrestrial waders,' typically foraging across grassland and using tidal flats primarily for roosting. When tidal flats are covered at high water, intertidally-foraging waterbirds are excluded and many 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 <sup>A</sup>	Trophic Guild <sup>B</sup>	Food/Prey Requirements <sup>C</sup>	Principal supporting habitat within site <sup>D</sup>	Ability to utilise other/alternative habitats <sup>E</sup>	Site Fidelity <sup>F</sup>
Shelduck <i>Tadorna tadorna</i>	Anatidae (shelducks)	Localised	1, 5	Wide	Intertidal mud and sand flats	3	High
Wigeon <i>Anas penelope</i>	Anatidae (dabbling ducks)	Widespread	1, 5	Narrower	Intertidal mud and sand flats	1	Weak
Red-breasted Merganser <i>Mergus serrator</i>	Anatidae (sea ducks)	Localised	2	Highly specialised	Sheltered & shallow subtidal	1	Unknown
Great Northern Diver <i>Gavia immer</i>	Gaviidae (divers)	Localised	3	Highly specialised	Sheltered & shallow subtidal	1	Unknown
Golden Plover <i>Pluvialis apricaria</i>	Charadriidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	2	Moderate
Lapwing <i>Vanellus vanellus</i>	Charadriidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	Moderate
Dunlin <i>Calidris alpina</i>	Scolopacidae (wading birds)	Intermediate	4	Wide	Intertidal mud and sand flats	3	High
Black-tailed Godwit <i>Limosa limosa</i>	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	2	High
Bar-tailed Godwit <i>Limosa lapponica</i>	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	Moderate
Curlew <i>Numenius arquata</i>	Scolopacidae (wading birds)	Widespread	4	Wide	Intertidal mud and sand flats	2	High
Black-headed Gull <i>Chroicocephalus ridibundus</i>	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal flats & sheltered & shallow subtidal	2	Moderate
Common Gull <i>Larus canus</i>	Lariidae (gulls)	n/c	1, 2, 4, 6, 7	Wide	Intertidal mud and sand flats & sheltered & shallow subtidal	2	Moderate

<sup>A</sup> 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).

<sup>B</sup> 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.

<sup>C</sup> 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).

<sup>D</sup> Principal supporting habitat present within Courtmacsherry Bay (main habitat used when foraging with the exception of Golden Plover and Lapwing (roosting)).

<sup>E</sup> 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.

<sup>F</sup> 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 Courtmacsherry 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) were undertaken.<sup>17</sup> Waterbirds were counted within a series of 17 count subsites (refer to Appendix 6). It should be noted that the count subsite boundaries and SPA boundaries are not coincident.

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. <i>Spartina</i> 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. The terrestrial category was also used for non-tidal waterbodies such as lagoons and lakes.

In addition to the main survey programme described above, two high tide roost surveys were undertaken on 02/11/10 and 17/02/11. During these surveys 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 Courtmacsherry 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.

<sup>17</sup> Low tide counts on 10/10/10, 06/11/10, 10/12/10 & 07/02/11 plus a high tide count on 12/01/11.

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

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

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 selected species and 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<sup>18</sup> 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).

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<sup>18</sup> Note that birds within supratidal or terrestrial habitat are not included within these maps.

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 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 48 waterbird species were recorded during the 2010/11 survey programme at Courtmacsherry 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; 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 Red-breasted Merganser and Great Northern Diver that were absent on 10/10/10; and Golden Plover that was not recorded during the final two low tide surveys (10/12/10 and 07/02/11). 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 65% (Black-headed Gull) to just 6% (Golden Plover). Only three species (Black-headed Gull, Curlew and Black-tailed Godwit) were distributed across more than half of the count subsites.

Average percentage area occupancy is defined as the average proportion of the whole site area that a species occurred in during low tide counts. Although this is a broad calculation across all habitat zones it presents some indication of the range of a species across the site as a whole. In line with the very low use of subsites, the Golden Plover was only recorded from 10% of the survey area. Most widespread was the Black-headed Gull and this was the only species to distribute across more than half of the survey area. Nine SCI species, on average, were recorded from less than 40% of the survey area (Table 5.4).

**Table 5.4 Courtmacsherry Bay 2010/2011 waterbird surveys – summary data**

Site Special Conservation Interests (SCIs)	Peak number - LT surveys <sup>i</sup>	Peak number - HT survey <sup>ii</sup>	Average subsite % occupancy <sup>iii</sup>	Average % area occupancy <sup>iii</sup>
Shelduck	183 (n)	302 (n)	16 (7)	14 (8)
Wigeon	1,355 (n)	2,052 (n)	44 (15)	30 (14)
Red-breasted Merganser	13	4	12 (6)	17 (16)
Great Northern Diver	43	8	22 (9)	36 (24)
Golden Plover	58	0	6**	10**
Lapwing	326	361	32 (12)	14 (10)
Dunlin	877	744	25 (15)	16 (13)
Black-tailed Godwit	595 (i)	429 (n)	59 (5)	42 (2)
Bar-tailed Godwit	172 (n)	230 (n)	38 (16)	32 (10)
Curlew	313	153	62 (3)	43 (4)
Black-headed Gull	1,134(n)	302	65 (8)	57 (3)
Common Gull	246	126	37 (13)	40 (14)

(i) denotes numbers of international importance (after Wetlands International, 2012); (n) denotes numbers of all-Ireland importance (1% thresholds; 1999/00 – 2003/04 Crowe et al. 2008); (l) denotes numbers of international importance (after Wetlands International, 2012). <sup>i</sup> 4 low-tide counts undertaken on 10/10/10, 06/11/10, 10/12/10 & 07/02/11; <sup>ii</sup> High-tide count undertaken on 12/01/11; <sup>iii</sup> Mean (± s.d.) averaged across the four low tide surveys with the exception of Red-breasted Merganser and Great Northern Diver (averaged over three LT counts) and Golden Plover\*\* (peak shown).

Whole site species richness (total number of species) ranged between 28 species (10/10/10) to 37 species (10/12/10) during low tide surveys and 36 species were recorded during the high tide survey on 16/01/11.

During low tide surveys, just under half of the subsites (8) subsites supported, on average ten or more species. Average subsite species richness ranged from one species (0L407 Pool) to 19 species (0L409 Flaxfort Strand). 0L409 also recorded the highest number of species (21) during the high tide survey. 14 out of the total 17 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)
0L406	Ummera	9 (5)	7	15 (L)
0L407	Pool	1 (1)	2	2 (H)
0L409	Flaxfort Strand	19 (4)	21	22 (L)
0L413	Bateman's Bridge	4 (1)	3	5 (L)
0L418	Broadstrand	6 (2)	11	11 (H)
0L419	Garraneragh Strand	13 (2)	14	16 (L)
0L420	Garraneteen Strand	16 (3)	17	19 (L)
0L433	Coolmain Bay	8 (2)	9	11 (L)
0L434	Courtmacsherry Harbour	12 (4)	5	17 (L)
0L435	Barry's Point	3 (2)	8	8 (H)
0L440	Coolmain Pt to Curry's Point	3 (2)	5	6 (L)
0L441	Clooncalla South	13 (2)	6	15 (L)
0L442	Kilnamanagh Woods to Abbey	8 (3)	9	10 (L)
0L443	Burren	16 (4)	13	20 (L)
0L444	Peter's Point	18 (4)	15	23 (L)
0L445	Creggane	7 (6)	12	13 (L)
0L446	Friary	14 (4)	8	18 (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 Courtmacsherry Bay. Waterbird distribution dot-density maps are provided in Appendix 7; summary roost data are presented in Appendix 8.

**Table 5.6 (a) Courtmacsherry 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).**

Species	SU	WN	RM	ND	GP	L.	DN	BW	BA	CU	BH	CM
Subsites												
0L406		L						M		M	H	
0L407												
0L409		H				M	H	M	H	V	V	V
0L413						L		L		L	L	
0L418		L		V							M	M
0L419	V	V				M	L	M	M	H	M	H
0L420	H	H				H	H	V	V	H	M	M
0L433				M							L	M
0L434		L	V	H				L	M	M	L	L
0L435				H							M	L
0L440			M	V								
0L441	M	H	V			V	V	V	H	M	M	M
0L442	V					L	V	V	V	V	L	
0L443	M	V				H	L	M	H	V	H	V
0L444	V	V	H		V	L	V	H	V	H	V	H
0L445		M				V	M	V		H	H	H
0L446		L	V		V	V	V	H	H	M	V	V

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

Species	SU	WN	RM	ND	GP	L.	DN	BW	BA	CU	BH	CM	
Subsites													
0L406					<i>not recorded</i>					8			
0L407												8	
0L409		4					4		2	3	1	1	
0L413													
0L418		10										5	4
0L419	3	6					2	5	4		5	6	3
0L420	4	5					3		2	3	4	3	2
0L433											7	7	4
0L434				1								9	
0L435				3				6			9		
0L440				2									
0L441		8	1								2		
0L442	2	3						6	1				
0L443		2	2				4	1		1	1		
0L444	1	1							3		6	10	7
0L445		7					1	3			9	4	6
0L446		9				5	2		4		2		



**Table 5.6 (c) Courtmacsherry Bay Subsite assessment – total numbers foraging intertidally<sup>I</sup> and subtidally<sup>II</sup>**

(L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods)

Species	SU <sup>I</sup>	WN <sup>I</sup>	WN <sup>II</sup>	RM <sup>II</sup>	ND <sup>II</sup>	GP <sup>I</sup>	L <sup>I</sup>	DN <sup>I</sup>	BW <sup>I</sup>	BA <sup>I</sup>	CU <sup>I</sup>	BH <sup>I</sup>	BH <sup>II</sup>	CM <sup>I</sup>
Subsites														
0L406		V	L						M		H		V	
0L407														
0L409			H					V	H	V	V			V
0L413									L		L			
0L418		V			V									M
0L419	V		V				V	L	V	H	H			
0L420	H		M					V	V	H	L			
0L433					H									
0L434				V	V				M	M	L		V	M
0L435					H									
0L440				M	V									
0L441	M		M	V			V		H	H	M		H	
0L442	V						H	V	V	V	V	M		
0L443			V				H		M	H	H	V		H
0L444	V	V	V	H		V		V	H	V	H	H	V	H
0L445		H						M	L		M			
0L446			H	V			V	L	M	M	L			

**Table 5.6 (d) Courtmacsherry Bay Subsite assessment – ranked peak low tide intertidal foraging densities - LT surveys (selected species)**

Species	SU	DN	BW	BA	CU
Subsites					
0L406			6		2
0L407					
0L409		7		5	8
0L413					
0L418					
0L419	4	6	4	1	1
0L420	2	4	2	9	10
0L433					
0L434			9	8	
0L435					
0L440					
0L441	5		3	2	3
0L442	3	2	1	7	4
0L443		8	8	3	6
0L444	1	3	10	6	9
0L445		1	7		5
0L446		5	5	4	7

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

Species	SU <sup>I</sup>	WN <sup>I</sup>	WN <sup>II</sup>	RM	ND <sup>II</sup>	GP <sup>I</sup>	L <sup>I</sup>	DN <sup>I</sup>	BW <sup>I</sup>	BA <sup>I</sup>	CU <sup>I</sup>	BH <sup>I</sup>	BH <sup>II</sup>	CM <sup>I</sup>	CM <sup>II</sup>	
Subsites																
0L406				not recorded							L					
0L407																
0L409		V	L							H		V	V			
0L413								M		H			L			
0L418						V							H		V	
0L419			V					M					H		H	
0L420			H					V			V	V	H		H	
0L433													L		V	
0L434			V			H					H	M	L			
0L435						M							L			
0L440																
0L441			H					V	V	V			H		M	
0L442													H		L	
0L443	V		V					H		V		H		V		V
0L444	V	V						M				L		V		
0L445		V						V		V		V	V		H	
0L446		H				V	V	V	V	V	H	V		V		

**Table 5.6 (f) Courtmacsherry Bay Subsite assessment – highest rank obtained (roosting/other behaviour) during the HT survey (Intertidal<sup>I</sup>, Subtidal<sup>II</sup>)**

Species	SU <sup>II</sup>	WN <sup>II</sup>	RM	ND	GP	L <sup>I</sup>	DN <sup>I</sup>	BW	BA <sup>I</sup>	CU <sup>I</sup>	BH <sup>I</sup>	BH <sup>II</sup>	CM <sup>II</sup>				
Subsites																	
0L406			not recorded	not recorded	not recorded			not recorded									
0L407															3		
0L409		2													1	1	
0L413																	
0L418		7													2	2	
0L419	3	5															
0L420	4	4															
0L433																	
0L434															3		
0L435											3			1			
0L440																	
0L441																	
0L442	2	3															
0L443																	
0L444	1	1													4		
0L445		6									2			1	2		
0L446						1	1		1		1						

## **Courtmacsherry 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 (2012) and NPWS (2014).

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

### Shelduck *Tadorna tadorna* - Family (group): Anatidae (ducks)

The Shelduck has five known populations which breed across temperate Eurasia. The northwest Europe population breeds and winters along coasts of Britain, Ireland, Scandinavia, the Baltic and continental Europe. Although a breeding species in Ireland, Shelducks undertake a moult migration each autumn. Large moult gatherings occur along traditionally used areas of the north German coast of the Wadden Sea although several sites in Britain have also become recognised as important moulting areas such as Bridgewater Bay (Severn Estuary), the Humber Estuary, the Wash, and the Firth of Forth. Following the moult, the ducks then migrate to wintering areas.

#### Numbers

Whole site numbers of Shelduck rose from just three in October to a peak of 183 individuals on 10/12/10. A total 302 Shelduck were counted during the high tide survey (12/01/11). The two final low tide counts plus the high tide count surpassed the threshold of all-Ireland importance.

The peak I-WeBS count recorded in the 2010/11 season was 227 Shelduck, recorded in the month of January.

Shelduck were recorded in six subsites overall (0L419, 0L420, 0L441, 0L442, 0L443 and 0L444). 0L442 (Kilnamanagh Woods to Abbey) and 0L444 (Peter's Point) were the only subsites to record the species in three low tide surveys plus the high tide survey. 0L444 recorded the subsite peak count of 139 Shelduck on 10/12/10.

#### Foraging Distribution

Shelducks can forage in a variety of ways from scything their bill through wet mud on exposed tidal flats, to dabbling and scything in shallow water and up-ending in deeper waters (Thompson, 1981). They can therefore forage throughout the tidal cycle. While the mud snail *Peringia (Hydrobia) ulvae* is considered a favoured prey of Shelduck (Olney, 1965; Bryant & Leng, 1975; Viain et al. 2011), Shelducks take a variety of small invertebrates.

At Courtmacsherry Bay Shelducks foraged intertidally in six subsites (0L419, 0L420, 0L441, 0L442, 0L443 and 0L444). 0L442 (Kilnamanagh Woods to Abbey) held peak numbers on 06/11/10 (13 individuals); thereafter 0L444 (Peter's Point) held peak numbers with 139 and 103 Shelduck on 10/12/10 and 07/02/11 respectively. The benthic community of both 0L442 and 0L444 has been assigned to the community complex 'sand to mixed sediment with oligochaetes'. While the substrate is variable and ranges from fine to medium sand to mixed and coarse sediments, a higher proportion of fine material (silt-clay) occurs along the southern shore of 0L442 and 0L444. The distinguishing species of this community are oligochaetes of the family Enchytraeidae and *Tubificoides benedii*, the polychaetes *Scolecopsis (Scolecopsis) squamata*, *Capitella* sp. and *Eteone longa*, the gastropod *Peringia (Hydrobia) ulvae* and the bivalve *Mytilus edulis*.

Results of the 2010/11 survey show remarkable consistency with an earlier study undertaken during the winter of 2001/02. Murphy et al. (2006) reported highest densities of foraging Shelduck in their count subsites that fall within 0L444, and where 2010/11 flock maps show largest flocks of foraging individuals. These areas were found to support good densities of the mud snail *Peringia (Hydrobia) ulvae*. However, while *Peringia (Hydrobia) ulvae* was recorded in 0L444 in recent sampling (MERC, 2012), highest numbers of this snail were recorded from 0L420 (Garraneleen strand), where Shelduck were recorded in relatively low numbers during the 2010/11 surveys.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of foraging Shelduck in subsites 0L442 and 0L444 with a similar pattern the following winter (2012/13) when peak numbers foraged within 0L444.

Subtidal foraging was recorded just twice – 15 individuals in 0L444 (Peter's Point) on 07/02/11, and nine individuals in 0L443 (Burren) on 10/12/10.

The peak intertidal foraging density was recorded for 0L444 (Peter's Point) ( $2.5 \text{ Shelduck ha}^{-1}$ ). This was the only subsite to record a foraging density of  $>1 \text{ Shelduck ha}^{-1}$ . The average whole site foraging density was  $0.2 \text{ individuals ha}^{-1}$ .

#### Roosting Distribution

Shelduck were not recorded in roosting/other behaviour during low tide surveys with the exception of 12 individuals in 0L444 (Peter's Point) on 07/02/11 and six individuals within 0L443 (Burren) on 10/12/10.

302 Shelduck roosted subtidally during the high tide survey, the majority of these (74%) in 0L444 (Peter's Point)

The November 2010 roost survey (02/11/10) recorded two flocks of roosting/other Shelduck. One subtidal flock recorded nearly two hours before high water were positioned on the boundary between 0L442 (Kilnamanagh Woods to Abbey) and 0L444 (Peter's Point). A second subtidal flock were in 0L444 two and a half hours later (therefore possibly the same birds as recorded previously); these Shelduck associated with Teal (116) and Mallard (3).

The February 2011 roost survey recorded roosting/other individuals in four subsites (0L420, 0L441, 0L442 and 0L444). The largest flock (48 individuals) was in 0L442 (Kilnamanagh Woods to Abbey) and positioned subtidally. Two further flocks of 28 and two individuals were also recorded. 14 Shelduck roosted supratidally (saltmarsh) in 0L420, these birds recorded alongside 41 Bar-tailed Godwits and 33 Curlew. A further eight individuals roosted subtidally in 0L444 and a single individual roosted terrestrially in fields to the north of subsite 0L441.

### 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 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 153 on 10/10/10 to a low tide peak count of 1,355 on 10/12/10. However the peak count of 2,052 individuals was recorded during the high tide count on 12/01/11. All whole site counts with the exception of 10/10/10 exceeded the all-Ireland threshold.

The peak I-WeBS count recorded in the 2010/11 season was 1,478 Wigeon, recorded in the month of December.

