Drumcliff Bay
Special Protection Area

(Site Code 4013)

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Conservation Objectives
Supporting Document

VERSION 1

National Parks & Wildlife Service

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TABLE OF CONTENTS

SUMMARY

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

Part Two provides site designation information for Drumcliff 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 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 can be any 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 Drumcliff Bay Special Protection Area

Drumcliff Bay, Co. Sligo is the most northerly of Sligo Bay's three estuarine inlets. The bay extends from east to west from Drumcliff village to Raghly Point and comprises an inner area of sheltered estuarine habitat and an outer area of shallow seawater.

The bay is the estuary of the Drumcliff River, a substantial river flowing east from Glencar Lough. The inner bay is sheltered by a low sand spit that mainly supports embryonic dunes, some fixed dunes and some saltmarsh (McCorry & Ryle, 2009).

The northern part of the bay is fringed by fine sandy beaches - Ballygilgan Strand, Lissadell Strand and Ardtermon Strand. Salt marsh occurs in the most sheltered areas and at low tide, extensive intertidal flats are exposed. A seagrass community, dominated by *Zostera noltii,* is recorded in the south-eastern extreme of the bay at Doonierin (NPWS, 2013a).

Drumcliff Bay SPA is of importance as it supports nationally important populations of two species of non-breeding waterbird, namely Sanderling and Bar-tailed Godwit, as well as supporting an assemblage of over-wintering waterbirds. The site is additionally important as the third component of the much larger Sligo Bay complex that also includes Cummeen Strand and Ballysadare Bay to the south.

Ballintemple and Ballygilgan SPA (Site Code 4234) is situated on the north side of Drumcliff Bay. This is a large area of improved permanent pasture which is a traditional wintering site for over 2,000 Barnacle Geese (*Branta leucopsis*). This SPA includes Ballygilgan Nature Reserve ("the Goose Field'') which is owned and managed by NPWS.

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

1.3 Introduction to Conservation Objectives

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

Box 1

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

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

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

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

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

Site-specific conservation objectives define the desired condition or range of conditions that a habitat or species should be in, in order for these selected features within the site to be judged as favourable. At site level, this state is termed 'favourable conservation condition.' Site conservation objectives also contribute to the achievement of the wider goal of biodiversity conservation at other geographic scales, and to the achievement of favourable conservation status at national level and across the Natura 2000 network[1].

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

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

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

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

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

PART TWO – SITE DESIGNATION INFORMATION

2.1 Special Conservation Interests of Drumcliff Bay Special Protection Area

The **Special Conservation Interest species**[3] for Drumcliff Bay SPA are listed below and summarised in Table 2.1. This table also shows the importance of Drumcliff Bay SPA and the Sligo Bay Complex as a whole for the SCI species, relative to the importance of other sites within Ireland and within the Border region[4].

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

1. During winter the site regularly supports 1% or more of the all-Ireland population of Sanderling (*Calidris alba*). The mean peak number of this species within the SPA during the baseline period (1995/96 – 1999/00) was 237 individuals.

2. During winter the site regularly supports 1% or more of the all-Ireland 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 336 individuals.

3. The wetland habitats contained within Drumcliff 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.

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

[4] 'Region' refers to regions as defined by Irish Regions Office and in the case of the Border region takes into account cross-border sites Lough Foyle and Carlingford Lough, as well the cross-region site Killala Bay/Moy Estuary.

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

Special Conservation Interests	Annex I species	Baseline Population[a]	Population status at baseline	National Importance Rank[1]	Regional Importance Rank[2]
Sanderling (*Calidris alba*)		237	All-Ireland importance	5	1
Bar-tailed Godwit (*Limosa lapponica*)	Yes	336	All-Ireland importance	18	3
Other conservation designations associated with the site[b]	**SAC**	**RAMSAR SITE**	**IMPORTANT BIRD AREA (IBA)**	**WILDFOWL SANCTUARY**	**OTHER**
	00627		Yes	Yes	pNHA

[a] Baseline data are the 5-year mean peak counts for the period 1995/96 – 1999/00 (I-WeBS).
[b] Note that other designations associated with Drumcliff Bay may relate to different areas and/or some of these areas may extend outside the SPA boundary.
[1]National importance rank – the number given relates to the importance of the site and the Sligo Bay wetland complex as a whole, for the non-breeding population of a SCI species during the baseline period (1995/96 – 1999/00) relative to other sites in Ireland.
[2]Regional importance rank - the number given relates to the importance of the site and the Sligo Bay wetland complex as a whole, for the non-breeding population of the SCI species during the baseline period (1995/96 – 1999/00) relative to other sites within the Border Region (includes cross-border sites Carlingford Lough and Lough Foyle as well as cross-region site Killala Bay/Moy Estuary).

PART THREE – CONSERVATION OBJECTIVES FOR DRUMCLIFF BAY SPA

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

The overarching Conservation Objective for Drumcliff 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 Drumcliff 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 Drumcliff Bay SPA.*

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

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

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

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

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

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

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

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

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

- ❖ Ex-situ factors: 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 Drumcliff 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 **1,843 ha,** other than that occurring from natural patterns of variation.

The boundary of Drumcliff 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 though 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 Drumcliff Bay SPA this broad category is estimated to be **831 ha**. Subtidal areas are continuously available for benthic and surface feeding ducks (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 Drumcliff Bay SPA this is estimated to be **918 ha**. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing[8] areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource.

The supratidal category refers to areas that are not frequently inundated by the tide (i.e. occurring above the mean high watermark) but contain shoreline and coastal habitats and can be regarded as an integral part of the shoreline. For Drumcliff Bay SPA this is estimated to be **94 ha**. Supratidal areas are used by a range of waterbird species as a roosting resource as well as providing feeding opportunities for some species.

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

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

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

Objective 1: *To maintain the favourable conservation condition of the waterbird Special Conservation Interest species listed for Drumcliff Bay SPA, which is defined by the following list of attributes and targets:*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Population	Population trend	Percentage change as per population trend assessment using waterbird count data collected through the Irish Wetland Bird Survey and other surveys.	The long term population trend should be stable or increasing	Waterbird population trends are presented in Part Four of this document.
Range	Distribution	Range, timing or intensity of use of areas used by waterbirds, as determined by regular low tide and other waterbird surveys.	There should be no significant decrease in the range, timing or intensity of use of areas by the waterbird species of Special Conservation Interest other than that occurring from natural patterns of variation.	Waterbird distribution from the 2010/11 waterbird survey programme is reviewed in Part Five of this document.
Objective 2: *To maintain the favourable conservation condition of the wetland habitat at Drumcliff Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets:*				
Parameter	**Attribute**	**Measure**	**Target**	**Notes**
Area	Wetland habitat	Area (ha)	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 1,843 ha, other than that occurring from natural patterns of variation.	The wetland habitat area was estimated as 1,843 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 Drumcliff Bay SPA

Non-breeding waterbirds have been counted at Drumcliff Bay as part of the Irish Wetland Bird Survey (I-WeBS) since 1994/95. The dataset spans the period 1994/95 to 2010/11 and the site was counted at least once in most seasons although a few seasons were not covered (1997/98, 2001/02, 2002/03). I-WeBS counts are undertaken during what is termed the 'core survey period' which covers the main wintering period when many species occur in their largest concentrations, but also the autumn and spring passage periods when total waterbird numbers may be enhanced by staging/stopover birds[9]. During I-WeBS the site is divided into various count subsites. The SPA area and the I-WeBS count area are not coincident; the latter being larger in that it includes the terrestrial areas designated as Ballintemple and Ballygilgan SPA (Crowe, 2005). I-WeBS and other species-specific surveys are described briefly in Appendix 2.

Table 4.1 presents population[10] data for the non-breeding waterbird SCI species of Drumcliff Bay. Annual maxima were identified and used to calculate the five-year mean peak for each species. The baseline period was 1995/96 – 1999/00 (four-year mean; data for 1997/98 missing) 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 species by helping to account for inconsistencies in data gathering (i.e. differing coverage) or extraordinary fluctuations in numbers. However it is important to note that waterbird counts represent a 'snapshot' of bird numbers during a count session, so in general and taking into account all potential sources of error, resulting data are regarded to be underestimates of population size (Underhill & Prŷs-Jones, 1994).

Table 4.1 indicates where the numbers shown surpass the threshold of all-Ireland importance. These thresholds are different for the baseline and recent time periods (refer to Crowe et al. (2008)).

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

Site Special Conservation Interests (SCIs)	Baseline Period[1] (1995/96 – 1999/00)	Recent Site Data[2] (2006/07 – 2010/11)
Sanderling	237 (n)	97
Bar-tailed Godwit	336 (n)	457 (n)

[1]Baseline data is the 4-year mean peak for the period 1995/96 – 1999/00;
[2]recent site data is the 5-year mean peak for the period 2006/07 – 2010/11 (I-WeBS).
(n) denotes numbers of all-Ireland importance; note that thresholds differ for the baseline and recent time periods used (refer to Crowe et al. 2008).

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

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

4.2 Waterbird population trends for Drumcliff 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. A detailed methodology for this trend analysis is provided in Appendix 3. For Drumcliff Bay however, incomplete coverage during I-WeBS (as noted above) precludes the use of this analysis process. Therefore an estimation of population change over time was calculated using the 'generic threshold method' (after JNCC, 2004). This compares population size for two different five-year time periods, the change being expressed as a proportion of the initial population, as follows:

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

where: I_y = recent population and I_x = baseline population.

