Saltmarsh Monitoring Project 2007-2008

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Comhshaol, Oidhreacht agus Rialtas Áitiúil
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Summary

The Saltmarsh Monitoring Project (SMP) was designed to meet the monitoring obligations of the EU Habitats Directive with regard to Annex I saltmarsh habitats in Ireland. The initial phase of the survey was carried out in 2006 and involved the survey of 31 sites (McCorry 2007). A monitoring methodology was developed for Irish saltmarsh habitats based on guidelines produced by the JNCC (2004) and the Cmmission of the European Communities (2006). This system is based on vegetation surveys, and assessments of threats and management practices. The current phase of the project mapped and assessed the conservation status of the following Annex I saltmarsh habitats at an additional 100 sites around the coast of Ireland.

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

Spartina swards were mapped where present but were not assessed at each site surveyed.

The current phase of the SMP mapped a total of 1890 ha of Annex I saltmarsh habitat at 100 different sites and carried out 1429 monitoring stops in total (Table i). In combination with the data collected from McCorry (2007) this will provide an excellent resource for the future monitoring of Irish saltmarshes. Unless otherwise stated, all of the results and data presented in this report refer to the 100 sites surveyed in 2007-2008.

Table i. Total area of each Annex I saltmarsh habitat and *Spartina* sward surveyed during 2007-2008 (100 sites), 2006-2008 (131 sites), estimates of total national area of each habitat and the percentage of each habitat surveyed during the two phases of the SMP.

	Total Surveyed Area (ha)			
Habitat	**2007-2008 (100 sites)**	**2006-2008 [1]**	**estimated National Area [2]**	**% national area surveyed by two phases of SMP**
1310	67.53	107.7	183 [3]	59
1330	1,002.81	1,462.35	2,590	56
1410	416.12	584.19	1,000	58
1420	0.358	1.088	1.1	99
Spartina sward	403.16	527.29	1,520	35
Total	**1,889.98**	**2,682.35**	**5,300**	

[1] Includes Annex I habitats surveyed during 2006 (McCorry 2007) (131 sites).
[2] See Section 3.3.
[3] Based on a proportion of the total estimated national area of saltmarsh.

Achieving Favourable Conservation Status is the overall objective for all Annex I habitat types of European Community interest listed in the Habitats Directive (Commission of the European Communities 2006). 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. Monitoring of habitats involves establishing a series of targets that define the desired condition of a habitat attribute, e.g. it is considered desirable that saltmarsh habitats were not overgrazed. Assessment of

conservation status follows a rule-based approach and involves the evaluation of four parameters – Range, Area (Extent), Structures and Functions, and Future Prospects. The method of assessing conservation status uses a 'Traffic light' system, with habitat condition rated as *favourable* (F), *unfavourable-inadequate* (UI) or *unfavourable-bad* (UB). A UB assessment of any of the four parameters assessed results in an overall rating of UB.

An assessment of the conservation status of the latter parameters (excluding range) was derived for each habitat at the site level. Changes in area were estimated by examining old maps. Structure and Functions was assessed by collecting data at a representative number of stops across each habitat. A suite of indicators of condition was derived and targets were set for each indicator. A certain number of targets had to be reached for a monitoring stop to pass. The proportion of passes or fails was used to assess the Structure and Functions parameter. Future Prospects were assessed by determining the impact of positive and negative activities at the site.

Impacts on Irish saltmarsh habitats (2007-2008)

The main impacts noted were identical to those noted in the first phase (McCorry 2007):

- grazing by livestock,
- Common Cordgrass (*Spartina anglica*) (invasive species),
- infilling, reclamation and other impacts related to coastal development.

This phase of the SMP found that only 8.3 ha of saltmarsh had been infilled, reclaimed or destroyed by other activities related to coastal development at the 100 sites surveyed, representing a loss of only 0.5% of the overall area of mapped Annex I saltmarsh habitat (ASM & MSM). Some significant destructive damage to saltmarsh was also caused by maintenance works on adjacent seawalls used for coastal defence.

Erosion and accretion also affects saltmarsh but both of these are natural processes and saltmarsh will attempt to adjust or reach equilibrium in response to climatic and local changes. In general while there were frequent physical signs of erosion observed at many sites, there was very little evidence of actual measurable saltmarsh loss or saltmarsh retreat during the current monitoring period. There were only 6 sites where erosion was assessed as having an irreparable influence on either ASM or MSM. This was related to the artificial constraint of saltmarsh habitats by landward coastal defences or structures like roads, so there was limited or no capacity for landward retreat at these sites. The methodology did not consider natural erosion as an unfavourable condition. The SMP is a baseline survey so erosional changes may become more apparent through future monitoring surveys

Accretion was also noted at many sites (34). Some of these sites are quite dynamic and some of the recent saltmarsh growth may be ephemeral and is likely to be continually re-worked. However, saltmarsh growth at other sites is likely to be part of long term accretion trend. At several sites continued accretion has promoted the development of *Spartina* swards.