Wigeon was a widespread species, occurring in ten of the total 12 subsites (0L406, 0L409, 0L418, 0L419, 0L420, 0L434, 0L441, 0L442, 0L443, 0L444, 0L445 and 0L446). Three of these (0L419, 0L420 and 0L443) recorded this species in all four low tide surveys plus the high tide survey.

Peak numbers were recorded by 0L419 (Garraneragh strand) (10/10/10), 0L443 (Burren) (06/11/10 and 10/12/10) and 0L444 (Peter's Point) (07/02/11). The peak subsite count (839 Wigeon) was recorded within 0L443 on 10/12/10.

#### 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.

A greater number of Wigeon were recorded foraging in subtidal habitats in all surveys. 0L443 (Burren) held peak numbers on 10/10/10 and 10/12/10 and during the high tide survey (12/01/11) with numbers ranked as second highest during the final low tide survey (07/02/11). The subsite peak count of 839 individuals was recorded within this subsite on 10/12/10 when the Wigeon were distributed in large flocks, the largest comprising 360 individuals. Foraging flocks generally were associated with other subtidally-foraging birds such as Teal, Mallard and Gadwall.

0L444 (Peter's Point) held peak numbers on 07/02/11; this the only occasion to record foraging individuals. 0L419 (Garraneragh strand) held peak numbers on 06/11/10 with good numbers in all other low tide surveys. 0L444 is notable for supporting dense mats of green macroalgae (*Ulva* spp).

Intertidal foraging was recorded in 0L406, 0L418, 0L444 and 0L445 on single occasions only; peak numbers of 154 in 0L444 (Peter's Point) on 07/02/11.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded intertidally foraging Wigeon in 0L406, 0L420, 0L441, 0L442 and 0L444. The following winter (2012/13) peak numbers of intertidally foraging individuals were recorded in 0L419 in two low tide surveys.

#### Roosting Distribution

Wigeon were recorded in roosting/other behaviour largely in subtidal habitat. Peak numbers were held by 0L419 (Garraneragh strand) (10/10/10), 0L443 (Burren) (06/11/10), and 0L434 (Courtmacsherry harbour) on 07/02/11 (none recorded roosting on 10/12/10).

1,617 Wigeon roosted subtidally during the high tide survey. 74% of these birds roosted subtidally within 0L444 (Peter's Point) with lower numbers in 0L409, 0L418, 0L419, 0L420, 0L442 and 0L445.

Intertidal roosting/other behaviour was recorded intertidally (generally on single occasions) in the following subsites: 0L409, 0L444, 0L445 and 0L446.

The November 2010 roost survey (02/11/10) recorded nine roosting/other flocks. 0L442 (Kilnamanagh Woods to Abbey) held the greatest number of flocks (3) and the largest single aggregation (540 individuals). At nearly two hours before high water flocks of subtidal Wigeon (flock size 36, 212, 200 & 66, totalling 514 individuals) were positioned at mid level in the subsite. A second count at half an hour after high water recorded a single flock of 540 roosting subtidally in a similar position to that recorded earlier.

The February 2011 roost survey recorded roosting/other individuals in 12 flocks in four subsites (0L409, 0L442, 0L443 and 0L444). All were positioned subtidally and the largest flock (385 birds) were in 0L444; this subsite also supporting five smaller flocks. Three flocks were in 0L442; the largest comprising 76 individuals. 0L409 held two flocks (largest flock 35 individuals) while 0L443 held just one flock of four Wigeon.

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

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

The wintering population is thought to be increased to some extent by the addition of birds from central Europe, eastern Greenland (Robinson, 1999) and Iceland (Scott & Rose, 1996).

**Numbers**

Red-breasted Mergansers were present in all surveys with the exception of the October 2010 low tide survey. Numbers were low overall, a site peak count of 13 individuals on 10/12/10. Four individuals were recorded during the high tide survey (12/01/11).

The peak I-WeBS count recorded in the 2010/11 season was 15 Red-breasted Merganser, recorded in the month of January.

Red-breasted Mergansers were recorded in six subsites overall (0L434, 0L440, 0L441, 0L443, 0L444 and 0L446). All subsites recorded this species just once with the exception of 0L441 (Clooncalla south) that recorded individuals during two low tide surveys plus during the high tide survey, and held the subsite peak count of ten individuals.

**Foraging Distribution**

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

All records of Red-breasted Mergansers were of foraging individuals. Six subsites were used overall (0L434, 0L440, 0L441, 0L443, 0L444 and 0L446) with single observations in each with the exception of 0L441 (Clooncalla south) that recorded individuals during two low tide surveys plus during the high tide survey (ten, four and three individuals respectively).

During the February roost survey (17/02/11), three Red-breasted Mergansers were recorded foraging in 0L442; three foraged in 0L446 and one foraged in 0L443.

**Roosting Distribution**

Red-breasted Mergansers were not recorded in roosting/other behaviour during the main survey programme or during the November (02/11/10) or February (17/02/11) roost surveys.

### Great Northern Diver - Family (group): Gaviidae (divers)

The Great Northern Diver breeds in Canada, parts of the northern United States, Greenland and Alaska with a smaller breeding population in Iceland. The species winters along coasts of Europe and America. During winter, the waters off Britain and Ireland are thought to support individuals from Iceland, Greenland and possibly Canada (Wernham et al. 2002).

The species occurs further offshore than many diver species so obtaining counts and estimating population size is difficult. However, they tend to come closer to shore and into sheltered estuaries during periods of bad weather.

#### Numbers

Great Northern Divers were not present during the October low tide survey; thereafter numbers climbed to a site peak of 43. Eight were recorded during the high tide survey (12/01/11). The peak I-WeBS count recorded in the 2010/11 season was 27 Great Northern Diver, recorded in the month of February.

This diver was recorded in five subsites overall (0L418, 0L433, 0L434, 0L435 and 0L440) and these are all outer bay subsites. 0L418 and 0L434 held the species with most regularity (3-4 surveys). The subsite peak count was 17 individuals in 0L418 (Broadstrand) on 07/02/11.

Note that Great Northern Divers are a species for which survey constraints such as poor visibility and rough sea conditions apply directly. This diver often occurs at considerable distances offshore and out of observation range.

#### Foraging Distribution

Great Northern Divers are primarily fish-eaters although a variety of other prey items can be taken including molluscs and crustaceans. Although generally diving in waters of depths 4m to 10m when foraging (BWPi, 2004), Great Northern Divers can forage successfully in deeper waters and can therefore occur up to 10km offshore. Indeed they tend to forage further offshore than smaller divers although they come closer to shore during periods of bad weather (Wernham et al. 2002).

The species foraged with most regularity (three LT surveys) in 0L434 (Courtmacsherry harbour), the peak number being six individuals. 0L440 (Coolmain Pt to Curry's Point) recorded eight foraging individuals on one occasion.

0L435 (Barry's Point) held low numbers on three occasions while 0L418, 0L433 and 0L440 held low numbers on two occasions each.

During the November roost survey (02/11/10) two Great Northern Divers were recorded foraging in 0L435 (Barry's Point). The February roost survey (17/02/11) recorded seven Great Northern Divers foraging across three subsites with three individuals in both 0L435 and 0L440 and a single individual in 0L434.

A previous survey at the site (Atkins, 2008) found that Great Northern Divers were largely confined to study sections that included the deep water channel, and while this survey did not cover the outer bay areas (subsites 0L433, 0L440 etc..) greatest use was made of an area corresponding to subsite 0L434 (Courtmacsherry harbour).

#### Roosting Distribution

No Great Northern Divers were recorded roosting during the high tide survey or during low tide surveys with the exception of 07/02/11 when a total of 32 individuals were recorded in three subsites: 0L418 (Broadstrand), 0L434 (Courtmacsherry harbour) and 0L435 (Barry's Point); over 50% of these birds in 0L418.

Great Northern Divers were not recorded in roosting/other behaviour during the November roost survey (02/11/10). During the February roost survey (17/02/11), eight Great Northern Divers roosted subtidally in 0L434 and a single bird was recorded in 0L444.

### Golden Plover *Pluvialis apricaria* - Family (group): Charadriidae (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°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

Golden Plover were present in two low tide surveys only (10/10/10 and 06/11/10); site counts of 50 and 58 individuals recorded respectively. No count exceeded the threshold for all-Ireland importance. The absence of the species in later surveys may be attributed to the cold weather spell, with December 2010 reported as the coldest since 1963 (Met Éireann, 2010). The peak I-WeBS count recorded in the 2010/11 season was 290 Golden Plover, recorded in the month of October.

50 individuals were recorded in 0L444 (Peter's Point) on 10/10/10 and 58 individuals were recorded in 0L446 (Friary) on 06/11/10.

#### 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, relatively little is known about their intertidal feeding patterns (Gillings et al. 2006).

One observation of foraging individuals was made - 50 individuals foraged intertidally in 0L444 (Peter's Point) on 10/10/10.

#### Roosting Distribution

One observation of roosting individuals (intertidal) was made – 58 roosted in 0L446 (Friary) on 06/11/10.

Golden Plovers were not recorded in roosting/other behaviour during the November roost survey (02/11/10) or during the February roost survey (17/02/11).

Low tide surveys carried out at Courtmacsherry Bay in the winter 2012/13 (surveys by NPWS Regional Staff) recorded the majority of intertidally roosting Golden Plover in 0L420 with a peak count of 770 individuals on 13/02/13.



### 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

Lapwings were present in all surveys. Low tide numbers peaked in October when a site count of 326 was made. However in December 2010 numbers dropped back to just 50 individuals, likely as a result of the cold weather experienced at this time. Numbers nationally dropped back substantially during this month (Crowe et al. 2012).

Numbers increased to 280 Lapwing on 07/02/11 and 361 were counted during the high tide survey. No whole site count surpassed the threshold of all-Ireland importance. The peak I-WeBS count recorded in the 2010/11 season was 499 Lapwing, recorded in the month of January.

Across the survey programme, Lapwings were recorded within ten subsites (0L409, 0L413, 0L419, 0L420, 0L441, 0L442, 0L443, 0L444, 0L445 and 0L446). 0L419 (Garraneragh strand) and 0L443 (Burren) recorded this wader in all four low tide surveys.

Peak numbers were held by 0L445 (Creggane), 0L446 (Friary), 0L441 (Clooncalla south) and 0L445 for the four respective low tide survey dates. The peak subsite count of 250 Lapwings was recorded for 0L446 (Friary) on 06/11/10.

#### 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).

Small numbers of Lapwings were recorded foraging intertidally across five subsites (0L419, 0L441, 0L442, 0L443 and 0L446) on single occasions only. The peak number recorded was 38 Lapwing in 0L441 (Clooncalla south) on 06/11/10.

Terrestrial foraging was recorded adjacent to four subsites: 0L409 (Flaxfort Strand), 0L420 (Garraneteen strand), 0L441 (Clooncalla south) and 0L443 (Burren). The peak number recorded was 52 individuals adjacent 0L420 on 10/10/10.

#### Roosting Distribution

Lapwings were recorded roosting intertidally within eight subsites: 0L413, 0L419, 0L420, 0L441, 0L443, 0L444, 0L445 and 0L446. 0L446 (Friary) held the largest number (250) but on one occasion only. 0L445 (Creggane) held good numbers on three occasions with numbers on 10/10/10 (63) the highest recorded. 0L420 (Garraneteen strand) held good numbers on two occasions; numbers peaking at 93 on 07/02/11. In terms of numbers recorded and regularity of observations during 2010/11, 0L445 (Creggane) appears to be the favoured subsite for roosting, both intertidally and supratidally (saltmarsh). Supratidal roosting was also recorded in 0L419 and 0L443 with 70 and 33 individuals respectively on 10/1/10.

During the high tide survey 19 individuals roosted intertidally within 0L446 (Friary).

The November roost survey (02/11/10) recorded roosting Lapwings in two subsites (0L419 and 0L445). In 0L419 (Garraneragh strand), 17 Lapwing roosted supratidally on one of the saltmarsh 'islands' in the southern part of the subsite. 0L445 recorded four separate roosting flocks in intertidal habitat (flock sizes 20, 9, 4, 5).

The February roost survey (17/02/11) recorded a single roost site in both 0L419 and 0L420 (flocks of 22 and 52 respectively). Both flocks were positioned in supratidal (saltmarsh) habitat.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of intertidally roosting Lapwing in 0L420, 0L442, and 0L445. The following winter (2012/13), peak numbers roosted within 0L444 and 0L445.

### 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° 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 10/12/10 when 877 were counted; this number close to the threshold of all-Ireland importance. 744 Dunlin were counted during the high tide survey (12/01/11). The peak I-WeBS count recorded in the 2010/11 season was 1,183 Dunlin, recorded in the month of December.

Dunlin were recorded within ten subsites during the survey programme (0L409, 0L419, 0L420, 0L435, 0L441, 0L442, 0L443, 0L444, 0L445 and 0L446). Peak numbers were held by 0L446 (Friary), 0L442 (Kilnamanagh Woods to Abbey), 0L444 (Peter's Point) and 0L441 (Clooncalla south) for the four respective survey dates.

The low tide subsite peak count of 410 Dunlin was recorded for 0L441 (Clooncalla south) on 07/02/11. However 0L443 (Burren) held 550 Dunlin during the high tide survey (12/01/11).

#### Foraging Distribution

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

Dunlin were recorded foraging across eight subsites overall (0L409, 0L419, 0L420, 0L442, 0L443, 0L444, 0L445 and 0L446). 0L420 (Garranateen strand) held peak numbers on 10/10/10 with just four individuals. On 06/11/10 all foraging Dunlin were recorded in 0L442 (Kilnamanagh Woods to Abbey) (132 individuals). On 10/12/10 a total of 817 Dunlin were recorded foraging and over 80% of these were within two subsites: 0L442 (Kilnamanagh Woods to Abbey) and 0L444 (Peter's Point). This wader was recorded in several flocks, the largest of which were positioned on the lower shore closer to the low tide channel (e.g. flock size 300, 285, 125).

The benthic community of 0L442 and 0L444 has been assigned to the community complex 'sand to mixed sediment with oligochaetes'. While the substrate is variable and ranges from fine to medium sand to mixed and coarse sediments, a higher proportion of fine material (silt-clay) occurs along the southern shore in 0L442 and 0L444. The distinguishing species of this community are oligochaetes of the family Enchytraeidae and *Tubificoides benedii*, the polychaetes *Scolecopsis (Scolecopsis) squamata*, *Capitella* sp. and *Eteone longa*, the gastropod *Peringia (Hydrobia) ulvae* and the bivalve *Mytilus edulis*.

On 07/02/10, the peak number of Dunlin (42) foraged in 0L409 (Flaxfort Strand). The sediment here is sandier and the benthic community 'sand with *Nephtys cirrosa*' has been assigned. The fauna of this complex is typical of mobile intertidal sands with low species abundances. It is distinguished by the polychaetes *Nephtys cirrosa*, *N. hombergii*, *Scoloplos (Scoloplos) armiger* and *Spio martinensis* and the bivalve *Angulus tenuis*. *N. cirrosa* occurs throughout the complex in low abundances. The remaining species are not uniformly distributed throughout the complex and where they are recorded they are in low abundances.

The peak intertidal foraging density was 7 Dunlin ha<sup>-1</sup> recorded for 0L445 (Creggane) on 10/12/10; the only survey in which foraging Dunlin were recorded there. 0L442 (Kilnamanagh Woods to Abbey) supported 6 Dunlin ha<sup>-1</sup> on 10/12/10 also. 0L420 and 0L444 recorded densities of >2 individuals ha<sup>-1</sup>. The whole site average intertidal foraging density was 0.6 Dunlin ha<sup>-1</sup>.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of foraging Dunlin in 0L409 and 0L444, with good numbers recorded in 0L442. Surveys the following winter (2012/13) recorded peak numbers in 0L409 and 0L443.

#### Roosting Distribution

Relatively few Dunlin were recorded in roosting/other behaviour during low tide surveys with the exception of birds in 0L441 (Clooncalla south); Dunlin roosting intertidally on three occasions with a peak number of 410 individuals on 07/02/11.

During the high tide survey (12/01/11) 135 individuals roosted intertidally across three subsites (0L435, 0L445 and 0L446); the majority (89%) in 0L446 (Friary).

The November roost survey (02/11/10) recorded roosting Dunlin in two subsites (0L409 and 0L443). In 0L409 (Flaxfort Strand), 14 Dunlin roosted supratidally (rock) in the west of the subsite; a mixed roost also comprising 11 Turnstone, 26 Oystercatcher and four Bar-tailed Godwits. A single roost in 0L443 (Burren) held 70 roosting Dunlin, these birds positioned supratidally on rock in the east of the subsite.

The February roost survey (17/02/11) recorded roosting flocks in three subsites. 0L409 held a flock of 470 Dunlin roosting supratidally (rock) along with 38 Ringed Plover in the far west of the subsite. Slightly further west, and into 0L443, a flock of 350 Dunlin also roosted supratidally on rock. 0L445 (Creggane) held a flock of 11 Dunlin roosting supratidally on saltmarsh.

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

Black-tailed Godwits 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 October 2010 when a site total of 595 was recorded. Numbers dropped down to 199 in December 2010 likely as a result of birds moving in response to the cold weather event. However 429 were recorded during the high tide survey on 12/01/11. All counts exceeded the threshold for national importance and the site count of 595 on 10/10/10 exceeded the threshold of international importance. The peak I-WeBS count recorded in the 2010/11 season was 693 Black-tailed Godwits, recorded in the month of November.

Black-tailed Godwits were recorded in 12 subsites overall (0L406, 0L409, 0L413, 0L419, 0L420, 0L434, 0L441, 0L442, 0L443, 0L444, 0L445, 0L446). Peak numbers were held by 0L442 (Kilnamanagh Woods to Abbey), 0L441 (Clooncalla south), 0L420 (Garraneteen strand) and 0L445 (Creggane) for the four respective low tide survey dates. The subsite peak count was 219 individuals in 0L442 (Kilnamanagh Woods to Abbey) on 10/10/10.

#### 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 12 subsites overall (same subsites as listed above). Only 0L420 (Garraneteen strand) and 0L444 (Peter's Point) held individuals in all four low tide surveys.

