Saltmarsh Monitoring Project 2006

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SUMMARY

This survey is designed to meet the monitoring objectives of the EU Habitats Directive with regard to saltmarsh habitats in Ireland. The aim of this project is to monitor the conservation status of several saltmarsh habitats including the following EU Annexed habitats (EC 2003):

- *Salicornia* and other annuals colonising mud and sand (1310),
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330),
- Mediterranean salt meadows (Juncetalia maritimae) (1410),
- Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420)

at several sites around the coast of Ireland. *Spartina* swards were also mapped. An original list of 20 sites was compiled using the saltmarsh inventory published by Curtis and Sheehy Skeffington (1998) and this extended to 31 sites during the survey. A monitoring methodology was developed based on JNCC guidelines for saltmarshes (JNCC 2004). This methodology was adapted for Irish saltmarsh habitats.

During site visits, habitats were mapped using a combination of GPS, aerial photos and Ordnance Survey maps. The site and the various saltmarsh habitats were described. The conservation status of saltmarsh habitats was assessed using a combination of monitoring stops and an examination of the impacts affecting each habitat and the site as a whole. Site reports were generated for each site. Each site report includes a description of the site and the EU saltmarsh habitats present at that site, a description and assessment of the impacts and activities affecting the site and the EU habitats, an assessment of conservation status of each EU habitat, details of impacts and activities and other information. A digitised map showing the extent of each habitat was also produced.

Most of the Annex I *Salicornia* flats (1310) and Atlantic salt meadows (ASM) (1330) habitats were assessed as either Unfavourable-Inadequate or Unfavourable-Bad while most of the Mediterranean salt meadow habitats (MSM) (1410) were assessed as Favourable. Assessment by area (ha) indicates that most of the ASM and MSM is in a favourable condition, because many of the unfavourably assessed sites only have portions of these sites that are in unfavourable conservation status. Over-grazing is probably the most frequent impact and was noted at a wide range of intensities. ASM is more vulnerable to overgrazing than MSM. Common Cordgrass is also present at several of the sites and probably is having the most significant impact on the *Salicornia* flats (1310) habitat. While there were frequent signs of older reclamation works with drains, sea walls and infilling, these activities were not noted frequently during the current assessment period. There were no significant indications of any erosional trends on saltmarshes due to sea level rise at the sites visited. Erosion and accretion was mainly a site specific phenomenon.

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1 INTRODUCTION

1.1 General description

Saltmarshes are wetland areas found along the coastline that are covered by the tide (Adam 1990, Boorman 2003, Curtis 2003). They are found in sheltered coastal areas such as in estuaries and in the lee of barrier islands and spits. Saltmarshes contain distinctive vegetation communities that have generally developed on soft mud or muddy sediments. The mud can generally only accumulate in relatively low energy environments where wave action is limited. Saltmarsh is generally restricted to the area between mid neap tide level and high water spring tide level. The lower marsh may be covered by the tide twice every day while the upper marsh may only by covered by the higher tides (spring tides) several times each month. The gradient of the saltmarsh allows the development of several ecological gradients in submergence and salinity, and this influences the development of distinctive zonation of plant communities. Landward, there may a transition to other habitats such as cliff, dune, shingle, machair, reedbed, fen, carr or saline wet grassland (grazing marsh) containing brackish ditches (Rodwell 2000).

There has been some noteworthy research and studies of the ecology and conservation of saltmarsh in Ireland. Many of the studies have been site specific, examples of which are O'Reilly and Pantin (1957) who focused on the vegetation and ecology of saltmarshes in Dublin estuaries and O'Connor (1992) who studied the vegetation and land use of saltmarsh at Tawin Island. Some of the studies have focused on one particular species such as Ferguson (1962) who examined the status of Perennial Glasswort (*Sarcocornia perennis*) and McCorry (2002) who examined the ecology and control of Common Cordgrass (*Spartina anglica*) at Bull Island. Some studies that focus on other issues still contain useful information and data related to saltmarshes such as ESB International (1996) who studied the impacts of the Bull Island causeway and Murray (2002) who examined the impacts of the Broadmeadow Water Estuary motorway bridge on saltmarsh habitats.

There has been little examination of the overall ecology and conservation of saltmarsh habitats. Wymer (1984) examined the vegetation of Irish saltmarshes while Nairn (1986) and McCorry *et al.* (2003) focused on different aspects of the impacts of Common Cordgrass. Sheehy-Skeffington and Wymer (1991), Curtis and Sheehy-Skeffington (1998) and Curtis (2003) discussed some of the general issues affecting the ecology and conservation of saltmarshes in Ireland. However, there has been no qualitative assessment of the conservation

status of Irish saltmarshes. This project will also provide accurate baseline information about the extent and condition of Annex I saltmarsh habitats for future monitoring projects.

The aim of this project is to monitor the conservation status of several saltmarsh habitats including the following EU Annexed habitats (Commission of the European Communities 2003) at several sites around the coast of Ireland:

- *Salicornia* and other annuals colonising mud and sand (1310),
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330),
- Mediterranean salt meadows (Juncetalia maritimae) (1410),
- Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420)

This survey is designed to meet the monitoring objectives of the EU Habitats Directive with regard to saltmarsh habitats in Ireland. The methodology employed has been adapted from a system of habitat monitoring developed by the Joint Nature Conservancy Council (JNCC), which is described in a series of Common Standards Monitoring (CSM) guidance documents (JNCC 2004). This system is based on vegetation surveys, and assessments of threats and management practices.

Nearly all Irish saltmarsh vegetation can be allocated to one of the above habitats with Atlantic salt meadows the most common. Irish saltmarshes also have considerable stands dominated by Common Cordgrass. Previously these stands were considered to correspond to the EU habitat, *Spartina* swards (Spartinion) (1320) and several Irish SACs were listed for this habitat. This is no longer the case as Common Cordgrass is not considered to be native in Ireland. However, the extent of Common Cordgrass was mapped during this survey.

Figure 1.1. Mallaranny saltmarsh.

2 METHODOLOGY

2.1 Assessment of conservation status

Achieving Favourable Conservation Status 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. 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. In order that the legal necessity for monitoring and reporting on the conservation status of habitats within EU Member States can be carried out, a system for assessing and reporting on the conservation status has been established by the Scientific Working Group of the Habitats Committee. The latest version of the scheme - DocHab 04-03/03-rev.3: Annex E – is being used during this project.

Referred to as the 'Traffic light' system, the following ratings of habitat condition apply in EU conservation status assessment:

Estimation of conservation status of for each habitat currently involves assessment of four parameters – Range, Area, specific structures and functions, and future prospects (DocHab 04-03/03-rev.3). As range cannot be applied to the assessment of each individual saltmarsh site, the system employed in the present survey involves consideration of the three remaining criteria as outlined in Table 2.1.

Table 2.1. Summary matrix of the parameters and conditions required to assess the conservation status of habitats.

	Favourable	Unfavourable - Inadequate	Unfavourable - Bad
Area	Stable	1% decline/year	> 1% decline/year
Structure & Functions	Stable	1 – 25% decline	> 25% decline
Future Prospects	Good	Poor	Bad
Overall	All green	Combination of green and amber	One or more red

Extent and structure and functions are considered to be in favourable condition if they have remained stable since the previous monitoring or most recent survey. If future prospects are thought to be good, then they may be assigned favourable status. A decline in extent of 1% or >1% leads to unfavourable – inadequate or unfavourable – bad judgements, respectively, for

Area. Structure and functions are thought to be unfavourable – inadequate if they have undergone a 1-25% decline, and unfavourable – bad if they have undergone a >25% decline.

A favourable (green) judgement for each of the main criteria leads to an overall favourable judgement. A combination of Favourable (green) and Unfavourable – inadequate (amber) leads to an overall unfavourable-poor assessment, while the inclusion of any unfavourable – bad (red) assessment results in an overall unfavourable – bad (red) judgement.

Monitoring of habitats involves establishing a series of targets that define the desired condition of habitat attributes, e.g. it is considered desirable that saltmarsh habitats are not overgrazed. Assessments of the selected attributes are made using various methods such as examination of aerial photographs, visual assessments at selected monitoring stops and throughout the sites and vegetation quadrats at selected monitoring stops.

2.1.1 ASSESSMENT OF SALTMARSH HABITATS

The following generalised attributes were assessed for Irish Annex I saltmarsh habitats. This list is based on attributes used during this survey (Saltmarsh Monitoring Project 2006). These attributes have been adapted from Joint Nature Conservancy Council's Common Standards Methodology guidelines on monitoring of saltmarshes (JNCC 2004) with inputs from NPWS Research Branch staff. Each attribute and associated targets are described in more detail in the following sections.

1. Habitat extent (Area)

2. Habitat structure and functions

- Physical structure: creeks and pans
- Vegetation structure: zonation
- Vegetation structure: sward cover
- Vegetation structure: sward height
- Vegetation composition: characteristic species
- Indicators of negative trend (Common Cordgrass)
- Other negative indicators
- Indicators of local distinctiveness, such as notable plant species or vegetation mosaics. These are site-specific features, which are not adequately covered by the other attributes.

3. Future prospects

These attributes were modified for each individual Annex I saltmarsh habitat (Appendix I). Other attribute targets for future monitoring may be set or targets may be revised following full deliberation of the results of this survey. These attributes have been selected to help monitor accurately the main impacts that affect Irish saltmarshes and were adapted from JNCC (2004). These main impacts include grazing, infilling and reclamation, erosion, the spread of invasive Common Cordgrass and amenity use. Most of the saltmarshes along the west coast of Ireland are grazed (Curtis & Sheehy-Skeffington 1998). The attributes for sward height, sward cover and vegetation composition monitored the impact of overgrazing, poaching and disturbance the saltmarsh surface by cattle and sheep. The attribute for habitat extent monitored the impact of infilling and reclamation. Many saltmarshes show visual signs of erosion with a small saltmarsh cliff along the seaward edge of many saltmarshes. However, this is a dynamic feature and very often there is no measurable loss of extent when maps and aerial photos are examined, or erosion is compensated by newly accreted areas. Recording the signs of erosion and the loss of saltmarsh extent monitored the potential impact of 'coastal squeeze' due to climate-change -induced sea level rise, taking into consideration natural changes due to the dynamic nature of these intertidal habitats. Recording the vegetation composition at each monitoring stop monitored the migration of various saltmarsh zones in response to 'coastal squeeze'.

Common Cordgrass is an invasive species that is found on saltmarshes around the coast of Ireland. It has the capacity to spread on bare mudflats adjacent to the saltmarsh and into the lower saltmarsh zones, creating the habitat, *Spartina* swards. Monitoring the abundance and distribution of Common Cordgrass allowed the assessment of its potential impact on Irish saltmarsh vegetation and also provided useful information about its impact on Irish mudflats, another Annex I habitat, although one that is not being assessed in this project.

The current monitoring period was set as the past 10-15 years, taking the NHA survey as the baseline where information was available. The NHA survey contains useful information on the extent and status of some of the saltmarsh sites but there is very little previous information available for others.

2.1.1.1 Habitat extent

The assessment of habitat extent is based on stability of the habitat over the monitoring period. If a habitat has been stable – with loss and expansion in balance – or increasing, then conservation status is assessed as *favourable*. A decline in area of up to 1% per year within a reporting period will result in a conservation status assessment of *unfavourable – inadequate*, while any greater rate of decline implies a conservation status assessment of *unfavourable – bad.* Assessment of habitat extent must take into account losses and gains due to erosion,

accretion, or transformation to other semi-natural habitats that are natural processes within saltmarsh habitats.

Current habitat area was measured at each site by using a combination of aerial photos and GPS ground-truthing along habitat boundaries. A visual assessment was made of erosion and/or accretion affecting the saltmarsh habitat during the field survey. A further assessment was then made by comparing the current habitat extent to previous sets of aerial photos, 6 inch OS maps and older NPWS habitat maps to see if habitat area has been reduced due to erosion (or increased due to accretion) and if trends indicated from the field survey corresponded with an examination of the map data. If erosion and accretion were in balance then the habitat extent was assessed as *favourable*. If there were signs that the saltmarsh was eroding, there was no sign of accretion within the coastal system, and the loss of extent was significant (percentage loss depends on the monitoring period), then habitat extent was assessed as *unfavourable* (< 1% loss of habitat per year). It such be noted that this assessment is dependant on accurate baseline data from older NPWS habitat maps, NHA survey and aerial photos. There may also be other natural factors such as natural transition to other habitats (e.g. saltmarsh being covered by sand-dunes).

Habitat area could also be reduced due to reclamation, dumping etc. This was more easily assessed from a comparison of the aerial photos to current extent. Habitat loss due to reclamation, infilling or other activities must occur within the current monitoring period for the assessment to be *unfavourable*. Older reclamation works may still be visible and may have affected habitat extent but these were not considered as they occurred outside the current monitoring period.

2.1.1.2 Habitat structure and functions

Several attributes that reflect various features of the habitat structure and functions were selected for each Annex I saltmarsh habitat. These attributes were assessed at each monitoring stop and were given a pass or fail rating depending if the attribute reached the required target (e.g. a stop would fail if there was more than 10% bare substrate cover for the attribute, vegetation structure – sward cover). Each attribute of habitat structure and functions, and the various targets for each attribute for each habitat are described in more detail in the following sections and in Appendix I. The failure of one attribute (target not reached) would fail the overall monitoring stop for each Annex I habitat. Habitat structure and functions were not assessed for *Spartina* swards.

As the categories of conservation status assessment are based on declines in condition of between 1-25% (*unfavourable – inadequate*), and greater than 25% (*unfavourable – bad*), the monitoring stops were usually (but not always) applied in multiples of 4, e.g. the number of stops used was either 4, 8, 12, 16 etc., according to habitat area and existence of different management regimes within a site (grazing in one section but not in another). This allowed for simple estimates of conservation status rating, and facilitates consistency of application at all the sites.

If 8 stops were carried out in a particular habitat, then all 8 would have to pass the necessary criteria for the habitat to attain an overall pass for habitat structure and functions. If either 1 or 2 stops fail, then the failure rates – at 12.5% and 25% respectively - indicate an *unfavourable – inadequate* conservation status. More than 2 fails indicated a failure rate of at least 37.5% and give an *unfavourable – bad* conservation status assessment to the habitat. Where the number of monitoring stops was not a multiple of 4, percentage stops passed/failed was calculated and an assessment made depending on the pass/failure rate.

In some instances – usually when habitat areas were very small (usually < 1 ha) – less than 4 stops are carried out. In these cases the percentage of passes and fails is still used to yield the appropriate conservation status assessment, e.g. where 1 of only 2 stops failed, the habitat was regarded as *unfavourable – bad*. The monitoring stop numbers and locations were selected to faithfully represent the habitat, so that in the above example, approximately 50% of the habitat area is thought to be in bad condition.

Vegetation composition was also examined at each monitoring stop. A 2 X 2 m quadrat was surveyed and the percentage cover (%) of each species present was recorded. The plant community present at the monitoring stop was classified according to a pre-defined list of saltmarsh plant communities adapted from Rodwell (2000) and Wymer (1984). Species nomenclature followed Stace (1997).

Physical structure – creeks and pans

This attribute assessed the condition of the creeks and pans in the saltmarsh habitats. Signs such as the dissection and enlargement of creeks and pans could indicate erosional treads. The main target was no further human alternation of creek function.

Vegetation structure: zonation

This attribute assessed the presence of plant zonation. The main target was to maintain a range of plant zonation typical of the site. The size of a site and habitat was taken into account, as a small patch of habitat may be significantly zoned. Reverse zonation with

pioneer plant communities in the upper marsh may be a sign of coastal squeeze and erosion of saltmarsh.

Vegetation structure: plant height

This attribute assessed the diversity of the sward structure. The main target was to maintain site specific structural variation in the sward. A guideline is to maintain a 25%:75% ratio of tall/short sward height through the whole saltmarsh. The usual status of some western saltmarshes is a very low closely-cropped sward height and this should be considered.

Vegetation structure characteristic species

This attribute assessed the species diversity of the Annex I habitats. The target for each habitat was to maintain the presence of typical species. Zonation should be taken into account with typical species varying for different zones. (See Appendix I for a list of typical species in each habitat and zone.)

Vegetation structure –negative indicators (*Spartina anglica*)

This attribute assessed the impact of Common Cordgrass, which is considered a negative indicator. The main target was no evidence of recent expansion of *Spartina* into pioneer salt marsh and mid marsh areas during the current monitoring period. For sites with no previously known *Spartina* cover the target was less than 5% cover.

Other negative indicators

This attribute assessed the impact of other negative indicators such as dumping, trampling or vehicle use, which may affect an individual part of the saltmarsh. The main target was that negative indicators should not affect more than 5% of the habitat extent during the assessment period.

Indicators of local distinctiveness

This attribute assessed the presence of known records of rare plants, certain habitats or other features during site visits. The main target was to maintain the presence and extent of the elements of local distinctiveness. This attribute was site specific.

2.1.1.3 Future prospects

The future prospects for Annex I salt marsh habitats at each site were based on an assessment of the threats posed or potential benefits likely to accrue from various impacts and activities. These can include management regimes, e.g. grazing; recreational activities, e.g. walking, horse-riding; agricultural practices, e.g. overgrazing; potential developments, e.g.

reclamation, infilling, etc (Table 2.2). Assessments were made during site visits and also from information gathered in relevant reports, and from bodies such as County Councils.

Table 2.2. Most common impacts and activities affecting saltmarsh habitats (sorted by codes). A full list of impacts and activities and codes in given in Appendix III.

Code		Category
		Agriculture, forestry
120		Fertilisation
140		Grazing
	141	Abandonment of pastoral systems
	142	Overgrazing by sheep
	143	Overgrazing by cattle
	146	Overgrazing by hares, rabbits, small mammals
	147	Overgrazing by geese
	149	Under-grazing
170	*171*	Stock feeding
		Mining & extraction of materials
300		Sand and Gravel extraction
310		Peat Extraction
	311	Hand-cutting of peat
		Urbanisation, industrialisation & similar activities
400		Urbanised areas, human habitation
410		Industrial or commercial areas
420		Discharges
	421	Disposal of household waste
	422	Disposal of industrial waste
		Transportation & communication
500		Communication networks
	501	Paths, tracks, cycling tracks
	502	Routes/autoroutes
510		Energy transport
	511	Electricity lines
		Leisure & tourism
600		Sports and leisure structures
	601	Golf course
	607	Sports pitch
	608	Camping & caravans
620		Outdoor sports and leisure activities
	622	Walking, horseriding & non-motorised vehicles
	623	Motorised vehicles
		Pollution & other human impacts/activities
700		Pollution
	701	Water pollution
720		Trampling, overuse
		Human induced changes in hydraulic conditions (wetland & marine environments)
800		Landfill, land reclamation & drying out in general
	801	Polderisation
	802	Reclamation of land from sea, estuary or marsh
	803	Infilling of ditches, dykes, ponds, pools, marshes or pits
810		Drainage
	811	Management of aquatic & bank veg^{n} for drainage purposes
820		Removal of sediments (muds)
870		Dykes, embankments, artificial beaches, General
		Natural processes (biotic & abiotic)
900		Erosion
910		Silting up
920		Drying out
	952	Eutrophication
	954	Invasion by a species
	963	Introduction of disease
990		Other natural processes

An assessment of each recorded or perceived impact or threat, with an evaluation of the intensity of that impact and the percentage area of each habitat affected, is included for each

site in the project database. The same information is presented in each individual site report. On considering the overall affect of all impacts and activities, the future prospects of each habitat are rated as *favourable*, *unfavourable – inadequate*, or *unfavourable – bad*, and are, in conjunction with habitat extent and vegetation structure and functions, used to assign an overall conservation status assessment for each habitat.