Overall gross changes to the lower saltmarsh boundary in the past 100 years were also analysed using GIS by comparing the current extent of saltmarsh to the former extent as indicated by the OSI 2nd edition 6 inch maps. These data estimates that 17.5 ha of saltmarsh were eroded away at the surveyed sites during this period. However, 255.6 ha of saltmarsh were also newly developed. Sites with saltmarsh growth were more common in the northern

half of the country. (This analysis did not consider changes to the upper saltmarsh boundary.)

Impacts on *Salicornia* flats

This habitat has a much more limited extent compared to established saltmarsh with only 68 ha mapped, and its site-by-site distribution varied significantly. About 84% of the total area mapped during 2007-2008 was found at only two sites. Most saltmarshes contained < 0.01 ha of this habitat. There were few impacts on *Salicornia* flats and this is related to its position at the seaward end of the saltmarsh zonation, where there is less pressure from coastal development and much less grazing pressure. The most significant impact was the presence of Common Cordgrass and this invasive species has the capacity to spread into this habitat and reduce its extent in the future. Therefore its future prospects at many sites (18 out of 48) were assessed as *unfavourable*.

Impacts on Atlantic salt meadows (1330) and Mediterranean salt meadows (1410)

Atlantic salt meadows (ASM) was the most extensive saltmarsh habitat mapped during the 2007-2008 survey with 1002 ha mapped (forming 53% of the total saltmarsh area) while 416 ha of MSM was also mapped (22%).

The main impacts on ASM and MSM were related to unsustainable heavy grazing by livestock, which created low closely cropped swards with areas badly damaged by poaching in the most badly damaged areas. About 58% of the ASM and 70% of the MSM surveyed during the project was grazed by sheep and/or cattle. However, only 3.1% of the ASM and 0.3% of the MSM was assessed as being overgrazed by sheep while 11.9% of ASM and 9% of MSM was being overgrazed by cattle. Cattle generally cause more damage compared to sheep and this is related to poaching damage caused during grazing. This was frequently confined to sections of the saltmarsh where there was increased traffic, such as access points and tracks. The overall impact of grazing by livestock on MSM was generally lower compared to ASM as Sea Rush (*Juncus maritimus*) is generally unpalatable and not grazed by sheep or cattle and sheep will generally avoid dense tall vegetation dominated by Sea Rush.

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 and/or Sea Purslane, and also containing frequent Glasswort and Annual Sea-blite. It has significantly altered the sward structure (sward height is higher and denser) in this zone and created *Spartina* sward habitat in former pioneer and low zone saltmarsh. Common Cordgrass appears most frequently as clumps in the lower-mid saltmarsh zone but is generally not dominant, with cover values most frequently between 1-5%. Even though *Spartina* swards are well-developed at many saltmarshes, there was very little quantitative evidence that this species was spreading, however it should be noted that this was a baseline survey. It was only found at one new site where it had not been recorded in the past. Common Cordgrass did not have a significant impact on MSM, as MSM generally occupies the upper saltmarsh zone and Common Cordgrass generally does not successfully invade this type of saltmarsh.

There were frequent signs of some natural succession of *Spartina* swards to ASM communities at the landward side of these stands at many sites. *Spartina* swards in this situation are acting as a pioneer saltmarsh community and taking part in the natural functioning of the saltmarsh.

A desktop resource assessment was made using GIS of the actual area of former ASM that has been 'replaced' by *Spartina* sward and ASM/*Spartina* sward mosaic at sites surveyed during 2007-2008. This estimated that 74.3 ha of established saltmarsh had been replaced by habitats with Common Cordgrass. This represented about 6.9% of the overall amount of former established ASM.

Impacts on Halophilous scrub (1420)

This habitat was defined by the presence of Perennial Glasswort (*Sarcocornia perennis*) in saltmarsh vegetation in Ireland. Few impacts and activities affect this habitat, which is related to its very small extent in Ireland; being only found in Bannow Bay, Fethard Bay and Ballyteige in Co. Wexford (estimated national total is 1.1 ha). The habitat was only recorded at four sites during the 2007-2008 survey, whilst a fifth site, Grange at the mouth of Bannow Bay, has in the past number of years been largely destroyed due to coastal erosion. The loss of this site and the vulnerability of the habitat due to even small impacts due to its relatively small extent were the main reasons for the overall assessment of conservation status as *unfavourable-bad*.

While invasive Common Cordgrass is generally thought to out-compete most saltmarsh species in the lower marsh zone, it seems to have provided new habitat for colonisation by Perennial Glasswort. Perennial Glasswort was found in newly developed areas of *Spartina* sward/ASM mosaic at several sites, indicating it has recently colonised this habitat. Several clumps of Perennial Glasswort are being threatened by infilling adjacent to a track at one site.

