

**Ballyteige Burrow SAC (site code 696)  
Conservation objectives supporting document  
-coastal habitats**

**NPWS**

**Version 1**

**July 2014**

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*Please note that the opinions expressed in the site reports from the Saltmarsh Monitoring Project (SMP) and the Sand Dunes Monitoring Project (SDM) are those of the authors and do not necessarily reflect the opinion or policy of NPWS.*

**Please note that this document should be read in conjunction with the following report: NPWS (2014). Conservation Objectives: Ballyteige Burrow SAC 000696. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.**

## 1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (Commission of the European Communities, 2007). It is defined in positive terms, such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Ballyteige Burrow SAC is a coastal site that extends westwards and northwards from the village of Kilmore Quay in County Wexford. Most of the site is designated as a Nature Reserve. It consists of a long narrow spit of coarse sand and gravel with an impressive sand dune system (Ballyteige Burrow) which forms most of the seaward boundary of this site. Behind the spit lies a shallow, tidal sea inlet and estuary of the Duncormick River (The Cull). The eastern portion of this intertidal system was reclaimed in the 19<sup>th</sup> Century by construction of the Cull Bank and is now polderland, most of which is intensively farmed grassland and arable land. The western portion of The Cull retains semi-natural habitats including mudflats which are exposed at low tide and saltmarsh.

A dominating feature of this site is its large dune system, many of the dunes reaching over 20m high. Embryonic shifting dunes and marram dunes occur along the seaward side and more stable fixed dunes and dune heath inland, though blow-outs occur throughout. The fixed dunes occupy the central ridge of the Burrow and are well-developed and species-rich.

One of the notable features at Ballyteige is the presence of developing acid heath within (calcareous) fixed grey dune area, which is very unusual in Irish dune systems. In addition, along with the classical foredune/fixed grey dune sequence, there are some unusual incipient slack/blowout complexes. These are eroded down in places to the shingle base on which the dunes rest.

Saltmarsh fringes The Cull and part of the saltmarsh complex contains Halophilous scrub vegetation. This is a very rare habitat in Ireland, with only two known locations (both in County Wexford) Ballyteige and Bannow Bay. This habitat is characterised by the rare perennial glasswort (*Sarcocornia perennis*). This species is listed on the Flora Protection Order and also is a Red Data Book species (Curtis & McGough, 1988). It is the characteristic species for the rarest of Irish saltmarsh habitats – Mediterranean and thermo-Atlantic halophilous scrubs. The rare Borrer's saltmarsh grass (*Puccinellia fasciculata*) is also found in the Mediterranean salt meadows.

Ballyteige Burrow SAC (site code: 697) is designated for a range of coastal habitats including vegetated shingle, saltmarsh and sand dunes. The following ten coastal habitats are included in the qualifying interests for the site (\* denotes a priority habitat):

- Perennial vegetation of stony banks (1220)
- *Salicornia* and other annuals colonising mud and sand (1310)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (ASM) (1330)

- Mediterranean salt meadows (*Juncetaliaea maritimi*) (MSM) (1410)
- Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (1420)
- Annual vegetation of drift lines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)\*
- Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) (2150)

The first habitat represents vegetated shingle, the next four are saltmarsh habitats and the last five are associated with sand dune systems, although all ten of these habitats are found in close association with each other. Dune slacks were also recorded at this SAC by the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). An additional Annex I habitat *Spartina* swards (*Spartinion maritimae*) (1320) is also currently listed as a qualifying interest for this site due to historical records forms of cordgrass other than common cordgrass (*Spartina anglica*). However, all stands of cordgrass in the Republic of Ireland are now thought to be common cordgrass (*S. anglica*) (McCorry *et al.*, 2003, McCorry & Ryle, 2009). Consequently, a conservation objective for the habitat *Spartina* swards has not been set for this site.

The distribution of saltmarsh habitats within Ballyteige Burrow SAC is presented in Appendix I and of sand dune habitats in Appendix II.

This backing document sets out the conservation objectives for the ten coastal habitats listed above in Ballyteige Burrow SAC, which is defined by a list of parameters, attributes and targets. The main parameters are (a) Range (b) Area and (c) Structure and Functions, the last of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **vegetated shingle** is based in part on the findings of the National Shingle Beach Survey (NSBS), which was carried out in 1999 on behalf of the National Parks and Wildlife Service (NPWS) (Moore & Wilson, 1999) and partly on the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009), who recorded vegetated shingle at Ballyteige Burrow. The habitat was subsequently not recorded when the site was resurveyed during the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013). However, it should be noted that the SDM assigned the vegetation within the dry hollows at this site to the habitat 'humid dune slacks', when realistically it could equally have been assigned to 'perennial vegetation of stony banks', particularly as the shingle base is visible within these 'slacks' and many do not retain water. This needs further investigation.

During the NSBS profiles and transects were recorded from each shingle beach and each site was assigned a High/Medium/Low interest ranking. A 'high interest' ranking denotes a site that is of high conservation value. The site may be of interest botanically or geomorphologically. A 'medium interest' ranking implies the site may be extensive but not of particular interest either botanically or geomorphologically. A 'low interest' ranking is reserved for small sites, highly damaged sites or sites that are of a very common classification.

The NSBS surveyed the vegetated shingle habitat at Ballyteige and rated the habitat highly. At this site there are a number of shingle based grasslands between the dunes and this is considered an extremely rare habitat in Ireland. A small population of cottonweed (*Otanthus maritimus*) was noted at the site during the NSBS, however this was a part of a translocation project which subsequently failed.

The targets set for the **saltmarsh habitats** are based primarily on the results of the Saltmarsh Monitoring Project (SMP) (McCorry, 2007; McCorry & Ryle, 2009) and this document should be read in conjunction with those reports.

The SMP surveyed, mapped and assessed a total of two sub-sites within Ballyteige Burrow SAC (McCorry, 2007):

1. Ballyteige Burrow
2. Duncormick

As part of the SMP detailed individual reports and habitat maps were produced for each sub-site and these are included in a set of Appendices to this document (Appendix III and IV).

The conservation objectives for the saltmarsh habitats in Ballyteige Burrow are based on a combination of the findings of the individual reports for each of these sub-sites. It is estimated that the two sub-sites as surveyed by the SMP represents all of the saltmarsh within Ballyteige Burrow SAC. There is also a small area of ASM and MSM located north of the Cull along the northern side of the estuary which is excluded from the SAC (McCorry, 2007).

The targets set for the **sand dune habitats** are based primarily on the results of the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013) and this document should be read in conjunction with that report. It is also recommended that this document be read in conjunction with the final report from the Coastal Monitoring Project (CMP) report (Ryle *et al.*, 2009). The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. The SDM reviewed and modified the methodology used during the CMP to map and assess the conservation status of dune habitats. A subset of 40 sites (including Ballyteige Burrow) were selected as a representative sample of the national dune resource for the SDM survey.

As part of the SDM, detailed individual reports and habitat maps (a revised baseline habitat map and an updated habitat map) were produced for the Ballyteige Burrow sub-site and these are included in Appendix V. It should be noted that it was decided to overwrite any saltmarsh habitat areas mapped during the Saltmarsh Monitoring Project (SMP) (McCorry, 2007) with the more recent and accurate SDM polygons when calculating habitat areas.

The conservation objectives for the sand dune habitats in Ballyteige Burrow are based on the findings of the SDM for Ballyteige, combined with the results of Nooren & Schouten (1976), Gaynor (2008) and Ryle *et al.*

(2009). It is thought that the one sub-site as surveyed by the SDM represent the total area of sand dunes within Ballyteige Burrow SAC.

## **2 Conservation Objectives**

A conservation objective aims to define the favourable conservation condition of a habitat or species at a particular site. Implementation of the objective will help to ensure that the habitat or species achieves favourable conservation status at a national level.

## **3 Perennial vegetation of stony banks**

Perennial vegetation of stony banks is vegetation that is found at or above the mean high water spring tide mark on shingle beaches (i.e., beaches comprised of cobbles and pebbles). It is dominated by perennial species (i.e. plants that continue to grow from year to year). The first species to colonise are annuals or short-lived perennials that are tolerant of periodic displacement or overtopping by high tides and storms. Level, or gently-sloping, high-level mobile beaches, with limited human disturbance, support the best examples of this vegetation. More permanent ridges are formed by storm waves. Several of these storm beaches may be piled against each other to form extensive structures. However, little is known about the distribution and nature of this habitat at this site.

### **3.1 Overall Objective**

The overall objective for 'perennial vegetation of stony banks' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'. This objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Range, (b) Area and (c) Structure and Functions.

### **3.2 Area**

#### **3.2.1 Habitat extent**

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target for favourable condition is '*no decrease in extent from the established baseline*'. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

The exact current extent of this habitat in Ballyteige Burrow is unknown. The National Shingle Beach Survey (Moore & Wilson, 1999) surveyed the site, but did not map the area. The CMP recorded and mapped a narrow band of shingle vegetation extending approximately 630m along the strand at Ballyteige Burrow (0.506ha) (Ryle *et al.*, 2009). The habitat was not recorded during the Sand Dunes Monitoring Project (Delaney *et al.*, 2013), however it appears that the differences in the records may be down to the interpretation of the habitat.

The target is that the area should be stable or increasing, subject to natural processes, including erosion and succession.

### **3.3 Range**

#### **3.3.1 Habitat distribution**

Current distribution unknown. Shingle was noted to occur as a narrow band along the strand at Ballyteige by Ryle *et al.* (2009). The NSBS also noted a number of shingle based flat grasslands between the dunes (Moore & Wilson, 1999). Some of the vegetation within the areas assigned as 'humid dune slacks' by Delaney *et al.* (2013) could possibly be assigned to this habitat.

The target is that there should be no decline or change in the distribution of this habitat, unless it is the result of natural processes, including erosion and succession.

### **3.4 Structure and Functions**

A fundamental aim of shingle conservation is to facilitate natural mobility. Shingle beaches are naturally dynamic systems, making them of geomorphological interest as well as ecological interest. They are constantly changing and shingle features are rarely stable in the long term.

#### **3.4.1 Functionality and sediment supply**

The health and on-going development of this habitat relies on a continuing supply of shingle sediment. This may occur sporadically as a response to storm events rather than continuously. Interference with the natural coastal processes, through offshore (or onshore) extraction or coastal defence structures in particular, can interrupt the supply of sediment and lead to beach starvation.

The target is to maintain the natural circulation of sediment and organic matter, without any physical obstructions.



### **3.4.2 Vegetation structure: zonation**

Ecological variation in this habitat type depends on stability; the amount of fine material accumulating between the pebbles; climatic conditions; width of the foreshore and past management of the site. The ridges and lows also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle. In the frontal less stable areas of shingle, the vegetation tends to be dominated by annuals and short-lived salt-tolerant perennials. Where the shingle is more stable the vegetation becomes more perennial in nature and may include grassland, heathland and scrub, depending on the exact nature of the site. The presence of lichens at Ballyteige Burrow indicates long term stability of the shingle structure. Transitions to intertidal, saltmarsh and sand dune habitats occur at this site (Moore & Wilson, 1999). The rare lichen, *Fulgensia semibracteata* has its only known station in Ireland in the dry slacks of Ballyteige Burrow, where there is an absence of winter flooding, primarily due to the underlying shingle substrate.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes including erosion and succession.

### **3.4.3 Vegetation composition: typical species & sub-communities**

The degree of exposure, as well as the coarseness and stability of the substrate determines species diversity. There is little information concerning the vegetation growing on the shingle at Ballyteige Burrow but it is assumed to support a typical flora for this habitat. Typical species include sea sandwort (*Honckenya peploides*), sea-holly (*Eryngium maritimum*), sea bind weed (*Calystegia soldanella*) and yellow horned-poppay (*Glaucium flavum*).

The target for this attribute is to ensure that the typical flora of vegetated shingle is maintained, as are the range of sub-communities within the different zones.

### **3.4.4 Vegetation composition: negative indicator species**

Where shingle becomes more stabilised negative indicator species can become an issue. Negative indicator species can include non-native species (e.g. *Centranthus ruber*, *Lupinus arboreus*); species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered to be typical of the habitat (e.g. *Pteridium aquilinum*).

The target for this attribute is that negative indicator species (including non-native species) should represent less than 5% of the vegetation cover.

#### 4 Saltmarsh habitats

Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid neap tide level and high water spring tide level. In Ireland, there are four saltmarsh habitats listed under Annex I of the EU Habitats Directive (92/43/EEC):

- *Salicornia* and other annuals colonising mud and sand (1310)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (ASM) (1330)
- Mediterranean salt meadows (*Juncetalia maritimi*) (MSM) (1410)
- Mediterranean and thermo-Atlantic halophilous scrub (1420)

All four habitats are listed as Qualifying Interests for Ballyteige Burrow SAC. Detailed descriptions of each habitat in the two sub-sites recorded by McCorry (2007) in Ballyteige Burrow can be found in Appendices III and IV.

The SMP surveyed, mapped and assessed a total of two sub-sites within Ballyteige Burrow SAC (McCorry, 2007):

- 1 Ballyteige Burrow (Appendix III)
- 2 Duncormick (Appendix IV)

All four qualifying interest habitats have been recorded at Ballyteige while ASM and MSM were recorded at Duncormick.

Within Ballyteige Burrow SAC the areas of *Salicornia* habitat are limited, though the typical structure is present especially in salt meadows where the transition from one habitat to the other is evident, i.e. saltmarsh, *Salicornia* beds, mudflats (McCorry 2007). Narrow bands of *Salicornia* flats have developed along the edge of the ASM and the *Spartina* swards. Small isolated patches of *Salicornia* flats develop along the edge of the intertidal flats towards the western end of Ballyteige Burrow. There is also a small mosaic of *Salicornia* flats and *Spartina* sward.

Atlantic salt meadows is the dominant saltmarsh habitat at the site and was recorded at both sub-sites. Mediterranean salt meadows are more restricted in their distribution and size, but the habitat was also recorded from both sub-sites.

Mediterranean and thermo Atlantic halophilous scrub (*Sarcocornetea fruticosi*) is the rarest of the four Annex I saltmarsh habitats found in Ireland. Within Ballyteige Burrow, it is found within the ASM west of the Cull Bank. It is characterised by the presence of the legally protected perennial glasswort (*Sarcocornia perennis*) (McCorry, 2007).

Ballyteige Burrow is a long sand/shingle spit located along the southern coast of County Wexford. The spit extends approximately 8.5km in a westerly direction from Forlorn Point at Kilmore Quay and encloses a shallow estuary and intertidal area along the western half. Land along the back of the eastern part of the spit has been reclaimed as polder land, and a seawall and pumping station was built at the Cull Bank. Saltmarsh has developed along the back of the spit in the sheltered intertidal area and also behind the seawall and along some of the channels that drain this polder land.

Duncormick saltmarsh is located along the southern Wexford coast, 2km south of Duncormick village, which is 8km north-west of Kilmore Quay. The site is part of the Ballyteige Burrow Nature Reserve and is owned by the NPWS. Duncormick saltmarsh is located along the northern side of the intertidal area and subtidal area enclosed by Ballyteige Burrow. The site extends from the northern shore in to a spit. A ridge runs along the seaward side with the main saltmarsh area located behind the ridge. The saltmarsh has developed behind this ridge and behind a second artificial embankment along the eastern side. A small intertidal 'bay' containing mudflats occurs on the eastern side behind the second embankment. The intertidal area is fed by two main water courses, a stream/artificial channel at the Cull (managed by a sluice) and the Duncormick River. The eastern portion of this intertidal system was reclaimed in the last century by the construction of the Cull Bank and is now polder land. The drains and pumping station of the polder are maintained by the Drainage Department of the OPW (McCorry, 2007).

#### **4.1 Overall Objectives**

The overall objective for 'Salicornia and other annuals colonising mud and sand' in Ballyteige Burrow SAC is to '*maintain the favourable conservation condition*'.

The overall objective for 'Atlantic salt meadows' in Ballyteige Burrow SAC is to '*restore the favourable conservation condition*'.

The overall objective for 'Mediterranean salt meadows' in Ballyteige Burrow SAC is to '*maintain restore the favourable conservation condition*'.

The overall objective for 'Mediterranean and thermo-Atlantic halophilous scrub' in Ballyteige Burrow SAC is to '*restore the favourable conservation condition*'.

These objectives are based on an assessment of the recorded condition of each habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

## 4.2 Area

### 4.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is no decrease in extent from the baseline which was established by McCorry (2007). Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is assessed subject to natural processes, including erosion and succession.

Baseline habitat maps were produced for the saltmarsh in Ballyteige Burrow during the SMP. These maps are included with the individual site reports in the Appendices at the end of this document.

The total areas of each saltmarsh habitat within the SAC and the total area of the habitat within each sub-site as mapped by the SMP are presented in the following tables.

There are a number of differences in the figures below. Most of the differences can be explained by the fact that the SMP mapped the total saltmarsh resource at Ballyteige Burrow and not all of the saltmarsh mapped is contained within the SAC boundary. In addition, the total area within the SAC can be greater than given in the SMP as the SMP did not include any mosaics when calculating their total areas. The following rules were applied when calculating the areas for the site's conservation objectives:

1. Where a polygon was identified as a mosaic of an Annex I habitat and a non-Annex I habitat, then the entire area was counted as the Annex I habitat.
2. Where a polygon was identified as a mosaic of two Annex I habitats, the area was divided 50:50 for each habitat.

<b>Sub-site</b>	<b>Total area (ha) of <i>Salicornia</i> mudflats (excluding mosaics) from SMP</b>	<b>Total area (ha) of <i>Salicornia</i> mudflats within SAC boundary (including mosaics)</b>
Ballyteige	2.86	3.13
Duncormick	-	-
<b>Total</b>	<b>2.86</b>	<b>3.13</b>

<b>Sub-site</b>	<b>Total area (ha) of ASM (excluding mosaics) from SMP</b>	<b>Total area (ha) of ASM within SAC boundary (including mosaics)</b>
Ballyteige	21.15	20.62
Duncormick	5.31	6.11
<b>Total</b>	<b>26.46</b>	<b>26.73</b>

<b>Sub-site</b>	<b>Total area (ha) of MSM (excluding mosaics) from SMP</b>	<b>Total area (ha) of MSM within SAC boundary (including mosaics)</b>
Ballyteige	3.04	2.92
Duncormick	0.13	0.11
<b>Total</b>	<b>3.17</b>	<b>3.03</b>

<b>Sub-site</b>	<b>Total area (ha) of Halophilous scrub (excluding mosaics) from SMP</b>	<b>Total area (ha) of Halophilous scrub within SAC boundary (including mosaics)</b>
Ballyteige	0.166	0.73
Duncormick	-	-
<b>Total</b>	<b>0.166</b>	<b>0.73</b>

The target for all four saltmarsh habitats is that their areas should be stable or increasing, subject to natural processes, including erosion and succession.