When the habitat is not thought to be under significant threat from the observed impacts, such that its long-term viability is assured and future prospects are excellent or good, then it is assessed as being in *favourable* condition. When the structure and functions of a habitat are assessed as *unfavourable-bad* and this is related to a particular impact, activity or management regime, then the future prospects are also assessed as *unfavourable-bad. This* assessment assumes the current management or level of impacts and activities will continue in the near future. These habitats have bad long-term prospects and no assurance as to their long-term viability. Any scenario in which the future prospects of habitats are thought to fall between the above extremes, leads to an *unfavourable – inadequate* assessment.

2.1.2 DEFINITION OF ANNEX I HABITATS IN AN IRISH CONTEXT

Annex I habitats are defined following the Interpretation Manual of EU Annex I Habitats (Commission of the European Communities 2003) (Table 2.3). Some interpretation of each Annex I habitat in an Irish context is also required. Most of the interpretation is based on vegetation communities and each Annex I habitat has lists of several NVC communities (Rodwell 2000) that correspond to equivalent Annex I habitats. Most Irish saltmarsh vegetation can be placed into one of these Annex I habitats and most NVC communities correspond to equivalent Irish saltmarsh communities. White and Doyle (1982) is also useful for defining plant associations found in Ireland that correspond both to the phytosociological order Glauco-Puccinellietalia maritimae. Saltmarsh vegetation is described and classified by Wymer (1984) and this source is also very useful for listing plant associations in various different alliances of the order Glauco-Puccinellietalia maritimae.

There is some overlap according to the Interpretation Manual of EU Annex I Habitats (EC 2003) between the Annex I habitats and this could cause some confusion about the interpretation of Irish saltmarsh vegetation. *Salicornia* flats (1310) is listed as containing "SM7 *Arthrocnemum perenne* stands", "SM8 Annual *Salicornia* saltmarsh", "SM9 *Suaeda maritima* saltmarsh" and "SM27 Ephemeral saltmarsh vegetation with *Sagina maritima*". However, Halophilous scrubs (1420) in Ireland is defined by the presence of Perennial Glasswort (*Arthrocnemum perenne*). The NVC community "SM18 *Juncus maritimus* community" is listed as being part of the Atlantic salt meadows (1330) but Mediterranean salt meadows are defined as tall/short saltmarshes dominated by Sea Rush (*Juncus maritimus*) or

Sharp Rush (*J. acutus*). These habitats may also occur in mosaics that may also be transitional habitats between various saltmarsh habitats such as *Spartina* swards and ASM.

Table 2.3. Interpretation of Saltmarsh Annex I habitats in Irish context.

Code	Habitat	Definition
1310	*Salicornia* and other annuals colonising mud and sand	Defined by the presence of Glasswort swards (*Thero-Salicornietalia*) or swards of Annual Sea-blite (*Suaeda maritima*). These swards or smaller patches form pioneer saltmarsh communities on the lower seaward edge of the saltmarsh on mud or sand. Small swards of Glasswort (*Salicornia* spp.) or Annual Sea-blite may also colonize salt pans within the *Spartina* swards, ASM or MSM. These were mapped and assessed where they are significant. They were not mapped in situations where their extent was too small. Small patches of Glasswort or Annual Sea-blite that colonise stony or shingle dominated substrate were not classified as this Annex I habitat but notes were taken of their presence and condition. Plant communities with Glasswort and Common Saltmarsh-grass that are commonly found along the seaward edge of saltmarshes and surrounding saltmarsh creeks and salt pans were not classified as this Annex I habitat but were classified as part of the ASM vegetation. Common Cordgrass may be present but must be less than 40% cover.
1320	*Spartina* swards (Spartinion)	*Spartina* swards in Ireland are dominated by Common Cordgrass (*Spartina anglica*). However, NPWS considers that these stands are not considered worthy of designation as this species is not considered native in Ireland. The extent of *Spartina* swards was mapped but no assessment was made of habitat structure and functions or future prospects.
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Defined by the presence of typical Irish saltmarsh vegetation. Includes the NVC communities "SM10 Transitional low-marsh vegetation", "SM12 Rayed *Aster tripolium* saltmarsh", "SM13 *Puccinellia maritima-Triglochin maritima* saltmarsh", "SM14 *Halimione portulacoides* saltmarsh", "SM15 *Juncus maritimus-Triglochim maritima* saltmarsh", "SM16 *Festuca rubra* saltmarsh community", "SM17 *Artemisia maritima* community", "SM19 *Blysmus rufus* saltmarsh community" and "SM20 *Eleocharis uniglumis* community". This Annex I habitat also includes any other unique Irish communities as defined by Wymer (1984). Common Cordgrass may be present but must be less than 40% cover.
1410	Mediterranean salt meadows (Juncetalia maritimae)	Defined by the presence of stands dominated by Sea Rush and Sharp Rush. Cover of Rush spp. must be greater than 20%. Borrer's Saltmarsh-grass (*Puccinellia fasculata)* salt meadows also classified as MSM.
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Defined by the presence of Perennial Glasswort (*Sarcocornia perennis*) (previously known as *Arthrocnemum perenne*).

2.2 Selected Sites

Sites were selected from an inventory of Irish saltmarshes published by Curtis and Sheehy Skeffington (1998) after discussions with NPWS Research Branch Staff (Table 2.4). An original list of 20 sites was selected. This list encompasses the variation in Irish saltmarshes with several different saltmarsh types (fringe, estuary, bay, sand flats) and substrates (mud, sand, gravel peat) included. Geographical variation is also covered with sites included from the northern, western, southern and eastern coasts of Ireland. Most of the sites are also part of designated areas (SACs) although not all the saltmarsh area may be designated. Some larger designated areas (e.g. Clew Bay) contain a lot of individual saltmarshes, so a selection of

these sub-sites was surveyed so that the conservation status of the saltmarsh habitat within the designated area could be assessed.

Table 2.4. Site list for the Saltmarsh Monitoring Project 2006. Site names generally follow those in Curtis and Sheehy Skeffington (1998). * Not listed by Curtis and Sheehy Skeffington (1998). Numbers relate to Figure 2.1.

Number	Site code	Site name	County	SAC site name	SAC code
1	SMP0001	Rogerstown Estuary	Dublin	Rogerstown Estuary	208
2	SMP0002	Malahide Estuary	Dublin	Malahide Estuary	205
3	SMP0003	Baldoyle Estuary	Dublin	Baldoyle Estuary	199
4	SMP0004	Bull Island	Dublin	North Dublin Bay	206
5	SMP0005	Ballyteige	Wexford	Ballyteige Burrow	696
6	SMP0006	Duncormick	Wexford	Ballyteige Burrow	696
7	SMP0007	Tramore	Waterford	Tramore dunes and backstrand	671
8	SMP0008	Lahinch	Clare	Inagh River Estuary	36
9	SMP0009	Tawin Island	Galway	Galway Bay complex	268
10	SMP0010	Dooaghtry	Mayo	Mweelrea/Sheefry/Erriff complex	1932
11	SMP0011	Mallaranny	Mayo	Clew Bay complex	1482
12	SMP0012	Tooreen	Mayo	Clew Bay complex	1482
13	SMP0013	Rosmurrevagh	Mayo	Clew Bay complex	1482
14	SMP0014	Tierna	Mayo	Clew Bay complex	1482
15	SMP0015	Rockfleet Castle	Mayo	Clew Bay complex	1482
16	SMP0016	Rosharnagh East	Mayo	Clew Bay complex	1482
17	SMP0017	Caraholly South	Mayo	Clew Bay complex	1482
18	SMP0018	Killadangan	Mayo	Clew Bay complex	1482
19	SMP0019	Annagh Island *	Mayo	Clew Bay complex	1482
20	SMP0020	Bartraw	Mayo	Clew Bay complex	1482
21	SMP0021	Bellacragher Bay	Mayo	Bellacragher Saltmarsh	2005
22	SMP0022	Lackan	Mayo	Lackan saltmarsh and Kilcummin Head	516
23	SMP0023	Bartragh Island	Mayo	Killala Bay/Moy Estuary	458
24	SMP0024	Ross	Mayo	Killala Bay/Moy Estuary	458
25	SMP0025	Rusheens	Mayo	Killala Bay/Moy Estuary	458
26	SMP0026	Castleconor	Sligo	Killala Bay/Moy Estuary	458
27	SMP0027	Ray	Donegal	Lough Swilly	2287
28	SMP0028	Rathmelton	Donegal	Lough Swilly	2287
29	SMP0029	Green Hill *	Donegal	Lough Swilly	2288
30	SMP0030	Lower Lough Swilly Complex	Donegal	Lough Swilly	2287
31	SMP0031	Fahan	Donegal	Lough Swilly	2287

The original list was then expanded to 31 sites during the fieldwork stage of the project, as some extra sites adjacent to selected sites were also surveyed. The location of sites surveyed is shown in Figure 2.1. Several sites surveyed were not listed by Curtis and Sheehy-Skeffington (1998) (e.g. Rosmurrevagh, Annagh Island & Green Hill). These two sites were identified from an examination of 6 inch maps and aerial photos of Clew Bay and Lough Swilly. It was felt that not surveying these sites would leave the surveys of Clew Bay and Lough Swilly (and therefore the assessment of conservation status of saltmarsh in these

SACs) incomplete. These sites also give an indication that the list provided by Curtis and Sheehy-Skeffington (1998) may be somewhat incomplete.

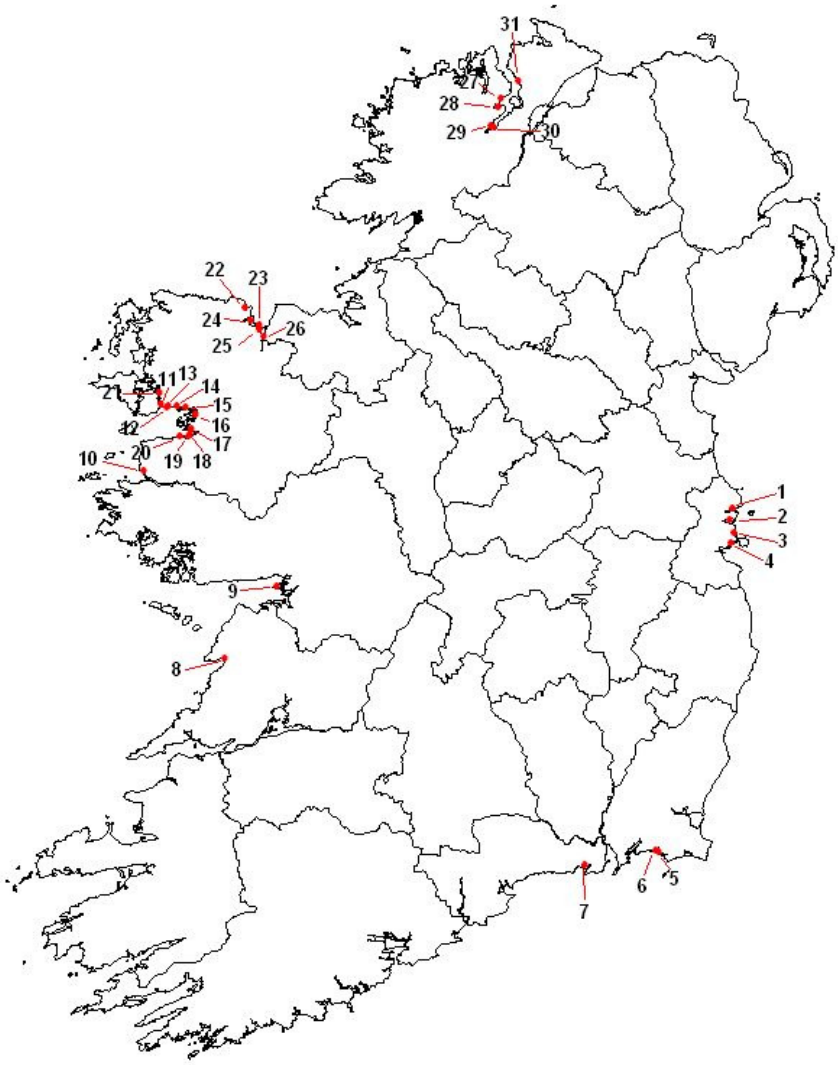

Figure 2.1. Map showing location of sites around the coast of Ireland. Numbers relate to Table 2.4.

2.3 Field Survey

Prior to the field survey, site packs were prepared, which contained an aerial photo, Ordnance Survey maps and any relevant information about the saltmarsh habitats available from NPWS site files. The aerial photo and maps were studied to plan the fieldwork, identify access points and the route through the habitats. Generally this was not important for the small sites (< 10 ha). However, there were several sites (e.g. Rogerstown) that had several sub-sites and this necessitated the use of a car to travel from site to site. Tide tables were studied to identify periods of low tide during the day that would allow the lower saltmarsh habitats to be

surveyed. This was important for surveying the *Salicornia* flats habitat found in the lower part of the saltmarsh. The number of potential monitoring stops was pre-planned although this could change depending on site management and the relative area of the various different EU annexed habitats.

Fieldwork was generally conducted in pairs. Generally a site or sub-site was covered from one side to the opposite side zigzagging from the seaward boundary to the landward boundary. GPS points were recorded at various points along the journey classifying habitats and recording boundaries between habitats and this information was recorded using an integrated GPS-handheld computer. Descriptions were made of general plant communities found on the site, zonation in the saltmarsh, physical structure of the saltmarsh including the creeks and pans, micro-topography and descriptions of the transitions to other habitats and the boundaries of the habitats using a field-card (Appendix II). Plant species names follow Stace (1997). Other information about management and impacts and activities was recorded during the survey. Any large areas of negative indicator species (e.g. areas of Common Cordgrass) and areas with intensive management or impacts were also mapped using GPS. A general site species list was made for each site visited. Digital photographs were taken to aid description of habitats and record impacts of activities. The grid reference of each photograph was fixed with GPS, and the aspect of each taken with a compass.

Once the approximate relative area of the different EU Annexed habitats was known from scanning a site the number of monitoring stops was decided. (Sometimes several EU annexed habitats were expected at a site and only one would be present and vice-versa, meaning the planned number of monitoring stops would have to be changed.) Monitoring stops were generally done in series of four, so larger sites would have eight or twelve stops etc. The location of monitoring stops was generally stratified so that the internal habitat variation would be included (i.e. stops would be located in the lower, mid and upper zones). Impacts and activities also affected the location and number of monitoring stops. Monitoring stops would be located in a sub-area of the site that had a different management regime (e.g. perhaps grazed more intensively). Stops were also positioned at locations were habitat change was possible (e.g. in Atlantic salt meadows close to the boundary with *Spartina* swards, where Common Cordgrass was possibly invading the ASM). Information from the monitoring stops was recorded using the integrated GPS-handheld computer.

2.4 Data collection

A GeoExplorer handheld GPS minicomputer (Trimble GeoXT) was used for recording the locations of the various points. This computer can also collect other data for each point using a data dictionary in the form of drop down menus and text fields. Therefore, Habitat points, Monitoring stops, Quadrats, Negative impacts, Features, Photographs and Points of interest can be collected. The positions of features were logged on the GPS receiver, which computes the GPS position and stores the information in a file using proprietary Terrasync software (Trimble). This data can then be downloaded onto a laptop or desktop computer and imported into GIS software to allow digital mapping.

2.5 Preparation of digital vegetation maps

The vegetation maps were created using GIS - Geographic Information System (ESRI Arcview 3.2). The maps were based in part on the information recorded on the handheld GPS device during the field survey and on field notes collected on aerial photos. The information was transferred from the GPS device to the computer. The data collected by the GPS receiver may be subject to errors caused by atmospheric noise etc. Corrections were applied to the data to account for such interferences. Differential correction improves the accuracy of the positions to the specified accuracy of the GPS receiver. The data was corrected using the Rinex data, downloaded from the Geodetic services on the Ordnance Survey website (www.osi.ie). The data was then displayed using the GPS Pathfinder Office software. Any editing etc. was undertaken at this stage. This was then exported to Arcview 3.2 and the vegetation maps were prepared for each site.

2.6 Outputs

Site reports were generated for each site. Each site report includes a description of the site and the EU saltmarsh habitats present at that site, a description and assessment of the impacts and activities affecting the site and the EU habitats, an assessment of conservation status of each EU habitat, details of impacts and activities and other information. A digitised map showing the extent of each habitat was also produced.

A GIS project for each site contains habitat maps showing the extent of the EU Annexed habitats and their relationship with adjacent habitats, data for each monitoring stop including what targets were met, the species abundance data collected in the quadrat, positions of photographs, positions of information points and positions of impacts and activities.

All of the data collected for each site, including the assessment of conservation status was imputed into an NPWS Access database.

3 RESULTS AND DISCUSSION

3.1 Area of saltmarsh habitats

This section summarises the area of each Annex I habitat at each site (Table 3.1). The total area of Annex I habitat mapped during the survey is 675 ha. The saltmarsh habitats are dominated by ASM (68%) with a smaller amount of MSM (24%). *Salicornia* flats only form a minor amount of the overall saltmarsh habitat (8%) and over half of this is located at Bull Island. The area of Halophilous scrub is only 0.11% of the total area surveyed. The area of *Spartina* swards at these sites was only 18% of the total Annex I saltmarsh habitat (*Spartina* swards not considered as an Annex I habitat in these statistics). Some of these habitats occurred as mosaics, particularly the ASM and MSM. However, the total Annex I habitat area was calculated at each site by estimating the proportion of each habitat within the mosaic.

It should be noted that saltmarsh habitat extended outside some survey sites. This generally occurred where a narrow band type saltmarsh was situated along the shoreline and continued along the coast outside the survey site. It also occurred when the site was actually a sub-site of a larger system, such as Tawin Island in Galway Bay. At these sites the surveys had to be constrained to fit in to the project timetable.

These totals include areas mapped as individual Annex I habitats and areas mapped as mosaics between the Annex I habitats. Mosaics between ASM and MSM were common and these generally occurred where there were frequent small clumps of Sea Rush scattered between ASM vegetation. Mosaics also occurred between Annex I habitats and *Spartina* swards. These occurred when frequent clumps of Common Cordgrass were scattered over an areas containing ASM or *Salicornia* flats or there was a transition habitat present with co-dominance of Common Cordgrass and ASM vegetation. General percentages for each individual habitat within the mosaic were usually assigned during fieldwork to calculate total areas of habitats.

Table 3.1. Summary statistics showing area in hectares of each Annex I habitat and area of *Spartina* swards at each site. *Note that saltmarsh habitat extends outside these survey sites.