This calculation was undertaken comparing the baseline population with the series of rolling peak means shown in Table 4.2. The results (% change) are shown in Table 4.3.

Table 4.2 Site Population data for waterbird Special Conservation Interest species of Drumcliff Bay SPA: rolling five-year means

Data period	Sanderling	Bar-tailed Godwit
1995/96-1999/00 (baseline)	237 (n)	336 (n)
2000/01-2004/05*	28	138
2003/04-2007/08	45	143
2004/05-2008/09	47	148
2005/06-2009/10	86 (n)	283 (n)
2006/07-2010/11	97 (n)	457 (n)

(n) denotes numbers of all-Ireland importance.
*all 5-year means except 2000/01 – 2004/05 which is a 3-year mean; data for 2001/02 and 2002/03 missing.

Table 4.3 Site Population trends – comparison of five-year means

Data period	Sanderling	Bar-tailed Godwit
Baseline vs 2000/01-2004/05	- 88	- 59
Baseline vs 2003/04-2007/08	- 81	- 57
Baseline vs 2004/05-2008/09	- 80	- 56
Baseline vs 2005/06-2009/10	- 63	- 17
Baseline vs 2006/07-2010/11	- 59	+ 36

Sanderling – numbers appear to have dropped significantly since the baseline period but it should be noted that count coverage during the period 2003/04 to 2007/08 comprised one annual count only. As Sanderlings are a relatively mobile species; this level of count coverage may fail to adequately represent the numbers using the site. Count coverage has increased in recent years and annual peak counts have increased (2009/10, 2010/11) but are still lower than the baseline peak mean. A recent (2010/11) high tide peak count (174) obtained during the NPWS Waterbird Survey programme (see Section 5) is also lower than the baseline mean peak number. These patterns are at variance with the national trend and

that observed in the UK; numbers of Sanderlings having increased across time (Boland & Crowe, 2012; Calbrade et al. 2010).

Bar-tailed Godwit – the long-term dataset shows great variability in numbers between years but the same caution must be applied as for Sanderling above. Bar-tailed Godwits are also a relatively mobile wader species and can move in response to local food conditions; low coverage in some seasons may have failed to adequately represent the numbers using the site. Numbers in recent seasons have increased with a peak count of 940 individuals during 2010/11 although the peak high tide count obtained during the NPWS Waterbird Survey programme (see Section 5) was lower (357). Nationally, numbers have remained broadly stable throughout I-WeBS, while a decline has been evident in Britain since the early 2000's with some recovery in recent seasons (Boland & Crowe, 2012; Calbrade et al. 2010).

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

Conservation condition of SCI species was determined using the species estimated site trend based on the comparison of the baseline peak mean with the most recent peak mean. Conservation condition was assigned using the following criteria:

Favourable population = population is stable/increasing.

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

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

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

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

With regards the two waterbird species of Special Conservation Interest listed for Drumcliff Bay SPA, and based on the population trend for the site, it has been determined that (Table 4.4):-

1. 1 species is currently considered as **Highly Unfavourable** (Sanderling).
2. 1 species is currently considered as **Favourable** (Bar-tailed Godwit).

Site conservation condition and population trends were also reviewed in light of species' national and international trends (Table 4.4). National trends were provided by the I-WeBS Office while International trends follow Wetlands International (2012).

Table 4.4 SCI species of Cummeen Strand SPA – Current Site Conservation Condition

Special Conservation Interests	BoCCI Category[a]	Site Population Trend[b]	Site Conservation Condition	Current National Trend[c]	Current International Trend[d]
Sanderling	Green	- 59	Highly Unfavourable	+ 125	Increase
Bar-tailed Godwit	Amber	+ 36	Favourable	+ 35	Increase

[a]After Lynas et al. (2007); [b] based on the comparison between baseline and recent means, as shown in Table 4.3; [c]recent national trend is for the 12 year period 1998/99 to 2010/11; [d]international trend after Wetland International (2012).

Table 4.4 also shows the relationship between a species' long-term site trend and the current national trend for the 12-year period 1998/99 to 2010/11. The colour coding used represents the following cases:-

- Green – species whose populations are stable or increasing at both site level and national level.
- Beige – species whose populations are declining at both site level and national level. Therefore there is a potential for factors at a larger spatial scale to be influencing the observed trend at site level.
- Orange - species whose populations are exhibiting a 1.0 – 24.9% decline at site level but are stable or increasing at all national level.
- Pink - species whose populations are exhibiting a 25.0 – 49.9% decline at site level but are stable or increasing at national level.
- Red - species whose populations are exhibiting a decline of >50.0% at site level but are stable or increasing at national level.

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

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 Drumcliff Bay SPA.

Section 5.2 provides selected ecological summary information for non-breeding waterbirds of Drumcliff 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 Drumcliff 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 March 2013.

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

Waterbirds, defined as *"birds that are ecologically dependent on wetlands"* (Ramsar Convention, 1971), are a diverse group that includes divers, grebes, swans, geese and ducks, gulls, terns and wading birds. During the data period 1994/95 – 2010/11 the I-WeBS database shows a total of 54 waterbird species that have been recorded within Drumcliff Bay. These species represent eleven waterbird families: *Gaviidae* (divers), *Podicipedidae* (grebes), *Anatidae* (swans, geese and ducks), *Rallidae* (Water Rail, Moorhen & Coot), *Haematopodidae* (oystercatchers), *Charadriidae* (plovers and lapwings), *Scolopacidae* (sandpipers and allies) and *Laridae* (gulls and terns) plus *Phalacrocoracidae* (Cormorants), *Ardeidae* (Herons) and *Alcedinidae* (Kingfisher). Regularly-occurring waterbird species that over-winter in Ireland are listed in Appendix 4 along with their Latin names and waterbird species codes.

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[11] or species that use the site at certain times only (e.g. as a cold weather refuge).

26 waterbird species occurred on a regular basis within Drumcliff Bay during the I-WeBS period 1994/95 – 2010/11.[12] These species, with the exception of the two SCI species listed for Drumcliff Bay SPA, are shown in Table 5.1 along with summary data.

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

[12] Regular is defined as a species that has occurred in 10 out of the 13-year data period.

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

Species	Baseline Data Period[1] (1995/96 – 1999/00)	Recent Site Average[2] (2006/07 – 2010/11)
Barnacle Goose (*Branta leucopsis*)	1,475 (i)	1,748 (i)
Light-bellied Brent Goose (*Branta bernicla hrota*)	74	276
Shelduck (*Tadorna tadorna*)	69	103
Wigeon (*Anas penelope*)	149	380
Teal (*Anas crecca*)	56	284
Mallard (*Anas platyrhynchos*)	83	68
Red-breasted Merganser (*Mergus serrator*)	26	18
Great Northern Diver (*Gavia immer*)	16	9
Cormorant (*Phalacrocorax carbo*)	9	6
Grey Heron (*Ardea cinerea*)	8	4
Oystercatcher (*Haematopus ostralegus*)	417	712 (n)
Ringed Plover (*Charadrius hiaticula*)	125	112
Grey Plover (*Pluvialis squatarola*)	12	21
Lapwing (*Vanellus vanellus*)	213	109
Knot (*Calidris canutus*)	110	472 (n)
Dunlin (*Calidris alpina*)	456	358
Curlew (*Numenius arquata*)	195	247
Greenshank (*Tringa nebularia*)	8	9
Redshank (*Tringa totanus*)	151	181
Turnstone (*Arenaria interpres*)	21	66
Black-headed Gull (*Chroicocephalus ridibundus*)	186	94
Common Gull (*Larus canus*)	142	271
Herring Gull (*Larus argentatus*)	35	136
Great Black-backed Gull (*Larus marinus*)	7	13

Grey shading denotes an Annex I species; (i) = numbers of international importance (after Wetlands International, 2012); (n) = numbers of all-Ireland importance (after Crowe et al. 2008).
[1] Baseline data is the 3-year mean peak for the period 1995/96 – 1999/00 (I-WeBS); [2]recent site data is the 5-year mean peak for the 5-year period 2006/07 – 2010/11 (I-WeBS).

Of note in Table 5.1 is the Annex I species Barnacle Goose (*Branta leucopsis*). These birds are usually recorded feeding in fields around Lissadell and Ballintemple to the north of Drumcliff Bay; areas included in the Drumcliff Bay I-WeBS count area but not included within the Drumcliff Bay SPA, being designated separately as follows:-

- **Ballintemple and Ballygilgan SPA** (Site Code 4234) - comprise two separate areas of agriculturally-improved grassland fields, situated on the north side of Drumcliff Bay. This includes Ballygilgan Nature Reserve ("the Goose Field"), a large area of improved permanent pasture which is a traditional wintering site for over 2,000 Barnacle Geese, while freshwater ponds on the site attract other waterfowl and waders, and a cereal patch at the east end attracts wintering finches and buntings (www.sligobirding.com). The reserve is owned and managed by NPWS.

Two other sites in the vicinity of Drumcliff Bay are also designated for Barnacle Geese:

- **Ardboline Island and Horse Island SPA** (Site Code 4135) - situated 16 km north-west of Sligo town, this site supports an internationally-important flock of Barnacle Goose during winter which feed, roost and seek refuge there.
- **Inishmurray SPA** (Site Code 4068) - is an exposed island located c.6 km north-west of Streedagh Point, County Sligo. The site is a regular wintering area for Barnacle Geese and these birds are likely to be part of the internationally important population that is centred at Ballintemple and Lissadell on the mainland.