### 4.3 Range

#### 4.3.1 Habitat distribution

Saltmarsh is currently known to display a wide distribution throughout the site (Appendix I). Atlantic salt meadows are by far the dominant saltmarsh habitat, being recorded at both sub-sites. There are also some mosaic communities with *Salicornia* mudflats, Mediterranean salt meadows and Halophilous scrub.

Mediterranean and thermo-Atlantic halophilous scrub (*Sarcocornetea fruticosi*) was recorded at the Ballyteige sub-site (McCorry, 2007).

The target is that there should be no decline or change in the distribution of these saltmarsh habitats, unless it is the result of natural processes, including erosion, accretion and succession.

#### **4.4 Structure and Functions**

The location, character and dynamic behaviour of saltmarshes are governed by sediment supply, tidal regime, wind-wave climate and sea level change. The slope of the saltmarsh allows the development of several ecological gradients such as tidal submergence and salinity, and this influences the development of distinctive zones of halophytic and salt tolerant plant communities. Maintaining the favourable conservation condition of the saltmarsh habitats in Ballyteige Burrow in terms of its structure and functions depends on a range of attributes for which targets have been set as outlined below.

##### **4.4.1 Physical structure: sediment supply**

Accretion and erosion are natural elements of saltmarsh systems. Maintaining the sediment supply is vital for the continued development and natural functioning of a saltmarsh system. Interruption to the sediment circulation through physical structures can starve the system and lead to accelerated erosion rates.

At Ballyteige, there are signs that the saltmarsh is increasing in extent along the inner part of the intertidal and estuarine area. An accretional ramp is present along the edge of the saltmarsh and there is a natural transition from ASM to *Salicornia* flat on a gentle slope. This is one of the few sites where there is an active pioneer zone with accretion at the seaward edge. The spread of common cordgrass (*Spartina anglica*) may also be affecting sedimentation and the growth of the saltmarsh (McCorry, 2007).

At Duncormick, there are some signs of natural erosion along the edge of the saltmarsh in the small bay. Analysis of aerial photos and 6" inch map indicates that the saltmarsh has actually grown somewhat since the map was drawn. Saltmarsh has grown 5 to 15m around the edge of the small bay. The eastern portion of the intertidal system at Duncormick was reclaimed in the last century by the construction of the Cull Bank and is now polder land. The drains and pumping station of the polder are maintained by the Drainage Department of the OPW (McCorry, 2007).

The target is to maintain the natural circulation of sediment and organic matter, without any physical obstructions.

##### **4.4.2 Physical structure: creeks and pans**

Saltmarshes can contain a distinctive topography with an intricate network of creeks and pans occurring on medium to large-sized sites. Creek density is influenced by vegetation cover, sediment supply and tidal influence. Creeks absorb tidal energy and assist with delivery of sediment into the saltmarsh. The efficiency of this process depends on creek pattern. Creeks allow pioneer vegetation to become established along their banks higher up into the saltmarsh system. Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins.

At the Ballyteige sub-site, the topography is not as well-developed as on other sites, but this is probably related to the ontological development of the saltmarsh. The main part of the ASM has few salt pans and minor creeks. Some of the more sheltered sections on the westward section of Ballyteige Burrow are drained by creeks (McCorry, 2007).

The saltmarsh at Duncormick has been disturbed by reclamation works in the past. Drainage has affected the creek and salt pan structure and this is still having a residual impact. The saltmarsh, however, is recovering and the drains are slowly being revegetated. Some of the drains have partially infilled creating an artificial saltpan structure that is becoming more naturalised (McCorry, 2007).

The target is to maintain creek and pan networks where they exist and to restore areas that have been altered.

#### **4.4.3 Physical structure: flooding regime**

The regular ebb and flow of the tide brings salinity, but also nutrients, organic matter and sediment, which are central to the development, growth and indeed survival of saltmarshes. Saltmarsh vegetation consists of a limited number of halophytic (salt-tolerant) species that are adapted to regular immersion by the tides. Species in the lowest part of the saltmarsh require regular inundation, while those higher up on the marsh can only tolerate occasional inundation.

The target is to maintain a flooding regime whereby the lowest levels of the saltmarsh are flooded daily, while the upper levels are flooded occasionally (e.g. highest spring tides).

#### **4.4.4 Vegetation structure: zonation**

Saltmarshes are naturally dynamic coastal systems. As is the case on the majority of Irish saltmarshes, ASM is the dominant saltmarsh habitat at Ballyteige Burrow where it occurs in a mosaic with other saltmarsh habitats, including '*Salicornia* and other annuals colonising mud and sand', 'Mediterranean salt meadows' and 'Halophilous scrub'. In order to ensure the ecological functioning of all of the saltmarsh habitats it is vital to maintain the zonations and transitions to other habitats, including intertidal, shingle and sand dune habitats.

At Ballyteige, there is natural transition from ASM communities to vegetation dominated by glasswort (*Salicornia* species). Seaward of the *Salicornia* flats there is a very gentle slope to adjacent intertidal flats. Further west, this habitat is found in sheltered areas in isolation from other saltmarsh habitats in bends along the edge of sand dunes. Patches of halophilous scrub also occur in these sheltered areas. These patches develop in flat platforms with a steep gradient down to the intertidal flats along the seaward side. The gradient from saltmarsh to intertidal flats also becomes greater towards the western end. Patches of glasswort (*Salicornia* species) also form mosaics with *Spartina* swards on mudflats adjacent to the

saltmarsh. Also at Ballyteige there is a natural transition along the landward boundary from ASM to fixed dune vegetation. Within the MSM at Ballyteige there are some transitions to brackish conditions with patches of sea club-rush (*Scirpus maritimus*) forming eastward of the habitat (McCorry, 2007).

At Duncormick, there are mosaics of ASM and MSM habitat (McCorry, 2007).

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes including erosion and succession.

#### **4.4.5 Vegetation structure: vegetation height**

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing is often used as a tool for maintaining structural diversity in the sward but stocking levels need to be appropriate. Overgrazing can lead to loss of species and destruction of the vegetation cover, while undergrazing can lead to a loss of plant diversity due to competitive exclusion.

Saltmarsh along the western part of Ballyteige Burrow saltmarsh (and fixed dunes) are heavily grazed by rabbits. The grazing intensity is so high that the rabbits are eating common cordgrass (*Spartina* species) (McCorry, 2007).

At Duncormick signs of recent grazing are absent. The site may have been overgrazed in the past but has since recovered (McCorry, 2007).

The target is to maintain structural variation within the sward. A general guideline is that there should be a sward ratio of 30% tall:70% short across the entire saltmarsh.

#### **4.4.6 Vegetation structure: vegetation cover**

Vegetation cover can have a major effect on saltmarsh development by reducing the velocity of the tide and thereby enhancing the deposition of sediment. Excessive bare mud, however, is often a sign of overuse by livestock or humans and can lead to destabilisation and accelerated erosion of the system.

At Ballyteige sub-site, some of the saltmarsh is damaged by vehicle use. The SMP noted wheel ruts in the ASM located east of the Cull Bank that were probably related to the dredging of the main channel. The SMP also recorded frequent wheel ruts along the upper section of the saltmarsh west of the Cull Bank. These tracks affect the ASM and have disturbed the surface of the saltmarsh and created bare substrate which is being vegetated by pioneer species (McCorry, 2007).

At Duncormick, some light poaching was noted by the SMP and a small track is located on the western side of the site allowing access to vehicles visiting the site from along the shoreline (McCorry, 2007).



The target is to maintain 90% of the area outside of the creeks vegetated.

#### 4.4.7 Vegetation composition: typical species & sub-communities

Saltmarshes contain several distinct zones that are related to elevation and frequency of flooding. The lowest part along the tidal zone is generally dominated by the most halophytic (salt-tolerant) species including common saltmarsh-grass (*Puccinellia maritima*) and species more usually associated with *Salicornia* muds. The mid-marsh zone is generally characterised by sea thrift (*Armeria maritima*), sea plantain (*Plantago maritima*) and sea aster (*Aster tripolium*). This mid-zone vegetation generally grades into an herbaceous community in the upper marsh, dominated by red fescue (*Festuca rubra*), sea milkwort (*Glaux maritima*) and saltmarsh rush (*Juncus gerardii*).

The target for this attribute is to ensure that a typical flora of saltmarshes is maintained, as are the range of sub-communities within the different zones. Below are lists of typical species for the different saltmarsh zones, although some of these species have a restricted distribution nationally and may not occur in the Ballyteige Burrow area.

Typical species		
Lower marsh	Low-mid marsh	Mid-upper marsh
<i>Salicornia</i> spp.	<i>Puccinellia maritima</i>	<i>Festuca rubra</i>
<i>Suaeda maritima</i>	<i>Triglochin maritima</i>	<i>Juncus gerardii</i>
<i>Puccinellia maritima</i>	<i>Plantago maritima</i>	<i>Armeria maritima</i>
<i>Aster tripolium</i>	<i>Atriplex portulacoides</i>	<i>Agrostis stolonifera</i>
	<i>Aster tripolium</i>	<i>Limonium humile</i>
	<i>Spergularia</i> sp.	<i>Glaux maritima</i>
	<i>Suaeda maritima</i>	<i>Seriphidium maritimum</i>
	<i>Salicornia</i> spp.	<i>Plantago maritima</i>
	<i>Glaux maritima</i>	<i>Aster tripolium</i>
		<i>Juncus maritimus</i>
		<i>Triglochin maritima</i>
		<i>Blysmus rufus</i>
		<i>Eleocharis uniglumis</i>
		<i>Leontodon autumnalis</i>
		<i>Carex flacca</i>
		<i>Carex extensa</i>

Species of local distinctiveness were recorded at the sub-sites throughout the SAC.

Within the MSM at Ballyteige there is a small area dominated by Borrer's Saltmarsh grass (*Puccinellia fasciculata*). This species is very rare in Ireland and is listed on the Flora protection Order. It has only been recorded from seven 10km<sup>2</sup> squares in Ireland (Preston *et al.*, 2002).

Mediterranean and thermo-Atlantic Halophilous scrubs (1420) is the rarest of the four Annex I saltmarsh habitats found in Ireland. The habitat is characterised in Ireland by the presence of perennial glasswort (*Sarcocornia perennis*). This species is a Red Data Book species (Curtis & McGough, 1988) and is listed on the Flora Protection Order. Ballyteige Burrow is one of only two coastal sites where perennial glasswort (*Sarcocornia perennis*) has been recorded in Ireland. The sub-site at Ballyteige supports a population that is found in the ASM west of the Cull Bank (McCorry, 2007). This habitat was previously recorded at the Duncormick sub-site, however, was not recorded by the SMP at time of survey (McCorry, 2007)

#### **4.4.8 Vegetation structure: negative indicator species**

The only invasive and non-native species recorded on saltmarshes during the SMP was common cordgrass (*Spartina anglica*). This species was recorded frequently in Ballyteige Burrow SAC by the SMP (McCorry, 2007).

At Ballyteige, common cordgrass has mainly colonised intertidal mudflats. It has also spread in to the mid-lower zone of the ASM and is distributed along most of the ASM west of the Cull Bank (McCorry, 2007).

At Duncormick, *Spartina* occurs only occasionally and does not form the dense sward as seen on the other side of the Cull along Ballyteige Burrow (Mc Corry, 2007).

The aim is that negative indicators such as *Spartina* should be absent or under control. The current target for this particular site is no significant expansion and an annual spread of less than 1%.

## 5 Sand dune habitats

Sand dunes are hills of wind-blown sand that have become progressively more stabilised by a cover of vegetation. In general, most sites display a progression through strandline, foredunes, mobile dunes and fixed dunes. Where the sandy substrate is decalcified, fixed dunes may give way to dune heath. Wet hollows, or dune slacks, occur where the dunes have been eroded down to the level of the water-table. Machair is a specialised form of dune system that is only found on the northwest coasts of Ireland and Scotland. Transitional communities can occur between dune habitats and they may also form mosaics with each other. Dune systems are in a constant state of change and maintaining this natural dynamism is essential to ensure that all of the habitats present at a site achieve favourable conservation condition.

In Ireland, there are 9 sand dune habitats (including annual vegetation of drift lines) listed under Annex I of the EU Habitats Directive (92/43/EEC) (\* denotes a priority habitat):

- **Annual vegetation of drift lines (1210)**
- **Embryonic shifting dunes (2110)**
- **Shifting dunes along the shoreline with *Ammophila arenaria* (2120)**
- **Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) \***
- Decalcified dunes with *Empetrum nigrum* (2140) \*
- **Atlantic decalcified fixed dunes (2150) \***
- Dunes with *Salix repens* (2170)
- Humid dune slacks (2190)
- Machair (21AO) \*

Six dune habitats were recorded by Ryle *et al.* (2009) but only the five habitats indicated in bold above are listed as Qualifying Interests for Ballyteige Burrow SAC. These habitats include mobile areas at the front, as well as more stabilised parts of dune systems. Humid dune slacks were also recorded at the Ballyteige Burrow sub-site by the CMP. However, these areas need to be assessed further to investigate whether they are better placed within the habitat 'perennial vegetation of stony banks'.

Annual vegetation of drift lines is found on beaches along the high tide mark, where tidal litter accumulates. It is dominated by a small number of annual species (i.e. plants that complete their life-cycle within a single season). Tidal litter contains the remains of marine algal and faunal material, as well as a quantity of seeds. Decaying detritus in the tidal litter releases nutrients into what would otherwise be a nutrient-poor environment. The habitat is often represented as patchy, fragmented stands of vegetation that are short-lived and subject to frequent re-working of the sediment. The vegetation is limited to a small number of highly specialised species that are capable of coping with salinity, wind exposure, an unstable substrate and lack of soil moisture. Typical species include spear-leaved orache (*Atriplex prostrata*), frosted orache (*A. laciniata*), sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*) and prickly saltwort (*Salsola kali*).

Embryonic dunes are low accumulations of sand that form above the strandline. They are sometimes referred to as foredunes, pioneer dunes or embryo dunes, as they can represent the primary stage of dune formation. They are characterised by the presence of the salt-tolerant dune grasses sand couch (*Elytrigia juncea*) and lyme grass (*Leymus arenarius*), which act as an impediment to airborne sand. Strandline species can remain a persistent element of the vegetation.

Where sand accumulation is more rapid, marram grass (*Ammophila arenaria*) invades, initiating the transition to mobile dunes (Shifting dunes along the shoreline with *Ammophila arenaria*). Marram growth is actively stimulated by sand accumulation. These unstable and mobile areas are sometimes referred to as 'yellow dunes' (or white dunes in some European countries), owing to the areas of bare sand visible between the tussocks of marram.

Fixed dunes refers to the more stabilised area of dune systems, generally located in the shelter of the mobile dune ridges, where the wind speed is reduced and the vegetation is removed from the influence of tidal inundation and salt spray. This leads to the development of a more or less closed or 'fixed' carpet of vegetation dominated by a range of sand-binding species (Gaynor, 2008).

At the older landward edge of the fixed dunes, leaching of basic minerals and nutrients can lower the pH over time and create conditions suitable for colonisation by heath species. As these decalcified or acidic conditions can only form on the older, landward extremes of dune systems, they are often vulnerable to housing or other developments. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as *Calluna vulgaris* (heather), and *Erica* spp., that are generally regarded as characterising the habitat, are not well represented in Ireland.

All of the dune habitats indicated above occur as a complex mosaic of constantly changing and evolving vegetation communities. They are inextricably linked in terms of their ecological functioning and should be regarded as single geomorphological units. As such, no dune habitat should be considered in isolation from the other dune habitats present at a site, or the adjoining semi-natural habitats with which they often form important transitional communities.

The CMP surveyed one sub-site within Ballyteige Burrow SAC:

1. Ballyteige Burrow (Appendix V)

Ballyteige Burrow is a long sand/shingle spit extending approximately 8.5km in a westerly direction from Forlorn Point at Kilmore Quay. The distribution of sand dune habitats as mapped by the SDM is presented in Appendix II. A total of 253.53ha of sand dune habitat was mapped within the Ballyteige Burrow SAC, of which 17.68ha represents 'humid dune slacks' which need to be reviewed. The remaining area represents habitats of qualifying interest for this particular site.

## 5.1 Overall objectives

The overall objective for 'Annual vegetation of drift lines' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Embryonic shifting dunes' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria*' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Ballyteige Burrow SAC is to 'restore the favourable conservation condition'.

While acknowledging that the habitat may be poorly developed at this site, the overall objective for 'Atlantic decalcified fixed dunes (Calluno-Ulicetea)' in Ballyteige Burrow SAC is to 'maintain the favourable conservation condition'.

These objectives are based on an assessment of the recorded condition of each habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Area (b) Range and (c) Structure and Functions.

## 5.2 Area

### 5.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats at each sub-site in Ballyteige Burrow SAC during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). During the SDM, these baseline maps were checked and revised to account for changes in habitat interpretation and omissions. Updated maps were then produced to reflect the current situation on the ground. The revised baseline habitat maps and updated habitat maps from the SDM are included with the individual site reports in the Appendix V.

Ballyteige Burrow is an important site for the range and extent of its coastal habitats. In general, the habitats at the front of the system are limited in their development and extent in view of the tidal exposure. The fixed dunes are significant in extent and species diversity.

Dune heath habitat occurs in transition with the fixed dune habitat. Neither the CMP nor the SDM separated dune heath from fixed dune as the dune heath habitat was recognised based in the presence of gorse (*Ulex*

*europaeus*) which is concentrated on the leeward side of the dunes. The difficulty in delineating the habitat at Ballyteige Burrows and most Irish sites that are designated for dune heath is the absence of other ericoid species typical of dune heath. The status of this habitat requires further review.

The total areas of each sand dune habitat within the SAC as estimated by Delaney *et al.* (2013) are presented in the following table.

Habitat	Total area (ha) of habitat within SAC boundary following SDM
Annual vegetation of driftlines	0.66
Embryonic shifting dunes	0.43
Shifting dunes along the shoreline with <i>Ammophila arenaria</i>	8.11
Fixed coastal dunes with herbaceous vegetation	225.65
Atlantic decalcified fixed dunes	-
<b>Total</b>	<b>234.85</b>

In the case of ‘embryonic dunes’ and ‘shifting dunes along the shoreline with *Ammophila arenaria*’, losses were reported during the baseline survey (Ryle *et al.*, 2009). However, the extent of these habitats is naturally limited by the tidal conditions at the site. Therefore, the general target for this attribute in the case of each habitat is that the area should be stable, or increasing. Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is always assessed subject to natural processes, including erosion and succession.