		Area (ha)					
		Annex I habitats					
Number	**Site name**	**1310**	**1330**	**1410**	**1420**	**Total area**	***Spartina* swards**
SMP0001	Rogerstown Estuary	2.6	33.02	1.87		37.49	15.79
SMP0002	Malahide Estuary	1.61	26.47	0.71		28.79	11.06
SMP0003	Baldoyle Estuary	0.39	12.68	2.64		15.71	38.42
SMP0004	Bull Island	28.69	82.34	8.21		119.24	0.83
SMP0005	Ballyteigue	2.86	21.15	3.04	0.73	34.14	6.37
SMP0006	Duncormick *		5.31	0.13		5.44	
SMP0007	Tramore	0.99	29.55	1.76		32.3	28.71
SMP0008	Lahinch *	0.21	49.97	56.71		106.89	
SMP0009	Tawin Island *	1.08	38.33	1.53		40.94	
SMP0010	Dooaghtry		17.77	1.17		18.94	
SMP0011	Mallaranny	0.002	19.93	2.1		22.03	
SMP0012	Tooreen *		1.88	0.34		2.22	
SMP0013	Rosmurrevagh		6.4			6.4	
SMP0014	Tierna *		0.4	0.57		0.97	
SMP0015	Rockfleet Castle *		0.71	0.09		0.8	
SMP0016	Rosharnagh East *		0.2	0.3		0.5	
SMP0017	Caraholly South		1.68			1.68	
SMP0018	Killadangan		0.86	4.57		5.44	
SMP0019	Annagh Island	0.01	4.45	4.46		8.92	0.33
SMP0020	Bartraw		0.41			0.41	
SMP0021	Bellacragher Bay *		1.82	2.61		4.43	
SMP0022	Lackan	0.001	28.27	66		94.27	
SMP0023	Bartragh Island	0.26	29.11	0.01		29.38	
SMP0024	Ross	0.25	15.82	6.26		22.33	
SMP0025	Rusheens *		1.24	2.46		3.7	
SMP0026	Castleconor *		1.67			1.67	
SMP0027	Ray		0.06			0.06	
SMP0028	Rathmelton *	1.24	10.03	0.53		11.8	4.79
SMP0029	Green Hills *		1.92			1.92	15.1
SMP0030	Lower Lough Swilly Complex *	0.01	8.46			8.47	2.73
SMP0031	Fahan		7.51			7.51	
	Total	**40.23**	**459.42**	**168.07**	**0.73**	**674.79**	**124.13**

3.2 Conservation status assessment

This section summarises results of the assessment of conservation status for habitats at all the sites surveyed (Table 3.2). Mediterranean salt meadows (MSM) was the habitat that was most frequently in favourable conservation status. Less than 50% of the Atlantic salt meadows (ASM) and *Salicornia* flats were in favourable conservation status. The conservation status of each site is outlined in Table 3.3 and a further breakdown for assessment of extent, structure and functions and future prospects is outlined in Table 3.4.

Table 3.2. Summary compilation of conservation status (traffic light system) of saltmarsh habitats recorded from 31 sites.

	Habitat occurrence (No. of sites)	**Favourable**	**Unfavourable inadequate**	**Unfavourable bad**
1310 *Salicornia* flats	15	43%	36%	21%
1330 Atlantic salt meadows	31	32%	16%	51%
1410 Mediterranean salt meadows	23	67%	14%	29%
1420 Halophilous scrub	1			100%
***Spartina* swards (1320)**	1	100%		

Table 3.3. Summary table indicating conservation status assessment for each site. Colour scheme as follows Green - *Favourable* conservation; Amber - *Unfavourable-inadequate*; Red - *Unfavourable-bad*. Uncoloured – Habitat absent from site or not enough to warrant an assessment. 1310 – *Salicornia* flats; 1330 – Atlantic salt meadows; 1410 – Mediterranean salt meadows; 1420 – Halophilous scrub; 1320 – *Spartina* swards.

Number	Site Name	1310	1330	1410	1320	1420
SMP0001	Rogerstown Estuary					
SMP0002	Malahide Estuary					
SMP0003	Baldoyle Estuary					
SMP0004	Bull Island					
SMP0005	Ballyteige					
SMP0006	Duncormick					
SMP0007	Tramore					
SMP0008	Lahinch					
SMP0009	Tawin Island					
SMP0010	Dooaghtry					
SMP0011	Mallaranny					
SMP0012	Tooreen					
SMP0013	Rosmurrevagh					
SMP0014	Tierna					
SMP0015	Rockfleet Castle					
SMP0016	Rosharnagh East					
SMP0017	Caraholly South					
SMP0018	Killadangan					
SMP0019	Annagh Island					
SMP0020	Bartraw					
SMP0021	Bellacragher Bay					
SMP0022	Lackan					
SMP0023	Bartragh Island					
SMP0024	Ross					
SMP0025	Rusheens					
SMP0026	Castleconor					
SMP0027	Ray					
SMP0028	Rathmelton					
SMP0029	Green Hills					
SMP0030	Lower Lough Swilly Complex					
SMP0031	Fahan					

Table 3.4. Conservation status of each category at each site. Colour scheme as follows Green - *Favourable* conservation; Amber - *Unfavourable-inadequate*; Red - *Unfavourable-bad*. Uncoloured – Habitat absent from site or not enough to warrant an assessment. 1310 – *Salicornia* flats; 1330 – Atlantic salt meadows; 1410 – Mediterranean salt meadows; 1420 – Halophilous scrub; 1320 – *Spartina* swards.

		Conservation status assessment															
		1310			1330			1410			1320			1420			
Number	Site Name	Extent	Structure and functions	Future prospects	Extent	Structure and functions	Future prospects	Extent	Structure and functions	Future prospects	Extent	Structure and functions	Future prospects	Extent	Structure and functions	Future prospects
SMP0001	Rogerstown Estuary															
SMP0002	Malahide Estuary															
SMP0003	Baldoyle Estuary															
SMP0004	Bull Island															
SMP0005	Ballyteigue															
SMP0006	Duncormick															
SMP0007	Tramore															
SMP0008	Lahinch															
SMP0009	Tawin Island															
SMP0010	Dooaghtry															
SMP0011	Mallaranny															
SMP0012	Tooreen															
SMP0013	Rosmurrevagh															
SMP0014	Tierna															
SMP0015	Rockfleet Castle															
SMP0016	Rosharnagh East															
SMP0017	Caraholly South															
SMP0018	Killadangan															
SMP0019	Annagh Island															
SMP0020	Bartraw															
SMP0021	Bellacragher Bay															
SMP0022	Lackan															
SMP0023	Bartragh Island															
SMP0024	Ross															
SMP0025	Rusheens															
SMP0026	Castleconor															
SMP0027	Ray															
SMP0028	Rathmelton															
SMP0029	Green Hills															
SMP0030	Lower Lough Swilly Complex															
SMP0031	Fahan															

3.3 Site summaries

In this section a short summary describes the important features and status of each site. For further details please consult the individual site reports.

3.3.1 ROGERSTOWN ESTUARY

This saltmarsh site contains several sub-sites. ASM saltmarsh at Rush is part of a larger coastal system containing sand dunes and part of this area is evolving at present with sand being blown on the saltmarsh. Extensive *Spartina* swards have developed on mudflats in the south-east corner of the outer estuary. Common Cordgrass is also frequent on ASM saltmarsh on both sides of the inner estuary. *Spartina* swards are also extensive on mudflats adjacent to Balally Landfill. This site is notable for having several areas that were formerly reclaimed and improved but are now changing back to saltmarsh. These areas have eroding embankments around their edges. One section is grazed and this is unusual on eastern coast saltmarshes.

3.3.2 MALAHIDE ESTUARY

This saltmarsh site contains several sub-sites. Saltmarsh located at Portrane Spit is notable as it is one of the few sites that is actively accreting along parts of the seaward edge. This area also has notable natural transitions to sand dune habitats. Saltmarsh located at the head of the estuary has been damaged by the construction of the Broadmeadow Estuary motorway bridge. Permanent quadrats located at this site indicate that saltmarsh vegetation around this area has changed significantly. There are some substantial patches of *Spartina* swards in the north-east corner of the estuary.

3.3.3 BALDOYLE ESTUARY

Saltmarsh is present at several locations around the shoreline of Baldoyle Estuary and there are several sub-sites. The estuary is notable for having the largest area of *Spartina* swards encountered during this survey. This habitat has mainly colonised on the intertidal mudflats towards the head of the estuary. The largest saltmarsh is located in the north-west section of the estuary and this area is notable for the amount of Common Cordgrass, which is present on the lower saltmarsh zone. Saltmarsh has also developed recently (past 100 years) at the southern end of Portmarnock Spit. The site also includes a small area of more brackish marsh classified as MSM that contains Borrer's Saltmarsh-grass. The saltmarsh has a favourable conservation status and is also notable for the lack of grazing including grazing from wild birds and animals, which is probably related to the closeness of the saltmarsh site to roads and urban areas.

3.3.4 BULL ISLAND

This was the largest site surveyed and is probably the best example of saltmarsh in Ireland. Saltmarsh has developed at the back of a barrier island. All of the main Annex I habitats are present and it contains 71% of the total area of *Salicornia* flats surveyed this year. Zonation of saltmarsh plant communities is particularly well developed, as is the saltmarsh creek network. The saltmarsh habitats are part of a larger coastal ecosystem but much of the landward transition to sand dunes has been destroyed by the creation of golf courses. Some transition to sand dunes is still present, particularly at the northern end of the site. Common Cordgrass is present at this site, although it is mainly scattered on the *Salicornia* flats and the ASM at low cover densities, so the cover of *Spartina* swards is low. Common Cordgrass has not increased in extent significantly in the past 10 years. Common Cordgrass has the potential to increase in extent in the future at the expense of *Salicornia* flats.

3.3.5 BALLYTEIGE

This saltmarsh has developed at the back of a barrier spit. The site is notable for the presence of Perennial Glasswort, the species that characterises the Annex I habitat, Mediterranean and thermo-Atlantic halophilous scrubs (*Sarcocornetea fruticosi*). The saltmarsh habitats have an unfavourable conservation status due to several impacts and activities. These include cattle poaching, impacts on drainage and the presence of Common Cordgrass. This species has the potential to increase in extent at the expense of *Salicornia* flats and the rarer MSM community characterised by the presence of Borrer's Saltmarsh-grass. This site has been listed for the presence of *Spartina* swards.

3.3.6 DUNCORMICK

This small site is situated north of Ballyteige on the north side of the Cull. The main habitat present is ASM and this has developed in a sheltered area behind a spit. The site has been disturbed in the past from attempts at reclamation and drainage, but is recovering from this damage. There is a notable transition area present on this site with a mosaic of rank grassland and ASM. There are indications that the site was damaged by heavy grazing intensity in the recent past but the grazing intensity is now low or absent and the vegetation has recovered.

3.3.7 TRAMORE

This site includes several sub-sites around the Backstrand, the sheltered area behind Tramore Burrow. Saltmarsh at this site is dominated by ASM and zonation of saltmarsh plant communities is particularly well-developed along the back of a barrier spit. The site is notable for the presence of Rock Samphire (*Inula crithmoides*), a species generally found in rocky coastal habitats and not usually found on saltmarsh. *Spartina* swards have developed

on adjacent mudflats and dominate the pioneer saltmarsh zone. One of the sub-sites shows signs of erosion along the seaward edge and a second sub-site has a substantial amount of Common Cordgrass within former ASM that has now developed a *Spartina*/1330 mosaic. The saltmarsh has a favourable conservation status but *Spartina* swards have the potential to replace *Salicornia* flats.

3.3.8 LAHINCH

This was the second largest site surveyed. A large area of MSM and ASM has developed in a flat plain as part of the Inagh River Estuary and sheltered from Liscannor Bay by a sand spit. The saltmarsh habitats have an unfavourable conservation status in places due to high levels of cattle grazing and associated damage from poaching. However a substantial area is still in good condition. A notable feature of this site is that the saltmarsh forms a substantial mosaic area with terrestrial and other wetland habitats. The MSM at this site has several indicators of more brackish conditions compared to MSM at other sites.

3.3.9 TAWIN ISLAND

This site was the only one surveyed in Galway Bay. It is dominated by ASM and has a unique hummock-hollow topography due to the development of saltmarsh over glacial deposits and rocky outcrops. The saltmarsh has developed within an area that is classed as a lagoon and is sheltered by tall storm beach barriers. The site is notable for the abundance of Sea Wormwood (*Seriphidium maritimum*) in the upper saltmarsh zone. Most of the site has a favourable conservation status but there are portions of the site that are damaged by grazing.

3.3.10 DOOAGHTRY

This western site is part of a larger coastal system that includes machair and sand dune habitats. There are two sub-sites present with different conservation status assessments. The southern section has a favourable status and has a notable short sward height and dwarfed saltmarsh plants due to moderate-high levels of grazing. Part of this area has been destroyed by the development of a car park. The northern part of this site is badly damaged by heavy levels of grazing. This site is actually more vulnerable to damage from overgrazing as the upper section is quite dynamic and is evolving in response to accretion of Corragaun Lough.

3.3.11 MALLARANNY

This site located in Clew Bay and has developed in a sheltered area behind a storm beach barrier. The site is notable for having a particularly low sward height in the ASM with dwarfed saltmarsh plants due to moderate-high levels of grazing. This saltmarsh also has a

very well developed creek structure. The grazing levels are having a negative impact on the ASM at this site. Some machair is associated with this site on the eastern side of the bay.

3.3.12 TOOREEN

This is a small site located in Clew Bay and is situated adjacent to Mallaranny. It does not have any notable features and is somewhat damaged by grazing and poaching.

3.3.13 ROSMURREVAGH

This site is located in Clew Bay and is situated adjacent to Mallaranny. The ASM at this site is part of a larger coastal site that includes machair habitats. The site has an unfavourable conservation status due to high levels of grazing and the lower zone is badly poached.

3.3.14 TIERNA

This is a small fringe type saltmarsh located along the north side of Clew Bay. It does not have any notable features.

3.3.15 ROCKFLEET CASTLE

This is a small fringe type saltmarsh located along the north side of Clew Bay. It does not have any notable features and parts are being damaged by grazing and poaching. Some sections are vulnerable to damage as a thin layer of saltmarsh overlays bedrock.

3.3.16 ROSHARNAGH EAST

This small saltmarsh is located at the head of Clew Bay in one of the narrow sheltered bays between drumlin hills. It has been partially infilled in recent times and is also being damaged by poaching. Most of the saltmarsh is excluded from the Clew Bay Complex SAC as the boundary used was the lower shoreline boundary along the seaward side of much of the saltmarsh.

3.3.17 CARAHOLLY SOUTH

This small saltmarsh is located in the south-east section of Clew Bay. A minor area of saltmarsh has been infilled in recent times and is also being damaged by poaching. Most of the saltmarsh is excluded from the Clew Bay Complex SAC as the boundary used was the lower shoreline boundary along the seaward side of much of the saltmarsh.

3.3.18 KILADANGAN

This site is located along the southern edge of Clew Bay. The saltmarsh has developed t the back of a shingle/pebble barrier. It is one of the few site dominated by MSM and most of the

site is in good condition. ASM is damaged by poaching but this habitat covers a minor area compared to the MSM.

3.3.19 ANNAGH ISLAND

This site is located close to Kiladangan and is part of the same shingle/pebble barrier system. It was not listed by Curtis and Sheehy-Skeffington (1998). It is separated from Kiladangan by a narrow channel that can only be crossed at low neap tides. This island has a heterogeneous topography with low mounds and hollows that have created notable transitions between coastal grassland and saltmarsh. However, the saltmarsh is in poor condition due to heavy sheep grazing levels. A small patch of *Spartina* swards are present at this site and was the only area of this habitat surveyed in Clew Bay, (although there is some Common Cordgrass situated around Westport Quay).

3.3.20 BARTRAW

This is a small site situated in a sheltered area behind Bartaw spit, a coastal barrier containing sand dune habitats and a storm beach barrier. This site is notable as being the only area of saltmarsh surveyed in Clew Bay that was not grazed.

3.3.21 BELLCRAGHER BAY

This site is notable as it was the only site that was designated as an SAC in Ireland with Annex I saltmarsh habitats only. This site is a notable example of fringe type saltmarsh that has developed on blanket peat. It is also notable as being the first site where Turf fucoids were identified and these are still present. However the saltmarsh has an unfavourable conservation status due to heavy sheep grazing levels.

3.3.22 LACKAN

This western site is one of the larger saltmarshes surveyed. It is notable for having a large area of MSM that has developed in an estuary. There are characteristic brackish habitats present at the head of the estuary. Most of the site is in good condition but there are several enclosures that are damaged by grazing and poaching. The seaward edge of the saltmarsh is being eroded by the river channel. This is one of the only examples of measurable saltmarsh erosion. *Salicornia* flats are listed as a qualifying interest at this site but it was only recorded from several very small patches during the current survey.

3.3.23 BARTRAGH ISLAND

This ASM saltmarsh has developed along the back of a barrier island in Killala Bay. Saltmarsh plant community zonation is particularly well developed. This saltmarsh is in good

condition and its conservation value is enhanced by the presence of a natural transition along the landward side to an extensive sand dune system.

3.3.24 ROSS

This site covers several smaller sheltered bays and inlets on the eastern side of Killala Bay. This site overall has an unfavourable conservation status. This is because some sections are badly poached by cattle. However, the grazing intensity varies over the whole site and there are significant areas with a favourable conservation status. This is one of the few sites that is actively accreting along part of the seaward edge. This site is also notable for the presence of Saltmarsh Flat-rush (*Blysmus rufus*).

3.3.25 RUSHEENS

This small saltmarsh is located along the western side of Killala Bay in a small sheltered inlet. It is dominated by MSM and was somewhat damaged by cattle grazing and poaching. Fringe type saltmarsh extends along the shoreline outside the sheltered area.

3.3.26 CASTLECONOR

This small saltmarsh is located on the east side of Killala Bay. Fringe type saltmarsh extends along the shoreline in a narrow band and there are some larger patches of saltmarsh in small sheltered inlets along the Moy River channel. The ASM at this site has a favourable conservation status.

3.3.27 RAY

This site is located midway up the western side of Lough Swilly and was listed by Curtis and Sheehy-Skeffington (1998). However, there are only several remnants patches of saltmarsh left at this site so erosion is likely to have decreased extent.

3.3.28 RATHMELTON

This site is located along the western side of Lough Swilly in a sheltered inlet. It is one of the larger saltmarsh sites in Lough Swilly. It is notable for the presence of some relatively large patches of *Salicornia* flats (1 ha). The saltmarsh contains both MSM and ASM and there are several different management units along the shoreline adjacent to different farms. Some sections are in poor condition due to heavy levels of sheep and cattle grazing. *Spartina* swards and clumps are also present on adjacent mudflats.

3.3.29 GREEN HILLS

This small site is located on the western side of Lough Swilly Estuary, close to Letterkenny. It was not listed by Curtis and Sheehy-Skeffington (1998). Saltmarsh has developed in a

small enclosed area. There were attempts to reclaim this area of shoreline in the past but they failed and saltmarsh is recovering on the site. *Spartina* swards have spread adjacent to this area on mudflats and clumps have spread along most of the shoreline of this part of Lough Swiilly. The saltmarsh has an unfavourable conservation status due to heavy grazing levels in some parts of the site.

3.3.30 LOWER LOUGH SWILLY

This site is located on the eastern side of the Lough Swilly Estuary along the edge of a large reclaimed area called Big Isle. This area was embanked and reclaimed in the past and a fringe type saltmarsh has developed on the seaward side of the embankment. Some larger patches of saltmarsh developed in sheltered areas along the embankment and there are some remnant patches of saltmarsh present that were left or cut off after this area was embanked. The saltmarsh has an unfavourable conservation status as some sections are badly damaged from heavy grazing and poaching.

3.3.31 FAHAN

This site is located midway along the eastern side of Lough Swilly. It has developed relatively recently in the past 100 years in association with a sand dune system. ASM saltmarsh has developed behind the sand dunes in a sheltered area. This site is notable for the presence of a natural transition from sand dunes to saltmarsh and some mosaic areas with both habitats are present. Part of the site has been infilled in the past few years due to the development of a marina at Lisfannon and due to this loss of habitat the site currently has an unfavourable conservation status.

3.4 Impacts and activities

3.4.1 IMPACTS AND ACTIVITIES ON *SALICORNIA* FLATS

This habitat has the fewest impacts and activities of all the saltmarsh habitats (Table 3.5). This can be explained by its general location at the seaward side of the main saltmarsh, acting as a pioneer zone and the fact that the habitat is generally located on soft mud. This area is not easily accessible. This means the habitat is generally not affected by amenity or development activities. At several sites there are no recorded impacts although the area of the habitat may be quite small. The habitat is, however, vulnerable to disturbance, and this may include accretion, erosion and trampling. Disturbance of the ASM saltmarsh zones can provide a bare substrate niche that this habitat can develop in as it is a pioneer habitat.