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. As with Barnacle Goose above, different species or

groups of species may 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 Drumcliff Bay SPA. Information is provided for the following categories[13]:-

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

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

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

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

objectives should also consider the use of these '*ex-situ'* habitats, and their significance to the listed bird species.

Table 5.2 Waterbirds – Ecological characteristics, requirements & specialities

Special Conservation Interests	Family (group)	Winter distribution[A]	Trophic Guild[B]	Food/Prey Requirements[C]	Principal supporting habitat within site[D]	Ability to utilise other/alternative habitats[E]	Site Fidelity[F]
Sanderling *Calidris alba*	Scolopacidae (wading birds)	Localised	4, 6	Wide	Intertidal mud and sand flats	3	High
Bar-tailed Godwit *Limosa lapponica*	Scolopacidae (wading birds)	Localised	4	Wide	Intertidal mud and sand flats	3	Moderate

[A] Winter distribution: Very widespread (>300 sites); Widespread (200 – 300 sites); Intermediate (100 – 200 sites); Localised (50-100 sites); Highly restricted (<50 sites) (based on Boland & Crowe, 2012).
[B] Waterbird foraging guilds. 1 = Surface swimmer, 2 = water column diver (shallow), 3 = water column diver (deeper), 4/5 = intertidal walker (out of water), 6 = intertidal walker (in water), 7 = terrestrial walker. Further details are given within Appendix 5.
[C] Food/prey requirements - species with a wide prey/food range; species with a narrower prey range (e.g. species that forage upon a few species/taxa only), and species with highly specialised foraging requirements (e.g. piscivores).
[D] Principal supporting habitat present within Drumcliff Bay.
[E] Ability to utilise alternative habitats refers to the species ability to utilise other habitats adjacent to the site. 1 = wide-ranging species with requirement to utilise the site as and when required; 2 = reliant on site but highly likely to utilise alternative habitats at certain times (e.g. high tide); 3 = considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited habitat requirements.
[F] Site fidelity on non-breeding grounds: Unknown; Weak; Moderate; or High (based on published literature).

5.3 The 2010/11 waterbird survey programme

5.3.1 Introduction

The 2010/11 waterbird survey programme was designed to investigate how waterbirds are distributed across coastal wetland sites during the low tide period. The surveys ran alongside and are complementary to the Irish Wetland Bird Survey (I-WeBS) which is a nationwide survey undertaken primarily on a rising tide or at high tide (Crowe, 2005).

Drumcliff Bay forms part of the larger Sligo Bay complex that comprises Cummeen Strand in the middle, Drumcliff Bay to the north, and Ballysadare Bay to the south. Waterbirds are thought to range across these sites collectively, so Cummeen Strand and Drumcliff Bay were surveyed on the same day, and Ballysadare Bay was surveyed, where possible on the following day.

At Drumcliff Bay, a standard survey programme of four low tide counts (October, November & December 2010 and February 2011) and two high tide counts (January and February 2011) were undertaken.[14] Waterbirds were counted within a series of 12 count subsites (refer to Appendix 6). It should be noted that the count 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. *Spartina* sp.) surrounded by intertidal flats, were included in the intertidal category.
Terrestrial	Used where birds were recorded within habitats close to the shoreline but were above the intertidal and supratidal levels.

In addition to the main survey programme described above, a high tide roost survey was undertaken on 30th November 2010. During this survey waterbird roost sites were located, species and numbers of waterbirds counted and the position of roosts marked onto field maps.

5.3.2 Waterbird data, analyses and presentation

The aim of data analyses was to understand how waterbirds are distributed across the site of Drumcliff 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

[14] Low tide counts on 21/10/10, 22/11/11, 21/12/10 & 02/02/11 plus high tide counts on 27/01/11 and 11/02/11.

invertebrate distribution and abundance, we aimed to identify areas (subsites) within the site that are the most important for foraging and roosting on a species by species basis.

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

- 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 high tide surveys that are presented simply as rank numbers. The highest rank position/category for each subsite across any of the low tide count dates is presented in a subsite by species matrix.

Subsite Rank Position - Categories

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

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

Waterbird count data for low tide surveys are also presented as species distribution maps ('dot density maps'). Dot-density maps show waterbird species distribution within intertidal or subtidal habitat[15] 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

Waterbirds are thought to range across the three component sites of Sligo Bay (Cummeen Strand, Drumcliff Bay and Ballysadare Bay) although the extent to which they do this is largely unknown. Every effort was made to record bird movements during surveys and the

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

two adjoining sites, Cummeen Strand and Ballysadare Bay were surveyed on the same day or on nearby dates. However, these features and the possibility of bird movements, double-counting etc should be borne in mind when examining count data.

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 also be borne in mind that the cold weather is likely to have affected the numbers and distribution of waterbirds at the site, as well as nationally, as was the case in the previous cold winter of 2009/10 (Crowe et al. 2011).

Subsite rankings and dot-density maps relate to the distribution of waterbirds at subsite level as recorded within the survey area during the 2010/11 waterbird survey programme. Care must be taken in the interpretation of these data, and subsite rankings in isolation should not be used to infer a higher level of conservation importance to one area over another without a 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 45 waterbird species were recorded during the 2010/11 survey programme at Drumcliff Bay. The total species list included some less regularly-occurring species such as Eider (*Somateria mollissima*) and Woodcock (*Scolopax rusticola*).

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.

The SCI species Sanderling and Bar-tailed Godwit were recorded within all counts of the main survey programme. Table 5.4 shows peak numbers recorded during the low tide (LT) and high tide (HT) surveys.

On average, Sanderlings occurred in 15% of subsites representing an average 18% of the total count area and reflecting a relatively restricted range within the site. Bar-tailed Godwits were more widespread and occurred on average in nearly half of subsites and across half of the survey area (Table 5.4).

Table 5.4 Drumcliff Bay 2010/2011 waterbird surveys – SCI summary data

Site Special Conservation Interests (SCIs)	Peak number - LT surveys[I]	Peak number - HT surveys[II]	Average subsite % occupancy [III]	Average % area occupancy [III]
Sanderling	358 (n)	174 (n)	15 (8)	18 (9)
Bar-tailed Godwit	980 (n)	357 (n)	48 (8)	52 (6)

(n) denotes numbers of all-Ireland importance (1% thresholds; 1999/00 – 2003/04 Crowe et al. 2008); [I] 4 low-tide counts undertaken on 21/10/10, 22/11/10, 21/12/10 & 02/02/11; [II] peak number from either high-tide count undertaken on 27/01/11 or 11/02/11; [III] Mean (± s.d.) averaged across low tide surveys.

Whole site species richness (total number of species) was relatively consistent for the four low tide surveys (range 33-34 species). 33 and 27 species were recorded respectively during the January and February 2011 high tide surveys.

During low tide surveys, average subsite species richness ranged from five species (0C425) to 18 species (0C494) (Table 5.5). 0C309 (Ballgilgan) is a terrestrial (grassland) subsite and recorded only Barnacle Goose.

Table 5.5 Subsite species richness

Subsite Code	Subsite name	Mean (±S.D) LT Survey	HT Survey (Jan/Feb)	Peak Overall (H/L)
0C309	Ballygilgan NNR (goose field) (Lisadell)	0	0/1	1 (H/L)
0C424	Lissadell/Ballygilgan Strand	13 (1.6)	7/11	15 (L)
0C425	Lower Rosses	5 (2.1)	13/3	13 (H)
0C443	Lower Rosses East	12 (1.4)	9/8	13 (L)
0C444	Doonierin	9 (3.4)	3/2	12 (L)
0C448	Coolbeg	16 (2.2)	8/6	19 (L)
0C449	Ballinaphunta	15 (4.5)	8/12	19 (L)
0C450	Kintogher	6 (1)	3/8	8 (H)
0C494	Drumcliff Bay Outer: Ardtermon Strand	18 (1.6)	12/8	20 (L)
0C922	Drumcliff Bay Outer: Raghly Harbour	16 (4.2)	20/11	21 (L)
0C931	Cloghcor	8 (1.2)	10/4	10 (H)
0C932	Lissadell Strand	10 (2.4)	11/8	13 (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 where data for intertidal/subtidal habitat 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 Drumcliff Bay. Waterbird distribution dot-density maps are provided in Appendix 7; summary roost data are presented in Appendix 8.

Table 5.6 (a) Drumcliff 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 ► Subsites ▼	SS	BA
0C309		
0C424		M
0C425	M	
0C443	H	
0C444		H
0C448		H
0C449	H	V
0C450		M
0C494	V	V
0C922		L
0C931		H
0C932	V	

Table 5.6 (b) Drumcliff Bay Subsite assessment – highest rank obtained during either one of the high tide surveys (across all habitats)

Species ► Subsites ▼	SS	BA
0C309		
0C424		2
0C425	1	
0C443	2	
0C444		
0C448		
0C449	4	3
0C450		1
0C494	5	
0C922		4
0C931		
0C932	3	

Table 5.6 (c) Drumcliff Bay Subsite assessment – total numbers foraging intertidally
(L Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods)

Species ► Subsites ▼	SS	BA
0C309		
0C424		M
0C425		
0C443	H	
0C444		H
0C448		M
0C449	H	V
0C450		M
0C494	V	
0C922		
0C931		H
0C932	V	V

Table 5.6 (d) Drumcliff Bay Subsite assessment – ranked peak intertidal foraging densities

Species ► Subsites ▼	SS	BA
0C309		
0C424		4
0C425		
0C443	3	
0C444		8
0C448		6
0C449	1	3
0C450		7
0C494	4	1
0C922		
0C931		5
0C932	2	2

Table 5.6 (e) Drumcliff Bay Subsite assessment – total numbers (roosting/other behaviour) during LT surveys (Intertidal) Low, M Moderate; H High V Very high; please see Section 5.3.2 for methods).