### 5.3 Range

#### 5.3.1 Habitat distribution

Ballyteige Burrow is a long sand/shingle spit and supports a good range of dune habitats (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

The distribution of sand dune habitats as mapped by Delaney *et al.* (2013) is presented in Appendix II.

Of particular interest at the site is the possible existence of small areas of decalcified dune heath, a priority Annex I habitat. This is normally characterised by the presence of ericoid or heath species in association with dune species. The status of this habitat in Ireland is currently under review.

There should be no decline or change in the distribution of these sand dune habitats, unless it is the result of natural processes, including erosion, and succession.

## **5.4 Structure and Functions**

The location, character and dynamic behaviour of sand dunes are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. Sand dunes are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered. Maintaining the favourable conservation condition of all of the sand dune habitats in Ballyteige Burrow SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

### **5.4.1 Physical structure: functionality and sediment supply**

Coastlines naturally undergo a constant cycle of erosion and accretion. There are two main causes of erosion: (a) those resulting from natural causes and (b) those resulting from human interference. Natural causes include the continual tendency towards a state of equilibrium between coasts and environmental forces, climatic change (particularly an increase in the frequency of storms or a shift in storm tracks), relative sea level rise and natural changes in the sediment supply. Human interference is usually associated with changes in the sediment budget, either directly, through the removal of beach or inshore sediment, or indirectly, by impeding or altering sediment movement. It is important to recognise that the process of coastal erosion is part of a natural tendency towards equilibrium. Natural shorelines attempt to absorb the energy entering the coastal zone by redistributing sediment.

Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sediment supply is especially important in the embryonic dunes and mobile dunes, as well as the strandline communities where accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

The target for this attribute is to maintain the natural circulation of sediment and organic matter throughout the entire dune system, without any physical obstructions.

#### **5.4.2 Vegetation structure: zonation**

The range of vegetation zones on a dune system should be maintained. Gaynor (2008) highlights the highly transitional nature of much of the vegetation; therefore, it is important that the transitional communities are also conserved, including those to the saltmarsh communities.

Ballyteige Burrows represents one of the finest examples of a dune/saltmarsh system with intact transitional communities between the two habitats. This is an extremely rare feature on Irish dune systems.

The target is to maintain the range of coastal habitats, including transitional zones, subject to natural processes, including erosion and succession.

#### **5.4.3 Vegetation structure: bare ground**

This target only applies to fixed dunes. It does not apply to the other habitats present where high levels of bare sand are a natural component of the habitat. In the fixed and slack areas some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions including invertebrates, helping to increase biodiversity.

The target is to achieve up to 10% bare sand. This target is assessed subject to natural processes.

#### **5.4.4 Vegetation structure: vegetation height**

This attribute applies to the fixed dunes, where a varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. The ecological benefits of moderate levels of grazing on dunes have been well documented (Gaynor, 2008). Moderate grazing regimes lead to the development of a species-rich vegetation cover. The animals increase biodiversity by creating micro-habitats through their grazing, dunging and trampling activities. Grazing slows down successional processes and in some cases reverses them, helping to achieve a diverse and dynamic landscape. The effects of trampling assist the internal movement of sand through the development of small-scale blowouts, while dunging can eutrophicate those dune habitats whose nutrient-poor status is crucial for the survival of certain vegetation types. Many species, from plants to invertebrates, benefit immensely from the open and diverse system created by a sustainable grazing regime. Many dune species are small in size and have relatively low competitive ability. Consequently, the maintenance of high species diversity on a dune system is dependent on the existence of some control to limit the growth of rank coarse vegetation (Gaynor, 2008).



There is limited grazing at Ballyteige Burrow as part of the management regime within the Nature Reserve, in order to maintain the dwarf grassland sward mosaic which is of considerable conservation value at the site. In contrast, in the land under private ownership the dunes are undergrazed and dominated by marram with relatively large patches of bracken and bramble present (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

The target for this attribute is to maintain structural variation within the sward.

#### **5.4.5 Vegetation composition: plant health of dune grasses**

This attribute applies to foredunes and mobile dunes, where blowing sand is a natural feature. The health of the dune grasses (particularly *Ammophila arenaria* and *Elytrigia juncea*) is assessed by the plant parts above the ground (they should be green) and the presence of flowering heads. This gives a clear indication of the status of the supply of blown sand, which is required for these species to thrive.

The target for this attribute is that more than 95% of the dune grasses should be healthy.

#### **5.4.6 Vegetation composition: typical species & sub-communities**

Species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance. In the younger, more mobile dunes, marram (*Ammophila arenaria*) is common, while groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* sp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (*Galium verum*), common birdsfoot trefoil (*Lotus corniculatus*), wild thyme (*Thymus praecox*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).

The Ballyteige sub-site supports a characteristic and species-rich dune flora, details of which can be found in the site report from the SDM (Ryle *et al.*, 2009) which is included in Appendix V. Additional information on the flora of the site can be found in Nooren & Schouten (1976), Gaynor (2008) and Ryle *et al.* (2009). Rare elements of the site flora include wild asparagus (*Asparagus officinalis* var. *prostratus*), a Red Data Book species (Ryle *et al.*, 2009).

The target for this attribute is to maintain a typical flora for the particular sand dune habitat.

#### **5.4.7 Vegetation composition: negative indicator species**

Negative indicators include non-native species (e.g. *Hippophae rhamnoides*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled.

The main invasive species identified in Gaynor (2008) were bracken (*Pteridium aquilinum*) and sea buckthorn (*Hippophae rhamnoides*). The invasion of non-native species compromises the typical plant community structure. Bracken (*Pteridium aquilinum*) is becoming increasingly dominant, particularly where sites have been abandoned or where grazing levels have been significantly reduced. The vegetation retains many elements of the original vegetation cover, but there is a reduction in biodiversity. As the canopy becomes taller and ranker, many of the low-growing species disappear. In this case, the vegetation is treated as a sub-community of the original community that was invaded. This is always the case unless the original vegetation cover has been completely destroyed, as can happen with *H. rhamnoides*, which can form dense impenetrable thickets.

Bracken (*Pteridium aquilinum*) and Bramble (*Rubus fruticosus*) have been recorded in fixed dunes to the east of the site at Ballyteige (privately owned land) where grazing is absent (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

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The target is that negative indicators (including non-native species) should represent less than 5% of the vegetation cover.

#### **5.4.8 Vegetation composition: scrub/trees**

This attribute only applies to the fixed dunes and dune heath. Scrub encroachment leads to reduction in dune biodiversity and needs to be controlled. The presence of scrub and trees which have deep roots can also lower the groundwater table which can have significant impacts on any slack communities.

The target for this attribute therefore is that the cover of scrub and tree species should be under control or represent no more than 5% of the vegetation cover.

## **6 References**

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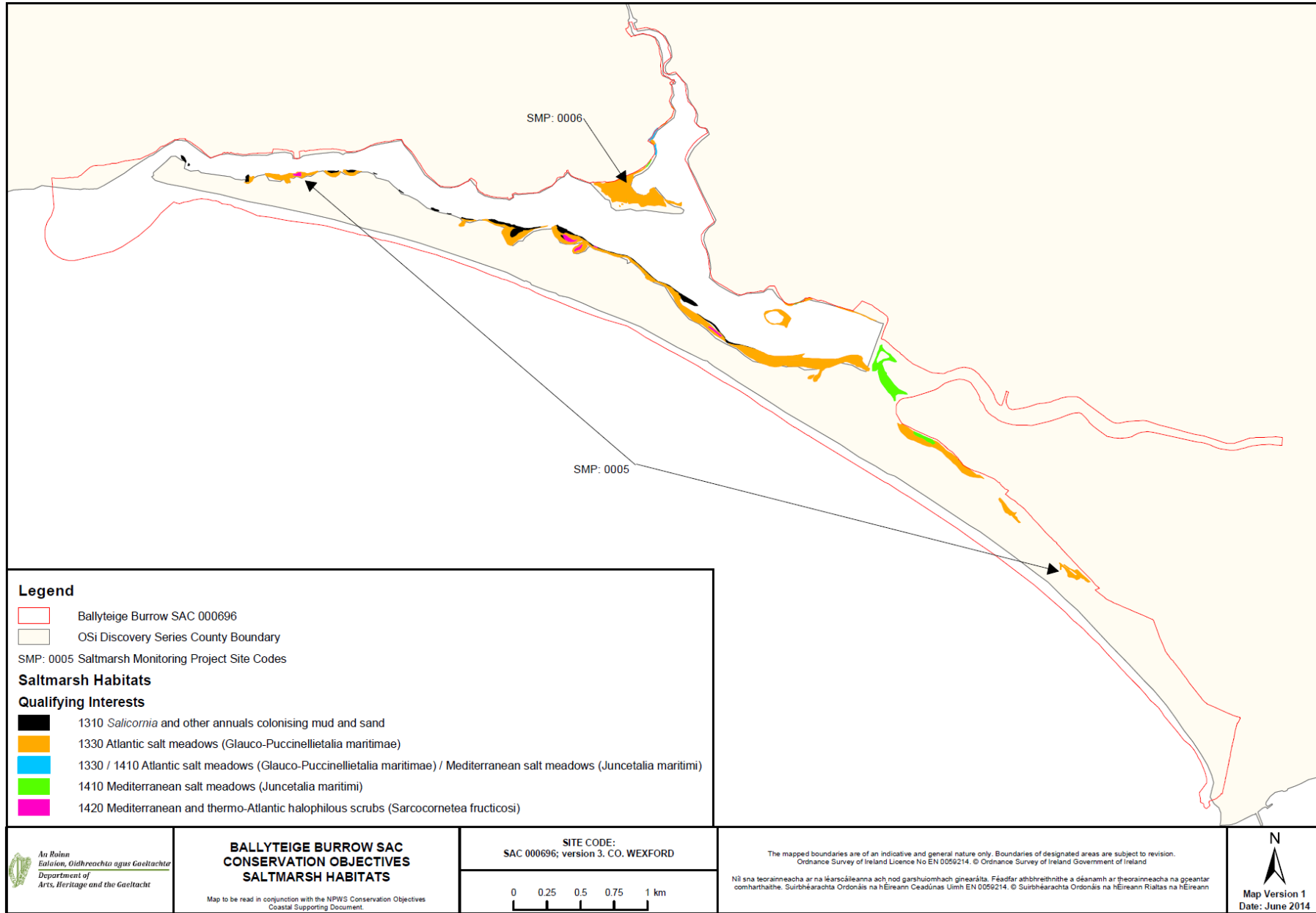
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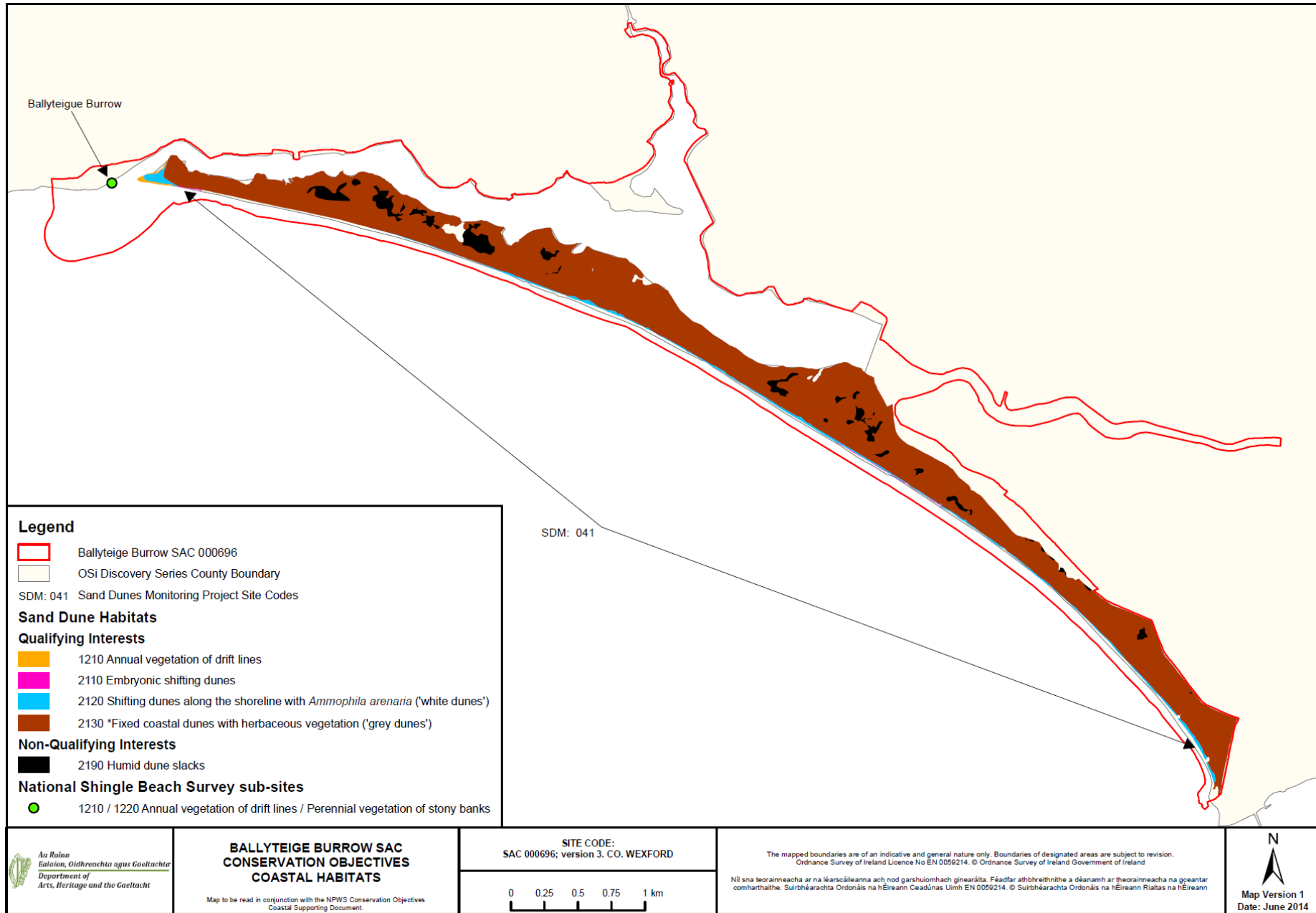
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# Appendix I – Saltmarsh habitats distribution map within Ballyteige Burrow SAC



## Appendix II – Sand dune habitats distribution map within Ballyteigue Burrow SAC



## Appendix III – Ballyteige site report and habitat map from the SMP (McCorry, 2007)

### 1 SITE DETAILS

SMP site name: <b>Ballyteige</b>	SMP site code: <b>SMP0005</b>
Site name (Curtis list): <b>Ballyteige</b>	CMP site code: <b>46</b>
	Site No: (Curtis list): <b>222</b>
NPWS Site Name: <b>Ballyteige Burrow</b>	Dates of site visit: <b>29-30/06/2006</b>
NPWS designation	cSAC: <b>696</b>
	MPSU Plan: <b>new format plan available</b>
	pNHA: <b>696</b>
	SPA: <b>Ballyteige Burrow SPA</b>
	Nature Reserve: <b>Ballyteige Burrow (S.I. no 279 of 1987 and 8 of 1990)</b>
County: <b>Wexford</b>	Discovery Map: <b>77</b> Grid Ref: <b>293100, 106570</b>
1 <sup>st</sup> ed 6 inch Map No: <b>Wx046, Wx051</b>	Aerial photos (1995 series): <b>not available</b>
2 <sup>nd</sup> ed 6 inch Map No: <b>Wx046, Wx051</b>	Aerial photos (2000 series): <b>05780-a, 05780-b, 08780-d, 05781-a, 05781, c, 05781-d, 05851-a, 05851-b</b>
	Aerial photos (2005 series): <b>0688606, 0688608, 0690606, 0690608, 0692606, 0692608, 0694604, 0694606</b>
Annex I habitats currently designated for Ballyteige Burrow	
cSAC:	
<b><i>Salicornia</i> and other annuals colonizing mud and sand (1310)</b>	
<b><i>Spartina</i> swards (<i>Spartinion maritimae</i>) (1320)</b>	
<b>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) (1330)</b>	
<b>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) (1410)</b>	
<b>Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) (1420)</b>	
Other SMP sites within this cSAC/pNHA: <b>Duncormick</b>	
Saltmarsh type: <b>Lagoon</b>	Substrate type: <b>Mud/sand/shingle</b>

## 2 SITE DESCRIPTION

Ballyteige Burrow is a long sand/shingle spit located along the southern coast of County Wexford. The spit extends approximately 8.5 kilometres in a westerly direction from Forlorn Point at Kilmore Quay and encloses a shallow estuary and intertidal area along the western half. Land along the back of eastern part of the spit was been reclaimed as polder land, and a seawall and pumping station was built at The Cull Bank. Saltmarsh has developed along the back of the spit in the sheltered intertidal area and also behind the seawall and along some of the channels that drain this polder land. The sand/shingle spit contains a complex sand dune system with several Annex I habitats and these habitats were surveyed in 2004 by the Coastal Monitoring Project.

The area around Ballyteige is generally low lying and land around the site is dominated by farmland. There is a small area of saltmarsh along the northern side of the intertidal area and estuary at Duncormick and this was surveyed as a separate saltmarsh site. Other parts of the northern side have a seawall around the shoreline protecting farmland. The intertidal area (The Cull) drains at low tide leaving wide expanses of sand and mudflats and the estuary habitat is confined to sometimes narrow sub-tidal channels in the centre of the intertidal area. This site was classified as a lagoon type saltmarsh (Curtis & Sheehy-Skeffington 1998) due to the unique tidal regime within the intertidal area and this varies significantly to tides outside The Cull. Polder land behind the sea wall built at The Cull is now farmed.

The following four Annex I habitats are found at this site: *Salicornia* flats, Atlantic salt meadows (ASM), Mediterranean salt meadows (MSM), and Mediterranean and thermo-Atlantic halophilous scrubs. This site is notable for the presence of this latter saltmarsh habitat (1420), which is only found at two sites in Ireland. All four habitats are listed as qualifying interests for the Ballyteige Burrow cSAC. *Spartina* swards are also present at this site and this habitat is also currently listed as a qualifying interest for this site. Nearly all the saltmarsh habitat is situated within the cSAC. There is a small area of Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM) located north of Cull Island along the northern side of the estuary excluded from the cSAC.