Peak numbers were supported by 0L442 (Kilnamanagh Woods to Abbey) (10/10/10 and 06/11/10), 0L420 (Garraneteen strand) (10/12/10) and 0L419 (Garraneragh strand) (07/02/11). The benthic community of these areas is largely the community complex 'sand to mixed sediment with oligochaetes'. The distinguishing species of this community are oligochaetes of the family Enchytraeidae and *Tubificoides benedii*, the polychaetes *Scolecopsis (Scolecopsis) squamata*, *Capitella* sp. and *Eteone longa*, the gastropod *Peringia (Hydrobia) ulvae* and the bivalve *Mytilus edulis*. The substrate is variable and ranges from fine to medium sand to mixed and coarse sediments, and while a higher proportion of fine material (silt-clay) occurs along the southern shore of 0L442, the sediment is sandier in much of 0L420 although it does grade into 'sandy mud to mixed sediments with *Tubificoides benedii* and *Hediste diversicolor*' through the eastern reaches. This community complex comprises the distinguishing species: oligochaetes *Tubificoides benedii* and *Heterochaeta costata*, the polychaetes *Hediste diversicolor*, *Pygospio elegans*, *Streblospio shrubsolei* and unidentified Nereididae, the gastropod *Peringia (Hydrobia) ulvae* and the bivalves *Scrobicularia plana*. *H. diversicolor* occurs throughout the complex in moderate to low abundances.

Terrestrial foraging was recorded adjacent 0L419 (Garraneragh strand) and 0L441 (Clooncalla south). During the high tide survey 305 Black-tailed Godwits foraged adjacent to 0L442 (Kilnamanagh Woods to Abbey). The February roost survey (17/02/11) recorded 196 Black-tailed Godwits foraging in grassland adjacent (south) of 0L442 (Kilnamanagh Woods to Abbey).

The peak intertidal foraging density was 4 Black-tailed Godwits ha<sup>-1</sup> recorded for 0L442 (Kilnamanagh Woods to Abbey) on 10/10/10. 0L420 and 0L444 recorded peak densities of >2 Black-tailed Godwits ha<sup>-1</sup>. The whole site average intertidal foraging density was 0.4 Black-tailed Godwits ha<sup>-1</sup>.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of foraging Black-tailed Godwits in 0L441, 0L444 and 0L445. Surveys the following winter (2012/13) recorded peak numbers in 0L409, 0L442 and 0L446.

#### Roosting Distribution

Good numbers of Black-tailed Godwits were recorded roosting intertidally during low tide surveys and in six subsites across the survey programme (0L409, 0L413, 0L441, 0L443, 0L445, and 0L446). 0L445 (Creggane) and 0L446 (Friary) held joint peak numbers on 10/10/10 (114). 0L441 (Clooncalla south) held peak numbers on 06/11/10 (214), 0L443 (Burren) on 10/12/10 (eight) and 0L445 on 07/02/10 (105). No Black-tailed Godwits were recorded roosting intertidally during the high tide survey; all individuals at this time roosting supratidally or terrestrially.

Supratidal roosting was recorded mainly for 0L420 (Garraneteen strand), 92 individuals recorded during the high tide survey while terrestrial roosting was recorded further up this estuary in 0L419 (Garraneragh strand).

The November roost survey (02/11/10) recorded roosting Black-tailed Godwits in three subsites (0L420, 0L444 and 0L446). The largest single roost of 208 individuals was recorded in 0L446 (Friary) at just over an hour before high water, these birds positioned intertidally along the bend in the river channel.

In 0L444 (Peter's Point), 30 Black-tailed Godwits roosted along the top of the shore with one Redshank. 0L420 (Garraneteen strand) held a single roost of 20 Black-tailed Godwits in saltmarsh, this mixed-species roost also comprising 15 Redshank, 41 Oystercatchers, 20 Common Gull and 47 Black-headed Gull.

The February roost survey (17/02/11) recorded roosting Black-tailed Godwits in four subsites (0L420, 0L442, 0L445 and 0L446). The largest flock in 0L442 (Kilnamanagh Woods to Abbey) (140 birds) roosted intertidally at the top of the shore along with two Curlew. 115 Black-tailed Godwits roosted supratidally on saltmarsh in 0L445 (Creggane). 0L420 (Garraneteen strand) held a flock of 110 individuals while 0L446 (Friary) recorded a flock of ten individuals roosting intertidally.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of roosting Black-tailed Godwits in 0L446. The following winter (2012/13) 0L441 held peak numbers during three low tide surveys.

### 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 were variable and peaked during low tide surveys in December 2010 (172 individuals) exceeding the threshold of all-Ireland importance. 230 individuals were recorded during the high tide survey on 12/01/11; this count also exceeding the threshold of all-Ireland importance. The peak I-WeBS count recorded in the 2010/11 season was 153 Bar-tailed Godwits, recorded in the month of February.

Bar-tailed Godwits were recorded in nine subsites overall (0L409, 0L419, 0L420, 0L434, 0L441, 0L442, 0L443, 0L444 and 0L446).

0L442 (Kilnamanagh Woods to Abbey) held peak numbers on 10/10/10 (22); 0L444 (Peter's Point) held peak numbers on 06/11/10 and 07/02/11 (7 and 48 respectively) and 0L420 (Garraneteen strand) held peak numbers (54) on 10/12/10; this also being the subsite peak count.

#### 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 *Nephtys* sp. The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993).

Bar-tailed Godwits were recorded foraging within nine subsites overall (0L409, 0L419, 0L420, 0L434, 0L441, 0L442, 0L443, 0L444 and 0L446). 0L442 (Kilnamanagh Woods to Abbey) held peak numbers on 10/10/10 (22). 0L444 (Peter's Point) held peak numbers on 06/11/10 and 07/02/11 (7 and 48 respectively) with the second highest numbers (21) on 10/12/10. 0L409 (Flaxfort Strand) held peak numbers on 10/12/10 (45) and second highest numbers (44) on 07/02/11. 0L441 (Clooncalla south) held good numbers during three low tide surveys (peak number of 16 on 07/02/11).

The benthic community of 0L442 and 0L444 is largely the community complex 'sand to mixed sediment with oligochaetes'. The distinguishing species of this community are oligochaetes of the family Enchytraeidae and *Tubificoides benedii*, the polychaetes *Scolecopsis* (*Scolecopsis*) *squamata*, *Capitella* sp. and *Eteone longa*, the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Mytilus edulis*. The substrate is variable and ranges from fine to medium sand to mixed and coarse sediments, and a higher proportion of fine material (silt-clay) occurs along the southern shore. The sediment of 0L409 is sandier and the benthic community 'sand with *Nephtys cirrosa*' has been assigned. The fauna of this complex is typical of mobile intertidal sands with low species abundances. It is distinguished by the polychaetes *Nephtys cirrosa*, *N. hombergii*, *Scoloplos* (*Scoloplos*) *armiger* and *Spio martinensis* and the bivalve *Angulus tenuis*. *N. cirrosa* occurs throughout the complex in low abundances. The remaining species are not uniformly distributed throughout the complex and where they are recorded they are in low abundances.

The highest intertidal foraging density recorded was 1.4 Bar-tailed Godwits ha<sup>-1</sup> (0L419, Garraneragh Strand) on 10/12/10. 0L441 (Clooncalla south) was the only other subsite to support >1 Bar-tailed Godwits ha<sup>-1</sup>. The whole site mean feeding density (intertidal habitat) was 0.2 Bar-tailed Godwits ha<sup>-1</sup>.

Low tide surveys carried out at Courtmacsherry Bay in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of foraging Bar-tailed Godwits in 0L441, 0L444 and 0L445. Surveys the following winter (2012/13) recorded peak numbers in 0L409, 0L442 and 0L446.

#### Roosting Distribution

Relatively few observations were made of Bar-tailed Godwits roosting intertidally during low tide surveys. The peak number was 54 individuals within 0L420 (Garraneteen strand) on 10/12/10. One individual roosted intertidally in 0L446 (Friary) during the high tide survey on 12/01/11. On this date 229 individuals also roosted supratidally, 110 individuals in 0L443 (Burren), 75 in 0L409 (Flaxfort Strand) and 44 in 0L420 (Garraneteen strand).

The November roost survey (02/11/10) recorded roosting Bar-tailed Godwits in two subsites (0L409 and 0L443). In 0L409 (Flaxfort Strand) four Bar-tailed Godwits roosted supratidally (rock) in the west of the subsite; a mixed roost also comprising 11 Turnstone, 26 Oystercatcher and 14 Dunlin. A single roost in 0L443 (Burren) held 35 roosting Bar-tailed Godwits, these birds positioned supratidally on rock in the east of the subsite; a mixed species flock also comprising Dunlin (70), Oystercatcher (166) and Turnstone (2).

The February roost survey (17/02/11) recorded roosting Bar-tailed Godwits in two subsites (0L409 and 0L420). 0L409 (Flaxfort Strand) held a flock of 63 individuals in the inner subsite, these birds flocking with 112 Oystercatcher, 45 Dunlin and six Redshank. 0L420 (Garraneteen strand) held a flock of 41 individuals that roosted alongside 14 Shelduck and 33 Curlew.

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

The Curlw 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 Curlw. Irish breeding Curlw 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 al. 2002).

#### **Numbers**

Whole-site numbers of Curlw were variable and at their lowest during December 2010 (113 individuals) likely a result of the cold weather spell. Numbers rose however to the low tide peak count of 313 on 07/02/11. 153 Curlw were recorded during the high tide survey (12/01/11). No count exceeded the threshold of all-Ireland importance. The peak I-WeBS count recorded in the 2010/11 season was 630 Curlw, recorded in the month of February.

Curlws were widespread and occurred in all 14 subsites overall (0L406, 0L409, 0L413, 0L419, 0L420, 0L433, 0L434, 0L435, 0L441, 0L442, 0L443, 0L444, 0L445, and 0L446). Seven subsites (0L409, 0L419, 0L420, 0L441, 0L442, 0L443, and 0L444) recorded this wader in all four low tide surveys.

Peak numbers were supported by 0L442 (Kilnaneanagh Woods to Abbey) (10/10/10), 0L409 (Flaxfort Strand) (06/11/10 and 10/12/10) and 0L443 (Burren) (07/02/11). The subsite peak count of 82 Curlw was recorded for 0L409 (Flaxfort Strand) on 06/11/10. 0L443 (Burren) also held peak numbers during the high tide survey (37).

#### **Foraging Distribution**

Curlws 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*). Curlws 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, Curlws are territorial foragers and tend to occur widely spaced from each other to avoid competitive conflicts.

Curlws foraged intertidally in 12 subsites (0L406, 0L409, 0L413, 0L419, 0L420, 0L434, 0L441, 0L442, 0L443, 0L444, 0L445, and 0L446). 0L442 (Kilnaneanagh Woods to Abbey) held peak numbers on 10/10/10 and 07/02/11. 0L409 (Flaxfort Strand) held peak numbers on 06/11/10 and 10/12/10, with numbers ranked as second highest in the other two low tide surveys. 0L419 (Garraneragh strand) supported numbers ranked in the top four in all low tide surveys; 0L444 (Peter's Point) held numbers ranked in the top three in three low tide surveys.

The benthic community of 0L442 has been assigned to the community complex 'sand to mixed sediment with oligochaetes'. The substrate is variable and ranges from fine to medium sand to mixed and coarse sediments. The distinguishing species of this community are oligochaetes of the family Enchytraeidae and *Tubificoides benedii*, the polychaetes *Scolecopsis* (*Scolecopsis squamata*, *Capitella* sp. and *Eteone longa*, the gastropod *Peringia* (*Hydrobia*) *ulvae* and the bivalve *Mytilus edulis*. The sediment of 0L409 is sandier and the benthic community is described as 'sand with *Nephtys cirrosa*'. The fauna of this complex is typical of mobile intertidal sands with low species abundances. It is distinguished by the polychaetes *Nephtys cirrosa*, *N. hombergii*, *Scoloplos* (*Scoloplos*) *armiger* and *Spio martinensis* and the bivalve *Angulus tenuis*. *N. cirrosa* occurs throughout the complex in low abundances. The remaining species are not uniformly distributed throughout the complex and where they are recorded they are in low abundances.

Terrestrial foraging was recorded adjacent 0L409, 0L441, 0L442 and 0L443 during low tide surveys, and adjacent 0L409, 0L420, 0L441 and 0L443 during the high tide survey. During the February 2011 roost survey (17/02/11) a total of 300 Curlws were recorded foraging terrestrially and adjacent to the SPA. 94 of these foraged in agricultural grassland to the north of 0L441 while further east, three flocks of 34, six and six respectively, foraged in fields north of 0L443. To the south of the site, 42 Curlws foraged in grassland south of 0L442 (Kilnaneanagh Woods to Abbey).

The peak intertidal foraging density recorded for a subsite was 1.4 Curlw ha<sup>-1</sup> (0L419, Garraneragh strand) recorded on both 10/10/10 and 06/11/10. The second highest density recorded was for 0L406 (Ummera) (1 individual ha<sup>-1</sup>). The whole site mean feeding density (intertidal habitat) was 0.2 Curlw ha<sup>-1</sup>.

Low tide surveys carried out in the winter 2011/12 (surveys by NPWS Regional Staff) recorded peak numbers of foraging Curlw in 0L409, 0L442, 0L443 and 0L444. Surveys the following winter (2012/13) recorded peak numbers in 0L442 during four low tide surveys undertaken.

#### **Roosting Distribution**

Good numbers of Curlw were recorded roosting intertidally across the site; this activity most regular within 0L409 (Flaxfort Strand) and 0L446 (Friary).

Just four individuals roosted intertidally during the high tide survey; a further 25 roosted supratidally in 0L419 (Garraneragh strand) and 0L433 (Coolmain Bay) (17 and 8 individuals respectively).

Terrestrial roosting was also recorded; most regular adjacent to 0L419 (Garraneragh strand) where 11, 17 and 40 Curlws roosted during the final three low tide surveys.

The November roost survey (02/11/10) recorded roosting Curlws in five subsites (0L406, 0L419, 0L435, 0L441 and 0L444). The largest single roost was held by 0L419 (Garraneragh strand) where 39 Curlws roosted supratidally upon one of the saltmarsh 'islands' that are present within this subsite. With the exception of a supratidal roost in 0L444 (3 individuals), all other subsites recorded solitary roosting individuals.

The February roost survey (17/02/11) recorded a single roost in each of five subsites (0L419, 0L420, 0L442, 0L445 and 0L446). The largest flock (75 Curlws) was in 0L445 (Creggane), these birds roosting on saltmarsh just upstream of Timoleague Bridge. 47 Curlws roosted supratidally (saltmarsh) in 0L419 (Garraneragh strand) and a further 33 roosted supratidally alongside 14 Shelduck and 41 Bar-tailed Godwits in 0L419 (Garraneragh strand). 0L442 and 0L446 held two and one Curlws respectively.



### 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 a total 1,134 were counted. Thereafter numbers dropped and were at their lowest during December 2010 (247), rising to 423 during the final low tide survey. 302 Black-headed Gulls were counted during the high tide survey. The peak I-WeBS count recorded in the 2010/11 season was 927 Black-headed Gulls, recorded in the month of November.

Black-headed Gulls were widely recorded and present in all subsites except 0L440.

0L444 (Peter's Point) held peak numbers on 10/10/10 and supported numbers ranked as second highest on two other survey occasions. 0L409 (Flaxfort Strand) supported peak numbers on 06/11/10 and during the high tide survey and held numbers ranked in the top three in all other surveys. 0L446 (Friary) held peak numbers on 10/12/10 and 07/02/11 with numbers during the high tide survey ranked as second highest.

#### Foraging Distribution

Black-headed Gulls were recorded foraging intertidally in three subsites: 0L442 (Kilnamanagh Woods to Abbey), 0L443 (Burren) and 0L444 (Peter's Point). Highest numbers were held by 0L443 (Burren) in all surveys (maximum number 133 individuals on 10/10/10).

Subtidal foraging was recorded on a single occasion in 0L406 (Ummera) (13), 0L441 (Clooncalla south) (32) and 0L444 (Peter's Point) (128) and on two occasions in 0L434 (Courtmacsherry harbour) (maximum number of 17).

Terrestrial foraging was recorded adjacent 0L409 (high tide), 0L418 (low tide) and 0L442 (low tide).

#### Roosting Distribution

The majority of Black-headed Gulls recorded were in roosting/other behaviour during low tide surveys, with a maximum count of 683 recorded on 10/10/10. Intertidal roosting was recorded within 12 subsites: 0L409, 0L413, 0L418, 0L419, 0L420, 0L433, 0L434, 0L435, 0L441, 0L444, 0L445 and 0L446. 0L445 (Creggane) held peak numbers on 10/10/10 and good numbers (ranked in top three) in three other surveys. 0L409 (Flaxfort Strand) held peak numbers on 06/11/10 (192 gulls) and numbers ranked as second highest during two other low tide surveys. 0L446 (Friary) held peak numbers on 10/12/10 and 07/02/11, plus peak numbers during the high tide survey.

Subtidal roosting was recorded less often. Single observations were made for 0L443 (Burren) (58 gulls on 06/11/10) and 0L444 (Peter's Point) (97 gulls on 07/02/11).

97 Black-headed Gulls roosted intertidally during the high tide survey; 68% of these in 0L446 (Friary) with lower numbers in 0L445 (28) and 0L434 (3). 62 Black-headed Gulls also roosted subtidally - 50% in 0L409 (Flaxfort Strand), smaller numbers in 0L418 (24) and 0L407 (7). A further 67 individuals roosted supratidally across five subsites (0L419, 0L420, 0L433, 0L444 and 0L445).

Terrestrial roosting/other behaviour was recorded on 10/10/10 adjacent 0L409 (Flaxfort Strand) (167 gulls) and 0L433 (Coolmain Bay) (17 gulls).

The November roost survey (02/11/10) recorded roosting Black-headed Gulls in ten subsites (0L407, 0L409, 0L418, 0L420, 0L435, 0L440, 0L442, 0L444, 0L445 and 0L446). The largest flock comprised 60 gulls and was recorded in both 0L409 and 0L442. In 0L409 (Flaxfort Strand), a large roost in the inner section of the subsite (supratidal) comprised 60 Black-headed Gulls, 14 Herring Gulls, 4 Great Black-backed gulls, and 43 Oystercatchers. In 0L442 60 Black-headed Gulls were recorded roosting subtidally c.45 minutes after high water. This subsite also supported another subtidal roost of 50 individuals and 25 gulls roosting supratidally. In 0L435 (Barry's Point), 31 Black-headed Gulls roosted supratidally (rock) with two Herring Gulls and ten Shags. A large supratidal (saltmarsh) roost in 0L420 (Garraneteen Strand) supported 47 Black-headed Gulls, 20 Common Gulls, 41 Oystercatchers, 23 Black-tailed Godwits and 15 Redshank.