Species ► Subsites ▼	SS	BA
0C309	not recorded	
0C424		V
0C425		
0C443		
0C444		V
0C448		V
0C449		
0C450		
0C494		
0C922		H
0C931		
0C932		

Table 5.6 (f) Drumcliff Bay Subsite assessment – highest rank obtained (roosting/other behaviour) during either HT survey (Intertidal)

Species ► Subsites ▼	SS	BA
0C309	not recorded	
0C424		
0C425		
0C443		
0C444		
0C448		
0C449		2
0C450		1
0C494		
0C922		
0C931		
0C932		

Drumcliff 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 ASU (2007, 2012) and NPWS (2013a).

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

Information relating to the NPWS Waterbird Survey Programme undertaken at Cummeen Strand and Ballysadare Bay can be found in NPWS (2013b) and NPWS (2013c) respectively.

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

Sanderlings are one of the most northerly of all Arctic-breeding waders with a circumpolar breeding range that includes Alaska, Northern Canada, Greenland and Svalbard. The species is a long-distance migrant and two subspecies are described of which the nominate *Calidris alba alba* breeds in Greenland, Jan Mayen, Svalbard, and Siberia and winters along the Atlantic coast of Europe and Africa (Delaney et al. 2009). Sanderling originating from the westernmost Siberian breeding population migrate south-west along the Atlantic seaboard and form the bulk of the birds wintering in Ireland, while it was thought that birds originating from Greenland continued south to winter in West Africa. However, it is now apparent that there is overlap in the wintering ranges of the two, and that Greenland-breeding Sanderling also occur in Ireland in winter as well as during the typical passage periods (Delaney et al., 2009; Reneerkens et al. 2009).

Numbers

Whole site numbers of Sanderling peaked in October 2010 (358 individuals) likely comprising some passage individuals. This count and the high tide count on 27/01/11 surpassed the threshold of all-Ireland importance. Thereafter numbers dropped to 44 (22/11/10) with only one bird present during the final low tide survey in February 2011. 81 were counted during the high tide survey (11/02/11).
Numbers were likely affected by the cold weather event that saw temperatures in December 2010 plummet to a record low (Met Éireann, 2010).

Ballysadare Bay (SPA 4129) held good numbers during low tide counts; numbers peaking at 328 individuals on 23/11/10 i.e. the day after the relatively low count of 44 at Drumcliff Bay. It is highly likely that Sanderlings move between the sites depending on various factors such as wind direction, weather, prey densities/availability, or level of human activity at a site.

At Drumcliff Bay, Sanderlings were recorded in five subsites: 0C425, 0C443, 0C449, 0C494 and 0C932; although 0C425 only recorded the species during the high tide surveys. 0C932 (Lissadell Strand) was clearly the favoured subsite supporting peak numbers in three low tide surveys and the subsite peak count of 188 Sanderling on 21/10/10. However it should be borne in mind that overall site numbers were low in the November, December and February low tide surveys.

Foraging Distribution

During the non-breeding season Sanderlings can be found in a variety of coastal habitats but are characteristic of sandy shorelines (strands) where they often forage along the tide line by rushing in and out with the waves searching for small prey such as sandhoppers. Significant numbers however may also be found along non-estuarine coastlines (Crowe, 2005), outer parts of estuaries (Musgrove et al. 2003) or within some sheltered bays where they may form part of mixed flocks with Dunlin or Ringed Plover.

Sanderlings foraged intertidally across four subsites: 0C443, 0C449, 0C494 and 0C932. 0C932 (Lissadell Strand) supported peak numbers in three low tide surveys, generally foraging on the lower shore. This subsite is in the outer bay (west of the spit at Rosses Point) and is dominated by sand (<70%) with an intertidal benthic community defined by 'fine sand with crustaceans and *Scolelepis squamata*.' As well as the forementioned polychaete, the distinguishing species of this community are the crustaceans *Eurydice pulchra*, *Bathyporeia pelagica* and *Haustorius arenarius*; all of which could form prey species for Sanderlings.

0C449 (Ballinaphunta) held good numbers (105) on 21/10/10. This subsite is muddier in its upper shore reaches ('intertidal fine sand with *Peringia* (*Hydrobia*) *ulvae* and *Pygospio elegans*) but grades to sandier sediment classified as 'fine sand with crustaceans and *Scolelepis squamata*' on the lower shore.

It should be borne in mind that overall numbers were low in the November, December and February low tide surveys and hence whole-season foraging patterns are not clear.

Surveys undertaken at Cummeen Strand on the same dates as Drumcliff Bay indicate that Sanderling regularly utilise the Cummeen Strand subsite (Code 0C466) for foraging.

A total of 174 Sanderlings foraged during the January 2011 high tide survey; over half within 0C425 (Lower Rosses), 44 in 0C443 (Lower Rosses East) and smaller numbers in 0C449 (12) and 0C932 (27). 81 Sanderlings foraged during the February 2011 high tide survey; 72% in 0C425 (Lower Rosses).

The peak intertidal foraging density was 1.4 Sanderling ha^{-1} recorded for 0C449 (Ballinaphunta). The whole site average intertidal foraging density was 0.1 Sanderling ha^{-1}.

Roosting Distribution

Sanderlings were not recorded roosting during the main survey programme or during the roost survey on 30/11/10 (45 were recorded foraging in 0C443 on that date). No Sanderlings were recorded roosting during the roost survey at Cummeen Strand on the same day. 25 Sanderlings roosted intertidally within the Cummeen Strand subsite (Code 0C466) on 22/11/10.

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

Total site numbers of Bar-tailed Godwits rose from 85 in October 2010 to a site peak of 980 during the February low tide survey. All low tide counts bar that in October 2010 surpassed the threshold of all-Ireland importance (160).

Bar-tailed Godwits were recorded within nine subsites overall (0C424, 0C444, 0C448, 0C449, 0C450, 0C494, 0C922, 0C931 and 0C932). 0C448 (Coolbeg) and 0C494 (Drumcliff Bay Outer: Ardtermon Strand) held the species in all four low tide surveys.

Peak numbers were recorded for 0C494 (Drumcliff Bay Outer: Ardtermon Strand), 0C932 (Lissadell Strand), 0C449 (Ballinaphunta) and 0C494 for the four low tide surveys respectively. The subsite peak count was 790 individuals recorded for 0C494 (Drumcliff Bay Outer: Ardtermon Strand) on 02/02/11.

Good numbers were also recorded at Cummeen Strand and Ballysadare Bay during the survey programme and this species is likely to range across all of the component sites of Sligo Bay Complex.

Foraging Distribution

Bar-tailed godwits are a wader species considered characteristic of coastal wetland sites dominated by sand. The birds forage by probing within intertidal sediment for invertebrate species, predominantly large polychaete worms such as *Arenicola marina* and *Nepthys* sp. The species is characteristic of sites with sandy substrates (e.g. Hill et al. 1993; Summers et al. 2002).

Bar-tailed Godwits were recorded foraging within eight subsites overall (0C424, 0C444, 0C448, 0C449, 0C450, 0C494, 0C931 and 0C932). Peak numbers foraging intertidally were recorded for 0C494 (Drumcliff Bay Outer: Ardtermon Strand), 0C932 (Lissadell Strand), 0C449 (Ballinaphunta) and 0C494 for the four low tide surveys respectively.

0C494 (Drumcliff Bay Outer: Ardtermon Strand) was notable for supporting numbers always ranked first or second highest; while 0C932 (Lissadell Strand) always supported numbers ranked in the top three. These subsites are in the outer bay (west of the spit at Rosses Point) and are dominated by sand (<70%) with an intertidal benthic community defined by 'fine sand with crustaceans and *Scolelepis squamata*.' The distinguishing species of this community are the crustaceans *Eurydice pulchra*, *Bathyporeia pelagica* and *Haustorius arenarius* and the polychaete *Scolelepis squamata*.

0C494 (Drumcliff Bay Outer: Ardtermon Strand) is in part classified as 'intertidal fine sand with *Peringia* (*Hydrobia*) *ulvae* and *Pygospio elegans*' and supports potential prey species of Bar-tailed Godwits such as polychaetes *Arenicola marina* and *Lanice conchilega*. Of note were 870 Knot that were foraging with Bar-tailed Godwits in 0C494 on 02/02/11.

408 Bar-tailed Godwits foraged in 0C932 on 22/11/10. These birds foraged on the lower shore as part of a loose flock that also comprised 582 Knot and 44 Sanderling, amongst other species.

Good numbers of foraging Bar-tailed Godwits were also recorded at Cummeen Strand, surveyed on the same dates as Drumcliff Bay. The areas Ballincar – Ballyweelin, Cummeen Strand and Cummeen west from Coney Island Road were used regularly. Of note were 275 Bar-tailed Godwits foraging within Ballincar – Ballyweelin during the high tide survey on 27/01/11. 135 individuals foraged within Cummeen Strand (subsite) during the October 2010 low tide survey, more than the total number recorded across the Drumcliff bay survey area on the same day. It is clear therefore that this species ranges across both Drumcliff Bay and Cummeen Strand.