The most significant impact affecting this habitat is the spread of Common Cordgrass (954) (Table 3.5). This is occurring at the eastern and south-eastern sites and in Lough Swilly. Clumps of Common Cordgrass are often frequently found within this habitat forming a mosaic with Glasswort and algae (a good example is Bull Island). *Salicornia* flats may also be found adjacent to *Spartina* swards with few or no clumps within them (Rathmelton is a good example). Common Cordgrass has the potential at some sites to keep spreading and form dense swards that will exclude or significantly lower the density of Glasswort and considerably change the habitat structure and function. There is no evidence that this has occurred significantly at any of the sites in the past 10-15 years.

Figure 3.1. Common Cordgrass within *Salicornia* flats (1310).

Accurate assessment of the impacts of the spread of Common Cordgrass is not possible due to the lack of information on the previous extent of both *Salicornia* flats and Common Cordgrass. The only site where detailed information is available is Bull Island. The main area of *Salicornia* flats developed soon after the construction of a causeway to the island in 1965. This area was also soon colonised by Common Cordgrass. The area of *Salicornia* flats was measured in 1989 as 25 ha (CAAS 1990) and in 2006 as 28 ha, so there has been no loss of extent although since it developed, although this area contains a significant number of Common Cordgrass clumps. As the density of Common Cordgrass increases more and more of this area will be classed as *Spartina* swards (cover > 40%). However there has been no significant increase in the extent of Common Cordgrass at Bull Island between 1997-2006.

There is substantial evidence to suggest that *Spartina* swards currently occupies mud that formerly was occupied by Glasswort such as at Rogerstown Estuary, Malahide Estuary and Baldoyle Estuary so the spread of Common Cordgrass has substantially reduced the extent of this habitat. This assessment is available because the saltmarsh habitats at these sites were mapped by O'Reilly and Pantin (1959). The spread of Common Cordgrass at these sites mainly occurred prior to the current period of assessment so these impacts are not assessed.

At some of the sites cattle and sheep may cross this habitat to access other saltmarsh. There are generally no signs of grazing. Footprints may be present and there may be some trampling, although the disturbance is minimal (140).

This habitat was disturbed by heavy cattle poaching and trampling (143) at Lahinch, although this is because several patches of this habitat had developed in large salt pans and in some large recently accreted hollows within the saltmarsh (Table 3.5). The *Salicornia* flats habitat was not located on mud or sand seaward of the saltmarsh. This is a pioneer habitat so it is more frequent in frequently disturbed areas such as some of these hollows. However, the actual disturbance by cattle may be a factor in preserving this habitat by creating these bare mud patches for Glasswort and other pioneers to colonise. Reducing the grazing intensity may mean some of these hollows that are not frequently flooded will develop lower ASM saltmarsh vegetation. This type of disturbance by cattle and sheep also occurs at several other grazed sites where Glasswort colonises salt pans within the ASM, although it is not assessed as it affects a very minor area. Small patches of Glasswort may be several m^2 in size.

This habitat is also affected by natural erosion and accretion cycles. Both these impacts can create bare substrate that Glasswort and other annual pioneers can colonise. *Salicornia* flats have developed on an accretional ramp along the edge of the ASM at Bull Island, Ballyteige

and at parts of Ross. *Salicornia* flats have also developed on eroding saltmarsh at the seaward edge of part of Bull Island and on one of the small saltmarshes at Tramore. This habitat has also developed along the upper ASM boundary at Ballyteige where a combination of accretion of sand and disturbance from vehicle use and cattle poaching has created bare sediment that is vegetated by Annual Sea-blite.

This habitat is likely to be ephemeral in places as it is so vulnerable to erosion and accretion cycles and storms. Some sand or sediment banks can move or disappear quickly and the habitat will move or disappear in response to this.

This habitat does not always develop where erosion and accretion are present. Rivers flowing through saltmarsh at Lackan, Lahinch and Mallaranny all have accretional ramps along the inside of meanders of these watercourses but this bare sediment is being colonised by pioneer vegetation dominated by Common Saltmarsh-grass with frequent Glasswort.

Table 3.5. Summary of impacts and activities on *Salicornia* flats (1310) at each site. Impacts and activities are as follows; 140 – grazing; 143 – overgrazing by cattle; 900 – erosion; 910 – accretion of sediment and 954 – invasion by a species (Common Cordgrass).

Site name	Habitat area (ha)	Impacts and activities														
		140			143			900			910			954		
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Rogerstown Estuary	2.60															
Malahide Estuary	1.61															
Baldoyle Estuary	0.39													C	-1	0.39
Bull Island	28.69							C	+1	0.10	C	+1	28.69	B	-1	28.69
Ballyteige	2.86	C	0	2.86				C	+1	0.5	C	+1	2.00	C	-1	2.86
Tramore	0.99							C	+1	0.01				C	-1	0.99
Lahinch	0.21				A	-1	0.21									
Tawin Island	1.08	C	0	1.08												
Mallaranny	0.002															
Annagh Island	0.01	C	0	0.01												
Lackan	0.001															
Bartragh Island	0.26	C	0	0.26												
Ross	0.25	C	0	0.25												
Rathmelton	1.24															
Lower Lough Swilly Complex	0.01															

3.4.2 IMPACTS AND ACTIVITIES ON ATLANTIC SALT MEADOWS

This habitat is the most frequently disturbed of all the saltmarsh habitats by impacts and activities and also had the widest range of impacts and activities (Table 3.6). There were few impacts or activities that have caused irreparable damage and loss of saltmarsh extent and most activities were assessed as either having a reparable negative impact or no significant impact. The most frequent impact was grazing and this also affected the largest area of saltmarsh. Erosion and accretion was also a common impact.

3.4.2.1 Destructive impacts and activities

It is estimated that only 2.5 ha of ASM habitat has been destroyed at the surveyed sites (0.5%) due to development etc. These impacts include a small car-park located at Dooaghtry that covered part of the ASM (490). Small areas of saltmarsh have also been infilled (800) with construction waste (used as a dump), spoil or soil. This has occurred Rathmelton and Ross. Some of these areas have been infilled and reclaimed (802) with some development of farmland on areas that previously had saltmarsh or land for other uses. This has occurred at Caraholly South, Rosharnagh East and Fahan. The largest area has been infilled at Fahan and this is related to the construction of a marina. The areas infilled at Caraholly South and Rosharnagh East were outside the SAC boundary. There has been some recent drainage at one site, Rathmelton, where a drain was cleaned and deepened (810).

3.4.2.2 Grazing

Grazing was probably the most common impact with 55% of the total ASM area grazed and there was a broad range of intensities. There were only two sites, Annagh Island and Bellacragher Bay, which were assessed as having the whole ASM area overgrazed. Over-grazing and damage was usually combined to sections or zones of saltmarsh, especially where there were several management units on the one site with different intensities of grazing. Twenty-three sites were grazed to some extent and 19 of these sites had sections that were overgrazed by cattle or sheep. Overgrazing by cattle affects about 10% of the total ASM area and by sheep affects a similar area (10%) and these areas overlap. Some of these damaged sites may be the dominant part of the site such as Dooaghtry, but usually the damaged areas were a smaller part of the site. These smaller areas were usually the lower saltmarsh zone or enclosure on the site that was badly damaged by grazing and associated impacts.

Figure 3.2. Impacts of heavy grazing and poaching at Rathmelton.

Saltmarsh was assessed as being overgrazed by cattle (143) or sheep (142) when the sward was at a very low height, the sward surface was being damaged by plants being stripped from the surface, a significant part of the saltmarsh surface was bare mud and the saltmarsh surface was poached. There were no signs that grazing was affecting species diversity apart from at Annagh Island. Sheep grazing has a lower impact on saltmarsh compared to cattle grazing although at some sites both were grazing the same saltmarsh. Cattle or horse grazing generally causes significant poaching unless they have very low stocking rates or are on the site for a short time. Sheep grazing has to be at a high stocking rate to have a significant impact. Most of the sites were grazing was present, but was not significantly damaging the site (140) were grazed by sheep. However, probably the two most damaged sites, Annagh Island and Dooaghtry, were grazed by sheep. The lower saltmarsh zone and edges of the creeks and pans are the areas most vulnerable to overgrazing and associated impacts. Cattle and sheep may form tracks across the saltmarsh that are particularly more damaged than the surrounding saltmarsh.

Several sites had low-moderate levels of grazing. These were not assessed as being significantly overgrazed (142/143) but were assessed as having grazing with a negative impact (140, -1). At these sites there generally one management unit, the sward height is generally quite uniform and had a poor height diversity. There may be some damage of the lower saltmarsh zones along the edges of creeks and pans but this does not affect a significant area (> 10%) of the habitat area. Examples of these sites include Lackan and Tawin Island.

Several sites such as Rathmelton, Lower Lough Swilly and Ross did have a diverse sward height due to the presence of several management units with different intensities of grazing.

It was difficult to separate natural grazing from grazing by livestock on those sites that were grazed. However, some comparison can be made of sites with no livestock to grazed sites. Parts of Bull Island and Rogerstown have a low sward height and poor sward diversity, particularly in the mid marsh zone and this is a natural phenomenon related to grazing by wild animals, waders and wildfowl. A comparison of Baldoyle to Bull Island shows there is much less natural grazing at Baldoyle because the upper marsh zone generally had a tall sward height. Natural grazing can also have a negative impact and this was seen at Ballytiege where part of the saltmarsh was heavily grazed by rabbits (146).

3.4.2.3 Erosion and accretion

Erosion (900) and accretion (910) also affects this habitat. Signs of water-induced erosion such as a saltmarsh cliff and mud balls at the seaward edge of the ASM are very frequent. However, many of these saltmarsh cliffs, some quite high (> 0.5 m), are still in the same position as indicated from the 1920's 6 inch OS map, so there has been no measurable loss of extent at many of these sites. Erosion may be occurring at these sites but the rate is either very low or there is no erosion on-going at present and the measurable geomorphological cycles are currently neutral. Erosion may have occurred on the past to create these saltmarsh cliffs. Signs of accretion with accretional ramps are less frequent.

Figure 3.3. Accretion ramp along the edge of the saltmarsh at Ross.

The assessment of erosion and accretion does not include the presence of these signs at each site but only includes sites where there is a measurable or definite indication of a trend of loss or increase in extent from erosion or accretion. This is indicated from a comparison of GPS points, 1995 and 2000 aerial photos, MIPSU habitat maps and 6 inch OS maps.

There are few signs of significant or measurable erosion or accretion in the current assessment period. These trends (in the past 15 years) are indicated by a comparison of the aerial photos (1995, 2000) and GPS points taken during the survey. The only site where there is measurable erosion is at Lackan, while there are indications of erosion at Bull Island and Lahinch from the aerial photos and habitat maps. Erosion at Lackan and Lahinch is related to changes in the positions of river channels. Saltmarsh at Ray has all but disappeared.

Trends of erosion or accretion were more easily identified when comparing the 1920's 6 inch OS maps to the aerial photos. This longer period means that the impact of the relatively slow rates of erosion and accretion can actually be observed from the comparison of the GIS data. Some trends indicated from a comparison of the GIS data are also confirmed from physical signs of erosion and accretion at these sites.

Erosion was also induced by moderate-heavy grazing levels in parts of Tawin island and at Annagh Island. Both these sites are vulnerable to erosion because relatively thin layer of peat overlying glacial deposits or bedrock. Overgrazing and poaching may strip the saltmarsh of vegetation and break up the saltmarsh surface where there is a thin mud layer, which means the substrate is more easily eroded by the tide and water currents.

At many of the sites were there is measurable or significant erosion since the 1920's there is compensation from accretion at other locations at these sites. These include erosion at Lahinch, Lackan, Dooaghtry and Mallaranny. There were a few sites where there has been overall erosion since the 1920s (a comparison of the aerial photos to the 6 inch map) that is not compensated by accretion. These include Tramore and Rosmurrevagh. There is no measurable loss of extent within the current assessment period but these trends are likely to have continued. This indicates that erosion of saltmarsh can be a slow process. Sudden losses due to storm damage should also be considered but this impact would not be picked up by the current monitoring programme.

Figure 3.4. Saltmarsh cliff at Rathmelton showing signs of erosion. However, comparison of aerial photos (2000) and 6 inch map (1920's) shows no significant loss of saltmarsh.

There are was only two sites, Ross and Fahan, where there has been an overall increase in extent due to 'natural' accretion since the 1920's. There is still an accretional ramp within the Ross inlet. Fahan saltmarsh has only developed in the past 100 years in association with a large sand spit that also contains a sand dune system. Several sites such as Rathmelton and Bartragh Island have areas where saltmarsh is not indicated in the 1920's 6 inch OS map but now contains extensive saltmarsh. This may be due to errors in map drawing so it is difficult to interpret these trends as accretion. There has also been accretion at Bull Island and Ballyteige but this is related to construction of a causeway and a seawall respectively.

Overall, erosion and accretion has not reduced or increased the extent of ASM measurably within the current assessment period. No overall trends of erosion or accretion are indicated from a longer comparison between the 1920's 6 inch maps and the aerial photos. Erosion and accretion is site specific and in most cases the two trends compensate each other.

Other natural processes that affect saltmarsh include the transition of saltmarsh to some other habitat (990). This is occurring at Fahan and at Rogerstown. Saltmarsh is being transformed to sand dune habitats (also Annex I) due to natural geomorphological coastal processes.

3.4.2.4 Common Cordgrass

Common Cordgrass is present at several sites visited during the survey. This is an invasive species and has been considered by some to have a negative impact on saltmarsh and mudflat habitats. This species is a characteristic part of the lower zone of several sites particularly Bull Island, Rogerstown, Malahide, Baldoyle, Ballyteige, Tramore, Rathmelton, Lower Lough Swilly and Green Hill. However, there are no signs of any significant spread of Common Cordgrass in ASM at any of the sites during the current assessment period. It was difficult to assess if there has been recent spread of Common Cordgrass without accurate baseline data. This species was also not recorded at any new sites during this survey. Nairn (1986) noted the presence of Common Cordgrass in Dublin Bay, Rogerstown Estuary, Malahide Estuary, Baldoyle Estuary, Tramore Bay and Lough Swilly.

Common Cordgrass is generally much more extensive on mudflats and sandflats rather than on saltmarsh. However, the impacts on this habitat (also Annex I) have not been assessed during this survey. This species probably has a greater impact on the Annex I saltmarsh habitat *Salicornia* flats (1310).

At sites where Common Cordgrass has been established on ASM, it appears most frequently as clumps in the lower-mid saltmarsh zone but is generally not dominant, with cover values most frequently between 1-5%. There are usually small areas with more frequent cover of Common Cordgrass (5-40%) where the species grows through other ASM vegetation but at low stem densities. There are small areas (< 1 ha) on ASM dominated by Common Cordgrass (classified as *Spartina* swards) at Bull Island, Rogerstown, Baldoyle, Rathmelton and Tramore. *Spartina* sward was classified as > 40% cover of Common Cordgrass in this project. These patches of *Spartina* swards have developed on former areas of ASM. However, it has not invaded the lower-mid saltmarsh zones and transformed significant areas of ASM to *Spartina* sward.

The main impact of the spread of Common Cordgrass on the ASM is the transformation of the lower-pioneer saltmarsh community dominated by Common Saltmarsh-grass with frequent Glasswort and Annual Sea-blite. This community is the most common pioneer saltmarsh community typically found on Irish saltmarshes but it has been replaced by *Spartina* swards, particularly at Tramore, Rogerstown and Baldoyle where the seaward edge of the ASM borders *Spartina* swards. However, the typical lower-pioneer saltmarsh community dominated by Common Saltmarsh-grass is still found at Bull Island and Ballyteige where Common Cordgrass is present so not all sites are equally affected.

3.4.2.5 Tracks

Tracks are also quite frequent on saltmarshes (501). These tracks are used by farm vehicles to access other parts of the saltmarsh and to access shoreline and intertidal area and tracks created by walking. This category also includes wheel ruts caused by amenity use such as on Ballyteige and Fahan. The intensity of use varies from tracks where the sward height is affected by trampling or compaction to tracks where the vegetation cover and sediment has been eroded away to rocky bedrock or rocky substrates. Permanent stone tracks or patches that been developed on saltmarsh at Dooaghtry and Ross. The tracks at Ross were put down by the farmer to allow cattle to cross the intertidal area to access grazing land and to prevent the cattle damaging the saltmarsh extensively. Tracks generally do not cover significant areas of saltmarsh and the impact on vegetation and saltmarsh structure was assessed in this category (and not disturbance to wildlife).

Figure 3.4. Damage form heavy grazing and vehicle damage at Dooaghtry.

3.4.2.6 Amenity use

Some saltmarshes are also used for amenity use (622). This includes walking, horse-riding and the use of all-terrain vehicles and scramblers. There are tracks caused by amenity use on Bull Island, Tramore, Fahan and Ballyteige. The saltmarsh at Fahan was used for camping (608) and the saltmarsh at Mallaranny was used for parking caravans and as an overflow car-park (during low tide?).

3.4.2.7 Other impacts and activities

Several impacts and activities occur quite infrequently. These include litter at Lahinch appearing along strandline (421); occasional dumping of small piles of rubble or soil (422) at Tawin Island, Castleconor and Rockfleet, and telegraph or electricity poles and lines across the saltmarsh (511).

3.4.2.8 Older impacts and activities

There are many signs of older impacts and activities on most of these sites. These include activities such as reclamation, old sea walls, embankments and drainage. While many of these activities occurred before the current assessment period they sometimes are still having a residual impact. Many of the drains dug across saltmarshes pre-date the 2nd edition 6 inch map are therefore quite old. These have significantly affected the creek drainage structure at some of these sites such as Lackan and Lahinch. Some of these drains have been cleaned or deepened in the intervening period. Drainage was associated with attempts at reclamation at some sites such as Lahinch and Greenhills.

A comparison of the 1920's 6 inch maps and the 2000 aerial photos shows that saltmarsh has been reclaimed or infilled at Bull Island, Baldoyle, Ballyteige, and Tramore during this period. However, most reclamation has occurred prior to this period. Some old reclaimed areas are reverting back to saltmarsh. This is occurring at Rogerstown where old embankments or berms are being eroding and allowing the tide to re-enter previously reclaimed land. Attempts at reclamation at Lahinch have also failed and a significant area of saltmarsh is now recovering, although the drains are still probably affecting the drainage function of the old creeks.

Table 3.6, Part A. Summary of impacts and activities on Atlantic salt meadows (1330) at each site. Impacts and activities are as follows; 140 – grazing; 142 – overgrazing by sheep; 143 – overgrazing by cattle; 146 – natural grazing by hares and rabbits and 421 – disposal of household waste (dumping).

Site name	Habitat area (ha)	Impacts and activities																		
		140			142			143			146			147			421			
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Rogerstown Estuary	33.02																		
Malahide Estuary	26.47																		
Baldoyle Estuary	12.68																		
Bull Island	82.34										C	0	82.34	C	0	82.34			
Ballyteige	21.15	C	0	20.00				B	-1	5.00	B	-1	3.00						
Duncormick	5.31	C	0	5.31															
Tramore	29.55	C	0	9.50															
Lahinch	49.97	C	0	49.97				B	-1	12.50							C	-1	0.10
Tawin Island	38.33	C	-1	38.33	A	-1	5.40												
Dooaghtry	17.77	C	0	17.77	A	-1	13.00	A	-1	13.00									
Mallaranny	19.93				B	-1	12.20												
Tooreen	1.88				A	-1	1.88	A	-1	1.88									
Rosmurrevagh	6.40	C	-1	6.4.	A	-1	2.00	A	-1	2.00									
Tierna	0.40	C	0	0.40															
Rockfleet Castle	0.71							A	-1	0.71									
Rosharnagh East	0.20	C	0	0.20															
Caraholly South	1.68	C	-1	1.68				B	-1	0.50									
Killadangan	0.86	C	0	0.86	A	-1	0.10												
Annagh Island	4.45				A	-1	4.45												
Bartraw	0.41																		
Bellacragher Bay	1.82				B	-1	1.82												
Lackan	28.27	C	-1	28.27	A	-1	6.00												
Bartragh Island	29.11	C	0	29.11															
Ross	15.82	C	-1	15.82				A	-1	7.00									
Rusheens	1.24																		
Castleconor	1.67	C	0	1.67				A	-1	0.01									
Ray	0.06																		
Rathmelton	10.03	C	-1	1.94				A	-1	2.73									
Green Hills	1.92	C	-1	1.92				A	-1	0.50									
Lower Lough Swilly Complex	8.46				B	-1	0.10	B	-1	1.80									
Fahan	7.51																		

Table 3.6, Part B. Summary of impacts and activities on Atlantic salt meadows (1330). Impacts and activities are as follows; 422 – disposal of industrial waste (dumping); 490 – other urbanisation (car park); 501 – tracks; 511 – telegraph & electricity poles; 608 – camping & caravans; 622 – walking & horse-riding ; 800 – landfill & reclamation.