Conservation assessments of sites surveyed in 2007-2008

The results from the 2007-2008 survey indicate that the majority of Annex I saltmarsh habitat area currently had an *unfavourable* (inadequate or bad) conservation status when habitats were assessed on a site-by-site basis (Figure A). However, the overall failed number of monitoring stops in each habitat was generally much lower compared to the actual area assessed as *favourable* or *unfavourable* with 4.2% of *Salicornia* flats stops failing, 16% of ASM stops failing and 6.1% of MSM stops failing. This indicates that the failed stops had a significant influence on conservation status assessment on a site-by-site basis and were quite widely distributed. In the case of halophilous scrub (1420), it should be noted that the assessment in Figure A does not take into account the sites where it was no longer present, which would have resulted in an unfavourable-bad rating.

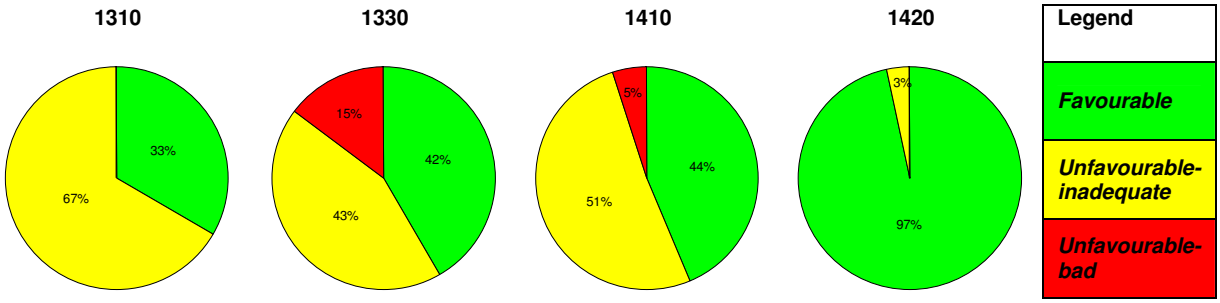

Figure A. Overall conservation status assessment (traffic light system) of saltmarsh habitats assessed on a *site-by-site basis* during 2007-2008 (100 sites) according to total habitat areas within each category.

Alternatively, when the habitats were assessed on the basis of area, the overall percentage assessed as *favourable* is even lower, particularly in the case of *Salicornia* flats and MSM. However, as a small number of unfavourably rated sites can contain the majority of the national resource, it was felt that this was not necessarily a true reflection of the national conservation status and that combining the data from the monitoring stops was more representative of the true status of the habitat.

Updated national overview

The national conservation status assessments of Irish saltmarsh habitats as reported in 'EU protected habitats and species in Ireland' (NPWS 2008) have been updated by combining data from McCorry (2007) and this phase of the SMP (Table ii). Overall, both ASM and MSM have been assessed at a national level as *unfavourable-inadequate,* mainly due to impacts such as over-grazing and infilling. The overall *Future Prospects* of *Salicornia* flats were assessed as *unfavourable-bad* and this was manly due to the potential negative impact of the spread of Common Cordgrass in the future at the expense of this habitat. The overall *Extent* of Halophilous scrubs was assessed as *unfavourable-bad* as it has recently disappeared from 2 of the 7 sites known to have contained this habitat within the current monitoring period.

Table ii. National conservation status of Annex I saltmarsh habitats.

Habitat	Range	Extent	Structure and functions	Future Prospects	Overall
1310	Favourable	Unfavourable-inadequate	Unfavourable-inadequate	Unfavourable-bad	Unfavourable-bad
1330	Favourable	Unfavourable-inadequate	Unfavourable-inadequate	Unfavourable-inadequate	Unfavourable-inadequate
1410	Favourable	Favourable	Unfavourable-inadequate	Unfavourable-inadequate	Unfavourable-inadequate
1420	Favourable	Unfavourable-bad	Favourable	Unfavourable-inadequate	Unfavourable-bad

Conclusions

When the entire 2007-2008 data set was amalgamated, the estimated area of damaged habitat was significantly reduced, with only 10% of MSM and 16% of ASM estimated to be in poor condition (estimated from amalgamated monitoring stops). These figures are supported by data from assessment of areas affected by various impacts and activities that indicated < 15% of the ASM and 9% of the MSM was damaged by overgrazing. The methods of assessment used during this project may have over-emphasised some negative indicators. Some of the 'damage' caused by grazing is very localised and seems to be a typical feature of saltmarshes grazed by cattle and perhaps the targets need to be adjusted to take this into account.