The highest intertidal foraging density recorded for a single subsite was 5.3 Bar-tailed Godwits ha^{-1} (0C494: Drumcliff Bay Outer: Ardtermon Strand). Only two other subsites (0C449 and 0C932) recorded densities greater than 1 Bar-tailed Godwits ha^{-1}. The whole site mean feeding density (intertidal habitat) was 0.5 Bar-tailed Godwits ha^{-1}.

Roosting Distribution

During low tide surveys, Bar-tailed Godwits were rarely recorded roosting intertidally; single observations recorded for 0C424, 0C444, 0C448 and 0C922.

No roosting was recorded during the January 2011 high tide survey. 228 Bar-tailed Godwits roosted intertidally during the high tide survey on 11/02/11; 180 in 0C450 (Kintogher) and 48 in 0C449 (Ballinaphunta). A further 87 roosted supratidally in 0C424 (Lissadell/Ballygilgan Strand); all inner bay subsites.

Roosting individuals were recorded from three subsites during the roost survey (30/11/10) the largest roosts recorded in 0C424 (flocks of 230 and 150 birds) that were positioned on the upper shore of Ballygilgan Strand. 0C922 and 0C931 recorded six and two individuals respectively.

5.4 Drumcliff 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, 2010). In its broadest sense, favourable conservation status means that an ecological feature is in a satisfactory condition, and that this status is likely to continue into the future.

At site level, the concept of 'favourable status' is referred to as 'conservation condition.' This can relate 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 Drumcliff 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. Sligo County Council, 2010, 2011), Western River Basin District documents (e.g. WRBD, 2009a,b) 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 70+ 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 Drumcliff 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 Drumcliff Bay;
   U known to occur but unknown spatial area hence all potential subsites are included (e.g. fisheries activities);
   H historic, known to have occurred in the past.
   P potential to occur in the future.

2. Of the activities and events identified to occur in and around Drumcliff 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 Drumcliff Bay

Activities and events identified to occur in and around Drumcliff 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 disturbance; and (5) others.

Habitat loss and modification and adjacent landuse
Drumcliff Bay is the most northerly of the three bays comprising the Sligo Bay Complex. It is located in a natural valley with higher ground on both the northern and southern sides (McCorry & Ryle, 2009). The surrounding environment of Drumcliff Bay is less developed than either Cummeen Strand (sometimes referred to as Sligo Harbour) or Ballysadare Bay.

The Drumcliff River enters the inner bay through Drumcliff Village, the most populated centre bordering the site. The Carney River flows into the site at Finned Point. Carney village lies adjacent to the bay. The Downowney River and a few small streams also discharge into the bay. The town of Rosses Point lies just south of Drumcliff Bay at the entrance to Sligo Harbour.

The majority of the site is surrounded by improved agricultural grassland. Woodland (both broadleaved and conifer) occurs in places, for example bordering subsite 0C424 (Lissadell/Ballygilgan Strand). Scattered housing occurs around the site on both the northern and southern sides but very few dwellings are close to the shoreline. Agriculture, tourism and aquaculture are the main commercial activities around the bay; most of the adjacent land used for mixed farming. Upland areas are used for sheep grazing (DoEHLG, 2009).

Common Cordgrass (*Spartina anglica*) has been recorded from the outer part of Drumcliff Bay in the past but was successfully removed during the 1980's (McCorry & Ryle, 2009).

Water quality

The 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 west coast of Ireland and covers Drumcliff Bay and its inflowing rivers.

The current water quality status of Drumcliff Bay is 'high' according to the Western River Basin Transitional and Coastal Waters Action Programme (WRBD, 2009a).

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)[16] and Nitrates Directive (91/676/EEC). Following assessment, waterbodies are classified as eutrophic, potentially eutrophic, intermediate, or unpolluted (O'Boyle et al. 2010). The most recent assessment (2007-2009) classified Drumcliff Bay as 'unpolluted.'

In addition to nutrient enrichment, other parameters are monitored by the EPA in relation to achieving the environmental objectives established by the Water Framework Directive. For the period 2007-2009, Drumcliff Bay was found to be compliant for factors such as dissolved inorganic nitrogen (DIN), phosphorus (as molybdate reactive phosphorus MRP) and biological oxygen demand (BOD) and overall ecological status based on a standard set of ecological criteria was classified as 'good' (O'Boyle et al. 2010).

Waste water treatment plants (WWTPs) are located at Drumcliff and Carney; both have received upgrades in recent years. There are two County Council licensed discharges into the bay (WRBD, 2009b). The WWTP at Sligo Town has been upgraded in recent years and this has already had a discernable positive effect on water quality in the estuary (O'Boyle et al. 2010).

An assessment of water quality within the Drumcliff Bay Shellfish Area (DoEHLG, 2009) found that there are 1,149 on-site waste water treatment systems (OSWWTS) in the catchment and their density is much higher than the national average. The risk of diffuse pollution of surface waters and groundwaters from pathogens and phosphorus is considered high throughout the catchment as is the likelihood of inadequate percolation. The majority of the systems are therefore likely to be located in hydrologically unsuitable conditions (DoEHLG, 2009).

Agricultural discharges are a second type of diffuse pollution to Drumcliff Bay and are a potential source of faecal contamination as indicated by shellfish monitoring (DoEHLG, 2009).

[16] Transposed by the Urban Waste Water Treatment Regulations S. I. No 254 of 2001, as amended by S.I. No 48 of 2010.

While 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)), 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 have subsequent knock-on effects upon waterbird foraging distribution, prey intake rates, and ultimately upon survival and fitness.

Related to this is the subject of macroalgal mats which are a common feature in Drumcliff Bay. Algal mats can have both negative and positive effects upon waterbird foraging ecology; some species avoiding them or being negatively affected by lowered invertebrate abundances beneath them, (Lewis & Kelly, 2001; Lopes et al. 2006) while herbivores such as Light-bellied Brent Geese and Wigeon benefit from the algae being a source of food. 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. 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

An area of 15.1 km^2 in Drumcliff Bay is designated as a Shellfish Water under the EU Shellfish Waters Directive[17] (No. 18) (DoEHLG, 2009). The area extends westwards from a line drawn across the bay south of Carney, westwards encompassing the whole bay to a line drawn between Raghly Point and Rosses Point. The shellfish area designation relates mainly to the cultivation of clams.

The Sea Fisheries Protection Authority (SFPA) is responsible for classifying shellfish production areas and the current classification of the Drumcliff Bay Bivalve Mollusc Production Area is Class B (all bivalves) as of 20th July 2012 (www.sfpa.ie).

Various commercial inshore fishing activities are likely to occur in the site (detail and spatial scale unknown). Line fishing and other static methods (e.g. pots) are widespread across the bay (DoEHLG, 2009). Drumcliff Estuary is not noted for sea or shore angling (e.g. Dunlop, 2009) and no leisure fishing was recorded during the 2010/11 waterbird survey programme. Shore angling occurs at Lissadell Strand (0C932). Bait digging does occur (recorded in three subsites). The hand-picking of molluscs was recorded to occur regularly within one subsite (0C449 Ballinaphunta).

Recreational disturbance

While the coastline of the Sligo Bay complex is a major draw for tourism, little direct attention is focused on Drumcliff Estuary, but rather on areas such as Strandhill or Rosses Point.

Walking is a popular activity and particularly along the sandy stretches of Lissadell Strand, Ballygilgan Strand and Ardtermon Strand. While these strands support a range of recreational activities during summer (e.g. swimming) these are much reduced during winter and relatively little activity was noted during the 2010/11 waterbird survey programme.

Others

Macroalgal mats are present within the inner estuary during summer months. Although a natural component of shallow estuarine communities, macroalgal mats of species such as

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

Ulva spp[18] are considered a consequence of organic enrichment when they occur in excessive amounts.

Wildfowling was not recorded at the site during the 2010/11 Waterbird Survey Programme but is reported to occur occasionally. Shooting was recorded in association with one subsite (0C931) and reported to disturb waterbirds. 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 (8th – 30th December 2010 inclusive).

5.4.4 Disturbance Assessment

During 2010/11 survey work, seven activities/events were recorded that had the potential to cause disturbance to waterbirds. These were aircraft, walking (including with dogs), motorised vehicles, horse-riding, shooting, hand-gathering of molluscs (winkle picking), and activities associated with intertidal aquaculture (Table 5.8).

Aircraft were observed to cause disturbance to waterbirds in three subsites. Both a rescue helicopter and light aircraft regularly fly low over the area causing disturbance to birds (D. Cotton. *pers. obs*).

Walking (including with dogs) was the most widespread activity occurring in six subsites overall during field work and accounting for the peak disturbance score in three of these (note that the results of the desk-top study show that this activity can occur in all subsites). Lissadell Strand (0C932) is particularly favoured for dog walking and dogs are observed to regularly chase birds.

Aquaculture activities were the second most widespread activity (five subsites) and accounted for the peak disturbance score in two subsites, related to machinery and in particular, tractors accessing the intertidal area to tend to trestles. Several tractors can be operating at the same time. In all cases these activities resulted in a noticeable disturbance to waterbirds.

Horse riding was observed regularly in 0C425 but this activity was largely confined to the dunes and caused little observed disturbance to waterbirds.

Wildfowling is an irregular occurrence; most shooting relates to that undertaken adjacent to the site by the local gun club.