Site name	Impacts and activities																							
	Habitat area (ha)	422			490			501			511			608			622			800				
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected		
Rogerstown Estuary	33.02																							
Malahide Estuary	26.47																							
Baldoyle Estuary	12.68							C	-1	0.01														
Bull Island	82.34							C	-1	1.00							C	-1	1.00					
Ballyteige	21.15							C	-1	1.50														
Duncormick	5.31							C	-1	0.01														
Tramore	29.55							B	-1	7.00							B	-1	3.00					
Lahinch	49.97							C	-1	0.1	C	-1	0.1											
Tawin Island	38.33	C	-1	0.01				C	-2	0.1	C	-1	0.01											
Dooaghtry	17.77				A	-2	0.25	A	-1	5.00	C	0	0.1											
Mallaranny	19.93							C	-1	0.10	C	-1	0.001	C	-1	0.01	C	-1	12.20					
Tooreen	1.88							C	-1	0.001														
Rosmurrevagh	6.40							C	-1	0.001														
Tierna	0.40							C	-1	0.10														
Rockfleet Castle	0.71	C	-2	0.01				C	-1	0.10														
Rosharnagh East	0.20																							
Caraholly South	1.68							C	-1	0.10	C	-1	0.01											
Killadangan	0.86																							
Annagh Island	4.45							C	-1	0.10														
Bartraw	0.41							C	-1	0.10														
Bellacragher Bay	1.82							C	-1	0.01														
Lackan	28.27							C	-1	0.10														
Bartragh Island	29.11							C	0	0.001							C	0	1.00					
Ross	15.82							C	-2	0.10										C	-2	0.10		
Rusheens	1.24																							
Castleconor	1.67	A	-2	0.01																				
Ray	0.06																							
Rathmelton	10.03							C	-1	0.10										A	-2	0.01		
Green Hills	1.92																							
Lower Lough Swilly Complex	8.46																							
Fahan	7.51							C	-1	0.01				C	-1	0.01	C	-1	0.10					

Table 3.6, Part C. Summary of impacts and activities on Atlantic salt meadows (1330). Impacts and activities are as follows; 802 – reclamation of land from sea or marsh; 810 – drainage; 900 – erosion; 910 – accretion, 954 – invasion of a species (Common Cordgrass) and 990 – other natural processes (transition of saltmarsh to sand dune).

Site name	Habitat area (ha)	Impacts and activities																	
		802			810			900			910			954			990		
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Rogerstown Estuary	33.02																		
Malahide Estuary	26.47																		
Baldoyle Estuary	12.68							C	0	N/A				C	-1	12.68			
Bull Island	82.34							C	0	N/A	D	0	N/A	B	-1	8.21			
Ballyteige	21.15										C	+1	N/A	C	-1	5.00			
Duncormick	5.31													C	-1	0.01			
Tramore	29.55							C	-1	N/A				C	0	N/A			
Lahinch	49.97							C	0	0.1	C	0	N/A						
Tawin Island	38.33							C	0	N/A									
Dooaghtry	17.77							C	0	N/A	C	0	N/A						
Mallaranny	19.93							D	0	N/A	C	+1	0.30						
Tooreen	1.88																		
Rosmurrevagh	6.40							A	-2	N/A									
Tierna	0.40																		
Rockfleet Castle	0.71																		
Rosharnagh East	0.20	A	-2	0.10															
Caraholly South	1.68	A	-2	0.10															
Killadangan	0.86																		
Annagh Island	4.45							C	-1	N/A				C	0	N/A			
Bartraw	0.41																		
Bellacragher Bay	1.82																		
Lackan	28.27							B	0	N/A	C	+1	N/A						
Bartragh Island	29.11																		
Ross	15.82										B	+1	N/A						
Rusheens	1.24																		
Castleconor	1.67																		
Ray	0.06							B	-2	0.02									
Rathmelton	10.03				C	-1	1.8	C	-1	N/A				C	-1	0.40			
Green Hills	1.92													C	-1	0.25			
Lower Lough Swilly Complex	8.46													C	-1	8.50			
Fahan	7.51	B	-2	2.00													B	-2	N/A

3.4.3 IMPACTS AND ACTIVITIES ON MEDITERRANEAN SALT MEADOWS

There are fewer impacts and activities on this habitat and impacts and activities also seem to be less intense compared to ASM (Table 3.7). This is due to several reasons, but the main one is that MSM is less extensive compared to ASM, being present at fewer sites (23 out of 31) and covering much less area (24%) compared to ASM (68%). The position of MSM, which is generally but not always landward of ASM is also a factor. At some sites no impacts or activities were recorded and this is usually related to the small size of the habitat.

The most common impacts on MSM are related to grazing. This habitat was generally grazed in the western sites. However the impact of grazing was lower compared to ASM. This is because the dense clumps of Sea Rush shielded the other vegetation somewhat. Typical ASM plant species were much bigger and better developed within these clumps of Sea Rush compared to the ASM. Sheep particularly did not graze intensively within the clumps of Sea Rush. Sheep will move through this habitat but will selectively graze small patches of ASM amongst the clumps of Sea Rush within the MSM. This means that the MSM is in better condition compared to ASM on sites that are grazed. Very heavy sheep grazing like that at Annagh Island can damage this habitat. Heavy cattle grazing is more likely to damage this habitat and examples of this are at Lahinch. Cattle will poach this habitat if they are left on the saltmarsh for a relatively long time. Not all the habitat may be damaged as enclosures may be managed differently and some enclosures are poached heavily such as at Lackan.

Figure 3.5. Poaching within MSM at Lahinch.

Natural grazing probably occurs to some extent at most sites in this habitat. However, it was only noticeable at Bull Island and Rogerstown where there is no livestock grazing. Rabbits and Hares are the most frequent grazers. Waders and wildfowl probably do not graze this habitat extensively due to the sward height and prefer the ASM.

Due to the position of this habitat generally at the landward side of ASM, several impacts and activities do not affect this habitat as frequently as they affect ASM. These include the potential spread of Common Cordgrass, erosion and accretion. Common Cordgrass was only noted alongside MSM vegetation at Baldoyle, Ballyteige and Annagh Island. Sea Rush dominated vegetation is found in the upper marsh and Common Cordgrass does not generally spread this high up the saltmarsh to any great extent. At Baldoyle MSM vegetation is found in a narrow fringe like strip alongside *Spartina* swards. There are no indications that Common Cordgrass is spreading significantly into this habitat. At Ballyteige, Common Cordgrass is found adjacent to a second MSM community containing Borrer's Saltmarsh-grass. This vegetation community is probably more vulnerable to the spread of Common Cordgrass as Common Cordgrass has the competitive edge due to its morphology. However this community usually favours less brackish conditions, which usually do not favour Common Cordgrass.

Erosion and accretion was only noted as affecting this habitat at several sites and this is because it is not found along the seaward edge. Rivers and large channels flowing through the MSM can erode and accrete this habitat and this occurs at Lackan and Lahinch. Some of this habitat at Annagh Island is eroding down to underlying gravel or rocky deposits but this is being induced by heavy grazing levels.

The position of this habitat along the landward side of the ASM and frequently adjacent to the landward boundary of the saltmarsh means it is vulnerable to infilling, reclamation and dumping. However, these activities have not occurred frequently during the current assessment period. Some rubbish was dumped within this habitat at Tawin Island. A carpark was partially built over this habitat at Dooaghtry. Very small areas have been infilled and reclaimed at Rockfleet and Rosharnagh East. The habitat at Rosharnagh East was outside the SAC boundary.

Tracks cross this habitat (501). These tracks are used to access other parts of the saltmarsh and access the shoreline and intertidal area. These tracks are sometimes frequently used and have eroded the mud or sediment away down to the rocky deposits that underlay the sediment. Telegraph or Electricity poles are sometimes positioned on the habitat (511).

The Mediterranean salt meadows habitat has been subject to much more extensive reclamation, infilling and drainage in the past. Old drains cross this habitat and some creeks have also been channelised. These impacts can be seen at Lahinch and Lackan. Some drains may be fairly regularly cleaned or deepened and these activities were seen at Lackan but probably occurred over 20 years ago. A large area of this habitat at Bull Island was reclaimed to develop St Anne's Golf Course. As these impacts have occurred prior to the current assessment period they are not assessed.

Table 3.7, Part 1. Summary table of the impacts and activities affecting MSM at each site. Impacts and activities are as follows; 140 – grazing; 142 – overgrazing by sheep;143 – overgrazing by cattle; 146 – natural grazing by hares and rabbits, 422 – disposal of industrial waste (dumping) and 490 – other urbanisation (car park).

Site name	Total area (ha)	Impacts and activities																	
		140			142			143			146			422			490		
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Rogerstown Estuary	1.87																		
Malahide Estuary	0.71																		
Baldoyle Estuary	2.64																		
Bull Island	8.21										C	0	8.21						
Ballyteige	3.04	C	-1	3.04															
Duncormick	0.13																		
Tramore	1.76	C	0	1.76															
Lahinch	56.71	C	-1	56.71				B	-1	14.00									
Tawin Island	1.53	C	0	1.53										C	-1	0.001			
Dooaghtry	1.17	C	0	1.17													A	-2	0.13
Mallaranny	2.10	C	0	2.10															
Tooreen	0.34				B	-1	0.34	B	-1	0.34									
Tierna	0.57	C	0	0.57															
Rockfleet Castle	0.09																		
Rosharnagh East	0.30	C	0	0.30															
Killadangan	4.57	C	0	4.57															
Annagh Island	4.46	C	-1	4.46															
Bellacragher Bay	2.61				B	-1	2.61												
Lackan	66.00	C	0	30.00	A	-1	6.00												
Bartragh Island	0.01	C	0	0.01															
Ross	6.26	C	-1	6.26				B	-1	3.00									
Rusheens	2.46							A	-1	1.90									
Rathmelton	0.53							A	-1	0.53									

Table 3.7, Part 2. Summary table of the impacts and activities affecting MSM. Impacts and activities are as follows; 501 – tracks; 511 – electricity and telegraph poles; 802 – reclamation of land from the sea; 900 – erosion; 910 – accretion of sediment and 954 – invasion by a species (Common Cordgrass).

	Total area (ha)	Impacts and activities																					
		501			511			701			802			900			910			954			
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Rogerstown Estuary	1.87																						
Malahide Estuary	0.71																						
Baldoyle Estuary	2.64																			C	0	1.0	
Bull Island	8.21																						
Ballyteige	3.04	B	-1	0.01																C	-1	1.0	
Duncormick	0.13																						
Tramore	1.76																						
Lahinch	56.71	C	-1	0.10	C	0	0.10							C	0	n/a	C	0	n/a				
Tawin Island	1.53																						
Dooaghtry	1.17																						
Mallaranny	2.10				C	0	0.01																
Tooreen	0.34	C	-1	0.001																			
Tierna	0.57																						
Rockfleet Castle	0.09	B	-1	0.001							B	-2	0.001										
Rosharnagh East	0.30										A	-2	0.01										
Killadangan	4.57																						
Annagh Island	4.46	B	-1	0.01										C	-1	1.50				C	0	0	
Bellacragher Bay	2.61							C	0	2.61													
Lackan	66.00													C	0	n/a	C	0	n/a				
Bartragh Island	0.01																						
Ross	6.26																						
Rusheens	2.46																						
Rathmelton	0.53																						

3.5 Comparison of conservation status and damaging activities

This section summarises conservation status for each habitat at each site and also examines the main reasons why the habitats were assessed as unfavourable inadequate or unfavourable bad.

Table 3.8. Comparison of conservation status assessment of *Salicornia* flats (1310) and the main reasons for the unfavourable assessment. Favourable – green; UA – unfavourable-inadequate (yellow); UB – unfavourable – bad (red)

Site Number	Site Name	1310	Main reasons for assessment
SMP0001	Rogerstown Estuary		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0002	Malahide Estuary		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0003	Baldoyle Estuary		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0004	Bull Island		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0005	Ballyteige		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0007	Tramore		Future prospects assessed as UA due to potential for Common Cordgrass to spread into the habitat.
SMP0008	Lahinch		Structure and functions assessed as UB due to excessive trampling of habitat by cattle in pans.
SMP0009	Tawin Island		All attributes favourable.
SMP0011	Mallaranny		All attributes favourable.
SMP0019	Annagh Island		All attributes favourable.
SMP0022	Lackan		No habitat present although it was listed as a qualifying interest for the site.
SMP0023	Bartragh Island		All attributes favourable.
SMP0024	Ross		All attributes favourable.
SMP0028	Rathmelton		All attributes favourable.
SMP0030	Lower Lough Swilly Complex		Future prospects assessed as UB as area of habitat very small so there is potential for Common Cordgrass to cover habitat.

Table 3.9. Comparison of conservation status assessment of Atlantic salt meadows (1330) and the main reasons for the unfavourable assessment. Favourable – green; UA – unfavourable-inadequate (yellow); UB – unfavourable – bad (red).

Site Number	Site Name	1330	Main reasons for assessment
SMP0001	Rogerstown Estuary		All attributes favourable.
SMP0002	Malahide Estuary		Disturbance by motorway bridge has significantly affected structure and functions.
SMP0003	Baldoyle Estuary		All attributes favourable.
SMP0004	Bull Island		All attributes favourable.
SMP0005	Ballyteige		Disturbance by cattle poaching, wheel ruts/tracks affecting structure and function.
SMP0006	Duncormick		All attributes favourable.
SMP0007	Tramore		All attributes favourable.
SMP0008	Lahinch		Some of habitat affected by heavy grazing and poaching affecting structure and function. Most of habitat in favourable condition.
SMP0009	Tawin Island		Some habitat affected by moderate heavy grazing and poaching. Most of the habitat in good condition.
SMP0010	Dooaghtry		Very heavy overgrazing affecting structure and function. Loss of habitat due to construction of car park.
SMP0011	Mallaranny		Moderate-heavy sheep grazing affecting creek and pan structure
SMP0012	Tooreen		Moderate-heavy poaching affecting structure and function.
SMP0013	Rosmurrevagh		Significant area heavily poached affecting structure and function.
SMP0014	Tierna		All attributes favourable.
SMP0015	Rockfleet Castle		Significant area heavily poached affecting structure and function.
SMP0016	Rosharnagh East		Part of site has been infilled reducing extent of ASM.
SMP0017	Caraholly South		Part of site has been infilled reducing extent of ASM.
SMP0018	Killadangan		Small area of habitat affected by poaching.
SMP0019	Annagh Island		Very heavy overgrazing affecting structure and function.
SMP0020	Bartraw		All attributes favourable.
SMP0021	Bellacragher Bay		Heavy overgrazing affecting structure and function.
SMP0022	Lackan		All attributes favourable.
SMP0023	Bartragh Island		All attributes favourable.
SMP0024	Ross		Small areas badly poached affecting structure and function. Most of habitat is in good condition.
SMP0025	Rusheens		All attributes favourable.
SMP0026	Castleconor		All attributes favourable.
SMP0027	Ray		Saltmarsh has all but eroded away. Loss of extent.
SMP0028	Rathmelton		Parts of the habitat overgrazed and poached affecting structure and function. Most of site in good condition.
SMP0029	Green Hills		Heavy overgrazing and poaching affecting structure and function.
SMP0030	Lower Lough Swilly Complex		Heavy overgrazing and poaching affecting structure and function.
SMP0031	Fahan		Loss of extent due to infilling beside marina. Rest of habitat in good condition.

Table 3.10. Comparison of conservation status assessment of Mediterranean salt meadows (1410) and the main reasons for the unfavourable assessment. Favourable – green; UA – unfavourable-inadequate (yellow); UB – unfavourable – bad (red).

Number	Site Name	1410	Main reasons for assessment
SMP0001	Rogerstown Estuary		All attributes favourable.
SMP0002	Malahide Estuary		All attributes favourable.
SMP0003	Baldoyle Estuary		All attributes favourable.
SMP0004	Bull Island		All attributes favourable.
SMP0005	Ballyteige		Future prospects of Borrer's saltmarsh-grass community assessed as UA due to potential for spread of Common Cordgrass and change in physical conditions.
SMP0006	Duncormick		All attributes favourable.
SMP0007	Tramore		All attributes favourable.
SMP0008	Lahinch		Structure and functions assessed as UA due to some of the habitat being badly poached. Most of habitat in good condition.
SMP0009	Tawin Island		All attributes favourable.
SMP0010	Dooaghtry		Extent assessed as UB. Loss of habitat due to development of car park
SMP0011	Mallaranny		All attributes favourable.
SMP0012	Tooreen		Habitat damaged by poaching, affecting structure and functions.
SMP0014	Tierna		All attributes favourable.
SMP0015	Rockfleet Castle		Extent assessed as UB. Loss of habitat due to infilling, but it was very small anyway.
SMP0016	Rosharnagh East		Extent assessed as UB.. Loss of habitat due to infilling.
SMP0018	Killadangan		All attributes favourable.
SMP0019	Annagh Island		All attributes favourable.
SMP0021	Bellacragher Bay		All attributes favourable.
SMP0022	Lackan		Structure and functions assessed as UA due to some of the habitat being badly poached. Most of habitat in good condition.
SMP0023	Bartragh Island		All attributes favourable.
SMP0024	Ross		All attributes favourable.
SMP0025	Rusheens		Habitat damaged by poaching, affecting structure and functions.
SMP0028	Rathmelton		Structure and functions assessed as UB due to some of the habitat being badly poached. Some of habitat in good condition.

3.6 Evaluation of the methods used for evaluation of conservation status

The monitoring methodology employed in the current survey was adapted from a system of habitat monitoring developed by the JNCC, which has been conveyed in a series of 'Common Standards Monitoring' (CSM) documents e.g. guidelines for saltmarsh habitats (JNCC, 2004). There are several issues that have arisen after the use of the monitoring methodology during this survey.

3.6.1 ASSESSMENT OF EXTENT

This assessment is likely to be fairly accurate for ASM and MSM Annex I habitats but less accurate for *Salicornia* flats (1310). Losses of extent in the current assessment period due the development or infilling of the ASM and MSM habitat were usually very obvious. In some cases these impacts have occurred quite recently (< 5years) and do not show up on the 2000 aerial photos. This occurred at Fahan, Caraholly South and Rosharnagh East. At these sites some estimation had to be made about how much habitat had been lost.

Older habitat maps (MPSU conservation plans and Natura 2000 database maps) varied in accuracy. They were useful for as an indicative guide as to where saltmarsh was on sites. However they were not accurate enough to be used for quantitative comparisons. The current extent was generally taken as a baseline measurement unless there was information available or indications that there had been a loss of extent.