Grazing is an important management tool for the continued maintenance of biodiversity and function of saltmarshes. However, it is quite easy to damage the saltmarsh with over-stocking. Saltmarsh can, however, recover from heavy grazing relatively quickly. The impact of under-grazing on saltmarshes (or abandonment of grazing practises) was probably not assessed adequately during the SMP project. This was because vegetation communities that tend to be promoted by the lack of grazing, such as Twitch, Sea Club-rush and Common Reed-dominated vegetation, were not actually classified as part of Annex I vegetation.

A significant area of *Spartina* swards was mapped during the project (403 ha) representing 21% of the overall saltmarsh habitat. It is now estimated that there is 1520 ha of *Spartina* swards nationally. Data from this survey shows that the majority of *Spartina* swards in Ireland

have developed on intertidal mudflats and not on saltmarsh. So while impacts on established Annex I saltmarsh habitats may not be as significant as previously thought, this species may be having impacts on other Annex I habitats such as mudflats (1140). Common Cordgrass still has the capacity to spread to new sites, such as in the larger estuaries and bays of the west coast. *Spartina* swards are also likely to continue to consolidate at sites where it has only colonised relatively recently. Some increases would be expected in the extent of *Spartina* swards at the expense of *Salicornia* flats or ASM, with the majority of its increase at the expense of mudflats. However, natural succession of *Spartina* swards into vegetation more typical of ASM is likely to continue in the future, so there may be some reduction in extent of *Spartina* swards at older sites.

There are no indications of an overall trend towards coastal erosion of saltmarshes or any climate-change induced erosion of saltmarshes in Ireland. There is no evidence that Irish saltmarshes are eroding at similar rates to those found in Britain. However, it should be stressed that this is predominantly a baseline survey. Any trends will only become apparent in future monitoring of sites.

About 87% of the Annex I habitat mapped during the project was located in cSACs and an additional 5.6% was located within pNHAs at sites not designated as cSACs. The percentage failure rate of monitoring stops within undesignated saltmarsh (39.7%) was over double of the failure rate in designated saltmarsh (17.1%), indicating that designated sites were more likely to be in better condition. However, most of the ASM and MSM damaged by infilling, reclamation and other impacts was located within cSACs.

Main Recommendations

- Some badly damaged sites would benefit from significantly reduced stocking rates while other sites would probably benefit from a small reduction in stocking rates or localised management of badly damaged sections. However, care should be taken that grazing is not abandoned altogether, as this may also have negative impacts on conservation status.
- A general policy of active Common Cordgrass control in Irish saltmarshes is not recommended. Any available resources should be used to prevent the spread of this species to new sites, specifically along the west coast of Ireland and to eradication of new populations. There is very little rationale in attempting to control Common Cordgrass at large sites like the Shannon Estuary or Dundalk Bay where there is very limited likelihood of success without considerable outlay of resources. Perhaps *Spartina* swards in Ireland should now be considered as a pioneer saltmarsh community that can take part in the natural ecosystem functioning and succession of Irish saltmarsh communities.
- There is no evidence from this project to conclude that saltmarsh erosion needs to be directly managed. Most recent research suggests that the natural dynamism of coastal habitats such as saltmarshes should be preserved and that processes such as erosion and accretion should be allowed to occur naturally. Conservation policies should be directed towards maintaining supply of sediment and preserving natural dynamism. The best way to mitigate any saltmarsh loss in the future is to re-create saltmarsh habitat using managed retreat. There are several examples of 'accidental retreat' in Ireland where seawalls have been breached and reclaimed land has reverted back to saltmarsh.

- Significant patches of undesignated Annex I habitat have been identified. Boundary revisions to existing designated sites should be considered, or alternatively these areas could qualify for natural heritage area (NHA) designation.
- The value of using Halophilous scrub (1420) for conservation designations and as a qualifying interest for cSACs in Ireland should be re-evaluated. While one of the primary indicator species, Perennial Glasswort, is present, it is not a prominent part of the saltmarsh vegetation over most of its distribution, becoming frequent on only a few small areas.
- The use of Mediterranean salt meadows (1410) as an Annex I habitat classification in Ireland should also be re-evaluated. There is no saltmarsh habitat classified as MSM in the UK, even though Britain does contain similar vegetation dominated by Sea Rush. Such vegetation is classified as ASM in the UK.

