

**Ballymacoda (Clonpriest and Pillmore) SAC (site code 77)
Conservation objectives supporting document
-coastal habitats**

NPWS

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Please note that the opinions expressed in the site reports from the Saltmarsh Monitoring Project 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: Ballymacoda (Clonpriest to Pillmore) SAC 000077. 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.

Ballymacoda (Clonpriest and Pillmore) SAC is located near the eastern boundary of Co. Cork, 5km south-west of Youghal town. Ballymacoda Estuary flows into Youghal Bay and is formed by the Womanagh River, a substantial river that drains a large agricultural catchment. Part of the tidal section of the river is included within the site and the boundary extends to the low tide mark on the seaward side. The inner part of the estuary is well sheltered by a stabilised sandy peninsula (Ring peninsula). Sediment types vary from muds to muddy sands in the inner part to fine rippled sands in the outer exposed part.

The main channel is flanked by saltmarshes and wet fields, much of the latter being improved for agriculture. The saltmarshes are predominantly classified as Atlantic salt meadows (ASM), being dominated by species such as sea purslane (*Atriplex portulacoides*), sea lavender (*Limonium humile*) and sea milkwort (*Glaux maritima*). On the lower levels of the marshes, and extending out on to the open sand and mud flats, annual saltmarsh species such as glasswort (*Salicornia* species) and sea blite (*Sueda maritima*) occur.

A substantial area of land adjacent to the estuary has been reclaimed in the past and there are tall berms along the edges of the shoreline, along the Womanagh River. The estuary forms part of a larger coastal system and sand dunes have developed on either side of the narrow channel connecting the estuary to the outer Youghal Bay. Saltmarsh has developed at several locations around Ballymacoda Estuary including Pilmore, Ringpoint, The Duck, Clonpriest East, and Near Crompaun Bridge. Ballymacoda saltmarsh is the largest saltmarsh site surveyed by the Saltmarsh Monitoring Project (SMP) in County Cork and one of the largest surveyed during the entire project (McCorry, 2007; McCorry & Ryle, 2009). The known distribution of saltmarsh habitats is presented in Appendix I.

The site is notable for the presence of Borrer's saltmarsh-grass (*Puccinellia fasciculata*). This species was recorded in the former farmland reflooded by the tide near Crompaun Bridge. The species is listed in the Flora Protection Order and is also listed in the Red Data Book (Curtis & McGough, 1988). Borrer's saltmarsh-grass is generally found in upper saltmarsh and muddy transitional areas particularly along embankments adjacent to coastal areas. It is also an indicator of a rarer sub-type of Mediterranean salt meadows (MSM) (McCorry & Ryle, 2009). This species has only been found from seven 10 km² squares along the Barrow Estuary, Wexford and Dublin shorelines since 1960 with the most westerly record in the past 20 years being the Barrow Estuary (Wexford) (Preston *et al.*, 2002). This site was previously unknown as a location for this species. It has been found further south-west at Commoge tidal Lagoon in Kinsale and has been re-recorded at this site in 2006 (O' Mahony, 2007).

Ballymacoda (Clonpriest and Pillmore) is a coastal site that is designated for a range of habitats including estuaries, mudflats and saltmarsh. The following two coastal habitats are included in the qualifying interests for the site (* denotes a priority habitat):

- *Salicornia* and other annuals colonising mud and sand (1310)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (ASM) (1330)

These two saltmarsh habitats occur in association with other coastal habitats. The SMP also recorded an area of 1.655ha of Mediterranean salt meadows (MSM) within this SAC. Sand dune habitats were also recorded within the SAC, on either side of the narrow channel at Ring Point and beach habitats along Youghal Bay during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). These included Annual vegetation of driftlines, Perennial vegetation of stony banks, Embryonic shifting dunes, Shifting dunes along the shoreline with *Ammophilla arenaria*, Fixed coastal dunes with herbaceous vegetation and Humid dune slacks. However, no sand dune habitat is listed as a qualifying interest for this SAC.

This backing document sets out the conservation objectives for the two coastal habitats listed above in Ballymacoda (Clonpriest and Pillmore) SAC, which are 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 **saltmarsh habitats** are based primarily on the results of the Saltmarsh Monitoring Project (SMP) (McCorry & Ryle, 2009) and this document should be read in conjunction with that report.

The SMP surveyed, mapped and assessed one sub-site within Ballymacoda (Clonpriest and Pillmore) SAC (McCorry & Ryle, 2009):

1. Ballymacoda

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 II). The conservation objectives for the saltmarsh habitats in Ballymacoda (Clonpriest and Pillmore) are based primarily on the findings of the Saltmarsh Monitoring Project. While there may be additional small areas of saltmarsh habitat present, it is thought that the area of saltmarsh mapped at Ballymacoda by the SMP represents the total area of saltmarsh within the SAC (31.54ha).

2 Conservation Objectives

The conservation objectives aim to define the favourable conservation condition of a habitat or species at a particular site. Implementation of these objectives will help to ensure that the habitat or species achieves favourable conservation status at a national level.

3 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)

The first two habitats (indicated in bold) are listed as Qualifying Interests for Ballymacoda (Pillmore and Clonpriest) SAC. The last habitat is restricted in its distribution to sites in the southeast of the country.

The distribution of saltmarsh habitats within the SAC is presented in Appendix I. Detailed descriptions of each habitat in the sub-site recorded during the Saltmarsh Monitoring Project (SMP) by McCorry & Ryle (2009) in Ballymacoda (Clonpriest and Pillmore) can be found in Appendix II.

The SMP surveyed, mapped and assessed one sub-site within Ballymacoda (Pillmore and Clonpriest) SAC (McCorry & Ryle, 2009):

- 1 Ballymacoda (Appendix II)

Ballymacoda is listed as a 'lagoon' type site in the Saltmarsh Inventory compiled by Curtis & Sheehy-Skeffington (1998). However, it is more typical of a sandflats type site, as most of the saltmarsh within the survey site does not show significant estuarine influences. A 'lagoon' type saltmarsh develops where saltmarshes are present along the edges of lagoons or areas that have developed behind shingle bars that have a restricted tidal influence (Curtis & Sheehy-Skeffington, 1998). Brackish vegetation is more typical of these saltmarsh types (McCorry & Ryle, 2009).

The main saltmarsh habitat is Atlantic salt meadows with smaller amounts of Salicornia flats and Mediterranean salt meadows present. A significant amount of *Spartina* swards has also developed, mainly on former intertidal mudflats.

Saltmarsh has developed at several locations around Ballymacoda Estuary including Pilmore, Ringpoint, The Duck, Clonpriest East, and Near Crompaun Brudge.

At Pilmore the saltmarsh has developed behind a smaller sand spit at the north-east corner of the estuary. Originally there was a band of saltmarsh dominated by ASM along the back of this sand spit on a moderate sloped shoreline (McCorry & Ryle, 2009).

At Ringpoint the saltmarsh is a sandflat type saltmarsh and has developed along the back of the larger sand dune system at Ring. The eastern boundary is adjacent to the sand dunes while the southern boundary is adjacent to farmland (McCorry & Ryle, 2009).

The Duck refers to the narrow inlet located in the northern part of the estuary. The saltmarsh is much more dispersed along the estuary shoreline and is mainly found on the western shoreline north of a small hill (McCorry & Ryle, 2009).

The saltmarsh at Clonpriest East includes saltmarsh that has developed along the western shoreline of the estuary and a large 'island' dominated by saltmarsh. Saltmarsh has also developed on the main shoreline along Clonpriest East (McCorry & Ryle, 2009).