This site is protected by several designations. Ballyteige Burrow SPA covers most of the sand spit and the saltmarsh habitats along the edge of the intertidal area. Most of Ballyteige Burrow is also a Nature Reserve, owned by NPWS, and this includes most of the saltmarsh habitats. Some of the saltmarsh located behind The Cull Bank seawall is excluded from the SPA. Saltmarsh located east of the Cull Bank is located outside the Nature Reserve designation. NPWS have entered into a management agreement with a local landowner to allow a limited number of cattle to graze on Ballyteige Burrow during the winter. The objective of the grazing is to promote habitat diversity and maintain a species-rich short turf in the sand dune habitats.

The saltmarsh can be accessed from The Cull via tracks across farmlands which access the Cull Bank pump house. The OPW manages the pump house at The Cull.

### 3 HABITATS

#### 3.1 General description

Most of the saltmarsh habitat is found along the back of the Ballyteige Burrow, west of the Cull Bank. Atlantic salt meadows form a long narrow band of habitat that extends nearly to the end of the spit and is the dominant habitat (Table 3.1). There are several breaks in its distribution towards the western side of Ballyteige Burrow where the adjacent sand dunes form the boundary with the intertidal flats and no saltmarsh has developed. Mediterranean and thermo-Atlantic halophilous scrub (1420) is also found along this band of saltmarsh and forms a mosaic with the ASM.

*Spartina* swards have developed on the mudflats along the edge of the ASM and are most prevalent near to the Cull Bank. *Spartina* swards also form patches of habitat within some of the larger saltmarsh areas that have developed in low-lying sheltered parts of Ballyteige Burrow. Mosaics of *Spartina* sward and ASM are also present. Narrow bands of *Salicornia* flats have also developed along the edge of the ASM and the *Spartina* swards. Small isolated patches of *Salicornia* flats develop along the edge of the intertidal flats towards the western end of Ballyteige Burrow. There is a small mosaic of *Spartina* sward and *Salicornia* flat.

There is a small amount of ASM and MSM along the northern side of the intertidal area, along the mainland shoreline, north of Cull Island. This saltmarsh is situated adjacent to a sea wall. Cull Island also contains a ring of ASM around its shoreline and a band of *Spartina* sward around part of the island.

Mediterranean salt meadows also form a large patch of saltmarsh in a low-lying area behind the Cull Bank. This area also contains some *Spartina* sward and some bare mudflat. ASM and some MSM have developed on low-lying land along the edge of the channel that drains the landward side of this part of Ballyteige Burrow.

The ASM generally transitions to fixed dune grassland on its landward side. There may be a narrow band of bare substrate (sand and shingle) at the landward boundary of the saltmarsh along the strandline. The MSM located behind the Cull Bank embankment transitions to wet grassland. Further east, saltmarsh along the north side of the channel transitions to rank grassland.

**Table 3.1.** Area of EU Annex I habitats listed at Ballyteige.

EU Code	Habitat	Area (ha)
1310	<i>Salicornia</i> and other annuals colonizing mud and sand (1310)	2.86 <sup>1</sup>
1320	<i>Spartina</i> swards and clumps	6.37 <sup>2</sup>
1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	21.15
1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	3.04
1420	Mediterranean and thermo-Atlantic halophilous scrubs ( <i>Sarcocornetea fruticosi</i> )	0.73
	<b>Total</b>	<b>34.15</b>

<sup>1</sup> this total includes 50% of the 1310/1320 mosaic

<sup>2</sup> this total includes 50% of the *Spartina* sward/mudflats mosaic and 5% of the area mapped as scattered clumps of *Spartina*.



### 3.2 *Salicornia* and other annuals colonizing mud and sand (H1310)

This habitat is found along the edge of the saltmarsh west of the Cull Bank. It generally forms a narrow band 2-5 m wide at the seaward edge of the saltmarsh. Occasionally this band widens, depending on the topography of the adjacent salt marsh and dunes and patches develop that are up to 40 m wide. These patches develop on soft mud. They are dominated by an almost mono-specific sward of Glasswort. Some of this habitat located at the western end of the spit contains a mixture of Annual Sea-blite (*Suaeda maritima*) and Glasswort (*Salicornia* sp.).

Common Cordgrass (*Spartina anglica*) is found in this habitat along most of the Burrow and in some of the patches towards the western end, although it is generally found at low cover values (< 1-5%) and the clump sizes are small. There are several patches of *Salicornia* flats towards the western end of the spit that do not contain any Common Cordgrass.

This habitat is developing in the more sheltered area on an accretional ramp. There is a natural transition from ASM communities to vegetation dominated by Glasswort. Low saltmarsh cliffs 10-20 cm high may develop along some of this saltmarsh in slightly less sheltered areas. Seaward of the *Salicornia* flats there is a very gentle slope to adjacent intertidal flats. Further west, this habitat is found in sheltered areas in isolation from other saltmarsh habitats in bends along the edge of the sand dunes. These patches develop in flat platforms with a steep gradient down to the intertidal flats along the seaward side. The gradient from saltmarsh to intertidal flats also becomes greater towards the western end.

There are frequent narrow bands of vegetation (< 1 m wide) dominated by Annual Sea-blite, and containing occasional Greater Sea-spurrey (*Spergularia media*) and rare Lax-flowered Sea Lavender (*Limonium humile*) that occur on muddy shingle/pebble banks. These bands of vegetation are situated at the extremities of ASM, as the ASM transitions to narrow shingle/pebble banks. Where the substrate is dominated by mud or sand, these bands of vegetation can be classified as this habitat. Small narrow bands may not be mapped.

Patches of Glasswort also form mosaics with *Spartina* sward on mudflats adjacent to the saltmarsh. Glasswort is present throughout this area and is also present within the clumps of Common Cordgrass. The Common Cordgrass cover is 50-60% in this area.

### 3.3 *Spartina* swards (H1320)

This habitat is characterised by dense swards and isolated clumps of Common Cordgrass that have mainly developed on intertidal mudflats. These swards have colonised bare mud adjacent to the ASM close to the Cull Bank. Large clumps have coalesced together to form a sward of dense Common Cordgrass. There are small amounts of Common Saltmarsh-grass (*Puccinellia maritima*) and rare Lax-flowered Sea Lavender within the dense swards of Common Cordgrass. There are patches of bare mud within the *Spartina* sward (75% cover).

Other areas are mapped as *Spartina* sward/mudflat mosaic (30-50% *Spartina* cover) and scattered clumps of *Spartina* on mud (1-5% *Spartina* cover) depending on the density of Common Cordgrass. Scattered clumps are frequently present along the boundary between the saltmarsh and the mudflats and these coalesce in

places to form a narrow strip of *Spartina* sward. Some sections of the mudflats adjacent to the *Spartina* sward and mapped as scattered clumps of *Spartina* on mud have occasionally frequent seedlings of Common Cordgrass, indicating that this species is spreading on the mudflats and the extent of *Spartina* sward is likely to increase in the future.

This species is also part of the ASM, *Salicornia* flats and Mediterranean scrub saltmarsh vegetation. Its occurrence within these habitats is described more detail in those sections. Common Cordgrass is sometimes found quite frequently within these habitats and forms mosaics or transition habitats between these Annex I habitats. It is distributed along the most of the saltmarsh west of the Cull Bank and is found in ASM close to the western tip of the spit, although it is most abundant within the more sheltered part of the intertidal area close to the Cull Bank. It is also found in a small area east of the Cull Bank embankment where it is colonising bare mudflats in a pool.

Ballyteige Burrow cSAC is one of only two sites in Ireland with *Spartina* swards currently listed as a qualifying interest. Several more sites were listed but have subsequently not been selected for this habitat. The EU Habitats Manual (Commission of the European Communities 2003) describes this habitat as being dominated by *Spartina maritima*, *S. townsendi*, *S. anglica* and *S. alterniflora*. However, preference should be given to areas supporting rare of local *Spartina* spp., particularly *S. maritima* and *S. alterniflora*. These two species are not found in Ireland and the *Spartina* swards in Ireland are predominately made up of *S. anglica*. The *Spartina* sward at Ballyteige does qualify as Annex I habitat, although it is dominated by *S. anglica*. This Annex I habitat was probably listed to protect the rarer forms of *Spartina* and not *S. anglica*. Confusion about this habitat has probably been exacerbated by confusion about the classification of this genus in Ireland.

### **3.4 Atlantic salt meadows (H1330)**

This habitat is situated at several locations along Ballyteige Burrow. The different sections have varying characteristics and are described separately.

#### **3.4.1 ASM west of the Cull Bank**

This is the largest area of ASM on the site. A band of ASM has developed along the back of the sand dune system on a very gentle slope. This has allowed a distinctive zonation of ASM vegetation communities to develop, particularly at the eastern end adjacent to the Cull Bank. Further west the ASM breaks up and only develops in the more sheltered areas. There are several large sections present within sheltered lips along the sand-dune system and these may be connected by narrower strips depending on the topography of the sand dunes. Towards the western end of Ballyteige Burrow, saltmarsh develops on gently sloped mud platforms and there is a steep slope from the seaward edge towards the intertidal flats and the central estuarine channel.

An upper marsh zone is dominated by Red Fescue (*Festuca rubra*) and occasionally frequent Saltmarsh Rush (*Juncus gerardii*), and may be quite narrow, developing where the saltmarsh begins to slope and transition to fixed dune. It also contains Long-bracted Sedge (*Carex extensa*), Sea Pink (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Greater Sea-spurrey and Buck's-horn Plantain (*Plantago coronopus*). Hard-grass (*Parapholis strigosa*) is also present. This zone generally had a track or bare sand along the

upper boundary with fixed dune vegetation. Some of this bare sand along the strand-line was being vegetated by Annual Sea-blite, creating some reverse zonation. Saltmarsh Rush is dominant in the more sheltered sections that protrude into the fixed dunes.

The mid-upper marsh zone is quite wide and is dominated by Sea Plantain with frequent Sea Pink and occasionally abundant Sea Milkwort (*Glaux maritima*). Other species include Sea Aster (*Aster tripolium*), Common Saltmarsh-grass and Lax-flowered Sea Lavender, the latter two species becoming more frequent towards the lower side of this zone where it transitions to mid-lower saltmarsh. This zone does not contain very many salt pans. This zone and the lower saltmarsh zone are drained by narrow shallow creeks.

A mid-lower marsh zone is dominated by Lax-flowered Sea Lavender and Common Saltmarsh-grass and also contains Glasswort and Annual Sea-blite. This was the best example of zonation of Lax-flowered Sea Lavender seen during the survey. Some sections of the lower saltmarsh zone contain frequent small scattered clumps of Common Cordgrass plants (1-5% cover). Further west a narrow band dominated by Common Saltmarsh-grass is present at the seaward boundary (1-5 m wide) and Lax-flowered Sea Lavender becomes less frequent. The substrate is quite muddy in the lower zone and this zone transitions to *Spartina* sward. The seaward boundary generally has scattered clumps of Common Cordgrass along it where it transitions to mudflats (mapped as scattered clumps of *Spartina* on mud). Other parts of the seaward boundary transition to a narrow band of *Salicornia* flats. There is a low saltmarsh cliff in places, but along some of the seaward boundary there is an accretion ramp and the vegetation has the appearance of spreading seaward. This indicates that the saltmarsh is growing in places.

There are several areas where saltmarsh enters the sand dunes and is situated on small sheltered low-lying areas surrounded by dunes. Some of these areas have pebble/shingle ridges that partially enclose the saltmarsh. These areas generally have typical saltmarsh vegetation zonation that follows bands around the edges of these areas. Zonation may be more complicated with zones also present along the back of the pebble/shingle ridges that partially enclose these areas. Each section generally has one main creek that drains the area. There are very few salt pans across the whole of this saltmarsh.

Sea Purslane (*Atriplex portulacoides*) was recorded several times along the spit and is a rare plant at Ballyteige Burrow. The absence of this species is notable as this allows the lower saltmarsh zone to be dominated by Common Saltmarsh-grass and frequent Lax-flowered Sea Lavender. It is likely that the abundance of this species will increase in the future. It is a characteristic feature of the saltmarsh further south at Tramore.

Pebbles are scattered on ASM at western end of the Burrow from the storm beach along the southern side. A shingle ridge along the seaward side of some of these ASM patches and saltmarsh has developed behind the ridge. Sea Beet (*Beta maritima*) and other transition zone species are present on the ridge. There are several breaks in the ridge to allow creeks draining the saltmarsh to connect to the intertidal flats.

### ***3.4.2 ASM along the east of Ballyteige***

There are several patches of ASM vegetation east of The Cull Bank. These areas are situated along a deep drain/channel that drains the eastern section of Ballyteige Burrow and the adjacent polderlands. This area has been disturbed significantly by the creation of the polderlands. This saltmarsh has developed in the past

150 years and has developed in a zone that was previously intertidal mudflats along the northern edge of the Burrow.

A small area of saltmarsh is situated in a low-lying area within a flat plain south of the channel and forms a mosaic with the surrounding fixed dune grassland. Upper saltmarsh vegetation is present at this location and is dominated by Saltmarsh Rush. Other saltmarsh species include Sea Aster, Red Fescue, Sea Plantain, Sea Arrowgrass (*Triglochin maritimum*), Long-bracted Sedge and Sea Milkwort. There are several frequent transition species present including Silverweed (*Potentilla anserina*), Sand Sedge (*Carex arenaria*) and Birdsfoot (*Lotus corniculatus*). Common Saltmarsh-grass is present along the bottom of some of the drains. There are small tussocks within this saltmarsh area that contain Yorkshire Fog (*Holcus lanatus*) and Buttercup sp. (*Ranunculus* sp.). There are several patches of Sea Club-rush (*Bolboschoenus maritimus*). This area has been affected by drainage in the past and is probably connected to the channel via these shallow drains.

A second larger area of saltmarsh is located further east at the end of the deep channel. Some of this saltmarsh is badly poached, particularly on the south side of the fence. This area is dominated by mid-marsh vegetation. This community is dominated by Sea Pink and Sea Plantain. There is also some lower marsh vegetation dominated by Lax-flowered Sea Lavender and Common Saltmarsh-grass. There is a narrow band of upper marsh vegetation around the edge of this zone dominated by Red Fescue and Saltmarsh Rush and containing Long-bracted Sedge. Annual Sea-blite is colonising some of the badly poached bare sand substrate and Glasswort is also present. This saltmarsh also transitions to fixed dune vegetation. Sea Rush (*Juncus maritimus*) and Sea Club-rush is present in an old infilled drain along the boundary between the flat plain and the dune section. Lesser Sea Century (*Centaurium pulchellum*) was recorded on the sandy bank along the fence-line that divides this habitat. This species is very rare and is listed on the Flora Protection Order.

A band of saltmarsh is also present north of the channel. This has developed on lower lying land along the edge of the channel. This area contains several saltmarsh communities and is dominated by upper saltmarsh with Saltmarsh Rush and Red Fescue prominent. The lower saltmarsh zone contains frequent patches of bare substrate. This area is drained by a central channel. Glasswort and Annual Sea-blite are present lower down the sides of the channel. Parts of this area are poached by cattle. There are several fence-lines crossing this area and the various sections have varied grazing intensities. There are several patches of Sea Rush mapped as MSM. The saltmarsh transitions to dry grassland at the landward side and this grassland is improved close to the saltmarsh. There is gravel and sand extraction to the east of this area.

### ***3.4.3 ASM on the north side of the intertidal area***

There is a narrow band of eroding saltmarsh present at this location alongside a seawall. Clumps of Common Cordgrass are present on mud further seaward of the ASM. This saltmarsh widens further west and contains several saltmarsh zones similar to those of the south side along Ballyteige Burrow. There is a low zone along the front of this saltmarsh that is vegetated by Twitch (*Elytrigia repens*). Some creeks and salt pans drain this area. This area also contains some MSM.

### 3.5 Mediterranean salt meadows (H1410)

This habitat is mainly situated behind the Cull Bank. It consists of two different vegetation communities. The more familiar community characterised by dense Sea Rush is present. This habitat forms a band along the back of the embankment and forms large meadow-like areas further east. The habitat is dominated by Sea Rush forming a tall sward (0.5 m high). Other species present include Sea Aster and Common Saltmarsh-grass on the lower lying areas. Saltmarsh Rush and Sea Milkwort become frequent higher up a gentle slope towards the landward edge of this habitat. Further east the habitat becomes brackish and the Sea Rush transitions to patches of Sea Club-rush. Parts of this habitat are grazed and there is an obvious track.

There is also a small area dominated by Borrer's Saltmarsh-grass (*Puccinellia fasciculata*). This species is very rare in Ireland and is listed on the Flora Protection Order. It has only been recorded from seven 10 km<sup>2</sup> squares in Ireland (Preston *et al.* 2002). This low-lying area behind the Cull Bank was known for the presence of this species. This habitat is similar to the lower ASM saltmarsh zone and it surrounds a flooded area of bare mud. Other species present include Sea Aster, Sea Plantain, Glasswort, Lesser Sea-spurrey (*Spergularia marina*) and Sea Arrowgrass. Some *Spartina* sward has also developed along the edge of this bare mud.

### 3.6 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (H1420)

This habitat is characterised by the presence of Perennial Glasswort (*Sarcocornia perennis*) (previously known as *Arthrocnemum perenne*). This is a very rare species in Ireland and is listed on the Floral Protection Order. It has only been recorded from four 10 km<sup>2</sup> squares in Ireland (Preston *et al.* 2002). The habitat (1420) is only known from this site and from Bannow Bay cSAC.

This species is found in the ASM west of the Cull Bank. Perennial Glasswort is generally found rarely within the ASM and does not form an important part of the vegetation. It is generally found amongst lower zone vegetation associated with Common Saltmarsh-grass, Lax-flowered Sea Lavender, Glasswort and Greater Sea-spurrey on muddy substrate. Common Cordgrass is also present within this habitat (2-5% cover). Further west it is situated with increasing amounts of Annual Sea-blite. It was also recorded amongst the band of Glasswort. Small amounts of bare substrate are generally present in this habitat (5-10%). It is only found frequently at one location along Ballyteige Burrow in a small sheltered area that protrudes into the dunes. Here it is found on sandier substrate. It is found frequently within a mid-lower zone 10 m wide and a mid-upper zone dominated by Sea Pink and Sea Plantain is situated adjacent to this zone. No Common Cordgrass is present in this area.

A study of the ecology of Perennial Glasswort (Wallace 1995) noted that it was found in a narrow zone in bare mud pools. The MPSU conservation plan noted that its habitat was damaged by horse riding and disturbance on the saltmarsh but the MPSU conservation plan notes that its population is recovering.

