Lower River Shannon SAC (site code 2165)
Conservation objectives supporting document -coastal habitats

NPWS

Version 1

May 2012

Table of Contents

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 (2012). Conservation Objectives: Lower River Shannon SAC 002165. 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.

The Lower River Shannon is a large site that stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of 120km. The site encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The geology of the site varies considerably. The Shannon and the Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of rhyolites, tuffs and agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smerlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Brenagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The Shannon and the Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon Estuary (considered a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries', e,g. Deal River, Mulkear River and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulsherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Casheen River Estuary.

Lower River Shannon SAC (site code: 2165) is designated for a range of coastal habitats including vegetated shingle, saltmarsh and sea cliff. The following five coastal habitats are included in the list of qualifying interests for the site:

- Perennial vegetation of stony banks (1220)
- *Salicornia* and other annuals colonising mud and sand (1310)
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330)
- Mediterranean salt meadows (*Juncetaliea maritimi*) (1410)
- Vegetated sea cliffs of the Atlantic and Baltic Coasts (1230)

The first habitat represents vegetated shingle, the next three are saltmarsh habitats and the last is sea cliffs. The first four of these habitats are usually found in close association with each other.

A further three habitats were also recorded within the Lower Shannon SAC by the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009):

- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with Ammophila arenaria (white dunes) (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)

These habitats were recorded at Beal Point and Ballybunnion sub-sites (Ryle *et al*., 2009)

This backing document sets out the conservation objectives for the five coastal habitats listed above in Lower River Shannon 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 latter of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **shingle** are 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).

The NSBS visited the following nine sub-sites within Lower River Shannon SAC:

1. Ross Bay (County Clare)
2. Kilbaha Bay (County Clare)
3. Cloonconeen Lough and Rinevella Bay (County Clare)
4. Carrigaholt Bay (County Clare)
5. Ballymacrinan Bay (County Clare)
6. Bunaclugga Bay (County Kerry)
7. Corcas and sandhills (County Kerry)
8. Bromore (County Kerry)
9. Ballybunnion (County Kerry)

The distribution of these sub-sites is presented in Appendix I. 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. At Lower River Shannon SAC, the Ross Bay, Cloonconeen Lough and Rinnevilla Bay and Bunaclugga Bay sub-sites are rated ‘high interest’.

The vegetated shingle habitat at Ross Bay is of high interest owing to large deposits of smooth rounded limestone that are associated with reed (*Phragmites* sp.) beds and a large bittersweet (*Solanum dulcamara)* population. In the Cloonconeen Lough and Rinevella Bay sub-site, a cobble barrier separates the lagoon from an intertidal peat based drowned forest and intertidal shingle. The shingle vegetation includes yellow horned-poppy (*Glaucium flavum*) which with the unusual lagoonal system, make this site of high interest. The yellow horned-poppy is a short lived perennial herb of shingle banks and stone beaches. This species is confined to coasts and has limited distribution along the west coast but is more frequent on the east and south coasts. The sub-site at Bunaclugga Bay in County Kerry is a small vegetated shingle bar with a population of yellow horned-poppy.

The Carrigaholt Bay sub-site is rate of 'medium interest' as it supports an interesting flora, although it is a relatively small shingle deposit. The rest of the sub-stes consist of small unvegetated fringing deposits that are rated of 'low interest'.

The vegetated shingle habitat was not mapped at any of the sub-sites, but the vegetation was recorded, as were the human impacts and alterations at the site, which are useful tools for assessing the Structure and Functions of the site.

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 distribution of saltmarsh habitats within Lower River Shannon SAC is presented in Appendix II.

The SMP surveyed, mapped and assessed a total of ten sub-sites within Lower River Shannon SAC (McCorry and Ryle, 2009):

1. Carrigafoyle (Appendix III)
2. Barrigone, Aughinish (Appendix IV)
3. Beagh (Appendix V)
4. Bunratty (Appendix VI)
5. Shepperton, Fergus Estuary (Appendix VII)
6. Inishdea, Owenshere (Appendix VIII)
7. Killadysart, Inishcorker (Appendix IX)
8. Knock (Appendix X)
9. Querin (Appendix XI)
10. Rinnevilla Bay (Appendix XII)

There are an additional 11 other sites listed within the inventory compiled by Curtis & Sheehy-Skeffington (1998).

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 to XII). The conservation objectives for the saltmarsh habitats in Lower River Shannon SAC are based on a combination of the findings of the individual reports for each of this sub-site. There are additional areas of saltmarsh known to be present within the site. It is estimated that the 10 sub-sites as surveyed by the SMP represents just over 26% of the total area of saltmarsh within the SAC. The targets set therefore are quite generic and may be adjusted in the future in light of additional information.

The targets set for **vegetated sea cliffs** is based on the findings of the Irish Sea Cliff Survey (ISCS) (Barron *et al.,* 2011) and this document should be read in conjunction with that report.

The distribution of vegetated sea cliffs within Lower River Shannon SAC is presented in Appendix XIII. The ISCS identified and carried out a detailed assessment as per the methodology outline in Barron *et al*. (2011). This included dividing the cliff length into a series of sections to reflect the variation within the site and to give a more accurate measurement for area. This was carried out for the following four cliff sites:

1. Kerry Head, Co. Kerry
2. Ballybunion, Co. Kerry
3. Kilclogher, Co. Clare
4. Loop Head, Co. Clare

Two of the sub-sites at Kerry Head and Loop Head were surveyed in the field by the ISCS and assessed using remote survey methodology (Barron *et al*., 2011).

An additional five sites were identified by the ISCS from an examination of aerial photographs but these were not examined in any detail other than to record the total cliff length. These are referred to as undocumented sites and include:

1. Kilbaha, Co. Clare
2. Ladder Rock, Co. Clare
3. Moyarta, Co. Clare
4. Lisheencrony, Co. Clare
5. Burrane, Co. Clare

The conservation objective for the **vegetated sea cliff habitat** within the entire SAC is extrapolated from Barron *et al*, (2011) and the sea cliff database, which was produced as part of that project. Based on the current estimates, it is thought that the sub-sites surveyed by the ISCS represent approximately 58% of the total length of vegetated sea cliffs within Lower River Shannon 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 these objectives 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 composed 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, supports 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.

3.1 Overall Objective

The overall objective for 'perennial vegetation of stony banks' in Lower River Shannon SAC is to 'maintain the favourable conservation condition'. This objective is based on an assessment of the current 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 Lower River Shannon SAC is unknown. The National Shingle Beach Survey recorded vegetated shingle from nine sub-sites: Ross Bay (County Clare), Kilbaha Bay (County Clare), Cloonconeen Lough and Rinevella Bay (County Clare), Carrigaholt Bay (County Clare), Ballymacrinan Bay (County Clare), Bunaclugga Bay (County

Kerry), Corcas and sandhills (County Kerry), Bromore (County Kerry) and Ballybunnion (County Kerry); but did not map the extent (Moore & Wilson, 1999).

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

An excellent array of shingle beaches, including three that are ranked of high interest, one of which is a lagoonal system occurs within the Lower River Shannon SAC (Oliver, 2007; Moore & Wilson, 1999). The distribution of know shingle sites is presented in Appendix I.

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.

The shingle beaches within the Lower River Shannon SAC appear to be functioning naturally, with no artificial restrictions to beach dynamics (Moore & Wilson, 1999).

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 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 indicates long term stability of the shingle structure.

Good lichen cover at Ross Bay and Cloonconeen indicates longterm stability. The sub-site at Cloonconeen Lough and Rinevella Bay is classified as a vegetated lagoonal system with associated habitats being intertidal shingle and lagoon.

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. The shingle habitat at Lower River Shannon is known to support a typical flora for this habitat type.

The dominant vegetation of the shingle beaches at the Ross Bay sub-site includes creeping bent (*Agrostis stolonifera*), spear-leaved orache (*Atriplex prostata*), sea beet (*Beta vulgaris* ssp. *maritima*), red fescue (*Festuca rubra*), cleavers (*Galium aparine*), silverweed (*Potentilla anserina*), curled leaved dock (*Rumex crispus*), bittersweet (*Solanum dulcamara*), and sea mayweed (*Tripleurospermum maritimum*). The population of bittersweet (*Solanum dulcamara*) is considered the best in the country. Lichens are also present, indicating a degree of stability.

The Carrigaholt Bay is a small sub-site with a diverse flora. Plant species recorded include marram (*Ammophila arenaria*), spear-leaved orache (*Atriplex prostrata*), sea beet (*Beta vulgaris*), red fescue (*Festuca rubra*), cleavers (*Galium aparine*), sea sandwort (*Honckenya peploides*), common bird's-foot-trefoil (*Lotus corniculatus*), long-leaved plantain (*Plantago lanceolata*), bramble (*Rubus fruticosus*), ragwort (*Senecio jacobaea*), bittersweet (*Solanum dulcamara*), white clover (*Trifolium repens*), sea mayweed (*Tripleurospermum maritimum*) and vetch (*Vicia* sp.)

The sub-site at Bunaclugga Bay in County Kerry includes yellow horned poppy (*Glaucium flavum*), which contributes to the high interest ranking of the site.

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 the 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 make up 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*) (1330) (ASM)**
- **Mediterranean salt meadows (*Juncetalia maritimi*) (1410) (MSM)**
- Mediterranean and thermo-Atlantic Halophilous scrubs (Sarcocornetea fruticosi)

The first three habitats (in bold) are listed as a Qualifying Interests for Lower River Shannon SAC. The last habitat is restricted in its distribution to sites in the southeast of the country.

The distribution of saltmarsh habitats witin Lower River Shannon SAC is presented in Appendix II. The SMP surveyed, mapped and assessed of the following ten sub-sites located within the SAC (McCorry and Ryle, 2009):

1. Carrigafoyle
2. Barrigone, Aughinish
3. Beagh
4. Bunratty
5. Shepperton, Fergus Estuary
6. Inishdea, Owenshere
7. Killadysart, Inishcorker
8. Knock
9. Querin
10. Rinnevilla Bay

Within Lower River Shannon SAC the areas of *Salicornia* habitat are limited, although the habitat was recorded from six of the ten sub-sites surveyed by the SMP (McCorry and Ryle, 2009). The spread of common cord-grass (*Spartina anglica*) is considered a significant threat.

Atlantic salt meadows is the dominant saltmarsh habitat at the site and was recorded at all ten sub-sites surveyed by the SMP (McCorry and Ryle, 2009).

Mediterranean salt meadows are more restricted in their distribution and size, being recorded from eight of the ten sub-sites.

Carrigafoyle saltmarsh (Appendix III) is located in the outer part of the River Shannon estuary in north-east Kerry. Extensive saltmarsh has developed in a long sinuous inlet called Ballylongford Creek. This inlet forms the estuary of the Ballyline River. The site at Carrigafoyle is notable for the extensive mature common cord-grass swards that have developed in the shallow inlet in the past 60 to 70 years. Common cord-grass has practically infilled or replaced mudflats as the main intertidal habitat in the channel between Carrig Island and the mainland. *Spartina* swards has also formed extensive habitat on both sides of the main estuarine channel south to Ballylongford. This sub-site can be divided into two main sections, the outer estuary around Carrig Island and Reenturk Point and the inner channel between Lislaughtin Friary and Bally Longford. The established saltmarsh is quite fragmented around the site. The most extensive Annex I habitat is ASM with a significant patch of MSM habitat found at Reenturk Point. The best developed section of ASM is located at the head of the inlet adjacent to Ballylongford Town. One notable feature is that the 1st edition 6inch map indicates this area as gravel whereas it had developed as saltmarsh when the 2nd edition map was drawn. This may have been in response to reclamation along the inlet. There is only minor development of *Salicornia* habitat at this site.

Barrigone/Aughinish (Appendix IV) is one of two sites in County Limerick that were surveyed as part of the SMP project, Beagh being the other one. Curtis and Sheehy-Skeffington (1998) however, recognised five saltmarsh sites along Limerick's relatively short coastline. The Barrigone sub-site is located along the south side of the River Shannon Estuary near the village of Barrigone. The Alumina plant directly to the north of Barrigone is the most noticeable landmark and occupies all of Aughinish Island. One of the main features of this site are the tall embankments along much of the shoreline and intertidal area. Saltmarsh is found along the seaward side of many of these embankments. The seaward boundary of the survey site is marked by the abandoned railway track that crosses the narrow river channel. Saltmarsh extends outside this survey site along the Robertstown River Channel, but this area was not surveyed by the SMP. The Barrigone sub-site and the development of the saltmarsh is largely characterised by earlier anthropogenic management regime. The narrow Robertstown River inlet which leads into this sheltered intertidal zone has been greatly modified through the

construction of an extensive embankment, with the result that a considerable area of ground has been reclaimed. The Barrigone sub-site is characterised by the extensive development of *Spartina* swards on the mudflats and features ASM and MSM as well as negligible amount of *Salicornia* and other annuals colonizing mud and sand.

The Beagh sub-site (Appendix V) occurs in west Limerick and the saltmarsh is relatively small and is confined to the narrow coastal fringe along the southern shores of the River Shannon. The saltmarsh is characterised by the presence of ASM along with *Spartina* sward which occupy similar areas within the sub-site. The distribution of the saltmarsh vegetation is controlled by the occurrence of outcropping limestone, although historical land modifications along this part of the river have also had an influence since much of this land has been remodelled and boulders placed on the mud or outcropping rock to prevent flooding.

The Bunratty sub-site (Appendix VI) is located on the upper part of the Shannon Estuary in Co. Clare. Embankments are a feature of the shoreline along this part of the estuary and there are substantial amounts of reclaimed land behind the embankments. There are also several small islands in the estuary close to the shoreline. This part of the Shannon estuary empties at low tide to expose extensive mudflats. There is a large sewage treatment plant close to the shoreline. The saltmarsh and other marginal vegetation along this part of the estuary is almost continuous and extends into many of the shoreline undulations west to Shannon Airport. Marginal brackish vegetation also extends east towards Limerick. At this sub-site, ASM is the most extensive of all the saltmarsh habitats and is widespread in its distribution.

The Shepperton sub-site (Appendix VII) is located along the north-east side of the Fergus Estuary in Co. Clare. Saltmarsh habitats are spread along this shoreline and form an almost continuous band of habitat from Ing Point to Latoon Bridge. The development of saltmarsh varies along this shoreline and is less extensive towards the northern end where the estuary narrows. Much of the estuary has been modified by the construction of the embankments, although there are still large sections of relic saltmarsh that are relatively intact. In addition to the current site, Curtis and Sheehy-Skeffington (1998) recognise two additional saltmarshes from the Fergus Estuary, namely Islandavanna on the opposite side of the estuary and Inishmacnaghtan, at the confluence of the Fergus and Shannon estuaries. At this sub-site the main habitats are ASM and *Spartina* swards.

The Inishdea, Owenshere sub-site (Appendix VIII) is located in southern County Clare along the western side of the Fergus Estuary. This part of the Fergus Estuary is quite shallow and there are extensive intertidal mudflats adjacent to the shoreline that are exposed at low tide. This sub-site is a long and complex one that has in parts been considerably altered through the construction of earthen berms as a means both to protect against flooding and also to reclaim land. The site is composed of saltmarsh and brackish marsh vegetation. One notable species

recorded at this site is Meadow Barley (*Hordeum secalinum*). This species is listed on the Flora Protection Order and is also listed in the Red Data Book (Curtis and McGough, 1998). The Annex I habitats that were recorded at this site include, ASM, MSM and '*Salicornia* and other annuals colonizing mud and sand'.

The Killadysart, Inishcorker sub-site (Appendix IX) is located in the south-west corner of the Fergus Estuary, where it joins the River Shannon Estuary. The sub-site includes the small island of Inishcorker. There is a narrow intertidal channel called Killadysart Creek between the island and the Mainland and the island can be reached at low tide. Some of the saltmarsh within this sub-site has been modified by the creation of embankments. At this subsite, *Spartina* swards is the dominant saltmarsh habitat although ASM and MSM also occur.

The Knock sub-site (Appendix X) is located along the northern bank of the outer River Shannon Estuary in Co. Clare. The site is located around a small inlet at Rusheen Point. The saltmarsh is mainly found around the fringes of the small inlet between Rusheen Point and the mainland. Much of this inlet has infilled with *Spartina* sward. The land to the south of Rusheen Point has been reclaimed and is fronted by a stone/concrete embankment ranging in height from 75cm to 2.5m. The ground is bisected by a number of linear drainage features that forces the water towards a system of one-way gates that drain out into the Shannon. In addition to *Spartina* swards, ASM, MSM and *Salicornia* and other annuals colonising mud and sand also occur at this sub-site, however, *Spartina* sward is by far the most abundant.

The Querin sub-site (Appendix XI) is a small saltmarsh system located toward the mouth of the River Shannon, a short distance west of Poulnasherry Bay. Extensive swards of common cordgrass (*Spartina anglica*) characterise this sub-site. Smaller areas of ASM, MSM and *Salicornia* and other annuals colonizing mud and sand also occur.

The Rinevilla Bay sub-site (Appendix XII) is a remote site that is located halfway along the southern side of Loop Head in County Clare. It is the most westerly saltmarsh occurring along the lower reaches of the Shannon River. This sub-site was classified as an estuarine site by Curtis and Sheehy-Skeffington (1998), however it is more typical of a 'Lagoon type' site, as the saltmarsh occurs behind a shingle ridge with no permanent tidal connection to the outer bay. Overflow during spring tides seems to be the main tidal inundation into this area and there is a large permanent lagoon, Cloonconeen Pool, adjacent to the area where there is overflow. This lagoon is classified as a sedimentary lagoon with a mid-range salinity and has been surveyed as part of Lagoon Surveys in the past (Healy *et al.,* 1997; Oliver, 2005; NPWS, 2007). Rinevilla Bay sub-site is not an extensive saltmarsh and supports ASM (the most extensive saltmarsh habitat within the sub-site) as well as MSM, *Salicornia* and other annuals colonising mud and sand as well as small areas of *Spartina* swards.

All sub-sites support estuary-type saltmarsh that is mostly underlain by a mud substrate.

4.1 Overall Objectives

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

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

The overall objective for 'Mediterranean salt meadows' in Lower River Shannon SAC is to '*restore the favourable conservation condition*'.

These objectives are 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.

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 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.

A baseline habitat map of all saltmarsh in the Lower River Shannon was produced based on the findings of the SMP (McCorry and Ryle, 2009) and is presented in Appendix II. A total of 141.958ha of saltmarsh habitat was mapped by the SMP within the SAC and an additional 401.72ha of potential saltmarsh habitat was identified using aerial photographs, to give a total estimated area of 543.678ha for the SAC. Of this potential saltmarsh, it is estimated that 376.075ha represents Atlantic salt meadow and 25.646ha represents Mediterranean salt meadows. Future groundtruthing may lead to an adjustment of these figures.

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 Bannow Bay 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.

Sub-site	**Total area (ha) of *Salicornia* (excluding mosaics) from SMP**	**Total area (ha) of *Salicornia* within SAC boundary (including mosaics)**
Carrigafoyle	0.003	0.0045
Barrigone, Aughinish	0.0001	-
Beagh	-	-
Bunratty	-	-
Shepperton, Fergus Estuary	-	-
Inishdea, Owenshere	0.003	0.003
Killadysert, Inishcorker	-	-
Knock	0.029	0.029
Querin	0.19	0.185
Rinevilla Bay	0.001	0.001
Total	**0.226**	**0.223**

In view of the fact that all sub-sites were rated as 'Favourable' for extent by the SMP (McCorry and Ryle, 2009), the target is that the area of '*Salicornia* and other annuals colonising mud and sand' should be stable or increasing, subject to natural processes, including erosion and succession.

Sub-site	Total area (ha) of ASM (excluding mosaics) from SMP	Total area (ha) of ASM within SAC boundary (including mosaics)
Carrigafoyle	7.589	6.774
Barrigone, Aughinish	10.2	10.288
Beagh	0.538	0.517
Bunratty	26.968	26.939
Shepperton, Fergus Estuary	35.935	37.925
Inishdea, Owenshere	19.636	18.127
Killadysert, Inishcorker	2.94	2.604
Knock	0.740	0.576
Querin	3.56	3.726
Rinevilla Bay	11.73	11.883
Total	**119.836**	**119.359**
Potential habitat	376.075	376.075
Total	**495.911**	**495.434**

.

In view of the loss of habitat recorded by the SMP (McCorry and Ryle, 2009) at four sub-sites, the target is that the area of ASM should be increasing, subject to natural processes, including erosion and succession.

Sub-site	Total area (ha) of MSM (excluding mosaics) from SMP	Total area (ha) of MSM within SAC boundary (including mosaics)
Carrigafoyle	4.559	4.193
Barrigone, Aughinish	2.41	2.407
Beagh	-	-
Bunratty	0.865	0.865
Shepperton, Fergus Estuary	-	-
Inishdea, Owenshere	11.553	11.609
Killadysert, Inishcorker	0.709	0.705
Knock	0.144	0.143
Querin	0.008	0.008
Rinevilla Bay	2.45	2.449
Total	**22.698**	**22.379**
Potential habitat	25.646	25.646
Total	**48.344**	**48.025**

In view of the loss of habitat recorded by the SMP (McCorry and Ryle, 2009) at the Knock sub-site, the target is that the area of MSM should be increasing, subject to natural processes, including erosion and succession.

4.3 Range

4.3.1 Habitat distribution

The distribution of saltmarsh habitats within the Lower River Shannon SAC is presented in Appendix II. Saltmarsh is known to display a wide distribution throughout the site, with concentrations at Bunratty, Shepperton and Inishdea. Within those sub-sites surveyed by the SMP, estuary type saltmarshes over a mud substrate were most common and ASM is the dominant saltmarsh habitat (McCorry and Ryle, 2009).

The distribution of each habitat at each sub-site can be found in the Appendices at the end of this report (Appendices III to XII).

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 habitat in Lower River Shannon SAC 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.

A feature of the SAC site is the embankments along much of the shoreline and intertidal area. The saltmarsh is found on the seaward side of many of these embankments. These

embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed because of them.

The target is to maintain, or where necessary restore, 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 Carrigafoyle sub-site, the ASM has well developed structure with salt pans and natural creek channels present, while the MSM contains some large salt pans (McCorry and Ryle, 2009).

Within the ASM at Shepperton, Fergus Estuary sub-site, the larger patches still retain a natural creek and salt pan structure. At the Inishdea, Owenshere sub-site within some of the intact saltmarsh there is a complex network of creeks, salt pans and depressions. At Killadysart, Inishcorker and Querin sub-sites, creek and pan development is generally poor.

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 saltmarshes, 'Atlantic salt meadows' is the dominant saltmarsh habitat at Lower River Shannon SAC where it occurs in a mosaic with 'Mediterranean salt meadows' and '*Salicornia* and other annuals colonising mud and sand'. 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, shingle and sand dune habitats.

At Carrigafoyle sub-site *Salicornia* flats, ASM and MSM occur, within the ASM, there is some typical zonations between mid-marsh and upper marsh communities. Also at this sub-site there is some natural transition from MSM to transitional wet grassland.

At Barrigone sub-site, *Salicornia* flats, ASM and MSM occur and habitats were recorded that mark the transition from saline to brackish or terrestrial zone.

At Bunratty sub-site, ASM and MSM occur, and there is extensive development of brackish vegetation within the site.

At Beagh sub-site, only ASM was recorded and there is an absence of pioneer and lower marsh communities

At Shepperton, Fergus Estuary sub-site, only ASM was recorded and there are zonations within the ASM ranging from lower, to mid and upper marsh.

At Inishdea, Owenshere sub-site, *Salicornia* flats, ASM and MSM occur and there are natural transitions from saltmarsh to adjacent transitional grassland.

At Querin sub-site, *Salicornia* flats, ASM and MSM occur and the saltmarsh transitions in to wet grassland and dune grassland along the upper boundary.

At Knock, *Salicornia* flats, ASM and MSM occur. The ASM grades into terrestrial habitats such as wet improved grassland, transitional acid grassland and coastal grasslands.

At Killadysart, Inishcorker, both ASM and MSM were recorded as well as relatively large stands of adjacent brackish habitats. Some zonation was also recorded within the ASM.

At Rinevilla, *Salicornia* flats, ASM and MSM occur and there are transitions, to other habitats such as wet grassland.

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.

All of the sub-sites within the Lower Shannon SAC are grazed, to some extent. Overgrazing was noted from Carrigafoyle, Shepperton, Fergus Estuary and Knock sub-sites (McCorry and 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.

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.

Within the ASM at Carrigafoyle there are variations in the grazing intensity. Some of the grazed sections contain more frequent common cord-grass cover. Long-term grazing and poaching has promoted the spread of this species into some of the more established ASM vegetation and formed mosaics. This can be seen south of the embankment around Lislaughtin Friary and at Reenturk Point. There is also some localised damage from overgrazing and heavy poaching (McCorry and Ryle, 2009).

At Barrigone, many of the larger areas of saltmarsh are grazed and some areas are poached as a result (McCorry and Ryle, 2009).

Grazing also occurs at Beagh, however the impact is negligible (McCorry and Ryle, 2009).

At Bunratty, the majority of the land within the saltmarsh and its hinterland are grazed by both cattle and sheep and some parts of the saltmarsh are showing signs of damage. While grazing is important for maintaining the diversity of the saltmarsh vegetation, some areas which were

ungrazed were dominated by rank grasses such as twitch (*Elytrigia repens*) or sea club-rush (*Bolboschoenus maritimus*) (McCorry and Ryle, 2009).

At Shepperton, Fergus Estuary sub-site most of the saltmarsh is grazed to some extent by cattle or horses and some areas have been damaged by overgrazing and poaching (McCorry and Ryle, 2009).

At Inishdea, Owenshere sub-site grazing is widespread throughout the site and few areas of the saltmarsh are ungrazed. Poaching was confined to larger areas of saltmarsh such as the main section west of Horse Island (McCorry and Ryle, 2009).

Unlike the majority of saltmarshes, grazing was not a major activity at Killadysart, Inshcorker sub-site, however some small areas of saltmarsh along the embankments were accessible to cattle and grazing was noted as well as trampling and poaching damage (McCorry and Ryle, 2009).

At Knock, grazing by cattle and horses occurs on the saltmarsh and damage from overgrazing, trampling and poaching has occurred in places (McCorry and Ryle, 2009).

At Rinevilla Bay sub-site most of the saltmarsh is grazed and trampling and poaching are localised in occurrence and mostly confined to the western half of the site (McCorry and Ryle, 2009).

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

4.4.7 Vegetation composition: typical species and 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 Lower River Shannon area.

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

The rare hard-grass (*Parapholis strigosa*) was recorded in the the Atlantic salt meadow habitat at Carrigafoyle during the Salt marsh Monitoring Project (McCorry and Ryle, 2009).

Sea wormwood (*Seriphidium maritimum)*, a species of local distinctiveness, was recorded at Barrigone, Killadysert, Inishcorker/Inishdea and Owenshere sub-sites. At Inishdea, Owenshere, an abundance of meadow barley (*Hordeum secalinum*) was also recorded (McCorry and Ryle, 2009).

4.4.8 Vegetation structure: negative indicator species

Common cordgrass *(Spartina anglica*) is a major element of the vegetation at all sub-sites in the Lower Shannon SAC and is the main impact affecting the SAC. It was planted in the River Shannon Estuary during the 1930's (Nairn, 1986) and has mainly colonised intertidal mudflats to form extensive swards. The area of these swards now exceeds the former area of established saltmarsh (McCorry and 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%.

5 Vegetated sea cliffs

Sea cliffs can be broadly divided into two categories: hard (or rocky) cliffs and soft (or sedimentary) cliffs, both of which are covered by Annex I habitat 'vegetated sea cliffs of the Atlantic and Baltic coasts'. Hard cliffs are composed of rocks such as limestone, sandstone, granite or quartzite which are hard and relatively resistant to erosion. Soft cliffs are composed of softer rock such as shale or unconsolidated material such as glacial till. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Soft cliff habitats are more prone to slope failure which results in the presence of fast-colonising pioneer species.

Defining the limits of what constitutes a sea cliff is problematic and a number of different interpretations have been used in the past (Fossitt, 2000; Commission of the European Communities, 2007; JNCC, 2004; Browne, 2005). In order to address any inconsistencies, the following definition for sea cliffs was developed and used during the Irish Sea Cliff Survey (Barron *et al*., 2011):

"A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave-cut platform or sand, among other substrates. During this survey where cliffs occur within the subtidal zone the base was considered to be the high water mark. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) of 3m high (soft cliffs), or no longer has a steep slope. To be considered in this study, a cliff had to be a minimum of 100m in length. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others."

Most of the Lower River Shannon SAC west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. There are some areas where the hard rock is overlain by soft rock and some other small areas dominated by soft rock. The cliffs support a typical maritime flora and habitat for a diversity of cliff nesting birds including peregrine falcon (*Falco peregrinus*) and chough (*Pyrrhocorax pyrrhocorax*).

5.1 Overall Objective

The overall objective for 'vegetated sea cliffs of the Atlantic and Baltic coasts' in Lower River Shannon SAC is to 'maintain favourable conservation condition'. The objective is based on an assessment of the current condition of the 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. The target is 'for the area to remain stable'. 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.

As cliffs are linear features on maps, their extent is measured in kilometres rather than hectares, as for other habitats. The extent of each of the sub-sites identified is presented in the following table. There are three columns of figures as not all sites were examined in the same level of detail during the ISCS (Barron *et al*., 2011). The first column of figures gives the total cliff length for the five undocumented sites. The second column gives the figures for the four sites where each cliff was divided into sections based on physical characteristics and vegetation cover. Breaks (i.e. non-cliff areas) of between 80m and 500m along a length of cliff were discounted from the calculations. The final column gives the length of each cliff that is located within the SAC boundary.

There are a number of differences in the sets of figures below, particularly in relation to the last four sites. Most of the differences are explained by the fact that the ISCS mapped the total sea cliff resource at each site and not all of the sea cliff mapped is contained within the SAC boundary. In addition, the County boundary line was used to draw the line for the ISCS, a different mapping dataset than was used to draw the SAC boundary. As a result, the length of cliff inside the SAC boundary may be underestimated. The total length of cliff sections for the ISCS mapped sites in Lower River Shannon SAC is 80.6km (i.e. 7.3km and 73.3km). However, when this dataset was clipped to the SAC boundary 67.3km is included in the boundary. However in reality, this figure is likely to be higher as a result of the mapping anomalies.

Site name	Total area/length (km) of undocumented sea cliff from ISCS	Total area/length (km) of sea cliff sections assessed by ISCS	Total area/length (km) of sea cliff within SAC boundary
Kilbaha	4.1		4.1
Ladder Rock	1.0		1.0
Moyarta	0.9		0.9
Lisheencrony	1.1		1.1
Burrane	0.2		0.2
Kerry Head		45.19	33.4
Ballybunion		16.73	15.6
Kilclogher		5.2	4.9
Loop Head		6.2	6.1
Totals	**7.3**	**73.30**	**67.3**

5.3 Range

5.3.1 Habitat Distribution

The distribution of vegetated sea cliffs as identified during the Irish Sea Cliff Survey (ISCS) (Barron *et al*., 2011) is shown on a map in Appendix XIII.

Sea cliffs are concentrated around the mouth of the Shannon from Kilcredaun Point in County Clare to Kilconly Point in County Kerry (Browne, 2005; Barron *et al*., 2011). Both hard and soft cliff types are present within the site, with hard cliffs being more common. Soft cliffs were identified from two sub-sites by the ISCS: Loop Head, Ballybunion and Kerry Head. The hard cliffs in Lower River Shannon River SAC are unlikely to be redistributed through natural processes, unlike more dynamic coastal systems such as sand dunes and saltmarshes.

5.4 Structure and Functions

A fundamental aim of sea cliff conservation is to facilitate some degree of natural mobility through slumping. Sea cliffs can be of geomorphological interest as well as ecological interest and also erosion can expose geological features of interest.

Functionality and hydrological regime

Coastal protection works can disrupt the natural integrity of a sea cliff. The health and ongoing development of vegetated sea cliffs relies on natural processes such as erosion continuing without any impingement. This is generally a bigger issue for soft cliffs which require a degree of slumping and erosion to expose bare soil for pioneer species to colonise; otherwise the vegetation is replaced by hardy grasses and scrub of little conservation value can develop. In addition, cliff erosion provides an important sediment source to sites further along the coast (e.g. sand dunes). Preventing erosion at a cliff site can lead to beach starvation at another site.

Sea defence or coast protection works or tidal barrages are impacting on the cliffs at Ballybunnion (Barron *et al*., 2011).

Flushes can be associated with cliffs in areas where the groundwater seeps out onto the cliff face. This is more usually associated with soft cliffs where these flushes contribute to the natural instability of the ground and provide patches of wetland habitat.

Fresh water seepage was noted from the cliffs at Loop Head, Kilclogher and stream or cascade was recorded from Kerry Head subsite (Barron *et al.,* 2011).

The target is to maintain, or where necessary restore, the natural geomorphological processes without any physical obstructions, and the local hydrological regime including groundwater quality.

5.4.1 Vegetation structure: zonation

Ecological variation in this habitat type depends on a number of physical and biological factors, in particular climate, degree of exposure to sea-spray, geology and soil type, as well as the level of grazing and sea bird activity. The rocky cliff flora often grades naturally into coastal heath vegetation and maritime grassland.

The cliffs in the outer part of the site are sparsely vegetated with lichens, red fescue (*Festuca rubra*), sea beet (*Beta vulgaris* ssp. *maritima*), sea campion (*Silene uniflora*), thrift (*Armeria maritima*) and plantains (*Plantago* species). A rare endemic species of sea lavender (*Limonium recurvum* subsp. *pseudotranswallinum*) occurs on the cliffs near Loop Head. Cliff top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of red fescue (*Festuca rubra*) and species such as kidney vetch (*Anthyllis vulneraria*) and bird's-foot trefoil (*Lotus corniculatus*). In more sheltered areas up the estuary, patches of scrub occur on the rock cliffs, with species such as hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), and bramble (*Rubus fruticosus*) (Browne, 2005; Barron *et al*., 2011).

At the sea cliff sub-site at Loop Head, the zones recorded include: splash, crevice ledge and ungrazed coastal grassland on hard cliffs. At the Kerry Head sub-site zones recorded include: splash, pioneer, crevice ledge, coastal grassland on soft cliffs and ungrazed/grazed grassland on hard cliffs (Barron *et al.,* 2011).

The target is to maintain the sea cliff habitat, as well as transitional zones, including those to terrestrial communities.

5.4.2 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing increases the species diversity and is particularly important for maritime grasslands and coastal heath, which are often associated with sea cliffs. The target is to maintain the structural variation in the sward height.

5.4.3 Vegetation composition: typical species & sub-communities

Different sea cliff communities develop in a number of habitat zones related to the degree of maritime influence (exposure to wind and sea spray), geology and soil type. In general, Irish sea cliffs display a range of zones running in a series of horizontal bands up the cliff face, each of which has its own distinct sub-communities including:

- Splash zone
- Pioneer zone
- Rock crevice/cliff ledge zone
- Maritime grassland zone
- Maritime heath zone
- Maritime slope flush zone

There is considerable variation but the general pattern would be that the maritime influence is strongest near the base of the cliff and becomes gradually less dominant towards the cliff top. At the cliff base, vegetation is naturally very open and the species present have a high tolerance to salinity. The splash zone generally has a well-developed lichen flora dominated by species such as *Verrucaria maura*, *Ramalina* spp. and *Xanthoria* spp. These plant communities are dependent on rock crevices for rooting. Moving up the cliff, between the splash zone and the cliff top, vegetation on the cliff ledges is less open and can support some species which are not exclusively associated with coastal conditions. Closer to the cliff top maritime grasslands can occur. The plant communities and physical characteristics of maritime grasslands vary depending on the degree of exposure and whether or not grazing is a factor. Plant communities typical of sea birds and maritime therophyte communities are exceptions to this horizontal

zonation and can occur as a mosaic with the other plant communities. The following tables presents lists of species that are considered typical of the different zones associated with soft cliffs and hard cliffs by Barron *et al*. (2011), such as those found in Lower River Shannon SAC.

Typical pioneer slope species on soft cliffs		
Agrostis stolonifera	*Equisetum spp.*	*Tussilago farfara*
Daucus carota	*Lotus corniculatus*	
Flush on soft cliffs		
Equisetum spp.	*Orchid species*	*Schoenus nigricans*
Coastal heath		
Calluna vulgaris	*Erica cinerea*	*Ulex gallii*
Daboecia cantabrica	*Erica tetralix*	*Vaccinium myrtillus*
Empetrum nigrum	*Scilla verna*	
Coastal grassland on soft cliffs		
Agrostis stolonifera	*Dactylis glomerata*	*Festuca rubra*
Anthyllis vulneraria	*Daucus carota*	*Lotus corniculatus*
Arrhenatherum elatius	*Elytrigia repens*	*Tussilago farfara*

Typical splash zone species on hard cliffs		
Ramalina spp	*Verrucaria maura*	*Xanthoria spp*
Typical crevice and ledge species on hard cliffs		
Anthyllis vulneraria	*Asplenium marinum*	*Armeria maritima*
Aster tripolium	*Atriplex prostrata*	*Beta vulgaris ssp. maritima*
Catapodium marinum	*Cerastium diffusum*	*Crithmum maritimum*
Festuca rubra	*Inula crithmoides*	*Lavatera arborea*
Ligusticum scoticum	*Limonium sp*	*Plantago coronopus*
Plantago maritima	*Sedum anglicum*	*Sedum rosea*
Silene uniflora	*Spergularia rupicola*	
Typical coastal heath species		
Calluna vulgaris	*Daboecia cantabrica*	*Empetrum nigrum*
Erica cinerea	*Erica tetralix*	*Scilla verna*
Ulex gallii	*Vaccinium myrtillus*	

Typical maritime grassland species on hard cliffs		
Anthyllis vulneraria	*Armeria maritima*	*Crithmum maritimum*
Daucus carota	*Festuca rubra*	*Hyacinthoides non-scripta*
Plantago coronopus	*Plantago maritima*	*Scilla verna*
Sedum anglicum	*Silene uniflora*	*Spergularia rupicola*

At the Loop Head cliffs, crevice ledge, ungrazed coastal grassland on hard cliffs and splash zone vegetation was recorded. The dominant crevice ledge species include fescues (*Festuca rubra/ovina),* buck's-horn plantain *(Plantago coronopus), sea plantain (Plantago maritima),* and *Verrucaria species.* While dominant species of ungrazed coastal grassland on hard cliffs and include fescues *(Festuca ovina/rubra),* sea thrift *(Armeria maritima),* sea plantain *(Plantago maritima)* and kidney vetch *(Anthyllis vulneraria).* In the splash zone *Verrucaria* species were dominant (Barron *et al.,* 2011).

At the Kerry Head cliffs coastal grassland on soft cliffs, pioneer species, crevice ledge species, splash zone, ungrazed coastal grassland on hard cliffs and grazed coastal grassland on hard cliffs were recorded by the ISCS. The dominant species recorded in coastal grassland on soft cliffs were creeping bent (*Agrostis stolonifera*), false oat grass (*Arrhenatherum elatius*), oat (*Avena sativa*), creeping thistle (*Cirsium arvense)*, cock's foot (*Dactylis glomerata*), red fescue (*Festuca rubra*), meadow vetchling (*Lathyrus pratensis)* and bramble (*Rubus fruticosus*).

Dominant pioneer species include Yorkshire fog (*Holcus lanatus*), sea plantain (*Plantago maritima*), bramble (*Rubus fruticosus*). Dominant crevice ledge species at this sub-site include sea beet (*Beta vulgaris*), *Caloplaca* species, fescues (*Festuca ovina/rubra*) and *Verrucaria* species. Dominant splash zone species include *Verrucaria* species. Within the ungrazed coastal grassland on hard cliffs habitat, dominant species include thrift (*Armeria maritima*), fescues (*Festuca rubra/ovina*), Yorkshire fog (*Holcus lanatus*), cat's-ear (*Hypochaeris radicata*), buck's-horn plantain (*Plantago coronopus*) and sea plantain (*Plantago maritima*). Grazed coastal grassland on hard cliffs includes the following dominant species: kidney vetch (*Anthyllis vulneraria*), fescues (*Festuca rubra/ovina*), wild thyme (*Thymus polytrichus*) and white clover (*Trifolium repens*) (Barron *et al*., 2011).

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

5.4.4 Vegetation composition: negative indicator species

Negative indicator species can include non-native species (e.g. *Hebe* sp.*, Carpobrotus edulis, Gunnera tinctoria*), 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 make up less than 5% of the vegetation cover.

5.4.6 Vegetation composition: bracken and woody species

Encroachment of bracken (*Pteridium aquilinum*) and woody/scrub species on cliffs, particularly the maritime grasslands and coastal heath leads to a reduction in species diversity.

The target for this attribute is that in the case of maritime grassland and/or heath, bracken should make up less than 10% of the vegetation cover, while woody species should make up no more than 20% of the vegetation cover.

6 References

Barron, S., Delaney, A., Perrin, P., Martin, J. and O'Neill, F. (2011). National survey and assessment of the conservation status of Irish sea cliffs. *Irish Wildlife Manual*s, No. 53. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Browne, A. (2005). *National inventory of sea cliffs and coastal heaths.* Unpublished report to the National Parks and Wildlife Service, Dublin.

Commission of the European Communities (2007). *Interpretation Manual of European Union Habitats – EUR 27*. DG Environment-Nature and Biodiversity, Brussels.

Curtis, T.G.F. and Skeffington, M. J. (1998) The saltmarshes of Ireland: an inventory and account of their geographical variation. Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104.

Fossitt, J.A. (2000) *A guide to habitats in Ireland.* The Heritage Council, Kilkenny.

JNCC (2004). *Common standards and monitoring guidance for maritime cliff and slope habitats*. Joint Nature Conservation Committee, Peterborough, UK.