The newly forming saltmarsh near Crompaun Bridge is mainly found behind the berm on the eastern side of the main channel. The area was formerly reclaimed for agriculture and contained improved grassland, however, the berm was breached during the storms around 2000 (McCorry & Ryle, 2009).

3.1 Overall Objectives

The overall objective for '*Salicornia* and other annuals colonising mud and sand' in Ballymacoda (Clonpriest and Pilmore) SAC is to '*restore the favourable conservation condition*'.

The overall objective for 'Atlantic salt meadows' in Ballymacoda (Clonpriest and Pilmore) SAC is to '*restore the favourable conservation condition*'.

This objective is based on an assessment of the current 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.

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 is no decrease in extent from the baseline which was established by McCorry and Ryle (2009). 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 Ballymacoda (Clonpriest and Pillmore) during the SMP. These maps are included with the individual site report 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 Ballymacoda (Clonpriest and Pillmore) 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 always include 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.

Sub-site	Total area (ha) of <i>Salicornia</i> mudflats (excluding mosaics) from SMP	Total area (ha) of <i>Salicornia</i> mudflats within SAC boundary (including mosaics)
Ballymacoda	1.565	1.57
Total	1.565	1.57

Sub-site	Total area (ha) of ASM (excluding mosaics) from SMP	Total area (ha) of ASM within SAC boundary (including mosaics)
Ballymacoda	27.058	28.325
Total	27.058	28.325

As there have been reported anthropogenic losses, the target for both *Salicornia* mudflats and ASM habitat is that their areas should be stable or increasing, subject to natural processes, including erosion and succession.

3.3 Range

3.3.1 Habitat distribution

Saltmarsh is currently known to display a wide distribution throughout the site, with concentrations at Pilmore, Ringpoint, The Duck and Clonpriest East. Saltmarsh has also developed at other locations around the estuary with the largest area found on a small island at the south-west corner of the estuary. This saltmarsh was not surveyed by the SMP.

Salicornia flats are found at several locations around the estuary. There are no large patches of this habitat, but when added together they represent a considerable extent of this habitat (in a national context). The largest areas are found at Pilmore and along the western shoreline at Clonpriest East and The Duck (McCorry & Ryle, 2009).

ASM is the dominant saltmarsh habitat at this site and its extent is notable in a regional context. Due to its relatively large extent and the fact that saltmarsh has developed on different substrates and in different situations this habitat is quite diverse and a range of different communities are present (McCorry & Ryle, 2009). There are also some mosaic communities with Mediterranean salt meadows.

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.

3.4 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 Ballymacoda (Clonpriest and Pilmore) in terms of its structure and functions depends on a range of attributes for which targets have been set as outlined below.

3.4.1 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.

Much of the estuary shoreline has been significantly modified in the past by the construction of sea walls and this has affected the saltmarsh within the estuary. Significant areas of saltmarsh located behind the seawalls have been reclaimed in the past 150 years. Some of the smaller rivers flowing in to the estuary were tidal for some distance upstream, but this tidal influence has been reduced by the creation of sluices. Some of the existing saltmarsh has been reclaimed in the past but has reverted back to saltmarsh (Ring Point). This saltmarsh has been significantly modified by drainage. The berms on the east side of the estuary are well maintained and have been modified in the past 10 years. There has been some dumping of material on the westside of the Duck along the edge of the saltmarsh for the purposes of coastal protection (or possibly waste disposal). The material is loose and does not form an actual structure. A storm in 2000 breached the berms on both sides of the river channel near Crompaun Bridge. The western berm was repaired by the OPW due to possible risks to flooding to Ballymacoda Village and the flooded land has been improved and reclaimed since then. Attempts to repair the berm on the east side of the river by the land owner were made but have failed and there are now several breaches. This has led to the development of saltmarsh and mudflats behind the berm (McCorry & Ryle, 2009).

At Pilmore, the northern estuary shoreline has been significantly modified by the construction of a seawall (McCorry & Ryle, 2009).

At Ringpoint an old incomplete wall/embankment is located along the seaward boundary of the saltmarsh (McCorry & Ryle, 2009).

At The Duck, the eastern and northern shorelines are significantly modified by the construction of a seawall and the land behind the sea wall is lowlying (McCorry & Ryle, 2009).

At Near Crompaun Bridge, the newly formed saltmarsh is found behind the berm on the eastern side of the main channel. The area was formerly reclaimed for agriculture and contained improved grassland, however the berm was breached during the storms of 2000 (McCorry & Ryle, 2009).

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

3.4.2 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.

The ASM saltmarsh topography is well-developed in several parts of the Ballymacoda sub-site, particularly Clonpriest East (McCorry & Ryle, 2009). At Ringpoint there is frequent evidence of old land use and reclamation attempts with several deep wide drains through the saltmarsh. These drains have modified the natural creek morphology but some creeks are still present. Some of the small drains have partially infilled (McCorry & Ryle 2009). The saltmarsh at Pilmore has a poorly developed topography.

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

3.4.3 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).

3.4.4 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 Ballymacoda (Clonpriest and Pilmore), where it occurs in a mosaic with other saltmarsh habitats, including '*Salicornia* and other annuals colonising mud and sand' and 'Mediterranean salt meadows'. 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 inter-tidal and sand dune habitats.

At Pilmore, the saltmarsh displays an excellent example of saltmarsh zonation and is dominated by a low-mid marsh Sea Purslane (*Atriplex portulacoides*) sward. There is an unmodified transition between the sand dune habitat and the upper saltmarsh boundary.

At Ringpoint, the saltmarsh has developed along the back of the larger sand dune system at Ring Point. The eastern boundary is adjacent to the sand dunes (McCorry & Ryle, 2009).

The saltmarsh at The Duck is mainly a mosaic of *Spartina* sward and ASM. Some MSM has developed along the landward side of the more established ASM in part of this saltmarsh (McCorry & Ryle, 2009).

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

3.4.5 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.

Most of the saltmarsh at this site is in good condition and only minor areas have been affected by overgrazing (McCorry & Ryle, 2009).

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.

3.4.6 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.

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

3.4.7 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 Ballymacoda (Clonpriest and Pilmore) 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>

The site is notable for the presence of Borrer's saltmarsh grass (*Puccinellia fasciculata*), which is considered a species of local distinctiveness. This species was recorded in the former farmland recently re-flooded by the tide near Crompaun Bridge. This species is listed on the Flora Protection Order and is also listed in the Red Data book (Curtis & McGough, 1988). The species is only found from seven 10km² squares along the Barrow Estuary, Wexford and Dublin shorelines since 1960. This site was previously unknown as a location for this species (McCorry & Ryle, 2009).

3.4.8 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 Ballymadosa (Clonpriest and Pillmore) SAC by the SMP (McCorry & Ryle, 2009).

The species forms extensive swards (about 15ha) in the estuary including some mosaic areas with ASM. Most of these swards have colonised on formerly unvegetated mudflats. The spread of *Spartina* will be at the expense of intertidal mudflats (McCorry & Ryle, 2009).

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%.