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).

[18] includes species formerly classified as *Enteromoropha* spp. (Hayden et al. 2003).

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
0C309	Ballygilgan NNR (goose field) (Lisadell)	-		
0C424	Lissadell/Ballygilgan Strand	1	7	• Aquaculture (associated activities)
0C425	Lower Rosses	3	7	• Walking (incl. with dogs)
0C443	Lower Rosses East	2	5	• Walking (incl. with dogs)
0C444	Doonierin	-		•
0C448	Coolbeg	1	6	• Aquaculture (associated activities)
0C449	Ballinaphunta	3	7	• Aquaculture (associated activities)
0C450	Kintogher	-		•
0C494	Drumcliff Bay Outer: Ardtermon Strand	3	5	• Aquaculture (associated activities)
0C922	Drumcliff Bay Outer: Raghly Harbour	1	6	• Aircraft
0C931	Cloghcor	3	6	• Aircraft/Shooting
0C932	Lissadell Strand	2	7	• Walking (incl. with dogs)

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

Species ► / Subsites ▼	SS	BA
0C309		
0C424		M
0C425	M	
0C443	H	
0C444		H
0C448		H
0C449	H	V
0C450		M
0C494	V	V
0C922		L
0C931		H
0C932	V	

5.4.5 Discussion

Some of the 'activities' identified at the Drumcliff Bay may act so as to modify the wetland habitats. While physical loss might be considered more historic in nature (e.g. the building of slips/piers), on-going modifications to intertidal and coastal habitats may occur due to changes in natural processes (e.g. sedimentation or erosion rates) as a result of former physical events.

Human recreational activities at coastal sites occur less frequently during winter months and the range of activities is much reduced. Nevertheless recreational activity in the form of walkers (with/without dogs) occurred in half of the count subsites during survey work, and was a regular activity in several (e.g. 0C932). Activities associated with aquaculture were also relatively widespread at this site and were the main source of disturbance to waterbirds in several subsites.

Any activity that causes disturbance can lead to the displacement of waterbirds. The significance of the impact that results from even a short-term displacement should not be underestimated. In terms of foraging habitat, displacement from feeding opportunities not only reduces a bird's energy intake but also leads to an increase in energy expenditure as a result of the energetic costs of flying to an alternative foraging area. Displacement also has knock-on ecological effects such as increased competition (within and/or between different species) for a common food source. In areas subject to heavy or on-going disturbance, waterbirds may be disturbed so frequently that their displacement is equivalent to habitat loss. When disturbance effects reduce species fitness[19] (reduced survival or reproductive success) consequences at population level may result.

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

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

and be influenced by:-

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

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

- 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: DRUMCLIFF BAY SPA

SITE CODE: 004013

Drumcliff Bay, Co. Sligo is the most northerly of Sligo Bay's three estuarine inlets. The bay comprises an inner area of sheltered estuarine habitat and an outer area of shallow seawater. It extends 9 km east to west from Drumcliff village to Raghly Point. Drumcliff Bay is the estuary of the Drumcliff River, a substantial river flowing from Glencar Lough to the east. The inner part of Drumcliff Bay is sheltered by a sandy/grassy peninsula extending north from Rosses Point. The northern part of the bay is fringed by fine sandy beaches - Ballygilgan Strand, Lissadell Strand and Ardtermon Strand. Salt marsh occurs in the most sheltered areas and at low tide, extensive inter-tidal flats are exposed. A bed of Dwarf Eelgrass (*Zostera noltii*) occurs near the south-eastern corner of the bay.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Sanderling and Bar-tailed Godwit. 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.

Drumcliff Bay SPA is of importance as it supports nationally important populations of two species of wintering waterfowl: Sanderling (237) and Bar-tailed Godwit (336) – all figures are four year mean peaks for four of the five winters between 1995/96 and 1999/2000.

Other species that occur regularly include Whooper Swan (45), Light-bellied Brent Goose (74), Shelduck (75), Wigeon (138), Teal (57), Long-tailed Duck (14), Red-breasted Merganser (20), Great Northern Diver (13), Oystercatcher (356), Ringed Plover (139), Lapwing (155), Knot (107), Dunlin (559), Curlew (177) and Redshank (138).

Drumcliff Bay SPA is of national importance for its winter populations of Sanderling and Bar-tailed Godwit, and the site supports a good diversity of other waterfowl species. Of note is that three of the species which occur regularly (Whooper Swan, Great Northern Diver and Bar-tailed Godwit) are listed on Annex I of the E.U. Birds Directive.

13.6.2011

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

DRUMCLIFF BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

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

SITE CODE: SPA 004013; version 2.02
County Sligo

0 0.25 0.5 0.75 1 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).

Níl sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059212)

N

Map Version 1
Date: June 2013

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' 12-year period (1995–2007) and the recent five-year period (2002-2007). The values given represent the percentage change in index (population) values across the specified time period, calculated by subtracting the smoothed index value at the start of the time-frame (1995) from the smoothed index value in the reference year (2007):-

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

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

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

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

Worked example

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

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

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

Limitations

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

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

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

APPENDIX 4

Waterbird species codes

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

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

APPENDIX 5

Waterbird foraging guilds (after Weller, 1999)

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

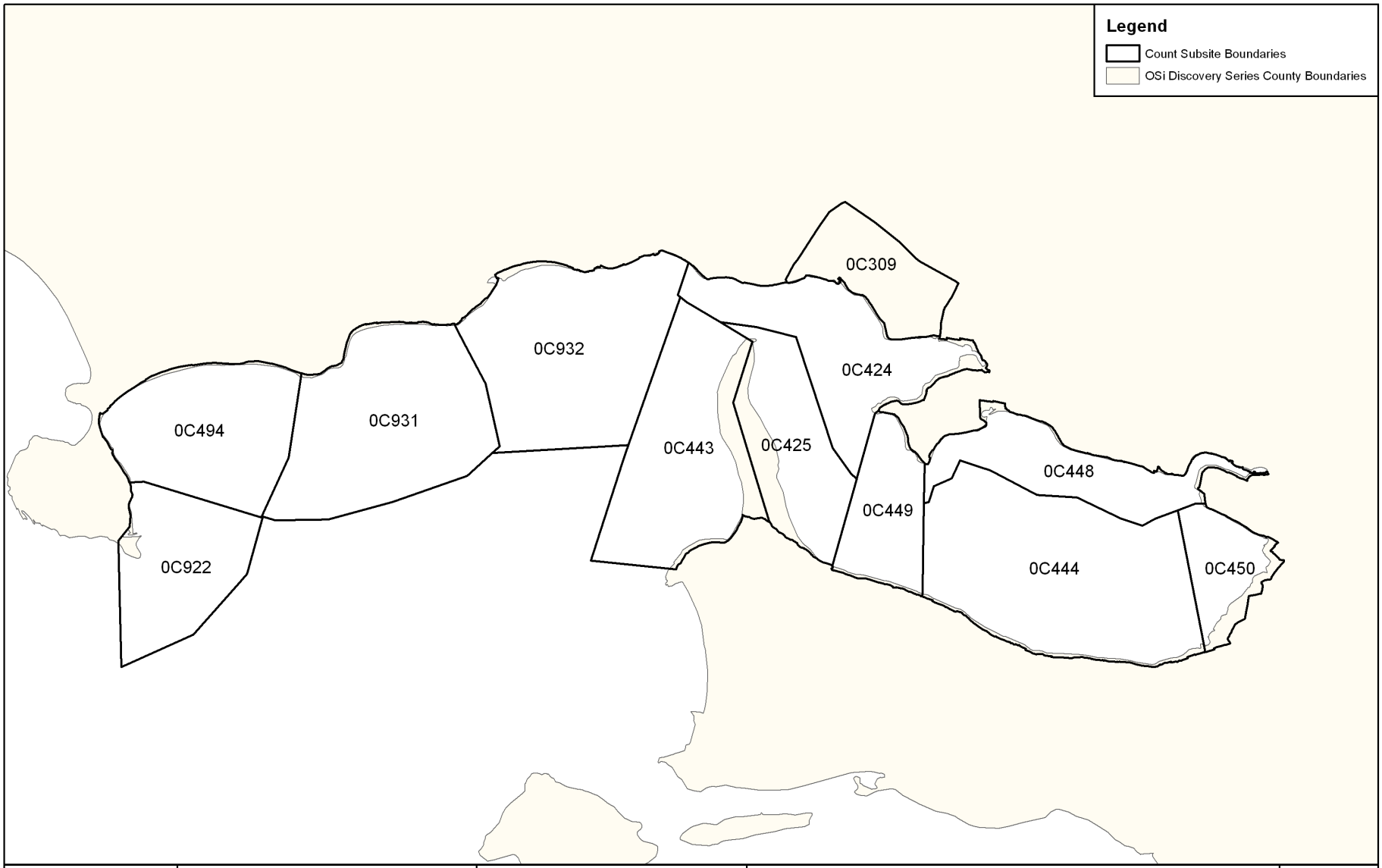
[a] dives <3m.

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

APPENDIX 6

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

Subsite Code	Subsite name	Subsite Area (ha)
0C309	Ballygilgan NNR (goose field) (Lisadell)	74.16
0C424	Lissadell/Ballygilgan Strand	143.70
0C425	Lower Rosses	112.41
0C443	Lower Rosses East	182.33
0C444	Doonierin	266.36
0C448	Coolbeg	101.71
0C449	Ballinaphunta	75.80
0C450	Kintogher	57.47
0C494	Drumcliff Bay Outer: Ardtermon Strand	149.64
0C922	Drumcliff Bay Outer: Raghly Harbour	115.26
0C931	Cloghcor	211.76
0C932	Lissadell Strand	217.28



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Drumcliff Bay
Count Subsites used during the 2010/2011 Waterbird Survey Programme
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.