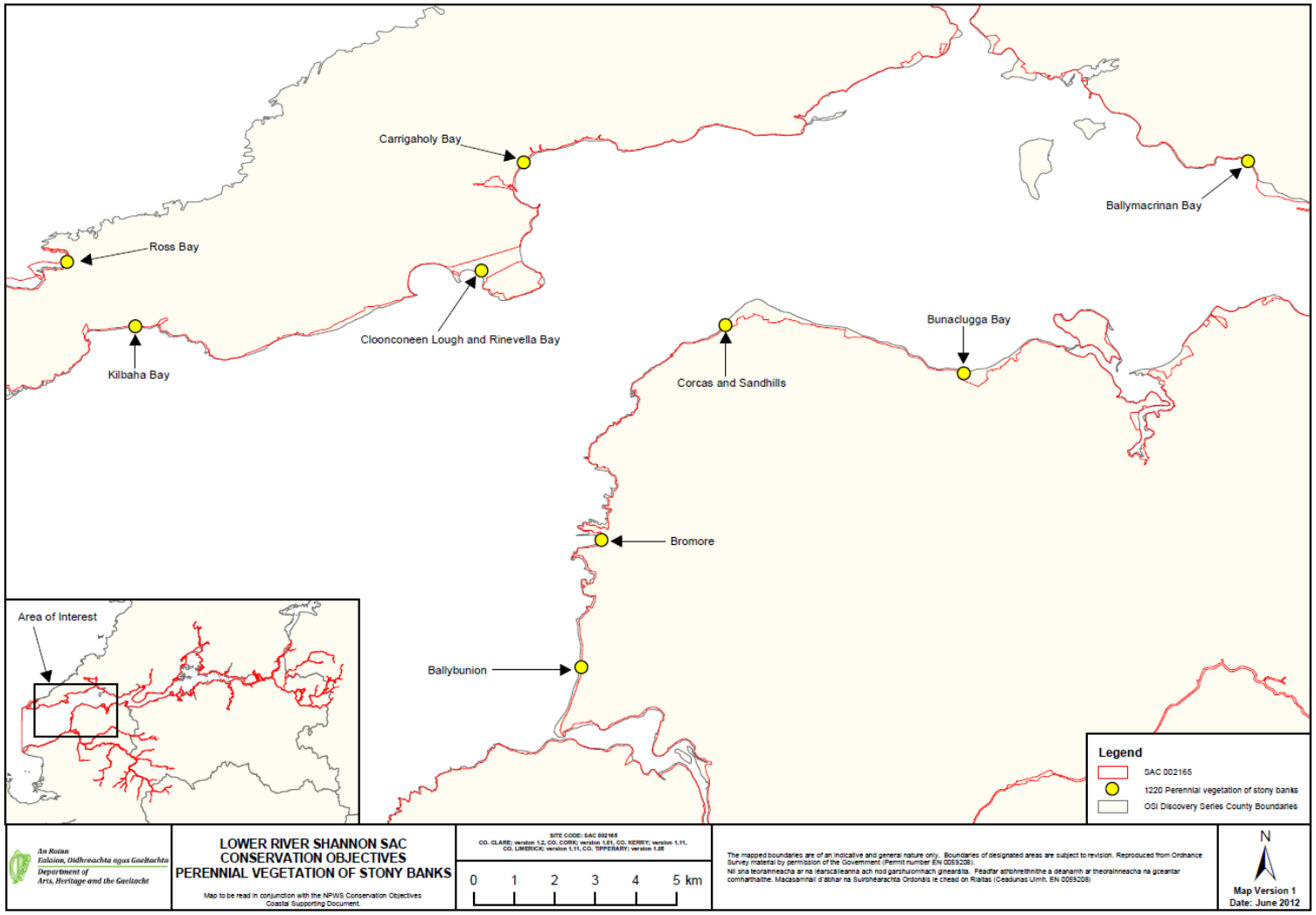
McCorry, M. and Ryle, T. (2009) *Saltmarsh Monitoring Project 2007-2008*. Unpublished report to the National Parks and Wildlife Service, Dublin.

Moore D. and Wilson, F. (1999) *National Shingle Beach Survey of Ireland 1999.* Unpublished report to NPWS, Dublin.

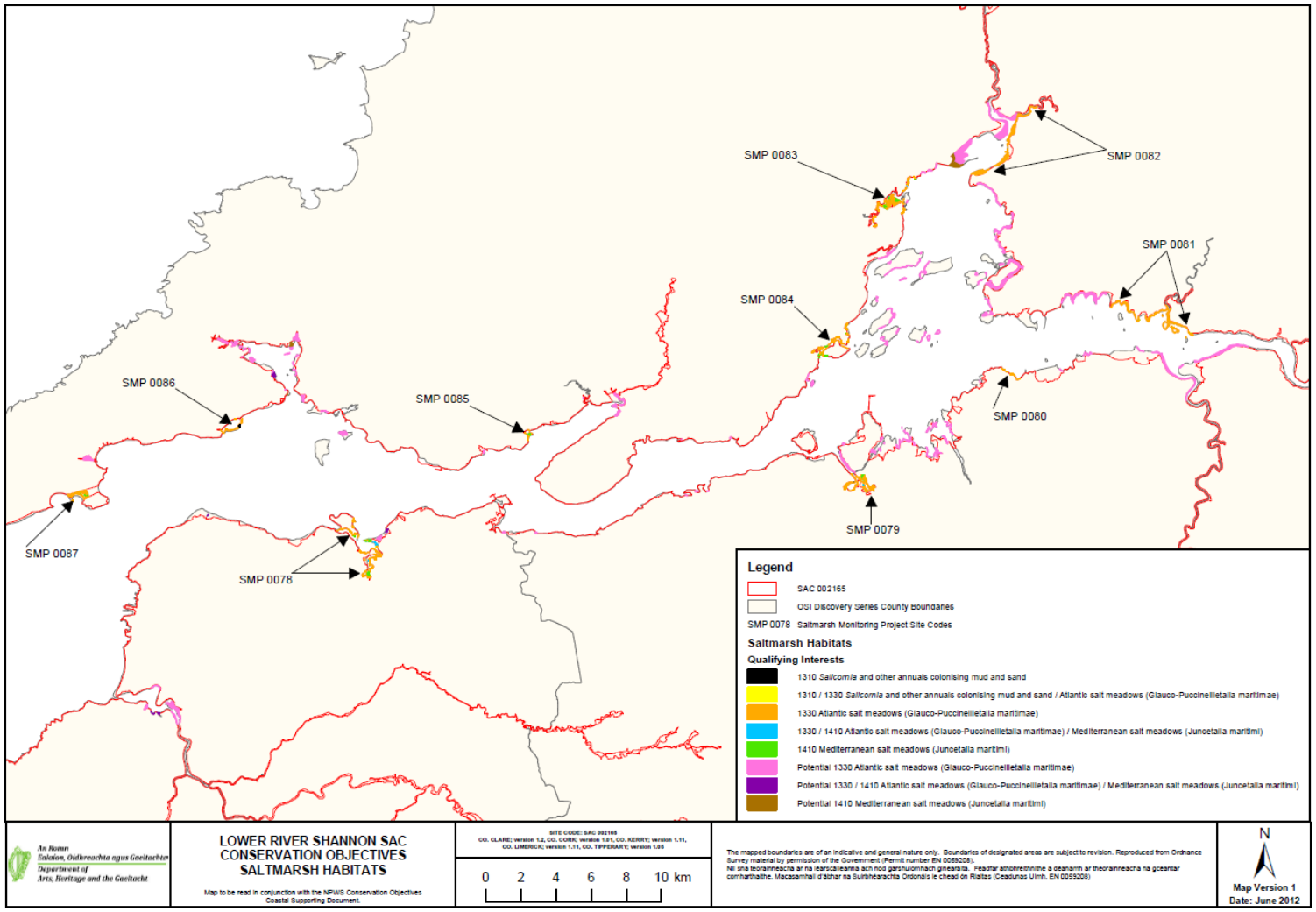
Nairn, R.G. W. (1986) *Spartina* anglica in Ireland and its potential impact on wildfowl and waders – a review. Irish Birds, 3, 215-258.

Oliver, G. (2007) Inventory of Irish coastal lagoons (version 2). Unpublished report to the National Parks and Wildlife Service.

Appendix I – Distribution map of known shingle sites within Lower River Shannon SAC



Appendix II – Distribution map of saltmarsh habitats within Lower River Shannon SAC



Appendix III – Carrigafoyle site report and habitat map from the SMP (McCorry and Ryle, 2009)

SITE DETAILS

SMP site name: **Carrigafoyle**		SMP site code: **SMP0078**
Dates of site visit **08-09-08/2008**		CMP site code: **N/A**
SM inventory site name: **Carrigafoyle**		SM inventory site code: **152**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2167**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **1332**	SPA: **4077**
County: **Kerry**		Discovery Map: **63, 64** Grid Ref: **099444, 146516**
Aerial photos (2000 series): **Ke 002**		6 inch Map No: **O 4913-A,B,D; O 4914-A,C; O 4973-B; O 4851-C,D**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC: **Barrigone, Aughinish, Beagh, Bunratty, Shepperton, Fergus Estuary, Inishdea, Owenshere, Killadysart, Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: Substrate type:

SITE DESCRIPTION

Carrigafoyle saltmarsh is located in north-east Co. Kerry in the outer part of the River Shannon estuary. Extensive saltmarsh has developed in a long sinuous inlet called Ballylongford Creek. This inlet forms the estuary of Ballyline River. The outer part of the inlet is quite wide with extensive intertidal mudflats while the inner part is quite narrow. Ballylongford Town is positioned at the head of this small estuary. The R551 regional road marks the landward limit of the western branch of this inlet with a smaller stream entering the estuary at this point.

Carrigafoyle Castle is located in the north-western part of the survey site along the shoreline. Part of the mouth of the inlet is sheltered by Carrig Island. The island is connected to the mainland by a causeway near the castle. There is also a shingle ridge along the western side that has enclosed the channel. This area is quite low-lying and dominated by farmland. There is scattered habitation around the site.

This site is notable for the extensive mature *Spartina* swards that have developed in the shallow inlet in the past 60-70 years. Common Cordgrass *(Spartina anglica)* has practically infilled or replaced mudflats as the main intertidal habitat in the channel between Carrig Island and the mainland. This area also contains some mixed sediment along the shoreline in places, particularly at Reenturk Point where the substrate is a mixture of mud and gravel and some cobble. *Spartina* swards has also formed extensive habitat along both sides of the main estuarine channel south to Ballylongford. This channel drains at low tide to expose soft intertidal mudflats. Some low-lying land along the main channel has been reclaimed in the past

and the upper boundary of the part of the east side of the estuary is marked by an embankment. There is still relic patches of established saltmarsh scattered around the survey site with the greatest extent found at the head of the inlet near Ballylongford. Some saltmarsh has also developed in sheltered patches behind shingle bars at Reenturk Point and Carrig Island Point that have developed at the mouth of the inlet.

Carrigafoyle is part of Lower River Shannon cSAC (Site Code 000343). This large cSAC includes a most of the River Shannon Estuary as well as many of the smaller bays and inlets along both sides of the estuary in Counties Kerry, Limerick and Clare. The cSAC has been designated for the presence of many Annex I and II coastal and estuarine habitats and species. Three Annex I saltmarsh habitats are found at this site, *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats are listed as qualifying interests for this cSAC. *Spartina* swards are also found on the intertidal flats at this site, although this habitat is not now considered to qualify as an Annex I habitat.

Ten other saltmarshes sites listed on the SM inventory (Curtis and Sheehy-Skeffington 1998) and located within this cSAC were surveyed during this project, Barrigone, Aughinish, Beagh, Bunratty, Shepperton, Fergus Estuary, Inishdea, Owenshere, Killadysart, Inishcorker, Knock, Querin and Rinevilla Bay. This was only a selection of the total number of saltmarshes found in the cSAC and there were 10 other sites listed on the inventory that were not surveyed during the SMP.

Most of the saltmarsh habitat is found within the digital cSAC boundary. However, a substantial portion of the Annex I habitat has been excluded, and this is mainly due to rectification issues between the OSI 2nd 6 inch map used to draw the cSAC boundaries and the actual saltmarsh distribution as outlined on the OSI 2005 series aerial photos.

SALTMARSH HABITATS

General description

The site can be divided into two main sections, the outer estuary around Carrig Island and Reenturk Point and the inner channel between Lislaughtin Friary and Ballylongford. The established saltmarsh is quite fragmented around the site. The most extensive Annex I habitat is ASM with a significant patch of MSM habitat found at Reenturk Point.

Outer Estuary

This section includes the saltmarsh around Carrig Island and in the sheltered side of Reenturk Point. The saltmarsh is dominate by *Spartina* swards that have almost totally infilled the channel between Carrig Island and the mainland. A shingle bar with some dune development partially blocked the western side of this channel but with a small tidal connection still present. However there has now been blocked and the shingle bar stretches across the entire length of this channel. There is only minor development of ASM around the edges of the *Spartina* sward, generally between 1-5 m wide in extent. Most of the saltmarsh habitat is enclosed by field boundaries and there is very little unmodified transition to terrestrial habitats. The main area of Annex I habitat is found at the eastern side of the island at Carrig Island Point. MSM has developed in low-lying land and there is some ASM development along the leeward side of a shingle spit. There are several smaller patches of saltmarsh development along the northern side of the island, generally sheltered by shingle bars, some of which have been partially enclosed with embankments.

Further east along the southern side of the inlet there is continued development of *Spartina* sward along the shoreline with very little ASM or MSM habitat along the landward boundary. There is some ASM development in low-lying land behind an embankment at Rusheen where there is still some tidal influence entering this area from drains.

The saltmarsh at Reehturk Point is dominated by MSM. This saltmarsh has also developed behind a shingle bar. This MSM patch has some brackish influence with patches of Common Reed developing in places. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification. Further east the saltmarsh develops into a narrower band along the shoreline. *Spartina* wards are present along the seaward side of the ASM and MSM but there extent is much less developed. There is some transition to wet grassland along the landward boundary. Further east towards Saleen Pier the saltmarsh development is much more limited where the channel narrows and enters the inner section and there are some breaks in its distribution.

Inner Channel

The inner channel is much narrower with less extensive development of intertidal mudflats on both sides of the estuarine channel. There is a narrow band of ASM development along the shoreline around the main bend in the inlet. The western side has been modified by the construction of a seawall, which has been breached and now contains some patches of *Spartina* swards behind and in front of the seawall. There is more extensive fragmented ASM and MSM on the eastern side of the channel adjacent to Lislaughtin Friary on thicker mud. *Spartina* swards have developed on the mudflats adjacent to this more established saltmarsh and form a broad band of sward along most of this side of the river. The landward boundary has been significantly modified by the construction of an embankment.

The best developed section of ASM is located and the head of the inlet adjacent to Ballylongford Town. One notable feature is that the 1st edition 6 inch map maps this area as gravel whereas it had developed as saltmarsh when the 2nd edition 6 inch map was drawn. This may have been in response to the reclamation along the inlet. This patch of saltmarsh contains some small patches of *Spartina* swards and ASM. The main channel spits near the head of the inlet and there is a smaller channel towards the west. This section also contains some patches of established ASM with patches of *Spartina* sward along the seaward side of these patches. The R551 road crosses a bridge over a stream marking the upper extent of the inlet.

Table 3.1. Area of saltmarsh habitats mapped at Carrigafoyle.

EU Code	Habitat	Area (ha)
1310	*Salicornia* and other annuals colonizing mud and sand (1310)	0.003
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	7.589
1410	Mediterranean salt meadows (Juncetalia maritimi)	4.559
non-Annex	*Spartina* swards	40.124
	Total	**52.275**

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

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

There is only very minor development of this habitat at this site. Annual Sea-blite (*Suaeda maritima*) forms some scattered patches along the back of some of the shingle banks, generally not in association with other saltmarsh habitat and generally on rocky or mixed substrate. This type of habitat was not considered to qualify as this Annex I habitat.

There were some pans within the ASM around the site that are vegetated by Glasswort sp. (*Salicornia* sp.). The Glasswort has infilled on mud with generally no other saltmarsh species in occurrence. There is also some minor development of bands of patchy Glasswort along the shoreline between the inner and outer section. This habitat was patchy and generally less than 1 m wide so it was not mapped. This type of habitat was somewhat more extensive in a small patch at Reenturk Point. This patch also includes some eroded patches of ASM on thin substrate and also some clumps of Common Cordgrass and was mapped as a mosaic.

Atlantic salt meadows (H1330)

This habitat appears a number of locations around the site. It is best developed at the head of the inlet. This area is dominated by mid-marsh and upper marsh communities with some typical zonation between these communities. The saltmarsh also has a well-developed structure with salt pans and natural creek channels present.

ASM saltmarsh found in some of the other larger fragments also contains some well-developed examples of mid and mid-upper zones. The grazing intensity varies on these sections and some are not grazed at all. The ungrazed sections contain shallow hollows with a low-mid zone. This zone contains Sea Plantain (*Plantago maritima*), Sea Pink (*Armeria maritima*), Lax-flowered Sea Lavender (*Limonium humile*), Annual Sea-blite, Common Scurvygrass (*Cochlearia officinalis*) and Common Saltmarsh-grass (*Puccinellia martima*). Some of these larger patches of ASM contain very little Common Cordgrass. There are also patches of more typical mid marsh vegetation where Lax-flowered Sea Lavender and Common Saltmarsh-grass disappears and species such as Red Fescue (*Festuca rubra*) and Saltmarsh Rush (*Juncus gerardii*) become more prominent. Some patches are dominated by a sward of Saltmarsh Rush. There is some zonation to an upper marsh community along the edge of the embankments where Creeping Bent-grass (*Agrostis stolonifera*) becomes dominant. There are further landward transitions along the embankment to Twitch-dominated vegetation and patches of scrub on the embankment.

Some of the graced sections contain more frequent Common Cordgrass cover. Long term Grazing and poaching has promoted the spread of this species into some of the more established ASM vegetation and formed mosaics. This can be seen south of the embankment around Lislaughtin Friary and at Reenturk Point.

The narrow saltmarsh fringe found along the shoreline in some of the other parts of the site usually contains a mixture of clumps of Common Cordgrass (sometimes forming a narrow band of sward) although with a narrow zone of saltmarsh vegetation with a mixture of low, mid and upper species depending on the micro-topography and including Sea Rush (*Juncus maritimus*). Some of this saltmarsh has developed on patches of mud of different heights.

Saltmarsh has also developed at several locations behind berms where there is still some tidal inundation entering along drains. The vegetation at Rusheen was somewhat brackish and was dominated by Common Saltmarsh-grass with frequent Creeping Bent and occasional Sea Aster and Greater Sea-Spurrey (*Spergularia media*). Other species present included Brookweed (*Samolus valerandi*) and Celery-leaved Buttercup (*Ranunculus sceleratus*). The ASM behind the embankment at Lislaughtin Friary shows some typical zonation from a Common Saltmarsh-grass dominated sward to a sward dominated by Red Fescue. The lower zone also contains Sea Aster, Sea Plantain and Sea Milkwort while the upper zone contains Creeping Bentgrass and White Clover (*Trifolium repens*). Both these areas are grazed and somewhat damaged by poaching from cattle with a low sward height. Both these sections were probably improved in the past as there is no sign of any typical saltmarsh structure and have reverted back to saltmarsh vegetation due to tidal inundation.

Mediterranean salt meadows (H1410)

This habitat is mainly found in two large areas at Reenturk Point and at the southern side of the inlet near Ballylongford. The large area of sward at Reenturk Point has developed behind a shingle bar. There is a gentle slope from the shingle bar to the seaward edge of the MSM. This MSM shows some typical zonation with several patches of Common Reed (*Phragmites australis*) within the Sea Rush-dominated sward near the shingle bar. The sward is generally quite tussocky and also contains present Red Fescue. Other species present include Creeping Bent, Sea Milkwort, Common Scurvy-grass, Autumn Hawkbit (*Leontodon autumnalis*), Spear-leaved Orache (*Atriplex prostrata*), Parsley Water-dropwort (*Oenanthe lachenalii*) and White Clover. There are some patches of mosaic with more typical grassy patches of ASM where Saltmarsh Rush is more prominent. Further east there is some transition from the MSM to transitional wet brackish grassland where species such as Purple Moor-grass (*Molinia caerulea*) and Purple Loosestrife (*Lythrum salicaria*) appear. This area shows some signs of erosion in the past with a saltmarsh cliff near the front of the MSM. However, Sea Rush is spreading at the base of this saltmarsh cliff on mixed sediment in places to develop new saltmarsh. In some cases it is spreading into the *Spartina* sward that lines the seaward edge of the MSM sward. Common Cordgrass has also spread into the lower MSM sward, particularly into some of the old drains that were cut through this area. Further east along Reenturk Point there is some development of MSM in a low-lying area where Common Cordgrass is spread more extensively to form a complicated mosaic with patches of *Spartina* sward, patches of ASM and patches dominated by Sea Rush.

The southern section near Ballylongford is not grazed and is quite tussocky and dominated by dense Sea Rush. There are a series of old drains and partially enclosed embankments that probably represent historical land-use and former reclamation. The MSM is species poor and rank in places. Other species present include Red Fescue, Sea Arrow-grass, Sea Milkwort, Creeping Bent, and Spear-leaved Orache. The saltmarsh still contains some large salt pans. Common Cordgrass is not a part of the MSM vegetation at this location. There is some transition on low mounds to a transitional wet grassland type and species like Purple Loosestrife, Silverweed (*Potentilla anserina*), Yorkshire Fog (*Holcus lanatus*) , Soft Rush (*Juncus effusus*) and False Oat-grass (*Arrhenatherum elatius*) appear in the sward, which is still mainly dominated by Sea Rush.

Spartina swards

The *Spartina* swards at this site are very well developed and very mature. The most extensive swards can be seen in the channel between Carrig Island and the mainland. These swards are very dense and cover soft mud. There has been very little habitat succession along the upper boundary of these *Spartina* swards so far. Species such as Common Saltmarsh-grass, Glasswort, Sea Aster and Lax-flowered Sea Lavender are frequently found along the upper boundary but their distribution does not extend very far into the *Spartina* sward.

There is some natural transition from *Spartina* sward to ASM along a landward gradient on a shingle bar at the eastern tip of Carrig Island. This is the best example of this habitat transition at this site and the cover of Common Cordgrass gradually increases from patchy clumps down to dense sward with few ASM elements on a moderate seaward gradient.

There are several small areas where Common Cordgrass has formed mosaics with both ASM and MSM. These mosaics can be seen at Reenturk Point and adjacent to Lislaughtin Friary. Common Cordgrass probably spread into established saltmarsh that was disturbed by the construction of the embankment at Lislaughtin Friary. These mosaics contain patches of pure MSM and ASM vegetation intermixed with *Spartina* sward that has infilled around or sediment

at a lower level. Species such as Lax-flowered Sea Lavender, Sea Aster, Common Saltmarsh-grass, Sea Plantain and Greater Sea-spurrey are all present within the *Spartina* sward created some mixed vegetation. Common Cordgrass has also spread along the back of some of these relic patches of established saltmarsh along drains dug adjacent to the embankment.

IMPACTS AND ACTIVITIES

This site is affected by several impacts and activities (Table 4.1). The main impact affecting this site is the spread of Common Cordgrass. This is an invasive species of saltmarsh and mudflats (954). It was planted in the River Shannon Estuary during the 1930's (Nairn 1986), but it is not known when Ballylongford Creek was planted or colonised by this species. This species has mainly colonised intertidal mudflats to form extensive swards. The area of these swards (77%) now far exceeds the former area of the established saltmarsh. Common Cordgrass has colonised some of the established saltmarsh but it has not replaced an extensive area of this established saltmarsh with *Spartina* sward. There has been some development of patches of *Spartina* mosaics with ASM and MSM. The area of these mosaics is relatively small compared to the total area of established ASM and MSM (0.3 ha or about 2%). The development of these swards has also lead to the development of minor patches of ASM (< 0.01 ha), mainly where there has been some succession of habitat along the upper boundary of the *Spartina* sward. Clumps of Common Cordgrass are also scattered over the established ASM and MSM but do not form a significant part of the vegetation. The impact of its presence is assessed as low negative influence. There is unlikely to have been significant spread of Common Cordgrass during the current monitoring period as the *Spartina* swards are already quite mature. Therefore its impact on the ASM and MSM is assessed as neutral. However it is present in the small area of *Salicornia* flats.

A significant portion of the saltmarsh is grazed. Cattle or sheep access saltmarsh at Lislaughtin Friary, Carrig Island Point and Reenturk (140). Saltmarsh found behind the embankment at Rusheen is also grazed. There is some localised damage and overgrazing that is causing some damage from heavy poaching (143). A track (501) is also located along the upper saltmarsh boundary along the south-east side of Carrig Island saltmarsh. There are several other tracks that bisect the saltmarsh and allow access to the shoreline. There are some signs of nutrient enrichment to the saltmarsh around Saleen Pier.

The site has been modified by reclamation in the past. Some former saltmarsh has been reclaimed by building a polder or berm around the seaward side, enclosing it, and draining and improving this land (870). This is seen at Lislaughtin Friary and in Rusheen Townland. Attempts were also made to enclose some of the estuary on the western side of the channel opposite the friary. The western estuary shoreline south of Rusheen House was significantly modified by the construction of an embankment and reclamation of saltmarsh during the 19th century. However, this wall was breached and the low-lying land has reverted to intertidal flats, *Spartina* sward and some ASM behind this embankment. There have been smaller enclosures on Carrig Island. There is still some saltmarsh in hollows and along drains behind some of these embankments where there is still some tidal influence. These impacts are not assessed as they occurred outside the current monitoring period.

There has been some infilling of saltmarsh at various points around the site. A small hollow with some ASM behind an embankment at the northern side of the Carrig Island was being infilled at the time of the survey (803). This infilling has destroyed about 0.15 ha already and if the hollow is complexly infilled then about 0.3 will be infilled. There has also been some infilling of ASM and *Spartina* sward at Rusheen House in the intertidal area behind the seawall. About

0.2 ha has been infilled at this location, but over a longer period of time and some of the infilling has occurred outside the current monitoring period.

Erosion (900) has not been a significant impact at this site. While typical indictors of erosion appear around the site, particularly along the seaward side of the saltmarsh at Reenturk Point where there is some scouring along a saltmarsh cliff, there is no indication of any significant erosion. A comparison of the OSI 2nd edition 6 inch map to the current 2005 series aerial photos shows that there has been no significant erosion during this period. So there has been no significant erosion during the current monitoring period either. The extensive *Spartina* sward probably protects the other established saltmarsh to some extent. The impact of erosion is assessed as neutral.

Impacts and activities around the site are mainly related to farming (102, 120, 140). There is scattered habitation (403) around this site and a sewage outflow is likely to be responsible for the nutrient enrichment seen at one location. Ballylongford Town Is positioned adjacent to the southern end of the inlet (402). Roads are located to the site at several locations including at Carrig Island where the road marks the upper limit of the *Spartina* sward and there is some tidal inundation over this road during high spring tides. There is a small pier at Saleen Harbour with some moored fishing boats.

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

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
1310	954	B	-1	0.003	Inside
1330	140	C	0	3.0	Inside
1330	143	B	-1	2.5	Inside
1330	501	C	-1	0.1	Inside
1330	803	A	-2	0.2	Inside
1330	900	C	0	0.5	Inside
1330	954	C	-1	1.0	Inside
1410	140	C	0	2.0	Inside
1410	143	B	-1	2.5	Inside
1410	900	C	0	0.5	Inside
1410	954	C	-1	1.0	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.

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 NHA survey, 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 was no specific information available for this site.

Carrigafoyle saltmarsh contains few features of significant conservation interest. It has been significantly modified over the years by the construction of the berms. Common Cordgrass has colonised the estuary to create dense swards, mainly on former unvegetated mudflats, but has spread into the established saltmarsh in places. The overall conservation status is *unfavourable-bad*. Some of the ASM has been damaged by infilling.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

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

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable – Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (1310)	Extent Structure and functions	Future prospects		Unfavourable - Inadequate
Atlantic salt meadows (1330)		Extent	Structure and functions, Future prospects	Unfavourable - Bad
Mediterranean salt meadows (1410)	Extent	Structure and functions, Future prospects		Unfavourable - Inadequate

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

Extent

The extent of this habitat is assessed as *favourable*. Only a very small area of this habitat was recorded at this site. There has been no significant loss of habitat due to land use changes, development, spread of Common Cordgrass or erosion within the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Due to the very limited extent of this habitat no monitoring stops were recorded in the habitat. However, a visual assessment indicates that the structure and functions of the habitat seem to be favourable. Common Cordgrass is present within this habitat although it is not known if this species has spread significantly due to the lack of accurate baseline information.

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 such as

grazing continue in the near future. Common Cordgrass is present within this habitat and has the potential to spread within this habitat in the future and threaten the extent of the habitat.

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *unfavourable-inadequate*. There has been a small loss of habitat due to recent infilling at two separate locations. There has been no other significant loss of habitat due to land use changes, the spread of Common Cordgrass or erosion within the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-bad.* Fifteen monitoring stops were carried out in this habitat and six stops failed. The main reasons for the failed stops were over-grazing and poaching by cattle. There is localised damage from cattle grazing around the site on the established saltmarsh and in saltmarsh behind the embankment. Some sections of the ASM are in relatively good condition.

The ASM saltmarsh at this site is quite diverse overall with several different zones and vegetation communities present due to differing conditions and topography around the site. The best developed SM with the best example of saltmarsh structure is located at the head of the inlet. This section has typical saltmarsh zonation from low-mid to high marsh zones. Creeks and salt pans are present. The structure of many of the other saltmarsh portions has been modified in the past by land reclamation. Common Cordgrass is present at this site and has formed extensive swards, mainly on mudflats at the seaward side of the established saltmarsh. It has colonised some ASM to form a *Spartina*/ASM mosaic but this is a relatively minor area compared to the overall area of ASM. This colonisation probably occurred prior to the current monitoring period so the spread of Common Cordgrass is assessed as neutral.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad.* This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. The ASM is vulnerable to further infill in the future and one area at the northern side of Carrig Island is vulnerable to being completely destroyed. The current level of grazing is causing localised damage and this is likely to continue in the future. Common Cordgrass has already created mature swards at this site so its capacity for further colonisation of the saltmarsh is limited at this site.

Mediterranean salt meadows (H1410)

Extent

The extent of this habitat is assessed as *favourable*. There has been no significant loss of habitat due to land use changes, development and the spread of Common Cordgrass or erosion within the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate.* Eight monitoring stops were carried out in this habitat and they all passed. All of the attributes reached their targets for favourable conservation status of the structure and functions at the monitoring stops. Most of the MSM habitat is in good condition. However, these monitoring stops do not reflect some localised damage caused by cattle grazing and poaching along

Reenturk Point. Therefore the conservation status of the structure and functions are revised as *unfavourable-inadequate*.

The MSM has a typical species assemblage and some zonation is evident in several sections, particularly at Reenturk Point. This area has a largely unmodified structure in places and some salt pans are present. There is some natural unmodified transition to transitional wet grassland, which contains terrestrial species. However the structure of most of the MSM saltmarsh has been modified by land reclamation and drainage in the past. Common Cordgrass is not a significant feature of most of the MSM but it has spread into some small areas forming mosaics with the MSM.

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 such as grazing continue in the near future. Grazing is causing some localised damage to this habitat and is likely to continue to do so in the future. Common Cordgrass is not likely to spread into this habitat in the future.

MANAGEMENT RECOMMENDATIONS

There are no specific management recommendations for this site.

REFERENCES

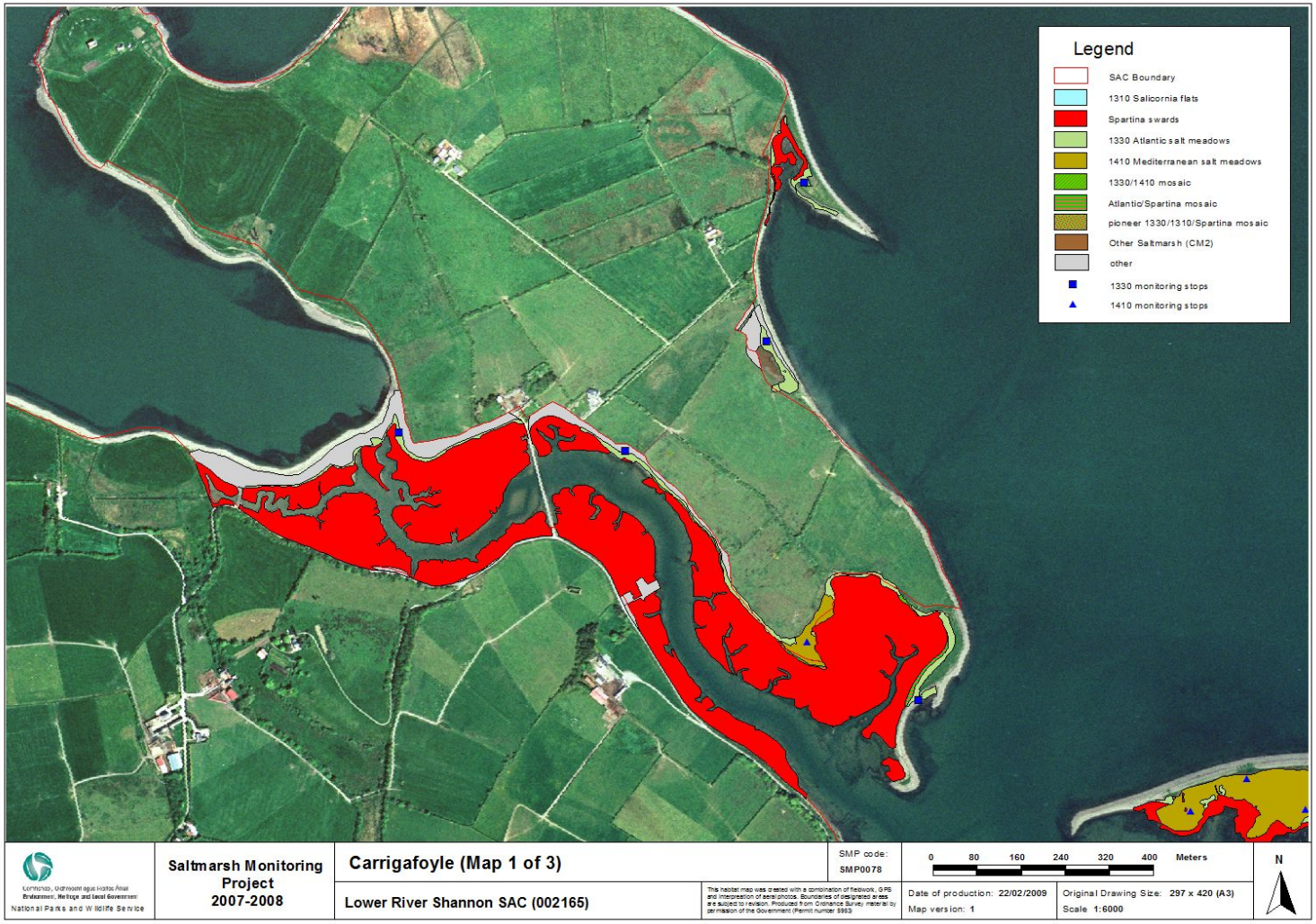
Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

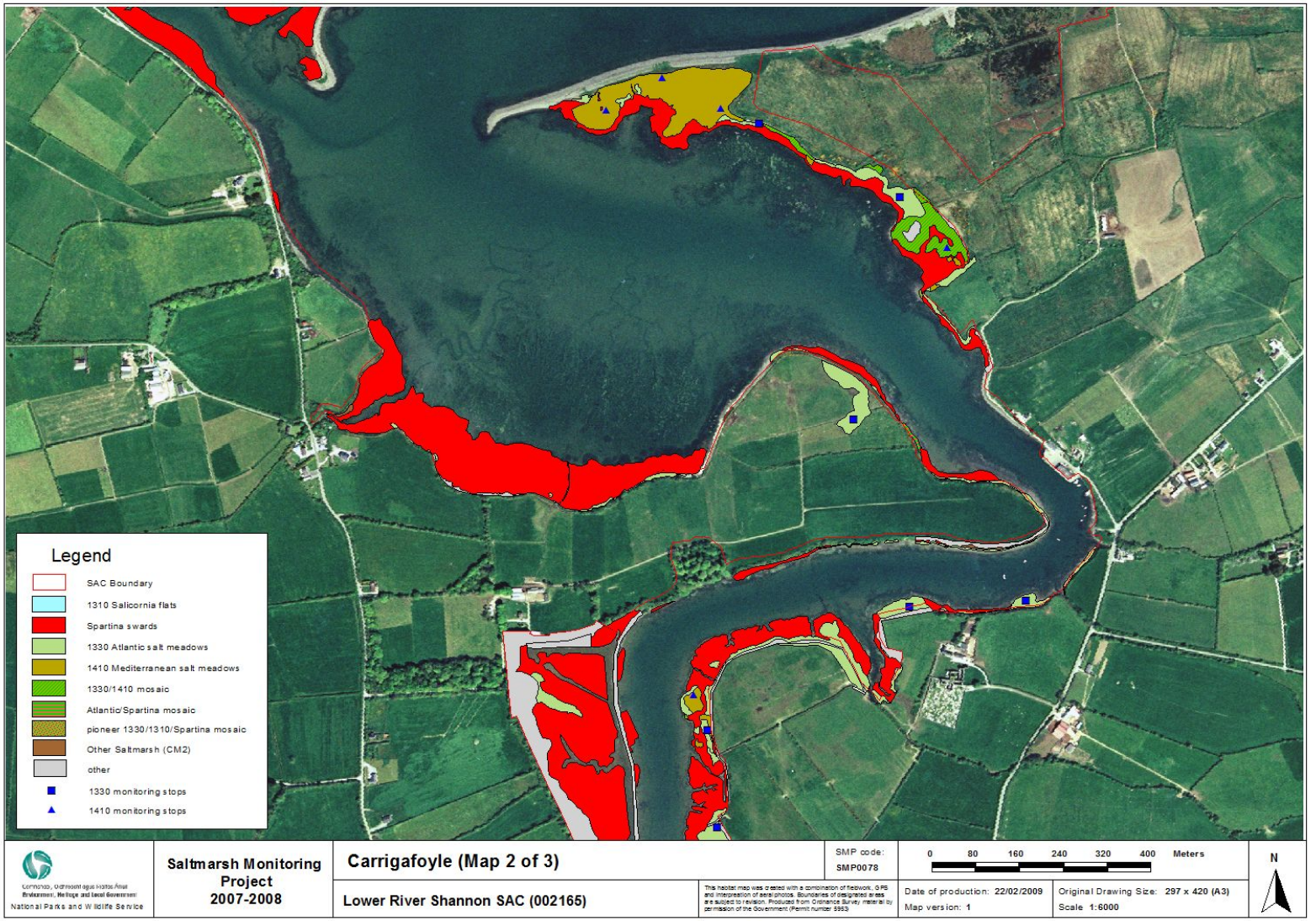
Nairn, R.G.W. (1986). *Spartina anglica* in Ireland and its potential impact on wildfowl and waders - a review. *Irish Birds*, **3**, 215-258.

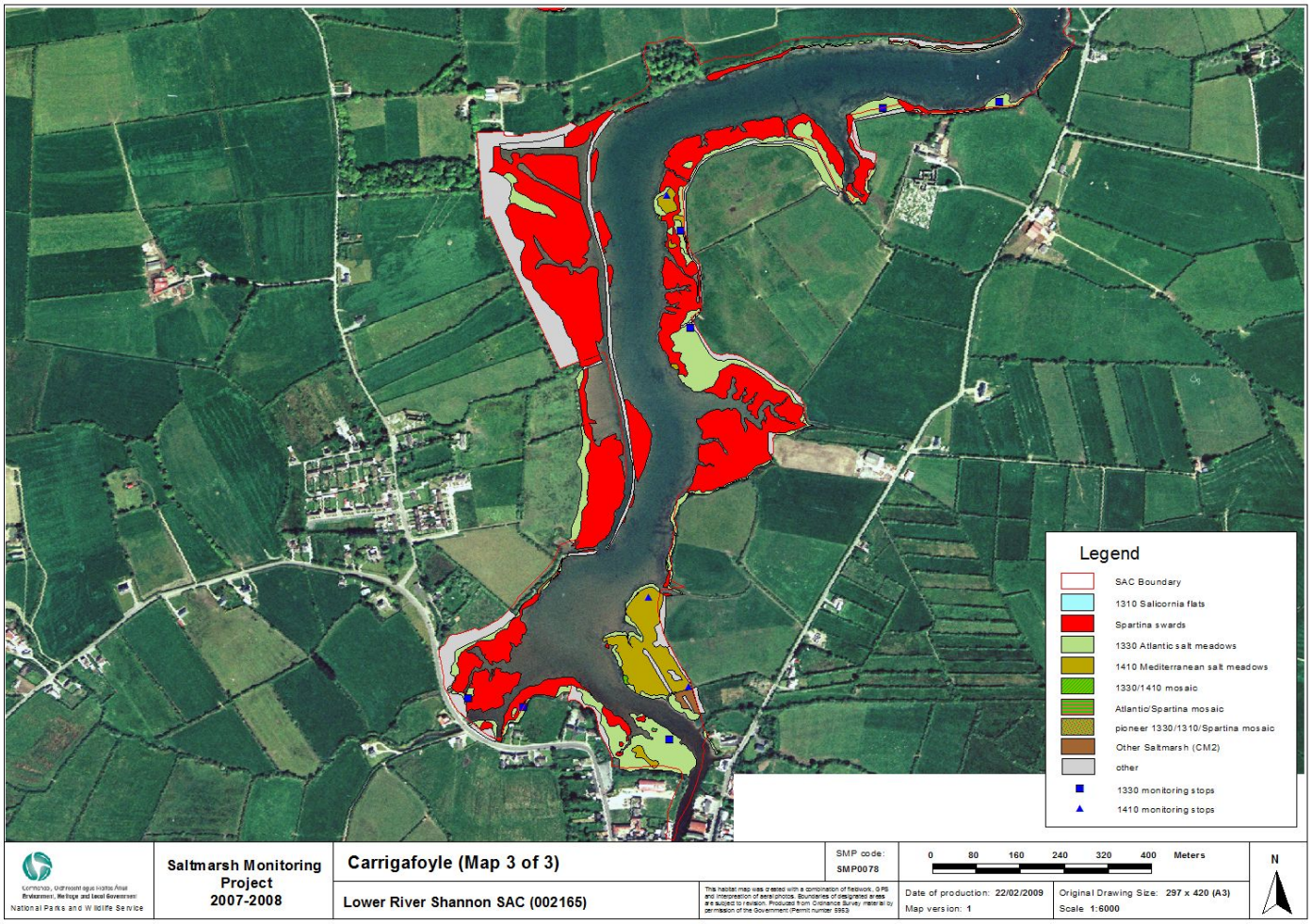
APPENDIX I

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 *Salicornia* flats	0.001	0.001				
2	Spartina swards	40.021					40.021
3	1330 Atlantic salt meadow	7.081		7.081			
4	1410 Mediterranean salt meadow	4.153			4.153		
5	ASM/MSM mosaic (50/50)	0.812		0.406	0.406		
6	ASM/*Spartina* mosaic	0.202		0.101			0.101
7	1330/other SM (CM2) mosaic						
8	1330/coastal grsld mosaic						
9	Other (non saltmarsh)	7.023					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic	0.007	0.002	0.002			0.002
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some Spartina						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.186					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**59.486**	**0.003**	**7.589**	**4.559**		**40.124**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
pioneer 1330/1310/Spartina mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Carrigafoyle (Map 1 of 3)
SMP code: SMP0078
0 80 160 240 320 400 Meters
N
Lower River Shannon SAC (002165)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 9953)
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6000
National Parks and Wildlife Service


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
pioneer 1330/1310/Spartina mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Carrigafoyle (Map 2 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0078
0 80 160 240 320 400 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6000
National Parks and Wildlife Service


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
pioneer 1330/1310/Spartina mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
National Parks and Wildlife Service
Saltmarsh Monitoring Project 2007-2008
Carrigafoyle (Map 3 of 3)
SMP code: SMP0078
0 80 160 240 320 400 Meters
N
Lower River Shannon SAC (002165)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 6953)
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6000

Appendix IV – Barrigone site report and habitat map from the SMP (McCorry and Ryle, 2009)

SITE DETAILS

SMP site name: **Barrigone/ Aughinish**		SMP site code: **0079**
Dates of site visit: **21 & 22 May 2008**		CMP site code: **N/A**
SM inventory site name: **Barrigone, Aughinish**		SM inventory site code: **150**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **0435**	SPA: **4077**
County: **Limerick**		Discovery Map: **64** Grid Ref: **127710, 150670**
Aerial photos (2000 series): **O 4858-B; O 4859-A**		6 inch Map No: **Li 010**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Beagh, Bunratty, Shepperton/Fergus Estuary, Inishdea/Owenshere, Killadysart/Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

This site is located along the south side of the River Shannon Estuary, near the village of Barrigone. It is located approximately 25 kilometres north-west of Limerick City along the N69 road leading to Foynes. Although the area is largely characterised by its farming background, mostly livestock, the Alumina plant directly to the north of Barrigone is the most noticeable landmark and occupies all of Aughinish Island. The survey site includes a small inlet off the main estuary. This inlet widens out south of Aughinish Island to form a large intertidal area. This area is connected to the main estuary by the narrow Robertstown River Channel. The landscape around this area is mainly low-lying and one of the main features of the site are the tall embankments along much of the shoreline of the intertidal area.