4 References

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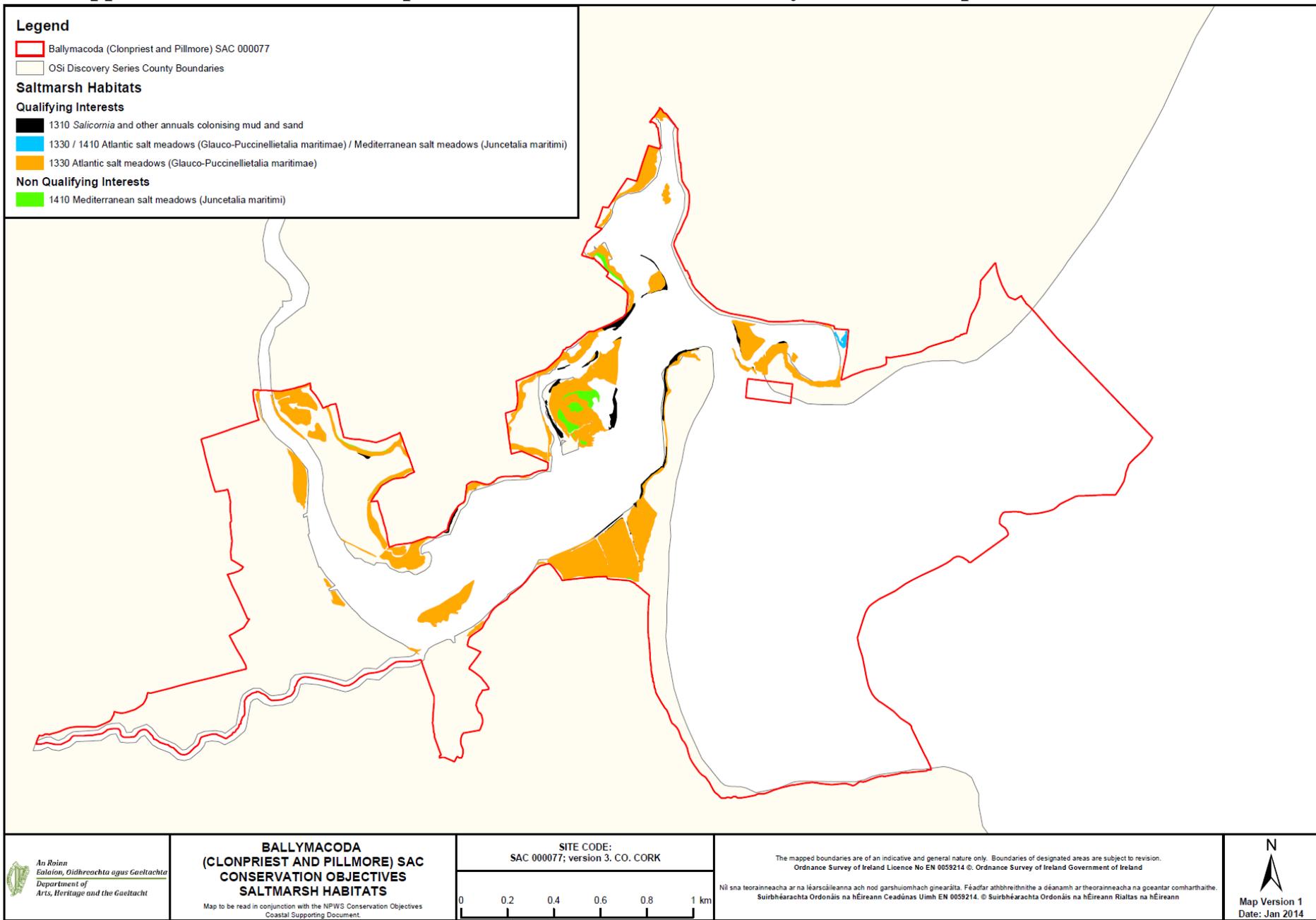
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Appendix I – Distribution map of saltmarsh habitats within Ballymacoda (Clonpriest and Pillmore) SAC.



Appendix II – Ballymacoda site report and habitat map from the SMP (McCorry & Ryle, 2009)

1 SITE DETAILS

SMP site name: Ballymacoda	SMP site code: SMP0055
Dates of site visit 27&28/09/2007	CMP site code: 54
SM inventory site name: Ballymacoda	SM inventory site code: 200
NPWS Site Name: Ballymacoda (Clonpriest & Pillmore)	
NPWS designation cSAC: 77	MPSU Plan: N/A
pNHA: 78	SPA: 4023
County: Cork	Discovery Map: Grid Ref: 206500, 073000
Aerial photos (2000 series): O 6392-A,B,C,D; O 6393-C; O 6347-C,D	6 inch Map No: O 6254-C; (O 6253-D)
Annex I habitats currently listed as qualifying interests for Ballymacoda c	
H1310 <i>Salicornia</i> and other annuals colonizing mud and sand	
H1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)	
H1410 Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	
Other SMP sites within this SAC/NHA: N/A	
Saltmarsh type: Estuary	Substrate type: Mud

2 SITE DESCRIPTION

Ballymacoda Estuary is located near the eastern border of Co. Cork 5 km, south-west of Youghal Town. The estuary flows into Youghal Bay. The Womanagh River flows into this estuary, which widens out and contains a significant area of intertidal flats, saltmarsh and other habitats before the channel narrows again and flows into the sea. The estuary is sheltered from the outer bay by two sand dune spits. The landscape around this area is low-lying and dominated by farmland. Several other smaller rivers and streams flow into the estuary. A substantial area of the land adjacent to the estuary has been reclaimed in the past and there are tall berms along the edges of the estuary shoreline. These berms extend along the Womanagh River. The estuary forms part of a larger coastal system and sand dunes have developed on either side of the narrow channel connecting the estuary to the outer Youghal Bay. There is scattered habitation around this area and Ballymacoda Village is located to the south of the estuary.

Saltmarsh has developed in several areas in this estuary and were surveyed as a series of sub-sites. Saltmarsh has developed on the landward side of the sand dunes on the eastern side of the estuary. There is also several saltmarsh 'islands' within the estuary that contain estuarine channels on both sides at Clonpriest East. Saltmarsh is also present along the western side of the estuary and extends northwards into 'The Duck'. Newly forming saltmarsh is developing in former agricultural farmland in the north-west corner of the site near Crompaun Bridge.

This is the largest site surveyed in Co. Cork and one of the largest sites surveyed during the Saltmarsh Monitoring Project. The survey site includes the whole of the estuary south of the Crompaun Bridge. The tidal influence extends further north along the Womanagh River for a about 4 km. However, this area was not surveyed due to time constraints. The aerial photo series indicate that there may be some Annex I habitat along the river channel, but most of the habitat is likely to be brackish and dominated by non-Annex I habitat types (such as Common Reed and Sea Club-rush). Several of the smaller saltmarsh 'islands' within

the estuary were not surveyed due to access problems (a significant length of soft tidal mudflat had to be crossed to access these areas).

This site is located within Ballymacoda (Clonpriest & Pillmore) cSAC. This small cSAC includes the intertidal parts of the estuary, coastal habitats, adjacent grasslands and part of the outer bay. The intertidal flats of the estuary and the adjacent grasslands are also used by notable numbers of wintering waterfowl. Three Annex I saltmarsh habitats are present at Ballymacoda, *Salicornia* flats, Atlantic salt meadows and Mediterranean salt meadows. All three saltmarsh habitats are listed as qualifying interests for this cSAC. There is also a significant area of *Spartina* swards on the intertidal flats at this site, although this habitat is not considered as an Annex I habitat any more. Ballymacoda has also been surveyed by the Coastal Monitoring Project. This survey mapped the sand dune habitats on either side of the narrow channel at Ring Point and beach habitats along Youghal Bay.

Most of the saltmarsh habitat mapped at this site is located within the cSAC boundary. Small amounts of habitat are excluded. This is mainly because the upper shoreline boundary on the OSI 6 inch map was used as the cSAC boundary and saltmarsh habitat extends beyond this boundary at several locations. A berm has been breached at one of these locations and saltmarsh has developed behind the berm in previously reclaimed land excluded from the cSAC. Some saltmarsh is also present in an exclusion for a football pitch from the digital cSAC boundary located at the north-east corner at Pilmore.