County Sligo

0 0.25 0.5 0.75 1 km

N

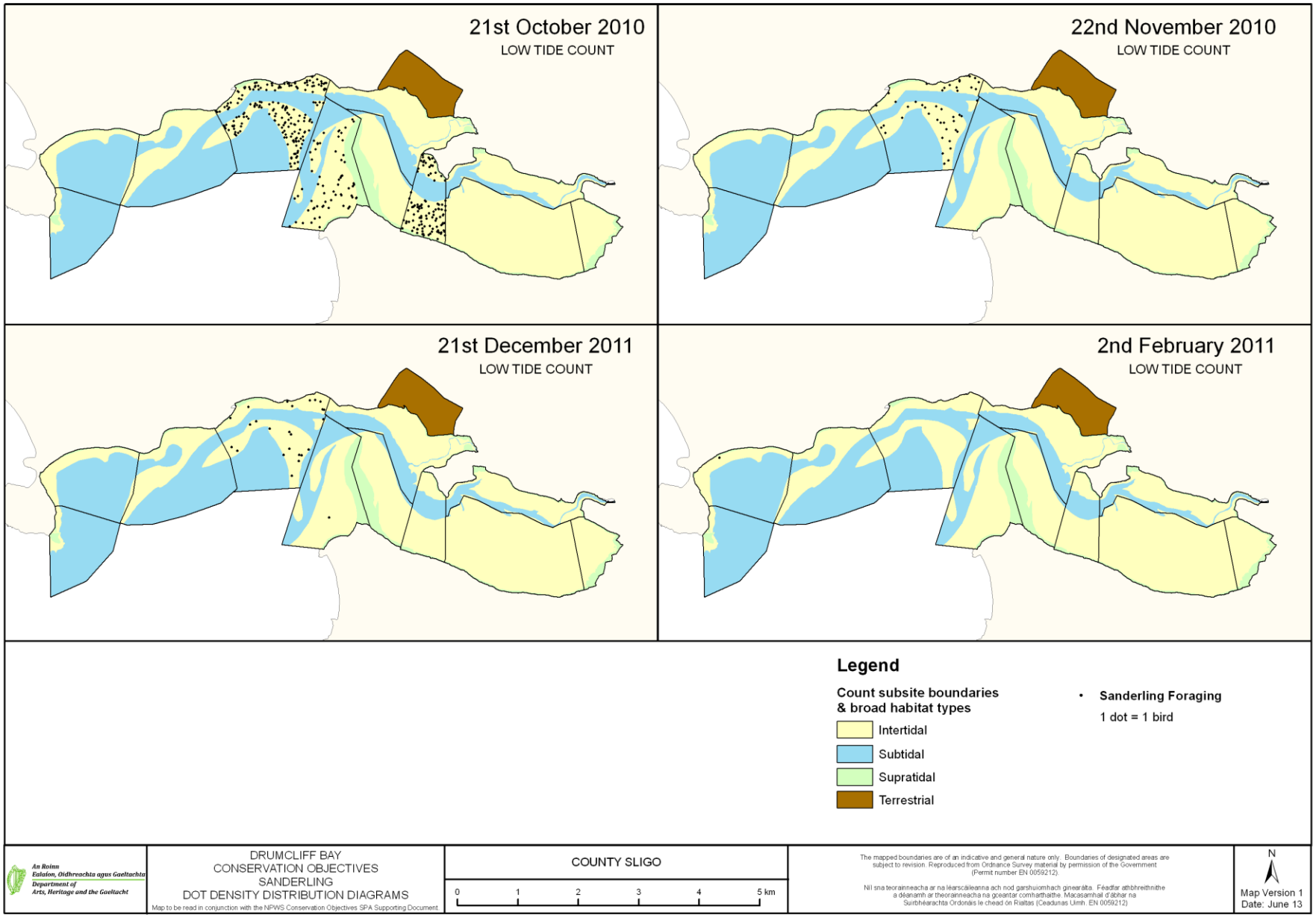
Map Version 1
Date: June 2013

APPENDIX 7

Drumcliff 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)


21st October 2010
LOW TIDE COUNT
22nd November 2010
LOW TIDE COUNT
21st December 2011
LOW TIDE COUNT
2nd February 2011
LOW TIDE COUNT
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Sanderling Foraging
1 dot = 1 bird
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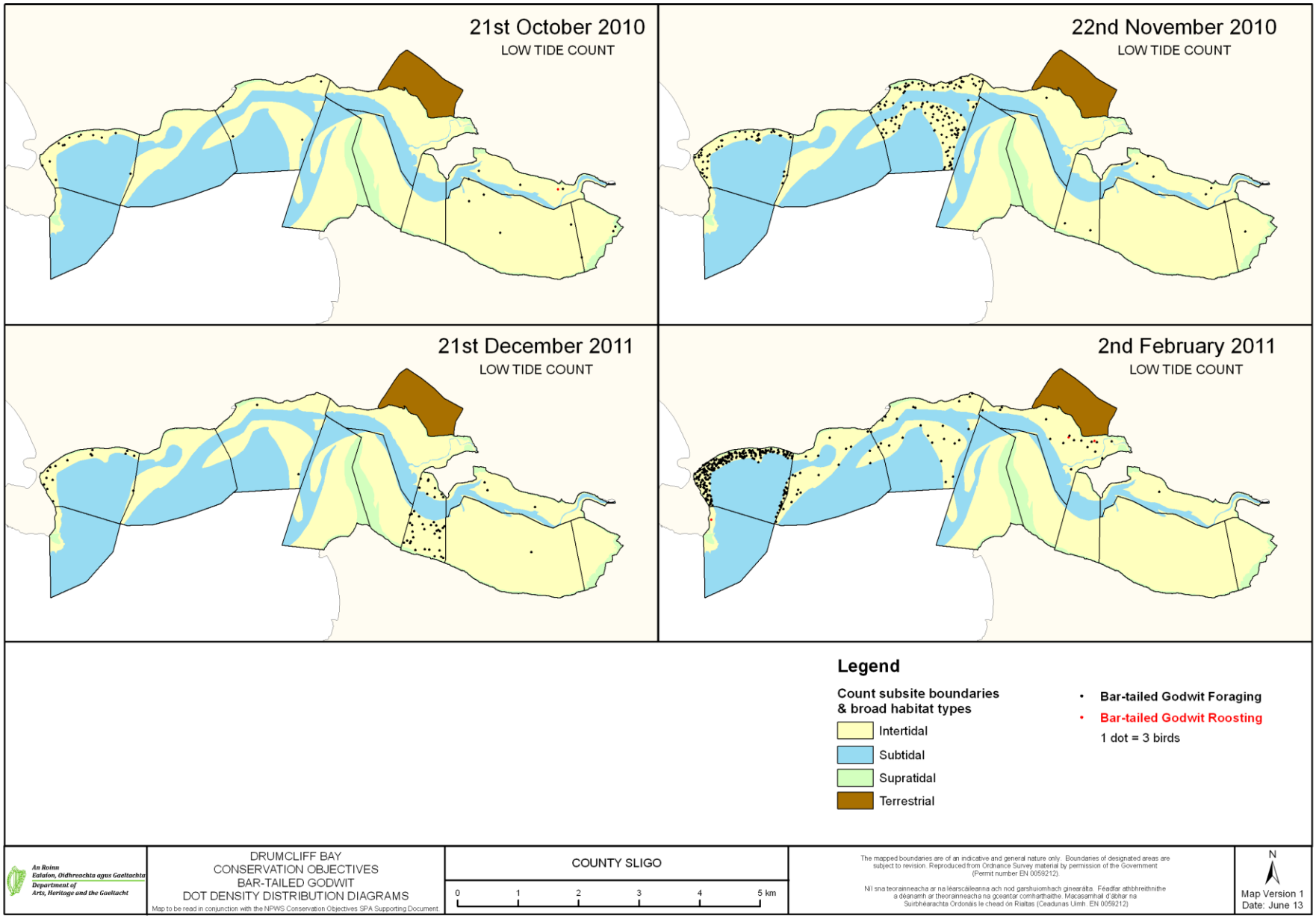
Department of Arts, Heritage and the Gaeltacht
DRUMCLIFF BAY
CONSERVATION OBJECTIVES
SANDERLING
DOT DENSITY DISTRIBUTION DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document
COUNTY SLIGO
0 1 2 3 4 5 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach gineartha. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadúnas Uimh. EN 0059212)
N
Map Version 1
Date: June 13


21st October 2010
LOW TIDE COUNT
22nd November 2010
LOW TIDE COUNT
21st December 2011
LOW TIDE COUNT
2nd February 2011
LOW TIDE COUNT
Legend
Count subsite boundaries & broad habitat types
Intertidal
Subtidal
Supratidal
Terrestrial
Bar-tailed Godwit Foraging
Bar-tailed Godwit Roosting
1 dot = 3 birds
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Department of Arts, Heritage and the Gaeltacht
DRUMCLIFF BAY
CONSERVATION OBJECTIVES
BAR-TAILED GODWIT
DOT DENSITY DISTRIBUTION DIAGRAMS
Map to be read in conjunction with the NPWS Conservation Objectives SPA Supporting Document.
COUNTY SLIGO
0 1 2 3 4 5 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a dhéanamh ar theorainneacha na gceantar comhartha. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead on Rialtas (Ceadúnas Uimh. EN 0059212)
N
Map Version 1
Date: June 13