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ABBREVIATIONS

agg.	aggregate
ASM	Atlantic salt meadows
CMP	Coastal Monitoring Project
cSAC	candidate Special Area of Conservation
MSM	Mediterranean salt meadows
NPWS	National Parks and Wildlife Service
pNHA	potential National Heritage Area
SMP	Saltmarsh Monitoring Project
sp.	species
spp.	number of species

1 INTRODUCTION

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 deposited by the sea. 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, an example of which is O'Reilly and Pantin (1957) who focused on the vegetation and ecology of saltmarshes in Dublin estuaries. Most research has been academic and many theses describe the vegetation, ecology and other aspects of various saltmarshes (e.g. Ni Lamnha 1982, O'Connor 1992). Some of the studies have focused on one particular species such as Wallace (1995) 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 environmental impact statements and coastal management plans that focus on other issues also contain useful information and data related to saltmarshes such as ESB International (1996) who studied the impacts of the Bull Island causeway and Murray (2003) who examined the impacts of the Broadmeadow Water Estuary motorway bridge on saltmarsh habitats. Records by Cummins, (1930), Praeger (1932) and Doyle (1934) were very useful to tracking the initial appearance of Common Cordgrass in Ireland.

There has been some examination of the overall ecology and conservation of saltmarsh habitats. Wymer (1984) examined the phytosociological classification of Irish saltmarshes while Nairn (1986) and McCorry *et al.* (2003) focused on different aspects of the ecological 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. Prior to the Saltmarsh Monitoring Project, there has been no qualitative assessment of the conservation status of Irish saltmarshes.

The Saltmarsh Monitoring Project mapped and assessed the conservation status of Annex I saltmarsh habitats at a total of 131 sites around the coast of Ireland. The initial Saltmarsh Monitoring Project carried out in 2006 assessed the conservation status of saltmarsh habitats at 31 sites (McCorry 2007), while the current phase assessed a further 100 sites. The data from both projects will provide accurate baseline information about the extent and condition of Annex I saltmarsh habitats for future monitoring projects.

The following Annex I habitats were mapped and assessed:

- *Salicornia* and other annuals colonising mud and sand (1310)

- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330)
- Mediterranean salt meadows (Juncetalia maritimi) (1410)
- Mediterranean & thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420)

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 candidate Special Areas of Conservation (cSACs) were listed as having *Spartina* swards (1320) as a qualifying interest. It has now been decided by NPWS that these stands are not worthy of designation, as Common Cordgrass is not considered to be native in Ireland (see Section 4.5 for further discussion). The extent of *Spartina* swards was mapped at these sites and particular attention was given to the distribution of Common Cordgrass, as it is considered to be an invasive species of saltmarshes and one of several threats to Irish saltmarsh.

This survey was designed to meet the monitoring objectives of the EU Habitats Directive with regard to saltmarsh habitats in Ireland and follows on from the methodology used by (McCorry 2007). This was 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.

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 (Commission of the European Communities 2006). 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 was established by the Scientific Working Group of the Habitats Committee. The scheme has developed over several iterations and the version that was used during this project is: DocHab 04-03/03-rev. 3: Annex E (Commission of European Communities 2006). This scheme is referred to as the 'Traffic light' system with habitat condition rated as *favourable* (F), *unfavourable-inadequate* (UI) or *unfavourable-bad* (UB) (Table 2.1).

Table 2.1. Summary matrix of the parameters and conditions required to assess the conservation status of habitats (Commission of European Communities 2006).

	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

Estimation of conservation status of for each habitat currently involves assessment of four parameters – Range, Area (Extent), Structures and Functions, and Future Prospects. As range could not be applied to the assessment of each individual saltmarsh site, the system employed in the present survey involved consideration of the three remaining criteria as outlined in Table 2.1.

Extent and structure and functions were considered to be in *Favourable* condition if they had remained stable since the previous monitoring or most recent survey. As the surveys were baseline in most cases best expert judgement was used. If future prospects were thought to be good, then they may be assigned favourable status. A decline in extent of 1% or >1% led to *Unfavourable–inadequate* or *Unfavourable–bad* judgements, respectively, for Area. Structure and functions were thought to be *unfavourable–inadequate* if they had undergone a 1-25% decline, or *Unfavourable–bad* if they have undergone a >25% decline.

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

Monitoring of habitats involved establishing a series of targets that defined the desired condition of habitat attributes, e.g. it was considered desirable that saltmarsh habitats were

not overgrazed. Assessments of the selected attributes were 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.

2.2 Assessment of saltmarsh habitats

The following generalised attributes were assessed for Irish Annex I saltmarsh habitats. This list is based on attributes used during the initial Saltmarsh Monitoring Project 2006 (McCorry 2007). 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). They were selected to help monitor accurately the main impacts that affect Irish saltmarshes. These main impacts include over-grazing, infilling and reclamation, erosion, the spread of invasive Common Cordgrass and amenity use. 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. Natural erosion was not considered unfavourable. Physical signs of erosion were taken together with measurable loss of saltmarsh using GIS and assessment of potential retreat as a negative indicator. 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.

Common Cordgrass is an invasive species that is found on saltmarshes around the coast of Ireland. It has the capacity to spread on unvegetated mudflats adjacent to the saltmarsh and into the lower saltmarsh zones, creating *Spartina* swards and various habitat mosaics. Monitoring the abundance and distribution of Common Cordgrass allowed the assessment of its potential impact on Irish saltmarsh vegetation.