This site is listed as a 'lagoon' type site in the SM inventory (Curtis and Sheehy-Skeffington 1998). However it is more typical of a sandflats type site as most of the saltmarsh within the survey site does not show significant estuarine influences. A 'lagoon' type saltmarsh develops where saltmarshes have developed along edges of lagoons or areas that have developed behind sand/shingle bars that have a restricted tidal influence (Curtis and Sheehy-Skeffington (1998). Brackish vegetation is more typical of these saltmarsh types.

The site is notable for the presence of Borrer's Saltmarsh-grass (*Puccinellia fasciculata*). This species was recorded in the former farmland recently re-flooded by the tide near Crompaun Bridge. This species is listed on the Flora Protection Order and is also listed in the Red Data Book. This species is found in more brackish conditions than found in typically in ASM. Borrer's Saltmarsh-grass is generally found in upper saltmarsh and muddy transitional areas particularly along embankments adjacent to coastal areas. It is also an indicator of a rarer sub-type of MSM. This species is only found from seven 10 km² squares along the Barrow Estuary, Wexford and Dublin shorelines since 1960 with the most westerly record in the past 20 years being the Barrow Estuary (Wexford) (Preston *et al.* 2002). This site was previously unknown as a location for this species. It has been found further south-west at Commoge tidal Lagoon in Kinsale and has been re-recorded at this site in 2006 (O' Mahony 2007).

3 SALTMARSH HABITATS

General description

Saltmarsh has developed at several locations around the Ballymacoda Estuary. These are described as a series of sub-sites. The main saltmarsh habitat is Atlantic salt meadows (Table 3.1) with much smaller amounts of *Salicornia* flats and Mediterranean salt meadows being present. A significant amount of *Spartina* swards has also developed, mainly on former intertidal mudflats.

Pilmore

This saltmarsh has developed behind a smaller sand spit at the north-east corner of the estuary. Originally, there was a band of saltmarsh dominated by ASM along the back of this sand spit on a moderate sloped shoreline. This saltmarsh has a poorly developed topography. The sand dune spit and saltmarsh has grown

in length compared to the extent marked on the 2nd edition six inch map. This saltmarsh is an excellent example of saltmarsh zonation and is dominated by a low-mid marsh Sea Purslane sward. There is a natural unmodified transition between the sand dune habitat and the upper saltmarsh boundary. This transition zone contains Sea Purslane, Red Fescue, Lax-flowered Sea Lavender, Common Scurvy-grass and Sand Couch (*Elytrigia atherica*). There has been significant expansion of saltmarsh habitat at this location due to a combination of accretion, natural habitat transition and the colonisation of Common Cordgrass.

The northern estuary shoreline has been significantly modified by the construction of a seawall. A large part of the intertidal flats enclosed between the sand spit and the estuary seawalls has been infilled with *Spartina* swards. This has created a mosaic of dense *Spartina* sward, *Spartina* sward/ASM mosaic and ASM where there has been some natural succession. A deep tide intertidal creek winds its way through this saltmarsh. There is some development of *Salicornia* flats along the edge of the more established saltmarsh.

A small brackish area is located on the east side of this sub-site on the landward side of the seawall, adjacent to the sluice. This small area contains some Sea Rush and was classified as a mosaic of ASM and MSM.

Ringpoint

This saltmarsh is a sandflat type saltmarsh and has developed along the back of the larger sand dune system at Ring Point. The eastern boundary is adjacent to the sand dunes while the southern boundary is adjacent to farmland. There is some transitional vegetation along the upper saltmarsh boundary with a band of Twitch and Sea Club-rush is also present in places. It has developed on thick mud. This saltmarsh is quite uniform and is made up of ASM. There is very little Common Cordgrass on this saltmarsh and it is confined to some of the large salt pans. The main vegetation communities are lower marsh Sea Purslane stands and a typical mid marsh *Armeria-Plantago* sward. The development of the saltmarsh salt pan topography is excellent with frequent large shallow pans present. Sea Purslane dominates along the edges of the large drains and the salt pans in this saltmarsh.

There is frequent evidence of old land use and reclamation attempts with several deep wide drains through the saltmarsh. These drains have modified the natural creek morphology, but some creeks are still present. Some of the small drains have partially infilled. This saltmarsh looks like it was reclaimed on the 1st edition OSI 6 inch map. An old incomplete sea wall/embankment is located along the seaward boundary of this saltmarsh. There are small patches of *Salicornia* flats associated with the intertidal banks adjacent to the seawall. The saltmarsh narrows into a very narrow strip of habitat that extends along the sand dunes to the tip of Ringfort. There is natural unmodified zonation along this narrow strip of habitat between *Salicornia* flats, the ASM and the adjacent fixed dune habitat.

The Duck

The Duck is known as the northern part of the estuary and is a narrower inlet. This saltmarsh is much more dispersed along the estuary shoreline and is mainly found on the western shoreline north of a small hill. The eastern and northern shorelines are significantly modified by the construction of a seawall and land behind the seawall is low-lying. The saltmarsh is mainly a mosaic of *Spartina* swards and ASM. Some MSM has developed along the landward side of the more established ASM in part of this saltmarsh and the shoreline north of the hill has not been modified by the creation of a seawall. There are several ASM saltmarsh 'islands' in the intertidal area that are isolated from the main saltmarsh. Much of the intertidal flats in The Duck contains scattered clumps of Common Cordgrass at various densities. Common Cordgrass seems to be spreading on the mudflats at this location.

Clonpriest East

This saltmarsh includes saltmarsh that has developed along the western shoreline of the estuary and a large 'island' dominated by saltmarsh.

The island contains a significant area of established saltmarsh and is dominated by ASM with a smaller amount of MSM. There is a narrow deep intertidal channel between the mainland and the island with *Spartina* swards on both sides. There is a small terrestrial grassy ridge dominated by Twitch and Sea Couch also present on this island. A small patch of Bramble is also present on higher ground. This established area has a well-developed saltmarsh topography with salt pans and creeks. This established area is marked as an island on both the 1st and 2nd edition OSI 6 inch maps and there is a significant contrast between the established saltmarsh and the more recently formed saltmarsh on the aerial photos. This area contains complex internal zonation of vegetation related to the various different heights of the creeks, pans and low mounds. *Spartina* swards are developing on the eastern side of this island, which is accreting. This younger area also contains extensive pioneer ASM and *Salicornia* flat saltmarsh communities.

Saltmarsh has also developed on the main shoreline along Clonpriest East. This saltmarsh generally contains a band of *Spartina* sward along the seaward edge of ASM. Saltmarsh has developed behind an old berm in a formerly reclaimed area and a large area of *Spartina* swards and smaller amounts of *Spartina* sward/ASM mosaic has developed that is surrounded by a narrower band of ASM. The berm is covered with Twitch-dominated vegetation. Further north a small hill is present and this is one of few parts of the estuary shoreline that has not been modified by the development of seawalls. There is some development of brackish vegetation on the landward side of the ASM at this location, dominated by Sea Club-rush. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project. Twitch (*Elytrigia repens*)-dominated grassland was also classified as other saltmarsh (CM2). There is a significant area of *Salicornia* flats developed along the shoreline further north along the edge of the hill.