Saltmarsh is found along the seaward side of many of these embankments. The seaward boundary of the survey site is marked by the abandoned railway track that crosses the narrow river channel. A narrow fringe of saltmarsh extends southwards along either side of this narrow creek before opening up into two separate inlets, where it occurs on the mudflats and extends around a large part most of the coastal fringe. The eastern inlet extends in the direction of Barrigone, whilst the larger western inlet extends into the town known as Churchfield. It should be noted that saltmarsh habitat extends outside the survey site along the Robertstown River Channel and north of the railway bridge, but this was not surveyed.

Barrigone/Aughinish saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC 2165). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species like Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three-headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). However, none of these species is known from Barrigone/Aughinish area. Three Annex I habitats are listed as qualifying interests for this cSAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats were found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

Barrigone/Aughinish is one of two sites in County Limerick that were surveyed as part of the SMP project, Beagh being the other site. Curtis and Sheehy-Skeffington (1998) however, recognised five saltmarsh sites along Limericks relatively small coastline. In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare.

In terms of accessibility, most of the saltmarsh is located on the seaward side of the extensive coastal embankments that were installed to prevent flooding and in an effort to reclaim agriculturally useful land. However, there is little public access onto the marsh and the only right of way onto the mudflats is located at a gate 130metres north-west of the church car-park. Elsewhere the saltmarsh was accessed at a number of locations by crossing over private property with the permission of local landowners. However, it was not always possible to identify landowners and it is possible that once on the saltmarsh, some privately owned saltmarsh were crossed as part of the survey.

SALTMARSH HABITATS

General description

This site and the development of the saltmarsh is largely characterised by earlier anthropogenic management regime. The narrow Robertstown River inlet which leads into this sheltered intertidal zone has been greatly modified through the construction of an extensive embankment, with the result that a considerable area of ground has been reclaimed. The intertidal inlet may at one time have consisted of a single larger area, but now comprises two smaller inlets. The saltmarsh vegetation occurs throughout the site and while it is regarded as

a single contiguous unit, there are differences in the distribution of some habitats. Indeed, gaps are not uncommon in the vegetation and these often occur along the narrower part of the inlet and around less sheltered parts of the site fronting the embankment.

Barrigone/Aughinish is listed as an estuarine marsh that has developed over mud (Curtis and Sheehy-Skeffington 1998). Whilst the site is characterised by extensive mudflats, other substrates that were noted include consolidated clays, peats and occasional glacial deposits. In terms of Annex I saltmarsh habitats, this site is characterised by the extensive development of *Spartina* swards on the mudflats and features Atlantic salt meadows (ASM) and Mediterranean Salt meadows (MSM), along with a negligible amount of *Salicornia* and other annuals colonizing mud and sand (*Salicornia* flats). These latter habitats are generally located to the landward side of the *Spartina* swards, although this is not always the case. The total area mapped for each of these habitats is shown in Table 3.1. The majority of the saltmarsh vegetation that was mapped at this site is located inside the cSAC. The only notable discrepancy is almost 2ha of ASM that extends beyond the cSAC boundary. Part of the north-eastern boundary of the site, follows the edge of a creek, in part, as shown on the 6inch map. However, a large part of the boundary was arbitrarily drawn along a fence-line that has since been removed.

It should be noted that additional saltmarsh vegetation occurs to the north or seaward side of the site beyond the abandoned Foynes railway. It was not possible to continue surveying beyond this point as much of the land is in private ownership of Aughinish Alumina plant and would entail crossing around the extensive tailings pond that is situated in this area.

Much of the western or Churchfield inlet is characterised by extensive sward development on the mudflats. This part of the saltmarsh is not as diverse as other parts of the marsh. There is no development of MSM here and the *Salicornia* flats were only recorded from recently excavated soil along the front of the embankment. The ASM is widely distributed throughout this half of the site, although it is fragmented and often consists of narrow fringe, particularly along the embankment. For the most part, mosaics between the two main habitats were not a feature of the western half of the site. The embankment greatly influences this part of the marsh and forms a definite upper boundary with the ASM. The remaining low-lying land that is associated with the marsh, here, is mapped as transitional or non saltmarsh. They are mostly characterised by derelict grasslands of varying composition.

Towards Barrigone and the eastern inlet, a greater diversity of habitats and structural composition of the saltmarsh was recorded. Again the *Spartina* sward is extensive, but it occurs along much of the frontline, except towards the most inner parts of the inlet. However, the extent of the ASM is more substantial, occurring as a relatively large plain, particularly towards the north-eastern corner of the site. A considerable amount of MSM was also recorded here. The distribution of these three habitats in this area is controlled by a network of creeks.

Continuing southwards into the upper reaches of this inlet, there is a gradual diminution in the extent of the *Spartina* sward further south. Indeed a considerable amount of it is mapped as mosaic with ASM. Both the ASM and MSM are more fragmented around this area. The gradation between saltmarsh and other habitats is usually distinct, although occasionally the development of transitional wet grassland was noted.

Table 3.1. Area of saltmarsh habitats mapped at Barrigone, Aughinish.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.0001
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	10.2
H1410	Mediterranean salt meadows (Juncetalia maritimi)	2.41
non-Annex	*Spartina* swards	12.67
	Total	**25.28**

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

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

A single, almost negligible patch of Glasswort (*Salicornia europaea* agg.) vegetation was recorded along the northern part of the site. The annual vegetation was recorded on perched ASM fringe at the foot of the recently regarded berm. During the enhancement of the flood defences, long areas of ground at the foot of the berm were mechanically scraped and the soil was deposited atop the berm to increase its height. The disturbance, which resulted in the loss of ASM, created a niche in which the patchy annual vegetation became established.

Atlantic salt meadows (H1330)

The ASM deceptively occupies almost as much territory as the *Spartina* sward (Table 5.1). Totalling approximately 10ha in extent, however, the ASM is more widely distributed. And unlike the *Spartina* sward which is characterised by dense Common Cordgrass, the ASM is mostly comprises a narrow fringe, some of it discontinuous, along with a number of discrete saltmarsh plains, most noticeably along the eastern half of the site.

The majority of ASM vegetation occurs as pure marsh, but it is also mapped separately, occurring variously in mosaic with MSM, *Spartina* sward or rocky shore mosaic. A final category, has a small patch (0.25ha) dominated by ASM, but in which there is a definite presence of Common Cordgrass (5%). It is possible to distinguish zonation from this site, although, they rarely occur as a continuous sequence.

Bare ground in the lower marsh is typically up to 10%, but can account for up 40% of a monitoring stop. The vegetation is dominated by Common Saltmarsh Grass (*Puccinellia*

maritima) along with occasional contributions from species such as Sea Aster (*Aster tripolium*), Sea Milkwort (*Glaux maritima*) and Greater Sea-spurrey (*Spergularia media*). Unsurprisingly, Common Cordgrass is a frequent component of the lower marsh and can account for up to 40% of the area.

The transition from low to low/mid and mid marsh is typified by the presence of species such as Thrift (*Armeria maritima*), Common Scurvy Grass (*Cochlearia officinalis*), Sea Plantain (*Plantago maritima*) and Sea Arrow-grass (*Triglochin maritimum*). Common Saltmarsh-grass is commonly recorded in the lower transition and typically accounts for between 50 and 75% ground cover. There is a considerable decrease in the amount of Common Cordgrass that is recorded in this part of the marsh and it is generally found as small isolated tufts along creeks or in pans.

The mid/upper and upper marsh is the most extensively developed community of the ASM vegetation. It is characterised by a graminoid sward in which saltmarsh herbs also occur. Dominated by Red Fescue (*Festuca rubra*), other constantly occurring species include Saltmarsh Rush (*Juncus gerardii*) whilst Creeping Bent (*Agrostis stolonifera*) is commonly abundant in wetter conditions. Herbaceous species that were constantly recorded included Sea Aster, Sea Milkwort, Sea Plantain and Sea Arrow-grass. The floristic diversity of the upper marsh is characterised by the presence of a large number of occasionally occurring species such as White Clover (*Trifolium repens*), Autumns Hawksbill (*Leontodon autumnalis*), Curled Dock (*Rumex crispus*), Common Scurvy Grass and Thrift. The occurrence of Common Cordgrass was very much reduced in the upper marsh. Where it was recorded, this was usually due to drainage channels such as creeks or shallow wet runnels. Sea Wormwood (*Artemisia maritima*) was a notable species that was occasionally recorded in the upper marsh. However, its greatest extent was found along the berms, in unpointed gaps between the blocks and boulders.

A number of separate habitats are recorded, in the transition from saline to brackish or terrestrial zone. In some situation the ASM has developed against the embankment and so is not backed by another habitat, rather by an assemblage of mixed species. Mostly, however, the ASM grades into wet grassland which, depending on the drainage, has varying degrees of As the drainage improves upslope, the wet grassland transition, dominated by Twitch (*Elymus repens*) is replaced by grassland species. On drier soils underlain by glacial till or in situations where the density of livestock is reduced, species-rich calcareous grasslands are recorded. Elsewhere, the transition is towards agriculturally-improved pasture, although occasionally it is demarcated by hedgerow or patches of scrub.

Mediterranean salt meadows (H1410)

The majority of the 2.41ha of MSM is located on the eastern inlet and is largely recorded from within the boundary of the cSAC. The vegetation is characteristically dominated by Sea Rush

(*Juncus maritimus*) which is distinctive in its appearance. And although it may at times be as tall Common Cordgrass, it is unlikely to be misdiagnosed.

The lower boundary of the MSM is generally demarcated by the *Spartina* sward, although occasional patches of ASM vegetation were also noted. Where the MSM is fronted by, or occurs directly on the mudflats, it is characterised almost entirely by Sea Rush. This usually occurs in small patches or as a narrow or linear band along the mudflats. Unlike the ASM vegetation, in which a certain degree of zonation was evident, the majority of the MSM is classified as upper marsh. It is generally found on level peaty plain that is perched anywhere from 30cm to 1 metre above the mudflats. The area although level can be treacherous underfoot due to drainage features that bisect the site as well as localised damage including trampling.

In addition to the Sea Rush, other regularly occurring species include: Red Fescue, Sea Milkwort, Saltmarsh Rush, Sea Plantain, Sea Arrow Grass and occasionally, White Clover, Common Scurvy Grass, Autumn Hawksbill, Sea Aster and Thrift. Given that a large part of the MSM habitat occurs on saturated peat soils, Creeping Bent is common and in many instances, is more abundant than Red Fescue. Sedges such as Distant and Long-Bracted Sedges (*Carex distans* and *C. extensa*) were also infrequently recorded in the MSM and it is interesting that they were not noted in the ASM. In one location, the freshwater influence on pans resulted in the occurrence of Brookweed (*Samolus valerandi*). Most of the vegetation occurs as pure MSM. A small amount of the MSM vegetation occurs as a mosaic with ASM.

Common Cordgrass is found within the MSM, particularly in the north-east corner of the site. The distribution of Common Cordgrass is generally related to the underlying topography and is found in lower lying parts of this habitat, including along the creeks and channels in this area. A habitat mosaic with *Spartina* swards and MSM has developed in this area. However, Common Cordgrass does not form a significant part of the MSM vegetation overall. The saltmarsh topography within the MSM is well-developed, particularly in the north-east corner of the site where there is an intricate network of creeks. Salt pans and depressions are also present.

The upper boundaries of the MSM are characterised by a number of different habitats, mostly *Spartina* sward and ASM communities, although transitional vegetation including wet or agricultural grassland and hedgerow.

Spartina swards

This habitat is widely distributed around this site and it is extensively characterised by pure sward which occurs on the mudflats throughout the two inlets. Although the sward might appear to dominate the saltmarsh and occupy a considerable portion of the site, in terms of

total area (12.67ha), it is only slightly greater in extent than the ASM. Apart from a negligible 0.219ha, the remainder of the Spartinion is located within the cSAC boundary.

Large tracts of the mudflats have been colonised by Common Cordgrass (*Spartina anglica*) and the majority of the this habitat occurs as pure sward. It is interesting that isolated tufts or small patches of developing *Spartina* sward vegetation were not a feature at this site. Asides from pure sward, however, the Common Cordgrass commonly transitions into ASM and it has been mapped as an ASM/*Spartina* mosaic, although occasionally, the sward can extend in behind the saltmarsh habitats, particularly around the north-eastern inlet of the site, where the sward is often found behind both MSM and ASM communities. This is due to the network of deep creeks that bisect this area.

IMPACTS AND ACTIVITIES

Several impacts and activities affect this site (Table 4.1), although many of them are localised in extent or impact. Historically, much of this site has been considerably remodelled and large areas of land have been reclaimed from within the sheltered intertidal inlet through the construction of an embankment. The embankment is extensive and is found along a large part of the western perimeter of the site as well the central townland landmass known as Oorla. It has obviously had an impact on the development of the saltmarsh and its various communities, including the sedimentation patterns and the spread of Common Cordgrass. These impacts are not assessed, as these activities and impacts commenced some time ago, they are only assessed in terms of any current or recognisable impact.

Common Cordgrass is present at this site. It is an invasive species of saltmarsh (954). First planted in the Shannon region in 1928, (Nairn 1986), it has since flourished and is widely distributed. It is not known when this invasive species first took hold at this site, but it has thrived on the extensively sheltered mudflats in the Shannon Estuary. It has developed extensive swards at several locations around this site. This sward development has been at the expense of both intertidal mudflats and established saltmarsh that was likely to contain ASM and MSM. There has also been significant creation of *Spartina* sward mosaic areas, mainly in areas of former established saltmarsh. This indicates that the spread of Common Cordgrass has had a negative impact on the extent of both ASM and MSM. The impact of its presence is assessed as a medium negative impact on these mosaic areas. However, due to the lack of baseline data it is difficult to judge if Common Cordgrass has spread significantly within the current monitoring period. It is likely that much of this sward development has occurred prior to this current monitoring period as Common Cordgrass has been established in the Shannon Estuary for a relatively long time.

In terms of agricultural management, grazing is the most prevalent activity (140). Many of the larger areas of saltmarsh are grazed in the summer months and possibly the winter months. Trampling was evident throughout much of the ASM and tracks (501) are not uncommon. These were rarely significant except around pinch-points such as gates or crossing points. Other damaging activities (143) included poaching and vegetation denudation. Despite the inclement summer and the fact that large parts of the saltmarsh were waterlogged, it was apparent that some parts of the marsh had an unsustainable level of livestock.

Not all of the tracks, however, were as a result of livestock or the occasional pedestrian. Some tracks are man-made, or at least have been improved upon, through the incorporation of hard core and rubble. The majority of these tracks are associated with the embankment, where tracked excavators have recently been working, making repairs and the like (810). Another impact associated with this maintenance regime has resulted in the loss of saltmarsh habitat. Soil is excavated (820), in places up to 0.5metres deep and the scraped material is then placed atop the embankment, both to increase its height and also to make a level surface along its ridge. This disturbance has lead to the development of the small patches of *Salicornia* flats at the site. It is also likely to encourage the spread of Common Cordgrass into the ASM.

There have been some small scale attempts at reclamation of land from the sea (800). Rubble and clay have been imported in a limited number of places and dumped atop presumably what was saltmarsh. Where encountered, this was often of recent origin, given that these areas were largely unvegetated and the nature of the foreign, organic soil was apparent. Elsewhere agricultural improvement including scrubbing out of hedges and the levelling of rubble downhill over the saltmarsh (803). The hedging, which is inside the cSAC boundary around a number of fields outside of the designated site, is located in an isolated patch of land above the saltmarsh at IslandMcTeige, below the old railway line. This activity happened some time after the series 2005 photographs were taken, as the hedges are still visible.

There are some indicators of erosion (900) at this site. While large parts of the site are bounded on their seaward side by *Spartina* sward, this is not always the case. Both ASM and MSM communities have some frontline exposure. Much of the fragmented saltmarsh fringe, largely dominated by ASM community, on the seaward boundary of the embankment is characterised by a tall cliff face, which in places is undercut or slumped. Elsewhere, the frontline of the saltmarsh varies in height from a gentle slope from the mudflats to a distinct terrace. Often the terracing has a convoluted frontline, which is indicative of erosion. And although indicators of erosion were apparent, it is not possible to detect any measurable loss of saltmarsh habitat between the year 2000 and series 2005 ortho-photographs. Erosion is assessed as having a low negative impact on a portion of the saltmarsh.

The small patches of saltmarsh vegetation that occur outside are similarly affected by impacts and activities that are listed from within the cSAC. The hinterland is predominantly agricultural, with much of the lower-lying ground consisting of reclaimed land. There are some areas of dispersed settlement or even individual residences, but most of these have been in existence for some time and so are not considered in this monitoring period. The fragments of both ASM and MSM are moistly affected by grazing (140), and damage associated with it (143), tracks (501), some minor dumping of garden and household waste (700), along with some land reclamation (803) although it is contiguous with that described from one area inside the cSAC boundary. These activities have little measurable impact on the saltmarsh habitats, other than those that have already been assessed.

Table 4.1. Intensity of various activities on saltmarsh habitats at Barrigone, Aughinish.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1310	820	A	1	0.0001	Inside
H1330	140	C	0	6.0	Inside
H1330	143	B	-1	3.5	Inside
H1330	501	C	0	0.5	Inside
H1330	803	A	-2	0.1	Inside
H1330	820	A	-2	0.15	Inside
H1330	900	C	0	0.2	Inside
H1330	954	B	-1	2.5	Inside
H1410	140	C	0	1.85	Inside
H1410	143	C	-1	0.15	Inside
H1410	501	B	-1	0.15	Inside
H1410	803	A	-2	0.005	Inside
H1410	900	C	0	0.05	Inside
H1410	954	B	-1	1.2	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.

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 NHA survey, 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.

Barrigone saltmarsh has some notable features. Sea Wormwood, a species of local distinctiveness, is found and this site. The saltmarsh has been considerably modified in the past through drainage and reclamation works including the construction of considerable lengths of embankment and berms. However, these operations were finished a long time ago and are shown on the 2nd edition 6inch map. Since the publication of that map, there is an indication of an overall increase in the area of saltmarsh vegetation at this site over the past century mainly as a result of the development of *Spartina* swards.

The overall conservation status of the saltmarsh at Barrigone/Aughinish is rated as *unfavourable-bad* (Table 5.1). The assessment is largely based on the condition of the ASM. Most of the site has been affected in some form either through grazing or repair works along the berm. These works have created trenches at the base of the embankments within the ASM that now contain bare mud and they are likely to encourage the spread of the Common Cordgrass into the ASM.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Barrigone, Aughinish.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions		Future prospects	Unfavourable - Bad
Atlantic salt meadows (H1330)		Extent	Structure and functions Future prospects	Unfavourable - Bad
Mediterranean salt meadows (H1410)	Extent Structure and functions Future prospects			Favourable

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

Extent

While Glasswort is occasionally recorded as a minor component in the both the ASM and MSM vegetation at this site, there is no information as to this habitat's occurrence let alone its distribution at this site. That a single patch was recorded on recently disturbed ground suggests that the extent of this habitat is assessed as *favourable*.

Habitat structure and functions

A *favourable* rating is based on a visual assessment, given that monitoring stops were not carried out. The single small patch of this habitat which was recorded occurs on recently excavated clay is typical of establishing annual vegetation. Given the extent of the *Spartina* sward, it might be suggested that this annual habitat has suffered in terms of its extent.

Future prospects

There is no information as to its previous distribution at this site. The presence of the habitat on bare, perched ground, although negligible, at the site is solely due to the excavation in parts of the saltmarsh to reinforce the berm. It is uncertain as to its persistence and it may be that as the vegetation cover develops, that it may be replaced by ASM which is the predominant vegetation surrounding it. For this reason, the future prospects are assessed as *unfavourable-bad*, as the habitat may not be recorded during the next monitoring period.

Atlantic salt meadows (H1330)

Extent

The extent of the ASM is assessed as *unfavourable-inadequate*. The occurrence of ASM along many of the inlets of the Lower Shannon is well documented and is shown on early NPWS maps. However, it is recognised that given the size of this cSAC, that the earlier vegetation maps are inaccurate. Notwithstanding this difficulty it is clear that the ASM is long established at this site and a large area is characterised by mature upper marsh vegetation.

Common Cordgrass has spread into the former established ASM at various locations around the site and has formed some ASM/*Spartina* sward mosaic. However this colonisation has largely occurred prior to the current monitoring period and is therefore not assessed as a negative impact on the extent of ASM.

Analysis of the recent year 2000 and the more recent 2005 series aerial photographs does not reveal any discernible change in the extent of the saltmarsh. However, there is a

confirmed loss of ASM habitat in the north-eastern half of the site. Recent field improvement of a number of sloping fields included scrubbing out 200 metres of hedgerow and regrading the ground so that excessive water from the fields would more freely drain into the marsh. Approximately 0.1ha of ASM habitat has been lost as earth was piled onto the saltmarsh. Some habitat has also been lost due to the removal of sediment from trenches in the ASM along the embankments. This represents a loss of about 2% of habitat.

Habitat structure and functions

The structure and functions are rated as *unfavourable-bad*. Twenty monitoring stops were carried out across the site, covering all zones and differences in the management. Of those, eight stops failed, which was largely due to the levels of damage associated with livestock. Within each separate farming unit, much of the larger portions of ASM are freely accessible to livestock density is such that trampling and overgrazing are a common feature of the habitat. Elsewhere some of the damage and loss of habitat is attributable to the recent engineering works where tracked diggers were brought onto the site to repair or improve the flood defences/coastal protection works. This operation has affected the structure of the marsh in places and the imprint of the heavy machinery was still visible 2 years after its completion. The ruts in the soft ground were common along much of the seaward side of the berm, and the vegetation denuded where soil had been excavated.

Several typical ASM communities are found at this site and there are some examples of zonation between these communities in places. Sea Wormwood, a species of local distinctiveness is found in the upper saltmarsh zone at this site. These are positive indicators. Common Cordgrass has spread into the ASM at locations around the site and has formed some ASM/*Spartina* sward mosaic. However, the impact of its spread on species composition is assessed as neutral, mainly due to the lack of accurate baseline data. The structure of this saltmarsh has also been modified in the past by reclamation and construction of embankments in the past. These are negative indicators.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad* (Table 5.1). This assessment assumes that the current management activities and levels of impacts continue in the near future. There are a small number of activities that are significantly affecting this habitat at present. While there are a number of different landowners associated with this, the overall land management practices in the area are likely to have a serious impact on the quality and extent of the ASM habitat in the future. Grazing is allowed on all available and accessible parts of the saltmarsh. The levels of grazing are such that large areas of the ASM have been suffered damage which includes trampling, poaching and overgrazing and it is unlikely that there will be any change in the condition of the ASM in the foreseeable future. It should be noted that the high levels of damage that are associated with the stocking density

were compounded by the unseasonably wet summer, which resulted in much of the site being waterlogged for most of 2008.

Another issue which has a localised impact, but is nonetheless of some importance is the cyclical repair works of the berm. Until the operation is rethought, the excavation of saltmarsh soils will recur in the near future.

There is unlikely to be significant further spread of Common Cordgrass into this ASM, as it is already well established at this site and has already established in to those low-mid zones that were vulnerable to its colonisation. However, excavation and disturbance to the ASM that are related to berm repairs leaves it vulnerable to continued colonisation by Common Cordgrass at this site.

Mediterranean salt meadows (H1330)

Extent

The extent of this habitat is assessed as *favourable* (Table 5.1). There is no reliable information as to the previous distribution of the vegetation. Although nowhere near as extensive as the either the ASM or *Spartina* sward, it is fair to assume that it has occurred at this site for some time, given that it generally occurs as large swards in the eastern inlet. Rarely is the MSM found on the mudflats as it is usually fronted by *Spartina* sward, although one relatively large patch occurs directly on mud.

There would appear to be few impacts which affect this habitat. There are no indications that the extent of MSM has been affected by erosion, land-use changes or colonisation by Common Cordgrass within the current monitoring period. MSM does form a mosaic with *Spartina* sward in the north-east corner of the site and Common Cordgrass has spread into this area. However, this colonisation is likely to have occurred prior to the current monitoring period and it was therefore not assessed as a negative impact on species composition.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Four monitoring stops were carried out in the MSM, all of which passed. There are few impacts and activities acting on this habitat, apart from grazing. Although the MSM is freely accessible to livestock, the grazing intensity is low, resulting in vegetation that is relatively uniform and rank. And unlike much of the adjacent ASM habitat which is heavily damaged by livestock, the only evidence of their impact on the MSM includes trails or localised poaching such as at crossing points. The MSM has a species typical species assemblage. Common Cordgrass is found in this habitat but does not form a significant part of the vegetation.

Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management regime and levels of impacts including grazing continue in the near future. Although heavy grazing levels are negatively affecting the ASM, the MSM is not affected to the same extent. There is unlikely to be significant further spread of Common Cordgrass into this MSM as it is already well established at this site and has already established into those low-mid zones that were vulnerable to its colonisation.

MANAGEMENT RECOMMENDATIONS

The berms are long established at Barrigone/Aughinish and are likely to require upkeep in the future, particularly in areas that are undermined during exceptional storm periods. The repair of the berms is an ongoing programme and most similar large coastal protection works are revisited periodically. In planning these operations, it would be prudent to suggest to the relevant authorities that greater consideration should be given towards the impact of excavating the topsod. It has had an impact on the Annex I habitat, which might be avoided if soil were excavated from inside the berm. Continued disturbance could encourage colonisation by Common Cordgrass.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

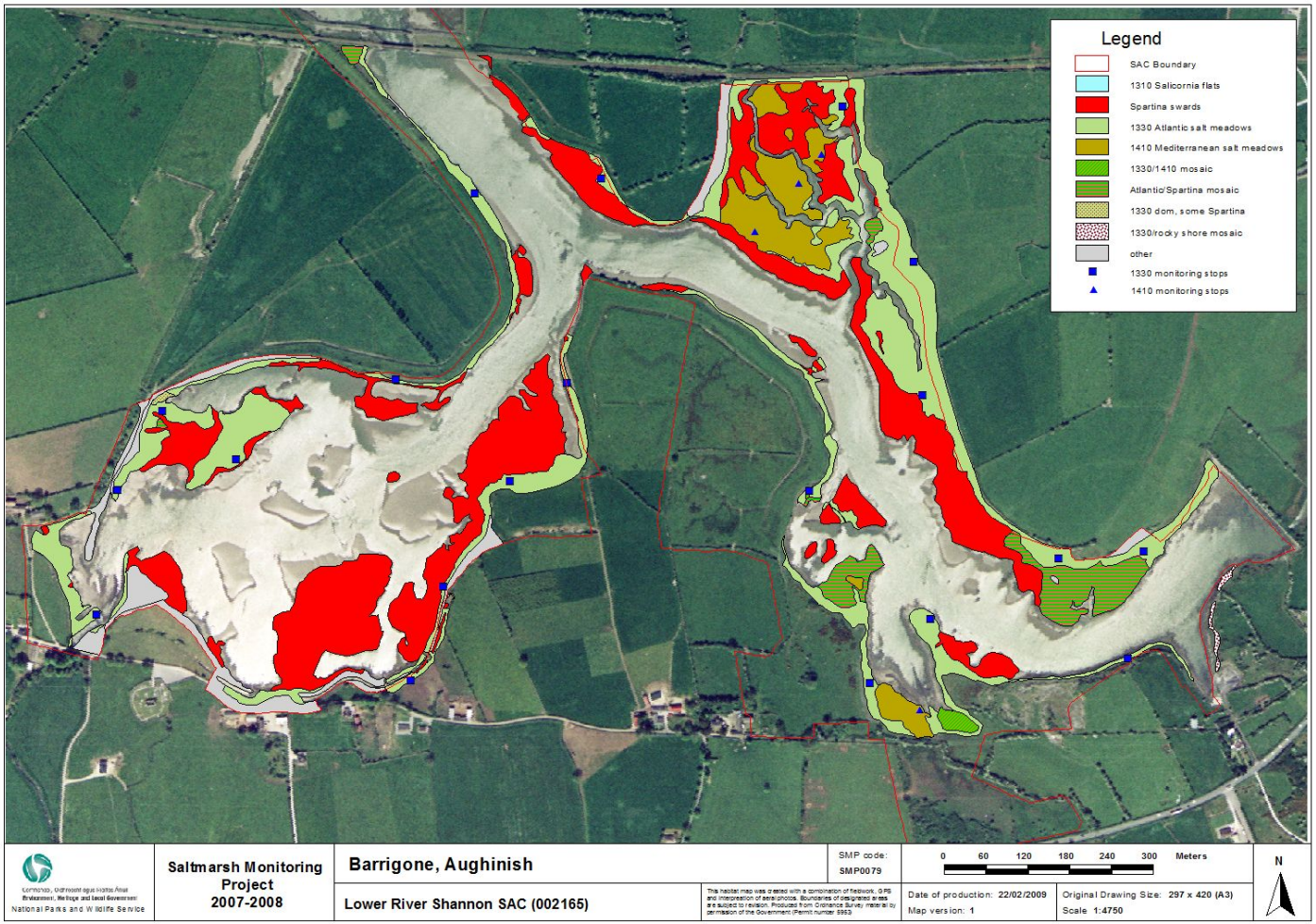
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

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 I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards	11.880					11.880
3	1330 Atlantic salt meadow	9.274		9.274			
4	1410 Mediterranean salt meadow	2.339			2.339		
5	ASM/MSM mosaic (50/50)	0.137		0.0685	0.0685		
6	ASM/*Spartina* mosaic	1.579		0.7895			0.7895
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	2.056					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*	0.025		0.0235			0.00125
17	1330/sand dune mosaic						
18	Other SM (CM2)						
19	1330/rocky shore mosaic	0.081		0.0405			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**27.371**		**10.196**	**2.408**		**12.671**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
1330 dom, some Spartina
1330/rocky shore mosaic
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Barrigone, Aughinish
SMP code: SMP0079
Lower River Shannon SAC (002165)
0 60 120 180 240 300 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:4750

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

Beagh

SITE DETAILS

SMP site name: **Beagh**		SMP site code: **0080**
Dates of site visit: **21 May 2008**		CMP site code: **N/A**
SM inventory site name: **Beagh**		SM inventory site code: **148**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **0435**	SPA: **4077**
County: **Limerick**		Discovery Map: **64** Grid Ref: **136745, 156340**
Aerial photos (2000 series): **O 4737-B; O 4738-A**		6 inch Map No: **Li 003**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Bunratty, Shepperton/Fergus Estuary, Inishdea,/Owenshere, Killadysart/Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

Beagh is a rural site in west Limerick on the southern banks of the River Shannon. It is situated directly opposite Rineanna Point. This saltmarsh is located 1 kilometre north of the small village of Ballysteen, which is itself 4.5 kilometres north east of Askeaton.

The saltmarsh is relatively small and is confined to a narrow coastal fringe along the southern shores of the River Shannon. The site extends southwards from the small quay that once served Beagh Castle towards the old farming estate known locally as Castle View before gradually petering out. The 6inch map indicates the presence of a small quay here but there was no evidence of its existence and indeed, it is unlikely that boats have been landed here in some time given the nature of the mudflats in this part of the site. The southern most extent of the saltmarsh is easily recognised by the presence of a man-made concrete berm that extends in a north-easterly direction towards Bushy Island.

Beagh saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species like Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I species are listed as qualifying interests for this cSAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats were found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Beagh is one of the smallest of twenty-one separate saltmarsh systems that are included in the National Inventory as occurring along the River Shannon (Curtis and Sheehy-Skeffington 1998). Of those, eleven were included in the current survey, although Barrigone/Aughinish was the only other saltmarsh site from County Limerick that was surveyed. Several of these other saltmarshes in Co. Clare were surveyed during the SMP project (see above table).

It is possible to access the fringing marsh from the small quay beside Ballinvoher Castle. However, this fringing saltmarsh occurs over outcropping limestone which is in places treacherous. The saltmarsh can be accessed from a number of other locations, although all of them require crossing private land. A landowner was approached and permission was granted to cross onto the saltmarsh.

SALTMARSH HABITATS

General description

Relative to other saltmarsh systems that are known from the Lower River Shannon, Beagh is one of the smallest, if not the smallest. It is not extensive and is confined to a narrow fringe for most of its length. The saltmarsh is characterised by the presence of a single Annex I habitat, namely Atlantic salt meadow – H1330 (ASM) along with the non-annexed *Spartina* sward, which occupy a roughly similar area (Table 3.1).

The site is largely characterised by a narrow band of discontinuous vegetation along the terrestrial/intertidal transition. Much of the saltmarsh vegetation is fragmented and its distribution is controlled by the outcropping bedded limestone. Remnant patches of vegetation develop in sediment in-filled hollows and as occasional patches on the extensive riverine mudflats that line the front of the site. The only considerable development of saltmarsh is in the southern-most point of the site, where there has been a considerable accumulation of mud in this sheltered cove.

Although both ASM and *Spartina* sward habitats are recorded throughout the site, there are distinct differences in the extent and distribution of each. The ASM, although fragmented is more consistent in its distribution. It is largely confined to a narrow, albeit discontinuous, fringe that extends southwards from the castle towards the southern most point of the site, where it peters out. In contrast, the majority of the Common Cordgrass (*Spartina anglica*) was recorded as a mono-specific sward in the southern-most part of the site. The sward largely found seaward of a similarly sized sward of Sea Club-rush (*Bolboschoenus maritimus*); although in places it transitions into ASM. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification. The zonation within this cover is somewhat unusual as Sea Club-rush has spread in part of the intertidal mud seaward of ASM and forms a zone between the ASM and the *Spartina* sward. This may be due to freshwater outflow from adjacent drainage channels. This type of zonation was also recorded further east towards the head of the estuary and is also likely to be related to the estuarine influence of the river. Elsewhere, it was only recorded as individual small tufts, usually fronting the ASM.

The distribution of the saltmarsh vegetation is controlled by the occurrence of outcropping limestone, although historical land modifications along this part of the river are important also. The transition from saltmarsh to terrestrial habitats is characterised by a number of other communities. Progressing southwards from the Beagh Castle, the patchy saltmarsh is often overshadowed by trees and scrub which occur on shallow soils that develop on the bedded limestone. A local road runs a considerable distance parallel to this. Further south towards the small quay at Castleview, the saltmarsh disappears. Much of this land has been remodelled and boulders brought and placed atop of the mud or outcropping rock to prevent flooding. The diversity of transition and habitat are found in the southern part of the site. Much of the low-lying ground behind the saltmarsh is agricultural, although some of it is characterised as transitional wet grassland.

The majority of the saltmarsh vegetation occurs inside the boundary of the cSAC. Of the small number of patches, which are mapped outside of the current boundary, this is related to cartographical differences between the boundary as shown on the statutory 6inch maps with what is actually observed on the ground.

Table 3.1. Area of saltmarsh habitats mapped at Beagh.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	0.538
non-Annex	*Spartina* swards	0.521
	Total	**1.059**

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

Atlantic salt meadows (H1330)

At approximately 0.6ha, the ASM is not extensive and is roughly similar in area to the *Spartina* swards (Table 3.1). Its distribution is dissimilar however. The ASM vegetation is fragmented in its distribution and its development is often controlled by the occurrence of outcropping bedded limestone. Most of the ASM is perched above the mudflats and there is little development of lower marsh vegetation. It is not surprising, then that all of the ASM is characterised by mid and upper marsh vegetation.

In general, the vegetation is not diverse and often consists of the same species, but in differing ratios. The ASM is characterised by regularly occurring species such as Red Fescue (*Festuca rubra*), Sea Milkwort (*Glaux maritima*) and Thrift (*Armeria maritima*). Other species which were recorded, but less abundantly included: Sea Aster (*Aster tripolium*), Saltmarsh Rush (*Juncus gerardii*), Common Scurvy Grass (*Cochlearia officinalis*), Sea Plantain (*Plantago maritima*) and Common Saltmarsh Grass (*Puccinellia maritima*). Another species of limited distribution was Common Sea Spurrey (*Spergularia media*).

In wetter situations, particularly in transitional and flushed ground, Creeping Bent (*Agrostis stolonifera*) was notable and in places surpassed Red Fescue in terms of ground cover. Towards the southern half of the site, Twitch (*Elymus repens*) was commonly recorded along the landward boundary, whilst a relatively large sward of Sea Club-rush was recorded between the ASM and *Spartina* sward. The landward gradation from ASM was not always distinct, which may reflect the diluting influence of freshwater draining off the agricultural land onto the saltmarsh. Occasionally, small patches or individual shoots of Common Cordgrass were noted in the ASM, but these were often confined to the transitional zone between the ASM and *Spartina* sward.

Spartina swards

The first record of Common Cordgrass in the Shannon River is from the opposite shore to Beagh, at Poulnasherry Bay, where it was planted in 1928 as a means of stabilising the shifting muds (Nairn 1986). It has spread rapidly throughout the lower reaches of the Shannon and is now well established in many of the saltmarshes. Unlike other saltmarsh systems, however, Common Cordgrass is not as well developed at Beagh as elsewhere. The

Shannon is tidal at this point and there is a considerable exposure of mudflats at low tides, the conditions appear not to favour the large scale development of the sward.

There are several Common Cordgrass patches of varying size at Beagh. Most are small patches or clumps that are found at the seaward side of the fragmented ASM habitat. There is only one significant area of sward which is found on the mudflats fronting the ASM in the southern most part of the site. Typically, Common Cordgrass occurs as a monoculture, whether in the sward or in the isolated tufts that were recorded along the saltmarsh fringe towards the castle.

IMPACTS AND ACTIVITIES

A list of impacts and activities that were considered to affect the saltmarsh at this site are listed in Table 4.1. The list is not extensive, and only a small number few direct impacts (that could be quantified) were noted. Much of the landscape around this part of Limerick is characterised by farmland, with some scattered pockets of habitation. The area is quite rural and apart from the presence of the ruined Beagh Castle, would not be subject to large numbers of visitors or tourists.

Extensive mudflats are a feature along the entire front of the saltmarsh. These are diurnally flooded. Most of the land around this site has been modified in the past in some form or another. This may have consisted of the construction of the old quays and retaining walls, to more recent improvements in the embankment marking the southern boundary of this site. Much of the improvement was done to improve access and prevent flooding. The construction of the concrete berm was done in order to reclaim land from the Shannon Estuary. Most of this reclaimed land is still rather wet as characterised by the extensive rushy pastures and is given over to grazing. It is not known if there was any saltmarsh present along the stretch of the site, but it is not assessed as it did not occur during the current monitoring period.

The principal land use in this area is grazing (140), although silage is also cut in some areas (102). All of the agricultural influence occurs outside of the saltmarsh proper. There is some evidence of cattle getting (140) onto the marsh through gaps in the hedgerow and damaged fencing. However, given the treacherous nature of the mudflats, the impact of livestock is negligible.

Another impact which is mentioned in NPWS documentation is the effects of waterborne pollution (700). With several large industrial and chemical plants along the Shannon, including the LNG terminal across the river, there is always the danger of a pollution incident occurring in the River Shannon. Asides from driftwood and other debris which has been brought in by the tide, there is little evidence of this

It is likely that there is some degree of erosion (900) of the ASM at Beagh, particularly along the fringe that is found on the mudflats. And while there were some indications of erosion such as small remnant tufts of ASM, erosion is a natural feature of coastal systems, particularly in a situation where the tidal range is so extensive and fast. There was no discernible difference in the extent of the saltmarsh when the recent aerial photographs are compared hence, the erosion is not considered to be significant. The impact of erosion is assessed as neutral.

Common Cordgrass is present at this site. It is an invasive species of saltmarsh (954). First planted in the Shannon region in 1928, (Nairn 1986), it has since flourished and is widely distributed. It is not known when this invasive species first took hold at this site, but it has thrived on the extensively sheltered mudflats in the Shannon Estuary. The presence of the mature sward at the southern end of the site is facilitating the build up of mud. The sward does not appear to be invading ASM territory. The cover of Common Cordgrass within the ASM is low (< 5%) so the impact of its presence is assessed as neutral. Indeed, the gradual consolidation of the mudflats may at some point in the future favour to spread of ASM (990).

Outside of the site, there are few direct impacts or activities influencing the condition or extent of the saltmarsh vegetation. Most of these impacts have been in existence for some time. Dispersed habitation (403) relates to a single farm holding at Castle View, as well as a small number of houses that run along the small road that runs parallel to the river from the ruins of Beagh Castle. These activities doe not have any measurable impact on the saltmarsh vegetation.

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

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	-1	0.217	Inside
H1330	900	C	0	0.01	Inside
H1330	954	C	0	0.001	Inside
H1330	990	C	0	0.001	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.

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.

In light of the fact that this is a relatively small saltmarsh, the overall conservation status of the site is *favourable* (Table 5.1). The saltmarsh is mostly discontinuous and has largely developed on remnant patches of mud that have accumulated atop the outcropping limestone pavement. Indeed so small is the site, that ASM is the only Annex I habitat that was recorded from the site. Given its exposed location on the lower part of the River Shannon and the land modification that has been carried out here, it is difficult to know if saltmarsh vegetation at site was ever extensive.