Although the next reporting period under the Habitats Directive is 2013 and covers the period from 2007, all of the site surveys are essentially baseline. Therefore, the current monitoring period was set as the period covering 1995 till 2007-2008, taking the pNHA (potential National

Heritage Area) survey and the OSI 1995 digital aerial photo series as the baseline where information was available. The pNHA survey contained useful information on the overall extent and status of some of the sites but there was very little specific information available about Annex I habitats or saltmarsh.

2.2.1 Habitat extent

The assessment of habitat extent was based on the stability of the habitat over the monitoring period. If a habitat was stable – with loss and expansion in balance – or increasing, then conservation status was assessed as *favourable*. A decline in area of up to 1% within a reporting period resulted in a conservation status assessment of *unfavourable–inadequate*, while a greater rate of decline (> 25%) led to a conservation status assessment of *unfavourable–bad.* Assessment of habitat extent took into account losses and gains due to erosion, accretion, or transformation to other semi-natural habitats that are natural processes within saltmarsh habitats. Best expert judgement was used in some cases.

Current habitat area was measured at each site by using a combination of OSI digital aerial photos (Year 2000 series and 2005 series – which actually covers the period 2003 and 2004) and GPS ground-truthing along habitat boundaries. (See Section 2.6 for a description of how habitat extents were calculated including the use of mosaics.) A visual assessment was made of erosion and/or accretion affecting the saltmarsh habitat during the field survey. Assessments of erosion were also carried out during monitoring stops (on a localised area). A further assessment was then made by comparing the current habitat extent to previous sets of aerial photos, 6 inch OSI maps and older NPWS habitat maps to see if habitat area had changed significantly due to erosion or 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, the loss of extent was measurable (percentage loss depends on the monitoring period), and there was no or limited potential for natural retreat of the saltmarsh habitat (i.e. habitat restricted by a sea wall), then habitat extent was assessed as *unfavourable* (> 1% loss). Signs of 'natural' erosion (which were frequently encountered) were not used as an indicator for *unfavourable* assessment of extent (See Section 3.4.2.6).

It such be noted that this assessment was dependant on accurate baseline data from older NPWS habitat maps, pNHA survey and aerial photos. This method was unsuitable to record small changes (on a scale of 5-10 m gain or loss) in saltmarsh extent during the monitoring period due to the relative accuracy of ortho-recification of the aerial photos. At some sites there was a shift of 5-10 m in position between the aerial photo series. Older NPWS habitat maps (generally produced during a desktop process for management plans and NATURA 2000 explanatory notes) were also generally not accurate enough for recording changes in extent caused by erosion. Other natural factors such as natural transition to other habitats (e.g. saltmarsh being covered by sand-dunes) could also cause changes in extent. These factors were not considered *unfavourable*.

Saltmarsh retreat or growth due to accretion was more noticeable when examining a longer period and comparing current habitat extent to the saltmarsh mapped by the 2nd edition OSI 6 inch map series (mainly mapped from 1910 to 1925). This comparison gave an indication of ongoing geo-morphological trends at sites in association with the visual assessment and was also used when assessing the impact of erosion on future prospects of various habitats.

Habitat area could also be reduced due to infilling, reclamation, dumping etc, and these were much more frequently recorded compared to erosion. This was more easily assessed from a

comparison of the aerial photos and older NPWS habitat maps to current habitat maps produced during the survey. Habitat loss due to reclamation, infilling or other activities had to occur within the current monitoring period for the assessment to be *unfavourable*. Older reclamation works were still visible at some sites and may have affected habitat extent but these were not considered as they occurred outside the current monitoring period.

2.2.2 Habitat structure and functions

Several attributes that reflect various features of the habitat structure and functions were selected for each Annex I saltmarsh habitat (Table 2.2). These attributes were assessed at each monitoring stop (area considered was 10 m X 10 m) 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 5% bare substrate cover for the attribute, vegetation structure – sward cover). Each attribute of habitat structure and functions, and the various target 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 because it is considered an invasive alien species.

Table 2.2. Attributes assessed for Habitat structure and functions.

Attribute	Description
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 such as recent drainage.
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.
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. This attribute was applied to both the ASM and MSM initially. However, during fieldwork it was decided to only consider this attribute when assessing the habitat overall (See Section 3.6.2.3).
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 Table 2.5 for how Annex I saltmarsh habitats were interpreted and how they overlap with pioneer, middle and upper marsh communities. See Appendix I for a list of typical species in each zone.)
Vegetation structure – negative indicators (*Spartina anglica*)	This attribute assessed the impact of Common Cordgrass, which in Ireland 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 (< 10% increase in cover during the reporting period). For sites with no previously known *S. anglica* cover the target was no new sites with this species.
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

Attribute	Description
	affect more than 5% of the habitat extent during the monitoring 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 (Table 2.3). This attribute was site specific.