Near Crompaun Bridge

This newly forming saltmarsh is mainly found behind the berm on the eastern side of the main channel. This area was formerly reclaimed for agriculture and contained improved grassland. However the berm was breached during storms around 2000. Attempts at repairing the berms failed and there are now several breaches that allow an extensive low-lying area to be inundated by the tide. A comparison of the aerial photo series in 2000 and 2005 shows the continued development of mudflats and saltmarsh behind the berm during this period. Some field boundaries and hedgerows have also been inundated and there are standing dead scrub areas still present along some of these old boundaries. There is no evidence of any former saltmarsh topography within this area.

Much of this area now contains bare intertidal mudflats. A band of saltmarsh about 10-20 m wide is developing around the outer extent of the tidal inundation. This saltmarsh is quite immature and the sward is quite open. It is mainly dominated by ASM, but there are small patches of pioneer saltmarsh dominated by *Salicornia* flats. Common Cordgrass is present but is generally found at low cover values. This saltmarsh is notable for the presence of Borrer's Saltmarsh-grass, which is widely distributed along the band of saltmarsh. A larger area of saltmarsh has developed at the northern end and this is dominated by a mosaic of ASM and newly colonising *Spartina* sward.

A small more established saltmarsh is present on the estuary side of the berm at the southern end of this area. This saltmarsh is dominated by ASM and is surrounded by a band of *Spartina* swards. A band of Twitch-dominated vegetation marks the transition along the upper saltmarsh boundary adjacent to the berm.

Other locations

Saltmarsh has also developed at other locations around the estuary with the largest area found on a small island at the south-west corner of the estuary. This saltmarsh was not surveyed. Small patches of ASM and *Spartina* sward are present on both sides of the main estuary channel along the berms towards Crompaun Bridge.

Table 3.1. Area of saltmarsh habitats mapped at Ballymacoda.

EU Code	Habitat	Area (ha)
1310	<i>Salicornia</i> and other annuals colonizing mud and sand (1310)	1.565
1330	Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	27.058
1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)	1.704
non-Annex	<i>Spartina</i> swards	15.570
	Total*	45.897

* note that saltmarsh habitat may continue outside the mapped area.

3.1 *Salicornia* and other annuals colonizing mud and sand (H1310)

This habitat is found at several locations around the estuary. There are no large patches of this habitat but added together they make a notable extent (1.5 ha) of this habitat (in a national context). Accretion within the estuary promotes the current extent of this habitat. The largest areas are found at Pilmore and along the western shoreline at Clonpriest East and The Duck. *Salicornia* flats at Pilmore are dominated by Glasswort spp. (*Salicornia europaea* agg. and *Salicornia decumbans* agg.), and also contain Annual Sea-blite. It develops on intertidal mud along the steep edges of the main creek and on the seaward side of ASM and *Spartina* sward. There are scattered small clumps and seedlings of Common Cordgrass within this habitat. *Salicornia* flats have developed on a similar habitat along the east side of the island at Clonpriest East. There are frequent clumps of common Cordgrass found in this habitat.

Salicornia flats have developed on sand along the estuary shoreline south of The Duck. This area is likely to be quite dynamic due to the narrow channel between the mainland and the large island at Clonpriest East.

This habitat is vulnerable to the further spread of Common Cordgrass in the estuary, particularly in The Duck and along the east side of the island at Clonpreist East. Both these locations are immature and Common Cordgrass is still spreading. *Salicornia* flats is likely to still persist in Pilmore as this sward is more established and the *Salicornia* flats is confirmed to the main creek, which will not be vegetated by Common Cordgrass due to water movements and its topographical position. This habitat is also likely to persist on the sandy substrate south of the Duck, as this substrate is less suitable for Common Cordgrass.

Atlantic salt meadows (H1330)

ASM is the dominant saltmarsh habitat found at this site and its extent is notable in a regional context (25 ha). Due to its relatively large extent and the fact that saltmarsh has developed on different substrates and in different situations this habitat is quite diverse and a range different communities are present.

Pioneer ASM is frequently found at this site. Some typical pioneer ASM with some Common Cordgrass is present in the damaged area within the small saltmarsh at the west side of the estuary. Common Saltmarsh-grass, Glasswort, Sea Aster, Sea Pink and Sea Purslane are all colonising an area that is still dominated by bare mud cover.

Pioneer vegetation is also found behind the berm in the saltmarsh near Crompaun Bridge. The vegetation at the southern end is the best developed and starting to display some typical zonation. An upper zone dominated by Red Fescue is present, while there is a central zone dominated by Saltmarsh Rush and a lower pioneer zone dominated by Sea Plantain and Common Saltmarsh-grass. The upper boundary of this saltmarsh is not marked definitely as a change in vegetation and there are clumps of Hard Rush within the upper zone in places. This probably indicates the immaturity of this vegetation type.

The ASM developing in a narrow band towards the northern end near Crompaun Bridge is still quite open with frequent bare mud cover. Mud is being colonised by a mixture of Common Saltmarsh-grass, Sea Club-rush, Greater Sea-spurrey, Lax-flowered Sea Lavender, Sea Plantain, Spear-leaved Orache and Saltmarsh Rush. There is no significant zonation yet. Glasswort forms some small patches along the lower boundary

in places. Green algae are occasionally quite extensive in cover. Common Cordgrass is quite rare within this zone. Some of this saltmarsh has been poached by cattle but most is not grazed extensively.

The most typical ASM community found at this site is a lower-mid marsh community dominated by Sea Purslane. This is seen at Pilmore where a band of this vegetation extends along the upper boundary of the adjacent *Spartina* sward and along the sand spit. Zonation is well-developed at this sub-site and there is a gradual increase in the extent of Common Cordgrass on a moderate gradient towards the *Spartina* swards. This Sea Purslane community contains more frequent Common Saltmarsh-grass, Sea Aster and Glasswort at its lower boundary.

The saltmarsh at Ringport is dominated by mid marsh communities. This saltmarsh is quite flat and there is a mosaic of *Armeria-Plantago* sward and a low-mid community dominated by Common Saltmarsh-grass and Sea Aster created by subtle differences in surface topography. These communities also contain Lax-flowered Sea Lavender. Sea Purslane is also frequently found around the salt pans and the wide drains within this saltmarsh. There is some development of a zone dominated by Saltmarsh Rush towards the back of the marsh and there is a tiny area dominated by upper marsh Red Fescue at the south-west corner of the sub-site. A very narrow band dominated by Creeping Bent and containing Common Scurvy-grass, Sea Milkwort and Autumn Hawkbit marks the upper boundary of the ASM.

Mediterranean salt meadows (H1410)

The largest extent of this habitat is found on the island at Clonpreist East. This saltmarsh is well-established and has a well developed saltmarsh topography. There is some saltmarsh dominated by dense Sea Rush. This is a typical grassy upper MSM community and is located along the terrestrial grassy ridge and represents one of the upper saltmarsh communities in the overall saltmarsh zonation. Neither of these areas was grazed and a tall sward height is present. Other species present include frequent Red Fescue and smaller amounts of Creeping Bent, Saltmarsh Rush, Common Scurvy-grass, Sea Milkwort, Sea Plantain and Sea Arrowgrass. Curled Dock is also present on some mounds.

A similar community is also found in the established saltmarsh along the west side of The Duck. This community also contains Parsley Water-dropwort and Distant Sedge. Sea Rush occasionally extends its distribution into a transitional zone landward of the MSM that is dominated by Twitch.

There is also some mosaic type vegetation present with less frequent cover of Sea Rush inter-mixed with a mid marsh *Armeria-Plantago* sward. The Sea Rush clumps are present on small grassy tussocks with Red Fescue and Sea Milkwort. Other species present in this vegetation community include Sea Aster, Lax-flowered Sea Lavender, Saltmarsh Rush and Sea Purslane. This community has a well-developed salt pan topography. Common Cordgrass is rarely found within this community within some of the pans.