There is little historical or baseline data with which to make a comprehensive assessment of this site. It is difficult to establish the extent of saltmarsh from earlier NPWS maps and the vegetation descriptions cover a large number of saltmarsh systems, without making any reference to Beagh. A comparison of the historical and more recent aerial photographs (year 2000 and 2005 series) does not reveal much additional information. Much of the river fringe shown on the 2nd edition 6 inch map covering Beagh is marked with rocky shoreline. There is some indication of wet ground towards the southern section, but nothing to clarify the extent of any saltmarsh. There is a considerable shadow from overhanging trees obscuring the 2005 series photographs. This makes it difficult to see changes in the fringing saltmarsh and compare it against the earlier year 2000 photograph.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

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

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable – Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent Structure and functions Future prospects			Favourable

Atlantic salt meadows (H1330)

Extent

The extent of the ASM is rated as *favourable* (Table 5.1). The saltmarsh at Beagh is not extensive and is largely confined to a narrow fringe along much of its exposure to the River Shannon. The single largest area of ASM is recorded behind the Common Cordgrass and Sea Club Rush swards that have developed on the mudflats in the most southerly point of the site.

Earlier reports note the presence of the saltmarsh vegetation at this site. However, there is no reliable information with which to compare changes in ASM distribution during the current monitoring period. The rocky shoreline indicated on the 6 inch map suggests that this was never a large saltmarsh. An analysis of the recent year 2000 and series 2005 aerial photographs does not reveal any changes although, this is obscured somewhat both by the quality of the aerials and also reflections from the exposed mud.

Habitat structure and functions

Four monitoring stops were carried out in the habitat, all of which satisfied the target criteria. The habitat structure and functions are thus assessed as *favourable*. Despite the relative paucity of the habitat and the absence of pioneer and lower marsh communities, it is still possible to recognise a certain degree of zonation among the outcropping limestone pavement and in the sheltered southern section of the site. There are few impacts or activities of concern affecting the vegetation.

Common Cordgrass is present in this habitat but its overall cover is low. The impact of its spread on species composition is assessed as neutral, mainly due to the lack of accurate baseline data.

Future prospects

The future prospects are assessed as *favourable*. The assessment assumes that there will be no major change in the management regime at this site. It is unlikely that saltmarsh vegetation was ever a considerable component of the coastal area around Beagh. There are few impacts or activities which are considered to be affecting this site. There is some indication of the seaward expansion of the *Spartina* sward onto the accumulating mudflats. However, the *Spartina* sward in the southern half of the site is relatively mature and it is unlikely to result in any change in the extent or condition of the ASM.

MANAGEMENT RECOMMENDATIONS

In light of the limited extent of saltmarsh that is recorded from this site, there are no specific recommendations for the management of the site.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

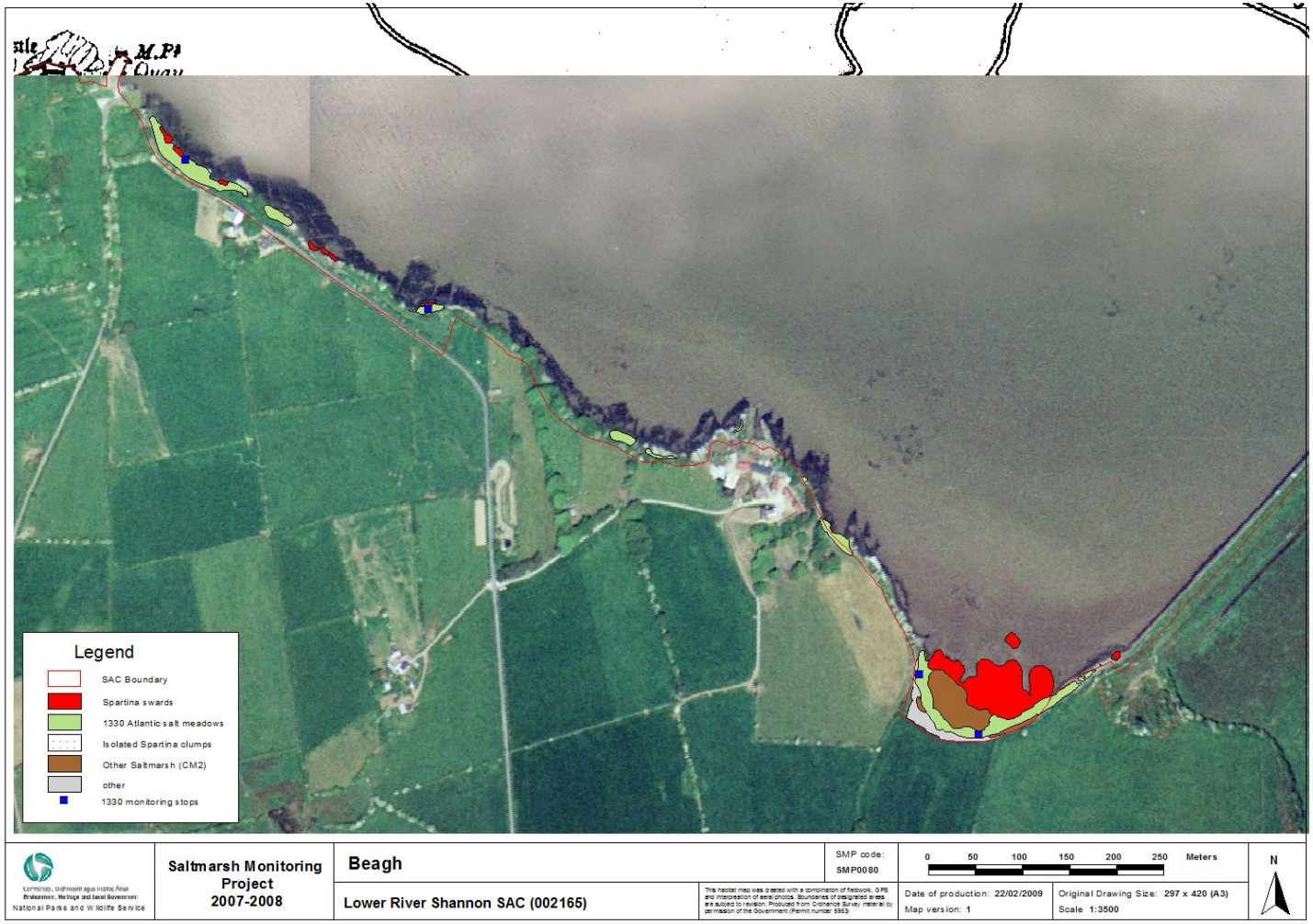
MPSU (?).*Conservation Plan for Lower River Shannon cSAC 2005-2010*. Government of Ireland, Unpublished.

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 I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards	0.521					0.521
3	1330 Atlantic salt meadow	0.538		0.538			
4	1410 Mediterranean salt meadow						
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	0.109					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.259					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**1.43**		**0.538**			**0.521**


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Beagh
Lower River Shannon SAC (002165)
SMP code: SMP0080
0 50 100 150 200 250 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:3500
National Parks and Wildlife Service

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

SITE DETAILS

SMP site name: **Bunratty**		SMP site code: **0081**
Dates of site visit: **23 & 26 May 2008**		CMP site code: **N/A**
SM inventory site name: **Bunratty**		SM inventory site code: **146**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **2048**	SPA: **4077**
County: **Clare**		Discovery Map: **58, 64, 65** Grid Ref: **145275, 159966**
Aerial photos (2000 series): **O 4618-C,D; O 4619-C; O 4678-B; O 4679-A,B**		6 inch Map No: **Cl 061, 062**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Shepperton/Fergus Estuary, Inishdea/Owenshere, Killadysart/Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

Bunratty saltmarsh is located in the upper part of the Shannon Estuary in Co. Clare. Bunratty Castle is a distinctive landmark on the N19 road between Limerick and Ennis and is a popular tourist attraction, due in part to its proximity of Shannon airport. The area has had a dramatic and turbulent history. The first known dwellings to occupy the site, in 970, were part of a Viking trading camp, which had made its way up the River Shannon and settled alongside the Ratty River. Indeed, the site gets its name from the old Irish, which translated means "the bend in the River Ratty". The castle was not built until the 13th century, but has gone through several incarnations as this Norman stronghold was repeatedly ransacked by Irish.

The landscape around this area is quite low-lying. Embankments are a characteristic feature of the shoreline along this part of the estuary and there is substantial amount of land reclaimed behind the embankments. There are also several small islands in the estuary close to the shoreline. This part of the Shannon estuary empties at low tide to expose extensive mudflats. There are few buildings close to the shoreline apart from a large sewage treatment plant.

It should be noted that saltmarsh and other marginal vegetation along this part of the estuary is almost continuous and extends into many of the shoreline undulations west to Shannon

Airport. Marginal brackish vegetation also extends east towards Limerick. This site is notable for the extensive stands of Common Reed (*Phragmites australis*) and Sea Club-rush (*Bolboschoenus maritimus*), which is found seaward of the more established saltmarsh and has spread onto the adjacent mudflats. This is an indication of the estuarine influence on the site. The survey site extends for about 7 km along the shoreline and is centred at the Ratty River channel.

The saltmarsh at Bunratty is located to the south of the iconic castle. Starting at the N19 road-bridge over the Ratty River, the marsh extends along both banks of the River. The road-bridge was selected as a cut-off point as it is the uppermost inland extension of saltmarsh vegetation. There is a significant reduction in the amount of saltmarsh vegetation, which was replaced, almost entirely by brackish vegetation typified by very large stands of Common Reeds and Sea Club-rush that was recorded. The saltmarsh extends downstream along either bank of the narrow Ratty River before it joins the Shannon River. The site extends in both an easterly and westerly direction away from the confluence of the two rivers.

The site continues upstream around the townlands of Moyhill and Ballymorris towards Ballymorris Point which is fronted by Bush Island. The survey was stopped at this point as there is a significant reduction in the typical saltmarsh vegetation and there was also a distinct change to the brackish vegetation with some development of Saw Sedge (*Cladium mariscus*) and Grey Club-rush (*Schoenoplectus lacustris spp. tabernaemontani*).

Downstream the narrow saltmarsh is constrained by the curvilinear embankment around Ilaunbeg Point and Tradree Point. The western boundary is demarcated by Inishcullin Point, as there is a short break in the vegetation along the rocky shoreline around the Point (~150 metres). However, marsh vegetation (both brackish and saltmarsh) reappears in the shallow bay into which Ballycassey Creek drains. The marsh extends, apparently continuously downstream towards Shannon Airport (the next site listed on the National Inventory).

Bunratty saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three-headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this SAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). The latter two habitats were found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

The site was accessed at a number of locations, most of which required the permission of individual landowners so that the saltmarsh could be accessed by traversing private property. The embankment is well maintained and had recently been repaired, as indicated by the lush sward of Perennial Ryegrass (*Lolium perenne*).

SALTMARSH HABITATS

General description

The saltmarsh covers approximately 7 kilometres of Lower Shannon frontline, centred on where the Ratty River enters the Shannon River. Bunratty is the most easterly developed saltmarsh along the estuarine stretch of the Shannon River and while there may in places be small patches of saltmarsh vegetation further upstream, the brackish element increases and there is much less development of typical saltmarsh communities.

Unusually, this site is characterised by very extensive stands of Common Reed and Sea Club-rush spreading onto the soft mudflats, rather than Common Cordgrass (*Spartina anglica*). Measuring approximately 84.5ha, the brackish marsh is 2.5times greater in extent than the saltmarsh. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification, (although in estuarine situations these Reed stands should more accurately be classified as 'Reed and tall sedge swamps - FS1' (Fossitt 2000)). Twitch (*Elytrigia repens*)-dominated grassland on the embankments was also classified as other saltmarsh (CM2). It should be noted that the saltmarsh, was arbitrarily stopped at both its eastern and western flanks where there was a gap in saltmarsh vegetation. The site continues on along each end of this site, indeed it extends into another saltmarsh system at Shannon Airport and Ringmoylan, neither of which were surveyed as part of this project.

This site is characterised, not alone by the widespread and extensive development of brackish vegetation, but also by the fact that for much of the upper part of the marsh, it is embanked. These embankments were largely constructed in the 18th and 19th centuries but there have been some recent changes and modifications since then. Much of the saltmarsh is found on the seaward side of the embankments and is likely to be the relic remains of former more extensive saltmarsh that was found in this area prior to the reclamation and saltmarsh that has developed on the embankments after they were constructed.

Notwithstanding this fact, the saltmarsh at Bunratty is listed as an estuarine type of saltmarsh which is largely associated with mud (Curtis and Sheehy-Skeffington 1998).

Although the saltmarsh is characterised as a single contiguous unit, it should be noted that individual saltmarsh habitats are not continuous. Over the length of the saltmarsh there is considerable variation in the distribution and condition of the saltmarsh vegetation. The brackish influence upon the marsh is overwhelming. The remaining saltmarsh communities are less extensive. The ASM is the most extensive of all the saltmarsh habitats and is widespread in its distribution (Table 3.1). Typically it occurs as a narrow band at the landward side of the brackish vegetation. More often than not it is recorded on perched ground above the mudflats, the terrace face ranging anywhere from several centimetres to 1.75metres. The MSM is not as widespread as the ASM. It is generally found as small discrete patches within the ASM, although one patch extended for some 190metres.

The majority of the saltmarsh occurs within the confines of the cSAC boundary, although there are replaces where small patches extend beyond the limit of the designated site. These reflect minor cartographical errors and as such are not considered to be significant.

There are no known species of note or rare or threatened saltmarsh species listed for this part of the Shannon. More recently, however, the presence of Triangular Club-rush (*Schoenoplectus triqueter*) was newly reported in the Ratty River, north of the N18 road-bridge (Deegan and Harrington 2004). The area in which it was recorded is largely brackish and lies upstream of the saltmarsh site. Its presence was not confirmed during this survey.

Table 3.1. Area of saltmarsh habitats mapped at Bunratty.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	26.968
H1410	Mediterranean salt meadows	0.865
non-Annex	*Spartina* swards	0.284
	Total	**28.117**

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

Atlantic salt meadows (H1330)

Estimated to measure almost 32ha (Table 3.1), the ASM occupies the greatest area of all saltmarsh communities that were recorded at Bunratty. Most of the ASM occurs as a relatively narrow fringe perched atop a distinct terrace to the landward side of the brackish vegetation. In places, such as in sheltered coves, the development of the ASM vegetation increases and some small plains are mapped. In terms of saltmarsh development, the distribution and extent of the ASM is constrained by the brackish marsh which is extensive along much of the mudflats along the frontline.

For the most part, the substrates on which the ASM is recorded consists of consolidated muds and fibrous peats. However, other substrates of limited extent or distribution include muds and mud/shingle mosaics, such as is encountered along the western side of Tradree point, adjacent to the waterworks. Occasionally the ASM is characterised by naturally low-growing sward. However, in most cases, the sward is kept relatively short due to the intensity of the grazing.

There is little development of zonation. Small patches of lower marsh were recorded, on low-lying ground and mixed mud/shingle sediments. Although minor amounts of Annual Glasswort (*Salicornia europaea* agg.) were recorded at Bunratty, there is no development of it on the mudflats. It is possible that its extent is limited by the extent of the brackish vegetation on the mudflats. Where Annual Glasswort was recorded, it was generally noted among poached ground in the lower parts of the ASM. Other species indicative of the lower regions of the marsh include Common Saltmarsh-grass (*Puccinellia maritima*). This grass was occasionally recorded extending along creeks into the upper ASM. There is little differentiation between low and mid marsh and species such as Thrift (*Armeria maritima*), Sea Aster (*Aster tripolium*) and Common Scurvy-grass (*Cochlearia officinalis*) were noted. These areas were often characterised by bare ground, which could at times account for up to 30% of a monitoring stop.

It is not surprising, however, given that the saltmarsh is recorded on perched ground above the mudflats, that the ASM largely comprises upper marsh vegetation. Commonly recorded grasses include Red Fescue (*Festuca rubra*) and Creeping Bent (*Agrostis stolonifera*), which was indicative of the damp soil conditions that were characteristic of much of this site. Saltmarsh Rush (*Juncus gerardii*) was also quite frequent in some sections. Other common species include Sea Milkwort (*Glaux maritima*), Autumn Hawksbill (*Leontodon autumnalis*), White Clover (*Trifolium repens*), Distant Sedge and Sea Arrow-grass (*Triglochin maritimum*). The ASM was quite diverse at this site and included some untypical species, probably due to the estuarine influence on the site. These included Marsh Ragwort (*Senecio aquaticus*), Brookweed and Wild Celery (*Apium graveolens*). Brackish Water Crowfoot (*Ranunculus baudotii*) was noted in one pan. Across the ASM, Sea Club-rush was a regularly occurring feature, often accounting for up to 5% cover in a monitoring stop.

The upper boundary was often marked by a band of disturbed grassland between the saltmarsh vegetation and the embankment. The vegetation was often characterised by Twitch (*Elytrigia repens*)-dominated grassland, but in places which had been reseeded. Perennial Ryegrass (*Lolium perenne*) was recorded. Where the ground conditions change, a definite increase in the species diversity was noted. This last group of species that are recorded from the ASM reflect the differing ground conditions that were noted. While much of the narrow ASM band was damp, in places in was waterlogged or was subject to flushing from higher ground. Species such as Silverweed (*Potentilla anserina*), Curled Dock (*Rumex Crispus*),

Brookweed (*Samolus valerandi*) and even Kneed Foxtail (*Alopecurus geniculatus*).

Mediterranean salt meadows (H1410)

The MSM is not well developed at this site and is generally confined to narrow fragmented patches in the ASM or towards the back of the marsh. It was also recorded on the mudflats themselves, although lower marsh development was far from extensive. Measuring approximately 0.87ha, it represents less than 0.2% of the saltmarsh vegetation that is mapped or 0.007& of the total marsh area that was surveyed.

The habitat is easily recognised by the presence of Sea Rush (*Juncus maritimus*). Where the habitat is noted on mudflats, typically Sea Rush is the only species recorded. Other species that are more prevalent on consolidated substrates rather than mud include Creeping Bent, Red Fescue, Saltmarsh Rush (*Juncus gerardii*) Sea Milkwort, Sea Arrow-grass and other species commonly recorded from upper ASM communities.

Surface water draining off higher ground resulted in flushing within the saltmarsh and species such as Marsh Ragwort and Cuckooflower (*Cardamine pratensis*) were occasionally recorded. Elsewhere, the agricultural influence was characterised by disturbance and species such as Greater Plantain (*Plantago major*) were recorded.

Spartina swards

Unlike many other saltmarsh systems that occur along the Shannon River, Common Cordgrass (*Spartina anglica*) was not a significant feature. In terms of the overall marsh, it is estimated to cover approximately 0.28ha which represents less than 0.001%. Typically the Cordgrass vegetation is confined to mudflats, although small patches were noted among the ASM in creeks and pans and alongside the MSM. Stands of Sea Club-rush and Common Reed are much more extensive. Small patches of Spartina sward are found in association with stands of Sea Club-rush are on patches seaward of these Sea Club-rush stands. The cover of Spartina sward increased towards the west, indicating that the estuarine conditions probably limited its competitiveness in this area with other species like Sea Club-rush.

IMPACTS AND ACTIVITIES

Despite its proximity to Bunratty Castle, this is largely a rural site which is privately owned by multiple owners. It is not readily accessible to tourists or other recreational users. The majority of the land behind the marsh has been embanked. A small number of activities and

impacts are recorded from this site and are listed in Table 4.1, the most apparent of which is the agricultural management of the area.

The principal activity at this site is grazing (140). The majority of the land within the saltmarsh and its hinterland is given over to livestock grazing, although not all the saltmarsh was grazed. Some of the saltmarsh to the west of the site is grazed by sheep and cattle, while the eastern side of the site is grazed by cattle. While grazing in itself is not necessarily damaging, the consistency and widespread occurrence among the damp ground conditions was such that parts of the saltmarsh were showing signs of damage (143), which was unlike most other sites that were surveyed in County Clare. Although the saltmarsh fringe is managed by multiple owners, the consistency with which it is grazed, particularly the "larger" plains was almost uniform. Grazing is important for maintaining the diversity of the saltmarsh vegetation and it was noticeable that some fenced off areas that were not grazed were dominated by rank grasses such as Twitch or Sea Club-rush. Within individual management parcels, trails (501) are not uncommon. Invariably the trails are of limited impact in the larger patches of marsh and only become negatively damaging where they occur along the narrow stretches of saltmarsh connecting headlands. The wet ground is often heavily trampled and in places poached. The greatest poaching was often around crossing points and along narrow saltmarsh corridors. Several areas were so badly damaged that the ground was completely churned up. The MSM, unlike the ASM, is not as badly impacted, as livestock tend to avoid grazing this rank vegetation.

One of the main features of this site is the relatively narrow extent of saltmarsh vegetation that is recorded. Much of the site has in the past been modified through land reclamation and drainage (801, 810). A large part of the upper marsh is constrained by an earthen berm which was constructed to curtail the effects of following on the low-lying land found behind the embankment. The construction of the embankment is not assessed as it is clearly pre-dates the current monitoring period.

However, the embankments are still regularly maintained (800) and a number of outfall points including sluice gates and one-way drains have been repaired in the recent past. In addition to these mechanical repairs and clearing of drains (810), localised repairs have been made to the embankment, not all of which were carried out by the OPW. The repairs include re-grading the earthen berm to level it off or repair areas that have been undermined through heavy livestock volumes. In places, the repaired berm was largely reseeded with Perennial Ryegrass, which further encourages a repetition of livestock-induced damage. These works have had a limited impact on the adjacent saltmarsh.

Common Cordgrass is present at this site and is an invasive species of saltmarsh (954). While it has rapidly colonised estuaries and creeks along the Shannon since it was first transplanted in the Shannon region in 1928, at Bunratty, its development is completely overshadowed by the brackish vegetation (Nairn 1986). This is likely to be due to the increased freshwater conditions in this part of the estuary. Common Cordgrass has mainly

spread onto the mudflats adjacent to the more established saltmarsh and forms small patches surrounded by Sea Club-rush. It has not spread significantly onto the ASM or MSM. For this reason its impact is assessed as neutral. The extent of *Spartina* swards on the adjacent mudflats is much less significant compared to the extent of brackish Reed and Sea Club-rush stands.

A comparison of the current habitat map to the OSI 2nd edition 6 inch map shows that the extent of the stands of Sea Club-rush and Common Reed has changed somewhat in this period. These changes are likely to be natural (990). The development and extent of the brackish marsh is not assessed, nor is it possible to realistically estimate if there has been any loss of Annex I saltmarsh habitat due to its occurrence. Most of the saltmarsh occurs atop perched ground which is fronted by dense stands of Sea Club-rush or Reeds.

The small areas of saltmarsh that were found on low-lying or muddy substrates were showing no real signs of erosion (900). Occasionally the terraced marsh was not fronted by brackish vegetation. In such situations, the frontline was highly indented or convoluted. There was little sign of any appreciable undercutting or slumping. Overall, there has been no significant measurable erosion when the OSI 2000 and 2005 series aerial photographs are examined. The impact of erosion is assessed as neutral on a small portion of the saltmarsh.

While the distribution of the saltmarsh is largely constrained by the embankment, it also serves to limit the influence of other activities and their impacts which occur outside the site. The area is rural and any settlement (403) is not an issue, as it is found some distance away from the saltmarsh. The only industrial plant is the waterworks around Tradree Point. This plant, which serves Shannon Town Centre, has been in existence for some time. It is managed under strict guidelines and there are no sign of any discharges (420) or pollution (700) emanating from this plant.

Most of the hinterland is given over to agriculture, grazing in the main, although some fields were cut for silage (120). It is likely that some agricultural improvement is carried out in some of the fields with fertilisers (102) and clearance of drains undertaken (810).

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

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	0	14.0	Inside
H1330	143	B	-1	11.6	Inside
H1330	501	C	0	0.75	Inside
H1330	800	C	-1	0.2	Inside
H1330	810	C	0	0.2	Inside
H1330	900	C	0	1.0	Inside
H1330	954	C	0	26.968	Inside
H1410	140	C	0	0.6	Inside
H1410	143	B	-1	0.1	Inside
H1410	501	C	0	0.1	Inside
H1410	954	C	0	0.865	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.

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 NHA survey, 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 is little other detailed information for this site.

Bunratty saltmarsh contains several features of notable conservation interest. The extensive development of brackish vegetation is one notable feature and is indicative of the estuarine influence on the site. It is the most inland saltmarsh that was surveyed along the River Shannon, which explains the transition from maritime to brackish conditions. This influence can also be seen within the ASM with the appearance of species such as Marsh Ragwort. The ASM vegetation is relatively diverse in places due to this freshwater influence. There are also diverse transitions to other terrestrial and brackish communities, which increases the diversity of the site as a whole. The saltmarsh structure is poorly developed at this site and has been modified by the construction of tall embankments along the seaward side of the saltmarsh.

The overall conservation status of this site is *unfavourable-inadequate* (Table 5.1). This is a relatively narrow saltmarsh system which has been highly modified in the past. High grazing intensities have damaged some of the saltmarsh due to heavy poaching in places. Common Cordgrass is present at this site but is not a significant feature of the vegetation.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

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

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent	Structure and functions Future prospects		Unfavourable - Inadequate
Mediterranean salt meadows (H1410)	Extent	Structure and functions Future prospects		Unfavourable - Inadequate

Atlantic salt meadows (H1330)

Extent

The extent of the ASM is rated as *favourable*. While a considerable part of this site is characterised by brackish marsh vegetation, the ASM is the most extensive of the saltmarsh communities that is recorded at Bunratty. The majority of the ASM occurs behind the brackish vegetation and so is not prone natural erosion, as might be expected. There are no indications of any significant loss of ASM due to erosion, spread of Common Cordgrass land-use changes or embankment works.

Habitat structure and functions

The structure and functions of this habitat are rated as *unfavourable-inadequate*. While a high proportion of the characteristic species was recorded from the ASM at Bunratty, there is little development of zonation and other features such as creek and pan development are not well developed and usually have been modified to some degree by excavation associated with draining the land behind the berm. Fifty percent (eight) of the monitoring stops that were carried out in the ASM failed to achieve the target criteria. The saltmarsh fringe crosses a number of differing landholdings, most of which were grazed to some degree. Although the grazing levels varied from light to heavy across the site, rarely was the relatively narrow band

of ASM vegetation undamaged. The levels of trampling and poaching were high in many areas as the saltmarsh was well utilised as a feeding resource by the livestock.

Common Cordgrass is present at this site but is not a prominent feature of this habitat, so its spread is not assessed as a negative indicator for species composition.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. The assessment assumes that there will be no significant change in the management regime at Bunratty in the future. The high grazing intensity is likely to continue in the future so damage is likely to continue from cattle poaching. The ASM is not likely to be vulnerable to colonisation by Common Cordgrass, due to estuarine influence on this site, which limits its competitiveness.

Mediterranean salt meadows (H1410)

Extent

The extent of the MSM is assessed as *favourable* (Table 5.1). The MSM does not occur extensively at this site and over the course of the approximate 6 kilometre of frontline only thirteen separate, relatively small patches are mapped. Given the absence of previous information as to its occurrence, it seems likely that this is the natural extent of the MSM at this site. There are no indications of any significant loss of MSM due to erosion, land-use changes or embankment works at this site.

Habitat structure and functions

The structure and functions of this habitat are rated as *unfavourable-inadequate*. One of the four monitoring stops failed, due to the excessive nature of the poaching that was recorded around that area. Despite the relative paucity of this habitat at Bunratty, many of the features that are characteristic of the MSM in this part of the country were noted. However, the habitat was showing signs of localised damage, which is unsurprising given the intensity of livestock traffic along parts of the site.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. The assessment assumes that there will be no significant change in the management regime at Bunratty in the future. The high grazing intensity is likely to continue in the future so some of the MSM is likely to vulnerable to continued damage from cattle poaching. This habitat is not vulnerable to colonisation by Common Cordgrass.

MANAGEMENT RECOMMENDATIONS

There are no specific management recommendations for this site. .

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

Deegan, B.M & and Harrington, T.J (2004). The distribution and ecology of *Schoenoplectus triqueter* in the Shannon Estuary. *Biology and Environment. Proceedings of the Royal Irish Academy* **104B**, 107-117.

Fossitt, J.A. (2000). *A guide to habitats in Ireland.* The Heritage Council, Dublin.

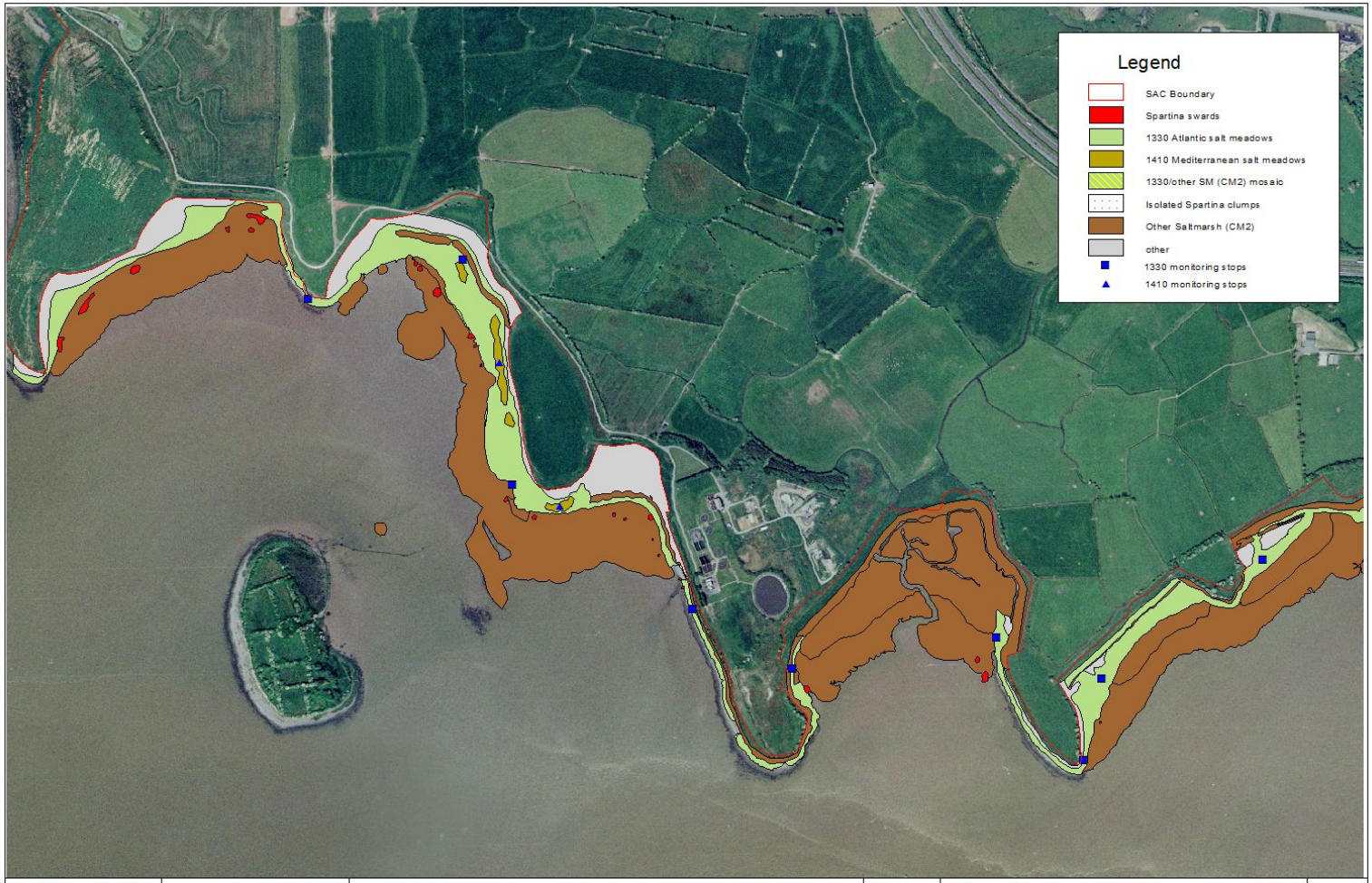
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

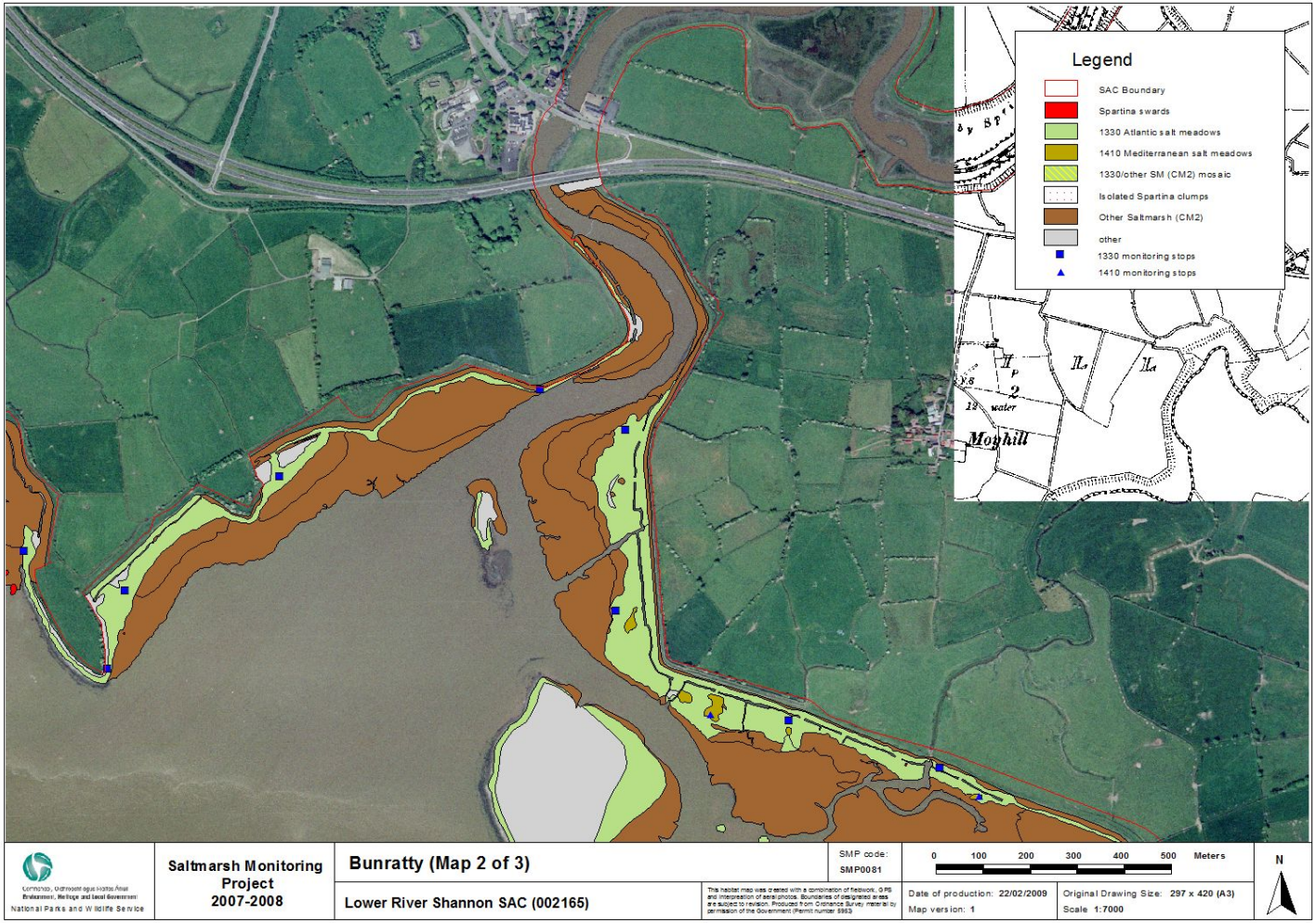
Nairn, R.G.W. (1986). *Spartina anglica* in Ireland and its potential impact on wildfowl and waders – a review. *Irish Birds*. **3**, 215-258.

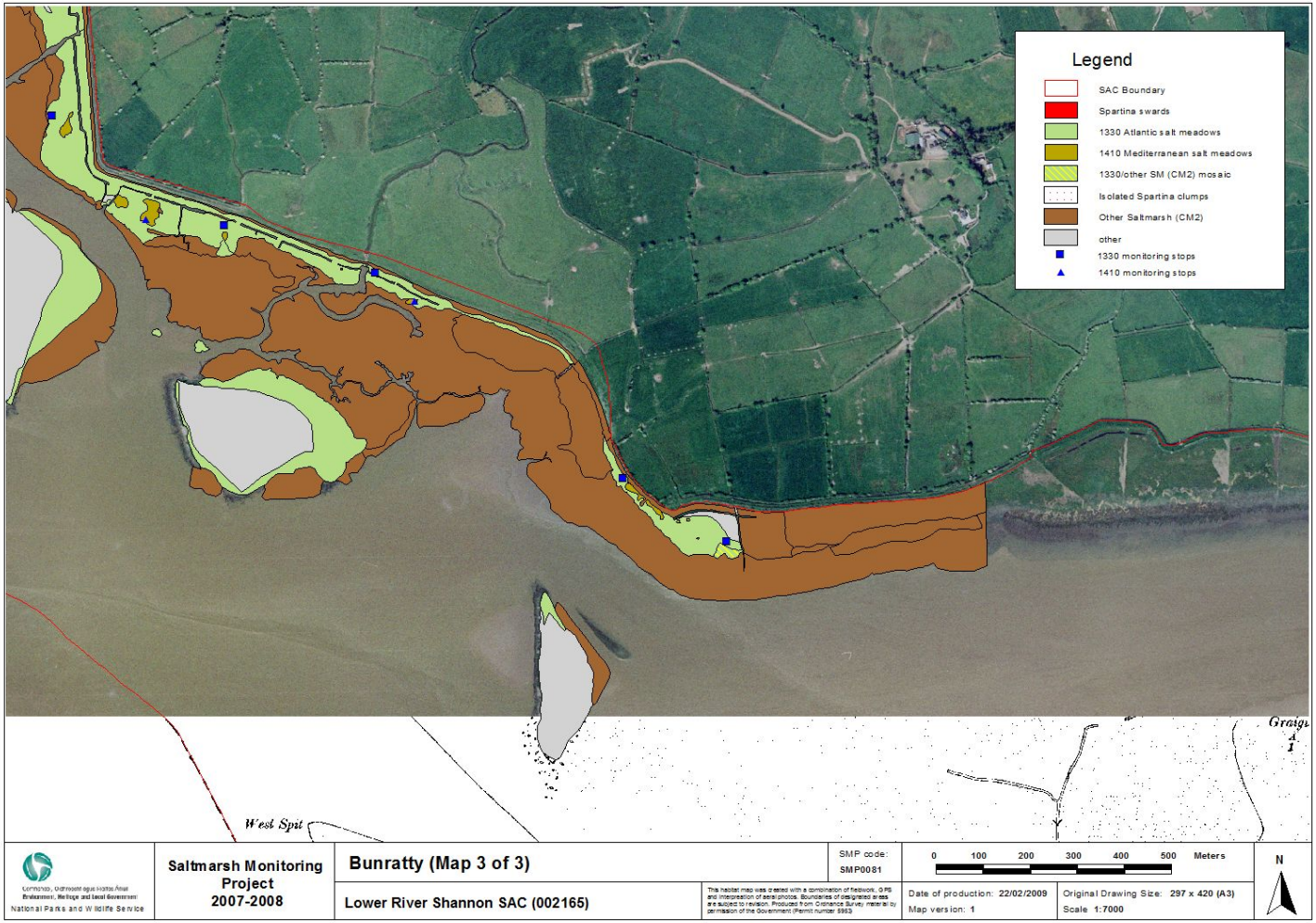
APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards	0.284					0.284
3	1330 Atlantic salt meadow	26.899		26.899			
4	1410 Mediterranean salt meadow	0.865			0.865		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic	0.138		0.069			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	21.138					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)	0.002					0.0001
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	88.922					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**138.248**		**26.968**	**0.865**		**0.284**


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/other SM (CM2) mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Bunratty (Map 1 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0081
0 100 200 300 400 500 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:7000
National Parks and Wildlife Service


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/other SM (CM2) mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Moyhill
Saltmarsh Monitoring Project 2007-2008
Bunratty (Map 2 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0081
0 100 200 300 400 500 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:7000
National Parks and Wildlife Service


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/other SM (CM2) mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
West Spit
Saltmarsh Monitoring Project 2007-2008
Bunratty (Map 3 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0081
0 100 200 300 400 500 Meters
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:7000
N

Appendix VII – Shepperton, Fergus Estuary site report and habitat map from the SMP (McCorry & Ryle, 2009)

SITE DETAILS

SMP site name: **Shepperton, Fergus Estuary**	SMP site code: **0082**
Dates of site visit: **27 May 2008**	CMP site code: **N/A**
SM inventory site name: **Shepperton, Fergus Estuary**	SM inventory site code: **142**
NPWS Site Name: **Lower River Shannon**	
NPWS designation cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
pNHA: **2048**	SPA: **4077**
County: **Clare**	Discovery Map: **458** Grid Ref: **136235, 169920**
Aerial photos (2000 series): **O 4438-D; O 4439-A,C; O 4497-B; O 4498-A**	6 inch Map No: **Cl 042, 050, 051**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Bunratty, Inishdea/Owenshere, Killadysart/Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Sand:pebbles**

SITE DESCRIPTION

This site is located along the north-east side of the Fergus Estuary in Co. Clare. The site is properly listed as Shepperton, Fergus Estuary in the National Inventory (Curtis and Sheehy-Skeffington 1998). This refers to a house named Shepperton House in Ballysallagh West Townland, close the site. Extending downstream of Clarecastle, County Clare, the Fergus Estuary is a long estuary which enters the River Shannon to the west of Shannon Airport. The survey site extends from Ing Point northwards towards Crow Island, where the estuary narrows considerably, before splitting off along the Latoon Creek where surveying was stopped beside the old Latoon Bridge, a distance of approximately 6 kilometres. This part of the shoreline is about 3 km east of Newmarket-on-Fergus. The site crosses a number of townlands, including – Ing, Ing East and Ing West, Ballygirreen and Latoon South. The surrounding landscape is quite low-lying and a substantial part of the shoreline is marked by tall embankments that were built to reclaim adjacent land. These are regularly maintained, as some of the land behind them is lower then that river. Wet grassland and improved grassland are the main habitats found behind these embankments. There is some higher ground around a mound near Ing Point. This area is quite rural and there are few dwellings close to the shoreline apart from at Ing Point.

Saltmarsh habitats are spread along this shoreline and form an almost continuous band of habitat from Ing Point to Latoon Bridge. The development of saltmarsh varies along this shoreline and is less extensive towards the northern end where the estuary narrows. Much of the saltmarsh has been modified by the construction of the embankments, although there are still large sections of relic saltmarsh that are relatively intact. This saltmarsh has developed adjacent to soft intertidal mudflats in the estuary. Further north the intertidal channel deepens considerably. Large areas of mono-specific vegetation are not uncommon, either *Spartina* sward or brackish vegetation such as Common Reed (*Phragmites australis*) or Sea Club-rush (*Bolboschoenus maritimus*).

It should be noted that this survey has only mapped part of the saltmarsh in the Fergus Estuary. The opposite side of the estuary is listed as a separate site on the saltmarsh inventory - Islandavanna (Curtis & Sheehy-Skeffington 1998). Saltmarsh is also found south of Ing Point.