APPENDIX 8

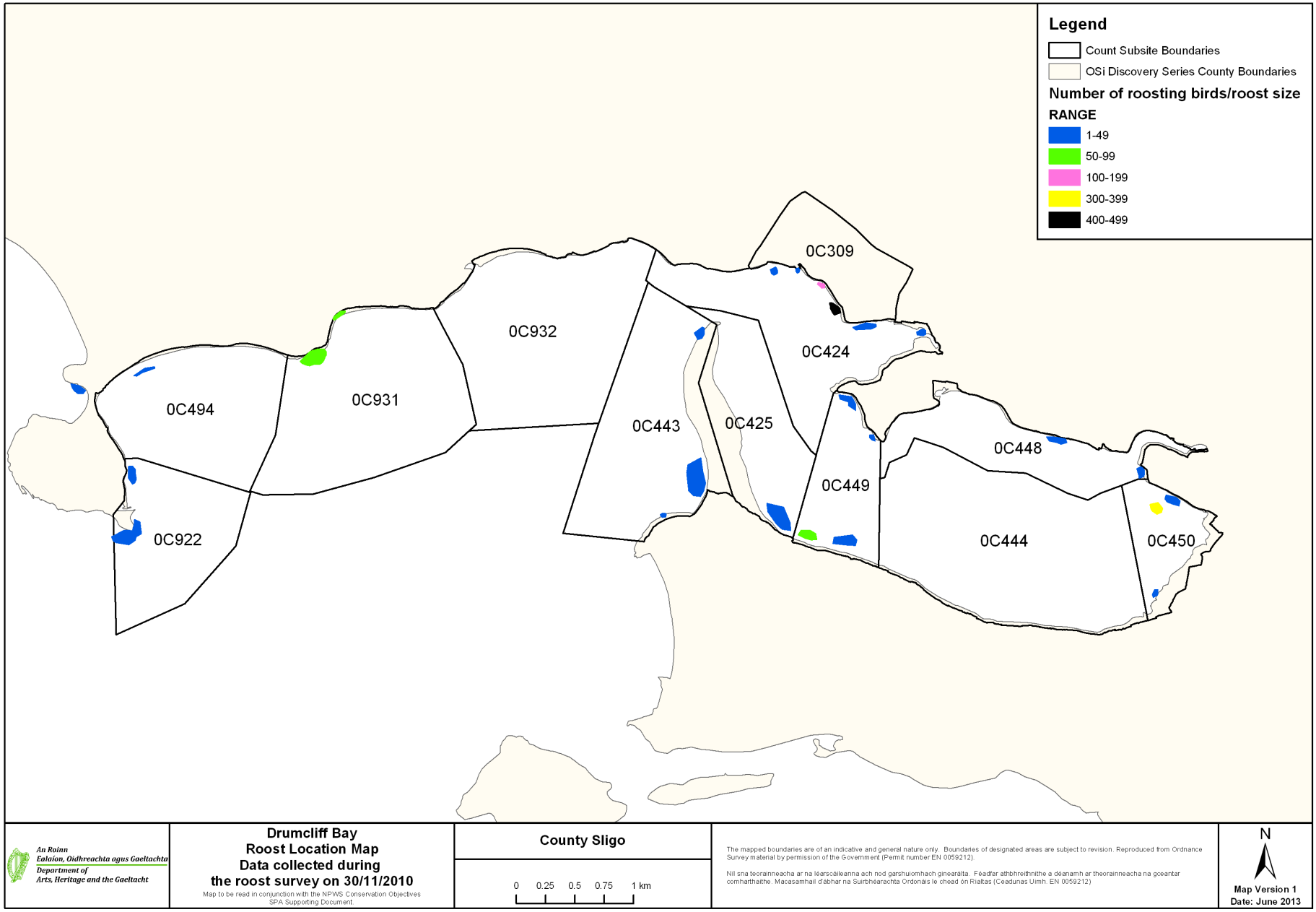
Drumcliff Bay

(1a) Summary data and roost location maps from the roost survey 30th 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
0C309	Ballygilgan NNR (goose field) (Lisadell)	-	-	
0C424	Lissadell/Ballygilgan Strand	6	8	BA, CM, CU, OC, RK, T., TT, WN
0C425	Lower Rosses	1	1	GP
0C443	Lower Rosses East	3	2	BH, CM
0C444	Doonierin			
0C448	Coolbeg	2	5	H., MA, SV, T., WN
0C449	Ballinaphunta	4	7	CA, CM, CU, OC, PB, RK, SU
0C450	Kintogher	3	3	CU, DN, OC
0C494	Drumcliff Bay Outer: Ardtermon Strand	2	4	CU, H., GV, OC
0C922	Drumcliff Bay Outer: Raghly Harbour	3	12	BA, CA, CM, CU, DN, GB, OC, PB, RK, RP, SA, TT
0C931	Cloghcor	2	9	BA, CM, CU, GV, H., L., OC, PB, RK
0C932	Lissadell Strand	-	-	

(1b) Drumcliff Bay SPA (4013) SCI species and recorded roosts 30/11/10 - shows number of roost locations within subsite, and in brackets, the peak number recorded at a single roost location

Subsite Code	SS	BA
0C309	*not recorded*	
0C424		2 (230)
0C425		
0C443		
0C444		
0C448		
0C449		
0C450		
0C494		
0C922		1 (6)
0C931		1 (2)
0C932		


Legend
Count Subsite Boundaries
OSi Discovery Series County Boundaries
Number of roosting birds/roost size
RANGE
1-49
50-99
100-199
300-399
400-499
0C309
0C424
0C932
0C931
0C494
0C443
0C425
0C448
0C449
0C444
0C450
0C922
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Arts, Heritage and the Gaeltacht
Drumcliff Bay
Roost Location Map
Data collected during
the roost survey on 30/11/2010
Map to be read in conjunction with the NPWS Conservation Objectives
SPA Supporting Document.
County Sligo
0 0.25 0.5 0.75 1 km
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059212).
Nil sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059212)
N
Map Version 1
Date: June 2013

APPENDIX 9

Drumcliff Bay - Activities & Events

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

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

Activity/Event	0C309	0C424	0C425	0C443	0C444	0C448	0C449	0C450	0C494	0C922	0C931	0C932
1. Coastal protection, sea defences & stabilisation												
1.1 Linear defences												O
2. Barrage schemes/drainage												
2.2 Altered drainage/river channel									O			O
4. Industrial, port & related development												
4.2 Fishing harbour										O		
4.3 Slipway					O					O		
4.4 Pier							O			H		
6. Pollution												
6.1 Domestic & urban waste water		O				O		O				O
6.3 Landfill										O		
6.4 Agricultural & forestry effluents		O			O	O		O				
6.8 Others							O					O
7. Sediment extraction (marine & terrestrial)												
7.1 Channel dredging (maintenance & navigation)										O		
8. Transport & communications												
8.2 Flight path			O	O			O		O	O	O	O
11. Education & scientific research												
11.2 Nature trails	O											
12. Tourism & recreation												
12.2 Non-marina moorings							O			O		
12.14 Tourist boat trips										O		
12.15 Angling										O		
12.17 Bathing & general beach recreation												Y
12.18 Walking, incl. dog walking	O	O	O	O	O	O	O	O	O	O	O	O
12.19 Birdwatching	O	O			O	O		O	O	O	O	O

12.20 Sand-yachting												O
12.22 Motorised vehicles	O	O	O	O	O							
12.23 Horse-riding			O	O								O
12.27 Others												O
13. Wildfowl & hunting												
13.1 Wildfowling										O	O	
13.2 Other hunting-related activities									O	O	O	O
14. Bait-collecting												
14.1 Digging for lugworms/ragworms		O			O	O						
15. Fisheries & Aquaculture												
15.1 Professional passive fishing (e.g. longlining)		U	U	U	U	U	U		U	U	U	U
15.6 Molluscs - hand-gathering							O		O			
15.8 Fish-farming									H/P	O		
15.9 Intertidal aquaculture e.g. trestles		O		O	O	O	O		O			O
15.11 Bottom culture									F			
16. Agriculture & forestry												
16.1 Saltmarsh grazing/harvesting								O				
16.2 Grazing: intensive (terrestrial)		O			O	O		O				
16.3 Grazing: non-intensive (terrestrial)	O											
16.4 Sand dune grazing												O
16.5 Stock feeding												O
16.10 Mowing/grassland cutting	O	O			O	O		O				
16.14 In-filling of ditches, pools, marshes and pits								H		O		
19 Natural events												
19.2 Severe cold weather	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.
TOTAL SCORE	**6**	**MODERATE**

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

Activity/Event	0C309	0C424	0C425	0C443	0C444	0C448	0C449	0C450	0C494	0C922	0C931	0C932
8.2 Flight path				4						6	6	
12.18 Walking, incl. dog walking			7	5			6		3		3	7
12.22 Motorised vehicles			4									
12.23 Horse-riding			4									
13.1 Wildfowling/shooting											6	
15.6 Molluscs - hand-gathering							4		4			
15.9 Intertidal aquaculture		7				6	7		5			4