A rarer sub-type of MSM with Borrer's Saltmarsh-grass as an indicator species is present at this site (0.203 ha). This species is found in the newly developing saltmarsh behind the berm near Crompaun Bridge. The Borrer's Saltmarsh-grass is found in a fairly open sward on bare mud in association with Sea Pink, Greater Sea Spurrey, Glasswort, Lax-flowered Sea Lavender, Sea Aster, Creeping Bent, Saltmarsh Rush and Common Saltmarsh-grass. Without the presence of Borrer's Saltmarsh-grass, this vegetation type is a typical ASM sward. Common Cordgrass is present but is found rarely in this zone. Borrer's Saltmarsh-grass is generally found in a narrow zone (2-4 m wide) along this new saltmarsh (overall 10-15 m wide) towards the upper limit but not exclusively at this limit. This vegetation community is still developing and can be considered to be pioneer vegetation. Borrer's Saltmarsh-grass is found occasionally within this zone. A zone dominated by Red Fescue and Twitch and also containing Silverweed and Spear-leaved Orache is developed along the upper limit of this vegetation type. Borrer's Saltmarsh-grass is found rarely within this zone. The development of wet grassland dominated by Hard Rush marks the upper saltmarsh limit.

A small area towards the west side and close to a newly dug channel draining adjacent farmland is dominated by Borrer's Saltmarsh-grass. While Borrer's Saltmarsh-grass is found only rarely or occasionally

overall within this area, this is the most extensive population of this species recorded during the SMP in terms of the frequency of the plant. Common Saltmarsh-grass is out-competing the Borrer's Saltmarsh-grass in places due to its vegetative growth. It could be considered that if this sward is allowed to mature, then the status of Borrer's Saltmarsh-grass may be threatened. Heavy grazing would be beneficial to this species by maintaining an open sward (this area was not grazed in 2008).

***Spartina* swards**

Common Cordgrass forms extensive swards at this site. It has mainly formed swards on the intertidal mud. These swards are in various stages of development and the swards at Pilmore are the most established. A substantial area of this sward is a dense monoculture of Common Cordgrass. However, there are also some mosaic type areas and this is an indication of succession of this sward to ASM occurring with the appearance of frequent Common Saltmarsh-grass, Sea Purslane, Annual Sea-blite and Glasswort into this sward. The cover of Common Cordgrass varies from being quite sparse in places to becoming dominant. This natural saltmarsh succession may be developing in association with accretion within the estuary. Sea Purslane also extends along the creek edges within the *Spartina* sward at Pilmore. There are small patches of Glasswort (*Salicornia* flats) in places along the seaward boundary of the *Spartina* sward in various places around the estuary.

Some of these swards are much younger and are still spreading. *Spartina* swards around the island at Clonpriest East are quite open and the clumps are still coalescing. There is also happening to some extent at The Duck. This area also contains scattered clumps of Common Cordgrass at low densities (< 1% cover) that probably will eventually coalesce to form swards.

There are frequent examples of transitional vegetation between ASM and *Spartina* sward at this site. Some of this vegetation is found at Pilmore on a well-zoned saltmarsh along the landward boundary of the *Spartina* sward. This transitional zone contains frequent Common Cordgrass, but also contains frequent common Saltmarsh-grass and Sea Purslane. Other species present include Sea Aster, Greater Sea-Spurrey, Glasswort and Annual Sea-blite. Other transitional vegetation is found north of the island at Clonpreist East. However, this is a pioneer saltmarsh community and is characterised by an open sward of patches of Common Cordgrass, Glasswort, Common Saltmarsh-grass and Sea Purslane.

Natural unmodified transitions are also found between *Spartina* sward and *Salicornia* flats. Usually the *Salicornia* flats appear as a band alongside the edge of the dense *Spartina* sward. A small area located at Pilmore was mapped as a mosaic of *Spartina* clumps and *Salicornia* flats and this area contains frequent clumps within an area of mud dominated by Glasswort.

4 IMPACTS AND ACTIVITIES

This large site is affected by a range of impacts and activities (Table 4.1). Most of the saltmarsh is not grazed by livestock. However, there are multiple landowners around the site and small area of ASM is grazed along the north-west side of The Duck (140). Some sections are overgrazed and badly poached (143). Saltmarsh located behind the berm at Clonpriest East was grazed. Some of the saltmarsh developing behind the berm near Crompaun Bridge was cut for silage (102). This saltmarsh is developing adjacent to improved grassland. There are indications that this saltmarsh near Crompaun Bridge was grazed in the past (wire fences preventing accessing to the soft mudflats area) but there has been no grazing this year. A small area of saltmarsh south of this area has been recently damaged by the extraction of earth or mud (302) possibly for the repair of the adjacent berms. This area is now recolonising and contains pioneer saltmarsh but frequent wheel ruts are still present.

Table 4.1. Intensity of various activities on saltmarsh habitats at Ballymacoda.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
1310	910	C	+ 1	1.565	Inside
1310	954	B	-1	1.00	Inside
1330	102	C	-1	0.01	Inside
1330	140	C	0	2.5	Inside
1330	143	C	-1	1.3	Inside
1330	302	B	-1	0.15	Inside
1330	871	C	0	0.005	Inside
1330	900	C	0	0.1	Inside
1330	910	C	+1	0.5	Inside
1330	954	B	-1	4.0	Inside
1330	990	A	+1	2.4	Inside
1410	140	C	0	0.2	Inside

¹ EU codes as per Interpretation Manual.

² Description of activity codes are found in Appendix III, Summary Report 2007-2008.

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

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

⁵ 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.

Common Cordgrass

Common Cordgrass is present at this site and is an invasive species of saltmarsh and mudflats (954). It is not known when this species colonised or was planted in Ballymacoda Estuary but it has been planted since the 1960s (Nairn 1986). Notes from NPWS site files state that it has established since the late 1970's. This species has now formed extensive swards (about 15 ha) in the estuary including some mosaic areas with ASM. Most of these swards have colonised on formerly unvegetated mudflats. These mosaic areas may indicate some succession from *Spartina* swards to ASM due to natural saltmarsh succession (990), especially as these saltmarshes have developed on former intertidal mudflats and there is evidence of accretion. There probably has been some colonisation by Common Cordgrass of the lower ASM at various places around the site, including Pilmore and the small saltmarsh at the western side of the estuary (south of Crompaun Bridge).

There is evidence that *Spartina* swards will continue to grow in extent in the estuary in the future. Scattered clumps of Common Cordgrass are frequently found on the mudflats within The Duck and these are increasing in extent from a comparison of the 2000 and 2005 aerial photo series. The spread of *Spartina* sward will be at the expense of intertidal mudflats.

There is no evidence that Common Cordgrass has spread significantly during the current monitoring period at the expense of ASM. There is a substantial amount of *Spartina* sward/ASM mosaic habitat present (3.7 ha) and some of this habitat developed as a result of succession from *Spartina* swards. Some pioneer saltmarsh vegetation has developed with a combination of Common Cordgrass and ASM species within the current monitoring period (saltmarsh near Crompaun Bridge). This saltmarsh can be considered to be negatively impacted by an invasive species within the current monitoring period. This is the main reason for an assessment of the presence of Common Cordgrass as having a negative impact on the ASM. It is also present within the *Salicornia* flats where seedlings are present.