This site is located within the Lower River Shannon candidate Special Area of Conservation (cSAC). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this SAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Atlantic salt meadows was the only Annex I saltmarsh habitat found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat. One plant species of note that was previously recorded as occurring in the River Fergus Estuary is Golden Dock (*Rumex maritimus*). It was not refound during the current survey.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

The site, although several kilometres in length, is not freely accessible, although it is possible to gain access along a maintenance track at the upper end of the site adjacent to the Latoon Bridge/N18 flyover. While much of the saltmarsh vegetation lies outside of managed land, it often requires crossing private land to reach it. Theoretically, it is possible to walk along most

of the site unhindered by creeks or rivers and other man-made drainage features. However the land is managed variously by a considerable number of landowners and each management unit is often demarcated by fencing. Several landowners were identified along the site and permission sought.

SALTMARSH HABITATS

General description

The Fergus Estuary is similar to the Lower Shannon Estuary in that it has very extensive mudflats and is subject to strong tides. The estuary contains extensive areas of intertidal mudflats along with saltmarsh and wet marsh habitats. Extensive areas of brackish marsh vegetation occur along each side of the estuary along its upper reaches. In addition to the current site, Curtis and Sheehy-Skeffington (1998) recognise two additional saltmarshes from the Fergus Estuary, namely Islandavanna on the opposite side of the estuary, and Inishmacnaghtan, at the confluence of the Fergus and Shannon estuaries.

The saltmarsh is described in the National Inventory as estuarine and is associated with sand and pebble substrates. It extends a considerable distance along the eastern side of the Fergus estuary, approximately 6.5 kilometres. Notwithstanding this fact, the saltmarsh is not diverse in terms of its habitats that are present. The site is overwhelmingly dominated by Atlantic salt meadows – 1330 (ASM) and the non-Annexed *Spartina* Sward. There are, however, many admixtures between both of these habitats and mosaics are not uncommon. In addition to these mosaic, other vegetation that was associated with the saltmarsh is largely comprises brackish marsh with Common Reeds (*Phragmites australis*) and Sea Club Rush (*Bolboschoenus maritimus*) forming large stands, particularly towards the upper parts of the site. This reflects the increasing estuarine conditions for the site. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project, (although in estuarine situations these Reed stands should more accurately be classified as 'Reed and tall sedge swamps - FS1' (Fossitt 2000)). Twitch (*Elytrigia repens*)-dominated grassland on the embankments was also classified as other saltmarsh (CM2).

The total area of the individual habitats is shown in Table 3.1. It should be noted that while the main body of saltmarsh vegetation was surveyed, isolated patches of fringing saltmarsh vegetation were noted on other banks. These were not surveyed as they were considered to form part of another saltmarsh system listed for the estuary. Indeed, a comprehensive survey of the entire Fergus estuary would entail a considerable number of field days and the cooperation of many landowners on both side of the estuary, as it is large and complex site which is not easily accessible by the public.

The majority of the saltmarsh occurs within the confines of the cSAC boundary, although there are places where it extends beyond the limit of the designated site. This is partially explained by the fact that much of the site has been heavily modified through embanking, which was extensively carried along parts of the estuary as a means of flood relief and land reclamation. The berms provide landmarks with which to define boundaries, which is the case with the 6inch maps, which is the statutory mapping standard. Often, however, there is a reasonable difference between what is encountered on the ground with that which is mapped on the 2nd edition OSI 6inch map. These relatively minor differences reflect differences in the levels of accuracy at the time of its production.

Over the length of the saltmarsh, there is some variation in the structural composition of the habitats and there is a degree of variation in the gradient from the front to the back. The development of a relatively large marsh in the low-lying areas is mostly found towards the southern end of the estuary. In the townland of Ing, there is an extensive development of ASM, which extends down onto the mudflats, with a narrow *Spartina* fringe. Occasionally, the freshwater influence draining onto the marsh results in a mosaic between the ASM and Sea Club Rush. Further north, the ASM is greatly reduced and is replaced by a narrow fringe of young *Spartina* on the mudflats. The ASM returns further north, although now it is generally found perched above the mudflats. The face of the terrace ranges between 30cm and 1metres, but the trend is for an increase further north. This second extensive plain of ASM has been influenced by human interference a linear band of trenches where soils are excavated for incorporation into the berm. Sluice gates, draining the wet agricultural land behind the embankment, become more common and deep creeks channels bisect the saltmarsh. There is a considerable increase in the amount of *Spartina* sward fronting the ASM in the section, which mirrored the very extensive development which was observed on the opposite side of the Fergus estuary.

The structural composition of the saltmarsh changes, south of where the Latoon Creek leads off from the main estuarine channel. There is a startling decrease in the abundance of *Spartina*, which is gradually replaced by large stands of Sea Club Rush. The ASM, although still extensive, is heterogeneous in its distribution and patches of Sea Club-rush and Common Reeds are found along creeks and topographical depressions.

Departing the main estuarine channel, the ASM extends along the Latoon Creek. Indeed, it is quite extensive at the first bend and it is notable that there is very little development of brackish vegetation fronting the saltmarsh at this point. Further upstream, however, it reappears along both sides of this modified creek. The ASM decreases into a narrow fringe of highly disturbed vegetation which is fronted by Common Reeds as far as the upper extent of the site at Latoon Bridge.

Throughout the entire length of this site, much of the upper boundary of the saltmarsh is demarcated by transitional vegetation, much of it characterised by Twitch (*Elymus repens*)-dominated vegetation along the embankments, although in places, the saltmarsh extends

right up to the grassy berm. Elsewhere, Scrub was recorded but overall it is not extensively encountered at the back of the saltmarsh.

Table 3.1. Area of saltmarsh habitats mapped at Shepperton, Fergus Estuary.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	35.935
non-Annex	*Spartina* swards	7.524
	Total*	**43.459**

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

Atlantic salt meadows (H1330)

Although there is some extensive development of *Spartina* swards in parts of the Fergus Estuary, the majority of this site is characterised by ASM vegetation. Although largely contiguous, it is characterised by a number of individual larger marsh plains which are connected by narrow bands to the landward side of the mudflats and *Spartina* sward. Asides from some ground towards the south of the site, most of the vegetation is grazed to some degree. There are signs of damage, mostly poaching although overgrazing was also recorded in places.

There is some example of zonation at this site ranging from lower to mid and upper marsh. Most however is characterised by mid and upper communities and large parts are relatively uniform in terms of structural and floristic composition. Some of the ASM is recorded on the mudflats. This is generally confined to the southern end of the site and often occurs as discrete patches with Common Cordgrass (*Spartina anglica*). For the most part, the marsh is raised above the mudflats. The height of the terrace was rarely less than 30cm and reached over 2metres at the upper parts of the marsh along the Latoon Creek.

The lower parts of the marsh were dominated by Common Saltmarsh-grass (*Puccinellia maritima*) along with other species such as Common Sea-spurrey (*Spergularia media*), Common Scurvy-grass (*Cochlearia officinalis*) and Sea Aster (*Aster tripolium*). Annual Glasswort (*Salicornia europaea* agg.) was occasionally recorded but never in any great abundance. It is not surprising, given its relative abundance at this site, that Common Cordgrass was a common component of the lower ASM community. Bare ground was another feature of the lower parts of the marsh and could be as much as 20%.

There was some limited development of mid marsh with Saltmarsh Rush (*Juncus gerardii*), Sea Aster, Common Saltmarsh-grass and Sea Arrow-grass (*Triglochin maritimum*) commonly noted. It was not uncommon for species from other zones to be recorded, which reflected the complexity of this site.

The majority of the ASM is characterised by mid-upper and upper marsh vegetation. It is widely distributed throughout the site and was often the vegetation that showed the greatest

degree of damage or interference. Sea Arrow-grass was the only species which was more commonly recorded in the mid-upper rather than upper marsh. Otherwise the species was fairly similar. The vegetation was dominated by Red Fescue (*Festuca rubra*) along with Saltmarsh Rush and Creeping Bent (*Agrostis stolonifera*) in many parts. Common associate species included Sea Milkwort (*Glaux maritima*), Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Long Bracted Sedge (*Carex extensa*) and Distant Sedge (*Carex distans*). There is a notable estuarine influence on this site and this is reflected in the abundance of Creeping Bent within the ASM towards the northern end of the site.

The upper boundary of the saltmarsh is roughly delineated by the protective berm which extends a considerable distance along the southern shore of the Fergus estuary. However, while the saltmarsh vegetation abutted the berm in places, there was often a transitional component of the vegetation, with the ASM grading into Twitch-dominated grassland.

Spartina swards

The *Spartina* sward is well established along the River Shannon. Since its introduction into Poulnasherry Bay the 1928 (Nairn 1986), it has rapidly spread and is now extensively established on the mudflats throughout the Fergus Estuary. While large linear swards occur on the intertidal muds and occasionally along creeks and drainage trenches within the saltmarsh, it was more extensively developed on the opposite side of the estuary (Islandavanna).

It is well developed in parts of this site, with most of it recorded on the mudflats, although some transitional mosaic or as isolated patches were recorded as high up as upper marsh. Most of the habitat is characterised by a mono-specific sward. Other species are not common and are generally only recorded at the upper or landward transition where Common Cordgrass occurs in its various mosaics with the ASM vegetation.

There is a significant decline in the abundance and distribution of Common Cordgrass further upstream where conditions become more estuarine and it is effectively replaced by Sea Club-rush or Common Reeds within the Latoon Creek.

IMPACTS AND ACTIVITIES

This site is affected by several impacts and activities (Table 4.1). However, given the size and extent of the site, some of the impacts are locally important. There is considerable diversity in the management practices and condition of the vegetation. It is largely a rural setting in which the land is given over to pasture. Most of the saltmarsh is grazed to some extent by cattle or horses (140). Most of the low-lying land along the seaward side of the embankment is divided into separate landholdings which are associated with the farm holding

that are located on higher ground. The saltmarsh is also divided into management units to reflect these separate landholdings. Livestock trails (501) were not uncommon throughout the site but were rarely considered as a negative impact. Some areas have been damaged (143) through overgrazing and poaching.

This site has been considerably modified by reclamation and construction of the embankments in the 18th and 19th centuries. Former areas of saltmarsh were likely to be reclaimed in this way (801). This reclamation has also occurred in a piecemeal fashion, with newer embankments being created in front of old ones to reclaim more land. Some reclamation has occurred more recently in the 20th century. However, the effects of this reclamation are not assessed as they commenced prior to the current monitoring period.

The influence of the sea is still apparent beyond the embankment, although the sea defences largely prevent the widespread development of saltmarsh vegetation in the reclaimed or protected fields. Routine maintenance, however, is still carried out along the embankment by the OPW and local landowners (810). Most of this work is carried out on the landward side of the berm and so does not directly affect the saltmarsh communities. However, repairs in the fabric of the berm are carried out by excavating soils from the saltmarsh and placing it atop the berm. In a number of locations it is possible to see trenches where soils had been recently excavated. This operation clearly has an immediate effect as it results in a defined loss of habitat, usually ASM (820). Over time, however, these trenches become infilled with fresh mud and gradually become revegetated – at first with Common Cordgrass or Sea Club-rush. However, the spread of Common Saltmarsh-grass among some of these areas is indicative of the restoration of some ASM vegetation.

In the past, Common Cordgrass was planted to assist in stabilisation and potentially for land reclamation. This is an invasive species of saltmarsh habitats (954). It is now widespread at this site either through planting or by natural colonisation. It has mainly established its sward on the previously unvegetated mudflats, seaward of the more established saltmarsh. It does not seem to have spread significantly into ASM to replace this vegetation. Some *Spartina* sward/ASM mosaics are evident along the site but many of these are related to re-colonisation of areas damaged by the removal of sediment for maintenance of the embankments. Common Cordgrass can not be considered to have naturally spread into this ASM. However, the impact of invasive Common Cordgrass is assessed a negative impact (-1) as it has spread at the expense of ASM. If it was not present some of these areas would revert back to lower marsh ASM dominated by Common Saltmarsh-grass.

There are also some instances where ASM species are spreading into the upper *Spartina* sward to create small areas of mosaic and this reflects natural saltmarsh succession (990). However, this is a fairly minor occurrence.

There were some indicators of natural erosion (900) along the site. Much of the ASM is found perched behind the *Spartina*-vegetated mudflats. However, there are situations where the ASM terrace, which can reach up to 2 metres, was not fronted by other habitats. Such is the

tidal range at this site that the exposed ASM is in places undercut by wave action or is scoured by the river flow and elsewhere slumping was occasionally recorded. Erosion is particularly evident at one point in the northern part of the site where the main River Fergus channel comes close the saltmarsh and berm. However, there has been no measurable erosion at this site when the current extent of the saltmarsh habitats is compared to the extent as indicated from the OSI 2000 and 2005 series aerial photos. The impact of erosion is assessed as neutral on a small portion of the saltmarsh face.

A comparison of the current extent of saltmarsh to the extent mapped by the OSI 2nd edition 6 inch map shows some differences. The seaward boundary of the established saltmarsh has changed in places, mainly by some seaward growth of ASM. This is especially evident where the Latoon Creek meets the Fergus River. There has been some significant growth of mainly a large stand of Sea Club-rush at this point. The extent of ASM at this location has remained relatively unchanged. The expansion of the saltmarsh is likely to be related to changes in sedimentation (910) that may be related to reclamation in the estuary and upriver of this location. However, this is not assessed as there has been no significant growth of saltmarsh during the current monitoring period.

The NATURA 2000 datasheet notes that domestic and industrial waste water is discharged into the Fergus Estuary at a number of locations (421, 422) and that the threat of a serious pollution incident is ever present given that a number of large industrial complexes are situated along the Shannon and Fergus estuaries. Alongside this fact, the continued urbanisation of places like Clarecastle and Ennis (400) might be expected to have an impact on the Annexed habitats and species, particularly the fish and avian fauna. There were no indications of pollution at this site.

Table 4.1. Intensity of various activities on saltmarsh habitats at Shepperton, Fergus Estuary.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	B	0	30.00	Inside
H1330	143	B	-1	3.5	Inside
H1330	501	C	0	0.4	Inside
H1330	810	C	0	0.4	Inside
H1330	820	A	-2	2.5	Inside
H1330	900	C	0	1.5	Inside
H1330	954	B	-1	3.0	Inside
H1330	990	C	+1	0.1	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.

Elsewhere outside of the site, most of the land is agricultural. Most of the settlement is scattered or is found a considerable distance back from the saltmarsh. There are few houses and little settlement along the corridor running alongside either side of the estuarine channel, reflecting the areas past tendency to flood. Most of the houses/farm-buildings are situated on higher ground, outside of the cSAC (403). Much of the land is improved agriculture and is actively maintained as such. This requires maintenance of the drainage channels. There is some risk of polluting materials including fertilisers (102) making their way into the saltmarsh environment, but the risk is not quantifiable.

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 NHA survey, 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 is little other detailed information for this site.

Shepperton saltmarsh is a moderately sized site with few features of significant conservation interest. Much of the saltmarsh occurs as a fringe along the seaward side of the embankment, which connects a number of more extensive saltmarsh plains which extend some distance inland such as at the southern end of the site. Throughout the saltmarsh, there is considerable diversity in the management practices and condition of the vegetation, all of which influences the conservation status of the site. There is a distinctive estuarine influence on the vegetation of the site with increased brackish vegetation appearing in the northern section where the estuary channel narrows and becomes Latoon Creek. The structure of the saltmarsh has been considerably modified by the construction of the embankments and reclamation in the past although some larger sections are still intact.

The overall conservation status of this site is assessed as *unfavourable-inadequate* (Table 5.1). Much of the saltmarsh is grazed by cattle and there is some localised poaching. Common Cordgrass is present at this site and has formed extensive swards mainly seaward of the established ASM. It has also spread into the ASM where it has been disturbed by berm maintenance works.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Shepperton, Fergus Estuary.

Habitat	EU Conservation Status Assessment			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)		Extent, Structure and functions Future prospects		Unfavourable - Inadequate

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *unfavourable-inadequate*. Repair work to parts of the embankment involved excavating soil from the saltmarsh and putting it on top of the berm. This action has left deep bare trenches of mud in the ASM. Some of these have re-vegetated with a mosaic of *Spartina* sward and ASM or with stands of Sea Club-rush. This activity has reduced the extent of ASM along the site by about 2.5 ha and encouraged the colonisation of Common Cordgrass into the ASM. This represents a loss of about 6%. There are indications that Common Saltmarsh-grass swards are developing on infilling trenches so ASM may redevelop in some of these trenches. However, at present it is assessed as an irreversible negative impact as most of these trenches are likely to infill with vegetation not typical of ASM. There are no indications of any loss of ASM due to erosion at the site during the current monitoring period.

Habitat structure and functions

The habitat structure and functions of the ASM are assessed as *unfavourable-inadequate*. Sixteen monitoring stops were carried out across the ASM habitat and its various mosaic habitats throughout the site. Four stops, all of them located in lower and low-mid marsh failed due to the high level of poaching. There was some development of zonation throughout the marsh, although mid-upper and upper communities dominated. Much of the saltmarsh has been modified by the creation of the embankments in the past, which has altered the structure of this saltmarsh. Some of the larger patches of ASM still retain a natural creek and salt pan structure.

More recent maintenance works has damaged the ASM and encouraged the spread of Common Cordgrass into previously established ASM. However, the total spread of this species during the current monitoring period is not likely to be greater than 10%. There the impact of its spread is assessed as neutral. This invasive species is otherwise largely

confined to the mudflats adjacent to the seaward edge of the ASM, the natural drainage channels and the disturbed areas within the ASM.

Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. The assessment assumes that there will be no significant change in the levels of activities and their impacts recorded at this site. The levels of grazing and its associated damaging effects are likely to continue into the future. In addition, flood relief works and berm maintenance continues to pose a threat in the upper stretches of the site, where soils are excavated from the marsh. Continued berm maintenance will also encourage further colonisation of Common Cordgrass into the ASM. These are negative indicators.

Common Cordgrass is not likely to extensively spread within the undisturbed ASM. At present it is largely confined to the mudflats seaward of the ASM and the disturbed areas. Indeed, its gradual seaward expansion may have a positive effect on the extent of ASM as accretion within the *Spartina* sward encourages natural succession of this habitat to ASM along the landward boundary.

MANAGEMENT RECOMMENDATIONS

The use of the saltmarsh habitat to supply material for berm maintenance works should limited to prevent further damage to the saltmarsh.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

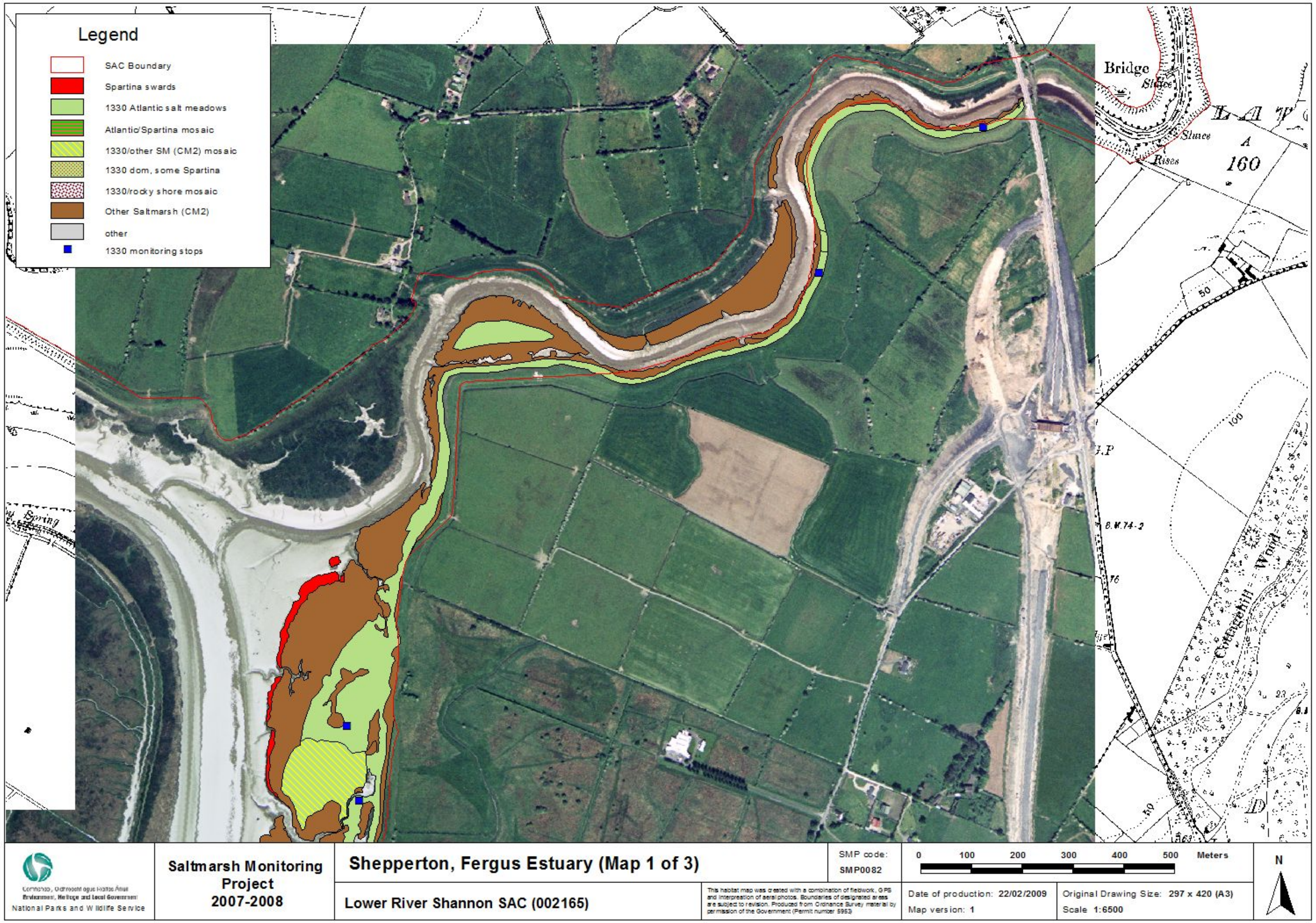
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

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

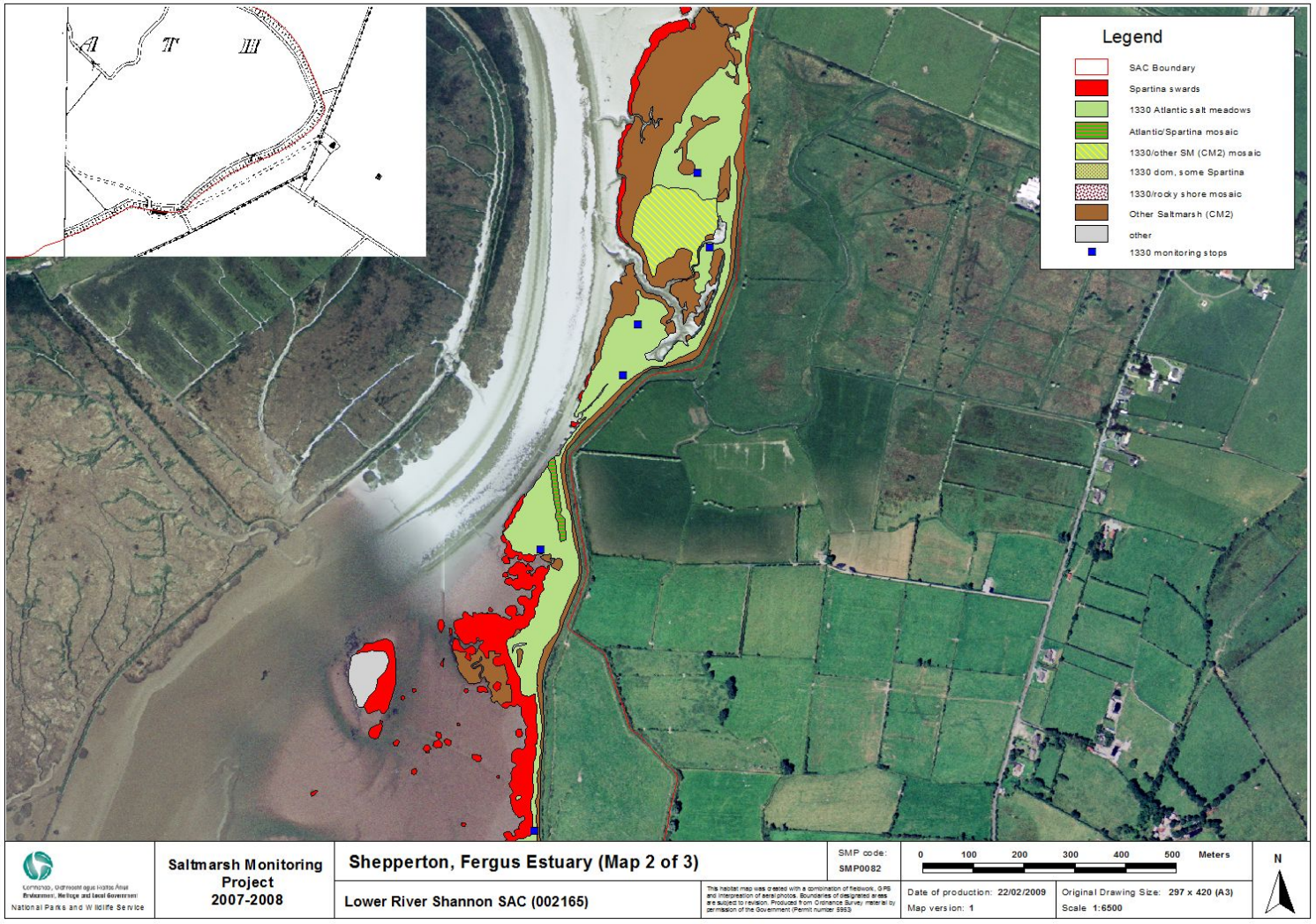
APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards	7.524					7.524
3	1330 Atlantic salt meadow	33.062		33.062			
4	1410 Mediterranean salt meadow						
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic	0.809		0.4045			0.4045
7	1330/other SM (CM2) mosaic	2.921		1.461			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	2.223					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*	1.061		1.008			0.053
17	1330/sand dune mosaic						
18	Other SM (CM2)	16.609					
19	1330/rocky shore mosaic	0.072		0.036			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**64.281**		**35.935**			**7.524**



Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
1330 dom, some Spartina
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
Bridge
Sluice
Rises
160
Cottagehill Wood
Spring
Saltmarsh Monitoring Project 2007-2008
Shepperton, Fergus Estuary (Map 1 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0082
0 100 200 300 400 500 Meters
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6500
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
National Parks and Wildlife Service
N


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
1330 dom, some Spartina
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Shepperton, Fergus Estuary (Map 2 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0082
0 100 200 300 400 500 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:6500
National Parks and Wildlife Service

Appendix VIII – Inishdea, Owenshere site report and habitat map from the SMP (McCorry & Ryle, 2009)

SITE DETAILS

SMP site name: **Inishdea, Owenshere**		SMP site code: **0083**
Dates of site visit: **4 & 5 September 2008**		CMP site code: **N/A**
SM inventory site name: **Inishdea, Owenshere**		SM inventory site code: **140**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **2048**	SPA: **4077**
County: **Clare**		Discovery Map: **57** Grid Ref: **129600, 166575**
Aerial photos (2000 series): **4496-B,C,D; O 4556-A,B**		6 inch Map No: **Cl 050**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Bunratty, Shepperton/Fergus Estuary, Killadysart/Inishcorker, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

Inishdea saltmarsh is located in southern Co. Clare, along the western side of the Fergus Estuary. This site is associated with Ballycorick Creek, which is located approximately two kilometres north of Ballynacally. This village is located approximately twenty kilometres south-west of Ennis along the R473. Ballycorick Creek flows through a number of townlands including Inishdea, Mount, Inishaellaun, Ballycorick and Island O'Brien. While the Townland of Inishdea and its hinterland occupies much of the southern portion of the saltmarsh, Owenshere was not located on any map. This area is rural and is dominated by fertile farmland. The landscape is quite low-lying in places, particularly along the creek, although there is higher ground around the site, particularly along the shore of the Fergus Estuary towards the north. There is scattered habitation in this area. This part of the Fergus Estuary is quite shallow and there are extensive intertidal mudflats adjacent to the shoreline that are exposed at low tide.

The main part of the survey site is the saltmarsh that has developed along the main channel that extends inland. Part of the main Fergus Estuary shoreline to the north of Horse Island was also surveyed. The survey site begins at the R473 Ballycorick Bridge and extends downstream where a number of tributary creeks merge into the main Ballycorick Creek

channel. This winds its way roughly in a northerly direction, before turning in an easterly direction where it enters the Fergus Estuary. Horse Island, which was formerly inhabited, lies across the mouth of the Ballycorick Creek at this point. It should be noted that this is not a discrete site and saltmarsh habitat is distributed along the Fergus River estuary beyond the limits of the survey site. The size of the survey site has to be restricted due to time limitations.

Inishdea, Owenshere is a long and complex site that has in parts been considerably altered through the construction of earthen berms as a means both to protect against flooding and also to reclaim land. The site is composed of saltmarsh and brackish marsh vegetation. Indeed, the margins of upper Ballycorick Creek are extensively vegetated by large stands of Common Reeds (*Phragmites australis*).

Inishdea, Owenshere saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this cSAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats were found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

One notable species recorded at this site is Meadow Barley (*Hordeum secalinum).* This species is listed on the Flora Protection Order and is also listed in the Red Data Book (Curtis and McGough 1998). Meadow Barley is found in brackish situations and in unimproved lowland meadows close to estuaries. This species is known from 21 10 km^2 squares in Ireland mainly distributed around the coastline (with some inland sites) since 1960. At Inishdea, Owenshere it was recorded on dry transitional mounds on the saltmarsh and it was also locally frequent within some of the transitional grassland and upper saltmarsh, along the upper saltmarsh boundary. It is already known from this 10 km^2 grid square and has recently

been recorded on saltmarsh found around some of the islands in the southern part of the Fergus Estuary (Canon Island) (NPWS Rare plant survey).

For the most part, this large site, which occurs along both sides of the Ballycorick Creek, is not publicly accessible. While limited number of public rights of way exists, they are not readily identifiable. They generally comprise narrow tracks between fields, but more often than not are overgrown and easily overlooked. Some saltmarsh was accessed after crossing adjacent farmland. Permission was sought to enter this land.

SALTMARSH HABITATS

General description

Inishdea, Owenshere is a large and complicated site that is characterised by a sinuous Ballycorick Creek which winds its way downstream from the Ballycorick Bridge at the R473 towards the Fergus Estuary. The northern most extent of the saltmarsh occurs along the main shoreline of the Fergus Estuary and is taken as the townland boundary of Island O'Brien. There is an abrupt decline in the *Spartina* sward at this point, where the shoreline becomes rocky. The southern boundary of the survey site along the Fergus Estuary is taken as the concrete seawall on the eastern side of Inishdea. Between this point and Horse Island, the development of saltmarsh vegetation is confined to small isolated pockets among the exposed limestone shoreline.

Three Annex I saltmarsh habitats were recorded from this site including Atlantic salt meadows – H1330 (ASM) and Mediterranean salt meadows – H1410 (MSM). The third habitat is *Salicornia* and other annuals colonizing mud and sand – H1310 (*Salicornia* flats), which was recorded as a single small patch. *Spartina* sward was also recorded from this site. The total area of the individual habitats is shown in Table 3.1. For the purposes of this report it is treated as a single marsh, although it should be remembered that the saltmarsh is largely characterised by discontinuous or fragmented bands of vegetation. The largest area is found in a low-lying area in Inishdea Townland along the south side of the main channel. Other habitats associated with the saltmarsh include brackish vegetation, particularly towards the upper parts of the Ballycorick Creek. Appendix I details the full breakdown of the various habitats and mosaics that were recorded throughout this site.

This is a site that retains many vestiges of earlier attempts to reclaim land as well as protection against flooding of low-lying ground. A considerable part of the site has been embanked, which is well maintained to this day. The marsh is characterised by large swathes of Common Reeds (*Phragmites australis*) along the margins of the creek, with some fragmented development of saltmarsh vegetation in sheltered corners and as small fringing

bands behind the brackish vegetation. The stands of Common Reed were mapped as non-Annex I vegetation or CM2. The saltmarsh vegetation is not extensive in the upper parts of the creek, often confined to a narrow band on the seaward side of the embankment.

Heading downstream, the majority of the brackish vegetation occurs on the western side of the creek, although it occasionally thins out on bends in the creek or where tributary creeks join the main creek channel. The opposite bank is more open and the brackish vegetation is often missing from in front of the narrow saltmarsh band.

A stronger maritime influence appears at the first major downstream bend in the creek and there is an abrupt decrease in the freshwater influence, which is marked by the fact that around this section, the creek almost fully drains at low tide. Common Cordgrass (*Spartina anglica*) makes its first appearance. It occurs as a thin discontinuous band along either side of the creek. Shortly thereafter, there is a considerable increase in saltmarsh vegetation.

The greatest extent of saltmarsh is located around the first bend in Ballycorick Creek west of Horse Island. Unlike the fringing ASM–dominated saltmarsh which is recorded alongside the brackish vegetation further upstream, and which is rarely much higher than the level of the creek water, the perched saltmarsh plain can be up to 2 metres above the drained creek channel. This area is characterised by an extensive development of both MSM and ASM, and there is often a complex pattern between these two habitats along with some intermixing with Common Cordgrass and other transitional drier grassland areas. Much of the saltmarsh plain is bisected by a network of drainage creeks and man-made ditches. Much of this ground is grazed by livestock, with livestock access to outlying parts facilitated through a number of small land-bridges. Despite its elevated position, much of the peaty substrate is water-logged and the vegetation was heavily poached in places.

The extensive MSM is often backed by ASM vegetation, whereas the upper ASM boundary is often characterised by transitional grassland. This site is notable for the relatively extensive natural transitions to unimproved dry calcareous grassland (GS1) on thin soils with frequent exposed bare limestone. Some adjacent dry land adjacent to the saltmarsh has been improved, re-seeded and cleared of exposed rock. Towards the eastern side of the main saltmarsh plain, the saltmarsh vegetation, mostly ASM tends to be more transitional, particularly as the soils are shallower and better draining. This is as a result of the proximity of the underlying limestone bedrock to the surface. Indeed, swallow holes were occasionally noted.

Heading out through the narrow, but deep forded channel between the mainland and Horse Island, there is some limited development of saltmarsh along the southern shoreline. There is considerable outcropping of limestone along the exposed coastline here and small patches of

ASM were noted, as well as the only patch of *Salicornia* flats, at the south-eastern extent of the site.

While a limited amount of saltmarsh vegetation was observed around the inner parts of Horse Island, most of the maritime vegetation was characterised by patches of Common Cordgrass. Its greatest development however, occurred northwards of Horse Island, where a narrow perched band running along the front to the embankment, gradually developed into a considerable sward which extends out over the mudflats, towards the townland of Island O'Brien. There were some limited fragments of ASM vegetation along this narrow band, which also expanded to form a near-continuous band circling around the back of the *Spartina* sward.

Given the size of this site and the extent of the brackish marsh in places, some of the ground was visually surveyed. This included the upper reaches of the Ballycorick Creek where there was little or no evidence of saltmarsh vegetation and where access was difficult. Elsewhere the islands around Horse Island were not visited, due to the treacherous nature of the mudflats. It is possible to access Horse Island via the ford at very low tide, but it was not attempted due to time limitations.

Whilst springs are not uncommon in limestone areas, one of the unusual features of this site is the reputed presence of springs which outflow on the mudflats. A number are shown on the 6inch map, particularly around the north-western edge of Horse Island. This might explain the occurrence of a large stand of Common Reed some distance out on the mudflats where conditions should be more typically maritime.

The majority of the saltmarsh is recorded from within the cSAC boundary. The majority of the small patches that are mapped outside the current boundary merely reflect cartographical differences between the 6inch maps with what occurs on the ground. However, a small area of saltmarsh, measuring 0.891ha, occurs in the townland of Inishdea and is excluded from the site. There is a significant change in the trend of the boundary, where it follows the edge of a creek as indicated by the 6inch map and does not take into account the land behind the creek.

Table 3.1. Area of saltmarsh habitats mapped at Inishdea, Owenshere.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.003
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	19.636
H1410	Mediterranean salt meadows (Juncetalia maritimi)	11.553
non-Annex	*Spartina* swards	13.236
	Total	**44.428**

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

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

This habitat is not well developed at Inishdea, Owenshere. Indeed a single patch occupying a negligible 0.003ha was recorded (Table 3.1). The vegetation is naturally species poor and comprised Annual Glasswort (*Salicornia europaea* agg.) along with minor Annual Sea-Blite (*Suaeda maritima*). It occurred on a mud/shingle substrate in a small sheltered cove and graded into grazed ASM vegetation fringe over outcropping limestone. Common Cordgrass is not present in this area.

Atlantic salt meadows (H1330)

Measuring nearly 19.2 ha (Table 3.1), the ASM is the most extensive of the saltmarsh habitats recorded from this site. It is widely distributed, although rarely is it extensive. Indeed, in the main part of the saltmarsh, the MSM is co-dominant with the ASM in terms of extent. Much of the ASM is quite fragmented and forms mosaics with MSM. The remaining ASM is often narrow, constrained as it was by the embankment.

Within the ASM, there were few extensive areas with well-developed zones. There was no extensive pioneer or lower marsh vegetation. Some limited low/mid marsh vegetation was noted, mostly towards the upper parts of Ballycorick Creek. Similarly, mid and mid/upper vegetation was not well developed. The majority of the ASM is accounted for by upper marsh (14 of 17 monitoring stops), which is not unsurprising, given that most of the saltmarsh is perched quite high above the adjacent mudflats and intertidal channel.

Species that were recorded from the upper ASM are typical of the habitat. The most common species included Red Fescue (*Festuca rubra*), Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Sea Arrow Grass (*Triglochin maritimum*) and Sea Aster (*Aster tripolium*). Creeping Bent (*Agrostis stolonifera*) was also commonly recorded and at times surpassed Red Fescue in its cover. Other species which were less common but nonetheless typical include Common Saltmarsh-grass (*Puccinellia maritima*) which was often found in wet depressions within the perched saltmarsh and along low-lying creeks. White Clover (*Trifolium repens*) and Autumn Hawksbill (*Leontodon autumnalis*) were two species that were not uncommon, although of limited ground cover. Two species indicative of the drier conditions were Perennial Rye-Grass (*Lolium perenne*) and White Clover (*Trifolium pratense*). These were two of the more common species as well as Meadow Barley and Twitch (*Elytrigia repens*) that were associated with transitional ASM/grassland areas. Sea Wormwood was also recorded at one location along the shoreline of the Fergus Estuary along the upper saltmarsh boundary.

The structure of the main saltmarsh was well developed with frequent depressions, salt pans and intricate drainage creeks. One large salt pan was filled with Tasselweed (*Ruppia* sp.). One notable feature of the ASM at Inishdea was the development of slightly raised natural

ridges of Twitch-dominated grassland along the edges of the established saltmarsh and along old embankments on the saltmarsh. Some of these ridges were mapped as CM2 vegetation. They also contained occasional Meadow Barley.

Other species that were recorded with the ASM in low-lying areas included Common Cordgrass, which was found along creeks and in a number of pans. In addition, it is mapped occurring as a mosaic with ASM. Brackish elements were more commonly recorded at the upper parts of the Creek, where they were clearly delineated from the ASM. However, there were a number of instances when small patches of Common Reeds or more often than not Sea Club Rush occurred within the ASM habitat.

The upper boundary of the saltmarsh, in terms of the ASM, was rarely distinctive. Much of it was characterised by transitions, of which there were several types depending on the location. In agriculturally-managed areas such as the main body of the marsh, there was a gradation to various forms of grassland or Blackthorn (*Prunus spinosa*)-dominated scrub where there was a noticeable decrease in soil depth. Elsewhere, the ASM is often more fragmented in its distribution and is constrained by the embankment. It was not uncommon to record transitional grassland (CM2), dominated by Twitch (*Elymus repens*) behind the ASM. Typically, this transitional grassland was not extensive. Often it was less than two metres wide and only rarely was it more than a few metres wide. Some of the ASM has developed behind former berms that have deteriorated. One section at Inishdea has been recently drained and there have been some recent coastal protection works.

Mediterranean salt meadows (H1410)

Unlike the ASM, which is heterogenous, depending on the intensity of grazing and also its position in the marsh relative to its distance and height above the mudflats, the MSM is very much more homogenous in appearance. Covering an area estimated at 11.61ha, the majority of the MSM is associated with the main body of saltmarsh plain, with some smaller fringing fragments recorded elsewhere. It is generally perched up to 2 metres above the mudflats, although, this can rise to 3 metres along the exposed central creeks.

Characterised by the tall growing Sea Rush (*Juncus maritimus*), the vegetation is typically rank. Although the tough Sea Rush is generally avoided by livestock, nonetheless trails are not uncommon and the cover provided by this rush is not always complete. Tussocks of Sea Rush are intermingled by common saltmarsh species here, many of them also found in the upper ASM. The constant species include Saltmarsh Rush (*Juncus gerardii*), Creeping Bent, Red Fescue, White Clover and Autumn Hawksbill.

Most of the MSM is characterised as upper marsh and is mapped as pure habitat with a distinct change to other habitats recorded. However, a limited amount (0.167ha) of ASM/MSM mosaic is recorded. The upper boundary of the MSM is often marked by ASM, although in some cases, this is replaced by other non saltmarsh habitats.

3.5 *Spartina* swards

Easily identified by the presence of its mono-specific sward, Common Cordgrass (*Spartina anglica*) is a non-native grass that was purposely introduced into the Shannon Estuary as far back as 1928 and has since spread voraciously (Nairn 1986).

At Inishdea, Owenshere it is widely distributed throughout this site. The greatest extent of sward development is recorded extending northwards of Horse Island, where the intertidal mudflats are shallow and the sward can extends in a seaward direction ranging between 40 and 100 metres. Elsewhere it is less extensive but nonetheless abundant and occurs a considerable distance along the Ballycorick Creek, where it is replaced by extensive bands of Common Reeds on either side of the branching creek. Scattered patches are found on the intertidal mud in the deep channels that divide the main saltmarsh.

While the greatest concentration is recorded from soft mudflats and low-lying ground along the creek, in areas that are not suitable for other saltmarsh habitats, it is not solely confined to muddy substrates. It extends inland along smaller creeks and drains and in places patches of sward are recorded within the more established saltmarsh. While there is some development of ASM/*Spartina* mosaic at the back of the *Spartina* sward, the majority of this mixed vegetation is found perched above the mudflats in heavily poached ground and drainage runnels.

IMPACTS AND ACTIVITIES

This is a large and complex site which covers a considerable area. There are many landowners and the management regime is often different, depending on the area and accessibility of the available saltmarsh. Large parts of the site have been modified either through embanking or through attempts to drain the low-lying ground in the past. The list of impacts and activities that were recorded at Inishdea, Owenshere are shown in Table 4.1. There are few current activities, other than grazing which are considered to be causing any serious damage at this site.