The habitat is described as perennial vegetation of marine saline mud mainly composed of scrub. Other associated species include Sea Purslane. The habitat corresponds to the UK classification SM7 *Arthrocnemum perenne* stands. This habitat is described as Perennial Glasswort forming an open mosaic

with Sea Purslane, Common Saltmarsh-grass and Annual Sea-blite (Rodwell 2000). In Britain it is generally encountered only occasionally and only very locally is it an important part of the vegetation.

#### **4 IMPACTS AND ACTIVITIES**

There are several impacts and activities on this site (Table 4.1). The activity codes used on Table 4.1 are given in brackets in the following text. A significant part of the upper and mid-upper ASM zones show signs of low-moderate poaching by cattle. At some locations there is heavy poaching and there is 1-15% bare substrate present (143). The mid-lower saltmarsh zone is generally not affected by poaching or poaching is quite light. The saltmarsh is grazed light-moderately along the ASM adjacent to the Cull Bank. There are signs of cattle grazing along most of the saltmarsh towards the western end of Ballyteige Burrow. Some of the saltmarsh located at the eastern end of Ballyteige is badly damaged by poaching and this area may be used for feeding cattle. Part of the MSM is currently grazed lightly but has been heavily in past and shows signs of disturbance.

Saltmarsh along the western part of Ballyteige Burrow saltmarsh (and fixed dunes) was also grazed heavily by rabbits (146). The grazing intensity is so high that rabbits are eating the Common Cordgrass. Rabbit grazing is much less intense close to the Cull Bank. This variation in grazing intensity may be related to variation in dune topography. The sand dunes adjacent to the saltmarsh close to the Cull Bank are steeper and this may shield the saltmarsh somewhat. The rabbit population may also be lower in this area.

Some of the saltmarsh is damaged by vehicle use (501). There are wheel ruts in the ASM located east of the Cull Bank. These are probably related to recent dredging of the main drainage channel. There are also frequent wheel ruts along the upper section of the saltmarsh west of the Cull Bank. These tracks mainly affect the ASM and have disturbed the surface of the saltmarsh and created bare substrate, which is being re-vegetated by pioneer species. These could be related to amenity use of the site. The MPSU conservation plan noted that there was increased amenity use of Ballyteige Burrow by motorbikes. Tracks also cross the MSM habitat.

The channel that drains the eastern section of Ballyteige Burrow has been recently dredged and this has disturbed the saltmarsh located long the northern side of the channel, although it is recovering.

Saltmarsh at this site was historically more extensive before the land behind the Cull Bank was reclaimed. This old reclamation has had a significant impact on the development of saltmarsh behind the Cull Bank, which has only developed to its current state within the past 150 years. There has been further reclamation between the Cull Bank since the 1920s and the channels have been narrowed and saltmarsh has developed in these old channel areas. Areas of marsh including saltmarsh have been drained and improved. These impacts are not considered during this current period of assessment. However, the saltmarsh behind the Cull Bank may be further disturbed in the future in response to maintenance work related to the Cull Pumpouse and the drainage of the polderlands. This patch of saltmarsh has considerable conservation value due to the presence of Borrer's Saltmarsh-grass. However, the more brackish conditions that this species favours have been created by the development of the Cull Bank and the change in position of the channel in this area.

There are signs that the saltmarsh is increasing in extent along the inner part of the intertidal and estuarine area. An accretional ramp is present along the edge of the saltmarsh and there is a natural transition from ASM to *Salicornia* flat on a gentle slope (910). This is one of the few sites where there is an active pioneer zone with accretion at the seaward edge. Parts of the mid-lower zone have increased bare substrate in places compared to other sites and this may be an indication that it is responding to the changing conditions and is in a dynamic state. The spread of Common Cordgrass may also be affecting sedimentation and the growth of saltmarsh. The inner coastline of the western part of Ballyteige Burrow has not changed significantly in the past 150 years, as several patches of saltmarsh are found in sheltered pockets that were marked on the 1<sup>st</sup> ed 6 inch map.

Common Cordgrass is an important part of the saltmarsh system at Ballyteige. However, this is an invasive species. It has mainly colonised on intertidal mudflats seaward of the saltmarsh. Nairn (1986) noted its presence at the Cull but indicated that it had not increased since 1960. It is likely that it has spread somewhat on the mudflats since 1986. The impacts of the spread of Common Cordgrass on the intertidal flats are not assessed during this survey (although the intertidal flats are also an Annex I habitat and listed as a qualifying interest for this site). Common Cordgrass has also spread into the mid-lower zone of the ASM and is distributed along most of the ASM west of the Cull Bank (954). The cover of Common Cordgrass is mainly 1-5% but there occasionally frequent small areas where its cover is greater (20-30%). Some of the ASM is mapped as containing frequent Common Cordgrass (cover 5-40%) and there is one area that is mapped as containing *Spartina* sward (75%) with some ASM. This area was likely to be formerly ASM. It is also present within the *Salicornia* flats (1310) and Mediterranean shrubs (1420) habitats and is sometimes dominating parts of these habitats.

Common Cordgrass is also found in association with two species listed on the Flora Protection Order: Perennial Glasswort and Borrer's Saltmarsh-grass. These two species are both indicators of local distinctiveness and are very rare in Ireland. Common Cordgrass has the potential to lower the abundance of both species by spreading in their habitat and lowering their cover.

Many of the clumps on the saltmarsh are quite small indicating that it has spread quite recently or is currently spreading significantly. Seedlings were recorded on the mudflats in places, indicating that it is likely to increase in extent in the future. An examination of the aerial photos (2000-2005) however does not indicate any significant change in extent of *Spartina* sward in the mudflats during this period.

*Spartina* swards are an Annex I habitat and are currently listed as a qualifying interest for this site. This leads to a contradiction for management, as while the EU requires *Spartina* swards to be protected at this site, it may be posing a threat to some of the other Annex I habitats and the two species listed on the Flora Protection Order.

**Table 4.1.** Intensity of various activities on saltmarsh habitats at Ballyteige.

<b>EU Habitat Code<sup>1</sup></b>	<b>Activity code<sup>2</sup></b>	<b>Intensity<sup>3</sup></b>	<b>Impact<sup>4</sup></b>	<b>Area affected (ha)</b>	<b>Location of activity<sup>5</sup></b>
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1310	140	C	0	2.86	Inside
1310	900	C	+1	0.5	Inside
1310	910	C	+1	2.00	Inside
1310	954	C	-1	2.86	Inside
1330	140	C	0	20.00	Inside
1330	143	B	-1	5.00	Inside
1330	146	B	-1	3.00	Inside
1330	501	C	-1	1.50	Inside
1330	910	C	+1	5.00	Inside
1330	954	C	-1	5.00	Inside
1410	140	C	0	all	Inside
1410	501	B	-1	< 0.01	Inside
1410	954	C	-1	1	Inside
1420	954	C	-1	0.23	Inside

<sup>1</sup> EU codes as per Interpretation Manual. Code 13s is an additional code used to signify the entire saltmarsh habitat.

<sup>2</sup> Description of activity codes are found in Appendix III summary report.

<sup>3</sup> Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

<sup>4</sup> Impact is rated as -2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence.

<sup>5</sup> Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

## 5 CONSERVATION STATUS

### 5.3 Overall Conservation Status

Overall, the saltmarsh habitats at this site currently have an *unfavourable* conservation status (Table 5.1). Grazing is the main impact on the site although the intensity of grazing and poaching varies in different sections and on different zones. The saltmarsh has several notable features that add to its overall conservation value. This site contains one of the best examples of saltmarsh plant community zonation seen during the survey. Several very rare species, Perennial Glasswort, Borrer's Saltmarsh-grass and Lesser Sea Century are associated with various parts of the saltmarsh and significantly add to its conservation value.

**Table 5.1.** Conservation status of Annex I saltmarsh habitats at Ballyteige.

Habitat	EU Conservation Status Assessment			Overall EU conservation status assessment
	Favourable	Unfavourable - inadequate	Unfavourable - Bad	
<i>Salicornia</i> flats (1310)	Extent, Structure and functions,	Future prospects,		Unfavourable - inadequate
<i>Spartina</i> swards (1320)	Extent, Structure and functions, Future			Favourable



	prospects,			
Atlantic salt meadows (1330)	Extent,		Structure and functions Future prospects,	Unfavourable - Bad
Mediterranean salt meadows (1410)	Extent, Structure and functions, Future prospects,	Future prospects,		Unfavourable - inadequate
Mediterranean and thermo-Atlantic halophilous scrubs	Structure and functions,	Future prospects	Extent,	Unfavourable - Bad

#### 5.4 *Salicornia* and other annuals colonizing mud and sand (H1310)

##### 5.4.1 *Extent*

The extent of this habitat is assessed as *favourable* in the absence of accurate information about the previous extent of this habitat. It is mainly present as a narrow band of pioneer saltmarsh vegetation along the seaward boundary of the saltmarsh with the intertidal flats. The habitat does widen in places and forms larger areas. Its overall extent is not high (2.8 ha) but it is spread over a large area. It also forms small patches in sheltered areas where conditions allow sediment to accumulate to a suitable elevation for seedling germination and establishment. Common Cord-grass forms a mosaic with Glasswort in places, so it is possible that this habitat was more extensive in the past, prior to the invasion of this species.

##### 5.4.2 *Habitat structure and functions*

The structure and functions of this habitat is assessed as *favourable*. Four monitoring stops were carried out in this habitat and they all passed. It is generally dominated by Glasswort with occasional Annual Sea-blite. Common Cordgrass is also present though generally at low cover (1-5%). It does become more frequent in some areas (5-20%) and also forms a mosaic with *Salicornia* flats in places (20-60% cover). This habitat was notable as it predominantly forms a pioneer saltmarsh community along the seaward edge of the ASM and did not develop as isolated patches further out in the intertidal mudflats of The Cull. It develops on an accretional ramp along the seaward edge of the ASM as well as seaward of *Spartina* swards that have developed along the edge of the ASM. This habitat also includes a second vegetation community dominated by Annual Sea-blite. This generally develops along the seaward edge of ASM where ASM is transitioning to

pebble or shingle-dominated sand. These communities develop further westward along Ballyteige Burrow where the ASM breaks in distribution and only forms patches in more sheltered areas.

There are also small patches of upper saltmarsh that are being colonised by Annual Sea-blite and could be classed as this habitat. These areas were not mapped and occur where there has been disturbance of the upper marsh from sand accretion, vehicle use and poaching. Annual Sea-blite is recolonising the bare substrate areas as a pioneer species.

### ***5.4.3 Future prospects***

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that current management activities and impacts continue in the near future. There are few impacts on this habitat and it is likely to continue to thrive along the seaward edge of the ASM in the current accretional conditions along the saltmarsh within the sheltered part of the Cull near the embankment. However, it is assessed as *unfavourable-inadequate* due to the pressure of Common Cordgrass. This species is likely to increase in extent in the future and reduce the extent of Glasswort.

## **5.5 *Spartina* swards (H1320)**

### ***5.5.1 Extent***

The extent of this habitat is assessed as *favourable*. *Spartina* swards have mainly developed on intertidal mudflats adjacent to the saltmarsh. Common Cordgrass is also found on the saltmarsh as part of the ASM and *Salicornia* flats vegetation, though generally at low cover values. It is sometimes more abundant and some areas have been mapped as mosaics between *Spartina* swards and ASM or *Salicornia* flats. A comparison of the aerial photos (2000-2005) indicates that Common Cordgrass has not spread significantly during this period.

### ***5.5.2 Habitat structure and functions***

The structure and functions of this habitat is assessed as *favourable*. No attributes were assessed for this habitat. However, no negative indicators were noted. No die-back of this habitat was noted. There are some patches close to the seaward edge of the saltmarsh with small amounts of ASM species such as Common Saltmarsh-grass and Lax-flowered Sea Lavender.

### ***5.5.3 Future prospects***

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that current management activities and impacts continue in the near future. There are no significant impacts or activities on this habitat. Its extent is likely to increase in the future as seedlings of Common Cordgrass are present on one section of mudflats. There are also many small clumps of Common Cordgrass present and these are likely to grow in size in the future. The increase in extent of this habitat is likely to be mainly at the expense of bare mud and sandflats with small increases at the expense of ASM and *Salicornia* flats. The saltmarsh along the inner part of The Cull adjacent to the embankment is accreting at present, so there may be some transition from *Spartina* sward to ASM in the future.

## 5.6 Atlantic salt meadows (H1330)

### 5.6.1 Extent

The extent of this habitat is assessed as *favourable* in the absence of accurate information about the previous extent of this habitat. This habitat was likely to be previously more extensive prior to the development of the Cull Bank and the reclamation of the polderlands, but these historical impacts are not considered. The ASM is predominately distributed to the west of the Cull Bank. There are some indications that the ASM along the inner part of The Cull (east of Duncormick estuary) is spreading seaward and increasing in extent in response to accretion. There is an accretional ramp along the seaward side of the saltmarsh and parts of the lower saltmarsh zone have relatively high amounts of bare substrate, which seems to indicate that the vegetation in this zone is quite dynamic and has formed quite recently.

Common Cordgrass is present at this site and is an important part of the lower marsh ASM vegetation in places. Some areas are classified as a mosaic of ASM and *Spartina* swards indicating that *Spartina* swards have possibly replaced ASM. However, this area is quite small in extent (< 0.5 ha). Most of the *Spartina* swards mapped at the site have developed on previously bare intertidal mudflats.

There are small several patches of ASM located to the east of the Cull Bank. These have recently developed (< 150 years old) and there are relic patches of saltmarsh along the channel draining the polderlands close to Ballyteige Burrow. Saltmarsh is likely to have been more extensive along this channel, but has reduced in extent as more and more land is reclaimed and conditions become less saline.

### 5.6.2 Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad*. Twenty-two monitoring stops were carried out in this habitat and seven failed (32%). Monitoring stops generally failed due to the impacts of heavy cattle poaching or disturbance from wheel ruts, although accretion of sand along the upper saltmarsh boundary may also be significant in places. These activities generally disturb the saltmarsh surface and create significant amounts of unvegetated bare substrate. Some of this bare substrate in small patches along the upper saltmarsh boundary is being colonised by pioneer species, creating reverse zonation in places. The upper and mid-upper zones of the ASM are most affected by these activities. The intensity of grazing in parts of the saltmarsh is also high, with grazing from rabbits significant on ASM in the westward section of Ballyteige Burrow. Much of the ASM in this section has a very low sward of uniform height (1-2 cm high). Rabbits were even grazing Common Cordgrass, which gives some indication of the high grazing pressure.

Most of the other attributes reached their targets and the ASM on this site has several features of significant conservation value. Distinctive zones of upper, mid and lower saltmarsh vegetation have developed in places due to the topography of the shingle/sand spit, which allows saltmarsh to develop on a gentle slope along the back of Ballyteige Burrow in sheltered conditions. There is also a natural transition along the landward boundary to fixed dune vegetation. The species diversity is typical of this habitat and species such as Hard-grass increase the overall diversity. The absence of abundant Sea Purslane in the mid-lower saltmarsh zones is also significant and leads to the development of extensive lower saltmarsh zone vegetation dominated by Lax-flowered Sea Lavender and Common Saltmarsh-grass. The extent of this

community and the predominance of Lax-flowered Sea Lavender are notable. The overall sward height is quite diverse as grazing intensity varies in different sections and different zones. Some small areas are not grazed at all.

Saltmarsh topography is not as well-developed on this site compared to other sites, but this is probably related to the ontological development of the saltmarsh. The main part of the ASM has few salt pans and minor creeks. Some of the more sheltered sections in the westward section of Ballyteige Burrow are drained by creeks.

Common Cordgrass is a prominent part of the lower saltmarsh zone of parts of the ASM located along the sheltered part of the Cull. It forms scattered small clumps or isolated plants and stems within the other ASM vegetation. It is more frequent in some sections (up to 20% mapped as ASM with some *Spartina*) and also dominates small sections of saltmarsh with minor amounts of ASM. It is frequently found along the seaward edge of the ASM on the accretional ramp and it may be having some impact on accretion on the saltmarsh in the inner part of The Cull. Common Cordgrass can increase rates of sediment accretion.

There are several patches of ASM located to the east of the Cull Bank. These areas, while not extensive, increase the conservation value of the habitat due to the dominance of upper saltmarsh zone communities and the brackish conditions that have developed in some of the patches, increasing the diversity of the habitat.

Lesser Sea Century, a species listed on the Flora Protection Order, is recorded on saltmarsh and in habitat adjacent to saltmarsh at the east end of Ballyteige Burrow. The presence of this species increases the conservation value of the habitat.

### ***5.6.3 Future prospects***

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that current management activities and impacts continue in the near future. The ASM is being negatively affected by activities related to vehicle use and to poaching. The intensity of these impacts may actually be relatively low but are having a significant negative impact on parts of the saltmarsh.

Common Cordgrass is also present within this habitat. This is an invasive species and is likely to increase somewhat in extent in the future. While it is unlikely to significantly replace ASM vegetation it may dominate some patches of ASM vegetation in the lower zones. This would increase the extent of *Spartina* swards at this site at the expense of ASM, although it should be remembered that both habitats are Annex I habitats at this site. The substrate at Ballyteige is quite sandy, so this may negate the potential for spread of Common Cordgrass, as this species is less competitive in sandier sediments.

## **5.7 Mediterranean salt meadows (H1410)**

### ***5.7.1 Extent***

The extent of this habitat is assessed as *favourable*. There is limited information about the previous extent of this habitat, although patches of Sea Rush were known from behind the Cull Bank embankment. This habitat also includes the saltmarsh community dominated by Borrer's Saltmarsh-grass and this was also

known from behind the Cull Bank. There is another small patch of MSM along the northern side of the intertidal flats that was not recorded during previous surveys.

Information held in the NHA survey files indicates that Borrer's Saltmarsh-grass has been recorded at several other locations behind the Cull Bank. This survey did not record it at these locations, although this species is quite difficult to identify in the field, so it may be more frequent than the records indicate.

### ***5.7.2 Habitat structure and functions***

The extent of this habitat is assessed as *favourable*. Five monitoring stops were carried out in this habitat and they all passed. Most of this habitat is dominated by Sea Rush and it has a typical habitat diversity. It has developed relatively recently (past 150 years) in a low-lying area formerly containing inter-tidal flats before the creation of the Cull Bank. After the development of this embankment this low-lying area was formerly part of the drainage channel that drained the newly developed polderlands. There are few salt pans or creeks within this habitat although this can be related to the recent development of the habitat. There is some transition to brackish conditions with patches of Sea Club-rush forming eastward of the habitat. A bare mud channel through the centre of the habitat is likely to become vegetated in the future. Further eastwards clumps of Sea Rush are present on saltmarsh north of the channel.