Coastal protection and reclamation

Much of the estuary shoreline has been significantly modified in the past by the construction of sea walls and this has affected the saltmarsh within the estuary. Significant areas of saltmarsh located behind the sea walls have been reclaimed in the past 150 years. Some of the smaller rivers flowing into the estuary were tidal for some distance upstream, but this tidal influence has been reduced by the creation of sluices. Some of the existing saltmarsh has been reclaimed in the past but has reverted back to saltmarsh (Ring Point). This saltmarsh has been significantly modified by drainage. The berms on the east side of the estuary are well-maintained and have been modified in the past 10 years (870). There has been some dumping of material on the west side of The Duck along the edge of the saltmarsh for the purposes of coastal protection (or possibly waste disposal). This material is loose and does not form an actual structure (871). There are sluices allowing flow from drains and small streams into the estuary from adjacent land.

A storm around 2000 breached the berms on both sides of the river channel near Crompaun Bridge. The western berm was repaired by the OPW due to possible risks to flooding to Ballymacoda Village and the flooded land has been improved and reclaimed in the past 10 years. Attempts were made to repair the berm on the east side of the river by the land owner, but these have failed and there are now large several breaches. This has led to the development of saltmarsh and mudflats behind the berm.

Accretion and Erosion

An examination of the various maps available for this site shows that there have been significant changes to the estuary shoreline within the past 150 years. The 1st edition OSI six inch map shows that the estuary channel was much wider at this stage and the sand dune spits at Pilmore and Ring Point were much shorter. Both of these spits had grown when the 2nd edition six inch map was drawn and the estuary channel was narrower. Currently the estuary channel is much narrower and both sand dune spits have grown in length in the intervening period. This has influenced the development of saltmarsh around the estuary, particularly at Pilmore. This saltmarsh has grown significantly in size during this period (910) and extended along the back of the new part of the sand spit.

Saltmarsh along the shoreline at Clonpriest East and saltmarsh along the west side of The Duck has grown in size during this period. These changes may be due to natural shifts in sediment deposition within the estuary. The construction of seawalls along large parts of the estuary shoreline and the Womanagh River channel to protect and reclaim adjacent land may have also contributed to changes in the shoreline profile of the estuary within the past 150 years. The presence of these seawalls may mean that sediment loads that would have been deposited along the lower floodplain of the Womanagh River are now deposited within the estuary and this is contributing to accretion and saltmarsh growth (910). Over half the saltmarsh currently found in Ballymacoda Estuary (including *Spartina* swards) has developed in the past 90 years. Accretion is assessed as having a positive impact on the *Salicornia* flats and a portion of the ASM.

The sand dune system at Ring Point has also shifted in position further west in the past 90 years. This is likely to be related to coastal erosion. The shift in position of this sand dune system has reduced the area of the saltmarsh along the back of the sand dunes somewhat, as the seaward boundary of the saltmarsh has not changed during this period and the sand dunes have encroached over the saltmarsh. This is an example of natural habitat transition (990). Some of the sediment eroded from this shoreline may be contributing to the growth of the sand dune spits on both sides of the estuary channel.

There have also been some losses of saltmarsh at various locations during the last 90 years due to erosion (900). These losses have mainly occurred within The Duck where several saltmarsh islands have disappeared. There has been a small amount of erosion along the seaward boundary of the saltmarsh at Ring Point and saltmarsh along the western side of the estuary that could be attributed to natural erosion from the adjacent river channel. However, losses due to erosion are quite minor compared to the growth of saltmarsh within the past 90 years. The impact of erosion is assessed as neutral.

There is no evidence of any significant growth of saltmarsh in the intertidal parts of the estuary during the current monitoring period. However, there were frequent signs of accretion along the eastern boundary of the island during the field survey. *Spartina* swards and pioneer ASM are developing in this area and there is also a significant area of *Salicornia* flats. There are also signs of continued development of *Spartina* sward and isolated *Spartina* clumps in The Duck area on the intertidal flats. However, the evidence presented above suggests there was continued growth of saltmarsh at this site during the current monitoring period and this is likely to continue in the future.

There has been some growth of saltmarsh (990) behind the berm near Crompaun Bridge. This saltmarsh has developed during the current monitoring period with about 2.4 ha ASM and 1.3 ha of *Spartina* sward/ASM mosaic already developed.

Impacts and activities adjacent to the site include agriculture (102, 120, 140), scattered habitation (403) and roads (502). Related impacts such as runoff from the road may have some impact on the saltmarsh but these impacts are low or not detected.

5 CONSERVATION STATUS

Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the 1995, 2000 and 2005, OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site. There are no specific notes in the NHA survey for the saltmarsh at this site. This means it is difficult to assess the impact of the extent of Common Cordgrass cover during the assessment and to assess if this species has spread significantly during the current monitoring period.

Ballymacoda saltmarshes have several features of notable conservation interest. The most important feature is the presence of Borrer's Saltmarsh-grass with the largest population recorded during the SMP survey at a previously unknown location for this species. This species is found in newly forming saltmarsh in an area formerly reclaimed and protected from the tide by an embankment. The presence of a notable area of newly forming saltmarsh is also a significant feature. Saltmarsh in other parts of the estuary has also grown significantly in extent during the past 100 years and there are indications of continued expansion and growth of saltmarsh related to accretion in the future.

Several of the sub-sites display excellent examples of saltmarsh zonation and contain many typical saltmarsh features and saltmarsh plant communities. The relative abundance of Sea Purslane reflects lack of intensive grazing on this site. There is a substantial area of *Spartina* sward in the estuary and the area of this sward is likely to increase in the future at the expense of intertidal mudflats. There are also indications of succession of ASM from *Spartina* sward that developed in previously unvegetated mudflats.

The overall conservation status of this site is *unfavourable-inadequate* (Table 5.1). Most of the saltmarsh is in good condition. However, minor areas have been affected by damaging activities including overgrazing. Common Cordgrass is present at the site and this poses a threat to the *Salicornia* flats in the future. This invasive species is also likely to colonise accreting and newly forming pioneer ASM.

Nearly the entire saltmarsh habitat is located within Ballymacoda (Clonpriest & Pillmore) cSAC. There is no management plan available for this site.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Ballymacoda.

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
Atlantic salt meadows (1330)	Extent	Structure and functions, Future prospects		Unfavourable - Inadequate
Mediterranean salt meadows (1410)	Extent Structure and functions,	Future prospects		Unfavourable - Inadequate

5.1 *Salicornia* and other annuals colonizing mud and sand (H1310)

Extent

The extent of this habitat is assessed as *favourable*. There is a notable area of this habitat present at this estuary. There are no indications of any loss of habitat due to land-use changes, erosion or the spread of Common Cordgrass within the current monitoring period. However, there is no accurate baseline data in indicate if *Salicornia* flats were more extensive in the past. This habitat is found adjacent to *Spartina* swards and it is likely that it may have occupied sections of accreting areas within the estuary prior to the development of extensive *Spartina* swards. However, the development of these swards is not assessed as they mainly developed prior to the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Thirteen stops were carried out in this habitat and they all passed. All the attributes required for the favourable conservation of the habitat reached their targets. This habitat is dominated by Glasswort spp. There is some Annual Sea-blite present. The main impact affecting this habitat is the presence of Common Cordgrass, an invasive species. This species was found in 10 out of 13 stops, generally at very low cover (< 1%) but sometimes higher (10-20%). Small clumps and seedlings are present at various locations around the site. The presence of seedlings indicates that Common Cordgrass is spreading within this habitat so the conservation assessment is revised as *unfavourable-inadequate*. There are few other impacts affecting this habitat at this site. This habitat is developing on accreting muddy banks. Accretion within the estuary is likely to be beneficial to this habitat.