The February roost survey (17/02/11) recorded roosting/other individuals in seven subsites: 0L407, 0L409, 0L434, 0L442, 0L444, 0L445, and 0L446. All except one of these flocks were roosting subtidally. The largest flock of 127 gulls roosted subtidally in 0L409 (Flaxfort Strand) along with 44 Common Gulls and 32 Lesser Black-backed Gulls. 44 individuals roosted subtidally in 0L442 (Kilnamanagh Woods to Abbey). 0L445 held a flock of 22 gulls while 0L446 held a flock of 28 roosting subtidally plus an intertidal roost of 34 individuals; these latter birds part of a large mixed-species roost that were positioned by the bend in the river channel.

### 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 peaked in November 2010 (246) dropping back to just 84 during December, possibly as a result of the cold weather spell. Numbers then rose again for the high tide count (126 on 12/01/11) and the final low tide survey (201 on 07/02/11). The peak I-WeBS count recorded in the 2010/11 season was 347 Common Gulls, recorded in the month of November.

Common Gulls were widespread across the site and recorded in 12 subsites overall (0L409, 0L418, 0L419, 0L420, 0L433, 0L434, 0L435, 0L441, 0L443, 0L444, 0L445, and 0L446).

0L409 (Flaxfort Strand) held peak numbers on two occasions, with numbers in other surveys always ranked in the top three. 0L443 (Burren) and 0L446 (Friary) also held peak numbers. The subsite peak count was 131 Common Gulls in 0L409 (Flaxfort Strand) on 06/11/10.

#### Foraging Distribution

Common Gulls foraged intertidally across five subsites: 0L409, 0L418, 0L434, 0L443, and 0L444. Peak numbers in all four low tide surveys were recorded for 0L409 (Flaxfort Strand).

Subtidal foraging was rarely recorded; just one individual in 0L435 on 07/02/11. Terrestrial foraging was recorded adjacent 0L409 (Flaxfort Strand) during the high tide survey (22 gulls).

#### Roosting Distribution

Most Common Gulls recorded were roosting intertidally; this behaviour recorded for eight subsites: 0L418, 0L419, 0L420, 0L433, 0L441, 0L444, 0L445 and 0L446.

0L446 (Friary) held peak numbers twice and numbers ranked as second highest on another low tide survey occasion. 0L433 (Coolmain Bay) also held peak numbers and good numbers on another two occasions. 0L418 (Broadstrand) held peak numbers (10 on 10/10/10) but did not record the species in any other survey. 0L420 (Garraneteen strand) was notable for supporting numbers ranked in the top three on three survey occasions. Just four individuals roosted intertidally during the high tide survey (0L445).

Subtidal roosting/other behaviour was recorded less often and just once during low tide surveys (54 Common Gulls in 0L443 Burren on 10/10/10).

During the high tide survey, 47 Common Gulls roosted subtidally in 0L409 (Flaxfort Strand) with a further seven in 0L418 (Broadstrand). Ten individuals roosted supratidally in 0L419 (Garraneragh strand) with a further seven in 0L433 (Coolmain Bay). 28 Common Gulls roosted terrestrially adjacent 0L420 (Garraneteen strand).

The November roost survey (02/11/10) recorded roosting Common Gulls in five subsites: 0L407, 0L420, 0L440, 0L445 and 0L446. The largest single roost was in 0L420 (Garraneteen Strand) where 20 Common Gulls roosted supratidally (saltmarsh) along with 47 Black-headed Gulls, 41 Oystercatchers, 23 Black-tailed Godwits and 15 Redshank. All other roosts held four or less individuals.

The February roost survey (17/02/11) recorded roosting/other individuals in five subsites (0L409, 0L420, 0L441, 0L442 and 0L446). All except one of the roosting/other flocks were positioned subtidally. The largest flock was of 44 individuals that roosted subtidally in 0L409 along with Black-headed Gulls and Lesser Black-backed Gulls. 38 Common Gulls roosted in 0L420 and a further 15 individuals were in 0L442.

The only intertidal roost was in 0L446 (Friary) where six Common Gulls roosted as part of a large mixed-species roost positioned by the bend in the river channel.

## 5.4 Courtmacsherry 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 Courtmacsherry 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 Courtmacsherry 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 Courtmacsherry Bay;
- U** 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 Courtmacsherry 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 Courtmacsherry Bay

Activities and events identified to occur in and around Courtmacsherry 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

Courtmacsherry Bay SPA is a large coastal complex located approximately 12 km south of Bandon and immediately east of the village of Timoleague in west Co. Cork. The site is largely estuarine in nature and from the west comprises the drowned valley of the Argideen River which opens out eastwards into the wider estuary and Courtmacsherry bay. In the north-east of the site, the estuary of the Kilbrittain River discharges into Coolmain Bay at

Harbour View. The beach here is known as either Harbour View or Garraneteen Strand. The seaward boundary for the site stretches from Coolmain Point to Barry Point, and includes Broadstrand Bay.

The village of Timoleague lies to the west of the inner estuary with Timoleague Abbey overlooking the inner estuary (subsite 0L446). Being lit at night and with parking facilities, this is a popular vantage point over the inner estuary for tourists and locals alike. The fishing village Courtmacsherry is located at the estuary mouth in the east. Scattered residential housing lines both north and south sides of the estuary and there has been an increase in new houses and holiday homes in recent years. The surrounding landscape is relatively hilly and dominated by agricultural grassland used mostly for cattle grazing although there are some areas of tillage. There is extensive mixed woodland around the village of Courtmacsherry. The woodland includes many exotic trees and was part of the former summer residence of the Earl of Shannon (Natura, 2005).

Much of the estuary is lined by roads (R600 and R601 to the north and south respectively) while a pavement also runs the southern boundary from Timoleague towards Courtmacsherry providing a walking route between the two. Two bridges cross the site north and south of Timoleague providing road access from the northern side to the southern side. A further bridge divides subsites 0L419 and 0L420 at Harbour View.

Saltmarsh has developed at many places within the site; most notable at Harbour View (subsite 0L420) and upstream of Timoleague bridge (subsite 0L445). The non-native and invasive saltmarsh plant *Spartina anglica* is present at several locations within the site, present since the 1960's (Nairn, 1986). At Harbour View it is spreading into the native lower saltmarsh habitat (McCorry & Ryle, 2009) however an examination of the OSI 1995, 2000 and 2005 aerial photos and field survey GPS points found that there had not been much expansion of *Spartina* during the ten-year period (McCorry & Ryle, 2009).

There is an established track at Garraneteen Strand that cuts across dune and saltmarsh habitats. An informal car park is also present, serving people who use the beach and coastal habitats for recreational purposes.

Some land claim at the site is evident from comparing historic OS maps with those of current day; and is applicable for subsites 0L413, 0L419, 0L420, 0L409, and 0L446.

The sand spit at Garraneteen Strand has grown considerably in size since early OSI maps were developed.

A fishing harbour is located in Courtmacsherry (subsite 0L434). A lifeboat is based here.

Algal mats of green macroalgae (*Ulva* spp<sup>19</sup>) are present at this site annually (see below) and in years where excessive growth occurs, macroalgal material washes up onto the beach at Harbour View (Garraneteen Strand) (subsite 0L420) where it causes considerable nuisance and odour pollution. Algal mats are also very visible in the inner estuary particularly along the southern sections of 0L442 and 0L444. The problem has escalated in the past decade and in 2009 some 10,000 tonnes of algae accumulated at Inchydoney (Clonakilty Bay), Harbour View, Coolmaine and Courtmacsherry. A Sea Letture Task Force was set up to investigate the problem and to provide some short-term solutions such as the collection of algal material from beaches and its use as fertiliser or its transportation to composting facilities. Longer-term solutions such as improved waste water treatment will be discussed below under 'Water Quality'.

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<sup>19</sup> Formerly known as *Enteromorpha*; reclassified as of Hayden et al. (2003).

## Water quality

The South Western River Basin District (WRBD) 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 Courtmacsherry Bay and its inflowing rivers and streams. The current water quality status of Courtmacsherry Bay is 'moderate' according to the South Western River Basin Transitional and Coastal Waters Action Programme (SWRBD, 2010b); this sub-standard status linked to below standard recorded levels of dissolved oxygen and fish in the estuary, and for the extensive growth of macroalgae. The pressures upon the system are listed as point source pollutants (WWTP), combined sewer overflows and treatment plant overflows.

The Environmental Protection Agency (EPA) monitors the status of estuarine and coastal water bodies using their Trophic Status Assessment Scheme (TSAS), a requirement under the Urban Waste Water Treatment Directive (UWWT) (91/271/EEC)<sup>20</sup> and Nitrates Directive (91/676/EEC). Following assessment, waterbodies are classified as eutrophic, potentially eutrophic, intermediate, or unpolluted (O'Boyle et al. 2010). Results for the period 2007-2009 reveal that the Argideen estuary is classified as 'eutrophic' (O'Boyle et al. 2010).

In addition to nutrient enrichment, other pressures such as hazardous substances and morphological alterations can impact on the quality of aquatic systems. Biological indicators are used to assess the ecological status of transitional and coastal waters. Classification schemes have been developed that use the characteristics of different biological communities, together with information on the physico-chemical environment to define ecological status. Ecological status for the period 2007-2009 was reported to be 'poor' for the Argideen Estuary (O'Boyle et al. 2010).

One of the major pressures upon water quality of Courtmacsherry Estuary is inadequate waste water treatment. A new sewerage scheme has been proposed for Timoleague and Courtmacsherry. The proposed route of the sewerage scheme will follow the R601 road linking Timoleague and Courtmacsherry. The sewerage system of Timoleague will be upgraded and a pumping station built in the village. This will link to sewerage pipes installed along the roadway to Courtmacsherry, where a waste water treatment plant (WWTP) will be installed. Currently, untreated waste is released from four point sources in Timoleague and waste is discharged from a septic tank overflow in Courtmacsherry on the receding tide.

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

Given that sustained high levels of macroalgal growth is linked to organic enrichment, there is a potential for a reduction in macroalgal abundance as a result of improvements to sewage discharges (also refer to previous section). While exerting many influences upon the estuarine system, algal mats can have both negative and positive effects upon waterbird foraging ecology. Some waterbird species avoid them or may be negatively affected by lowered invertebrate abundances beneath them (Lewis & Kelly, 2001; Lopes et al. 2006) while on the other hand, herbivores such as Light-bellied Brent Geese and Wigeon benefit

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<sup>20</sup> Transposed by the Urban Waste Water Treatment Regulations S. I. No 254 of 2001, as amended by S.I. No 48 of 2010.

from the algae being a source of food. Although such factors are complex and may operate over the long-term, it is advised that they be considered in future assessments of waterbird distribution patterns at this site.

#### Fisheries & aquaculture

The site has no current aquaculture activities. Various commercial inshore fishing activities are likely to occur in and adjacent to the site (detail and spatial scale unknown).

Fishing boats are based at Courtmacsherry Harbour (subsite 0L434) and some small-scale fishing, often recreational fishing, is likely to occur in the outer estuarine subsites (e.g. 0L433 and 0L440) but most boats make their way to fishing areas further offshore. A life boat station is based at Courtmacsherry Harbour.

Shore angling is a common activity at the site and some small-scale bait digging occurs. A sea angling centre is based at Courtmacsherry Harbour and boats are available for hire.

#### Recreational activities

Much of the site is bounded by roads and often pavements, and given this good accessibility, walking is a regular occurrence around the site with people walking immediately adjacent to mudflat feeding areas. Given the muddy nature of sediments in the inner estuary people rarely encroach onto the estuary itself but rather stay on the perimeter. The outer sandier areas however are used to some degree for walking. An annual horse race occurs on an area of sandy intertidal at low tide during summer months.

The beach at Harbour View is used extensively for recreational purposes during both summer and winter months. Beaches are also present at Flaxfort Strand (0L409), Blind Strand (0L435) and Broad Strand (0L418).

Sea kayaking and sailing are regular activities in the outer site

Courtmacsherry Hotel is located in the outer site adjacent to subsite 0L434 and the small beach here is used extensively for recreational purposes.

Horse riding occurs at Garraneteen Strand and on the small beach located in 0L434 which lies adjacent to a riding school.

#### Others

Wildfowling was not recorded at the site during the 2010/11 Waterbird Survey Programme. 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<sup>th</sup> – 30<sup>th</sup> December 2010 inclusive).

A Peregrine Falcon (*Falco peregrinus*) was observed on one occasion during the 2010/11 survey programme and there is a known Peregrine nest site close to the estuary. Some predation of waders is therefore likely during the winter months but was not observed during the survey programme.

#### 5.4.4 Disturbance Assessment

During 2010/11 survey work three activities were recorded that caused disturbance to waterbirds. These were windsurfing, walking (including with dogs) and the hand gathering of molluscs ('winkle picking') (Table 5.8).

Walking (including with dogs) was the most widespread activity and occurred in four subsites overall. Wind surfing was recorded from two subsites.

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
0L406	Ummera	0	-	
0L407	Pool	0	-	
0L409	Flaxfort Strand	2	5	- wind surfing - walking (incl. with dogs)
0L413	Bateman's Bridge	0	-	
0L418	Broadstrand	2	6	- walking (incl. with dogs)
0L419	Garraneragh strand	0	-	
0L420	Garraneteen strand	1	6	- walking (incl. with dogs)
0L433	Coolmain Bay	1	6	- walking (incl. with dogs)
0L434	Courtmacsherry harbour	0	-	
0L435	Barry's Point	0	-	
0L440	Coolmain Pt to Curry's Point	0	-	
0L441	Clooncalla south	0	-	
0L442	Kilnamanagh Woods to Abbey	0	-	
0L443	Burren	0	-	
0L444	Peter's Point	1	6	- wind surfing
0L445	Creggane	0	-	
0L446	Friary	0	-	

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

Species ▶ Subsites ▼	SU	WN	RM	ND	GP	L.	DN	BW	BA	CU	BH	CM
0L406		L						M		M	H	
0L407												
0L409		H				M	H	M	H	V	V	V
0L413						L		L		L	L	
0L418		L		V							M	M
0L419	V	V				M	L	M	M	H	M	H
0L420	H	H				H	H	V	V	H	M	M
0L433				M							L	M
0L434		L	V	H				L	M	M	L	L
0L435				H							M	L
0L440			M	V								
0L441	M	H	V			V	V	V	H	M	M	M
0L442	V					L	V	V	V	V	L	
0L443	M	V				H	L	M	H	V	H	V
0L444	V	V	H		V	L	V	H	V	H	V	H
0L445		M				V	M	V		H	H	H
0L446		L	V		V	V	V	H	H	M	V	V

#### 5.4.5 Discussion

Relatively few activities were recorded at Courtmacsherry Bay that caused disturbance to waterbirds. Human recreational activities at coastal sites occur less frequently during winter months and the range of activities is much reduced. Weather conditions during the 2010/11 survey programme were also unfavourably cold at times which may have led to reduced levels of some activities (e.g. walking).

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<sup>21</sup> (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.

<sup>21</sup> defined as a measure of the relative contribution of an individual to the gene pool of the next generation.

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 (1<sup>st</sup> winter birds) may be marginalised by older more dominant flocks so that their access to the optimal prey resources is limited. These individuals may already therefore be under pressure to gain their required daily energy intake before the effects of any disturbance event are taken into account;
- Timing/seasonality - birds may be more vulnerable at certain times e.g. pre- and post-migration, at the end of the winter when food resources are lower;
- Weather - birds are more vulnerable during periods of severe cold weather or strong winds;
- Site fidelity – some species are highly site faithful at site or within-site level and will therefore be affected to a greater degree than species that range more widely;
- Predation and competition – a knock-on effect of disturbance is that waterbirds may move into areas where they are subject to increased competition for prey resources, or increased predation – i.e. the disturbance results in an indirect impact which is an increased predation risk.

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

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## APPENDIX 1

**SITE NAME: COURTMACSHERRY BAY SPA**

**SITE CODE: 004219**

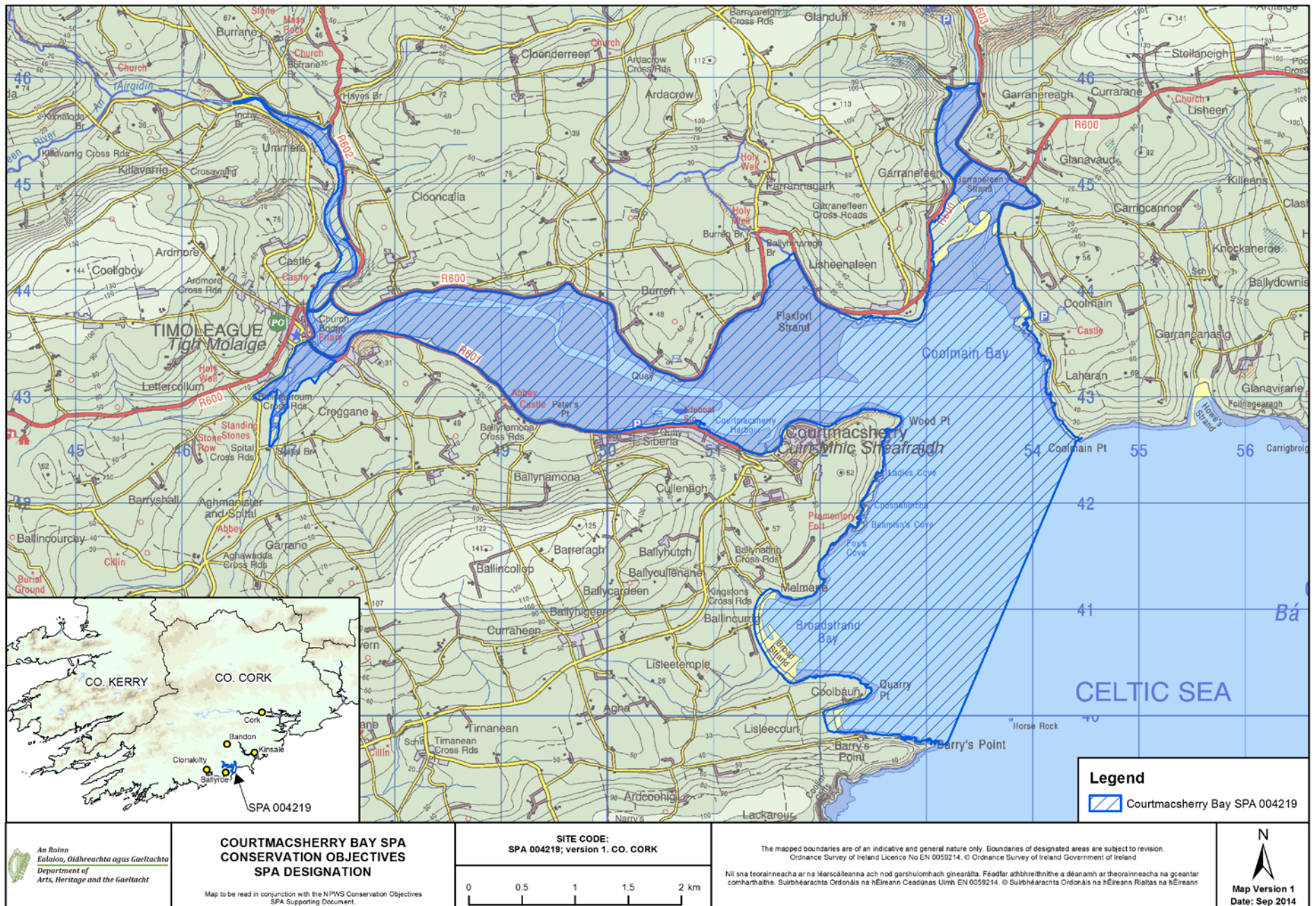
Courtmacsherry Bay SPA is located approximately 12 km south of Bandon and immediately east of the village of Timoleague in west Co. Cork. The site, which is largely estuarine in nature, consists of the drowned valley of the Argideen River which is now filled with sediments, resulting in extensive mudflats and areas of saltmarsh. The estuary of the Kilbrittain River in the north-east of the site holds an area of well-developed saltmarsh. The seaward boundary for the site stretches from Coolmain Point to Barry Point, and includes Coolmain Bay and Broadstrand Bay.