There were generally no major changes in extent due to erosion and accretion. These processes frequently occur at saltmarsh sites. However, while there may be physical signs of erosion and accretion visible on the ground, comparisons of GPS data indicates there were few losses of extent when comparing the aerial photos (1995 and 2000) and GPS points taken along the seaward boundaries. At one site (Lackan) a comparison of GPS points and aerial photos showed that there had been a loss of 2-3 m of saltmarsh along the seaward edge between 2000-2006. However, this is the only example of this kind of trend. There are indications of erosion and accretion along the saltmarsh at Bull Island but poor rectification between the 1995 and 2000 aerial photos (photos offset between 5-10 m) means that any analysis would not be accurate. Changes in saltmarsh extent were more evident when comparing the 2nd edition 6 inch maps (1920's) and the aerial photos (2000).

Assessment of extent for *Salicornia* flats was more difficult. Generally the current extent was taken as a baseline value as there was usually little or no information about the former extent

of this habitat. This habitat does not show up well on aerial photos so no retrospective analysis of habitat extent (ie measure extent from 1995 aerial photos) could be made.

Assessment of extent of *Spartina* swards and clumps is also difficult without ground-truthing. This habitat also does not show up clearly on aerial photos. Algae cover, Eelgrass beds and tide cover can obscure clumps of Common Cordgrass. Some of the intertidal areas on the aerial photographs are very heterogeneous while in the field look homogenous. At some sites GPS boundary points were placed around the habitat during fieldwork. Parts of the seaward boundaries were generally inaccessible due to the soft mud. However, if some of the seaward boundary was ground-truthed this helped interpret the aerial photo to allow the rest of the boundary to be picked out.

3.6.2 ASSESSMENT OF STRUCTURE AND FUNCTION

3.6.2.1 Physical structure (creeks and pans)

This attribute assessed if there was any damage to the creek and pan structure either from natural causes such as erosion or from disturbance due to drainage etc. This attribute was passed for all the monitoring stops. There was generally no major disturbance to the creek and pan structure observed during the survey. There were no signs of any recent drainage at any of the sites visited, apart from Rathmelton.

There were some indications that the creek structure at Malaranny was affected by sheep-induced erosion along the creek and pan edges. The creeks at this site look un-naturally wide and sometimes interlink, and there were frequent signs of erosion along the creek edges.

There were frequent signs of older disturbance due to drainage and reclamation, such as drains cut across the saltmarsh or the channelisation (straightening and deepening) of natural creeks. However as these activities occurred before the current assessment period they were not considered, even though they may be still having a residual impact. A large section of the saltmarsh at Lahinch is recovering from attempts at drainage and reclamation with uniformly spaced drains cutting across large areas of saltmarsh. This is also seen at Green Hill, Rathmelton and Duncormick. It can affect both ASM and MSM saltmarsh. There were also signs that some of the natural creeks at Tramore had infilled and this could be related to drains at this site replacing the natural drainage function of these creeks.

3.6.2.2 Vegetation structure (zonation)

This attribute assessed the presence of plant community zonation in the saltmarsh habitat. Plant zonation was present in all of the saltmarsh habitats. However it was not used to pass or

fail structure and function of habitats at individual stops, as sometimes there was no zonation present due to natural causes. This occurred when the habitat was small, such as in a small patch of *Salicornia* flats isolated on mudflats. It also occurred when there was a narrow band or fringe of saltmarsh vegetation generally dominated by just one species. This was seen in both ASM and MSM. Sometimes the individual Annex I habitats represented the zonation, so while there may not be individual zonation within the Annex I habitats, the saltmarsh as a whole still contained plant community zonation.

Mediterranean salt meadows were also frequently quite uniform at times. This habitat is characterised by the dominance of Sea Rush so the opportunities for distinctive zonation are limited. However zonation was present in this habitat at some of the larger sites with large extents. Zonation of other saltmarsh species could be seen within the areas dominated by or characterised by Sea Rush.

3.6.2.3 Vegetation structure (Plant height)

This attribute assessed the diversity of plant heights within the salt marsh habitats. A diverse sward structure is conducive to plant and invertebrate diversity. This attribute was NOT used after visiting several sites during the survey, as it was felt that it would fail some moderate-good quality sites. Some sites that are one management unit, and therefore have the same grazing intensity over the whole habitat, had a uniform short sward height. These sites include Dooaghtry (the good quality section). There is a characteristic low sward (lawn) created by sheep grazing at this site. The grazing intensity is not significantly damaging the saltmarsh surface or creating poached areas, but it does create a uniform sward height and characteristic dwarfed saltmarsh plants (feature of local distinctiveness).

Sites with no livestock grazing had a more diverse sward height that was related to zonation of plant communities. The upper saltmarsh zones dominated by grasses and rushes had a much higher sward height compared to the middle and lower marsh zones. The middle marsh zone was characterised by a naturally low uniform sward height. The presence of Common Cordgrass and Sea Purslane also introduces some height diversity to the lower and mid marsh zones. It should also be noted that natural grazing can also contribute to a naturally uniform sward height.

This attribute would probably be more suited to being applied to the saltmarsh overall, rather than at each monitoring stop.

3.6.2.4 Vegetation structure (plant cover)

This attribute assessed the amount of plant cover over the saltmarsh surface. This attribute was useful for identifying areas damaged by poaching and disturbance by livestock or eroding saltmarsh. Stops with greater than 5% bare substrate cover failed structure and functions. Most of the sites that had structure and functions of ASM and MSM assessed as having an unfavourable conservation status failed this attribute.

3.6.2.5 Vegetation composition (typical species)

This attribute assessed species diversity at each monitoring stop. Targets were set for typical species in the low middle and upper saltmarsh zones (JNCC 2004). Generally these targets were always reached. Annagh Island was one site where some monitoring stops were failed due to low diversity and lack of typical species.

Saltmarshes in Ireland have a lower plant diversity compared to other coastal habitats such as sand dunes. Quadrats at the monitoring stops were in general dominated by one-three species and also contained several other species at lower frequencies. Setting targets too high would also unnecessarily fail monitoring stops where there is naturally low diversity. Most sites are likely to have similar species diversities (this has not been analysed or compared to other studies like Wymer 1984). It is therefore difficult to detect subtle changes in diversity due to negative impacts.

3.6.2.6 Negative indicator species (Common Cordgrass)

This attribute assessed for the presence and spread of Common Cordgrass. Cover of this species was recorded at each monitoring stop and along some transects. The target was set at < 10% expansion of cover of this species during the assessment period, where a site was known to support Common Cordgrass. In addition any new sites for Common Cordgrass would be unfavourable. However, as there is no accurate baseline information on the former cover of this species at most of the sites, the current cover of this species was generally taken as the baseline. There were no indications that Common Cordgrass had recently expanded within the ASM at any of the sites and there were no sites where Common Cordgrass was recorded where it was known to be absent.

Information about the former cover of Common Cordgrass was available for Bull Island. A comparison of this data shows there has been no major increase in cover of Common Cordgrass within the *Salicornia* flats or the ASM.

Common Cordgrass may have spread into former *Salicornia* flats habitat during the current assessment period, but due to the lack of information about the former extent of *Salicornia* flats, no assessment can be made about the spread of this indicator species. Common Cordgrass is present within and adjacent to small patches of this habitat at several sites.

This data will be very useful for future surveys as a baseline. Future surveys will be able to assess whether the cover of Common Cordgrass is increasing or decreasing.

3.6.2.7 Other negative indicators

This attribute was used for extra information only. There were few stops where there was a damaging activity that was not already picked up by the other attributes. The most frequent 'other' damaging impact was wheel ruts created by vehicles using the saltmarsh for amenity use or agricultural vehicles.

3.6.2.8 Indicators of local distinctiveness

This attribute was used in some cases where there was a rare or interesting feature present on the saltmarsh. Indicators of local distinctiveness include the presence of uncommon species such as Sea Wormwood (*Seriphidium maritimum*), Marsh Samphire (*Inula crithmoides*) or Saltmarsh Flat-rush (*Blysmus rufus*) (not listed in Red Data Book) or species that have a disjunct distribution around the coastline, such as the presence of Sea Purslane on the west coast at Tawin Island.

3.6.3 FUTURE PROSPECTS

This assessment generally assumed that the current management activities and level of impacts recorded on the Annex I saltmarsh habitats would continue in the near future. So if there were damaging activities currently affecting the site it was assessed that these activities would continue in the future and the future prospects was assessed as unfavourable.

The future prospects of *Salicornia* flats were assessed as unfavourable-inadequate when Common Cordgrass was present. It was assumed that Common Cordgrass has the potential to spread into the *Salicornia* flats patches and reduce its extent, as Glasswort patches on pioneer saltmarsh and Common Cordgrass occupy a similar zone of the saltmarsh and Common Cordgrass has a competitive advantage (Ellison 1987).

4 CONCLUSIONS

4.1 The status of saltmarsh habitats

This survey has examined the status of saltmarsh habitats at selected sites and the current threats affecting their conservation status. While the site list is relatively small and the geographical distribution of the selected sites was disjunct, the site list did include all the various types of saltmarsh, the east-west geographical variation, and variation in biodiversity in saltmarshes, which were described by Curtis and Sheehy-Skeffington (1998). The survey also included a wide range of saltmarsh sizes from some of the biggest single units such as Bull Island (< 100 ha) to small patches less than 0.1 ha (Batraw) and a selection of the main land-uses. This survey can therefore give some indication of the national status of Irish saltmarshes.

Most of the Annex I *Salicornia* flats (1310) and Atlantic salt meadows (1330) habitats were assessed as either Unfavourable-Inadequate or Unfavourable-Bad while most of the Mediterranean salt meadow habitats (1410) were assessed as Favourable (Table 3.2). However, this does not give a full picture of the status of saltmarsh habitats and if conservation status was examined by area a higher percentage of the ASM habitat surveyed would be in favourable conservation status. Table 3.9 indicates that at some of the sites where ASM was assessed as unfavourable-bad, most of the habitat was actually in good condition (poor structure and functions in only 1-25% of the habitat). One monitoring stop may have failed and pushed the conservation assessment into unfavourable-bad. Many of the smaller sites also had an unfavourable conservation status due to the fact that damaged sections, while they may be small, were more significant.

Most of the *Salicornia* flats have been assessed as unfavourable due to the threat of Common Cordgrass (Table 3.8). This assessment is an arbitrary one and is based on the assumption that as *Salicornia* flats and *Spartina* swards occupy similar zones or niches in the saltmarsh, the patches of *Salicornia* are vulnerable to invasion by Common Cordgrass. However, there is very little quantitative data to show that this habitat is currently being replaced by Common Cordgrass. Data from Bull Island shows that Common Cordgrass is spreading quite slowly within the *Salicornia* flats area.

The assessment of conservation status in this survey is also limited by the lack of accurate information about the former extent and condition of saltmarsh habitats in Ireland. This

survey will provide accurate baseline information for future monitoring projects that will allow much more accurate assessment of conservation status.

This conservation assessment is based on the condition of the vegetation, the structure of the saltmarsh as defined by the vegetation communities and the physical structure of the saltmarsh. There was no assessment of the use of saltmarsh by wintering waders and wildfowl or their use by breeding birds. There was also no assessment of the disturbance to wildlife by damaging activities.

4.2 Current threats to saltmarsh habitats

Many of the damaging activities recorded in this report have been recorded previously on Irish saltmarshes by Sheehy-Skeffington and Wymer (1991), Curtis and Sheehy-Skeffington (1998) and Curtis (2003). Some of the most significant damaging activities have been agricultural reclamation and infilling for industrial use and large areas of saltmarsh have been reclaimed in the past (Curtis 2003). However, these activities have not occurred as frequently within the current monitoring period. This probably reflects increased awareness of the value of saltmarshes, lower emphasis in the agricultural industry to 'improve' unproductive land such as saltmarshes and the protection given to then by national and European nature conservation designations.

Some sites such as Rosharnagh East, Caraholly South and Fahan have been affected by infilling and reclamation. Infilling has two roles, the elimination of unwanted waste material and reclamation of poorer land. Waste material may be construction and demolition building waste or spoil and this reflects the increased construction in this country. It is important to note that saltmarsh at both these sites was outside the Clew Bay SAC boundary and was therefore unprotected by the designation. Curtis and Sheehy-Skeffington (1998) also noted that bay-type saltmarshes such as these were vulnerable to infilling. The development of a marina on saltmarsh at Fahan (Lisannon) has been discussed by McKenna *et al.* (2000, 2003). One of the issues the authors pointed out was that while the foreshore was owned by the Department of the Marine (as indicated by the 6 inch maps) there were possible legal difficulties about ownership and rights of saltmarsh that had accreted below the MHW mark since the 6 inch maps were drawn.

4.2.1 GRAZING

Grazing was probably the most common activity and this had a range of impacts depending on its intensity. Curtis and Sheehy-Skeffington (1998) noted that the one of the main threats to saltmarshes was overgrazing, particularly to sand flat type saltmarshes. Similar grazing trends were noted by Curtis and Sheehy-Skeffington (1998), with grazing most frequent along

the west coast and grazing much rarer along the east coast were also seen during this survey. Grazing along the west coast involves both cattle and sheep, sometimes together. Both cattle and sheep create low closely cropped uniform swards, depending on grazing intensity. The only difference between cattle and sheep is the increased poaching on cattle-grazed saltmarshes. The impact of grazing is generally related to the stocking levels, with saltmarsh better able to cope with higher sheep stocking levels than higher cattle stocking levels. Natural grazing can also be significant. This survey noted that Atlantic salt meadows were more vulnerable to the impacts of overgrazing compared to Mediterranean salt meadows.

Most studies and reports on the impact of grazing on saltmarshes and the management of saltmarshes suggest that light grazing has a positive influence on saltmarshes (Boorman 2003). As well as the direct removal of green shoots by the grazing animals, grazing also reduces the build-up of the surface litter layer. Adam (1990) points out that this could favour plant species diversity but this is only likely to be of overall significance at low grazing densities. At higher grazing intensities the impact of trampling may well outweigh any benefits of the control of the coarser vegetation. Heavy grazing in the lower marsh leads to a lowering of diversity leaving only Common Saltmarsh grass (Dijkema *et al*.1984). This was recorded at Annagh Island.

The absence of grazing or under-grazing promotes the dominance of Twitch (*Elytrigia repens*) in the upper saltmarsh (Dijkema *et al*. 1984, Boorman 2003). (Twitch-dominated vegetation was not considered as part of the Atlantic salt meadow Annex I habitat due to classification (Commission of the European Communities 2003) but can still be considered part of the overall saltmarsh.) The dominance of Twitch in the upper and transitional saltmarsh zones was noted in both the Malahide and Rogerstown Estuaries and these areas were all un-grazed.

Poaching by cattle was a significant negative impact recorded during this survey. However, Bakker (1985) noted that the patches of bare soil created by cattle poaching created niches for pioneer plants to colonise. This was also noted by Boorman (2003) who noted that low trampling intensities provided micro-habitats that allowed pioneer species such as Glasswort and Annual Sea-blite to persist. So even trampling at low intensities can have a positive influence. However, heavy poaching leads to the destruction of the saltmarsh surface. This is caused by cattle in localised sections of many sites and it is more widespread at sites such as Dooaghtry and Annagh Island, which are grazed by sheep. Recent recommendations and guidelines to farmers about the implantation of the EU Nitrates Directive also mention that heavy poaching is to be avoided (Anon. 2005).

Different levels of grazing may benefit birds, mammals, invertebrates and plants differently. This creates a conflict of management objectives. Some waders and wildfowl will only graze within short sward areas created by intensive grazing. Less intensive grazing can create tussocky areas in the upper saltmarsh that are favoured by breeding wildfowl. Invertebrate diversity has been related to diversity in sward height as found in ungrazed saltmarshes (Boorman 2003).

A more detailed examination of the species data from this survey is required to study the impacts of low-moderate grazing intensities on saltmarsh vegetation in Ireland. No major differences in species biodiversity could be observed between grazed and ungrazed saltmarshes. Only at Annagh island was it observed that heavy grazing had affected plant diversity. Some reassessment of the level of poaching and the amount of bare substrate surface that is favourable may be required.

Grazing is therefore an important activity for the continued maintenance of biodiversity and function of saltmarshes. However, it is quite easy to damage the saltmarsh with over-stocking. It can sometimes be difficult to get the balance right between light grazing and the prevention of damage from over-grazing and associated poaching. Ballyteige Nature Reserve is managed by the NPWS who have an agreement with a local farmer to graze the sand dunes with the main aim of enhancing and maintaining plant diversity of the sand dune habitats. However, cattle grazing this site has caused some damage to the saltmarsh in places and this was significant enough to cause the site to fail its conservation assessment. The sand dunes were also heavily grazed during the second visit to Ballyteige this summer and this was probably chiefly caused by an explosion in the rabbit population. Rabbits were even grazing Common Cordgrass! This demonstrates how difficult it is with best intentions to manage grazing, even on a nature reserve.

While damage from grazing may be significant it is repairable and the saltmarsh can quickly recover from damage from grazing and poaching. At some sites it was noticeable that while the grasses were quite long and the site had obviously not been grazed that season, there were signs of poaching still present that were caused grazing in previous seasons. The inundation of the tide will help alleviate the impacts of poaching by ‘levelling’ or ‘smoothing’ the surface of the saltmarsh

Probably the ideal situation on large sites is to have a mosaic of grazed and ungrazed areas (Boorman 2003, Curtis 2003, Adnitt *et al.* 2006). This would maximise the botanical value of the site with positive repercussions for the zoological and ornithological components. This type of grazing pattern is present at sites like Ross and Rathmelton where the shoreline is divided up into different management units adjacent to different farms. At sites like

Mallaranny where there is one single unit this type of management is not suitable as the site is grazed as a commonage creating a uniform sward height. Grazing at these sites is probably better managed by reducing the overall stocking rate somewhat every season until the correct intensity is reached. Grazing on many of the small sites (< 1 ha) probably cannot be managed without great difficulty.

4.2.2 COMMON CORDGRASS

Many older reports and reviews about the management of saltmarsh and invasive species state that Common Cordgrass can have a negative impact on the conservation value of saltmarshes (Gray & Benham 1990). But this general view was formulated in the 1960-1990's and now attitudes towards Common Cordgrass have changed somewhat. Boorman (2003) noted that the threat of Common Cordgrass on saltmarsh in Britain is now less than originally perceived. It is still a common colonist of mudflats but its survival and persistence into later saltmarsh communities is generally limited. Many of the concerns expressed in the 1960s on the possible loss of large areas of mixed species-rich marsh to stands dominated by *Spartina* have proved to be unfounded. McCorry *et al.* (2003) discussed attitudes towards Common Cordgrass and noted that many of the pre-conceived ideas about the impact of Common Cordgrass are ill-founded and that it can have positive impacts as well as negative ones. Lacambra *et al.* (2004) in a review of the status and management of Common Cordgrass in Britain note that the general consensus is Common Cordgrass can be acceptable in the right environment, but attempts to manage, control or disperse it should be in accord with the management objectives for the area and must take account of coastal processes and hydrodynamic conditions.

The impact of Common Cordgrass on the plant diversity and habitat structure and function of established ASM and MSM saltmarsh has probably been over-stated. This survey did not find Common Cordgrass at any sites where it was not already known to be present. There were also few signs of significant spread of Common Cordgrass into ASM and MSM saltmarsh, though it was difficult to assess if Common Cordgrass had spread recently without accurate and detailed baseline data. Common Cordgrass is a prominent part of the lower ASM saltmarsh at most sites where it is present, although it may only be present at low cover values. The extent of ASM saltmarsh with higher Common Cordgrass cover values (20-40%), ASM/*Spartina* mosaic and patches of *Spartina* swards (> 40% Common Cordgrass cover) is quite small at most sites is relation to the rest of the saltmarsh. The only site where some baseline data is available for Common Cordgrass on the ASM (Bull Island) (McCorry 2002), a comparison indicates that its cover has not increased significantly in the past 7 years.