Future prospects

The future prospects of the habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts continue in the near future. Common Cordgrass is present at in this habitat at low densities and this habitat is also located adjacent to *Spartina* sward. This species is likely to continue to spread in the future at the expense of *Salicornia* flats habitat, especially in the areas where there are frequent seedlings present. It should also be noted that *Salicornia* flats habitat is a pioneer saltmarsh habitat so some succession to other saltmarsh habitats could be expected. Continued accretion is required to maintain the current extent of this habitat so changes in sedimentation patterns could

affect the status of this habitat. There are few other impacts or activities that can negatively affect this habitat.

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes, erosion or the spread of Common Cordgrass within the current monitoring period. Common Cordgrass is a prominent part of the lower marsh ASM vegetation, especially at Clonpreist East, Pilmore and The Duck and some mosaic *Spartina* sward/ASM areas have developed. Some of these are likely to have developed where Common Cordgrass has invaded lower marsh ASM. Other mosaic areas have developed where there is succession to ASM from the original *Spartina* sward that developed on intertidal mud. Common Saltmarsh-grass, Sea Purslane and other species are spreading into this habitat at various locations, especially at Pilmore.

There is significant evidence of the growth of saltmarsh including ASM (possibly doubling in extent) in the past 100 years. This is a positive indicator. Some of the ASM is relatively young and immature. There has also been measurable growth of the saltmarsh within the current monitoring period in the saltmarsh found behind the berm near Crompaun Bridge.

Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Thirty-four monitoring stops were carried out in this habitat and all the stops passed bar one stop. All the attributes required for the favourable conservation of the habitat generally reached their targets. Most of the saltmarsh is in good condition and is not grazed. However, several small areas were damaged by over-grazing.

The ASM at this site has a typical species assemblage. There are several ASM communities present including typical communities of mud and sandy substrates. There are excellent examples of ASM zonation at this site as well as natural transitions to other saltmarsh habitats. Some of the ASM is relatively young and immature and there is also a significant area of pioneer ASM at several locations around the estuary, especially at Clonpreist East Island and in the new saltmarsh behind the berm. The saltmarsh topography is well-developed in several of the sub-sites. The sward height is quite variable and is related to the variation in ASM plant communities.

Common Cordgrass is present in this habitat (a negative indicator for species composition), and is a prominent part of the lower marsh communities in places. There are several areas where Common Cordgrass has formed a mosaic with the ASM. However, there is no evidence of any significant expansion of Common Cordgrass within the ASM within the current monitoring period so the impact of its spread is assessed as neutral.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts continue in the near future. Most of the habitat is in good condition although there are some minor areas being damaged by grazing or other activities. There are few significant damaging activities affecting the ASM around the estuary. Most of the habitat is located within the cSAC boundary so the habitat should not be affected by any land-use changes that have to be licensed by local or national authorities. There are prospects for further growth of ASM in the area behind the embankment near Crompaun Bridge. The land-owner has stated his intentions to repair the embankment and reclaim this land in the future.

Common Cordgrass is present at this site and is found on the ASM. There may be some potential for the spread of this species into this habitat in the future, especially in the ASM/*Spartina* sward mosaic areas.

This is likely to happen in the immature saltmarsh at Clonpriest East Island and behind the berm near Crompaun Bridge, where there is a significant area of pioneer ASM. However, not all the ASM is vulnerable to the spread of this species. There is likely to be some continued succession of ASM from *Spartina* sward, although at a slow rate. There is also significant evidence of accretion and growth of saltmarsh in the estuary, which is also likely to promote the expansion of the ASM.

Mediterranean salt meadows (H1410)

Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to land-use changes, erosion or the spread of Common Cordgrass within the current monitoring period. The more typical form of MSM dominated by Sea Rush has not been affected by accretion or the spread of Common Cordgrass within the estuary.

The development of the saltmarsh behind the embankment near Crompaun Bridge has led to the development of the rarer sub-type of MSM with Borrer's Saltmarsh-grass as an indicator species. This saltmarsh has developed within the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Eight stops were carried out in this habitat and they all passed. All the attributes required for the favourable conservation of the habitat reached their targets. This habitat (typical form dominated by Sea Rush) is in good condition. It contains a typical species assemblage. The habitat is not grazed and there is variable sward height. There is some zonation within this habitat and there are also natural unmodified transitions to other habitats. The saltmarsh on the island at Clonpreist East is not affected by any impacts or activities. Common Cordgrass is present in this habitat but is quite rare and is confined to creeks and salt pans on the island.

This site is notable for the development of the rarer sub-type of MSM with Borrer's Saltmarsh-grass as an indicator species. This site contains the largest population of this species recorded during the SMP and it is located at a site that is previously unknown for this species. The Borrer's Saltmarsh-grass is present in a narrow band of saltmarsh developing along the upper extent of tidal inundation in the area behind the embankment.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts continue in the near future. There are no impacts or activities significantly affecting the typical form of this habitat. The typical form of habitat is not vulnerable to the spread of Common Cordgrass. This habitat is less likely to increase in extent due to the overall growth of the saltmarsh in the estuary but this may occur in the longer-term.

The rarer sub-type of MSM with Borrer's Saltmarsh-grass as an indicator species is thriving at present with the largest population recorded during the SMP found at this site. One of the main reasons is that this saltmarsh is relatively immature and at a pioneer stage. This species prefers disturbed conditions and an open sward, so it is likely to be reduced in frequency as the saltmarsh naturally matures and the sward becomes denser. Borrer's Saltmarsh-grass will not compete with other saltmarsh species such as Common Saltmarsh-grass. This site was not grazed intensively during 2008. Heavy grazing levels would promote the conservation status of this species by introducing disturbance and creating the micro-habitats with bare mud that this habitat prefers. The long-term absence of grazing would have a negative impact on the status of this species by promoting the development of denser closed sward.

This species and habitat is also threatened if the embankments are repaired and the land behind the embankments is reclaimed again in the future.

6 MANAGEMENT RECOMMENDATIONS

NPWS should put a management programme in place to protect the new saltmarsh with Borrer's Saltmarsh-grass that is developing behind the old berm in the north-west part of the site. NPWS could also look at purchasing this site and leasing it back to farmers for grazing. Grazing levels should be moderate-heavy to help maintain an open and disturbed sward, which is preferred by Borrer's Saltmarsh Grass. The current owner plans to eventually fix the breaches in the berms and this would destroy this site by excluding the tidal influence.

7 REFERENCES

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8 APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			1310	1330	1410	1420	Spartina swards
1	1310 <i>Salicornia</i> flats	1.553	1.553				
2	Spartina swards	13.567					13.567
3	1330 Atlantic salt meadow	25.134		25.134			
4	1410 Mediterranean salt meadow	1.631			1.641		
5	ASM/MSM mosaic (50/50)	0.146		0.073	0.073		
6	ASM/ <i>Spartina</i> mosaic	3.702			1.851		1.851
7	1330/other SM (CM2) mosaic						
8	1330/coastal grsld mosaic						
9	Other (non saltmarsh)	42.929					
10	<i>Spartina</i> clump/mudflat mosaic (50/50)						
11	Isolated <i>Spartina</i> clumps on mud (5%)	2.814					0.141
12	pioneer 1330/1310/ <i>Spartina</i> mosaic						
13	1410/other SM (CM2) mosaic						
14	<i>Spartina</i> sward dominated, with some ASM						
15	1310/ <i>Spartina</i> mosaic	0.023	0.012				0.012
16	ASM dominated with some <i>Spartina</i>						
17	1330/sand dune mosaic						
18	Other SM (CM2)						
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic	0.473					
	Total	91.972	1.565	27.058	1.704		15.57