Most of the mudflats are unvegetated, although in places Cord-grass (*Spartina anglica*) occurs. Saltmarsh has developed in a number of areas, the abundant species mostly being Sea Club-rush (*Scirpus maritimus*), Common Scurvygrass (*Cochlearia officinalis*), Sea Arrowgrass (*Triglochin maritima*), Sea Plantain (*Plantago maritima*), Thrift (*Armeria maritima*) and Saltmarsh Rush (*Juncus gerardi*).

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Great Northern Diver, Shelduck, Wigeon, Red-breasted Merganser, Golden Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Black-headed Gull and Common Gull. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is of ornithological importance for the wintering waders and wildfowl that feed on the mudflats. It supports internationally important numbers of Black-tailed Godwit (506 - figures given here and below are mean peaks for the five winters in the period 1995/96 to 1999/00), as well as nationally important numbers of a further eleven species, i.e. Great Northern Diver (27), Shelduck (175), Wigeon (934), Red-breasted Merganser (63), Golden Plover (5,759), Lapwing (2,713), Dunlin (1,353), Bar-tailed Godwit (182), Curlew (1,357), Black-headed Gull (2,727) and Common Gull (2,226). Other species which occur include Oystercatcher (610), Redshank (227) and Greenshank (26).

Courtmacsherry Bay SPA is an important site for wintering birds. It holds internationally important numbers of Black-tailed Godwit and nationally important numbers of a further eleven species, including three that are listed on Annex I of the E.U. Birds Directive, i.e. Great Northern Diver, Golden Plover and Bar-tailed Godwit.





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

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

## APPENDIX 5

Waterbird foraging guilds (after Weller, 1999)

<b>Guild</b>	<b>Foods</b>	<b>Tactics</b>	<b>Examples...</b>
(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 <sup>a</sup>	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

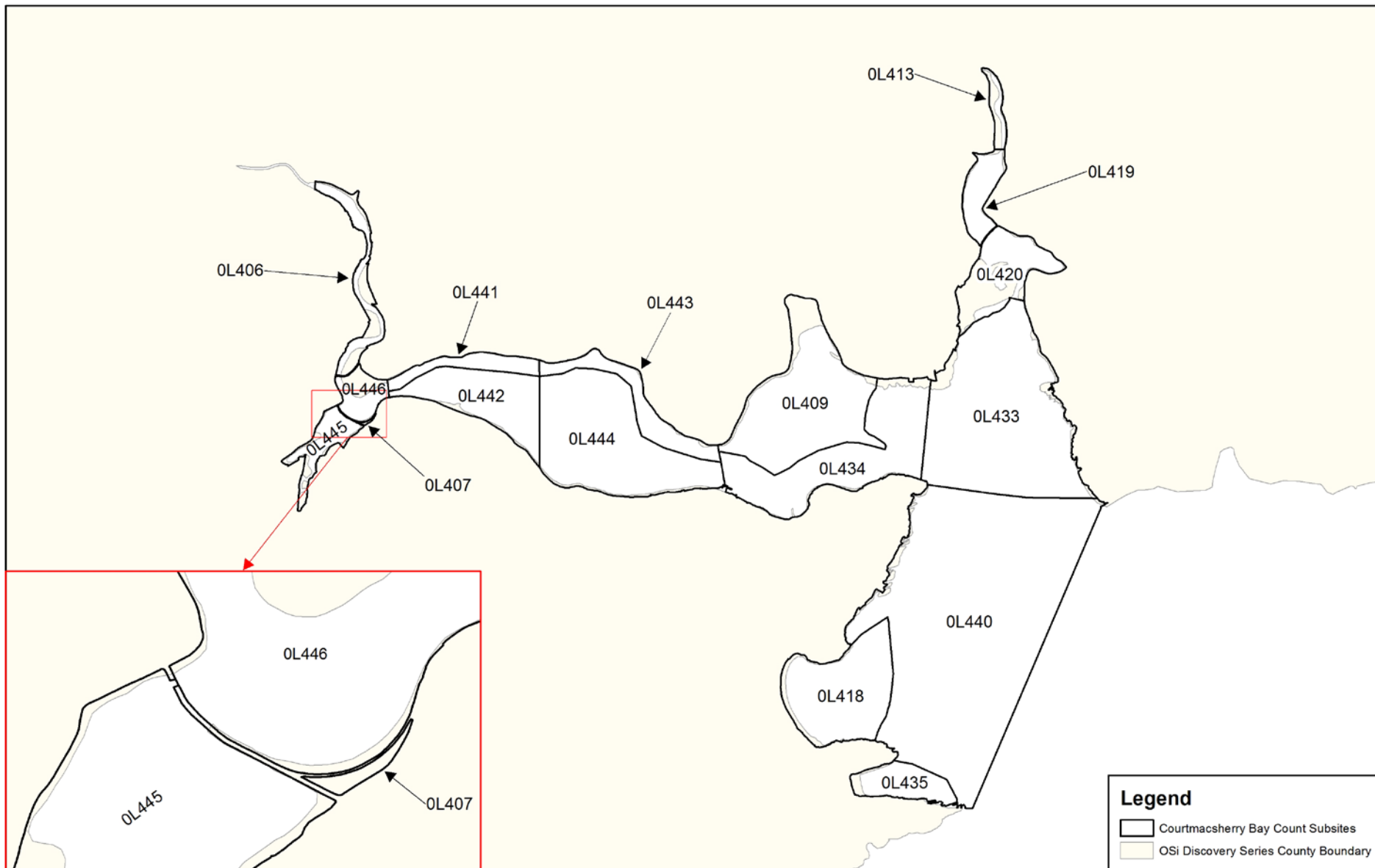
<sup>a</sup> dives <3m.

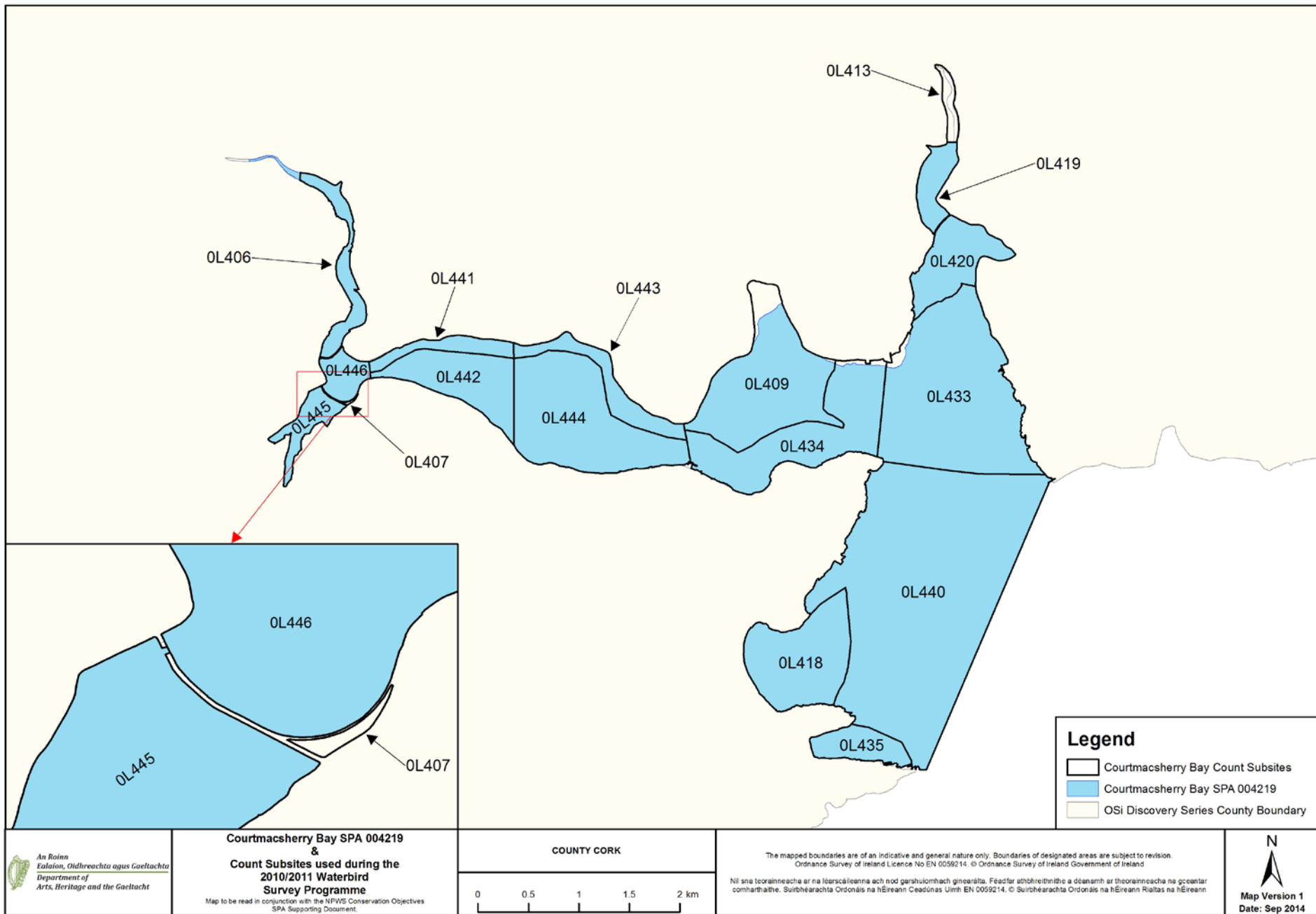
Please note that this table refers to generalised foraging strategies and is meant as a guide only. There is a great deal of variation between sites, seasons, tidal states and indeed, individual birds themselves. For example, some waterbird species may deploy several of the methods, e.g. Shelduck may 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

### Courtmacsherry Bay – Waterbird Survey Programme 2010/11 – Count Subsites

Subsite Code	Subsite Name	Area (ha)
0L406	Ummera	27
0L407	Pool	0.3
0L409	Flaxfort Strand	123
0L413	Bateman's Bridge	8
0L418	Broadstrand	84
0L419	Garraneragh Strand	22
0L420	Garraneteen strand	48
0L433	Coolmain Bay	200
0L434	Courtmacsherry Harbour	106
0L435	Barry's Point	27
0L440	Coolmain Pt to Curry's Point	400
0L441	Clooncalla south	19
0L442	Kilnamanagh Woods to Abbey	59
0L443	Burren	32
0L444	Peter's Point	130
0L445	Creggane	20
0L446	Friary	17
	<b>TOTAL</b>	<b>1,321</b>