Much of the low-lying ground adjacent Ballycorick Creek has been extensively remodelled through the construction of an embankment. Anecdotally, the tidal influence during high tides extended further upstream of the Ballycorick Bridge. It was often the case that the low-lying

ground was flooded for extended periods and unsuitable for livestock. As a result the embankment was commissioned and extends along much of the north-western bank of the Creek as well as some parts along the opposite bank, in the townland of Inishdea. This was constructed in the 19th century. The embankment mostly comprises an earthen bund, although downstream it has been modified with boulders or in some cases concrete seawall. It is still maintained and at the time of survey, the OPW had a maintenance crew working along a stretch of the berm. As the embankment has been in existence for some time prior to the current monitoring period, its impact is not assessed.

Ongoing maintenance of the embankment, however, includes repairing of sluice gates and clearing drains behind the embankment (810). As there was little or no saltmarsh behind the embankments, its impact are not thought to be major.

Most of the land surrounding the marsh has been given over to agriculture, namely grazing, for some time. Historical management practices, of which there are relics includes the network of drainage creeks, particularly in the main section of the saltmarsh. Some of the saltmarsh is isolated by wide creeks and small bridges and fords were constructed across mudflats. These are still in existence and some are maintained (810) enabling livestock to access otherwise isolated parts of the marsh.

Grazing (140) is widespread throughout this site, and there are few areas of ungrazed saltmarsh. Elsewhere, the remainder of the land is characterised by brackish marsh and stand of Reeds that are so extensive that it is generally avoided by livestock. The intensity of grazing is related to the individual landowner and the amount of land which is available to them. It is not surprising, that during this unseasonably wet summer that the impacts and damage caused by livestock may have been exacerbated. Trails (501) were not uncommon and at times the level of trampling was such that the ground was highly churned (143). The poaching was, not surprisingly, mostly concentrated in larger expanses of saltmarsh such as the main section west of Horse Island.

There has been some recent reclamation at Inishdea (801). An embankment enclosing some saltmarsh in the upper part of the saltmarsh has been re-profiled. A recently constructed drainage ditch adjacent to this embankment has resulted in ground drying out (810). It is likely that saltmarsh habitat has been lost in the area behind the embankment as indicated by the remnant flowering head of distinguishable species such as Sea Aster. This area is within the SAC. Asides from that there are no other real threats from agricultural restructuring.

There was some evidence of natural erosion (900) and a number of indicators were recognised. These included isolated tussocks of saltmarsh vegetation, such as was noted, in the narrow channel between the mainland and Horse Island. The most prominent indicator however was the exposed front face of the marsh, which was perched above the mudflats. It

was possible to see the effects of tidal undercutting or slumping of narrow chunks of vegetation. However, there was no measurable loss of habitat, especially when the current map is compared with the year 2000 or series 2005 aerial photographs. The impact of erosion is assessed as neutral on small portion of the habitat.

Common Cordgrass is considered as non-native invasive species of saltmarsh and mudflats in Ireland (954) and has become rapidly established at this site sometime after 1928, when it was first planted in the River Shannon. While it fronts most of the established saltmarsh along the lower parts of the Creek and occurs on deeper mud, its greatest concentration is towards the northern part of the site in the main Fergus Estuary. The largest expanse of sward is recorded on intertidal muds and it appears to be still extending outwards at the expense of intertidal mudflats. It is found on the ASM and has developed some ASM/*Spartina* sward mosaics where it is more common. However, the area of these mosaics is quite small (about 0.5 ha). The presence of Common Cordgrass is assessed as a negative influence (-1) on these mosaic areas due to its density.

Much of the land outside of the site is similarly managed. Grazing is the main activity, although there are instances of supplemental feeding (171) as well as field improvement through fertilisation (120). It is not possible to quantify any nutrient enrichment, if any, that occurs within the saltmarsh. Some limited tillage is also carried out (100).

Table 4.1. Intensity of various activities on saltmarsh habitats at Inishdea, Owenshere.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1310	140	B	0	0.003	Inside
H1330	140	B	0	8.5	Inside
H1330	143	B	-1	8.5	Inside
H1330	501	C	-1	1.0	Inside
H1330	801	C	-1	1.0	Inside
H1330	810	C	-1	0.1	Inside
H1330	900	C	0	0.15	Inside
H1330	954	B	-1	0.5	Inside
H1410	140	B	0	5.0	Inside
H1410	143	B	-1	6.0	Inside
H1410	501	C	-1	0.5	Inside
H1410	810	C	-1	0.03	Inside
H1410	900	C	0	0.02	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.

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 NHA survey, 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 is little other detailed information for this site.

Inishdea saltmarsh contains several features of notable conservation interest. The most notable feature is the relative abundance of Meadow Barley, which was widely distributed over the site and was found on the saltmarsh and also in adjacent transitional grassland. Sea Wormwood, another species of local distinctiveness, was also recoded at this site. The natural transitions from saltmarsh to adjacent unmodified dry-calcareous grassland and scrub are relatively extensive at this site, as not all the adjacent land has been improved and re-seeded. Some of the saltmarsh is still unmodified and has a complex natural structure. The underlying limestone bedrock has introduced some unusual features to parts of the saltmarsh, such as shallow-holes. Much of the saltmarsh along the main channel has been modified in the past by the construction of embankments. Former saltmarsh has been reclaimed in places.

The overall conservation status of this site is *unfavourable-bad* (Table 5.1), which is largely due to excessive poaching damage to a significant area of saltmarsh. Common Cordgrass is also present at this site. It is largely found in the intertidal mudflats and in the deep intertidal channels found in this site. However, it has also spread to some extent onto the established saltmarsh.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Inishdea, Owenshere.

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions	Future prospects		Unfavourable - Inadequate
Atlantic salt meadows (H1330)	Extent	Structure and functions Future prospects		Unfavourable - Inadequate
Mediterranean salt meadows (H1410)	Extent		Structure and functions Future prospects	Unfavourable - Bad

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

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

5.2.1 Extent

A single patch of annual vegetation that was recorded occurred in a small sheltered cove on mixed mud/shingle sediment. There is no information on the previous extent of this habitat at this site. It is unlikely that it was ever widespread at this site. Most of the available and vegetated mudflats are composed of deep oozing mud and are diurnally flooded. It is not thought likely that this annual habitat could become established let alone expand under such conditions. Given the overall lack of previous information, the occurrence of this habitat is assessed as *favourable* (Table 5.1).

5.2.2 Habitat structure and functions

Monitoring stops were not carried out in this habitat given its very limited distribution. However, based on a visual assessment of the vegetation and its condition, the structure and functions are rated as *favourable*.

5.2.3 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 such as grazing continue in the near future. It is difficult to determine the future prospects of this habitat, given the lack of information as to its previous extent or condition. The sheltered cove in which it occurred is freely accessible to livestock who roam down along the shoreline. Despite the many hoof-prints that were observed in this vegetation, it is unlikely to pose any real damage to this pioneer habitat. This habitat is vulnerable to colonisation by Common Cordgrass in the future. This is the main reason fro the assessment of *unfavourable-inadequate.*

5.3 Atlantic salt meadows (H1330)

5.3.1 Extent

The extent of the ASM is rated as *favourable* (Table 5.1). There are no indications of any significant habitat loss at this site due to erosion during the current monitoring period. A small area was damaged by attempted reclamation within the current monitoring period. A drain was constructed and an adjacent embankment was re-profiled. This has damaged a small area of saltmarsh but there has been no significant loss of habitat yet as there is still some tidal influence. Common Cordgrass has spread on this saltmarsh but there is no evidence

that it has spread significantly during the current monitoring period (mainly due to the lack of accurate baseline data).

5.3.2 Habitat structure and functions

Four of the seventeen monitoring stops carried out in this habitat did not satisfy the target criteria. For this reason, the structure and functions are assessed as *unfavourable-inadequate*. A significant part of the ASM is grazed and has suffered some form of damage from the excessive grazing pressure. While the damage in the largely water-logged saltmarsh developed on deep mud at Inishdea may have been compounded by the unseasonably wet summer, nonetheless the ground was heavily trampled and poaching was not uncommon in the main part of the saltmarsh. Much of the saltmarsh found on shallower soil is well-drained and less vulnerable to poaching.

The structure of some of the intact saltmarsh at Inishdea is relatively unmodified and there is a complex network of creeks, salt pans and depressions. The structure of some of the ASM is further diversified by the presence of features such as exposed rock and sinkholes, related to the underlying limestone bedrock. Some of the ASM has developed on thin substrates that overlay this bedrock. This is a feature of local distinctiveness.

Much of the other saltmarsh along the main creek has been modified in the past with the construction and maintenance of the embankments. Common Cordgrass is present at this site and is mainly found in the intertidal channels and on the mudflats where it has spread at the expense of bare mudflats. However, it has also created some patches of ASM/*Spartina* mosaic where is has spread into established saltmarsh. It has spread into low-mid ASM and changed the structure of this vegetation. However, there is no evidence that it has spread significantly during the current monitoring period (mainly due to the lack of accurate baseline data) so its spread is not considered to be a negative indicator at this site.

Several typical communities were noted at this site. These include some rare transitional communities along the upper boundary of the ASM which included Meadow Barley. These are positive indicators for species composition. This species was more abundant in the adjacent drier grassland which would not be considered ASM saltmarsh but it was still found occasionally in upper saltmarsh. The presence of this species of local distinctiveness enhances the overall diversity of the site.

5.3.3 Future prospects

The future prospects of this habitat are assessed as *unfavourable-inadequate*. This assessment assumes that the current management regime, in particular, grazing continues in the near future. The large parts of the saltmarsh vegetation are freely grazed by livestock and the damage impacts are unlikely to change. More recently, there have been some attempts to

drain a small area of the upper marsh. This has resulted in the significant damage to some ASM and possible losses of extent. Continued reclamation could reduce the extent of ASM and also damage adjacent transitional habitats that contain Meadow Barley, a species listed on the Flora Protection Order.

Common Cordgrass is found at this site and has already spread into the ASM. However, much of the ASM found at this site is upper ASM. This zone is much less vulnerable to colonisation by this species as it is uncompetitive. Therefore, Common Cordgrass is not likely to spread significantly at this site at the expense of ASM. Most of the ASM is quite sheltered within the creek and is not vulnerable to significant erosion. There are no signs of any significant erosional trends at this site.

5.4 Mediterranean salt meadows (H1330)

5.4.1 Extent

The extent of the habitat is assessed as *favourable* (Table 5.1). The MSM is well represented at Inishdea, Owenshere. It is widespread in its distribution and in places forms extensive swards. There is no accurate information with which to compare its previous extent. There were some limited signs of erosion along the seaward side of the MSM, particularly along the main channel where there is some undercutting of the terraced saltmarsh face. However, there has been no measurable loss of MSM at this site due to erosion.

5.4.2 Habitat structure and functions

The structure and functions of this habitat are rated as *unfavourable-bad*. Of the six monitoring stops that were carried out, two failed to reach the target criteria. This was largely due to the levels of poaching which were, in places considerable. Much of the MSM was damaged to some extent by the heavy grazing levels.

The structure of some of the intact saltmarsh at Inishdea is relatively unmodified and there is a complex network of creeks, salt pans and depressions. The structure of some of the MSM is further diversified by the presence of features such as exposed rock and sinkholes, related to the underlying limestone bedrock. The vegetation assemblage is typical for the habitat. There is little habitat differentiation within the MSM and other than a limited fringe occurring on sheltered muds, the majority of the MSM is classified as upper marsh. There are natural transitions to other coastal habitats such as ASM and to low mounds with Twitch-dominated vegetation.

5.4.3 Future prospects

The future prospects for this habitat are rated as *unfavourable-bad*. This assessment assumes that the current management activities and level of impacts such as grazing

continue in the near future. A significant portion of the MSM has been damaged by heavy poaching and grazing. This is likely to continue in the future.

Common Cordgrass is present in this habitat. MSM is not usually vulnerable to colonisation by this species, but heavy poaching in some of the MSM may promote the spread of Common Cordgrass. The MSM is not likely to be vulnerable to significant erosion in the future.

MANAGEMENT RECOMMENDATIONS

The presence of Wall Barley (*Hordeum secalinum*) at this site increases the conservation status of this site. This threatened species is not common, certainly within the Lower River Shannon. It was relatively widespread at Inishdea, Owenshere and was generally found on drier parts of the upper ASM marsh and ASM transition to MSM. It does not appear to be affected by the levels of grazing or damage associated with trampling and poaching. It is vulnerable to reclamation, especially of the adjacent drier grassland to the saltmarsh. Reclamation and reseeding in the past has probably negatively impacted the population of this species. Given its overall status in Ireland, it would be advisable to monitor its condition and status periodically.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

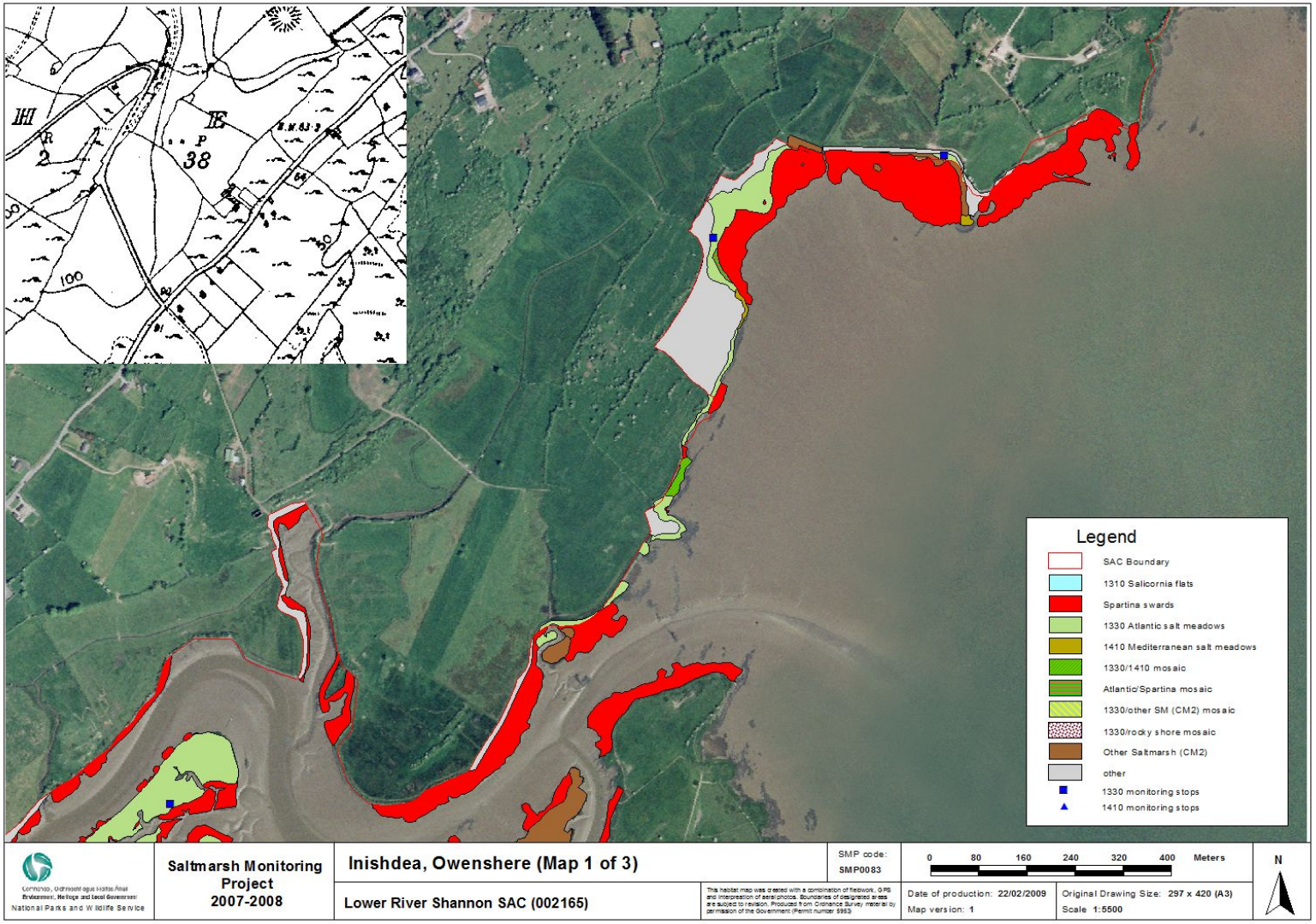
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

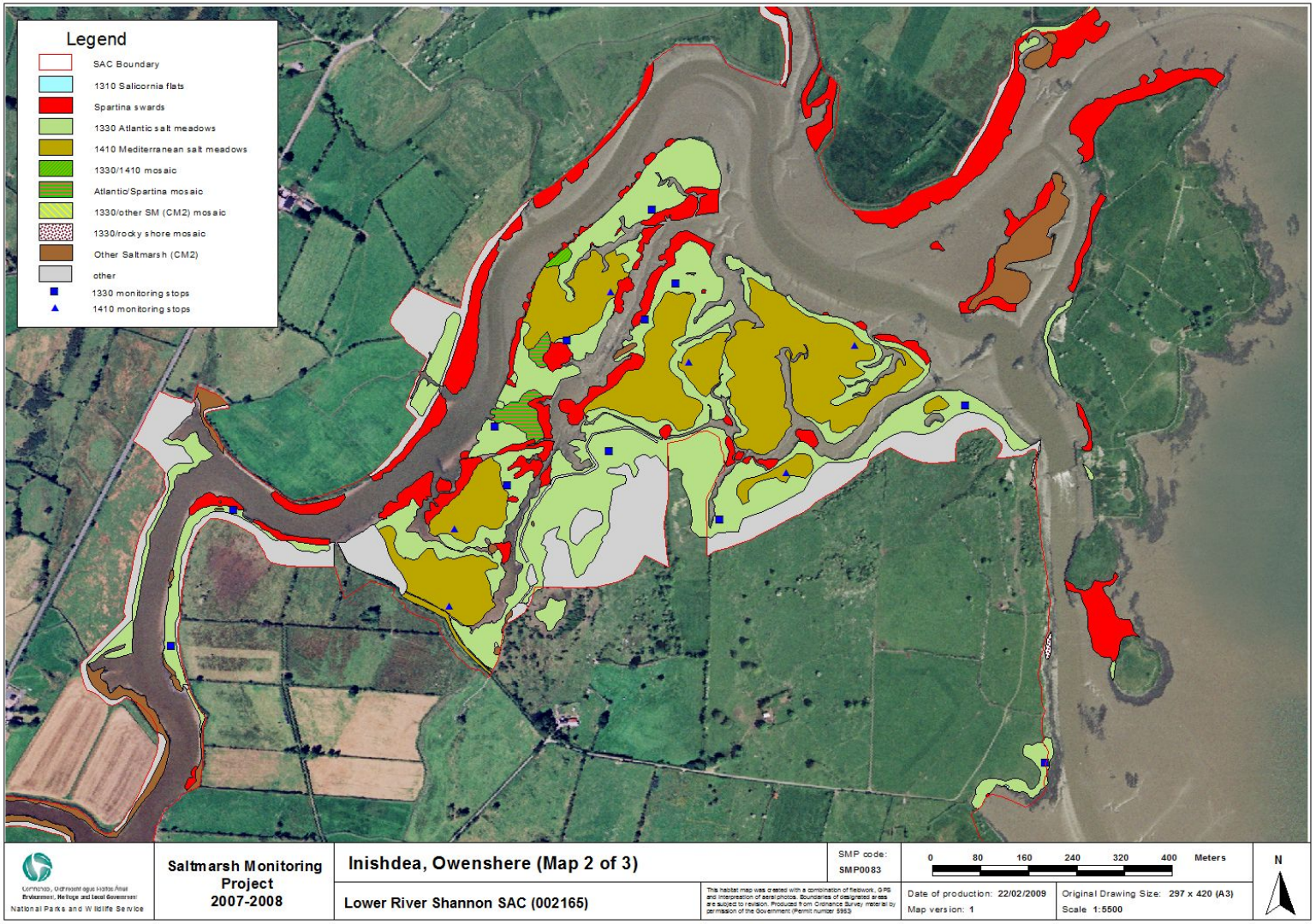
Nairn, R.G.W. (1986). *Spartina anglica* in Ireland and its potential impact on wildfowl and waders – a review. *Irish Birds*. **3**, 215-258.

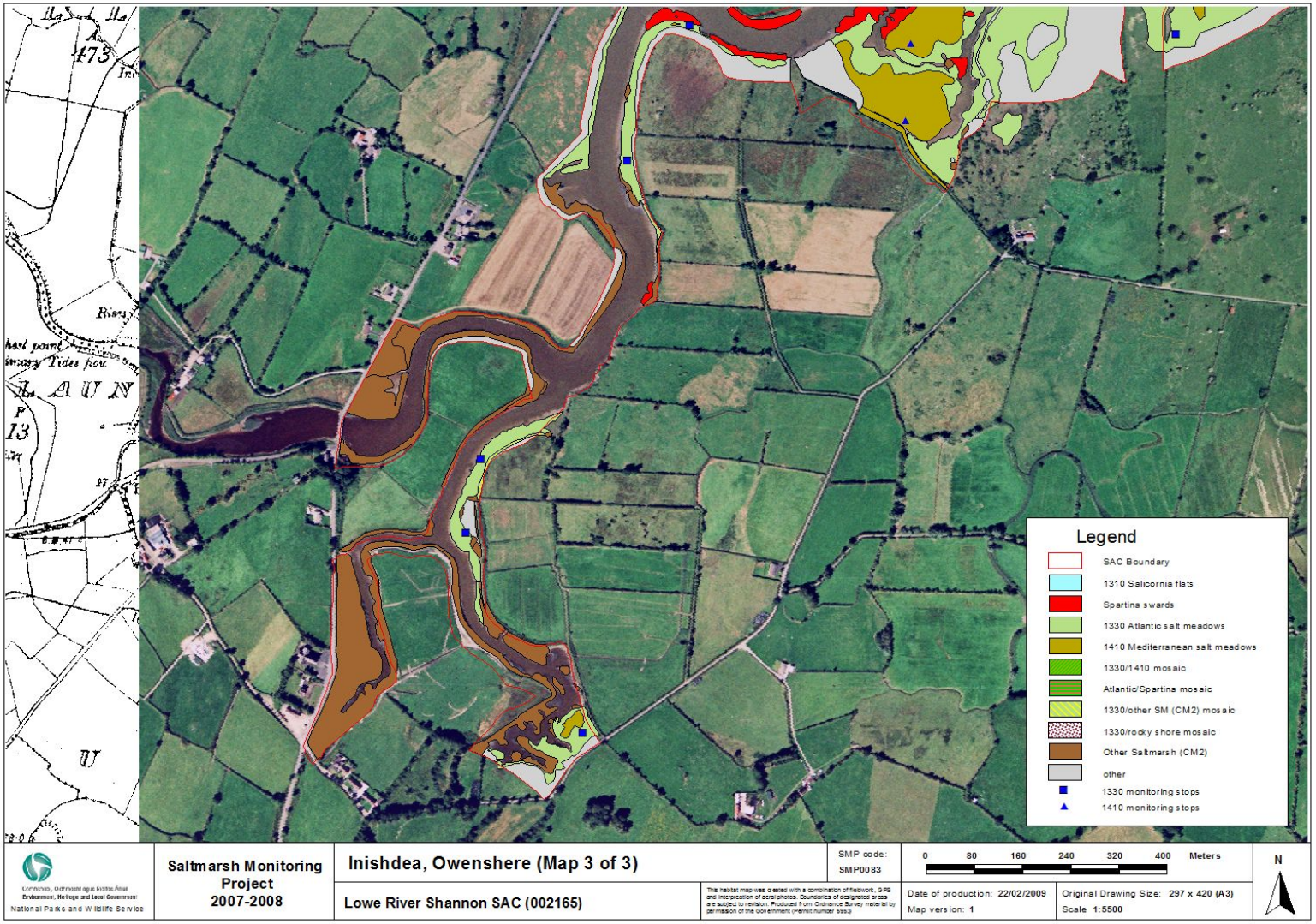
A**PPENDIX I**

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.003	0.003				
2	*Spartina* swards	12.976					12.976
3	1330 Atlantic salt meadow	19.227		19.227			
4	1410 Mediterranean salt meadow	11.469			11.469		
5	ASM/MSM mosaic (50/50)	0.167		0.0835	0.0835		
6	ASM/*Spartina* mosaic	0.519		0.2595			0.2595
7	1330/other SM (CM2) mosaic	0.077		0.0385			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	12.256					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	7.837					
19	1330/rocky shore mosaic	0.054		0.027			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**64.585**	**0.003**	**19.636**	**11.553**		**13.236**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Inishdea, Owenshere (Map 1 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0083
0 80 160 240 320 400 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:5500
National Parks and Wildlife Service


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Inishdea, Owenshere (Map 2 of 3)
Lower River Shannon SAC (002165)
SMP code: SMP0083
0 80 160 240 320 400 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:5500
National Parks and Wildlife Service


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Inishdea, Owenshere (Map 3 of 3)
SMP code: SMP0083
0 80 160 240 320 400 Meters
N
Lowe River Shannon SAC (002165)
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:5500
National Parks and Wildlife Service

Appendix IX – Killadysart, Inishcorker site report and habitat map from the SMP (McCorry & Ryle, 2009)

SITE DETAILS

SMP site name: **Killadysart, Inishcorker**	SMP site code: **0084**
Dates of site visit: **3 September 2008**	CMP site code: **N/A**
SM inventory site name: **Killadysart, Inishcorker**	SM inventory site code: **139**
NPWS Site Name: **Lower River Shannon**	
NPWS designation cSAC: **2165** pNHA: **2048**	MPSU Plan: **Old Format – Draft 2: Consultation** SPA: **4077**
County: **Clare**	Discovery Map: **64** Grid Ref: **127120, 158400**
Aerial photos (2000 series): **O 4614-D; O 4615-C; O 4674-A,B,C,D**	6 inch Map No: **Cl 059, 060**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Bunratty, Shepperton/Fergus Estuary, Inishdea/Owenshere, Knock, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

This site is located in the south-west corner of the Fergus Estuary, where it joins the River Shannon Estuary. Killadysart is a small rural town in County Clare, approximately twenty-five kilometres south-west of Ennis along the coastal R473 road to Labasheeda (Leaba Shíoda). This site is located on the opposite side of the River Shannon from Aughinish Island. A small island called Inishcorker is located adjacent to this town. There is a narrow intertidal channel called Killadysart Creek between the island and the mainland and the island can be reached by a ford at low tide. A small quay is located in this creek adjacent to the town.

This site is located in a rural area, which is dominated by farmland. There is some low-lying land adjacent to the shoreline east of Killadysart that has been reclaimed in the past. Tall embankments were built around this shoreline to enclose this land in the 18th-19th centuries. There is higher ground around Killadysart and on Inishcorker Island, although some low-lying land on Inishcorker was also enclosed by embankments. This part of the Fergus Estuary/Shannon Estuary is quite shallow and there are extensive intertidal mudflats adjacent to the shoreline that is exposed at low tide. There are several other small islands in the

estuary adjacent to this area with associated saltmarsh development and are surrounded by mudflats. Sub-tidal estuarine channels are located between these islands.

The survey site includes the saltmarsh found along Killadysart Creek and the shoreline adjacent to the townlands of Lackannashinagh and Crovraghan, north-east of Killadysart. The main part of the marsh is located in this area and there is fragmented marsh on both sides of Killadysart Creek. Some of this marsh has been modified by the creation of the embankments. The Ballyvohane River flows into this creek at Killadysart Quay and there is also some saltmarsh along this river channel, where it is tidal (east of the road bridge). There is no significant development of saltmarsh along the exposed eastern side of Inishcorker and much of the substrate is composed of rock and shingle. It should be noted that this is not a discrete site and saltmarsh habitat is distributed along the Fergus River estuary and the River Shannon shorelines beyond the limits of the survey site. The size of the survey site has to be restricted due to time limitations.

Inishdea, Owenshere saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this SAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). The latter two habitats were recorded at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

There are few publicly accessible access points to this extensive saltmarsh. The shoreline was accessed at several points by crossing adjacent farmland. Permission was sought to cross this land and also to access the island.

SALTMARSH HABITATS

General description

Although not as large as some of the other saltmarsh sites visited in County Clare such as Shepperton/Fergus or Bunratty, this site was nonetheless one of the longest that was visited during the current survey. The site extends along almost four kilometres and there is considerable variation in the distribution of the various habitats along with their structural and floristic composition. The established Annex I saltmarsh is dominated by ASM. However, the area of *Spartina* sward is much more extensive compared to the established saltmarsh.

Fragments of established ASM and MSM saltmarsh is scattered along both sides of the Killadysart Creek and in the channel of the Ballyvohane River. The embankment, which appears to be in relatively good condition, starts 0.5 km north of the small quay in Killadysart Creek and extends northwards for some distance. Much of the reclaimed land behind the embankment is pasture with wet grassland prominent. Much of this saltmarsh on the mainland has been significantly modified by the construction of the embankments and the remaining saltmarsh is a relic of former more extensive saltmarsh. Much of this saltmarsh occupies narrow bands adjacent to the embankments. *Spartina* swards have also developed in relativity small patches within this intertidal channel and adjacent to some of the more established saltmarsh. A large part of the fringing saltmarsh vegetation is classified as ASM, as the MSM is mostly confined to the southern end of the site, south of the ford to the island. It largely replaces ASM and occurs as a small number of discrete patches alongside patches of Common Cordgrass and transitional brackish vegetation.

The distribution of the saltmarsh vegetation is shaped not only by the embankment but also by the surrounding landscape. Much of the ground is composed of hard rock, particularly towards the southern end of Killadysart Creek. The upper boundary is often constrained by the rocky landscape, resulting in fragmented patches of saltmarsh along this irregular coastline. The shoreline along the Ballyvohane River and parts of Inishcorker has been unmodified and there are natural transitions from ASM or MSM to adjacent wet grassland along the shoreline. *Spartina* sward has also developed at the lower seaward boundary of this saltmarsh.

Inishcorker is somewhat different, in that the saltmarsh is poorly developed. Small patches were recorded around the ford and along the eastern side of Killadysart Creek. However, for large parts and most of the exposed eastern side of the island, the shoreline is rocky and a small amount of ASM/rocky shore mosaic was recorded. There is some reclaimed low-lying ground in the northern part of Inishcorker located behind an embankment. There are signs of brackish influence in the drains of this land with some stands of Sea Club-rush but there was no typical saltmarsh development. These stands were mapped as other saltmarsh (CM2) or

non-Annex I saltmarsh vegetation. Twitch (*Elytrigia repens*)-dominated vegetation was also classified as other saltmarsh (CM2).

Further north a large area of mudflats has been covered with *Spartina* sward. There is also some relic MSM and ASM between this sward and the adjacent embankment. There is also some development of stands of brackish vegetation comprising Common Reed (*Phragmites australis*) or Sea Club Rush (*Bolboschoenus maritimus*) along the embankment, particularly in the northern half of the site.

In terms of notable species, no mention was found within the NPWS literature of any rare or threatened having been recorded from this part of the Shannon Estuary. However, one species of local distinctiveness recorded at this site is Sea Wormwood (*Artemisia maritima*). It was noted along the base of a small section of seawall at the northern end of the Killadysart Creek.

The majority of the saltmarsh is mapped as occurring within the boundary of the cSAC. A number of relatively small patches extend beyond the boundary. These are mostly associated with minor cartographical boundary errors relating to the old 6inch map, rather than changes or extension in the distribution of any saltmarsh habitat per se.

Table 3.1. Area of saltmarsh habitats mapped at Killadysart, Inishcorker.

EU Code	Habitat	Area (ha)
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	2.94
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.709
non-Annex	*Spartina* swards	15.31
	Total	**18.96**

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

Atlantic salt meadows (H1330)

The ASM is widely distributed throughout this site. It is the dominant Annex I saltmarsh habitat that was recorded at this site (Table 3.1). However, this represents but a fraction of the *Spartina* sward, which is over 5 times more extensive. Unlike the Common Cordgrass, which occurs as an extensive sward or as large patches throughout the site, the ASM is discontinuous in its distribution and rarely occurs as an extensive plain. Throughout the ASM, bare ground was not common, reflecting the relative lack of livestock that are allowed onto the saltmarsh.

The majority of the ASM occurs as a relatively narrow band behind the *Spartina* sward or as fragmented patches atop remnant perched peat/mud. Occasionally, it may occur directly on the mudflats, such as around the sheltered parts in Killadysart Creek. Although the majority of the ASM is classified as upper marsh, it is possible to recognise some degree of zonation.

However it is fragmented and rarely sequential and there are no notable examples of typical ASM with distinctive zones. Another feature of the site is that while creeks are noted, particularly in the more extensive sward saltmarsh plain toward the northern half of the site, elsewhere creek and pan development is poor. This is likely a reflection of the narrow nature of the saltmarsh vegetation and modifications caused by reclamation in the past.

Where it is recorded, the lower parts of the ASM are characterised by a small number of commonly occurring species. These include Common Saltmarsh-grass (*Puccinellia maritima*) which typically accounts for 75-100% cover as well as Common Scurvy Grass (*Cochlearia officinalis*) and Sea Milkwort (*Glaux maritima*). This vegetation assemblage was not widespread.

There is some limited mid-marsh development, although it was often found as part of an intricate mosaic with the upper marsh. The mid marsh communities were only recorded in the northern half of the site behind the extensive *Spartina* sward. Its species assemblage consisted of Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Plantain (*Plantago maritima*), Saltmarsh Rush (*Juncus gerardii*) and Red Fescue (*Festuca rubra*). The sward, which was largely ungrazed was typically less than 20cm in height.

The upper marsh, which is the most extensive of all the ASM zones, is typified by grass-rich vegetation, which is somewhat more diverse than other zone. The main species include Red Fescue and Creeping Bent (*Agrostis stolonifera*), which was at times as abundant as Red Fescue, particularly where the substrates were saturated. Other common species included Saltmarsh Rush, Sea Plantain, Sea Arrowgrass (*Triglochin maritimum*) and Sea Aster. Other species that were common throughout but of lesser cover include White Clover (*Trifolium repens*), Autumns Hawksbill (*Leontodon autumnalis*) and Common Scurvy-grass.

Mosaics recorded at this site included the occurrence of ASM along MSM communities or as a mosaic with Common Cordgrass at the landward side of the mosaic. Common Cordgrass has spread onto established marsh in places to form *Spartina* sward and mosaics. Other features that were noted were the occurrence of small patches of Sea Club-rush or occasionally Common Reed. However, these were more extensive towards the back of the saltmarsh in the northern half of the site, where freshwater influence draining off the surrounding higher ground was noticeable. The upper boundary of the ASM was rarely distinct, even alongside the embankment. It graded into transitional wet grassland, gradually becoming replaced by Twitch (*Elymus repens*)-dominated grassland. This transitional grassland was rarely more than a few metres wide.

Mediterranean salt meadows (H1410)

In terms of extent, the MSM is not well developed at Killadysart, Inishcorker. One area was mapped in the northern half of the site at the back of a band of ASM. The MSM is mostly confined to the lower half of the site, where it occurs to the south of the ford in Killadysart Creek. The MSM largely replaces the ASM at this location.

Floristically the vegetation is not diverse and in most places is rank in nature. Dominated by Sea Rush (*Juncus maritimus*), this robust plant is tussocky and largely avoided by cattle. It has few constant companions. These include species that are also typical of the upper ASM such as Red Fescue which is often the most abundantly recorded species, accounting for 51-75% cover. Other common species include Creeping Bent (*Agrostis stolonifera*), Sea Plantain, Sea Milkwort and Autumn Hawksbill. Other species which were occasionally noted include Saltmarsh Rush, White Clover and Common Scurvy Grass. The saltmarsh structure within the MSM is poorly developed as these areas are relatively small. However some natural modified zonation was noted along the landward boundary to brackish wet grassland communities in places.

Spartina swards

Largely characterised by mono-specific swards, Common Cordgrass overwhelmingly dominates this site, particularly in the northern half. The sward has extensively developed on the mudflats and in places reaches 200 metres in width. Elsewhere discrete patches of varying sizes occur around the Killadysart creek which winds its way along the western side of Inishcorker Island. While there are a number of large patches, that never replicate the extent of the sward that occupies the mudflats further north.

The majority of the sward is well-established and mature. Some of this sward has developed on previously established saltmarsh. There are some natural transitions from ASM to *Spartina* sward along a gentle seaward gradient in places. Species such as Common Saltmarsh-grass, Greater Sea-spurrey and Sea Aster are present along the upper sward boundary but there distribution is limited to a narrow zone close to the upper boundary. There are some limited signs of dieback at the most northerly extent of the sward. It is not known why the dieback is occurring, although it is interesting that it occurs along a shallow creek, in which the freshwater may be influencing the Common Cordgrass. Further inland, the large stands of Reeds are showing signs of gradual expansion in a seaward direction. There area also signs of continued seaward growth of the sward on the mudflats. A large part of the sward occurs of perched mud that is somewhat consolidated. However, another band of open sward occurs on lower oozing mudflats. This is typical of younger habitat and is indicative of ongoing expansion. Indeed, small isolated clumps of young Common Cordgrass were noted in front of the main sward, indicating recent recruitment.

IMPACTS AND ACTIVITIES

The distribution of the saltmarsh is constrained by the rocky nature of its coastline, as well as human interference such as the embankment. The site is not easily accessible and for the most part, it is either too narrow or else the ground is too treacherous to allow cattle to access the marsh. The list of all the impacts and activities that were recorded at this site are listed in Table 4.1. The site is not used for amenity activities.

Unlike many other saltmarsh systems, grazing (140) was not recorded as a major activity at this site. Large parts of the fringing saltmarsh occur outside of agricultural fields and are largely inaccessible to livestock due to fences on the embankments. Indeed, six out of eight of the ASM monitoring stops indicate that there was no grazing associated with them. Some small areas of saltmarsh along the embankments were accessible to cattle and grazing was noted. There are a small number of places where patches of saltmarsh are clearly grazed and indeed trampling and poaching (143) was evident. This damage was noted around the southern part of the site in and around the fringing saltmarsh vegetation on either side of the ford crossing over to Inishcorker.

This site has been significantly modified by the construction of embankments in the 18-19th centuries and reclamation of saltmarsh behind these embankments (801). There is some evidence as well of more recent reclamation of established saltmarsh and *Spartina* sward at one location in the north part of the site. A new berm has been extended out onto the intertidal flats to take in this marsh, which has been drained and improved and now contains improved grassland (although it is likely to revert to wet grassland if it is not managed). It is not known if this reclamation took place during the current monitoring period.

The spread of Common Cordgrass, an invasive species (954), at this site is significant. This sward is likely to have developed since the 1930's and is well-established (Nairn 1986). Most of the sward has developed on formerly unvegetated mudflats. However it has also spread onto former established saltmarsh adjacent to the embankment, especially at the northern end of the site. This is particularly visible when the current habitat map is compared to the extent of saltmarsh as mapped by the OSI 2nd edition 6 inch map. Much of this colonisation is likely to have occurred prior to the current monitoring period so the impact of its spread is assessed as neutral. The colonisation may have been promoted by maintenance works to the embankments or the use of mud from the adjacent saltmarsh and mudflats to construct new embankments. The presence of Common Cordgrass within the ASM is assessed as a negative impact (-1) due to its abundance within the ASM, the creation of ASM/*Spartina* sward mosaics and the fact that some *Spartina* sward has developed in areas with previously established saltmarsh.

There are some signs of natural erosion (900) within the ASM and MSM habitats at this site. These are mostly concentrated around the southern half of the site and along the perched

fragments on the northern side of the Killadysart Creek. In places there is a tall saltmarsh cliff along the seaward boundary. The frontline is often indented and in places undercut by wave action. Subsidence or slumping was not a particular feature of this site, except around one or two sluice gates in the northern part of Killadysart Creek. Some of the saltmarsh vegetation in the southern end of the site occurred on lower terraces and even on mixed mud/stone substrates. Occasionally, isolated clumps of Sea Rush or tussocks of eroded ASM vegetation were noted. There has been no significant loss of saltmarsh from erosion when the current extent of saltmarsh is compared to the marsh mapped on the OSI 2nd six inch map. Overall there has been no measurable loss of saltmarsh habitat from erosion during the current monitoring period. The impact of erosion is assessed as neutral on a small portion of the saltmarsh face.

Table 4.1. Intensity of various activities on saltmarsh habitats at Killadysart, Inishcorker.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1330	140	C	0	0.5	Inside
H1330	143	C	-1	0.2	Inside
H1330	501	C	0	0.1	Inside
H1330	900	C	0	0.1	Inside
H1330	954	B	-1	1.5	Inside
H1410	140	C	0	0.1	Inside
H1410	143	C	-1	0.001	Inside
H1410	501	C	0	0.001	Inside
H1410	900	C	0	0.01	Inside
H1410	954	C	0	0.7	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.

The main impacts and activities adjacent to the survey site are grazing (140) and silage production (102) although some limited cultivation was noted (100). It is likely that associated impacts would include agricultural improvement (103), fertilisation (120) and restructuring of agricultural holding (150). There are few houses within any significant distance of the saltmarsh and most are clustered around the small town of Killadysart (400). Pollution both domestic and agricultural is another impact which could have some impact on the condition of the saltmarsh vegetation.

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 NHA survey, 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 is little other detailed information for this site. No specific or useful mention is made of the saltmarsh at Killadysart, Inishcorker in the Natura 2000 files. .

Killadysart, Inishcorker saltmarsh has few features of conservation interest. This is not an extensive or well developed saltmarsh system. The saltmarsh vegetation which is primarily located to the landward side of the sward is quite fragmented and rarely is it recorded other than as a narrow fringe. There is some degree of natural transition from the *Spartina* sward to the narrow saltmarsh fringe that is behind. In addition, to admixtures between the ASM, MSM and Common Cordgrass, relatively large stands of brackish habitats occur, especially towards the northern half of the site.

Historically, the site has been modified and an extensive embankment was constructed to prevent flooding of the land reclaimed from the estuary. The embankment is in relatively good condition and the low-lying ground behind it is still under agricultural management. The remaining saltmarsh adjacent to the embankment is the relic remains of much more extensive saltmarsh. Much of this established saltmarsh has also been colonised by Common Cordgrass to create extensive *Spartina* swards. There is no baseline data to accurately indicate when this marsh was colonised by Common Cordgrass. However, this colonisation is likely to have occurred prior to the current monitoring period to the current impact of Common Cordgrass is assessed as neutral. This is mainly because Common Cordgrass is already well established at this site and is unlikely to continue to significantly spread at the expense of the remaining ASM. While the spread of Common Cordgrass is assessed as neutral (mainly due to the lack of accurate baseline data), the extent of Common Cordgrass has had a significant impact on the structure of this marsh.