This habitat has additional conservation value due to the presence of a plant community dominated by Borrer's Saltmarsh-grass. This community is similar to lower saltmarsh zone dominated by Common Saltmarsh-grass. However, it is situated in a brackish area behind the embankment and forms a vegetated zone around a bare mud area, which is frequently flooded.

Common Cordgrass is also present in the area behind the embankment. This species' distribution currently is not extensive and does not affect this habitat significantly. However, this species has the potential to spread into the areas dominated by Borrer's Saltmarsh-grass and reduce its extent. There are few other impacts on this habitat, although some of the MSM is grazed and a track with extensive wheel rutting also crosses the habitat.

### ***5.7.3 Future prospects***

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that current management activities and impacts continue in the near future. This area adjacent to the embankment is vulnerable from disturbance to the drainage regime in the area, related to the drainage of the polderlands and recent reclamation of adjacent land. This area has been quite dynamic in the past 150 years and the creation of the Cull Bank has led to the creation of favourable brackish conditions for this habitat to develop. However, it is unlikely that this area has stabilised in terms of its drainage and its level of salinity. Therefore, it is probably still adjusting to the realignment of the drainage channel and recent reclamation of adjacent land (in the past 15 years). If the area is becoming more brackish and is drying out it is possible that Sea Rush will spread at the expense of the Borrer's Saltmarsh-grass community. The area where the MSM is located is outside the Nature Reserve, so management is not controlled by NPWS.

Future modifications to the drainage regime may further affect this habitat and specifically the plant community dominated by Borrer's Saltmarsh-grass. The presence of Common Cordgrass also means that

this habitat may be vulnerable to invasion. The continuation of saline conditions and high water levels may aid the spread of this species.

## **5.8 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (H1410)**

### ***5.8.1 Extent***

The extent of this habitat is assessed as *unfavourable-bad*. This habitat is characterised by the presence of Perennial Glasswort. This species is present in the ASM (and at one location on the *Salicornia* flats) as part of the ASM vegetation. The habitat extent was taken as small areas of saltmarsh where Perennial Glasswort was recorded (although it may be found only occasionally or rarely). Wallace (1995) studied the distribution and ecology of Perennial Glasswort at Ballyteige. This study was not made available but there is some information from this study in the NHA survey files, the Natura Form explanatory notes and the MPSU conservation plan. The Natura Form explanatory notes estimated the area of this habitat at 10 ha. This estimate is likely to be considerably over-estimated, as the total amount of saltmarsh was estimated at 75 ha. The current mapped habitat area is 0.7 ha. Perennial Glasswort was restricted to relatively narrow bands of marsh in shallow pans and areas subject to water-logging. The main area of habitat was affected by horse riding activities but was thought to be in recovery. A map indicating the former distribution of Perennial Glasswort suggests it had a wider distribution than that indicated from the current survey. This information leads to the assessment of extent as *unfavourable-bad*. However, its current extent is probably underestimated and further survey work may increase records of Perennial Glasswort.

### ***5.8.2 Habitat structure and functions***

The habitat structure and functions of this habitat is assessed as *favourable*. Two stops were carried out in this habitat and both passed all attributes (for ASM). This species is found generally in the mid-lower saltmarsh zone with Common Saltmarsh-grass and Lax-flowered Sea Lavender predominant. It is also found with frequent Glasswort at another location. It is also found amongst clumps of Common Cordgrass.

Information in the MPSU conservation plan indicates that the habitat was damaged by horse riding activities in the recent past (past 5 years) but was in recovery since then. The MPSU plan noted that Perennial Glasswort was affected by sand accretion related to disturbance on the upper marsh. There were no signs of poaching or vehicle use activity at any of the locations where this species was found, so the intensity of impacts on this habitat may have been reduced.

### ***5.8.3 Future prospects***

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that current management activities and impacts on this habitat continue in the near future. The intensity of impacts on this habitat is probably low at present. However, Perennial Glasswort is found in association with Common Cordgrass at one location and may be vulnerable to the further spread of this species. Increases in extent of Common Cordgrass on the ASM may reduce the frequency of Perennial Glasswort.

## 6 MANAGEMENT RECOMMENDATIONS

Grazing is the most significant activity on the site. The site is grazed during the winter under agreement with NPWS. The upper saltmarsh is heavily poached in places and this is probably related to cattle using the upper saltmarsh as a track to migrate to and from different sections. The saltmarsh is not actually heavily grazed and the mid and lower saltmarsh zones are generally not damaged at all. The intensity of grazing on the site is probably more significant for the fixed dune habitat so while the upper saltmarsh could benefit from less disturbance from grazing, fixed dune habitats require this level of grazing to maintain a species-rich sward. No change in grazing is required at present as it is an important management tool to maintain the current conservation status of the site.

Common Cordgrass is present at this site and *Spartina* swards are also listed as an Annex I habitat. However, this is an invasive species and is listed as a negative indicator for ASM (1330), *Salicornia* flats (1310) and Mediterranean scrubs (1420). It has the potential to increase somewhat in abundance in the future at the expense of these other habitats. Monitoring of Common Cordgrass is required.

## 7 REFERENCES

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- Rodwell, J.S. (ed.) (2000). *British Plant Communities, Volume 5: Maritime communities and vegetation of open habitats*. Cambridge University Press, Cambridge.
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**Legend**

- SAC boundary
- 1310 Monitoring stops
- 1330 Monitoring stops
- ▲ 1410 Monitoring stops
- ✚ 1420 Monitoring stops

**Habitats**

- 1310 Salicornia flats
- Spartina swards
- 1330 Atlantic salt meadows
- 1410 Mediterranean salt meadows
- 1330/1410 mosaic
- Spartina clump/mudflat mosaic
- Isolated Spartina clumps
- Spartina dom, some 1330
- 1310/Spartina mosaic
- 1330 dom, some Spartina
- 1420 Mediterranean scrubs
- other



**Saltmarsh  
Monitoring Project**

**Ballyteige (East)**

**Ballyteige Burrow cSAC (000696)**

The mapped boundaries are of an indicative and general nature only. Boundaries of the mapped areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government. (Product number 9953)

All final measurements at an interval of 100m and not at each grid point. Features shown in the diagram are for illustrative purposes only. The actual situation on the ground may differ. (Scale: 1:10575)


SMP Code: SMP0005

Map produced by: SMP 2006

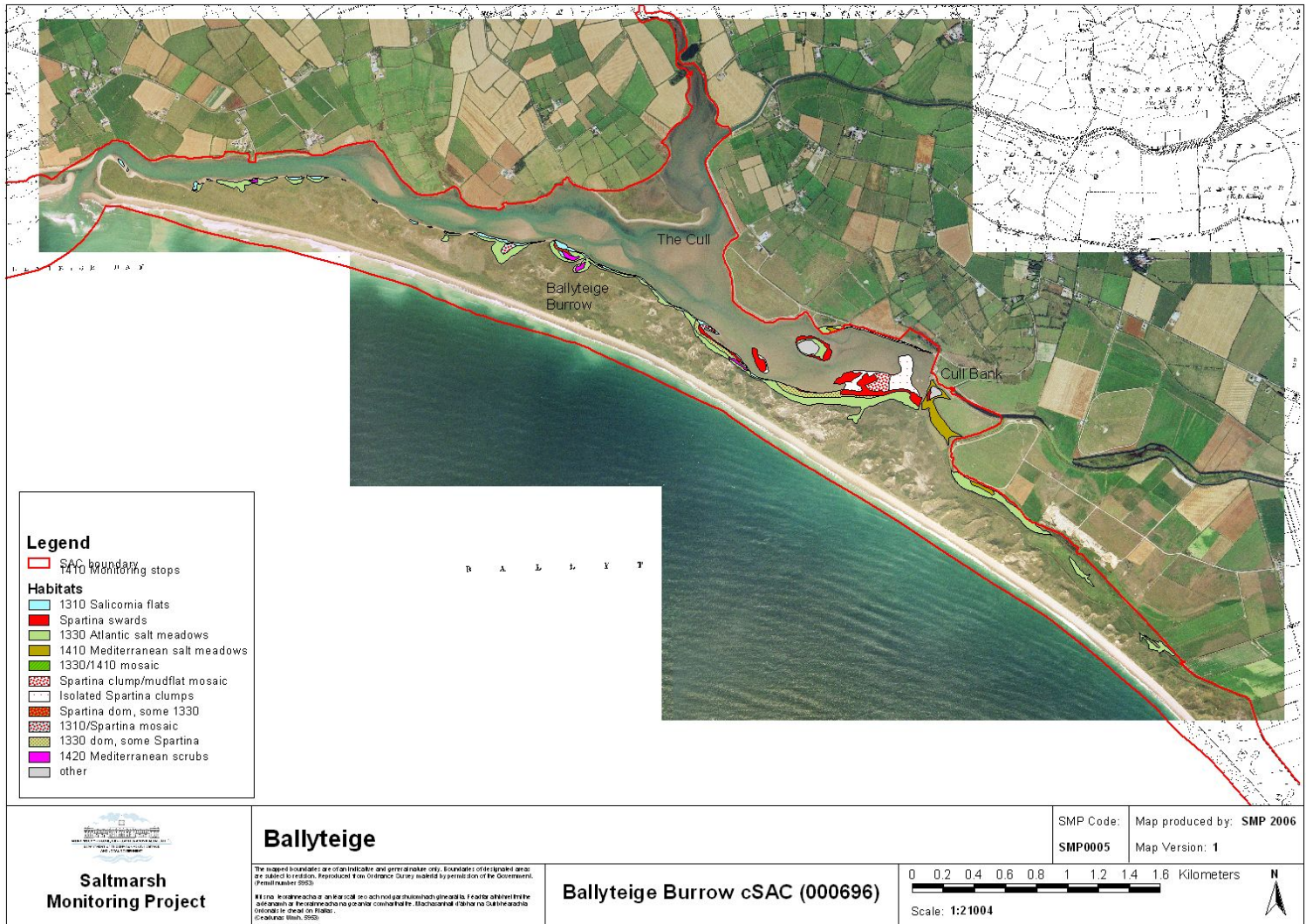
Map Version: 1

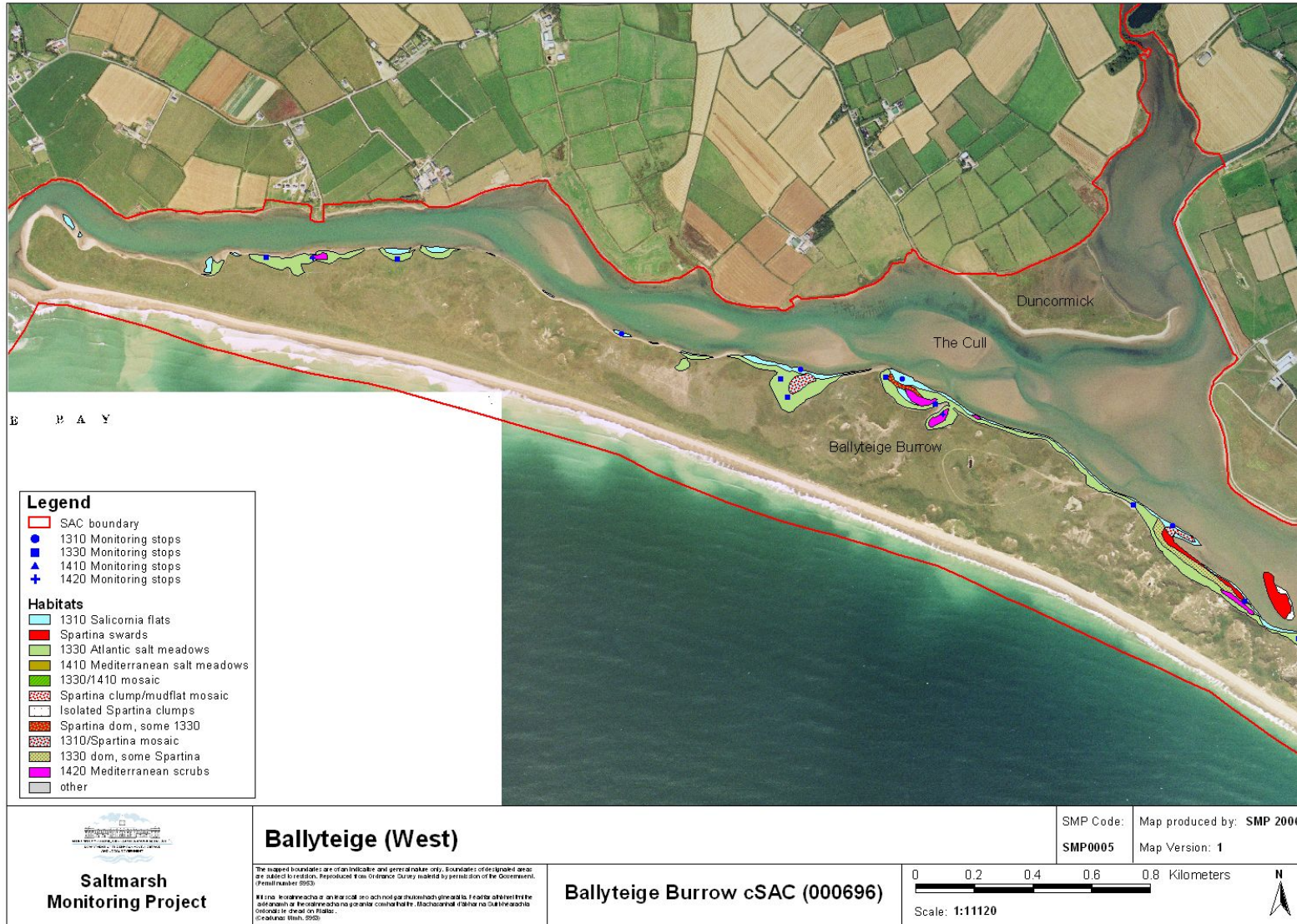
0 0.2 0.4 0.6 0.8 Kilometers

Scale: 1:10575









## Appendix IV – Duncormick site report and habitat map from the SMP (McCorry, 2007)

### 1 SITE DETAILS

SMP site name: <b>Duncormick</b>	SMP site code: <b>SMP0006</b>
Site name (Curtis list): <b>Duncormick</b>	CMP site code: <b>Not surveyed</b>
	Site No: (Curtis list): <b>231</b>
NPWS Site Name: <b>Ballyteige Burrow</b>	Dates of site visit: <b>8+9/06/2006</b>
NPWS designation	cSAC: <b>696</b>
	MPSU Plan: <b>new format plan available</b>
	pNHA: <b>696</b>
	SPA: <b>Ballyteige Burrow SPA 4020</b>
	Nature reserve: <b>Ballyteige Burrow (S.I. no 279 of 1987 and 8 of 1990)</b>
County: <b>Wexford</b>	Discovery Map: <b>77</b> Grid Ref: <b>291793, 107820</b>
1 <sup>st</sup> ed 6 inch Map No: <b>Wx46</b>	Aerial photos (1995 series): <b>not available</b>
2 <sup>nd</sup> ed 6 inch Map No: <b>Wx46</b>	Aerial photos (2000 series): <b>5780-b, 5781-a</b>
	Aerial photos (2000 series): <b>0692606, 0692608, 0690606, 0690608</b>
Annex I habitats currently designated for Ballyteige Burrow	
cSAC:	
<b><i>Salicornia</i> and other annuals colonizing mud and sand (1310)</b>	
<b>Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) (1330)</b>	
<b>Mediterranean salt meadows (<i>Juncetalia maritimi</i>) (1410)</b>	
<b>Mediterranean and thermo-Atlantic halophilous scrubs (<i>Sarcocornetea fruticosi</i>) (1420)</b>	
Other SMP sites within this cSAC/pNHA: <b>Ballyteige</b>	
Saltmarsh type: <b>Sandflats</b>	Substrate type: <b>Mud/sand with iron</b>

### 8 SITE DESCRIPTION

Duncormick saltmarsh is located along the southern Wexford coast, 2 km south of Duncormick village, which is 8 km north-west of Kilmore Quay. The site is part of Ballyteige Burrow Nature Reserve and is owned by NPWS. Duncormick saltmarsh is located along the northern side of the intertidal and subtidal area enclosed

by Ballyteige Burrow. Saltmarsh also lines the landward side of Ballyteige Burrow, which is a separate site (SMP0005). The site can be accessed by a small lane leading to the coast from minor roads to the south-west of Duncormick Village. The site is then accessed by following the seawall east at low tide to the saltmarsh. The site is shaped like a finger extending from the northern shore into a spit. A ridge runs along the seaward side with the main saltmarsh area located behind the ridge. The saltmarsh has developed behind this ridge and behind a second artificial embankment along the eastern side. A small intertidal 'bay' containing mudflats occurs on the eastern side behind the second embankment.

The ridge is comprised of pebbles, shingle and embryonic dune in places and the summit is vegetated by Twitch (*Elytrigia repens*), Marram grass (*Ammophila arenaria*) and other coastal and dune species. Further east the ridge grows wider and fixed dune grassland and some Gorse (*Ulex europaea*) scrub has developed. The western and highest part of the saltmarsh contains some transitional areas with brackish and dry grassland developing. Some saltmarsh extends along the coastline to the north.

The intertidal area is fed by two main watercourses, a stream/artificial channel at the Cull (managed by a sluice) and the Duncormick River. The Cull is a long, narrow sea inlet and estuary of the Duncormick River. The eastern portion of this inter-tidal system was reclaimed in the last century by construction of the Cull Bank and is now polder land. The drains and pumping station of the polder are maintained by the Drainage Dept. of the OPW.

Two Annex I habitats, Atlantic salt meadows (1330) (ASM) and Mediterranean salt meadows (1410) (MSM) are found at this site. Both habitats are listed as qualifying interests for the Ballyteige Burrow cSAC. Clumps of Common Cordgrass (*Spartina anglica*) are present on the site but are scattered over the site and do not form swards. Nearly all the saltmarsh habitat is included within the cSAC boundary. There is a small area of ASM and MSM located along the Duncormick Estuary excluded from the cSAC. This area was excluded because the edge of the shoreline was used to draw the cSAC boundary and not the high water boundary.

## **9 HABITATS**

### **9.3 General description**

The main block of saltmarsh at Duncormick is located behind the stony coastal barrier. The saltmarsh floods and drains from the eastern side through the small 'bay'. The eastern side contains the most lower-marsh vegetation with upper saltmarsh vegetation developing on more elevated ground towards the ridge and the fence-line along the northern boundary. The main area is dominated by ASM. There are several small clumps of Sea Rush (*Juncus maritimus*) scattered over the area that are mapped as MSM. However, these areas were too small to carry out a conservation assessment of this habitat. A mosaic of Sea Rush-Saltmarsh Rush dominated vegetation occurs as a narrow band along the coastline to the north. This was mapped as a mosaic of ASM and MSM (1330/1410). There are several small blocks of saltmarsh further north along the coastline bordering the Duncormick Estuary. A seawall borders the coastline west of Duncormick saltmarsh towards Lackan.