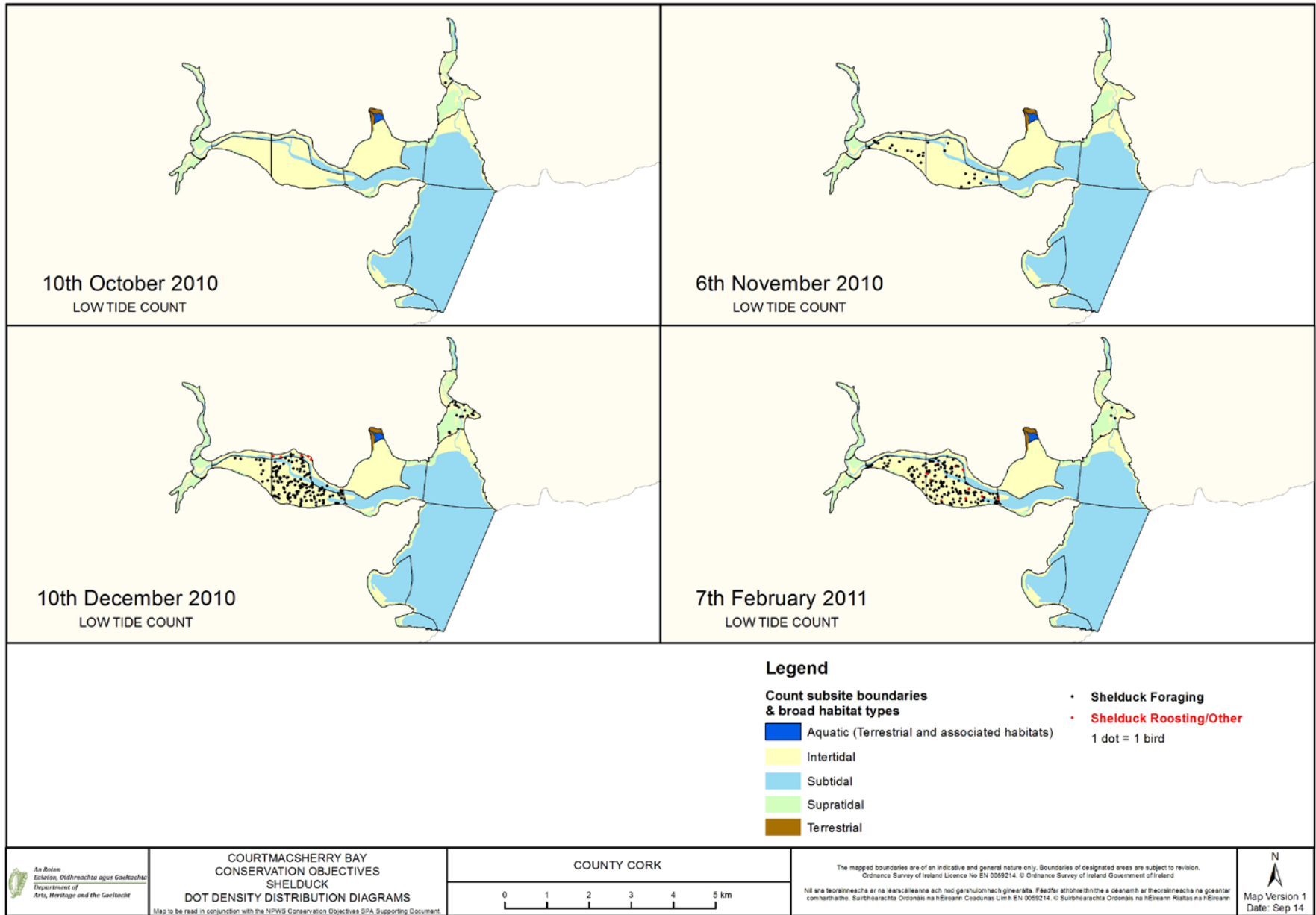


## APPENDIX 7

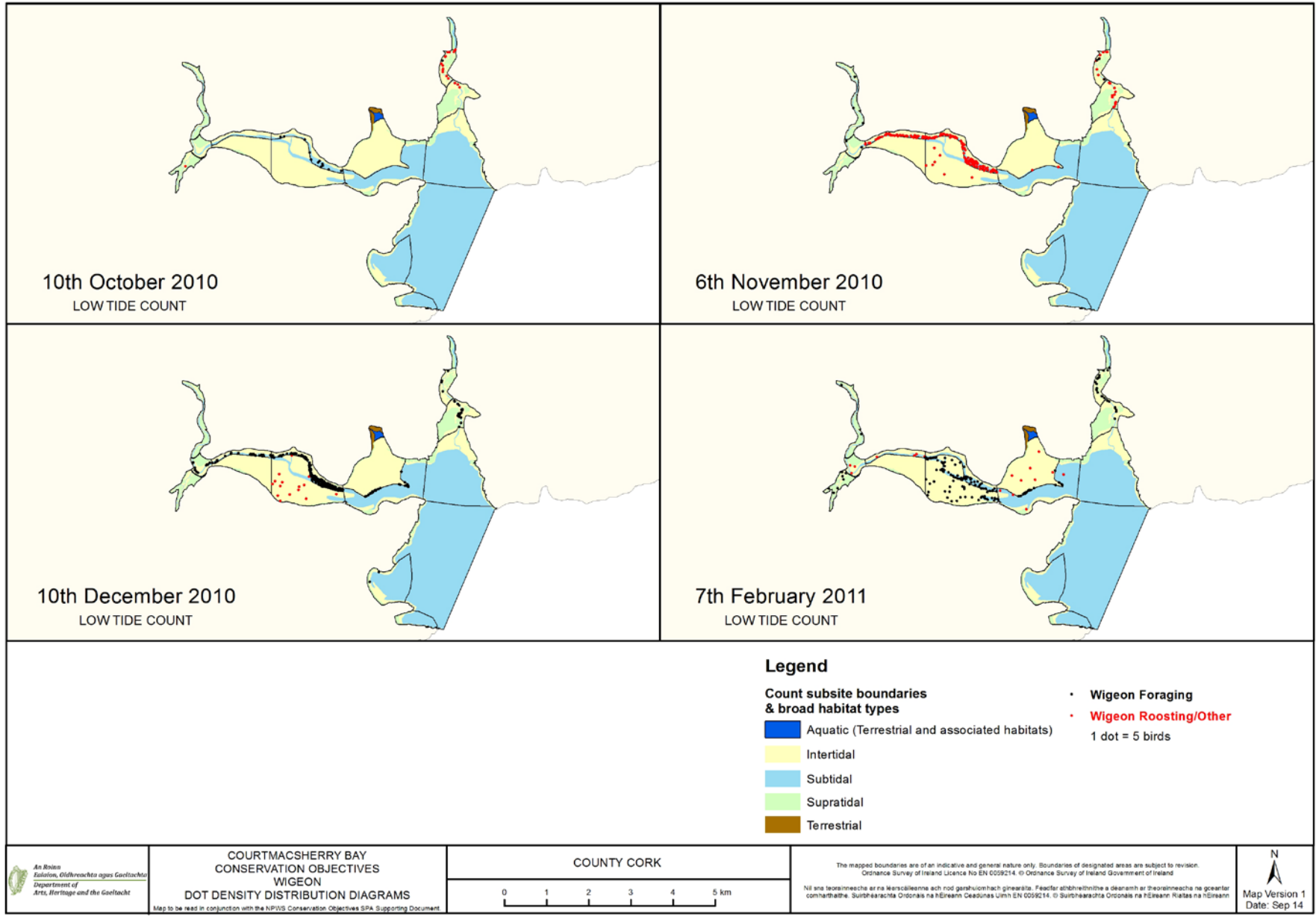
### Courtmacsherry Bay

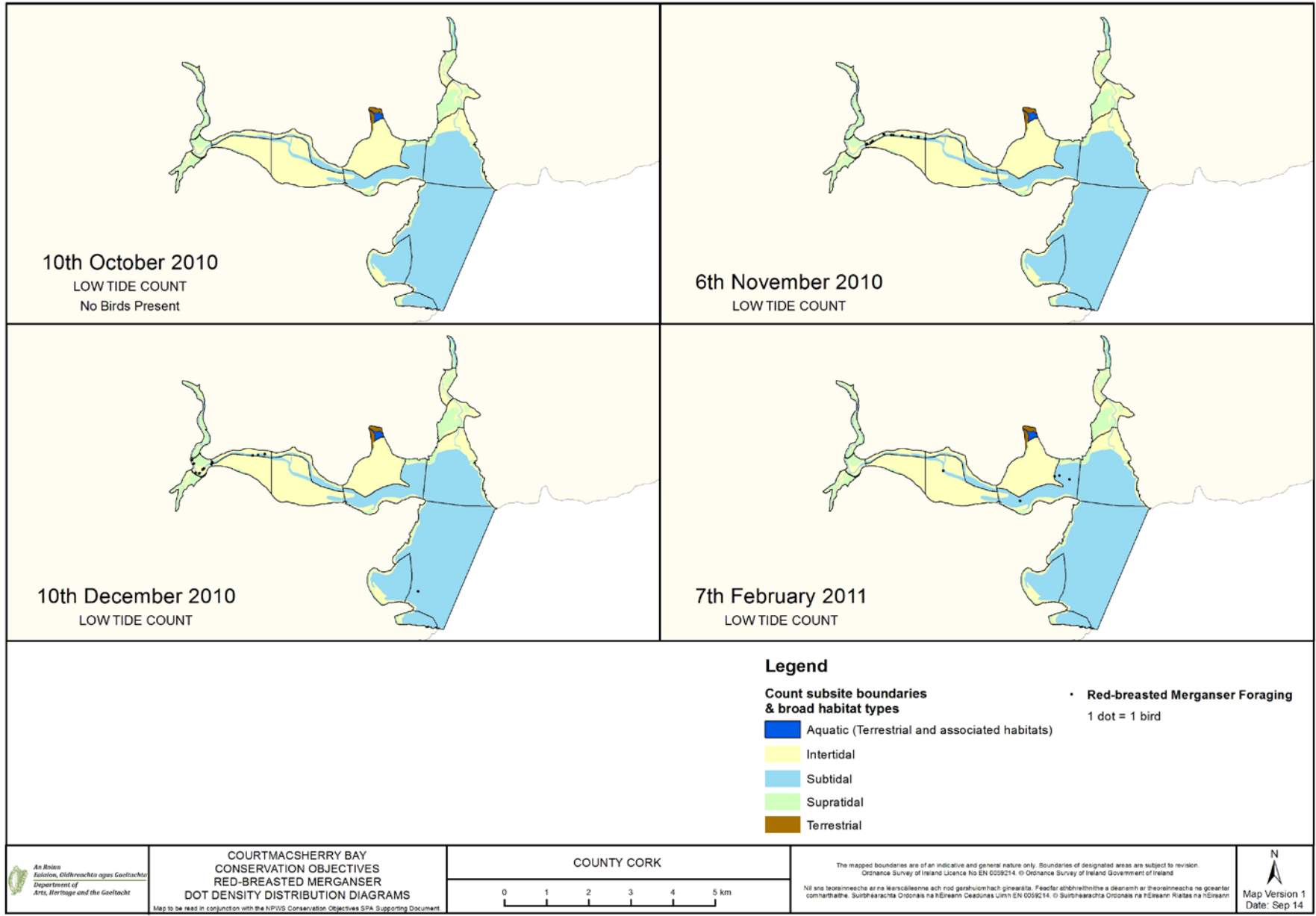
Waterbird distribution (dot-density diagrams) recorded during low tide surveys  
(October 2010 – February 2011)

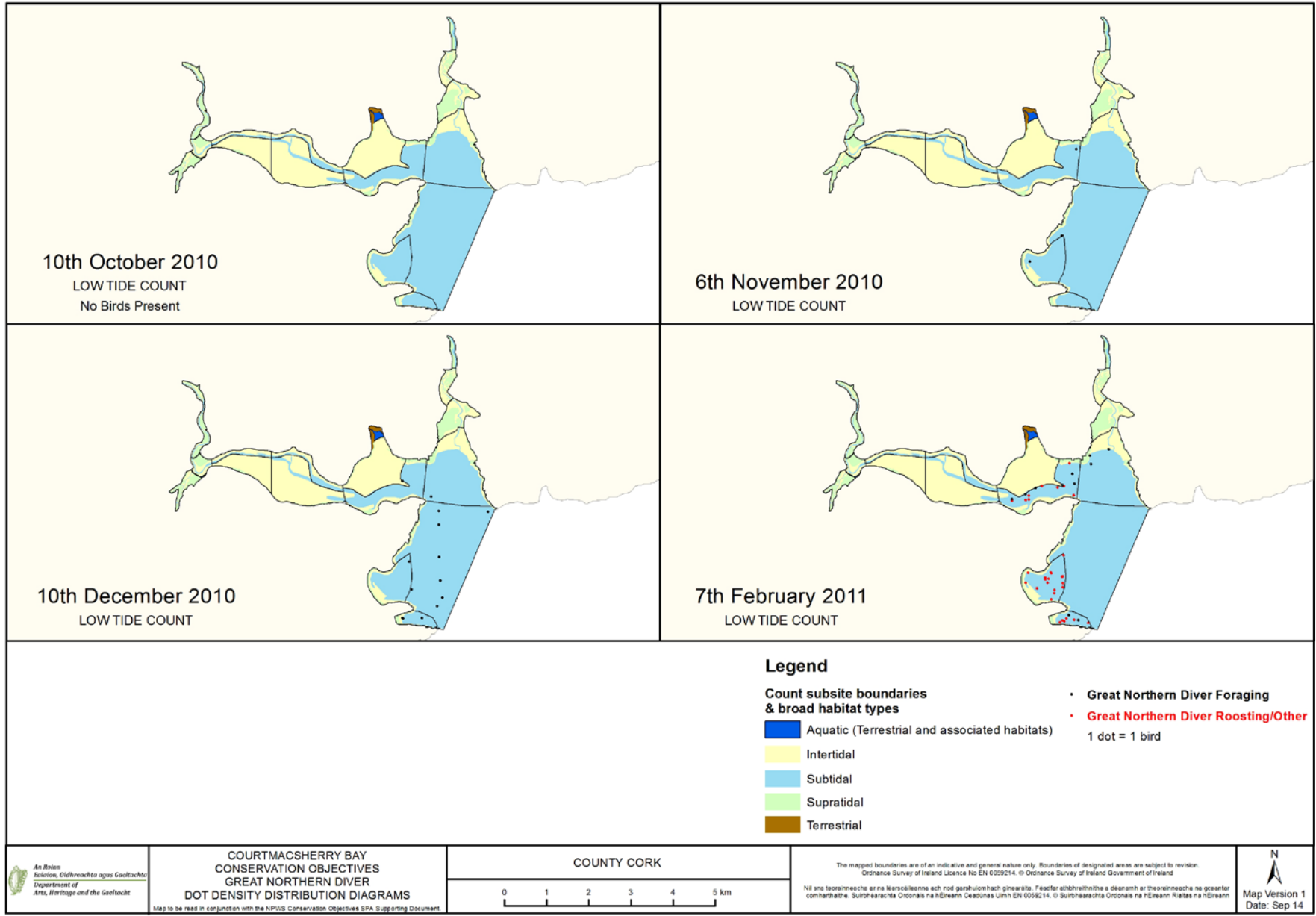
**(NB data are presented for birds located in intertidal and subtidal habitats only)**