The overall conservation assessment for the site is *favourable* (Table 5.1). There are few current activities which are considered to be negative impacting the marsh. Most of the saltmarsh is relatively inaccessible and is grazed or used for amenity activates. Some of the marsh may be vulnerable to reclamation in the future. Part of the marsh (ASM and *Spartina* sward) has been reclaimed recently but it is not known if this area was reclaimed during the current monitoring period.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Killadysart, Inishcorker.

Habitat	EU Conservation Status Assessment			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Atlantic salt meadows (H1330)	Extent Structure and functions Future prospects			Favourable
Mediterranean salt meadows (H1410)	Extent Structure and functions Future prospects			Favourable

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *favourable* (Table 5.1). Although it pales into insignificance besides the extensive *Spartina* sward, they occupy largely different ecotopes. The *Spartina* sward is extensively developed on the intertidal mudflats, whereas the ASM occurs on perched land at the back of the sward. Common Cordgrass is likely to have spread onto established ASM in the past to create extensive *Spartina* swards. However the impact of this colonisation is not assessed as it occurred before the current monitoring period.

Habitat structure and functions

The structure and functions attribute for this habitat is rated as *favourable*. Eight monitoring stops were carried out in the habitat and they all passed. All of the attributes required for favourable conservation status reached their targets. Most of the habitat is in generally good condition although there is some localised poaching damage from cattle grazing. While the ASM is not extensive, it does nonetheless exhibit many features that are characteristic of the habitat including a certain degree of zonation. Common Cordgrass is present within the ASM and forms some minor ASM/*Spartina* sward mosaics. However, there is no evidence that it has spread significantly during the current monitoring period (mainly due to the lack of accurate baseline data) so its spread is not considered to be a negative indicator on species composition at this site.

Future prospects

The future prospects of this site are assessed as *favourable* (Table 5.1). This assessment assumes that the current management activities and levels of impacts continue in the near future. Other than some natural erosion, it is unlikely that there will be any major change in the extent or condition of this habitat in the near future. Common Cordgrass is well established at this site and the remaining ASM is not likely to be vulnerable to further colonisation, as it is already well established.

Further reclamation has the capacity to further reduce the extent of saltmarsh at this site. However, this should be controlled by the designation of the saltmarsh within the cSAC.

Mediterranean salt meadows (H1330)

Extent

The extent of the MSM is assessed as *favourable* (Table 5.1). Relative to the ASM or in particular the *Spartina* swards, the MSM is not extensive. While it is not possible to determine if it was previously more widespread, its current distribution is considered to reflect its natural extent. There are no indications of any significant loss of MSM during the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Two monitoring stops were carried out in the habitat, both of which satisfied the target criteria. The largely rank vegetation, although not extensive, displayed typical characteristics of the habitat. The species assemblage and structure is typical of this habitat. The MSM is not affected by any significant damaging activities. Common Cordgrass is found in this vegetation and forms swards adjacent to the MSM on lower mudflats. However, it has not colonised the MSM to the same extent as the ASM.

Future prospects

The future prospects for this habitat are assessed as *favourable*. The assessment assumes that the current management activities and levels of impacts continue in the near future. Other than some limited grazing and poaching, which are not considered to be significant, there are no significantly damaging activities that are likely to threaten the persistence of the MSM at this site. This habitat is less vulnerable to colonisation by Common Cordgrass in the future.

MANAGEMENT RECOMMENDATIONS

There are no management recommendations for this site.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

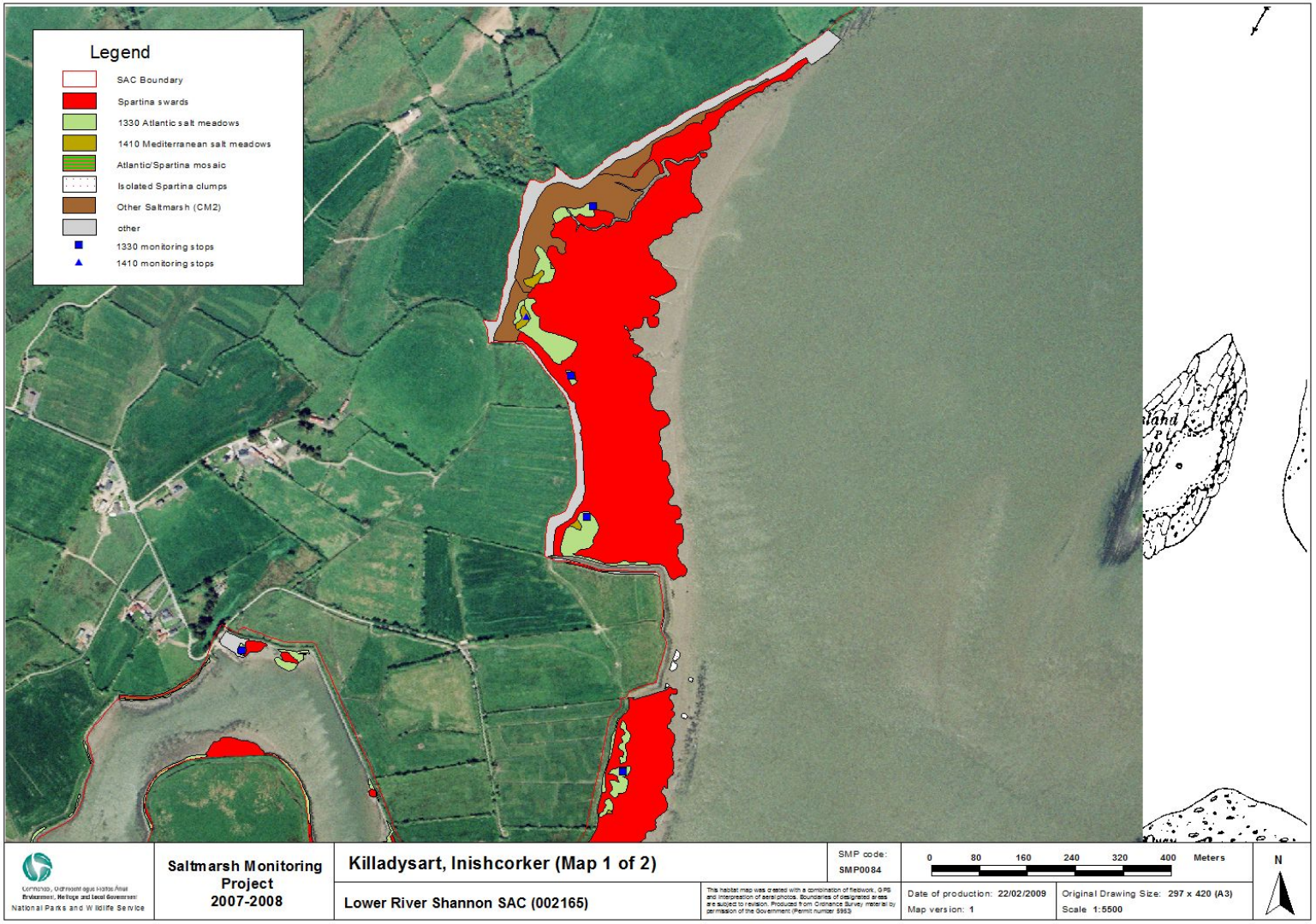
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

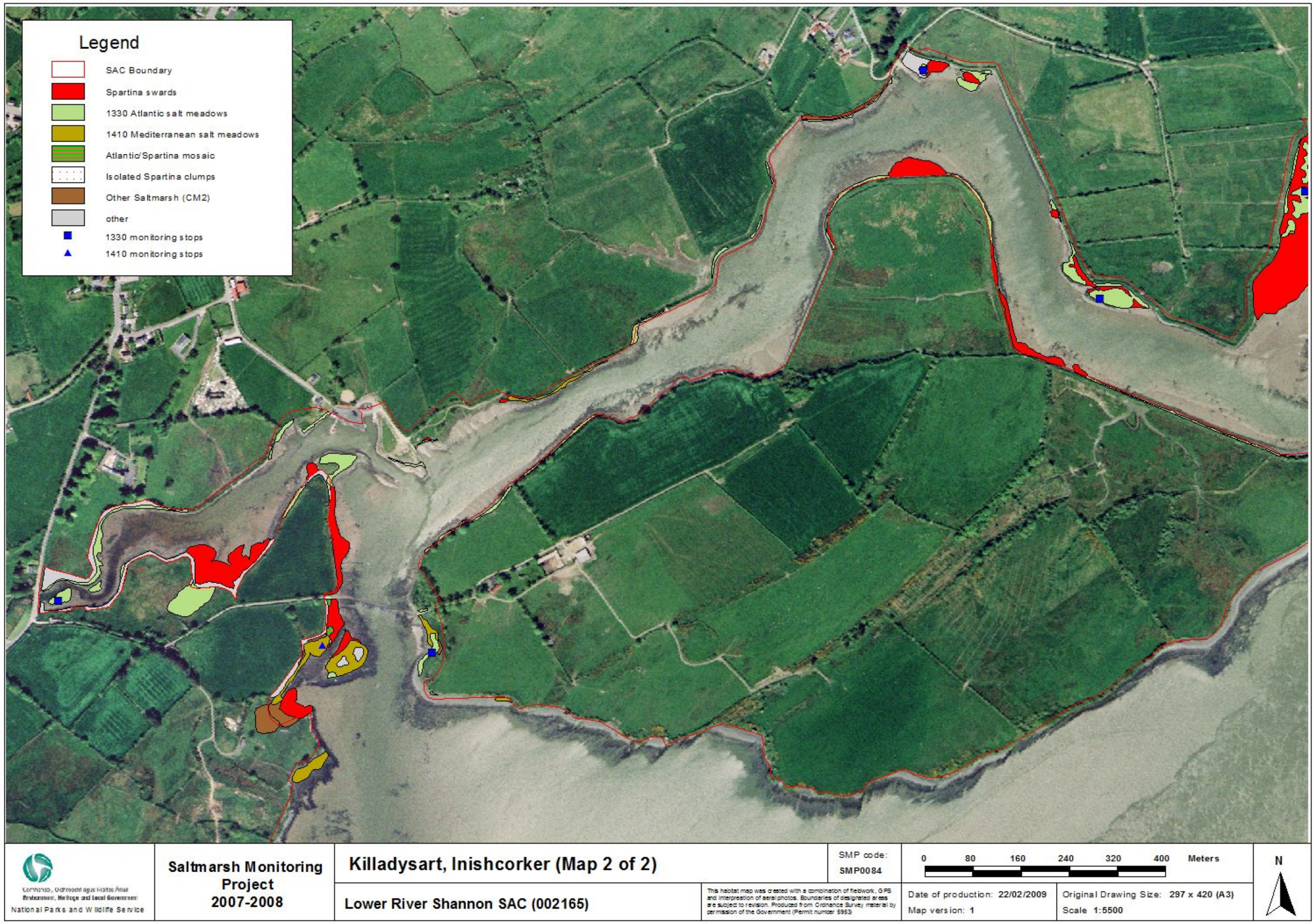
Nairn, R.G.W. (1986). *Spartina anglica* in Ireland and its potential impact on wildfowl and waders – a review. *Irish Birds*. **3**, 215-258.

APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	**SM habitat description**	**Mapped Area (ha)**	**Area (ha)**				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards	15.264					15.264
3	1330 Atlantic salt meadow	2.933		2.933			
4	1410 Mediterranean salt meadow	0.709			0.709		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic	0.019		0.0095			0.0095
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	2.608					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)	0.040					0.040
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	2.329					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**23.90**		**2.94**	**.709**		**15.31**


Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
Atlantic/Spartina mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Killadysart, Inishcorker (Map 1 of 2)
SMP code: SMP0084
0 80 160 240 320 400 Meters
N
Lower River Shannon SAC (002165)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5963)
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:5500
National Parks and Wildlife Service



Legend
SAC Boundary
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
Atlantic/Spartina mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
National Parks and Wildlife Service
Saltmarsh Monitoring Project 2007-2008
Killadysart, Inishcorker (Map 2 of 2)
Lower River Shannon SAC (002165)
SMP code: SMP0084
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
0 80 160 240 320 400 Meters
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:5500
N

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

SITE DETAILS

SMP site name: **Knock**		SMP site code: **0085**
Dates of site visit: **3 September 2008**		CMP site code: **N/A**
SM inventory site name: **Knock**		SM inventory site code: **137**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **0027**	SPA: **4077**
County: **Clare**		Discovery Map: **64** Grid Ref: **108880, 153305**
Aerial photos (2000 series): **O 4791-A**		6 inch Map No: **Cl 068**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafolye, Barrigone/Aughinish, Beagh, Bunratty, Shepperton/Fergus Estuary, Inishdea/Owenshere, Killadysart/Inishcorker, Querin, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud**

SITE DESCRIPTION

Knock is located along the northern side of the outer River Shannon Estuary in Co. Clare. It is one of the smaller saltmarsh systems and occurs on the western side near the mouth of Clonderlaw Bay. The site is located 4 km west of Moneypoint Power Station and the Killimer Ferry Terminal. The site is located around a small inlet at Rusheen Point, approximately 1 kilometre due west of the small village of Knock along the R486 road. The adjacent landscape is quite hilly and there are moderate-steep slopes with a northern aspect to this site. There is some low-lying land south of Rusheen Point that has been reclaimed in the past and has a tall embankment around the shoreline. This area is quite rural and is dominated by farmland, some of which is quite poor on the hillier area and wet grassland is the main habitat.

The saltmarsh is mainly found around the fringes of this small inlet between Rusheen Point and the mainland. Much of this inlet has been infilled with *Spartina* sward. There are mudflats along the seaward fringe that extend into Clonderlaw Bay and are much more extensive. The land to the south of Rusheen Point has been reclaimed and is fronted by a stone/concrete embankment, ranging in height from 75cm, to over 2.5 metres. This ground is bisected by a number of linear drainage features that forces the water towards a system of one-way gates that drain out into the Shannon. There is some saltmarsh development behind

this embankment and along these drains where there is still some tidal influence. This is probably related to some saline water entering though the sluice during some high tides.

Knock saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC 2165). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this cSAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). The latter two habitats were recorded at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table). Although the site is located in Clonderlaw Bay, it is separated from the larger Clonderlaw Bay saltmarsh system listed as a separate site on the saltmarsh inventory (Curtis and Sheehy-Skeffington 1998). This larger saltmarsh site is located in the head of the bay and was not surveyed as part of this survey.

There is no public access to this site. Access to the site was via a small farm access track leading from R486. Permission was sought to cross this private land.

SALTMARSH HABITATS

General description

Knock is classified as an estuarine saltmarsh whose substrate is largely mud (Curtis and Sheehy-Skeffington 1998), although wet clays and peaty soils were found in the upper parts of the saltmarsh. In comparison to the overwhelming dominance of the *Spartina* sward at Knock, the remainder of the saltmarsh communities are measurably less prominent. In addition to the *Spartina* swards, three Annex I saltmarsh habitats were recorded at this site. They include: *Salicornia* and other annuals colonizing mud and sand – H1310 (*Salicornia* flats), Atlantic salt meadows – H1330 (ASM) and Mediterranean Salt meadows – H1410

(MSM). The total area mapped for each of the four habitats is shown in Table 3.1. Asides from a small amount of transitional ASM (0.162ha) that was recorded along a man-made drainage channel in agricultural land, the majority of the saltmarsh occurs inside the cSAC boundary.

Most of the saltmarsh is located in the narrow inlet between Rusheen Point and the mainland. A large part of this shallow intertidal inlet has been infilled with *Spartina* swards. There is a small fringe of ASM along parts of the landward boundary of the *Spartina* sward on Rusheen Point and along the mainland. A small patch of *Salicornia* flats was also found at this location. Most of the intertidal *Spartina* sward backs onto transitional grassland dominated by Twitch (*Elymus repens*) or in some cases, stands of Sea Club-rush (*Bolboschoenus maritimus*) where there is no ASM development. These stands were classified and mapped as other saltmarsh (CM2) or other Non-Annex saltmarsh vegetation in accordance with the SMP project.

Some of this land on Rusheen Point has been modified in the past by reclamation and there is a low embankment along the north side of this spit. Some ASM and MSM saltmarsh is found behind this embankment where there is some tidal influence from drains. There is some more extensive ASM development in the reclaimed area south of the spit and behind the embankment. There is a subtle transition from this ASM to wet grassland along gentle gradients from the drains that flood this area. The terrestrial mosaic that occurs alongside the ASM is largely characterised by a variety of agriculturally-managed grasslands, including wet improved grassland or transitional acid or coastal grasslands, most of which occur on damp substrates in the low-lying ground further south and west to Burrane Point.

Table 3.1. Area of saltmarsh habitats mapped at Knock.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.029
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	0.740
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.144
non-Annex	*Spartina* swards	4.788
	Total	**5.701**

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

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

Salicornia flats are not well developed at this site, which may be due to the extensive development of Common Cordgrass. Occupying 0.029ha, it accounts for less than 0.005% of the total saltmarsh vegetation (Table 3.1). This habitat has developed along the edge of a narrow ridge or spit of ASM that extended into the *Spartina* sward. Species recorded in this habitat included Annual Glasswort (*Salicornia europaea* agg.), Common Saltmarsh-grass (*Puccinellia maritima*) and Annual Sea-blite (*Suaeda maritima*). As the habitat is found

adjacent to Common Cordgrass, it was not surprising to see some *Spartina* within the linear band of this annual habitat.

Atlantic salt meadows (H1330)

The development of the ASM is very much limited on its seaward boundary by the extensive *Spartina* sward and on its landward boundary by heavily modified or transitional grasslands. Much of this ASM vegetation is characterised by low marsh, although some limited zonation was apparent. It was dominated by a fringe of Common Saltmarsh-grass and also contained small amounts of Sea Aster, Sea Pink and Sea Plantain. This vegetation type is found on the narrow ridge that extends into the *Spartina* sward and has a stony substrate in places. Some of the fringe along the edge of the *Spartina* sward is dominated by Saltmarsh Rush. The structure of this ASM is poorly developed as it is quite minor in extent.

Much of the ASM found behind the embankment south of Rusheen Point is more typical of mid-upper marsh. The structure of this saltmarsh is poorly developed as it was reclaimed in the past and has since reverted to saltmarsh vegetation due to increased tidal influence. Some zonation was present along the drains where narrow fringes of low marsh vegetation dominated by Common Saltmarsh-grass were evident. The gentle gradients from these drains affected the zonation of the habitat. There were also some terrestrial ridges adjacent to the drains where spoil from the drains had been placed in the past. Stands of Sea Club-rush were also found in these drains and within the ASM in places. This area was grazed by cattle.

The mid-upper marsh community contained Red Fescue (*Festuca rubra*), along with Creeping Bent (*Agrostis stolonifera*), which was common in wetter areas. Other sections were dominated by Saltmarsh Rush. Other species included Thrift (*Armeria maritima*), Sea Aster (*Aster tripolium*), Sea Milkwort (*Glaux maritima*), Saltmarsh Rush (*Juncus gerardii*) and Sea Plantain (*Plantago maritima*). Other species that were occasionally recorded in this community included White Clover (*Trifolium repens*), Autumn Hawksbill (*Leontodon autumnalis*), Sea Arrow-grass (*Triglochin maritimum*) and Common Sea-spurrey (*Spergularia media*).

The upper boundary of the ASM behind the embankment was rarely distinct and often graded into wet grassland with species such as Selfheal (*Prunella vulgaris*) and Silverweed (*Potentilla anserina*), along with agricultural grasses such as Perennial Ryegrass (*Lolium perenne*) and Crested Dogs-tail (*Cynosurus cristatus*). These species occasionally occurred on low mounds within the ASM. Elsewhere, and in particular along northern half of the site, the upper boundary of small ASM patch is characterised by disturbed ground as well as species indicative of brackish conditions such as Sea Club Rush and Twitch.

Mediterranean salt meadows (H1410)

The MSM vegetation is patchily distributed around this site and is quite minor in extent. It is confined to the southern side of the site, where it was recorded as five separate patches. Typically, these are surrounded by ASM vegetation.

The habitat is characterised by stands of Sea Rush (*Juncus maritimus*), along with grasses and rushes such as Red Fescue, Creeping Bent and Saltmarsh Rush. The herbaceous component of the vegetation is similar to that encountered in the ASM and includes Thrift, Sea Aster and Sea Milkwort. The MSM is distinctly taller than the surrounding ASM vegetation, which is more heavily impacted by grazing. Some transitional species more typical of wet grassland were noted in the patches of MSM including Thistle spp. and Glaucous Sedge (*Carex flacca*).

Spartina swards

This habitat is the overwhelmingly dominant vegetation type associated with this site. A dense sward of Common Cordgrass is extensively established throughout the intertidal inlet around Rusheen Point. Smaller patches were also found, which extended into other habitats along creeks. This species has also spread into the area behind the embankment to form some sward. The Common Cordgrass does not appear to be greatly impacting the ASM or MSM habitats. Indeed, the occurrence of some ASM in the upper reaches of the sward, mapped as ASM/Spartina mosaic, is positive in terms of the development of ASM. Small amounts of Common Saltmarsh-grass and other species such as Sea Aster are spreading into the upper *Spartina* sward. The development of this sward may have had an impact on the development of *Salicornia* flats.

IMPACTS AND ACTIVITIES

This site is affected by several impacts and activities (Table 4.1). Grazing (140) is the principal activity which is carried out at this site. Cattle and horses make use of the low-lying area behind the embankment. The saltmarsh vegetation is relatively limited in extent and as the site is freely accessible to livestock, the distinction between saltmarsh and other transitional habitats is obscured. While the mudflats are avoided by the livestock, the remainder of the saltmarsh has suffered some damage (143) including overgrazing, trampling and in many places heavy poaching.

The extensive colonisation of the invasive species Common Cordgrass (954) commenced sometime after 1928, when it was first introduced into the Shannon River. It has spread prodigiously, including into this site, where it is now well established and forms mature swards. There are no indications that Common Cordgrass spread onto established saltmarsh around this inlet as no marsh is mapped on the OSI 2nd edition 6 inch map. The Common Cordgrass has developed on formerly unvegetated intertidal mudflats. On the ground,

however, there is some evidence that the narrow inlet may become largely infilled as the sward continues to spread slowly into the un-vegetated mudflats and along the gravel ridge where the *Salicornia* vegetation was recorded. The current ASM marsh has a limited amount of Common Cordgrass so its impact is assessed as neutral (Table 4.1).

The development of this *Spartina* sward may encourage further development of ASM along the landward boundary in the future, due to natural succession. The occurrence of some ASM/*Spartina* mosaic is indicative of the natural progression of the marsh communities at this site (990).

The site had recently been further modified through the importation of rubble and other material (423). Much of the area on Rusheen Point and along the north side of the main drain flowing east-west has been disturbed recently and there is substantial bare substrate present. It had been brought in along the access track and also bull-dozed out onto *Spartina* sward at one location at the inner most part of the narrow inlet. This limited reclamation (803) may have been carried out as a means of limiting the flooding of tidal waters out over the main road. There certainly has been some loss of ASM and MSM on Rusheen Point, but it is likely that the greater loss was suffered by the Common Cordgrass sward in the inlet.

The construction of the embankment and the resultant land reclamation has obscured any evidence of previous saltmarsh distribution (801). The OSI 2nd edition 6 inch map gives some indication that the low-lying ground was wet, but this is shown in the reclaimed low-lying ground. It is obvious that the distribution and extent of the former saltmarsh has been greatly reduced by the construction of the embankment. However as this occurred outside of the current monitoring period, it is not assessed. There has been some recent modifications to the network of narrow channels between fields and these drains are largely kept clear of vegetation (810) thus improving the drainage flow towards the one-way gates under the embankment.

Natural erosion (900) is not a significant feature of this site. As much of the Annex I saltmarsh habitats occur landward of the *Spartina* sward, there is little evidence of erosion, except possibly some shallow terracing around the ASM at the north-eastern end of the site.

The land outside the site is largely given over to agriculture including activities such as fertilising, land modification, grazing, silage production and overgrazing (102, 103, 120, 140, 143). The impact of these activities is largely undeterminable. The northern boundary of the cSAC is demarcated by the road (502) and a number of dispersed houses (403). However these have been in existence for some time and are not considered to be of any significant impact.

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

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1310	954	C	-1	0.029	Inside
H1330	143	B	-1	0.5	Inside
H1330	423	A	-2	0.214	Inside
H1330	801	A	-2	0.214	Inside
H1330	810	C	-1	0.2	Inside
H1330	954	C	0	0.74	Inside
H1330	990	C	+1	0.005	Inside
H1410	140	C	0	0.08	Inside
H1410	423	C	-2	0.05	Inside
H1410	801	C	-2	0.05	Inside
H1410	954	C	0	0.14	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.

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 NHA survey, 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 is little other detailed information for this site.

Knock saltmarsh is poorly developed and has few features of conservation interest. It has been greatly modified in the past through the construction of the embankment and the reclamation of land for agricultural purposes. The main saltmarsh habitat is *Spartina* swards, which has infilled a small intertidal inlet. Common Cordgrass has not spread into established marsh at this site and there was never any extensive established saltmarsh along the seaward side of the embankment. The saltmarsh behind the embankment has redeveloped on previously reclaimed land and is characterised by fragmented patches of marsh vegetation in wet hollows and along drainage creeks. Much of this vegetation is transitional, often grading imperceptibly into wet grassland, depending on subtle sub-surface hydrological conditions.

The overall conservation status of the saltmarsh at this site is *unfavourable-bad* (Table 5.1). Currently it is all grazed and is clearly suffering owing to the high grazing levels, which are causing some poaching damage. There has been some recent infilling and reclamation at this site on Rusheen Point. This is likely to have infilled some hollows that formerly contained saltmarsh.

Common Cordgrass is present although there are no indications that it is spreading landward into the ASM.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

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

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent	Structure and functions Future prospects		Unfavourable - Inadequate
Atlantic salt meadows (H1330)		Structure and functions Future prospects	Extent	Unfavourable - Bad
Mediterranean salt meadows (H1410)		Extent Structure and functions Future prospects		Unfavourable - Inadequate

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

Extent

The extent of this habitat is rated as *favourable*. A single linear patch of this annual vegetation was recorded at Knock. It is not known if it is the remnants of a greater extent or if it is naturally limited in extent at this site, as there are no known records as to its previous occurrence. However, given the establishment of Common Cordgrass on the adjacent mudflats, it is not surprising that this habitat is not more extensive.

Habitat structure and functions

The structure and functions of this habitat are assessed as *unfavourable-inadequate*. Given the paucity of the habitat, a single monitoring stop was carried out. This stop satisfied the target criteria, although it was noted that Common Cordgrass, which alone accounts for the

majority of the available intertidal mudflats as this site, accounted for between 11 to 15% of the total area. This is indicative of its gradual spread into this sole patch of *Salicornia*-dominated vegetation. Therefore the assessment was revised to *unfavourable-inadequate.* There were no other negatively impacting activities affecting this habitat.

Future prospects

The future prospects for this habitat are rated as *unfavourable-inadequate*. This assessment assumes that the current management activities and level of impacts such as the spread of Common Cordgrass will continue in the near future. This habitat is vulnerable to continued spread of Common Cordgrass into this habitat, which will reduce its extent.

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *unfavourable-bad*. There has been some recent infilling and reclamation at this site. This is likely to have destroyed a small area of ASM saltmarsh located behind the embankment on Rusheen Point. There are no indications of any significant loss of ASM habitat due to the spread of Common Cordgrass at this site.

Habitat structure and functions

The structure and functions of the habitat are rated as *unfavourable-inadequate* (Table 5.1). Three monitoring stops were carried out across this habitat, two of which satisfied the target criteria. Most of the habitat is in good condition. One monitoring stop failed due to a high grazing intensity and the associated level of poaching that the area had suffered. Much of the ASM has developed behind the embankment on previously reclaimed land, so its structure is poor. Several zones and typical ASM communities are present. Common Cordgrass is present and forms a small area of sward but there is evidence that this developed within the current monitoring period due to the lack of accurate baseline data, so the impact of its spread during the current monitoring period is assessed as neutral. There are no indications that it is spreading landward into the ASM. Reclamation works and infilling have disturbed some of the remaining saltmarsh found behind the embankment.

There is also some minor ASM development along the seaward side of the embankment and adjacent to the *Spartina* sward. This ASM is also poorly developed due to its relatively limited extent.

Future prospects

The future prospects for this habitat are rated as *unfavourable-inadequate*. The assessment assumes that the current management activities and level of impacts such as grazing

continue in the near future. The current grazing intensity coupled with continuing waterlogged conditions is damaging the ASM with some heavy poaching noted and this is likely to continue into the future. This site is also vulnerable to further infilling and reclamation, although this area is located within the cSAC. The development of ASM behind the embankment is related to some tidal influence entering the site through the sluice. This area was reclaimed in the past and a one-way sluice allows drainage from the site. Modifications to the sluice or any other activities that limit tidal influence will affect the development of saltmarsh behind the embankment. Most of the ASM found at this site is not likely to be vulnerable to colonisation by Common Cordgrass in the future, due to its position behind a seawall and the relatively low cover of the low ASM zones compared to the higher extent of the mid and upper ASM zones.

5.4 Mediterranean salt meadows (H1410)

5.4.1 Extent

The extent of this habitat is assessed as *unfavourable-inadequate*. There has been some recent infilling and reclamation at this site. This is likely to have destroyed a small area of MSM saltmarsh located behind the embankment on Rusheen Point.

5.5.2 Habitat structure and functions

The habitat structure and functions are assessed as *unfavourable-inadequate* (Table 5.1). A single monitoring stop was carried out in one of the larger MSM patches and it is indicative of the remaining four patches of MSM that are recorded from Knock. Although every available bit of land is grazed by livestock, the MSM is usually avoided, as it is less palatable. While there may be some trampling in and around the separate MSM patches, the damage is not extensive. The species assemblage is typical of the habitat. Common Cordgrass is not found within this habitat. There has been some disturbance to the remaining MSM from infilling and reclamation and this is the main reason for the revised assessment of *unfavourable-inadequate.*

5.5.3 Future prospects

The future prospects for this habitat are rated as *unfavourable-inadequate*. The assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. This site is also vulnerable to further infilling and reclamation, although this area is located within the cSAC. This may further reduce the extent of MSM at this site. This habitat is not vulnerable to colonisation by Common Cordgrass.

MANAGEMENT RECOMMENDATIONS

There are no specific management recommendations for this site.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

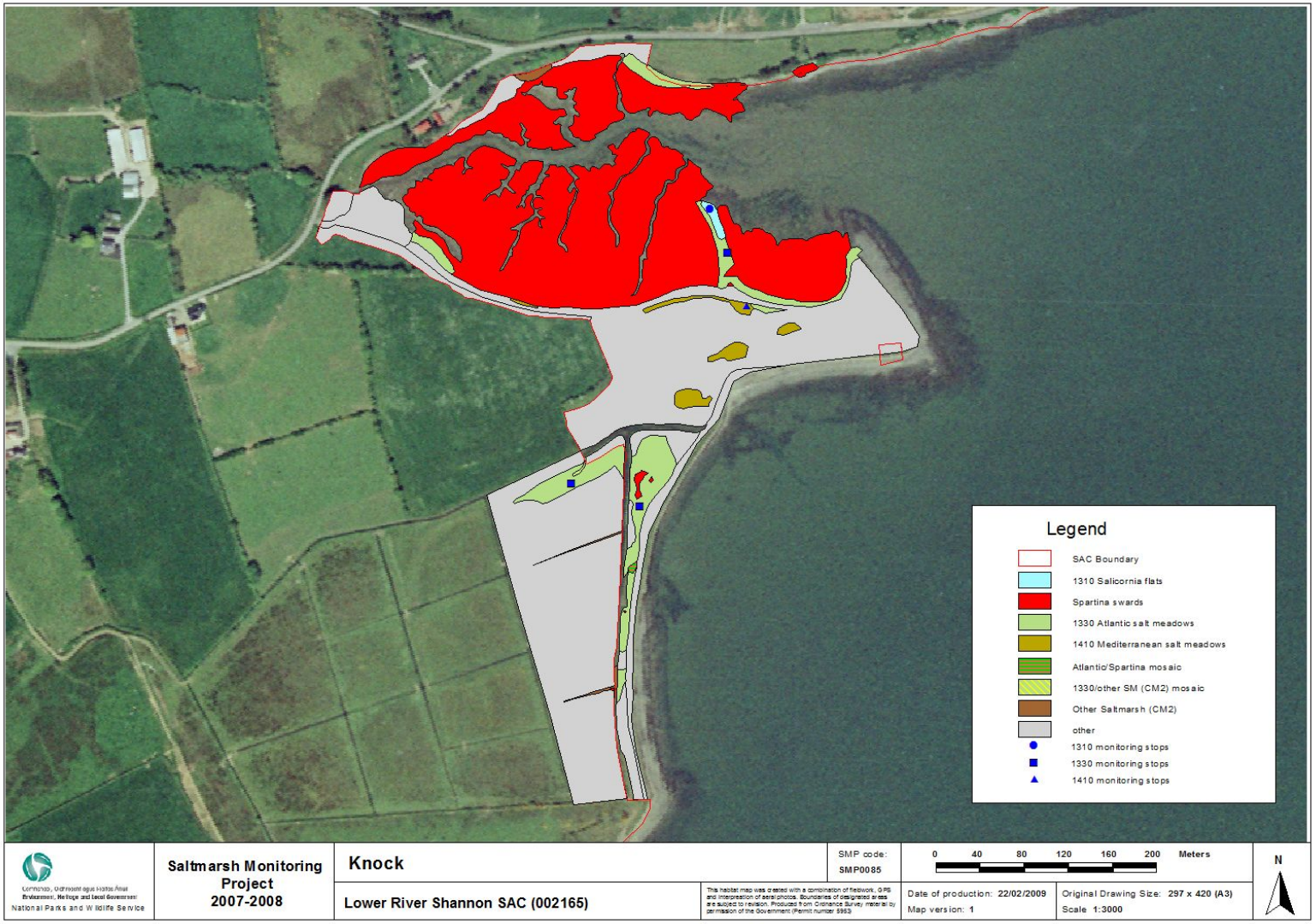
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

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 I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.029	0.029				
2	*Spartina* swards	4.785					4.785
3	1330 Atlantic salt meadow	0.735		0.735			
4	1410 Mediterranean salt meadow	0.144			0.144		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic	0.005		0.0025			0.0025
7	1330/other SM (CM2) mosaic	0.004		0.002			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	5.855					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.045					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**11.602**	**0.029**	**0.740**	**0.144**		**4.788**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
Atlantic/Spartina mosaic
1330/other SM (CM2) mosaic
Other Saltmarsh (CM2)
other
1310 monitoring stops
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Knock
Lower River Shannon SAC (002165)
SMP code: SMP0085
0 40 80 120 160 200 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:3000
National Parks and Wildlife Service

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

SITE DETAILS

SMP site name: **Querin**		SMP site code: **0086**
Dates of site visit: **2 September 2008**		CMP site code: **N/A**
SM inventory site name: **Querin**		SM inventory site code: **135**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **0065**	SPA: **40**
County: **Clare**		Discovery Map: **63** Grid Ref: **92058, 153725**
Aerial photos (2000 series): **O 4727-C; O 4787-B; O 7054-A**		6 inch Map No: **Cl 066**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Bunratty, Shepperton/Fergus Estuary, Inishdea/Owenshere, Killadysart/Inishcorker, Knock, Rinevilla Bay**

Saltmarsh type: **Estuary** Substrate type: **Mud:gravel**

SITE DESCRIPTION

Querin is a rural site in County Clare that is located toward the mouth of the River Shannon, a short distance west of Poulnasherry Bay. The small saltmarsh system is found on the leeward side of an east-facing sand ridge and extends between Querin Point and Corliss Point where a minor, unnamed river enters the uppermost part of this small inlet. In terms of the Shannon navigation, Querin Point is a landmark point and a light beacon and transmitter station are located alongside the quay.

This is a largely rural setting where most of the region is given over to agriculture. Much of the land within the survey site, however, which is held in common is not suitable for intensive agricultural purposes. The land is grazed by a small number of horses and occasionally cattle. More recently, individual holiday homes have been springing up throughout the larger Loop Head region including around Querin. The nearest village is Doonaha, although Carrigaholt to the west is more readily recognised as a village, while the nearest centre of population is Kilkee, approximately 10 kilometres to the north.

Querin saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC 2165). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary

between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three-headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I habitats are listed as qualifying interests for this SAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats were found at this site in addition to *Spartina* swards, which is not now considered a qualifying interest.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

The site is easily accessible along a narrow dirt track which leads out onto the Commonage. A local landowner indicated that the land was held in commonage, but that recently a fence had been erected to prevent horses from getting off the site, but also to discourage people from venturing onto the sandy isthmus.

SALTMARSH HABITATS

General description

The saltmarsh is confined to a small inlet that opens out onto the main Shannon Estuary at Querin Point. It is offered some protection from all but the worst onslaught of the Shannon's environmental fluctuations by a long sandy ridge extending eastwards from Corliss Point. Saltmarsh vegetation occurs on both sides of the inlet; indeed it occupies a significant portion of the intertidal mudflats. The upper limits of the tidal influence in this inlet are easily recognised, as there is an abrupt change in the *Spartina* sward to brackish vegetation, where an unnamed river enters the inlet alongside the Templeneagh Graveyard.

The saltmarsh at Querin is overwhelmingly characterised by the presence of an extensive sward of Common Cordgrass (*Spartina anglica)*. This non-native invasive is commonly found in many of the saltmarsh systems along the lower River Shannon.

Curtis and Sheehy-Skeffington (1998) characterised the site as an estuarine marsh which occurs on mud and gravel. This is indeed the case, although a large part of the Annexed

saltmarsh habitats occur on sandy substrates. The total area mapped for each of the four habitats is shown in Table 3.1.

The *Spartina* sward occupies a significant portion of the intertidal mudflats and occurs along both side of the inlet. The majority of the remaining saltmarsh habitats are found along the southern side of the site, between the *Spartina* sward and transitional area to coastal dune grassland. However smaller discontinuous fringes of ASM and also MSM vegetation are also recorded along the northern half of the site. They are not as well developed as on the southern half and are largely replaced by transitional and brackish vegetation dominated by Common Reed (*Phragmites australis*) or Sea Club Rush (*Bolboschoenus maritimus*). These stands were classified and mapped as other saltmarsh (CM2) or other Non-Annex saltmarsh vegetation in accordance with the SMP project.

The majority of the Annexed saltmarsh habitats occur inside the confines of the cSAC. Small patches of the ASM and MSM occur outside the boundary but their extent is not significant and is related to minor mapping differences between the statutory 6inch maps with actual boundaries on the ground.

Table 3.1. Area of saltmarsh habitats mapped at Querin.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.19
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	3.56
H1410	Mediterranean salt meadows (Juncetalia maritimi)	0.008
non-Annex	*Spartina* swards	31.42
	Total	**35.178**

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

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

Two patches of annual Glasswort-dominated vegetation were recorded at Querin. They are located on the north-eastern half of the site on sandflats. This area has developed on a breach in the sandy ridge around the southern side of the site. They occupy an area approximately 0.19ha. The vegetation is not dominated by its eponymously named Glasswort (*Salicornia europaea* agg.), but by Annual Sea Blite (*Suaeda maritima*) which occupies between 75 and 100% of ground cover on the sandflats where it is recorded. The only other species that was recorded is Common Saltmarsh Grass (*Puccinellia maritima*) and its contribution was small, typically <1%.

Atlantic salt meadows (H1330)

The ASM occupy an area of 3.56ha, most of which occurs inside the cSAC (Table 3.1).The majority of the ASM is confined to a narrow band which continues along the entire southern sandy ridge between the *Spartina* sward and the transitional/dune grassland. Elsewhere, the ASM is fragmented, often occurring as small discontinuous patches behind the *Spartina* sward. Some of this fringing vegetation occurs alongside the access track which skirts the western boundary of the site, whilst the remaining ASM habitat occur as smaller outliers alongside the upper boundary of the saltmarsh alongside the main road.

In terms of saltmarsh development and zonation, many of the species typical of all of the zones are recorded. However, most of the vegetation comprises lower and mid/upper communities and despite the presence of many creeks across the *Spartina* sward, there is little development of a creek and pan system within the ASM itself.

Most of the ASM is bounded on its seaward side by the extensive *Spartina* sward. Occasionally the ASM is marked by a discontinuous ASM/*Spartina* mosaic. The majority of the ASM, however, is mapped as pure habitat, although occasionally, there was some minor occurrence of Common Cordgrass within the ASM, notably along creeks or in small pans. The most commonly recorded and abundant species include Red Fescue (*Festuca rubra*) Sea Aster (*Aster tripolium*), Sea Milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*) and Common Saltmarsh Grass. Annual Glasswort is common throughout the lower parts of the ASM and accounted for 6-10% of the cover in three of four monitoring stops. Another species of minor occurrence within the ASM is Annual Sea Blite.

In places, where the *Spartina* sward is extensively developed and wide, the influence of salt laden water decreases and there is an increase in grassland species. Depending on the depth of sand beneath the vegetation, the saltmarsh transitions into wet grassland or dune grassland along the upper boundary. Within this upper community the distinction between drier and wetter areas is typified by the presence of Creeping Bent (*Agrostis stolonifera*), although Carnation Grass (*Carex flacca*) was locally frequent. ASM has also developed in one low-lying depression where the saltmarsh extends into hollows within the sandy ridge. The vegetation in this area is typical of mid-upper marsh and is dominated by Sea Plantain with less frequent Red Fescue and occasional Sea Pink and Long-bracted Sedge (*Carex extensa*).

Elsewhere, the ASM is nowhere near as abundant as in the southern half and is much more fragmented. The upper boundary is often demarcated by disturbed ground such as along the access track or transitional grassland communities that are variously characterised by admixtures of grasses including Twitch (*Elymus repens*), along with stands of Reeds or Sea Club Rush.

Mediterranean salt meadows 9H1410)

MSM vegetation is not well represented at this site and occurs as a single almost insignificant patch along the landward side of the marsh. Occupying a mere 0.008ha, the greater part occurs inside the designated site boundary. The vegetation is characterised by the presence of Sea Rush (*Juncus maritimus*).

Fronted on its seaward boundary by the expansive *Spartina* sward, the MSM is separated from other saltmarsh habitats. Its upper boundary is characterised by brackish vegetation, mostly transitional *Elymus repens* –dominated grassland, although there is some fringing Sea Club Rush present also.

Spartina swards

This site is predominantly characterised by the Spartinion, which is almost exclusively made up of extensive *Spartina* sward, which has infilled this small bay that formerly containing intertidal flats. It has developed on the intertidal zone within this sheltered inlet and is largely confined to muds or admixtures of mud, shingle and gravel. It is not found on sand. Of the total 31.42ha that is mapped for this habitat, however, only a small amount does not consist of a mono-specific sward. There is some development of ASM/*Spartina* sward approximately, 0.364ha in total. This habitat has developed in the transition zone between the ASM and the upper boundary of the *Spartina* sward. It contains a mixture of species like Common Saltmarsh-grass and Common Cordgrass with small amounts of Glasswort. A further 0.0005ha is mapped as isolated clumps, which are located towards Querin Point where the inlet is more exposed.