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 facilitated 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 - indicated an *unfavourable–inadequate* conservation status. More than 2 fails indicated a failure rate of at least 37.5% and gave 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 was 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 was 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. Species nomenclature followed Stace (1997).

Table 2.3. Indicators of local distinctiveness known to occur on Irish saltmarshes. Details of records of these species from the current survey are presented in Section 3.5.1.

Indicator	Description
Borrer's Saltmarsh-grass (*Puccinellia fasciculata*)	Listed on the Flora Protection Order (Anon. 1999) and also in the Red Data Book (Curtis & McGough 1988). It is found in more brackish conditions compared to ASM. Borrer's Saltmarsh-grass is generally found in upper saltmarsh and muddy transitional areas particularly along embankments adjacent to coastal areas. It is an indicator species of a rarer sub-type of MSM. Only found from seven 10 km^2 squares along the Barrow Estuary, Wexford and Dublin shorelines since 1960 (Preston *et al.* 2002).
Divided Sedge (*Carex divisa*)	Divided Sedge is one of several species that is an indicator of MSM. It is extremely rare in Ireland and is only known from three sites in the River Barrow Estuary. Listed as possibly extinct in the Red Data Book (Curtis & McGough 1988) but was re-found and is also listed in the Flora Protection Order (Anon. 1999). Only found in two 10 km^2 squares along the Barrow Estuary since 1960 and there is also a record in one 10 km^2 square in Co.

Indicator	Description
	Antrim near Belfast Lough (Preston *et al.* 2002).
Meadow Barley (*Hordeum secalinum)*	Meadow Barley is found in brackish situations along the upper saltmarsh boundary and in unimproved lowland meadows close to estuaries. It is listed in the Red Data Book (Curtis & McGough 1988) and also in the Flora Protection Order (Anon. 1999). Known from 21 10 km^2 squares in Ireland, mainly distributed around the coastline (with some inland sites) since 1960 (Preston *et al.* 2002).
Perennial Glasswort (*Sarcocornia perennis*)	Rare species listed on the Flora Protection Order (Anon. 1999) and also in the Red Data Book (Curtis & McGough 1988). Indicator species of Halophilous scrubs (1420). This habitat is characterized in Ireland by the presence of Perennial Glasswort on saltmarsh. Distribution confined to Bannow Bay, Ballyteige and Fethard Bay in Wexford. Known from 4 10 km^2 squares in Ireland, since 1960 (Preston *et al.* 2002).
Saltmarsh Flat-rush (*Blysmus rufus*)	This uncommon rush has a fragmented distribution around the coast of Ireland. It is most frequently found on saltmarshes along the north-west coastline.
Sea Purslane (*Atriplex portulacoides*)	This low-lying woody saltmarsh species is mainly confined to the eastern and south-eastern coast of Ireland. It is much less common along the western coast and this has been related to more frequent grazing along this coast (Sheehy-Skeffington & Curtis 2000)
Sea Wormwood (*Seriphidium maritimum*)	This species has a fragmented and local distribution around the coast of Ireland and is found on muddy and rocky coasts and confined to Galway Bay and Shannon Estuary along the west coast.
Sharp Rush (*Juncus acutus*)	This is an indicator species of a rarer sub-type of MSM. Sharp Rush can be found on both saltmarsh and brackish dune slacks. This uncommon species has a scattered distribution along the southern and south-east coast of Ireland.
Rock Sea Lavender (*Limonium binervosum*)	Uncommon shoreline and saltmarsh species (listed as *Limonium recurvum*) in Webb *et al.* (1996)
Sea Couch (*Elytrigia pycnanthus*)	Uncommon grass found in upper saltmarshes along the eastern and south-eastern coasts.
Sea Fern-grass (*Desmazeria marina*)	Uncommon grass found on saltmarsh and other coastal habitats.
Hard-grass (*Parapholis strigosa*)	Uncommon grass found on saltmarsh and other coastal habitats.
Dotted Sedge (*Carex punctata*)	Uncommon sedge found on saltmarsh along the south-west coast of Ireland.
Tasselweed (*Ruppia* spp.)	Uncommon species found in brackish situations including lagoons. Occasionally found in salt pans on saltmarshes.
(Sagino maritimae-Cochlearietum danicae) (Ephemeral saltmarsh vegetation with *Sagina maritima*).	This vegetation community is a rarer Annex I 1310 *Salicornia flats* subtype generally associated with the transition from saltmarsh to sand-dune and has been recorded at several sites in Ireland (Wymer 1984). This transition is usually very narrow (< 1 m wide but sometimes up to 5 m wide) and this plant community is associated with unstable substrate that is affected by erosion or accretion.