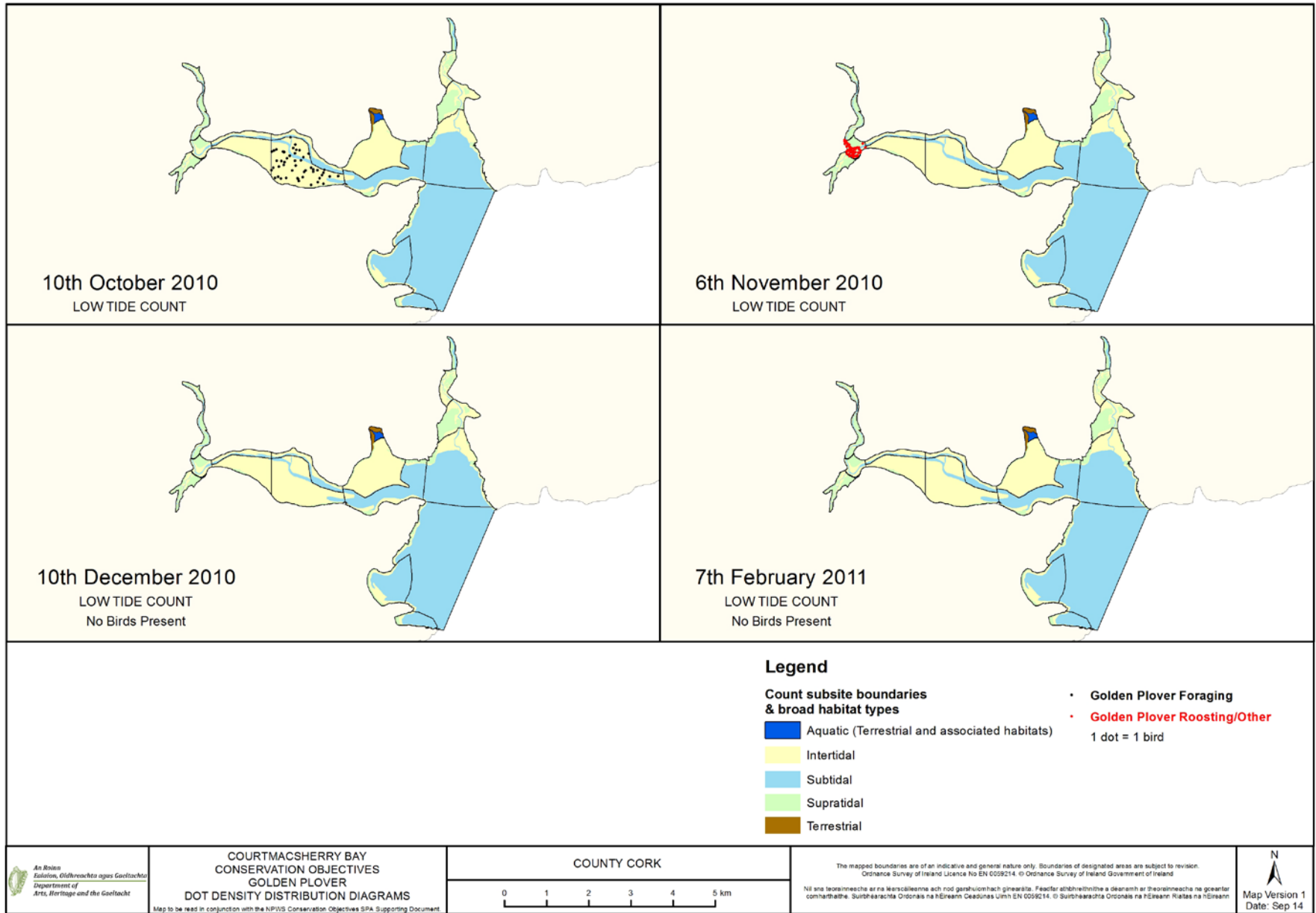


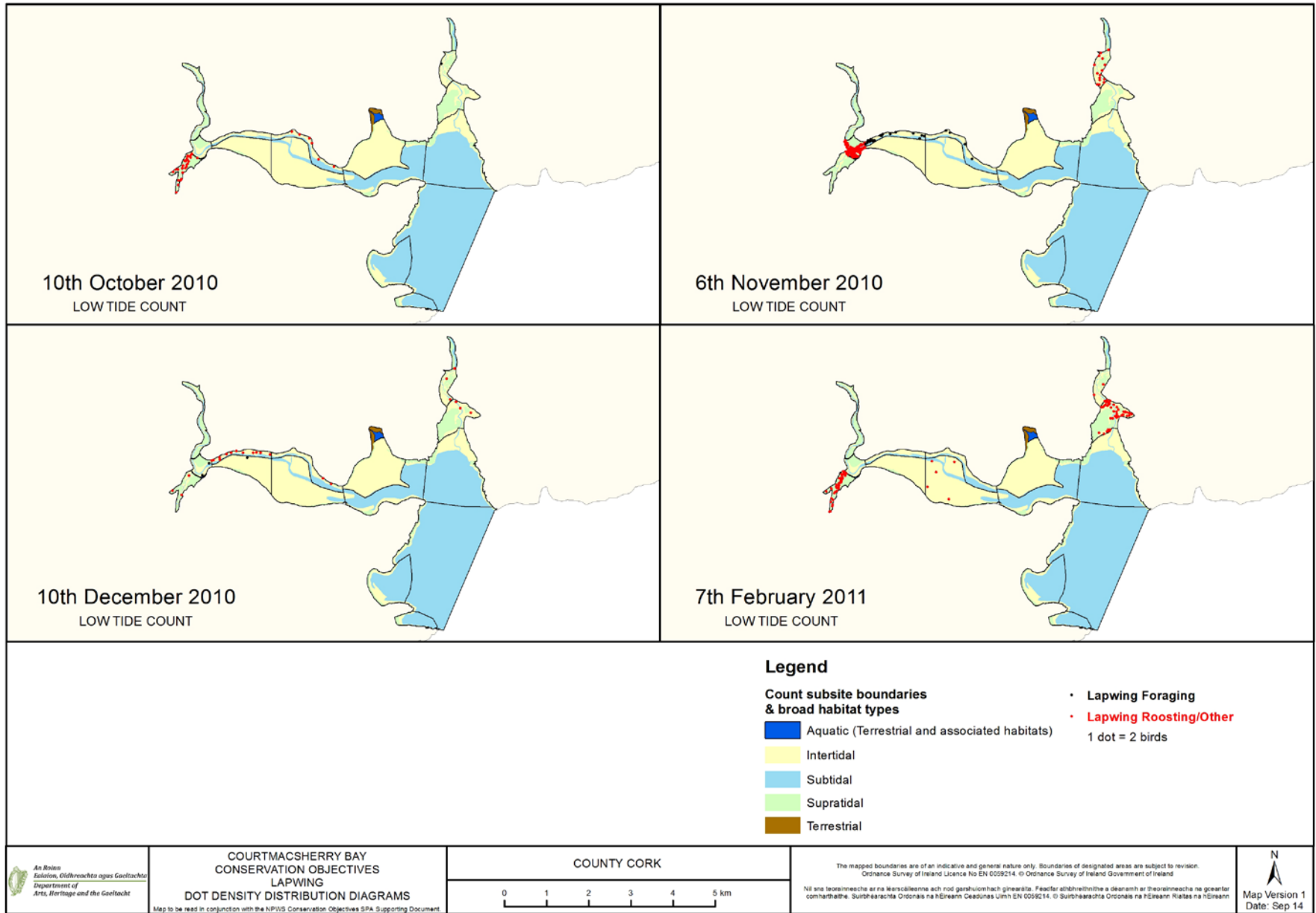


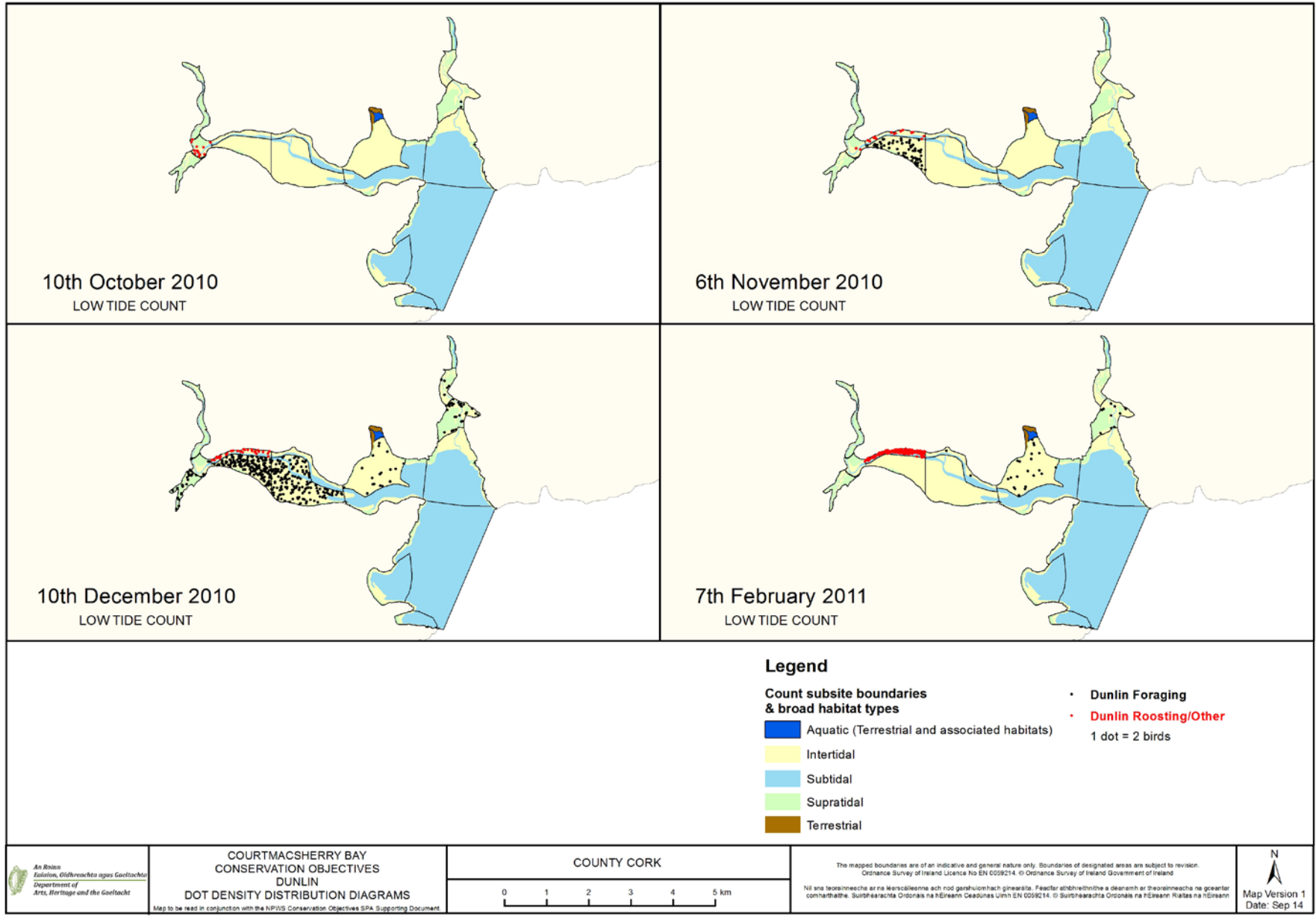


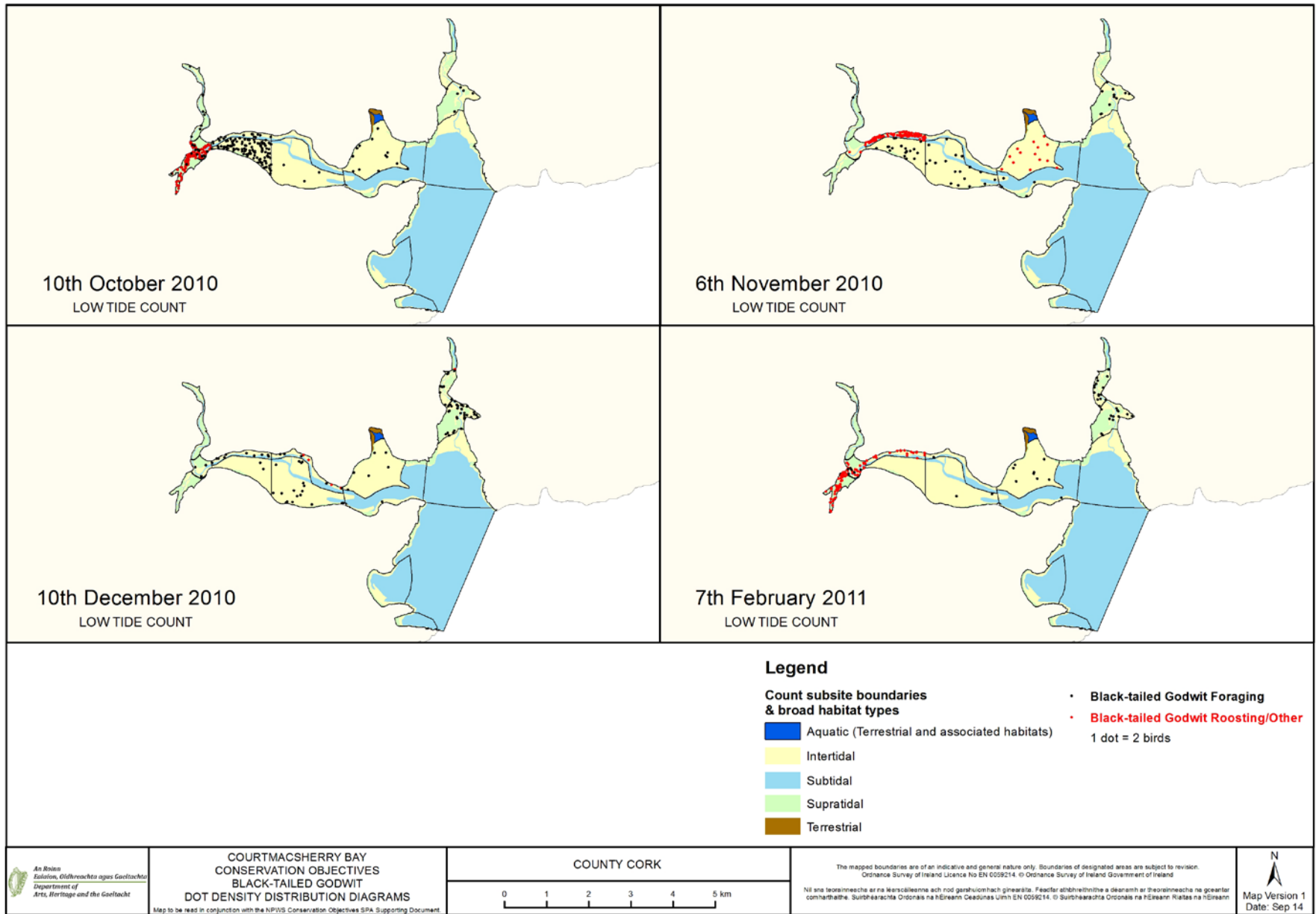




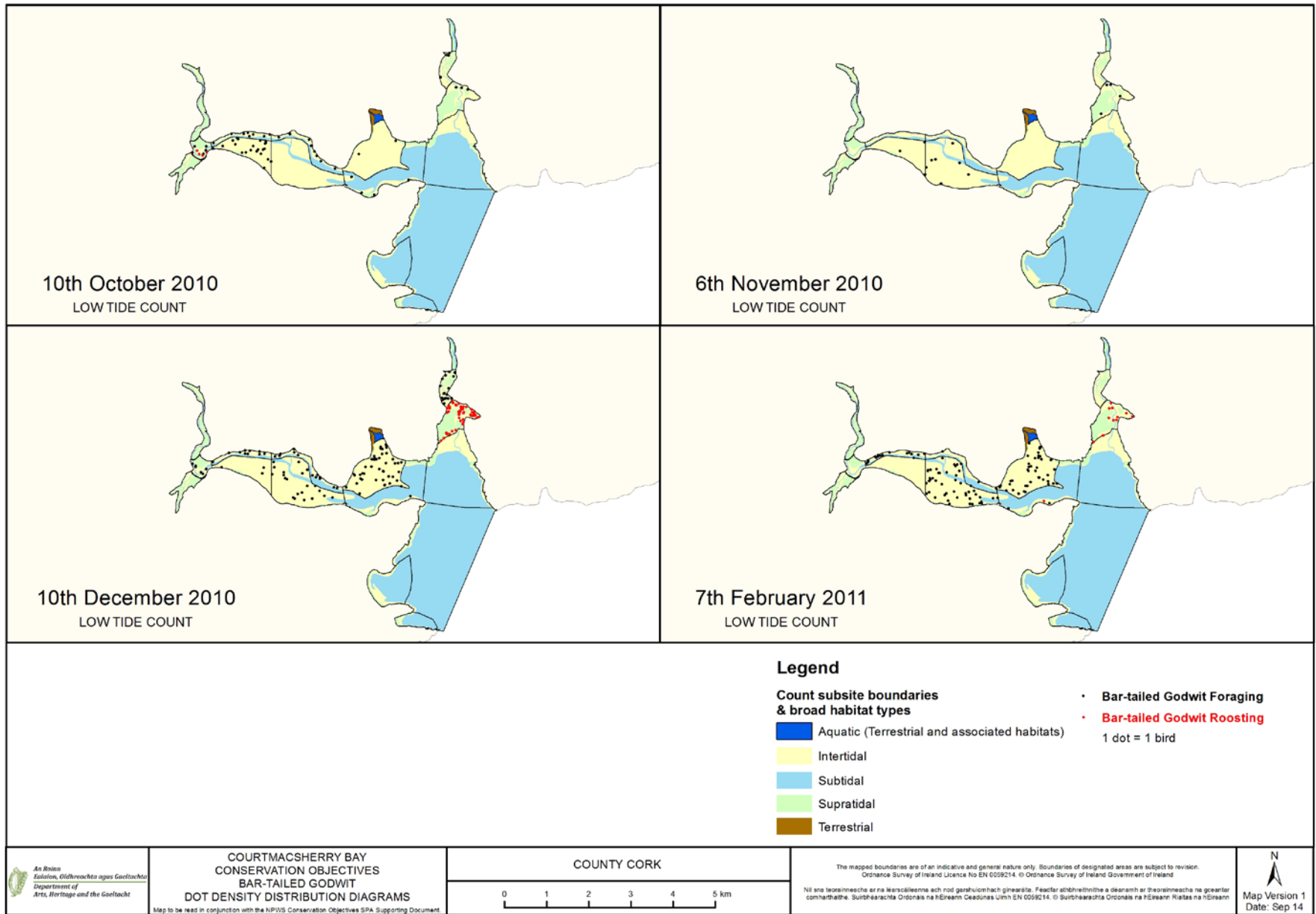




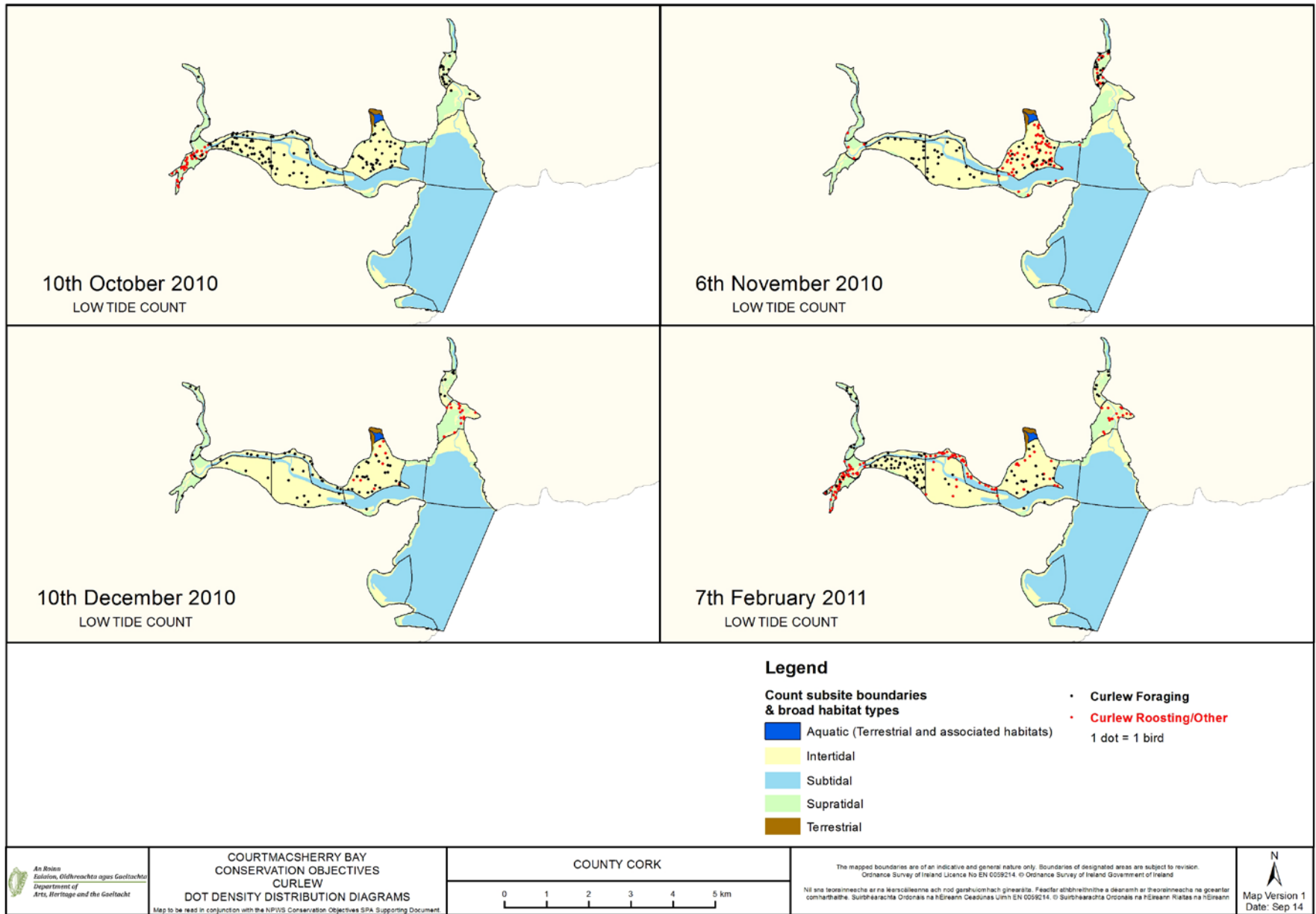


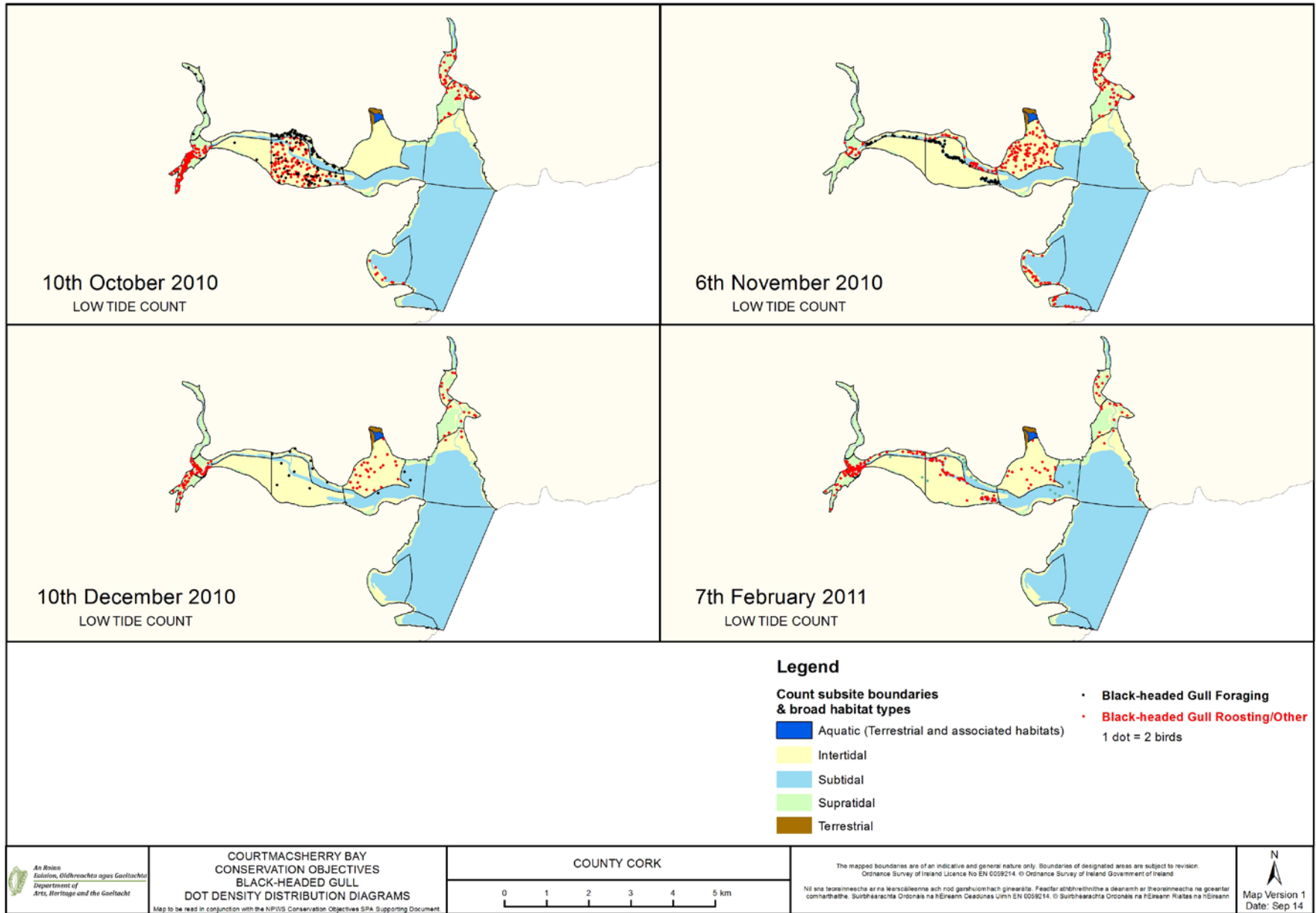


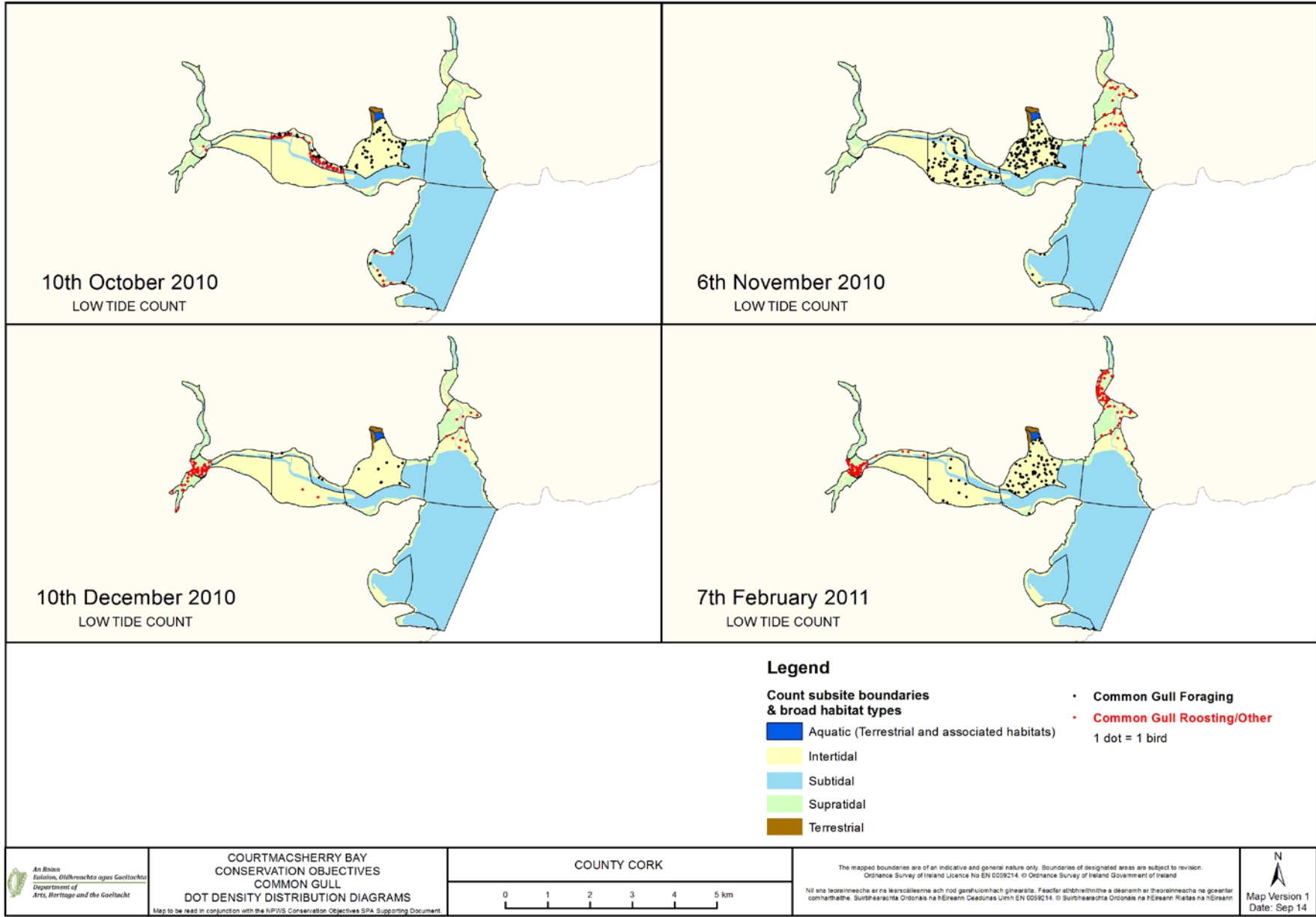












## APPENDIX 8

### Courtmacsherry Bay

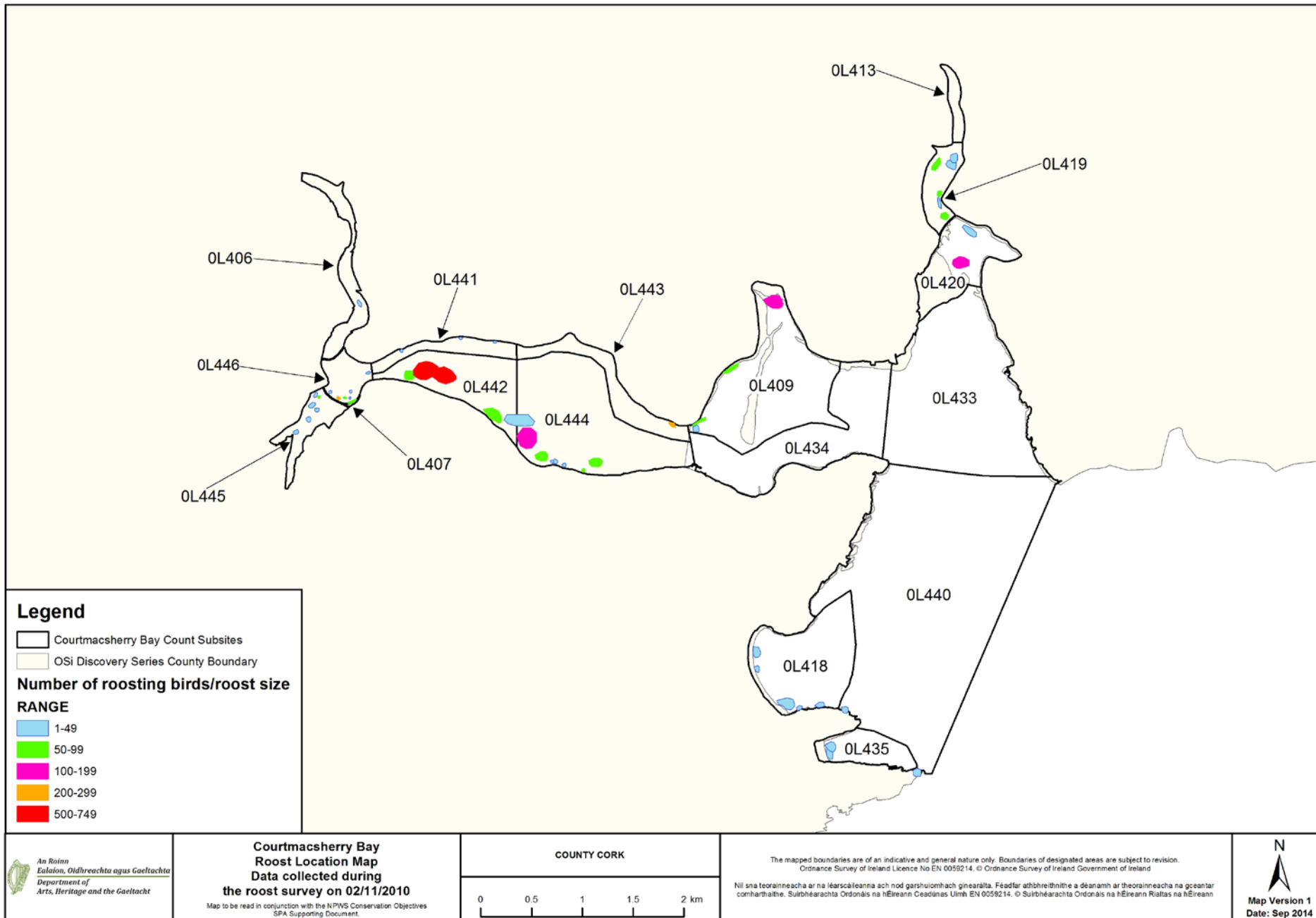
**(1a) Summary data and roost location maps from the roost survey 2<sup>nd</sup> November 2010**

(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
0L406	Ummera	1	3	CU, RK, WN
0L407	Pool	1	4	BH, CM, LB, MA
0L409	Flaxfort Strand	4	10	BA, BH, CA, DN, GB, GK, HG, OC, RK, TT
0L413	Bateman's Bridge	-	-	
0L418	Broadstrand	5	4	BH, GK, OC, WN
0L419	Garraneragh Strand	6	6	CU, L., OC, RK, T., WN
0L420	Garraneteen strand	2	6	BH, BW, CM, OC, RK, WN
0L433	Coolmain Bay	-	-	
0L434	Courtmacsherry Harbour	-	-	
0L435	Barry's Point	3	8	BH, CU, GK, HG, OC, RK, RP, SA
0L440	Coolmain Pt to Curry's Point	1	4	BH, CM, GB, HG
0L441	Clooncalla south	3	3	CU, OC, RK
0L442	Kilnamanagh Woods to Abbey	5	4	BH, SV, SU, T., WN
0L443	Burren	1	4	BA, DN, OC, TT
0L444	Peter's Point	8	10	BH, BW, CU, MA, OC, RK, SU, T., WM, WN
0L445	Creggane	6	7	BH, CM, GK, L., OC, RK, SN
0L446	Friary	6	10	BH, BW, CA, CM, CV, GB, HG, LB, MS, RK

(1b) Courtmacsherry Bay SPA (4219) SCI species and recorded roosts 02/11/10 - shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsites ▶	01L406	01L407	01L409	01L413	01L418	01L419	01L420	01L433	01L434	01L435	01L440	01L441	01L442	01L443	01L444	01L445	01L446
Species ▼																	
SU													1 (39)		1 (38)		
WN	1 (4)				1 (2)	1 (79)	1 (45)						3 (540)		2 (80)		
RM																	
ND																	
GP																	
L.						1 (17)											4 (20)
DN			1 (14)											1 (70)			
BW						1 (23)									2 (30)		1 (208)
BA			1 (4)											1 (35)			
CU	1 (1)		1 (39)							1 (1)		2 (1)				1 (93)	
BH		1 (31)	1 (60)		1 (22)		1 (47)			2 (31)	1 (13)		2 (60)		2 (25)	3 (43)	2 (18)
CM		1 (1)					1 (20)				1 (4)					2 (2)	1 (92)



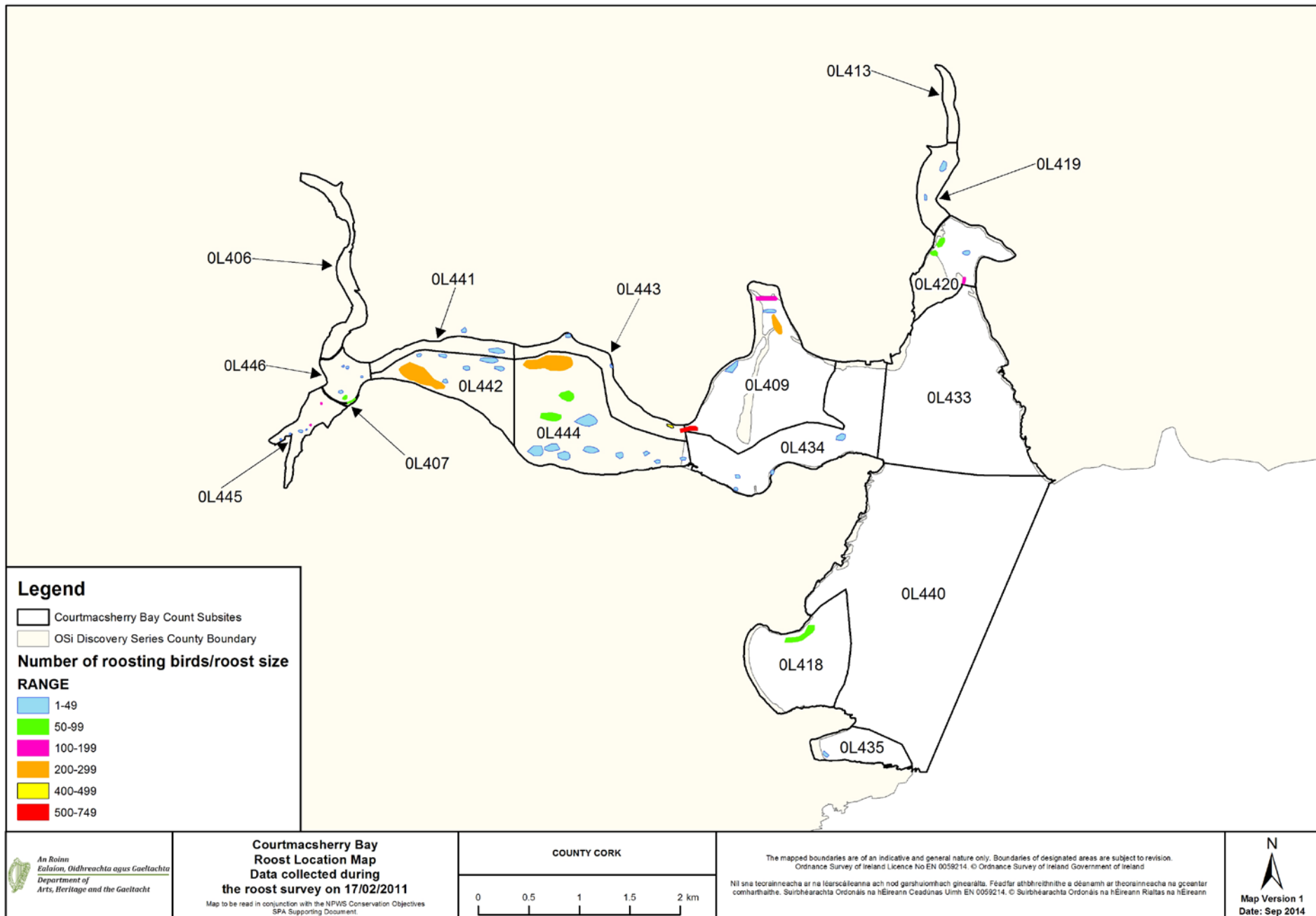
**(2a) Summary data and roost location maps from the roost survey 17<sup>th</sup> February 2011**  
 (Please see Sections 5.3.1 and 5.3.2 for further details on methods/limitations)

Subsite Code	Subsite Name	No. roost locations	No. species	Species
OL406	Ummera	-	-	
OL407	Pool	1	2	BH, MA
OL409	Flaxfort Strand	5	9	BA, BH, CM, DN, LB, PB, OC, RP, WN
OL413	Bateman's Bridge	-	-	
OL418	Broadstrand	1	1	HG
OL419	Garraneragh Strand	2	2	CU, L.
OL420	Garraneteen strand	4	6	BA, BW, CM, CU, L., SU
OL433	Coolmain Bay	-	-	
OL434	Courtmacsherry Harbour	4	3	BH, ND, RK
OL435	Barry's Point	1	2	OC, RP
OL440	Coolmain Pt to Curry's Point	-	-	
OL441	Clooncalla south	2	2	CM, SU
OL442	Kilnamanagh Woods to Abbey	7	8	BH, BW, CM, CU, RK, SU, SV, WN
OL443	Burren	3	5	DN, GK, OC, RK, WN
OL444	Peter's Point	12	7	BH, HG, ND, SU, SV, T., WN
OL445	Creggane	6	8	BH, BW, CU, DN, GK, HG, OC, RK
OL446	Friary	5	11	BH, BW, CM, CU, ET, HG, LB, MS, NB, RK, SN

(2b) Courtmacsherry Bay SPA (4219) SCI species and recorded roosts 17/02/11 - shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsites	01.406	01.407	01.409	01.413	01.418	01.419	01.420	01.433	01.434	01.435	01.440	01.441	01.442	01.443	01.444	01.445	01.446
Species																	
SU							1 (14)					1 (1)	3 (48)		1 (8)		
WN			2 (35)										3 (76)	1 (4)	6 (385)		
RM																	
ND									1 (8)						1 (1)		
GP																	
L.						1 (22)	1 (52)										
DN			1 (470)											1 (350)		1 (11)	
BW							1 (110)						1 (140)			1 (115)	1 (10)