Information held in the NHA survey files indicates that Perennial Glasswort (*Sarcocornia perennis*) (previously known as *Arthrocnemum perenne*) was recorded at this site. This is an indicator species for the

Annex I saltmarsh habitat Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*) (1420). However, this species was not recorded at this site during the survey. No *Salicornia* flats (1310) were recorded at this site.

**Table 3.1.** Area of EU Annex I habitats listed at Duncormick.

EU Code	Habitat	Area (ha)
1330	Atlantic salt meadows ( <i>Glauco-Puccinellietalia maritimae</i> )	5.31 <sup>1</sup>
1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	0.13 <sup>2</sup>
	<b>Total</b>	<b>5.44</b>

<sup>1</sup> this total includes 50% of the 1330/1410 mosaic and 50% of the 1330/other SM mosaic.

<sup>2</sup> this total includes 50% of the 1330/1410 mosaic.

#### 9.4 Atlantic salt meadows (H1330)

The western part of the saltmarsh is dominated by a mosaic of ASM and transition grassland or upper saltmarsh vegetation. This area is mapped as a mosaic. This occurs over an uneven topography with low mounds and shallow hollows. Some vegetated channels are present. Some low mounds are dominated by Twitch and Red Fescue (*Festuca rubra*), with frequent White Clover (*Trifolium repens*), Silverweed (*Potentilla anserina*), Creeping Bentgrass (*Agrostis stolonifera*), Long-leaved Plantain (*Plantago lanceolata*) and contain occasional Perennial Rye-grass (*Lolium perenne*), Creeping Thistle (*Cirsium arvense*) and Birdsfoot (*Lotus corniculatus*). The ASM in this area occurs in the hollows (or old channels) and is dominated by upper saltmarsh species such as Red Fescue and Saltmarsh Rush (*Juncus gerardii*). Some of these hollows in the mosaic area contain mid-marsh vegetation dominated by Sea Pink (*Armeria maritima*) and Sea Plantain (*Plantago maritima*) with frequent Sea Arrow-grass (*Triglochin maritima*), Sea Milkwort (*Glaux maritima*), Saltmarsh Rush and Common Saltmarsh-grass (*Puccinellia maritima*). Other species found in the lower saltmarsh include Greater Sea-spurrey (*Spergularia media*).

More typical saltmarsh develops towards the east with low-lying saltmarsh vegetation developing. This part of the saltmarsh has been drained in the past (visible from the aerial photo) and this has damaged the structure of the saltmarsh. There are few natural pans on the saltmarsh. More typical natural pans occur most frequently close to the seaward boundary. The old drains act as creeks although there are remnants of old creeks in the upper saltmarsh zones. The drains in the central area have infilled with Common Saltmarsh-grass and also contain Glasswort (*Salicornia* spp.) and Annual Sea-blite (*Suaeda maritima*). These drains divide upper or mid-upper saltmarsh dominated by Red Fescue and Saltmarsh Rush. Further east, there are channels 1-2 m apart with mid-saltmarsh vegetation dominated by Sea Pink and Sea Plantain between them. Some of these channels have not re-vegetated and still contain bare mud. Some of the channels have partly vegetated and now have characteristics of pans. Upper saltmarsh vegetation along the ridge is dominated by Red Fescue and Saltmarsh Rush with Sea Milkwort, Sea Plantain and Sea Pink. Other species recorded in the upper saltmarsh include Orache sp. (*Atriplex* sp.), Long-bracted Sedge (*Carex extensa*) and Buck's-horn Plantain (*Plantago coronopus*).

There is a small area of saltmarsh on the eastern side of the site divided from the main section by an embankment. The lower part of this saltmarsh shows some signs of erosion.

There is little cover of lower or pioneer saltmarsh vegetation dominated by Glasswort and Annual Sea-blite. This only occurs in small patches in some of the channels. These species usually occur in conjunction with Common Saltmarsh-grass-dominated areas. No Glasswort occurred on the intertidal mudflats.

This site is notable for the absence of Sea Purslane (*Atriplex portulacoides*).

### **9.5 Common Cordgrass on the saltmarsh**

Common Cordgrass is present at the site. However, it occurs only occasionally and does not form dense sward seen on the other side of the Cull along Ballyteige Burrow. Several clumps occur within the ASM and are confined to pans or are located in creeks or artificial drainage channels. Some clumps are also present on the intertidal mudflats found in the small 'bay' around the edge of the saltmarsh. Some of the clumps have seedlings around them.

### **9.6 Mediterranean salt meadows (H1410)**

There are occasional clumps of Sea Rush scattered over the saltmarsh, forming some small clumps in places. These clumps are associated with other saltmarsh species such as Saltmarsh Rush, Sea Plantain and Red Fescue.

A narrow band of Sea Rush and Saltmarsh Rush dominated vegetation occurs along the shoreline to the north and leads to several small areas of saltmarsh. This is mapped as a mosaic of ASM and MSM. Other saltmarsh species along this band include Sea Pink, Sea Plantain, Common Saltmarsh-grass, Glasswort and Annual Sea-blite. The mosaic of ASM and MSM vegetation located at the north of the site is characterised by scattered clumps of Sea Rush amongst other upper and mid zone saltmarsh species.

## **10 IMPACTS**

There are several impacts on this saltmarsh (Table 4.1) but the most significant impacts probably related to historical reclamation. The saltmarsh has been significantly modified in the past by drainage in the central and eastern portions (810). This drainage is likely to have been related to land reclamation (802). The drains are at least 150 years old as they were marked on the 1<sup>st</sup> ed 6 inch map (1860's). The embankment across the eastern side of the saltmarsh is likely to have been built to enclose the saltmarsh between the ridge and the embankment for land reclamation. The 2<sup>nd</sup> edition 6 inch map shows this embankment enclosing most of the saltmarsh with a small opening at the northern side. The embankment has been breached at some stage after the 6 inch map was drawn and this would have stopped the reclamation. The embankment now extends from both sides of the 'bay' with a small breach in the centre. The presence of the embankment may have actually helped saltmarsh development on its landward side.

The 2<sup>nd</sup> edition 6 inch map shows some drains pre-date the drawing of this map although most of the drainage post-dates the mapping. Larger drains were dug in a grid pattern and many of these are still active. The eastern side also contains regular shallow channels 1-2 m wide and 1-2 m apart giving a striped affect to the saltmarsh. This drainage work may have occurred over an extended period as some of the channels

seem to have recovered to a greater extent compared to others that still contain bare mud. This drainage works has negatively impacted the structure of the saltmarsh. There are fewer salt pans than would be expected and there is less natural creek formation draining the saltmarsh. The drains act as creeks. However, there are signs of some recovery as the channels are infilling and re-vegetating with Common Saltmarsh-grass. These impacts are not assessed as they occurred prior to the current period of assessment.

Some light poaching (140) was noted at several points on the saltmarsh. However, there are no signs of recent grazing so these impacts could be related to escaped cattle onto the site from nearby farmland. The most recent conservation plan for this site (MIPSU plan) makes reference to overgrazing by sheep (143) and supplementary feeding in this area. The site has now recovered from this overgrazing. A small track (501) is located at the western side of the site allowing access to vehicles visiting the site from along the shoreline.

There are some signs of natural erosion (900) along the edge of the saltmarsh in the small bay. A saltmarsh cliff is present. However, analysis of aerial photos and the 6 inch map indicates that the saltmarsh has actually grown somewhat since the map was drawn. Saltmarsh has grown by 5-15 m around the edge of the small bay. The small section of saltmarsh along the spit at the eastern end is likely to be younger as the 6 inch map indicates the spit has changed position since the map was drawn and this area was formerly a pebble/shingle bank similar to the habitat present along the seaward side of the ridge.

Clumps of Common Cordgrass are currently quite rare on the Atlantic saltmarsh although they do occur on the intertidal mudflats along the edge of the saltmarsh in the small 'bay'. Common Cordgrass is not likely to spread significantly on the ASM in the near future (954). However there is potential for further Common Cordgrass spread and the formation of swards on the intertidal flats adjacent to the saltmarsh in the small 'bay'. Seedlings were noted around some of the clumps indicating further spread in the future is likely. Nairn (1986) noted the presence of Common Cordgrass in The Cull and it is likely to be present since at least 1960.

**Table 4.1.** Intensity of various activities on saltmarsh habitats at Duncormick.

<b>EU Habitat Code<sup>1</sup></b>	<b>Activity code<sup>2</sup></b>	<b>Intensity<sup>3</sup></b>	<b>Impact<sup>4</sup></b>	<b>Area affected (ha)</b>	<b>Location of activity<sup>5</sup></b>
13s	140	C	0	5.44	Inside
13s	501	C	-1	< 0.01	Inside
13s	900	C	0	N/A	Inside
13s	954	C	-1	< 0.01	Inside

<sup>1</sup> EU codes as per Interpretation Manual. Code 13s is an additional code used to signify the entire saltmarsh habitat.

<sup>2</sup> Description of activity codes are found in Appendix III summary report.

<sup>3</sup> Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.

<sup>4</sup> Impact is rated as -2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence.

<sup>5</sup> Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

## 11 CONSERVATION STATUS

Overall this site has a favourable conservation status (Table 5.1). There are few impacts or activities on this site at present. The MPSU conservation plan noted that this site was heavily grazed by sheep but the site has now recovered from this disturbance. The site was not grazed during the survey. The site is now owned by NPWS.

The medium-term future prospects of natural landward saltmarsh migration in response to sea level rise are low-moderate. The upper saltmarsh and transition area at the western side of the saltmarsh will allow some migration of saltmarsh habitats.

**Table 5.1.** Conservation status of Annex I saltmarsh habitats at Duncormick.

Habitat	EU Conservation Status Assessment			Overall EU conservation status assessment
	Favourable	Unfavourable - inadequate	Unfavourable - Bad	
Atlantic salt meadows (1330)	Extent, Future prospects, Structure and functions			Favourable
Mediterranean salt meadows (1410)	Extent, Future prospects, Structure and functions			Favourable

### 11.3 Atlantic salt meadows (H1330)

#### 11.3.1 Extent

The extent of this habitat is assessed as *favourable*. There are no signs of erosion of the saltmarsh and the spit that the saltmarsh developed behind has remained stable. This area was marked on the 1<sup>st</sup> edition 6 inch map and has remained fairly stable since then.

#### 11.3.2 Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Four monitoring stops were carried out in this habitat and all four passed. All the attributes reached their targets. This saltmarsh has been disturbed by reclamation works in the past. Drainage has affected the creek and salt pan structure and this is still having a residual impact. However, these impacts are not assessed as they occurred prior to the assessment period. The saltmarsh is recovering from these impacts and the drains are slowly being



revegetated. Some of the drains have partially infilled creating an artificial salt pan structure that is becoming more naturalised.

The vegetation has not been affected by the disturbance and a typical species diversity is present. Several different plant communities are present and the ASM is dominated by mid marsh vegetation. There is also an upper saltmarsh zone at the western side that forms a transition habitat or mosaic with hummocks dominated by Twitch (non-Annex I vegetation). This area has a variable topography. The presence of this transition habitat to terrestrial vegetation enhances the conservation value of the site. There are also transition habitats to fixed dune type vegetation along the back of the spit.

### ***11.3.3 Future prospects***

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current intensity of management and impacts continue in the near future. There are no major impacts on this habitat at this site and its extent and structure and functions are likely to remain stable in the near future. Common Cordgrass is present on the saltmarsh but is generally found in the creeks and old drainage channels where it has colonised bare mud. This species is more likely to further colonise on the mudflats within the embankment. The site is now owned by NPWS.

## **11.4 Mediterranean salt meadows (H1410)**

### ***11.4.1 Extent***

The extent of MSM is assessed as *favourable* in the absence of any accurate information on the previous extent of this habitat. This habitat is present at this site but is not very extensive. Several large clumps are situated on the main section of the marsh but it is more extensive along the western edge of Duncormick Estuary.

### ***11.4.2 Habitat structure and functions***

No monitoring stops were carried out in this habitat due to its limited extent. It forms mosaics along the shoreline of the Duncormick estuary with ASM vegetation that are similar to the vegetation found east of the embankment at Ballyteige. There are no major impacts on this habitat.

### ***11.4.3 Future prospects***

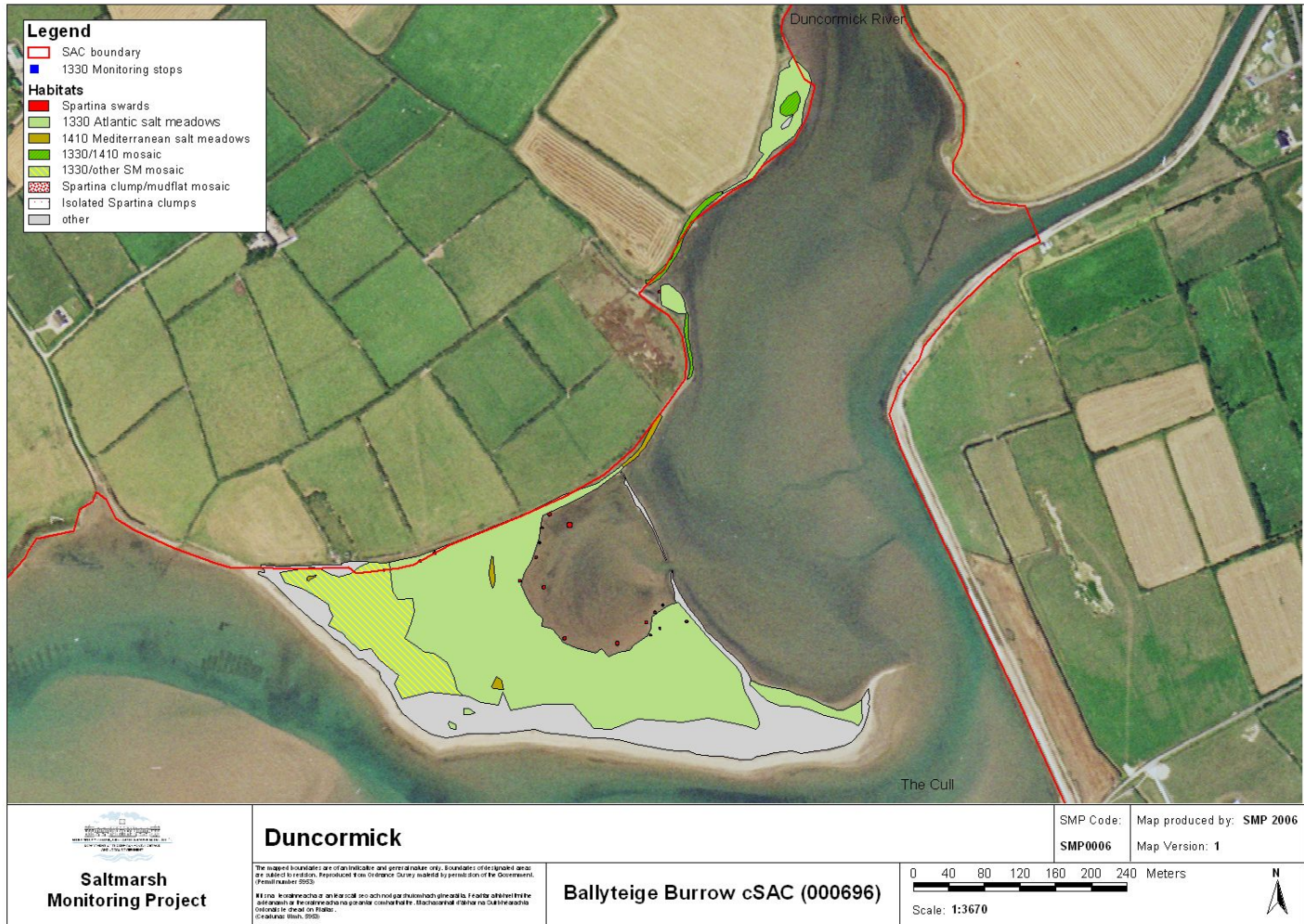
The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current intensity of management and impacts continue in the near future. There are no major impacts on this habitat at this site and its extent and structure and functions are likely to remain stable. The site is now owned by NPWS.

## **12 MANAGEMENT RECOMMENDATIONS**

No management is required for this site.

### **13 REFERENCES**

Nairn, R.G.W. (1986). *Spartina anglica* in Ireland and its potential impact on wildfowl and waders - a review. Irish Birds, 3, 215-258.



## Appendix V – Ballyteige Burrow report and habitat map from the Sand Dunes Monitoring Project (Delaney *et al.*, 2013)

### SITE 041 BALLYTEIGE BURROW

The following individual site report should be read in conjunction with the main report (Delaney *et al.*, 2013). Please note that CMP refers to the Coastal Monitoring Project (Ryle *et al.*, 2009) and SDM refers to the Sand Dunes Monitoring Project (Delaney *et al.*, 2013). Unless otherwise stated, the baseline maps refer to the habitat maps produced during the CMP. These baseline maps were revised, to account for discrepancies in the original survey, before comparisons were made with the habitat maps produced during the SDM (see section 2.3 in SDM main report). These revised maps are referred to as the revised baseline maps in the following text.

#### 1 SITE DESCRIPTION

Ballyteige Burrow is a large site located just west of Kilmore Quay, overlooking Ballyteige Bay in south Wexford. It comprises a sand spit overlying shingle, which is exposed in parts, and extends from Forlorn Point at Kilmore Quay, in a westerly direction for approximately 9 km. The tip of the spit nearly joins the mainland at Coolseskin, and there is a narrow sea inlet and estuary between the spit and mainland. Some of this inter-tidal system was reclaimed in the 19th century and is now polder land (NPWS, 2003). The site forms part of the Ballyteige Burrow SAC (SAC 000696). Six Annex I sand dune habitats (\* indicates a priority habitat) were recorded during the CMP: **1210 Annual vegetation of drift lines**, **1220 Perennial vegetation of stony banks**, **2110 Embryonic shifting dunes**, **2120 Marram dunes (white dunes)**, **\*2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks** (Ryle *et al.*, 2009). **\*2150 Decalcified dune heath** was also recorded, in transition with the **\*2130 Fixed dunes (grey dunes)** habitat, but was not mapped as a separate habitat. Other Annex I habitats associated with the sand dunes at Ballyteige Burrow include **1130 Estuaries**, **1140 Mudflats and sandflats not covered by seawater at low tide**, **1150 Coastal lagoons**, **1310 *Salicornia* and other annuals colonising mud and sand**, **1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritima*)**, **1410 Mediterranean salt meadows (*Juncetalia maritimi*)**, **1420 Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*)** and **\*2150 Decalcified dune heath**. The **\*2150 Decalcified dune heath** recorded during the CMP comprised *Ulex europaeus*, rather than *Ulex gallii* or ericoid species, and therefore was not considered to be **\*2150 Decalcified dune heath** for the SDM.