Common Cordgrass does have the potential to spread into *Salicornia* flats and lower their extent. This has been noted in Britain (Lacambra *et al.* 2004). The current survey did not

indicate that Common Cordgrass is spreading into *Salicornia* flats at present. However, Common Cordgrass is present in or adjacent to stands of Glasswort at several sites including Bull Island, Baldoyle, Tramore and Rathmelton. Common Cordgrass may increase in extent at the expense of *Salicornia* flats at these sites in the future. A comparison of the current extent of *Salicornia* flats in Co. Dublin (Baldoyle Estuary, Malahide Estuary and Rogerstown Estuary) to former extent in the 1950's (O'Reilly & Pantin 1957) shows that some of the mudflats areas previously vegetated by Glasswort are now vegetated by *Spartina* swards. However, this expansion of Common Cordgrass at the expense of Glasswort occurred prior to the current assessment period.

There were some signs that Common Cordgrass has spread somewhat on mudflats adjacent to saltmarshes at some of the sites surveyed. However, this survey only examined the impact of Common Cordgrass on the plant communities of the saltmarsh and did not consider its impact on seagrass (*Zostera* spp.) communities, for example, or on wintering waders and wildfowl. Nairn (1986) discussed the spread of Common Cordgrass in Irish estuaries and its probable impact on wintering waders and wildfowl. Common Cordgrass has spread over areas of mudflats formerly used as feeding grounds by waders and wildfowl. However, there is no quantitative data to show that the spread of Common Cordgrass in Irish estuaries has had a negative impact on wintering waterbird populations. In fact in Dublin Bay total wintering bird numbers have generally increased since the 1970s while common Cordgrass was spreading at Bull Island (McCorry 2002). The spread of Common Cordgrass may have affected waterbird numbers at an individual site like Baldoyle where a significant area of mudflats in the estuary was covered but again there is no data to confirm this hypothesis.

The management of Common Cordgrass is still a sensitive issue in Ireland. The International Single Species Action Plan for the Conservation of the Light-bellied Brent Goose (Robinson and Hughes 2005) called for an all-Ireland management plan for Common Cordgrass to be formulated. The Northern Ireland Habitat Action Plan for saltmarsh (Department of the Environment, 2005) also lists as one of its targets the formulation of a management strategy to control Common Cordgrass. There is very little information about the actual overall status of Common Cordgrass in the Republic of Ireland apart from its distribution, which is well documented (Preston *et al.* 2002). There is very little information about its abundance, if it is still spreading on mudflats or if it has reached equilibrium at many sites.

Cooper *et al.* (2006) studied the past and present and future distribution of Common Cordgrass in Northern Ireland. This study modelled the potential distribution of Common Cordgrass based on the known niche of Common Cordgrass and substrate elevation in Northern Irish estuaries. This study was able to identify what sites where vulnerable to the further spread of Common Cordgrass and how much intertidal flat could potentially be lost.

4.2.3 IMPACTS OF SEA LEVEL RISE AND EROSION

Coastal erosion has affected saltmarshes in Britain (Boorman 2003) and coastal squeeze between an eroding seaward edge and fixed flood defence walls has been identified as a major negative impact. The best available information suggests that saltmarshes in the UK are being lost to erosion at a rate of 100 ha a year. There is evidence that coastal erosion in Britain is exacerbated both by the isostatic tilting of Britain towards the south-east, and by climatic change leading to a relative rise in sea level and to increased storminess (Boorman 2003).

However, there were no significant indications of any erosional trends on saltmarshes due to sea level rise at the sites visited. Erosion and accretion was mainly a site specific phenomenon. Coastal erosion in Ireland has been recorded, particularly along the south-east coastline so any national trends in erosion may not have been identified by this survey. An overall trend may not have been identified due to the small sample size. The specific causes of coastal erosion in Ireland are likely to be different compared to Britain.

4.2.4 OTHER NEGATIVE IMPACTS AND ACTIVITIES

Other negative impacts and activities such as dumping and damage from amenity use should be managed on a site by site basis.

4.3 Recommendations

4.3.1 GENERAL RECOMMENDATIONS

The site list should be increased to include saltmarshes from all the coastal counties ensuring an even distribution of surveyed sites around the coast. This would significantly increase the amount of data available for further studies.

There should be some revision of SAC, NHA and SPA boundaries around saltmarsh habitats to include some new habitat identified during this survey and to make sure that the boundaries correspond to the edges of the Annex I habitat on sites where there are discrepancies between the 6 inch map and the aerial photos due to rectification issues. At some sites the mean tide level (the lowest shoreline edge marked on the 6 inch map) was used to mark the designation boundary and the upper shoreline boundary should be used (high spring tide level). This would further protect Annex I saltmarsh habitats present in Ireland.

A further study of the impact of grazing on saltmarshes in Ireland should be carried out. This should include the creation of exclusion plots on some moderate-heavily grazed sites such as Mallaranny, Dooaghtry and Ballyteige. This would allow the formulation of a grazing strategy for different types of saltmarsh

The national distribution and abundance of Common Cordgrass should be assessed along with a study of its potential distribution similar to Cooper *et al.* (2006) and its ecological impact on other components of the intertidal ecosystems (waterbird feeding grounds and Seagrass beds). This monitoring project will significantly aid these assessments and studies by providing accurate baseline information for further monitoring projects. This would allow the formulation of a realistic management strategy for Common Cordgrass in Ireland.

4.3.2 SITE SPECIFIC RECOMMENDATIONS

These are some recommendations for specific management or further study at several of the sites surveyed. They do not include all the specific recommendations for each site to help maintain and enhance the conservation status such as reducing overgrazing etc.

4.3.2.1 Ballyteige

This site contains the Annex I habitat Mediterranean and thermo-Atlantic halophilous scrubs (1420) defined by the presence of Perennial Glasswort. This year's survey suggested that this species may have decreased in abundance. This species, also listed on the Flora Protection order is worthy of further detailed monitoring to assess accurately its current condition.

4.3.2.2 Tawin Island

Sheehy-Skeffington and Curtis (1998) discussed the distribution of Sea Purslane around the coast of Ireland and noted how it was only found at several locations along the western coast of Ireland and was quite rare. This species is much more common along the eastern shore. One of these sites on the western coast was at Tawin Island where it is a species of local distinctiveness and they noted that it had thrived here in an area that was not grazed for some time. Grazing is detrimental to this species. Part of the area where Sea Purslane is found at Tawin island is now being grazed so its presence at this site may be threatened. Grazing should be prevented where this species is present at this site.

4.3.2.3 Mallaranny

This site has a unique creek topography and a low sward height created by sheep grazing. The survey of this site suggested that the creeks were widening and the saltmarsh was eroding due to sheep-mediated erosion. This impact is worthy of further investigation so that the site can be properly managed and a adequate stocking rate can be defined for the site.

4.3.2.4 Rogerstown Estuary

This was one of the largest systems studied during the survey. There are sections that were formerly reclaimed for agriculture but have now fallen into disrepair and embankments have

been breached allowing the tide to flood these areas. These areas are now reverting back to saltmarsh vegetation and changes are similar to 'managed retreat' used to restore former saltmarsh in Britain. Some reclamation work such as opening embankments and re-developing creeks, and a grazing regime would further aid the recovery of saltmarsh in these areas. Some of these areas are owned by Fingal County Council and are adjacent to land owned by Birdwatch Ireland so there are opportunities to enhance the conservation value of this site for vegetation and wintering waterbirds.

4.3.2.5 Bull Island

This site contains the largest area of *Salicornia* flats habitat mapped during the survey. Common Cordgrass is present within this area and has been the subject of control measures by Dublin City Council. This area has also been the subject of several studies examining sedimentation and the spread of Common Cordgrass since the construction of the causeway. The dynamics between the *Salicornia* flats and Common Cordgrass at this site should be studied in more detail as it is the only site where there is baseline information available as well as information at various times between 1965 and 2006. This study would help model the potential of Common Cordgrass to spread into *Salicornia* flats habitat at other sites and formulate a management strategy for its conservation.

The SAC/NHA and nature reserve boundaries that exclude the two golf courses on the site should be revised. There are significant discrepancies, with the excluded areas containing a significant area of saltmarsh.

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6 APPENDICES

Appendix I. Targets for saltmarsh habitats.doc

Appendix II. Field card used during the survey (Saltmarsh field card.doc).

Appendix III. Impacts and Activities influencing the conservation status of the site (adapted from Natura 2000 form).

ATTRIBUTES AND TARGETS OF IRISH SALT MARSH HABITATS

Adapted from 'Common standards monitoring guidance for salt marsh habitats' JNCC 2004.

General salt marsh

Attributes	Assessment	Targets (See Notes)
Habitat Extent:	Baseline habitat map, aerials and transect. Visual assessment of marsh edge, is marsh accreting, eroding or neutral? Evidence of cliff edge toppling, mud mounds or accretional ramp with pioneer species.	No change from baseline unless subject to natural changes. No net erosion – allow 50% erosion, 50% accretion. (Consider impact of long-term geomorphological cycles.) BUT see notes.
Physical Structure: Creeks and pans	Aerial photographs combined with site visit.	No further human alteration to creek patterns or pans. (Major erosion indicated by dissection and enlargement.)
Vegetation Structure: Zonation	Transect Structured walk	Maintain range of variation of zonations typical of the site while taking into account the dynamic nature of the zones. Allow narrowing of one or more zones.
Vegetation Structure: Plant height	Visual assessment of plant height at the stops.	Maintain site specific structural variation in sward. Target is maintain diversity of sward heights (25% tall - 75% short) through whole saltmarsh.
Vegetation Structure: Plant cover	Visual assessment of plant cover at the stops.	Maintain 90% plant cover outside creeks and pans on low-mid and upper saltmarsh. Target is less than 5% poached or bare ground.
Vegetation Composition: Typical Species	Visual assessment of cover at the stops. Using the modified DAFOR scale.	Maintain the presence of characteristic species (listed at bottom) of salt marsh zones (site specific) as follows: Pioneer – (at least one species frequent and another occasional), low-mid marsh - (at least one of *Puccinellia*, *Armeria, Glaux* or *Plantago* dominant, other two listed species at least frequent), mid-upper marsh (at least one listed species dominant and three frequent), terrestrial transition.

Vegetation Composition: Negative indicator species *Spartina anglica*	Areas of *Spartina* mapped. Visual assessment of cover at the stops, using the modified DAFOR scale.	No evidence of recent expansion of *Spartina* into pioneer salt marsh and mid marsh areas. Target is less than 5% cover on sites with no previously known *Spartina* cover No target for *Spartina* expansion on bare mudflats
Other Negative Indicators:	Visual assessment of damage from human activities, such as reclamation, drainage, pollution, vehicle tracks, peat-cutting, turf cutting, poaching and overuse. Saltmarsh constrained by human constructions such as fixed sea walls or embankments?	Damage from human activities should be absent or rare.
Indicators of local distinctiveness:	Confirm the presence of rare plants or certain habitats or other features during site visits.	Maintain the presence and extent of the elements of local distinctiveness. This is site specific.

NOTES – general salt marsh

Attributes	Notes
Habitat Extent:	Problems of erosion and 'natural erosion'. Erosion being a possible indicator of loss of extent. Consider impact of long-term geomorphological cycles. Some systems may be in an eroding or accreting phase for 10s –100s of years. Consider a system like Bay. There may be erosion of salt marshes on one side of the bay and accretion on the other. This is favourable but 'Curtis sites' may be sub-units of these systems and so some may be favourable or unfavourable for extent due to presence of erosion. 50% erosion and 50% accretion means no net change – favourable. Note possible 'coastal squeeze' the landward migration of a saltmarsh in response to sea level rise begin restricted by seawalls, embankments etc. For erosion JNCC recommend: Where there is erosion and natural landward migration of saltmarsh – this is favourable. Where there is erosion and landward migration of saltmarsh is being restricted by artificial sea wall or embankment, this is unfavourable. Where there is erosion and landward migration of saltmarsh is being restricted by natural embankment, this is favourable. Curtis and SS note that many of the western salt marshes are eroding at present. Small losses in extent may not be recognised by examination of aerial photos and maps.
Physical Structure: Creeks and pans	
Vegetation Structure: Zonation	Note reversed vegetation succession with pioneer communities in mid-high marsh areas 'coastal squeeze'. Target is no loss of one or more salt marsh zones. In some western marshes there may be no zonation, i.e. saltmarsh has generally uniform vegetation (fringe marshes).
Vegetation Structure: Plant height	Over-grazing likely to affect sward height and possibly plant community diversity. Under-grazing can also be a negative feature but it is not likely to be on western salt marshes according to literature.
Vegetation Structure: Plant cover	This attribute is not listed by JNCC. This attribute is an indicator of overgrazing.
Vegetation Composition:	The JNCC targets have been changed to reflect typical vegetation communities occurring on western salt marshes.

Typical Species	Some species have been substituted for other species but expected diversity has not been changed Typical vegetation communities are site specific with some sites missing 'zones' etc. Curtis 2003 notes the replacement of *Puccinellia maritima* on the lower parts of some western salt marshes with *Juncus gerardii* and *Festuca rubra*, which are more typical of upper salt marsh. Transitions to terrestrial habitats may or may not be present.
Vegetation Composition: Negative indicator species: *Spartina anglica*.	
Other Negative Indicators:	
Indicators of local distinctiveness:	

Spartina swards (not assessed as Annex I but see notes)

Attributes	Assessment	Targets
Habitat Extent:	Baseline habitat map and aerials.	No target for loss of extent. As it is a possible invasive species, target for increases in extent is less than 10% expansion in less than 10 years into pioneer salt marsh and mid marsh areas (at the expense of 1310 *Salicornia* on mud and 1330 Atlantic salt meadows). No target for *Spartina* expansion on bare mudflats. See notes.
Vegetation Structure: Zonation	Transects.	Maintain range of variation of zonations typical of the site while taking into account the dynamic nature of the zones. (Note any transitional zones *Spartina – Salicornia*, *Spartina* - Atlantic)
Vegetation Composition: Typical Species	Visual assessment of cover at the stops. Using the modified DAFOR scale.	Maintain the presence of species-poor swards with characteristic species *Spartina* +/- other species (*Salicornia spp., Puccinellia maritima, Aster tripolium, Suaeda maritima*).
Other Negative Indicators:	Visual assessment of damage from human activities, such as reclamation, drainage, pollution, vehicle tracks, peat-cutting, turf cutting, poaching and overuse.	Damage from human activities should be absent or rare.
Indicators of local distinctiveness:	Confirm the presence of rare plants or certain habitats or other features during site visits.	Maintain the presence and extent of the elements of local distinctiveness. This is site specific.

NOTES – *Spartina* swards

Attributes	Notes
Habitat Extent:	Only *Spartina* swards is to be assessed in this way. Scattered clumps of *Spartina* on mudflats or within salt marsh vegetation may not be classed as *Spartina* swards. Spartina may be present in both 1310 *Salicornia* on mud and 1330 Atlantic salt meadows.
Vegetation Composition:	In the UK stands of this Annex I type have only been considered for selection as SACs where they are dominated by *Spartina maritima*, *S. alterniflora*, or support the rare and local hybrid *S.* x *townsendii*. The two significant stands of these species known in the UK have both been included within the SAC series. *Spartina* swards are only listed as a qualifying interest (1320) at two sites Ballyteige and Malahide Estuary. The stands of the widely-planted *S. anglica* have not been considered as worthy of extensive listing at many sites as an Annex I habitat (NPWS memo). Status of *S. maritima* and *S. x townsendii* in Ireland is unclear. They have been recorded in the past but records have not been verified for some time. Possible presence of 'varied forms' of *Spartina* (varied genotype such as 'dwarf' forms) may allow correspondence with the Annex I habitat 1320 *Spartina* swards (Spartinion maritimae).

Salicornia and other annuals colonising mud and sand

Attributes	Assessment	Targets
Habitat Extent:	Baseline habitat map and aerials.	No change from baseline unless subject to natural changes.
Physical Structure: Creeks and pans	Aerial photographs combined with site visit.	No further human alteration to creek patterns or pans
Vegetation Structure: zonation	Transect. Structured walk.	Maintain range of variation of zonations typical of the site while taking into account the dynamic nature of the zones. (Note any transitional zones *Spartina* – *Salicornia*, *Salicornia* - Atlantic)
Vegetation Composition: Typical Species	Visual assessment of cover at the stops. Using percentage cover.	Maintain the presence of species-poor communities with characteristic species *Salicornia* +/- other species (*Puccinellia maritima*, *Aster tripolium*, *Suaeda maritima*).
Vegetation Composition: Negative indicator species: *Spartina anglica*.	Areas of *Spartina* mapped. Visual assessment of cover at the stops, using the modified DAFOR scale.	No evidence of recent expansion of *Spartina* into pioneer salt marsh areas dominated by *Salicornia* spp. Target is less than 10% expansion in less than 10 years)
Other Negative Indicators:	Visual assessment of damage from human activities, such as reclamation, drainage, pollution, vehicle tracks, peat-cutting, turf cutting, poaching and overuse.	Damage from human activities should be absent or rare.
Indicators of local distinctiveness:	Confirm the presence of rare plants or certain habitats or other features during site visits.	Maintain the presence and extent of the elements of local distinctiveness. This is site specific.

Atlantic salt meadows

Attributes	Assessment	Targets
Habitat Extent:	Baseline habitat map and aerials.	No change from baseline unless subject to natural changes.
Physical Structure: Creeks and pans	Aerial photographs combined with site visit.	No further human alteration to creek patterns or pans (Major erosion indicated by dissection and enlargement)
Vegetation Structure: zonation	Transect.	Maintain range of variation of zonations typical of the site while taking into account the dynamic nature of the zones. (Note any transitional zones low to mid marsh, mid to high marsh, high marsh to terrestrial).
Vegetation Structure: Plant height	Visual assessment of plant height at the stops.	Maintain site specific structural variation in sward. Target is maintain diversity of sward heights (25% tall - 75% short) overall.
Vegetation Structure: Plant cover	Visual assessment of plant cover at the stops.	Maintain 95% plant cover outside creeks and pans on low-mid and upper saltmarsh. Target is less than 5% poached or bare ground.
Vegetation Composition: Typical Species	Visual assessment of cover at the stops. Using percentage cover.	Maintain the presence of characteristic species (listed at bottom) of salt marsh zones (site specific) as follows: Pioneer – (at least one species frequent and another occasional), low-mid marsh - (at least one of *Puccinellia*, *Armeria, Glaux* or *Plantago* dominant, other two listed species at least frequent), mid-upper marsh (at least one listed species dominant and three frequent), terrestrial transition.
Vegetation Composition: Negative indicator species: *Spartina anglica*.	Areas of *Spartina* mapped. Visual assessment of cover at the stops, using the modified DAFOR scale.	No evidence of recent expansion of *Spartina* into pioneer salt marsh and mid marsh areas. Target is less than 10% expansion in less than 10 years.
Other Negative Indicators:	Visual assessment of damage from human activities, such as reclamation, drainage, pollution, vehicle tracks, peat-cutting, turf	Damage from human activities should be absent or rare.

	cutting, poaching and overuse. Bare-mud extent < 25%	
Indicators of local distinctiveness:	Confirm the presence of rare plants or certain habitats or other features during site visits.	Maintain the presence and extent of the elements of local distinctiveness. This is site specific.