BA			1 (63)				1 (41)										
CU						1 (47)	1 (33)						1 (2)			1 (75)	1 (1)
BH		1 (27)	1 (127)						1 (1)				1 (44)		1 (1)	1 (22)	2 (34)
CM			1 (44)				1 (38)					1 (2)	1 (15)				1 (6)





## APPENDIX 9

### Courtmacsherry Bay - Activities & Events

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

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

Activity/Event	OL406	OL407	OL409	OL413	OL418	OL419	OL420	OL433	OL434	OL435	OL440	OL441	OL442	OL443	OL444	OL445	OL446
<b>1. Coastal protection, sea defences &amp; stabilisation</b>																	
1.1 Linear defences			O				O		O			O	O	O	O		O
1.4 <i>Spartina</i> planting/growing	O			O		O	O		O				O		O	O	O
1.6 Other modifications												O		O		O	O
<b>2. Barrage schemes/drainage</b>																	
2.2 Altered drainage/river channel																	O
<b>4. Industrial, port &amp; related development</b>																	
4.2 Fishing harbour									O								
4.3 Slipway									H			O				H	O
4.4 Pier							H							O			H
<b>6. Pollution</b>																	
6.1 Domestic & urban waste water									O								O
6.7 Solid waste incl. fly-tipping							O									O	
<b>7. Sediment extraction (marine &amp; terrestrial)</b>																	
7.1 Channel dredging (maintenance & navigation)									H								
7.4 Removal of beach materials									O								
<b>8. Transport &amp; communications</b>																	
8.3 Bridges & aqueducts	O					O	O									O	O
8.5 Road schemes	O	O	O	O		O	O	O	O			O	O	O	O	O	O
8.6 Car parks							O						O				
8.7 Shipping channel, shipping lanes									O								
8.9 Cables - suspended												O		O		O	

Activity/Event	0L406	0L407	0L409	0L413	0L418	0L419	0L420	0L433	0L434	0L435	0L440	0L441	0L442	0L443	0L444	0L445	0L446
<b>9. Urbanisation</b>																	
9.1 Urbanised areas, housing									o								o
<b>12. Tourism &amp; recreation</b>																	
12.2 Non-marina moorings									o								o
12.4 Caravan parks & chalets									o								
12.8 Sailing									o								
12.9 Sailboarding & wind-surfing			o					o	o						o		
12.13 Rowing									o								
12.15 Angling									o								
12.17 Bathing & general beach recreation			o		o		o			o							
12.18 Walking, incl. dog walking			o		o		o	o		o							o
12.19 Birdwatching																	o
12.21 4WD, trial & quad bikes							o										
12.22 Motorised vehicles							o										
12.23 Horse-riding							o		o								
<b>15. Fisheries &amp; Aquaculture</b>																	
15.1 Professional passive fishing (e.g. longlining)								u	u		u						
15.6 Molluscs - hand-gathering					o												
<b>16. Agriculture &amp; forestry</b>																	
16.1 Saltmarsh grazing/harvesting							H										
16.2 Grazing: intensive (terrestrial)												o		o			
16.3 Grazing: non-intensive (terrestrial)							o										

Activity/Event	OL406	OL407	OL409	OL413	OL418	OL419	OL420	OL433	OL434	OL435	OL440	OL441	OL442	OL443	OL444	OL445	OL446
16.13 Agricultural land-claim				H		H	H										H
16.14 In-filling of ditches, ponds, pools, marshes and pits							H										
<b>19. Natural events</b>																	
19.2 Severe cold weather	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
19.3 Eutrophication	o	o	o	o		o	o	o	o			o	o	o	o	o	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.
<b>TOTAL SCORE</b>	<b>6</b>	<b>MODERATE</b>

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

Activity/Event	0L409	0L413	0L418	0L419	0L420	0L433	0L444
<b>12. Tourism &amp; recreation</b>							
12.9 Sailboarding & wind-surfing	5						6
12.18 Walking, incl. dog walking	5		6		6	6	
<b>15. Fisheries &amp; Aquaculture</b>							
15.6 Molluscs - hand-gathering			3				