Two lichen species of interest were recorded during the SDM: *Teloschistes flavicans* (Golden Hair Lichen) and *Fulgensia fulgens* (Scrambled Egg Lichen). The draft Red Data Book of Irish lichens lists *Teloschistes flavicans* as endangered due to a dramatic decline in its distribution. Ballyteige Burrow is the only known site in Ireland for *Fulgensia fulgens* (NPWS, 2003). The Flora Protection Order species, *Asparagus officinalis* subsp. *prostratus* (Wild Asparagus), was also found during the SDM. The site is a popular amenity site, with visitors encouraged, particularly in the eastern section of the site. There are two distinct management units at the site. The western part of the site is state-owned and is grazed by cattle. The eastern part of the site close to Kilmore Quay is ungrazed and is owned and managed by a local group, the Kilmore Quay

Community Development Association. There are various access points for walkers, particularly at Kilmore Quay village.

## 2 CONSERVATION ASSESSMENTS

### 2.1 Overview

The sand dunes at Ballyteige Burrow were surveyed over several days, from the 14th to the 16th May and the 23rd and 24th of May, 2012. Of the six Annex I sand dune habitats recorded on the site during the CMP, five were recorded again during the SDM. The habitats found at Ballyteige Burrow in 2012 and the results of the conservation assessments are presented in Table 1. **1210 Annual vegetation of drift lines**, **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed as Favourable, while **\*2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks** were assessed as Unfavourable-Inadequate. **1220 Perennial vegetation of stony banks**, previously recorded during the CMP, was not found in 2012.

**Table 1.** Conservation assessment results for all Annex I dune habitats surveyed at Ballyteige Burrow, Co. Wexford.

Habitat	Area	Structure & Functions	Future Prospects	Overall result
1210 Annual vegetation of drift lines	Favourable	Favourable	Favourable	Favourable
2110 Embryonic shifting dunes	Favourable	Favourable	Favourable	Favourable
2120 Marram dunes (white dunes)	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)
*2130 Fixed dunes (grey dunes)	Favourable (Stable)	Unfavourable- Inadequate (Stable)	Unfavourable- Inadequate (Deteriorating)	Unfavourable- Inadequate (Deteriorating)
2190 Humid dune slacks	Favourable (Stable)	Favourable (Stable)	Unfavourable- Inadequate (Stable)	Unfavourable- Inadequate (Stable)

#### 2.1.1 Area

The areas of Annex I sand dune habitats at Ballyteige Burrow are presented in Table 2. The baseline area of **\*2130 Fixed dunes (grey dunes)** was revised to take into account **2190 Humid dune slacks** which had not been mapped at Ballyteige Burrow during the CMP. There were also small changes made to the boundary between the saltmarsh north of the site and **\*2130 Fixed dunes (grey dunes)** which resulted in a reduction in the total sand dune area in the revised baseline map. **1220 Perennial vegetation of stony banks** was not found during the SDM. The total area of the site has grown by 1.29 ha since the CMP, and this is related to accretion at the distal end of the spit.

**Table 2.** Areas of Annex I habitats originally mapped at Ballyteige Burrow during the baseline survey (Coastal Monitoring Project), the revised baseline areas and areas mapped during the Sand Dune Monitoring Project in 2012.

Habitat	Baseline survey (ha)	Revised baseline (ha)	Sand Dunes Monitoring Project (ha)
1210 Annual vegetation of drift lines	0.09	0.09	0.66
1220 Perennial vegetation of stony banks	0.51	0.51	0.00
2110 Embryonic shifting dunes	0.09	0.09	0.43
2120 Marram dunes (white dunes)	6.24	6.24	8.11
*2130 Fixed dunes (grey dunes)	238.64	226.39	225.66
2190 Humid dune slacks	6.32	17.93	17.68
Total	251.89	251.25	252.54

### 2.1.2 Structure and Functions

Structure and Functions were assessed for five Annex I sand dune habitats at Ballyteige Burrow. Table 3 shows the results of the Structure and Functions assessment. Four of the five Annex I habitats assessed at Ballyteige Burrow passed the Structure and Functions assessment, resulting in Favourable status. The **\*2130 Fixed dunes (grey dunes)** habitat was assessed as having Unfavourable-Inadequate Structure and Functions as one criterion failed.

**Table 3.** Annex I sand dune habitats at Ballyteige Burrow for which Structure and Functions were assessed, with the number of monitoring stops, assessment criteria and the number of criteria that failed.

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
1210 Annual vegetation of drift lines	4	6	0
2110 Embryonic shifting dunes	4	7	0
2120 Marram dunes (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	17	11	1
2190 Humid dune slacks	8	11	0

### 2.1.3 Future Prospects

Impacts and activities recorded at Ballyteige Burrow are presented in Table 4. Impact codes are assigned according to Ssymanck (2010). **1210 Annual vegetation of drift lines** and **2110 Embryonic shifting dunes** had no impacts recorded during the SDM. Trampling and litter were recorded as negative impacts for **2120 Marram dunes (white dunes)** but as these were small isolated incidents, they were not judged to be significant. Significant negative impacts for **\*2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks** include a lack of grazing for both, scrub encroachment for **\*2130 Fixed dunes (grey dunes)** and drainage for **2190 Humid dune slacks**. Non-intensive cattle grazing, recorded in both of these habitats, was the only positive impact recorded for the site.

**Table 4.** Impacts recorded in Annex I sand dune habitats at Ballyteige Burrow in 2012. Source refers to whether the impact being scored originates inside or outside the Annex I habitat being assessed.

Habitat code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
1210	X	No impacts	-	-	100	-
2110	X	No impacts	-	-	100	-
2120	G05.01	Trampling	Medium	Negative	1	Inside
2120	H05.01	Litter	Low	Negative	1	Inside
*2130	A04.02.01	Non intensive cattle grazing	Medium	Positive	85	Inside
*2130	A04.03	Lack of grazing	High	Negative	15	Inside
*2130	F03.01	Shooting	Low	Positive	50	Inside
*2130	G01.02	Walking	Low	Neutral	5	Inside
*2130	G05.01	Trampling	High	Negative	1	Inside
*2130	H05.01	Litter	Low	Negative	1	Inside
*2130	K02.01	Scrub encroachment	Low	Negative	10	Inside
*2130	K04.05	Rabbit activity	Medium	Neutral	10	Inside
2190	A04.02.01	Non intensive cattle grazing	Medium	Positive	90	Inside
2190	A04.03	Lack of grazing	Medium	Negative	5	Inside
2190	G05	Campfires	High	Negative	1	Inside

2190	J02.01.01	Polderisation	High	Neutral	5	Outside
2190	J02.05.03	Man-made ponds	High	Negative	1	Inside
2190	J02.07.01	Drainage	Medium	Negative	100	Outside
2190	J02.09.01	Saltwater Intrusion	Low	Neutral	1	Outside

## 2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Ballyteige Burrow is discussed below. The present conservation status in 2012 is compared with the baseline status and if a habitat is not in Favourable status, the main reasons for the Unfavourable assessment are given. Areas recorded in 2012 are compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

### 2.2.1 1210 Annual vegetation of drift lines

There are some small patches of **1210 Annual vegetation of drift lines** on the southwest-facing beach at Ballyteige Burrow, but the largest area of the habitat is located at the western, distal tip where accretion was occurring in 2012. This habitat was very limited in extent and was not assessed during the CMP, so no trend was ascribed.

#### Area

The area of **1210 Annual vegetation of drift lines** increased from 0.09 ha during the CMP to 0.66 ha during the SDM. This increase is related to natural processes of deposition. Area was assessed as Favourable.

#### Structure and Functions

All of the criteria passed in the Structure and Functions assessment. Structure and Functions were assessed as Favourable.

#### Future Prospects

No impacts were recorded in this habitat. Future Prospects were assessed as Favourable.

#### Conservation assessment

All three of the parameters were assessed as Favourable. The conservation status of **1210 Annual vegetation of drift lines** was assessed as Favourable during the SDM.

### 2.2.2 1220 Perennial vegetation of stony banks

**1220 Perennial vegetation of stony banks** was not present at Ballyteige Burrow when it was surveyed in 2012; therefore no assessment was carried out. There was no indication that loss of this habitat was anthropogenic in nature.

### 2.2.3 2110 Embryonic shifting dunes

**2110 Embryonic shifting dunes** occurs as narrow bands on the seaward shore at Ballyteige Burrow. This habitat was not assessed during the CMP due to its limited extent, so no trend was ascribed.

### Area

The area of **2110 Embryonic shifting dunes** has increased from 0.09 ha during the CMP to 0.43 ha during the SDM. This is due to natural accretion processes. No anthropogenic loss was observed. Area was assessed as Favourable during the SDM.

### Structure and Functions

All of the criteria passed in the Structure and Functions assessment. Structure and Functions were assessed as Favourable.

### Future Prospects

No impacts were recorded in this habitat and Future Prospects were assessed as Favourable.

### Conservation assessment

All of the parameters were assessed as Favourable. The conservation status of **2110 Embryonic shifting dunes** at Ballyteige Burrow was assessed as Favourable during the SDM.

#### 2.2.4 2120 Marram dunes (*white dunes*)

For much of the site, **2120 Marram dunes (white dunes)** formed a narrow strip at the boundary between the sand dunes and the beach. The habitat was absent from much of the north-western part of the site, where **\*2130 Fixed dunes (grey dunes)** were directly adjacent to the shore.

### Area

The area of **2120 Marram dunes (white dunes)** increased from 6.24 ha during the CMP to 8.11 ha during the SDM. This is the result of succession along the front of the dunes. During the CMP, Area was assessed as Favourable. Area was assessed as Favourable (stable) during the SDM.

### Structure and Functions

All of the criteria passed in the Structure and Functions assessment. During the CMP, Structure and Functions were assessed as Favourable. Structure and Functions were assessed as Favourable (stable) during the SDM.

### Future Prospects

Trampling and litter were recorded from **2120 Marram dunes (white dunes)** at Ballyteige Burrow. These impacts were not considered to have a significant effect on the habitat because they affected a very small area. The current level of trampling is not problematic, but any increase would be considered a negative development. During the CMP, Future Prospects were assessed as Favourable although walking/horse-riding was listed as a negative impact. Future Prospects were assessed as Favourable (stable) during the SDM.

### Conservation assessment

All of the parameters were assessed as Favourable during the CMP and SDM. The conservation status of **2120 Marram dunes (white dunes)** was assessed as Favourable (stable) during the SDM.



### 2.2.5 \*2130 Fixed dunes (grey dunes)

This is the main habitat type at Ballyteige Burrow. The **\*2130 Fixed dunes (grey dunes)** are located on a large spit. The spit almost encloses a large lagoon in the western part of the site and the transitions from **\*2130 Fixed dunes (grey dunes)** to saltmarsh and lagoon are intact. The landward habitats adjacent to the eastern parts of the site have been polderised and are actively drained. The rare lichen *Fulgensia fulgens* was found on the sloping side of a dune within the **\*2130 Fixed dunes (grey dunes)** habitat overlooking a **2190 Humid dune slacks** habitat. *Asparagus officinalis* subsp. *prostratus* is occasional to frequent throughout **\*2130 Fixed dunes (grey dunes)**.

#### Area

The area of **\*2130 Fixed dunes (grey dunes)** at Ballyteige Burrow decreased from 226.39 ha during the CMP to 225.66 ha during the SDM, a loss of 0.73 ha, which is the result of natural processes. There has been a small element of scouring on the seaward side of the spit, and a low-lying part of the dunes on the lagoon side has developed into saltmarsh. During the CMP, area was assessed as Favourable. Area was assessed as Favourable (stable) during the SDM.

#### Structure and Functions

A single criterion failed during the Structure and Functions assessment. At one stop there were too few indicator species because the habitat was rank and undergrazed. The criterion assessing scrub encroachment was allowed to pass on expert judgement as much of the scrub was low-growing *Rosa spinosissima*. Any increase in the cover of *Rubus caesius* would be a cause for concern, however. During the CMP, the habitat was assessed as Unfavourable-Inadequate because of lack of indicator species, poor vegetation health and negative indicator species. Structure and Functions were assessed as Unfavourable-Inadequate (stable) during the SDM.

#### Future Prospects

Negative impacts recorded during the SDM included undergrazing, trampling, litter and scrub encroachment, while cattle grazing was recorded as having a positive influence on the habitat. Walking, shooting and rabbit burrows were neutral impacts. Undergrazing in the eastern part of the site has reduced the species richness there and has resulted in scrub encroachment. Rabbits have a beneficial effect by grazing the site and providing structural diversity, but they also cause damage by burrowing. The current level of rabbit activity is acceptable but shooting is considered a positive activity as it helps to control the rabbit population. During the CMP, Future Prospects were assessed as Favourable. Future Prospects were assessed as Unfavourable-Inadequate (deteriorating) during the SDM.

#### Conservation assessment

Area was assessed as Favourable and Structure and Functions and Future Prospects were assessed as Unfavourable-Inadequate during the SDM. There has been no change in the assessment of any of the parameters since the baseline survey, except for Future Prospects, which was assessed as Favourable during the CMP. The conservation status of **\*2130 Fixed dunes (grey dunes)** at Ballyteige Burrow was assessed as Unfavourable-Inadequate (deteriorating).

### 2.2.6 2190 Humid dune slacks

There are several large **2190 Humid dune slacks** at Ballyteige Burrow. The morphology of the slacks is typical: flat-bottomed, bowl shaped structures surrounded by dune ridges. However, the vegetation and substrate of several of the larger slacks are unusual. The slack floor is composed of sandy shingle and the vegetation is dominated by species typical of dry dune conditions. The vegetation of the shingle-based dune slacks differs from that of the surrounding **\*2130 Fixed dunes (grey dunes)** in that it has a higher content of bryophytes and lichens and is low-growing. In places, the vegetation is sparse, and here, *Cladonia rangiformis* and *Frullania tamariscinum* are prominent. In general, when plant communities which are indicative of dry habitats are found in dune slack-like structures, the habitat is classified as **\*2130 Fixed dunes (grey dunes)**. However, the ranger and local inhabitants have indicated that at least some of these slacks flood in winter, so they were mapped as **2190 Humid dune slacks**. Scrapes used as water holes for cattle indicated that there was water close to the surface of the **2190 Humid dune slacks**. A new record for the site was *Teloschistes flavicans*. This lichen is restricted to the south coast of Ireland (Seaward, 2010). No formal assessment of Area, Structure and Functions and Future Prospects was carried out for this habitat during the CMP. An informal assessment of Favourable was made on the basis of expert judgement.

#### Area

The area of **2190 Humid dune slacks** has decreased from 17.93 ha during the CMP to 17.68 ha during the SDM. There is no evidence to indicate that this change is due to anthropogenic activities. Area was assessed as Favourable.

#### Structure and Functions

All of the criteria passed the Structure and Functions assessment. Although some of the stops were located in areas which had an unusual flora for **2190 Humid dune slacks**, and contained few positive indicator species, they were allowed to pass the assessment on the basis of expert judgement. Ballyteige Burrow is a very unusual site and site-specific assessment criteria would be appropriate here to monitor the **2190 Humid dune slacks**.

#### Future Prospects

Cattle grazing had a positive impact on most of the **2190 Humid dunes slacks** at Ballyteige Burrow. Negative impacts included the presence of artificial ponds, drainage, undergrazing and campfires. The eastern part of the site is not grazed and the slacks there are becoming rank with reduced species diversity. The land adjacent to the site at the eastern end was polderised during the 19th century, and this has altered the transitions at the back of Ballyteige Burrow. The presence of the polders is a neutral impact, but the drains used to maintain the polders are probably having a negative effect on the **2190 Humid dune slacks**. It is very likely that the groundwater within the spit is maintained at a lower level than would otherwise occur. There are some indications of drying out at the edges of wet, eastern dune slacks. Although the effects of lack of grazing and drying out have not yet become clear elsewhere in the Area or Structure and Functions assessments, this does not indicate that they have had no effect on the habitat. The change in area could not be assessed easily as several of the slacks had not been mapped during the baseline survey. Only one of the monitoring stops was recorded from the undergrazed area. In future it may be considered appropriate to assess the dry-based slacks separately from the damp slacks at this site. Future Prospects were assessed as Unfavourable-Inadequate.

### Conservation assessment

Area and Structure and Functions were assessed as Favourable on the basis of the information available and expert judgement. Future Prospects were assessed as Unfavourable-Inadequate. Although the informal assessment of dune slacks at Ballyteige Burrow was Favourable, the impacts which were observed in 2012 were probably in place during the CMP. The conservation status of **2190 Humid dune slacks** was assessed as Unfavourable-Inadequate (stable).

### 3 DISCUSSION

#### 3.1 Management

For the most part, the management of the sites is appropriate, with non-intensive grazing and rabbit grazing maintaining a diverse sward. Recreational pressure is not excessive and there have been no visible attempts to interfere with the sediment dynamics within the boundaries of the site. However, part of the site is undergrazed and is dominated by a species poor sward. Although the current level of scrub is not damaging, continued lack of grazing is likely to result in an increase of the amount of scrub on the site. The continued drainage of the adjacent land for agricultural use may affect the hydrological balance of the dune system, and may be contributing to the very dry nature of part of the **2190 Humid dune slacks** habitat. The exact relationship between drainage of the polders and the hydrology of adjacent dune slacks systems at Ballyteige is not fully understood.

#### 3.2 Rare species

Three rare species were recorded from the dunes at Ballyteige in 2012: *Asparagus officinalis* subsp. *officinalis*, *Fulgensia fulgens* and *Teloschistes flavicans*. The population of *Asparagus officinalis* subsp. *officinalis* is extremely healthy, with individuals too numerous to count during the survey. *Fulgensia fulgens* was previously found in a dry-bottomed dune slack (Gilbert, 1978). During the SDM, it was found on a dry, open patch of **2130 Fixed dunes (grey dunes)**. It was not found during the CMP. The new record for *Teloschistes flavicans* adds to our understanding of the distribution of the species as well as underlining the conservation interest of the sand dunes at Ballyteige. Other rare species known from the sites include *Centaurium pulchellum*, *Lathyrus japonicus*, *Puccinellia fasciculata*, *Hyoscamus niger* and *Usnea articulata*. None of these were found either during the SDM or the CMP.

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