Mediterranean salt meadows

Attributes	Assessment	Targets
Habitat Extent:	Baseline habitat map and aerials.	No change from baseline unless subject to natural changes.
Physical Structure: Creeks and pans	Aerial photographs combined with site visit.	No further human alteration to creek patterns or pans
Vegetation Structure: zonation	Transect.	Maintain the overall diversity of habitats while taking into account the dynamic nature of the zones. (Note any transitional zones Atlantic-Mediterranean, Mediterranean –terrestrial).
Vegetation Structure: Plant height	Visual assessment of plant height at the stops.	No targets.
Vegetation Structure: Plant cover	Visual assessment of plant cover at the stops.	Maintain 95% plant cover outside creeks and pans on low-mid and upper saltmarsh. Target is less than 5% poached or bare ground.
Vegetation Composition: Typical Species	Visual assessment of cover at the stops. Using the modified DAFOR scale.	Maintain the presence of species-poor communities with characteristic species. See notes.
Vegetation Composition: Negative indicator species: *Spartina anglica*.	Areas of *Spartina* mapped. Visual assessment of cover at the stops, using the modified DAFOR scale.	No evidence of recent expansion of *Spartina* into pioneer salt marsh and mid marsh areas. Target is less than 10% expansion in less than 10 years.
Other Negative Indicators:	Visual assessment of damage from human activities, such as reclamation, drainage, pollution, vehicle tracks, peat-cutting, turf cutting, poaching and overuse.	Damage from human activities should be absent or rare.
Indicators of local distinctiveness:	Confirm the presence of rare plants or certain habitats or other features during site visits.	Maintain the presence and extent of the elements of local distinctiveness. This is site specific.

NOTES – Mediterranean salt meadows

Vegetation Composition:	There are some problems with the classification of this habitat. In UK they have put *Juncus maritimus*-dominated stands into 1330 Atlantic Salt Meadows (JNCC website). NVC communities that are included within 1330 Atlantic Salt Meadows include SM 15 *Juncus maritimus – Triglochin maritima* salt-marsh community and SM 18 *Juncus maritimus* salt-marsh community. EU habitats Manual defines **1410 Mediterranean salt meadows (*Juncetalia maritimi*)** as **1)** Various Mediterranean communities of the *Juncetalia maritimi*. The different associations are described under point 2) with their characteristic plant species. Sub-types : 15.51 - tall rush saltmarshes dominated by *Juncus maritimus* and/or *J. acutus* 15.52 - short rush, sedge and clover saltmarshes (*Juncion maritimi*) and humid meadows behind the littoral, rich in annual plant species and in *Fabacea* (*Trifolion squamosi*) 15.53 - mediterranean halo-psammophile meadows *(Plantaginion crassifoliae)* 15.54 - Iberian salt meadows (*Puccinellion fasciculatae)* 15.55 - halophilous marshes along the coast and the coastal lagoons (*Puccinellion festuciformis)* **2)** Plants : *Juncus maritimus*, *J. acutus, Carex extensa*, *Aster tripolium*, *Plantago cornuti*, *Scorzonera parviflora (*15.51*)*; *Hordeum nodosum*, *H. maritimum Trifolium squamosum*, *T. michelianum*, *Alopecurus bulbosus*, *Carex divisa*, *Ranunculus ophioglossifolius*, **Linum maritimum (*15.52); *Plantago crassifolia*, *Blackstonia imperfoliata*, *Centaurium tenuiflorum*, *Orchis coriophora* ssp. *fragans (*15.53*)*; *Puccinellia fasciculata*, *Aeluropus littoralis*, *Juncus gerardii (*15.54); *Puccinellia festuciformis (*15.55*)*; *Artemisia coerulescens* So it seems that the EU allows the J. *maritimus*-dominated stands to be classified as 1410 Mediterranean salt meadows (*Juncetalia maritimi*). The UK have a different view in this However, the order Juncetalia maritimi is not recognised as a phytosociological unit by White and Doyle 1982, Adam 1990 or Rodwell 2000. Plant associations dominated by *J. maritimus* are placed within alliance Armerion maritimae (order Glauco-Puccinellietalia) by Rodwell 2000 and Wymer 1984.

pioneer zone	**low-mid marsh**	**mid-upper marsh**
Salicornia spp.	*Puccinellia maritima*	*Festuca rubra*
Suaeda maritima	*Triglochin maritima*	*Juncus gerardii*
Puccinellia maritima	*Plantago maritima*	*Armeria maritima*
Aster tripolium	*Atriplex portulacoides*	*Agrostis stolonifera*
	Aster tripolium	*Limonium humile*
	Spergularia maritima	*Glaux maritima*
	Suaeda maritima	*Seriphidium maritimum*
	Salicornia spp.	*Plantago maritima*
	Glaux maritima	*Aster tripolium*
	turf fucoids	*Juncus maritimus*
		Triglochin maritima
		Blysmus rufus
		Eleocharis uniglumis
		Artemisia maritima
		Leontodon autumnalis
		Carex flacca
		Carex extensa
		turf fucoids

SITE NAME (CURTIS): *Site name from curtis list*			**CURTIS NO REF**
DISCOVERY MAP NO. *number*			**COUNTY:** *name*
NPWS SITE NAME: *SAC/NHA name*			**GRID REF:** *number*
NPWS SITE DESIGNATION	**SAC**	*NPWS code*	**AERIAL PHOTO(S):** *number*
	NHA	*NPWS code*	**NPWS SITE AREA (HA):** *area from man plan/natura form etc*
	SPA	*NPWS code*	**SURVEY DATE(S):** *date*
	N/A		**RECORDER(S):** *Names*
PROJECT SITE CODE: number			
SALTMARSH TYPE: *Curtis type*			**SUBSTRATE TYPE** Sand/mud/peat/other

ANNEX I HABITATS PRESENT

	1310	*Salicornia* and other annuals colonizing mud and sand
	1320	*Spartina* swards (Spartinion maritimae)
	1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
	1410	Mediterranean salt meadows (Juncetalia maritimi)

DESCRIPTION OF SITE (details on location, access, landscape)

TOPOGRAPHY(note topographic features, micro-relief, creeks and pans, size of pans slope, dominant zone)

ADJACENT HABITATS (note transitional terrestrial habitats with Fossit codes and description if present.

COASTAL SQUEEZE AND EROSION (presence or absence of artificial restraints like sea walls and embankments, could salt marsh move landward? Is site eroding?)

ACTIVITIES (Grazing, land use, etc within site/outside site)

OTHER DETAILS (Conservation measures, other features)

FLORA AND FAUNA OF NOTE (Comments from earlier surveys included here.)

IMPACTS AND ACTIVITIES

- Intensity of the influence of an activity is rated as: A = high, B = medium and C = low influence.
- Indicate if the influence is positive or negative using the following rating: -2=irreparable negative influence , -1=repairable negative influence, 0= neutral, +1= natural positive influence and +2= strongly managed postive influence.

Code	Category	Intensity			Impact					Habitat	% area damage	Inside/ Outside
	Agriculture, forestry	A	B	C	-2	-1	0	1	2			
100	Cultivation											
101	Modification of cultivation practice											
102	Mowing/Cutting											
103	Agricultural improvement											
120	Fertilisation											
140	Grazing											
141	Abandonment of pastoral systems											
142	Overgrazing by sheep											
143	Overgrazing by cattle											
146	Overgrazing by hares, rabbits, small mammals											
147	Overgrazing by geese											
149	Under-grazing											
150	Restructuring agricultural land holding											
170 *171*	Stock feeding											
180	Burning											
190	Agricultural activity not referred to above											
	Fishing, hunting & collecting											
200	Fish and Shellfish aquaculture											
210	Professional Fishing											
211	Fixed location fishing											
220	Leisure fishing											
221	Bait digging											
240	Taking/Removal of Fauna (General)											
243	Trapping, poisoning, poaching											
250	Taking/Removal of Flora (General)											
290	Hunting, fishing/collecting activities not referred to above											
	Mining & extraction of materials											
300	Sand and Gravel extraction											
302	Removal of Beach Materials											
310	Peat Extraction											
311	Hand-cutting of peat											
	Urbanisation, industrialisation & similar activities											
400	Urbanised areas, human habitation											
410	Industrial or commercial areas											
420	Discharges											
421	Disposal of household waste											
422	Disposal of industrial waste											
423	Disposal of inert materials											
430	Agricultural structures											
440	Storage of materials											
490	Other urbanisation, industrial and similar activities											
	Transportation & communication											
500	Communication networks											
501	Paths, tracks, cycling tracks											
502	Routes/autoroutes											
503	Railway lines											
504	Port areas											
507	Bridge, viaduct											
509	Other communication network											
510	Energy transport											
511	Electricity lines											
	Transportation & communication (cont.)											
512	Pipelines											
513	Other forms of energy transport											
520	Shipping											
530	Improved access to site											
590	Other forms of transportation and communication											
	Leisure & tourism											
600	Sports and leisure structures											
601	Golf course											
607	Sports pitch											
608	Camping & caravans											
620	Outdoor sports and leisure activities											
621	Nautical sports											
622	Walking, horseriding & non-motorised vehicles											

Code	Category	Intensity			Impact					Habitat	% area of damage	Inside/ outside
		A	B	C	-2	-1	0	1	2			
623	Motorised vehicles											
629	Other outdoor sports & leisure activities											
	Pollution & other human impacts/activities											
700	Pollution											
701	Water pollution											
703	Soil pollution											
709	Other forms or mixed forms of pollution											
710	Noise nuisance											
720	Trampling, overuse											
790	Other pollution or human impacts/activities											
	Human induced changes in hydraulic conditions (wetland & marine environments)											
800	Landfill, land reclamation & drying out in general											
801	Polderisation											
802	Reclamation of land from sea, estuary or marsh											
803	Infilling of ditches, dykes, ponds, pools, marshes or pits											
810	Drainage											
811	Management of aquatic & bank veg^{n} for drainage purposes											
820	Removal of sediments (muds)											
840	Flooding											
850	Modification of hydrographic functioning, General											
851	Modification of marine currents											
853	Management of water levels											
860	Dumping, depositing of dredged deposits											
870	Dykes, embankments, artificial beaches, General											
871	Sea defence/coastal protection works											
	Natural processes (biotic & abiotic)											
890	Other human induced changes in hydraulic conditions											
900	Erosion											
910	Silting up											
920	Drying out											
930	Submersion											
940	Natural catastrophes											
941	Inundation											
943	Collapse of terrain, landslide											
944	Storm, cyclone											
948	Fire (natural)											
949	Other natural catastrophes											
950	Biocoenotic evolution											
951	Accumulation of organic material											
952	Eutrophication											
953	Acidification											
954	Invasion by a species											
960	Interspecific faunal relations											
963	Introduction of disease											
970 *971*	Interspecific floral relations											
	Competition											
975	Lack of pollinating agents											
979	Other forms or mixed forms of Interspecific floral competition											
990	Other natural processes											

Site name: **Site Code:** **Date:** **Recorder:** **GPS Machine:**

Attribute	Targets at each stop	Stop #	Stop #	Stop #	Stop #	No. Stops Passed
Structure Creeks and pans	*no alteration, structure intact*					
Vegetation structure Zonation	*Are transitional zones present?*					
Typical Species	*note any additional species* *no target*					
Sward density	*Is sward dense or fragmented?* *% cover* *No target*					
Evidence of recent expansion signs of seedlings	*No target*					
	No estimate of attributes in Spartina swards					
Extent Erosion/ accretion	*note signs (mud mounds, cliff toppling, accreational ramps etc)* *overall accretion or erosion?* *No target* *Assess in future prospects*					
Other negative indicators	*any reclamation, vehicle tracks and other damaging activities* *Assess in future prospects*					
	GPS easting					
	GPS northing					
Notes						

Site name: **Site Code:** **Date:** **Recorder:** **GPS Machine:**

Attribute	Targets at each stop	Stop #	Stop #	Stop #	Stop #	No. Stops Passed
Structure **Creeks and pans**	*no alteration, target is structure intact*					
Vegetation structure **Zonation**	*Are transitional zones present?* *Target is some stops with transitional zonation*					
Typical Species	*note any additional species* *target is Salicornia +/- other species*					
Sward density	*Is sward dense or fragmented?* *No target*					
Negative indicator species *Spartina*	*Current Spartina density* *No target*					
Negative indicator species *Spartina*	*Target is less than* ***10% expansion*** *in less than 10 years* *Signs of expansion?*					
	Estimate of Attributes					
Extent **Erosion/ accretion**	*note signs, overall accretion or erosion?* *Assessed in future prospects*					
Other negative indicators	*any reclamation, and other damaging activities* *Assessed in future prospects*					
	GPS easting					
	GPS northing					
Notes						

Site name: **Site Code:** **Date:** **Recorder:** **GPS Machine:**

Attribute	*Targets at each stop*	Stop #	Stop #	Stop #	Stop #	No. Stops Passed
What Zone?	*Pioneer/low/mid/ upper*					
Structure Creeks and pans	*no alteration, structure intact*					
Vegetation structure Sward height	*Target is 25% tall - 75% short over whole saltmarsh*					
Vegetation structure Plant cover	*Target is less than 10% poached or bare ground.*					
Vegetation structure Zonation	*Are transitional zones present? Target is some stops with zonation*					
Typical Species						
Negative indicator species *Spartina*	*Current Spartina density % No target*					
Negative indicator species *Spartina*	*Target is less than 10%* ***expansion*** *in less than 10 years Signs of expansion?*					
	Estimate of Attributes					
Extent Erosion/ accretion	*note signs, overall accretion or erosion? Assessed in future prospects*					
Other negative indicators	*any reclamation, and other damaging activities Assessed in future prospects*					
	GPS easting					
	GPS northing					
Notes						

Site name: **Site Code:** **Date:** **Recorder:** **GPS Machine:**

Attribute	***Targets at each stop***	**Stop #**	**Stop #**	**Stop #**	**Stop #**	**No. Stops Passed**
What Zone?	*Pioneer/low/mid/ upper*					
Structure Creeks and pans	*no alteration, structure intact*					
Vegetation structure Sward height	*Target is 25% tall - 75% short over whole saltmarsh*					
Vegetation structure Plant cover	*Target is less than 10% poached or bare ground.*					
Vegetation structure Zonation	*Are transitional zones present?* *Target is some stops with zonation*					
Typical Species	*Dom by J. maritimus/J. acutus > 50%* *Pucc. f. meadows*					
Negative indicator species *Spartina*	*Current Spartina density %* *No target*					
Negative indicator species *Spartina*	*Target is less than 10%* ***expansion*** *in less than 10 years* *Signs of expansion?*					
	Estimate of Attributes					
Extent Erosion/ accretion	*note signs, overall accretion or erosion?* *Assessed in future prospects*					
Other negative indicators	*any reclamation, and other damaging activities* *Assessed in future prospects*					
	GPS easting					
	GPS northing					
Notes						

APPENDIX III: Impacts and Activities influencing the conservation status of the site (adapted from Natura 2000 form). *The original list supplied from Brussels has been modified slightly for NPWS use, with the recent addition of certain categories (in italics).*

CODE	CATEGORY
	Agriculture, Forestry
100	Cultivation
101	modification of cultivation practices
102	mowing/cutting
103	*agricultural improvement*
104	*removal of limestone pavement*
110	Use of pesticides
120	Fertilisation
130	Irrigation
140	Grazing
141	abandonment of pastoral systems
142	*overgrazing by sheep*
143	*overgrazing by cattle*
144	*overgrazing by deer*
145	*overgrazing by goats*
146	*overgrazing by hares, rabbits, small mammals*
147	*overgrazing by geese*
148	*overgrazing, general*
149	*undergrazing*
150	Restructuring agricultural land holding
151	removal of hedges and copses
152	*removal of scrub*
160	General Forestry management
161	forestry planting
162	artificial planting
163	forestry replanting
164	forestry clearance
165	removal of undergrowth
166	removal of dead and dying trees
167	exploitation without replanting
168	*felling of native or mixed woodland*
170	Animal breeding
171	stock feeding
180	Burning
190	Agriculture and forestry activities not referred to above

APPENDIX 7, continued

Fishing, hunting and collecting

200 Fish and Shellfish Aquaculture
210 Professional fishing
211 fixed location fishing
212 trawling
213 drift-net fishing
220 Leisure fishing
221 bait digging
230 Hunting
240 Taking/Removal of fauna, general
241 collection (insects, reptiles, amphibians.....)
242 taking from nest (falcons)
243 trapping, poisoning, poaching
244 other forms of taking fauna
250 Taking/Removal of flora, general
251 pillaging of floristic stations
290 Hunting, fishing or collecting activities not referred to above

Mining and Extraction of Minerals

300 Sand and gravel extraction
301 quarries
302 removal of beach materials
310 Peat Extraction
311 hand-cutting of peat
312 mechanical removal of peat
320 Exploration and extraction of oil or gas
330 Mines
331 open cast mining
332 underground mining
340 Salt Works
390 Mining and extraction activities not referred to above

Urbanisation, industrialisation and similar activities

400 Urbanised areas, human habitation
401 continuous urbanisation
402 discontinuous urbanisation
403 dispersed habitation
409 other patterns of habitation
410 Industrial or commercial areas

411 factory
412 industrial stockage
419 other industrial/commercial areas
420 Discharges
421 disposal of household waste
422 disposal of industrial waste
423 disposal of inert materials
424 other discharges
430 Agricultural structures
440 Storage of materials
490 Other urbanisation, industrial and similar activities

Transportation and communication

500 Communication networks
501 paths, tracks, cycling tracks
502 routes, autoroutes
503 railway lines, TGV
504 port areas
505 airport
506 aerodrome, heliport
507 bridge, viaduct
508 tunnel
509 other communications networks
510 Energy transport
511 electricity lines
512 pipe lines
513 other forms of energy transport
520 Shipping
530 Improved access to site
590 Other forms of transportation and communication

Leisure and Tourism
(some included under different headings)

600 Sport and leisure structures
601 golf course
602 skiing complex
603 stadium
604 circuit, track
605 hippodrome
606 attraction park
607 sports pitch

608 camping and caravans
609 other sport/leisure complexes
610 Interpretative centres
620 Outdoor sports and leisure activities
621 nautical sports
622 walking, horseriding and non-motorised vehicles
623 motorised vehicles
624 mountaineering, rock climbing, spieleology
625 gliding, delta plane, paragliding, ballooning
626 skiing, off-piste
629 other outdoor sports and leisure activities
690 Other leisure and tourism impacts not referred to above

Pollution and other human impacts/activities

700 Pollution
701 water pollution
702 air pollution
703 soil pollution
709 other forms or mixed forms of pollution
710 Noise nuisance
720 Trampling, overuse
730 Military Manoeuvres
740 Vandalism
790 Other pollution or human impacts/activities

Human induced changes in hydraulic conditions (wetlands and marine environments)

800 Landfill, land reclamation and drying out, general
801 polderisation
802 reclamation of land from the sea, estuary or marsh
803 infilling of ditches, dykes, ponds, pools, marshes or pits
810 Drainage
811 management of aquatic and bank vegetation for drainage purposes
820 Removal of sediments (mud ...)
830 Canalisation
840 Flooding
850 Modification of hydrographic functioning, general
851 modification of marine currents
852 modifying structures of inland water course
853 management of water levels
860 Dumping, depositing of dredged deposits

870 Dykes, embankments, artificial beaches, general
871 sea defence or coastal protection works
890 Other human induced changes in hydraulic conditions

Natural processes (biotic and abiotic)

900 Erosion
910 Silting up
920 Drying out
930 Submersion
940 Natural catastrophes
941 inundation
942 avalanche
943 collapse of terrain, landslide
944 storm, cyclone
945 volcanic activity
946 earthquake
947 tidal wave
948 fire (natural)
949 other natural catastrophes
950 Biocœnotic evolution
951 accumulation of organic material
952 eutrophication
953 acidification
954 invasion by a species
960 Interspecific faunal relations
961 competition (example: gull/tern)
962 parasitism
963 introduction of disease
964 genetic pollution
965 predation
966 antagonism arising from introduction of species
967 antagonism with domestic animals
969 other forms of mixed forms of interspecific faunal competition
970 Interspecific floral relations
971 competition
972 parasitism
973 introduction of disease
974 genetic pollution
975 lack of pollinating agents
976 damage by game species
979 other forms or mixed forms of interspecific floral competition
990 Other natural processes