IMPACTS AND ACTIVITIES

This is largely a rural saltmarsh site that is largely characterised by Common Cordgrass, with some fringing, albeit, fragmented saltmarsh vegetation. There are few impacts and activities that are considered to be negatively affecting the saltmarsh habitats at this site. Indeed, none are recorded for the fragmentary MSM. All impacts are listed in Table 4.1 and include some indication of outside influences on the condition of the saltmarsh within the cSAC.

In terms of saltmarsh development, it is clear that the majority of the saltmarsh at Querin has developed in the past century. The 2nd edition 6 inch map does not show much saltmarsh in this inlet. Indeed, there is no indication on the map of the extent of tidal inundation around the low-lying hinterland. Much of the saltmarsh development is accounted for by the spread of Common Cordgrass. This is an invasive species of saltmarsh and mudflats (954). Common

Cordgrass was first planted in the Shannon Estuary, in Poulnasherry Bay, in 1928 (Nairn 1986). The development of this sward was not assessed as it largely occurred outside of the current monitoring period and is likely to be quite stable.

In terms of more recent habitat change, most of the Annexed habitats occur landward of the Common Cordgrass sward. The sward is mature and does not appear to be progressing in a landward direction. There was no real difference discernible in the extent of other saltmarsh communities when the 2005 aerial photographs were compared with the year 2000. For this reason the impact of Common Cordgrass is assessed as neutral. However there also appears to be some natural succession (990) and the development a ASM/*Spartina* sward mosaic in areas with no previously mapped ASM is indicative of this progression. There is an increase in the sand content in the older substrates found along the upper or landward side of the *Spartina* sward, which favours the gradual encroachment of ASM species. It could also be suggested that the extent of the *Salicornia* vegetation could be limited by the extensive nature of the Common Cordgrass. However, this is not the case at Querin as the *Spartina* sward does not occur on the sandflats.

The site has only developed in the past century or so and the land is either individually owned or held in common by a number of separate owners. Thus here hasn't been much development within the site and the only real activity is grazing (140). However, given the extent of the *Spartina* sward, the only land that is suitable for grazing occurs around the edges of the saltmarsh. There is some limited grazing by horses and cattle along the barrier ridge. Anecdotally, one landowner is attempting to change the management regime on the barrier ridge and has erected a fence (150) across the ridge and saltmarsh. It has been suggested that there has been an increase in the number of horses being brought onto the site to graze. Asides from some localised damage and poaching (143), the overall impact is limited.

Given the relatively small size of the site and its recent genesis, land reclamation and/or modified drainage (800, 810) is not a significant impact unlike other saltmarsh sites along the Lower River Shannon. It is clear that some of the agricultural fields that lie outside the site, on the northern side of the road have in places been improved or had the drainage system cleared. However, it is not possible to quantify its impact if any on the saltmarsh.

There are some limited indications of erosion (900) at this site, such as isolated clumps of *Spartina* on the mudflats. However as most of the remaining saltmarsh communities occur behind the saltmarsh, so there are few signs of habitat loss. There is a case for some minor change in the ASM around a creek at the eastern tip of the barrier ridge, but overall, it is not possible to estimate any loss based on an analysis of the year 2000 and series 2005 aerial photographs. The impact of erosion is assessed as neutral on a small portion of the saltmarsh face.

In the main, it would appear the *Spartina* sward is generally quite stable with the possibility of some minor expansion of the sward along the seaward edge. However, there is no appreciable difference between the year 2000 and 2005 series aerial photographs. In terms of the other habitats, there are no measurable signs of accretion (910), although it is possible that succession in the ASM/*Spartina* mosaic will over time result in a gradual decline in the cover of Common Cordgrass, as the substrate becomes more consolidated and sandy.

Other impacts are limited in extent or influence. In terms of recreational pursuits, occasionally walkers access the site, but there are few signs of any damage in the naturally low sward such as trails (501), etc. Most pedestrian traffic is confined to the upper parts of the marsh or along the dune grassland along the barrier ridge.

All of the land outside of the cSAC is located to the north and western boundaries of the site. This land is mostly given over to agriculture (140), although a number of houses are found along the road (403). These impacts have remained constant for a considerable amount of time and any large-scale impacts to the saltmarsh are largely limited by a local road that runs along the northern side of the site. There were signs of dumping (700), mainly garden waste and at one location, building rubble. However, this was not extensive and mostly occurred on transitional vegetation rather than saltmarsh alongside the road. None of these impacts is considered to be of serious concern.

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

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1310	954	C	0	0.19	Inside
H1330	140	C	0	3.06	Inside
H1330	143	B	-1	0.5	Inside
H1330	501	D	0	0.005	Inside
H1330	900	C	0	0.002	Inside
H1330	954	C	0	3.56	Inside
H1330	990	C	+1	0.18	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.

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 NHA survey, 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 is little other detailed information for this site.

Querin is not a large site and the Annex I saltmarsh habitats are overshadowed by the extent of the *Spartina* sward, which is of relatively recent origin. As has previously been mentioned, there is no early indication of the occurrence of saltmarsh in this area on the 6inch map. Common Cordgrass was first reported in Poulnasherry Bay in 1928, when it was planted as a means of stabilising the changing mudflats any saltmarsh. So it is likely to have spread to the nearby site sometime thereafter.

The overall conservation status of this saltmarsh, which is a combination of the individual habitat assessments (Table 5.1), is rated as *unfavourable-inadequate*. Most of the site is in good condition and there is some localised damage from excessive poaching. There are indications of natural succession of the *Spartina* sward to ASM in places.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but it is now out of date.

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

Habitat	**EU Conservation Status Assessment**			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions	Future prospects		Unfavourable - Inadequate
Atlantic salt meadows (H1330)	Extent	Structure and functions Future prospects		Unfavourable - Inadequate
Mediterranean salt meadows (H1410)	Extent Structure and functions Future prospects			Favourable

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

Extent

Although not extensively developed at this site, the extent of the annual habitat is assessed as *favourable*. There is no previous information as to its extent at this site. And while is not possible to determine if there has been any great increase in the habitat during the current monitoring period, its occurrence on sandy substrates, some distance removed from the *Spartina* sward is a positive feature.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. A single monitoring stop was carried out in the habitat and it fulfilled the target criteria. The annual vegetation is naturally species poor and typically found in environments that are prone to change. This includes tidal inundation and changes in the sediment distribution on which the vegetation occurs. At Querin, the relatively constant cover, up to 75%, was indicative of a stable community. Common Cordgrass was not found within this community but it is found adjacent to this area. The *Salicornia* flats form part of the pioneer community at this site and their presence is a positive feature and enhances the overall diversity of the site.

Future prospects

The future prospects are rated as *unfavourable-inadequate*. The assessment assumes that there will be no significant change in the management regime at Querin in the future. It is unlikely that Common Cordgrass will significantly colonise within this annual habitat, given that this species is confined to the intertidal mudflats. The *Salicornia* flats are mainly found on sandy substrate, which does not favour the colonisation of Common Cordgrass, although it is probable that some of the habitat will be colonised.

Atlantic salt meadows (H1330)

Extent

The extent of the habitat is assessed as *favourable* (Table 5.1). Notwithstanding the fact that it is greatly dwarfed in terms of extent by the *Spartina* sward, the ASM is the most extensive of all the Annexed saltmarsh habitats that was recorded at Querin. There are no indications that the *Spartina* sward developed at the expense of ASM in the past. Other than a small area of erosion around the tip of the site towards Querin Point, there are few other indicators of erosion. Indeed, it may be that there is a gradual increase in the habitat, as consolidated substrates towards the back of the *Spartina* sward become colonised by ASM species.

Habitat structure and functions

The structure and functions of this habitat are rated as *unfavourable-inadequate*. In total, four monitoring stops were carried out and one stop failed. Most of the saltmarsh is in good condition but some localised habitat is damaged by excessive poaching. While most of the ASM, along the southern half of the site is grazed by horses and occasionally cattle, the damage is not great.

The ASM is characterised by a naturally low sward and any damage, such as poaching is localised in nature. The saltmarsh structure is mainly poorly developed at this site. Some

zonation is evident and there are examples of several different vegetation zones at this site including low, mid and upper communities. There is a zone of transitional vegetation from ASM to *Spartina* sward along the lower boundary on a minor gradient. Common Cordgrass is present but is not a significant part of the ASM. The development of the ASM/*Spartina* sward mosaic is more likely to be due to ASM species spreading into the *Spartina* sward and not vice versa, as no ASM was previously mapped in these areas. Therefore Common Cordgrass is not considered a negative indicator on species composition.

Future prospects

The future prospects of the ASM are rated as *unfavourable-inadequate*. The assessment assumes that there will be no significant change in the management regime at this site. There is a small amount of damage from grazing at the site that is causing excessive poaching and this is likely to continue in the future. It does not appear that the overwhelming dominance of the *Spartina* sward at this site is impacting greatly on the extent of the ASM. Indeed, it may be that such is the Common Cordgrass spread out onto the mudflats, that in places the sediments have been suitably consolidated. This enabled the gradual expansion of ASM into new ground due to natural succession of habitats.

Mediterranean salt meadows (H1410)

Extent

The extent of this habitat is assessed as *favourable* (Table 5.1). Although not extensively recorded from this site, the MSM is located towards the landward or mature part of the marsh. No direct impacts were noted and there is no indication of any recent loss of habitat as a result of the extensive *Spartina* sward.

Habitat structure and functions

Monitoring stops were not carried out in this habitat, given its relative paucity. However, based on visual assessment, the extant MSM vegetation is structurally and floristically similar to that encountered in other sites with more extensive tracts of the habitat. For this reason, the structure and functions are rated as *favourable*.

Future prospects

The future prospects for the habitat are assessed as *favourable*. Although it is not extensively developed at Querin, there are no indications of any great damaging activities or other impacts such as the spread of Common Cordgrass. It is likely to persist at Querin for some time.

MANAGEMENT RECOMMENDATIONS

There are no recommendations for the management of this site.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

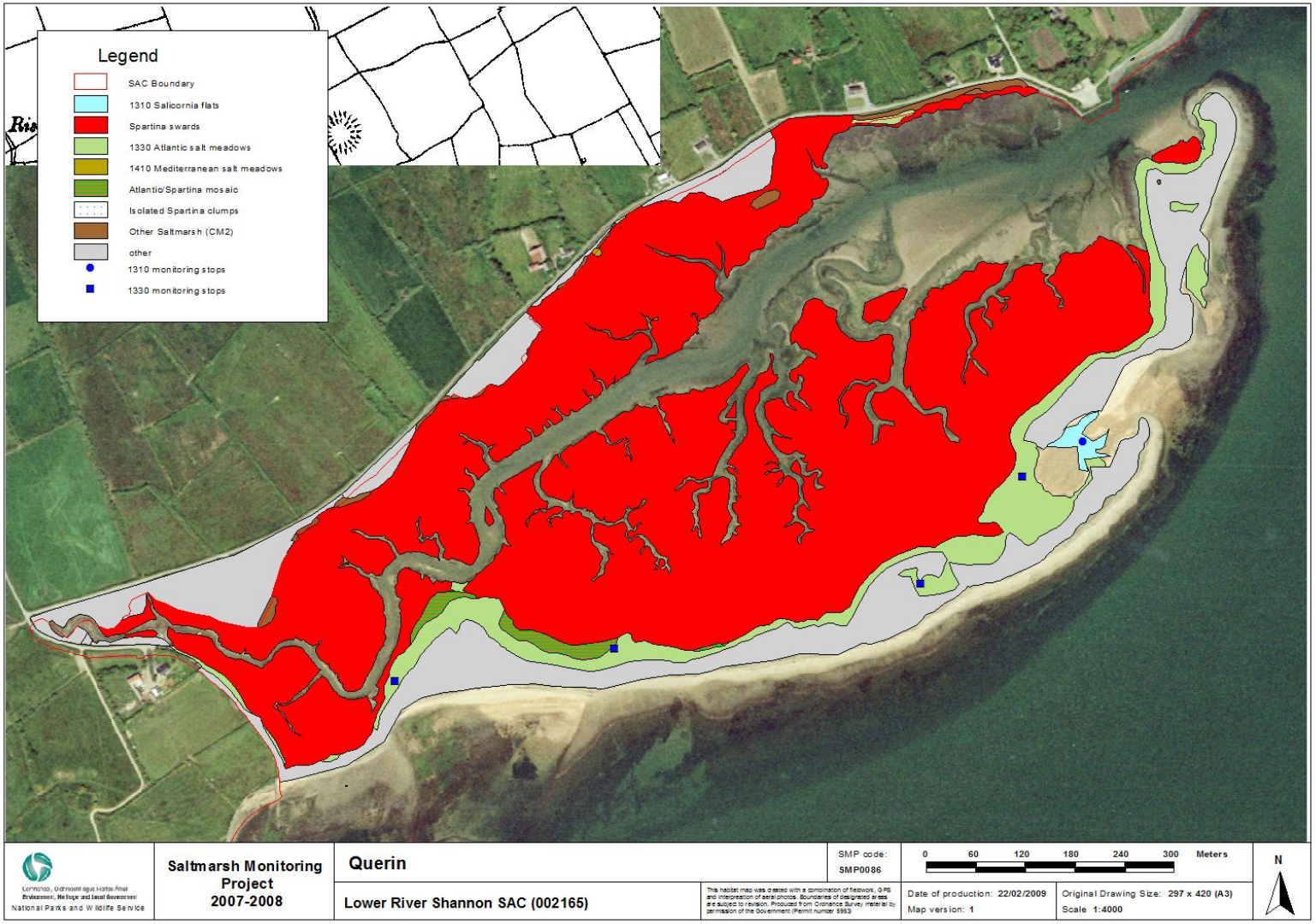
MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

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 I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	**SM habitat description**	**Mapped Area (ha)**	**Area (ha)**				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.185	0.185				
2	*Spartina* swards	31.243					31.243
3	1330 Atlantic salt meadow	3.381		3.381			
4	1410 Mediterranean salt meadow	0.008			0.008		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic	0.364		0.18			0.18
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	8.636					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)	0.001					0.00005
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	0.357					
19	1330/rocky shore mosaic						
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**44.18**	**0.185**	**3.56**	**0.008**		**31.42**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
Atlantic/Spartina mosaic
Isolated Spartina clumps
Other Saltmarsh (CM2)
other
1310 monitoring stops
1330 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Querin
Lower River Shannon SAC (002165)
SMP code: SMP0086
0 60 120 180 240 300 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:4000
National Parks and Wildlife Service

Appendix XII – Rinnevilla Bay site report and habitat map from the SMP (McCorry & Ryle, 2009)

SITE DETAILS

SMP site name: **Rinevilla Bay**		SMP site code: **0087**
Dates of site visit: **2 September 2008**		CMP site code: **N/A**
SM inventory site name: **Rinevilla Bay**		SM inventory site code: **133**
NPWS Site Name: **Lower River Shannon**		
NPWS designation	cSAC: **2165**	MPSU Plan: **Old Format – Draft 2: Consultation**
	pNHA: **N/A**	SPA: **N/A**
County: **Clare**		Discovery Map: **63** Grid Ref: **83610, 149779**
Aerial photos (2000 series): **O 4848-B,D**		6 inch Map No: **Cl 065, 072**

Annex I habitats currently listed as qualifying interests for Lower River Shannon cSAC:

H1310 ***Salicornia*** **and other annuals colonizing mud and sand**

H1330 **Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**

H1410 **Mediterranean salt meadows (Juncetalia maritimi)**

Other SMP sites within this SAC/NHA: **Carrigafoyle, Barrigone/Aughinish, Beagh, Bunratty, Shepperton/Fergus Estuary, Inishdea/Owenshere, Killadysart/Inishcorker, Knock, Querin**

Saltmarsh type: **Estuary** Substrate type: **Mud:peat**

SITE DESCRIPTION

Rinevilla Bay is a small remote site which is located halfway along the southern side of Loop Head in County Clare. It is the most westerly saltmarsh site occurring along the lower reaches of the Shannon River. The bay comprises both Rinevilla Bay proper to the west and a second smaller bay that is separated by a narrow rocky headland at Cloonconeen Point. The site is largely rural and the nearest village is Carrigaholt, whose quay is the starting point for many dolphin watching expeditions.

Although the underlying geology is composed of carboniferous limestone and shales with some more recent glacial till overburden, the ground is very wet and in places is waterlogged. Much of the surrounding landscape is intricately subdivided into fields of various sized and orientations by a series of ditches, hedgerows and drains. All of this agricultural improvement was started a long time ago and relics of the drainage and reclamation regime are still visible throughout the site.

The saltmarsh is small and is characterised by a fragmented and heterogeneous vegetation mosaic, which is largely confined to the low-lying ground behind a shingle ridge which extends around the eastern half of Rinevilla Bay. This area was cut for peat in the past. Curtis and Sheehy-Skeffington (1998) classified this saltmarsh as an estuarine site. However, it is more typical of a 'Lagoon type' site, as the saltmarsh is confirmed behind a shingle ridge with

no permanent tidal connection to the outer bay. Overflow during spring tides seems to be the main tidal inundation into this area and there is a large permanent lagoon adjacent to the area where there is overflow. This pool called Cloonconeen Pool has been identified as lagoon and has been surveyed for NPWS in the past (Healy *et al.* 1997, Oliver 2005, NPWS 2007). It is classified as a sedimentary lagoon with a mid-range salinity. Healy *et al.* (1997) describes the pool as being over-topped during spring tides and seepage zones through the barrier were also noted. No daily tidal fluctuation in the pool was noted. A smaller drainage channel with a connection to the outer bay is present at the west side of the site.

Rinevilla Bay saltmarsh is located within the Lower River Shannon candidate Special Area of Conservation (cSAC 2165). This very large site encompasses approximately 120 kilometres of the lower reaches of the Shannon and extends seawards towards the open estuary between Loop Head on its northern boundary and Kerry Head (west of Beal Point). It includes many secondary estuaries, including the Fergus Estuary and a great many freshwater tributaries. The site is considered to be of national ecological importance owing to the presence of eighteen important Annex I habitats. The site is primarily designated for its estuarine and coastal habitats and is also important for Annex II species such as Bottlenose Dolphin. The Shannon is also notable for the range of rare or threatened plant species. These include a number of saltmarsh species such as Three Headed Club-Rush (*Scirpus triqueter*), Wall Barley (*Hordeum secalinum*) and Sea Dock (*Rumex maritimus*). Three Annex I species are listed as qualifying interests for this cSAC: *Salicornia* flats, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). All three habitats were found at this site in addition to *Spartina* swards, which is not now considered to qualify as an Annex I habitat.

In total, twenty one separate saltmarsh sites are listed for the lower reaches of the River Shannon, occurring in counties Limerick, Kerry and Clare. Fourteen are found along the Co. Clare shoreline (Curtis and Sheehy-Skeffington 1998). Several of these other saltmarshes were surveyed during the SMP project (see above table).

The site is readily accessible through a number of gates along a local road which runs parallel to the marsh. The majority of the land, however, is privately owned by a number of different landowners and is fenced off. During the survey, most owners were eventually located and permission was granted to carry out the survey. The water level in the lagoon was quite high at the time of the survey so there was no access to the edge of the pool.

SALTMARSH HABITATS

General description

The saltmarsh vegetation was largely confined to the one half of Rinevilla Bay, on the eastern side of Cloonconeen Point. It is not an extensive saltmarsh. A discontinuous fringe of saltmarsh vegetation was recorded along the rocky shoreline extending eastwards from

Clonconeen Point. There was a significant increase in its extent along the inner part of this secondary bay. The vegetation is typically located in low-lying ground behind a shingle/cobble ridge and is constrained on its seaward boundary by a shingle/cobble ridge extending most of the way around the eastern half of the Rinevilla Bay. Its upper boundary is now largely constrained by an elevated local road on an embankment.

The extant saltmarsh forms a single contiguous unit around the smaller part of the bay. However, it is heterogeneous in composition and appearance, as it is confined to waterlogged soils, which have been greatly modified in the past through the construction of many drains in an attempt to reclaim agriculturally-useful land. A mosaic of various different habitats has developed.

There is considerable diversity in the extent and distribution of the individual saltmarsh communities and transitions with brackish vegetation characterised by species such as Common Reed (*Phragmites australis*) and Sea Club Rush (*Bolboschoenus maritimus*) are common. This vegetation was mapped as other saltmarsh (CM2) or non-Annex I vegetation in correspondence with the SMP classification. However the greatest extent of transitional vegetation comprises wet grassland dominated by species such as Twitch (*Elymus repens*), Creeping Bent (*Agrostis stolonifera*) and Silverweed (*Potentilla anserina*). This non Annex I saltmarsh vegetation is also classified as brackish marsh (CM2).

The site has seen a considerable reduction in its extent over time. This is clearly indicated on the 2nd edition 6 inch map and shows the previous limit of the shoreline some 115metres further out into the small bay. Despite the presence of the barrier ridge, the influence of the sea is apparent and the character of the land reflects the meeting of saline and brackish waters.

Table 3.1. Area of saltmarsh habitats mapped at Rinevilla Bay.

EU Code	Habitat	Area (ha)
H1310	*Salicornia* and other annuals colonizing mud and sand	0.001
H1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	11.73
H1410	Mediterranean salt meadows (Juncetalia maritimi)	2.45
Non-Annex	*Spartina* swards	1.53
	Total	**15.711**

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

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

The occurrence of annual vegetation is not well represented at this site. A single patch measuring approximately 0.001ha was recorded along a disturbed track at the landward side of the saltmarsh. This small access track onto the marsh is characterised by grass–dominated vegetation, which is in places showing signs of excessive trampling by livestock. This habitat,

which is normally confined to intertidal mudflats, was largely distinguished by the spartan occurrence of Annual Glasswort (*Salicornia europaea* agg.) on a small patch of bare ground, denuded of all grassland species.

Atlantic salt meadows (H1330)

The ASM at this site is dominated by mid and upper marsh communities and together account for 11.73ha or almost 75% of the total saltmarsh habitat that is mapped. There is very little pioneer or lower marsh vegetation developed at this site.

The lower reaches of the ASM was typically bounded by the shingle ridge, which could rise to more than 1metre above the level of the ASM, although there is a storm-cut breach at its eastern side, fronting the lagoon. Although the lower marsh zones are absent from Rinevilla, Common Saltmarsh Grass (*Puccinellia maritima*) is occasionally recorded throughout the site, especially along wetter ground adjoining drainage creeks. Common Sea-spurrey (*Spergularia media*) is another species typical of lower marshes that was commonly recorded.

The ASM vegetation is characterised by its grassy sward dominated by Red Fescue (*Festuca rubra*) and Creeping Bent (*Agrostis stolonifera*), along with a number of abundantly occurring species such as Sea Aster (*Aster tripolium*), Saltmarsh Rush (*Juncus gerardii*), Sea Plantain (*Plantago maritima*), Sea Milkwort (Glaux maritima), Common Scurvy Grass (*Cochlearia officinalis*) and Sea Arrow Grass (*Triglochin maritimus*). Spear-leaved Orache (*Atriplex prostrata*), although not providing much ground cover (<1%) was nonetheless common throughout the ASM.

While most of the ASM might be characterised as upper marsh vegetation, there was some development of mid marsh community towards the western end of the site. It was not extensively developed and the vegetation was similar in floristic composition, differing in the cover of individual species. The mid marsh was characterised by a somewhat better drainage pattern than the remainder of the site, although this may have been because of the occurrence of deeper drainage creeks among the shallow peats and glacial tills. The development of pans was not recorded at the western end of the site. However, there was some limited development of pans among the naturally low-growing sward towards the southern side of the lagoon.

The transition to other habitats, notably wet grassland was often gradual. Elsewhere the transition to brackish marsh was clear cut and patches of Sea Club Rush were not uncommon. In many cases, particularly towards the landward side of the saltmarsh, the transitional ASM vegetation was represented by admixtures of upper ASM species along with Common Reeds. One sizable stand of the transitional vegetation occurred at the back of the saltmarsh along the roadway, where the reeds had extensively spread along a ditch beside the road. Indeed the upper boundary of the ASM was often demarcated by other brackish

saltmarsh communities – usually large stands of Reeds or transitional wet grassland dominated by Twitch (*Elymus repens*).

Mediterranean salt meadows (H1410)

Along with Sea Rush (*Juncus maritimus*), grasses including Creeping Bent and Red Fescue were very much constant species throughout this habitat. Other species that were commonly recorded included Saltmarsh Rush, Sea Aster and Common Scurvy Grass. Species from other habitats were indicative of the saturated nature of the soils along with the freshwater influence. These included Sea Club Rush and some Reeds as well as Silverweed which was locally common on ground that was largely abandoned.

Spartina swards

Common Cordgrass is locally abundant and even overwhelmingly extensive in many saltmarshes along the lower parts of the River Shannon. However, this was not the case at Rinevilla Bay. Two separate areas of sward were recorded. The first area is located toward the northern or inner part of Cloonconeen Point. It is characterised by a mono-specific sward that has developed in a shallow pool and rarely are other species found except in transitional zones. The second area of sward is concentrated around the lagoon and some of its islands. Smaller patches were also recorded towards the eastern half of the lagoon in front of the MSM.

IMPACTS AND ACTIVITIES

Rinevilla bay is a small saltmarsh system, situated towards in the open mouth of the River Shannon. Asides from its exposed location and the current grazing regime, there are few impacts or activities that are negatively impacting upon the saltmarsh. There is some scattered settlement, but the area remains largely rural and is not on main tourist trails. The list of these impacts and activities is shown in Table 4.1.

The individual plots or fields are not large and are sometimes in multiple ownership. Previously, peat cutting and seasonal pasturing were carried out. All of the land within and surrounding the saltmarsh is still wet and is not really suitable for agricultural improvement. Given the treacherous nature of the saturated ground conditions, grazing (140) is the only practice that is carried out at this site. Most of the saltmarsh is still grazed and only a small number of areas are cordoned off by electric fences preventing livestock access. The ground

in most parts is very wet and boggy and the extent of the lagoon is deceptive, surrounded as it is by Common Cordgrass and other brackish vegetation types. There are places where the saltmarsh is showing signs of damage (143). Trampling and poaching are localised in occurrence and are mostly confined to the western half of the site. There are a small number of trails created by cattle in the vegetation (501). They are, however, of no great impact.

It is clear from the 2nd edition OSI 6inch map that this small wetland in Rinevilla Bay was at one time more extensive. However, over time and given the exposed nature of the site, it is clear that there has been a considerable loss of ground. The current shingle bar now lies approximately 115 metres inland of its previous limit as shown on the 6 inch map. This long-term retreat is not assessed as it occurred outside of the current monitoring period. However, it is an indication of an erosional trend at the site (900).

Along the seaward side of the shingle at the western side of the site, small tufts of ASM vegetation were noted, some of them with small clumps of vegetation still remaining. Elsewhere, unvegetated sods of clay sitting atop the shingle/mud intertidal zone indicate an earlier frontline limit. To the west of east of the site, around the mouth of the lagoon, there is some sign of vegetation loss around unvegetated cobble breach. The stony beach is prone to redistribution of the cobble during severe tidal conditions, resulting in some minor ASM loss. While there has been a gradual loss of saltmarsh and other vegetation through the years, the erosion is not large-scale and most of the saltmarsh vegetation lies in some shelter behind the shingle bar. It was not possible to distinguish any real change in habitat extent when the year 2000 and series 2005 aerial photographs of the site were examined. The impact of erosion is assessed as having a low negative impact. There are good prospects for landward retreat of saltmarsh at this site so erosion is assessed as having a repairable influence.

A small patch of land along the minor road at the west side of the site has been infilled during the monitoring period (803). It is likely that some ASM was infilled and destroyed but most of the adjacent vegetation is dominated by Common Reed. Much of the land has been modified and still bears some imprint of the land subdivision and drainage. Most of the drains were constructed in historical times, but some are still maintained, particularly towards the north-eastern half of the site alongside the north-south running dirt track (810) and despite the drainage features, considerable stands of Reeds and Sea Club Rush still remain. The greatest extent of brackish vegetation is towards the landward side of the marsh. The occurrence of large stands of brackish vegetation alongside the saltmarsh reflects the freshwater influence throughout this wet site. While there is some indication of the limited spread of brackish vegetation along drains, it is considered as a natural process (990) rather than spread of an invasive species (954).

Common Cordgrass is present at this site and is an invasive species of saltmarsh (954). It was first planted in a number of locations along the Shannon as early as 1928 (Nairn 1986).

Given its rapid colonisation at other sites throughout the Shannon estuary, it is not surprising that it has become established at Rinevilla Bay. It is difficult to fully quantify its impact, during the current monitoring period, as it is associated with both saltmarsh and brackish marsh habitats. A comparison of the current extent of *Spartina* sward to the habitat drawn by Healy *et al.* 1997) shows that *Spartina* sward has increased its extent, mainly as emergent vegetation in the lagoon. However, it would not appear to be significantly increasing in extent in the ASM and MSM. It only affects a small area of the ASM, about 0.1 ha around the fringes of the *Spartina* swards, and it is assessed as having a negative impact on this area. It has very little impact of the MSM. It has no current impact on the miniscule amount of *Salicornia* flats.

Outside of the site, most of the impacts and activities are similarly associated with the management regime. All of the land is subdivided by drains, some of which are maintained (810), although Reeds were noted extending along some drains. Most of the land is under grass and is either grazed (140) or cut for silage (102). It is likely that as part of the grassland management, fertilisers (120) are used to improve the quality of the sward and that they would have some impact on the saltmarsh, seeing as a large number of the fields drain into the saltmarsh. Some fields, particularly to the east of the saltmarsh had been left derelict, possibly due to waterlogged conditions of the soils and young reeds were expanding (990) into previously cut grasslands. These activities have no measurable impact on the saltmarsh at this site.

Table 4.1. Intensity of various activities on saltmarsh habitats at Rinevilla Bay.

EU Habitat Code	Activity code	Intensity	Impact	Area affected (ha)	Location of activity
H1310	143	B	1	0.001	Inside
H1330	140	C	0	4.0	Inside
H1330	143	C	-1	1.0	Inside
H1330	501	C	0	0.01	Inside
H1330	810	C	-1	0.08	Inside
H1330	900	C	-1	1.0	Inside
H1330	954	B	-1	0.1	Inside
H1330	990	C	0	0.1	Inside
H1410	140	C	0	1.0	Inside
H1410	501	C	0	0.01	Inside
H1410	810	C	-1	0.05	Inside
H1410	900	C	-1	0.25	Inside
H1410	954	C	-1	0.001	Inside
H1410	990	C	0	0.045	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.

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 NHA survey, the NPWS management plan, 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 this area during the survey at this site. There is some more detailed information in a survey of Cloonconeen Pool by Healy *et al.* (1997). However, this survey only covers the marginal vegetation around the edge of this lagoon.

The saltmarsh at Rinevilla is notable as it is the most westerly saltmarsh that is found along this mighty river, occurring as it does in the mouth of the Shannon. It has several notable conservation features including being part of a Lagoon complex. There is extensive development of brackish habitats in this type of site and the ASM and MSM both form complex mosaics with other habitats. Its exposed location means that it is subject to harsh environmental conditions and coupled with the presence of the shingle bar make it a notable, albeit small site.

The overall conservation status of the saltmarsh vegetation at Rinevilla is *unfavourable-inadequate* (Table 5.1). Most of the saltmarsh habitat is in good condition but there is some localised damage from excessive poaching. Most of the site is grazed by cattle but some sections are not grazed at all. The structure of this site has been modified in the past by drainage, reclamation and peat cutting in the past. Common Cordgrass is present at this site. It is unusual to see this species in a Lagoon type site and it seems to have spread in the shallow part of the lagoon. However, it is not a significant part of the saltmarsh vegetation and is largely confined to small pools and the main lagoon. The marginal vegetation around the lagoon has not changed significantly since the 1997 survey (Healy *et al.* 1997) although there seems to be some increase in the cover of *Spartina* sward.

The conservation status of the lagoon habitat at this site have also been assessed as part of an overall assessment of conservation status of lagoons in Ireland (NPWS 2007). The status of the lagoons has been assessed as *unfavourable-inadequate* mainly due the possibility of erosion disturbing the shingle barrier and destroying this lagoon.

This site is located within the Lower River Shannon cSAC. An old format NPWS Conservation management plan is available for this cSAC but is now out of date.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Rinevilla Bay.

Habitat	EU Conservation Status Assessment			
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**	**Overall EU conservation status assessment**
Salicornia flats (H1310)	Extent Structure and functions	Future prospects		Unfavourable-Inadequate
Atlantic salt meadows (H1330)	Extent	Structure and functions Future prospects		Unfavourable-Inadequate
Mediterranean salt meadows (H1410)	Extent Structure and functions Future prospects			Favourable

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

Extent

The extent of this habitat is rated as *favourable*. *Salicornia* flats are not well developed at Rinevilla. Indeed a single minor patch along a disturbed track was all that was recorded. However, its presence at this site increases the structural diversity of the entire saltmarsh. Healy *et al.* (1997) recorded a small area of this habitat around the margin of the site but this area was flooded at the time of the survey.

Habitat structure and functions

The structure and functions of this annual habitat are assessed as *favourable*. Given its limited extent, monitoring stops were not carried out and the determination is based on a visual assessment. The spartan vegetation, although occurring on a disturbed track, is typical of similar and establishing saltmarsh vegetation recorded elsewhere in Ireland. Common Cordgrass was not present.

Future prospects

The future prospects for this habitat are tentatively rated as *unfavourable-inadequate*. There is no information of its previous distribution at Rinevilla. The development of this vegetation is probably related to disturbance along this track. It is unlikely that this vegetation was ever widespread, given the topographical and substrate conditions at this exposed site. Its occurrence towards the back of the saltmarsh on bare ground is not its typical habitat. Over time the habitat may not persist and other saltmarsh may recolonise, at the expense of the annual habitat.

Atlantic salt meadows (H1330)

Extent

The ASM is the most extensive of all of the saltmarsh habitats that were recorded at Rinevilla. Its extent is rated as *favourable*. This site is a heterogeneous mixture of saline and brackish communities, whose distribution is controlled by the inflow of freshwater along relic and modern drainage features and tidal inundation mainly over the shingle bar. And while there has been a considerable loss of the entire saltmarsh system over time, there is little measurable evidence of any significant change in the extent of the ASM habitat during the current monitoring period. While some *Spartina* swards have developed at this site, there is no evidence that the extent of ASM has been reduced through colonisation by Common Cordgrass during the current monitoring period, mainly due to the lack of accurate baseline data. Its impact on extent is assessed as neutral.

Habitat structure and functions

The structure and functions of this habitat is assessed as *unfavourable-inadequate* (Table 5.1). Four monitoring stops were carried out in this habitat. They all satisfied the target criteria. Most of the ASM is generally in good condition but there is some localised damage in places due to excessive poaching by livestock. Therefore the conservation assessment is revised on best scientific judgement as *unfavourable-inadequate.*

There are a range of vegetation communities at this site. Some zonation is evident. Some of the saltmarsh is not grazed and the sward height is quite variable. The structure of this area has been modified in the past by drainage, land reclamation and peat-cutting. The ASM is found in a mosaic with a range of other habitats including MSM, *Spartina* sward, brackish stands of Sea Club-rush and Common Reed and drier grassland dominated by Twitch. Common Cordgrass is found in this habitat but only affects a small proportion of it. Therefore the impact of its spread is assessed as neutral.

Future prospects

The future prospects of this habitat are rated as *unfavourable-inadequate*. The assessment assumes that the current management activities and levels of impacts such as grazing continue in the future. Although it is a small site, livestock are still allowed to graze most of the saltmarsh. The damage caused by trampling and poaching in particular, has been compounded by a number of unfeasibly wet years, which effectively means that the vegetation has no time to recover. Some of this saltmarsh may be vulnerable to further colonisation by Common Cordgrass in the future, especially if there is severe poaching

damage. There is a long-term erosional trend at this site, although there are good prospects of landward retreat of saltmarsh at this site.

Mediterranean salt meadows (H1410)

Extent

The extent of this habitat is assessed as *favourable*. Although not as extensive as the ASM, the development of the MSM is nonetheless impressive and it is widely distributed throughout the site. There are no real indications of any loss of habitat due to erosion, natural changes and land-use. There has been a gradual decline in the area of the overall site, but this cannot be measured during the time-frame of the current monitoring period.

Habitat structure and functions

Two monitoring stops were carried out in this habitat. The attributes required to meet a satisfactory structure and functions were satisfied and hence the assessment is *favourable*. There are few impacts and activities acting on this habitat apart from grazing, which is not as damaging as it is on the ASM. Common Cordgrass is present within this habitat but is quite rare.

Future prospects

The future prospects of this habitat are rated as *favourable*. The assessment assumes that there will be no significant change in the management regime at this site. This would appear to be unlikely, given the size and condition of the overall saltmarsh. The only impacts are grazing, which is not a major problem, and the natural spread of brackish species as part of the natural development of this site. This habitat is not vulnerable to colonisation by Common Cordgrass. There is a long-term erosional trend at this site, although there are good prospects of landward retreat of saltmarsh at this site.

MANAGEMENT RECOMMENDATIONS

There are no specific management recommendations for this site.

REFERENCES

Curtis, T.G.F.C. and Sheehy-Skeffington, M.J. (1998). The saltmarshes of Ireland: An inventory and account of their geographical variation. *Biology and Environment: Proceedings of the Royal Irish Academy* **98B**, 87-104.

Healy, B., Hatch, P., Oliver, G., & Good, J. (1997). Coastal lagoons in the Republic of Ireland. Vol III. No.8. Cloonconeen Pool. Unpublished report for NPWS. www.npws.ie

MPSU (?).*Draft Conservation Plan for Lower River Shannon cSAC*. Government of Ireland, Unpublished.

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

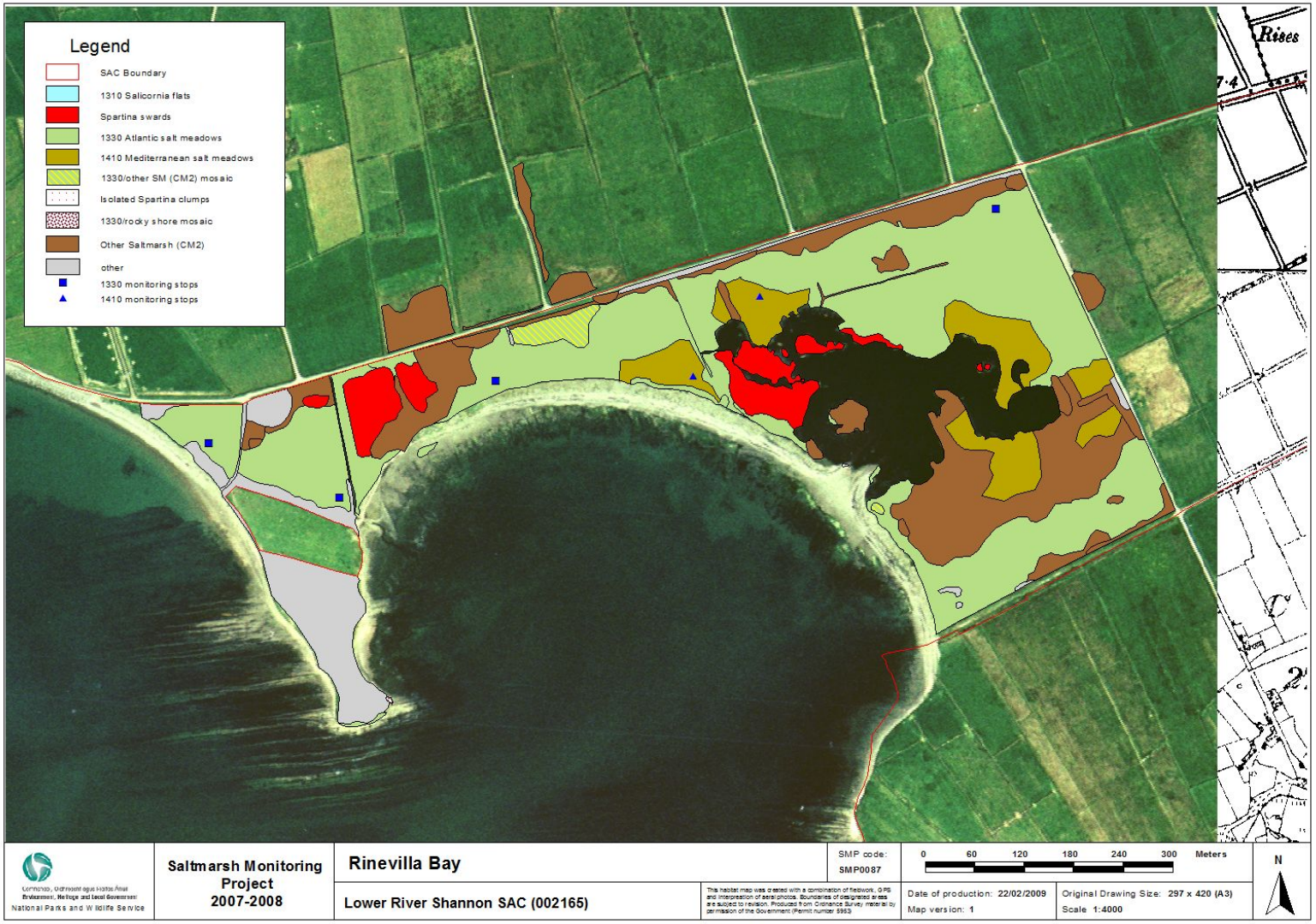
NPWS (2007). Conservation Assessment of Coastal lagoons in Ireland. NPWS. www.npws.ie.

Oliver, G. A. (2005). Seasonal changes and biological classification of Irish coastal lagoons. Ph. D Thesis. University College Dublin. www.irishlagoons.ie

APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			H1310	H1330	H1410	H1420	*Spartina* swards
1	1310 *Salicornia* flats	0.001	0.001				
2	*Spartina* swards	1.525					1.525
3	1330 Atlantic salt meadow	11.570		11.570			
4	1410 Mediterranean salt meadow	2.451			2.451		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic	0.323		0.1615			
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	2.332					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)	0.002					0.002
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic						
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)	5.886					
19	1330/rocky shore mosaic	0.004		0.002			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**24.09**	**0.001**	**11.73**	**2.451**		**1.527**


Legend
SAC Boundary
1310 Salicornia flats
Spartina swards
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/other SM (CM2) mosaic
Isolated Spartina clumps
1330/rocky shore mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Rises
Saltmarsh Monitoring Project 2007-2008
Rinevilla Bay
Lower River Shannon SAC (002165)
SMP code: SMP0087
0 60 120 180 240 300 Meters
N
Date of production: 22/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:4000
National Parks and Wildlife Service

Appendix XIII – Distribution map of vegetated sea cliff habitats within Lower River Shannon SAC