2.2.3 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 2.4). Assessments were made during site visits and also from information gathered in relevant reports, and from bodies such as local authorities.

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, was included for each site in the project database. The same information was presented in each site report in the main project report. The intensity of the influence of an activity was rated as A = high, B = medium, C = low influence or D = unknown. The impact was rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.

Table 2.4. Most common impacts and activities affecting saltmarsh habitats (sorted by codes). A full list of impacts and activities and codes is given in Appendix II.

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

Code		Category
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 vegetation 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

Impacts that caused destruction of saltmarsh habitat such as dumping (422), tracks (saltmarsh eroded away) (501), reclamation (802), recent infilling (803), removal of sediment (820) and coastal protection (871) were rated as an irreparable negative influence (although in some cases there is potential for repair in the long-term). Agricultural improvement (103) was also assessed in this way. Reclamation (802) was listed as an impact where former saltmarsh was being used for another activity such as farming or development. Reclamation is usually preceded by infilling (803). This activity was listed as an impact where saltmarsh was infilled but was not being used (yet) for other activities. Infilling has two roles, the elimination of unwanted waste material and reclamation of land. Dumping (422, 423) was listed as an impact where material was recently dumped or where there were no signs the material was being landscaped to infill a portion of the saltmarsh.

Erosion (900) was rated as a *reparable* negative influence (-1) where it was felt there was an erosional trend and there was potential for natural landward retreat of saltmarsh habitats in response to any sea-level rise. Erosion was rated as an *irreparable* negative influence (-2) when it was felt that there was no potential for natural landward retreat due to the presence of hard sea defences such as embankments or roads. Natural processes (990) were also assessed as having a negative influence where species such as Sea Club-rush and Common Reed were spreading into ASM and MSM, possibly promoted by impacts such as nutrient enrichment and under-grazing.

The assessment of the impact of invasive Common Cordgrass (954) was related to its overall cover within Annex I habitats and not its colonisation during the current monitoring period (used in monitoring stops). It was rated as having a reparable negative influence at sites where Common Cordgrass formed a substantial part of the lower and mid marsh zones.

Some impacts were assessed as having a positive influence. Accretion (910) was assessed as a positive influence where there was an overall trend for saltmarsh growth (positive for saltmarsh extent). Natural habitat succession (990) of *Spartina* sward to ASM was also assessed as a positive influence. This natural process was noted at sites where ASM (or ASM/*Spartina* mosaics) had developed in areas where there was no saltmarsh mapped on the 2nd edition OSI 6 inch map and it was felt that the current habitat condition was not created by Common Cordgrass spreading into established saltmarsh, (which also produces ASM/*Spartina* mosaics). Over-grazing or damaging grazing was assessed as a positive

impact on the status of Borrer's Saltmarsh-grass, as this colonising species seems to prefer open habitats with bare substrate such as poached cattle tracks. Other disturbance caused by grazing or sediment removal could have positive impacts on the extent of 1310 *Salicornia* flats, which is a habitat found in disturbed ground higher in the saltmarsh. Breaches in embankments (870) where previously reclaimed saltmarsh was reverting back to saltmarsh were also assessed as having a positive influence.

On considering the overall affect of all impacts and activities, the future prospects of each habitat were 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 was 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 was assessed as being in *favourable* condition. When the structure and functions of a habitat were assessed as *unfavourable-bad* and this is related to a particular impact, activity or management regime, then the future prospects were also generally assessed in most cases as *unfavourable-bad.* This assessment assumed the current management or level of impacts and activities would 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 were thought to fall between the above extremes, led to an *unfavourable–inadequate* assessment.

2.2.4 Definition of Annex I habitats in an Irish context

Annex I habitats were defined following the Interpretation Manual of EU Annex I Habitats (Commission of the European Communities 2003) (Table 2.5). Some interpretation of each Annex I habitat in an Irish context was also required (Tables 2.5 & 2.6). 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) was also useful for defining plant associations found in Ireland that correspond both to the phytosociological order Glauco-Puccinellietalia maritimae. Saltmarsh vegetation was described and classified by Wymer (1984) and this source is also very useful for listing plant associations in various alliances of the order Glauco-Puccinellietalia maritimae.

There is some overlap according to the Interpretation Manual of EU Annex I Habitats (Commission of the European Communities 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 were defined solely by the presence of Perennial Glasswort (*Sarcocornia perennis*).

The phytosociological classification of stands of Sea Rush has caused some difficulty in the past (Adam 1990). MSM is defined as containing various Mediterranean communities of the Juncetalia maritimi and several different associations are described with characteristic species (Commission of the European Communities 2003). The main sub-type of MSM (15.51) was defined as tall/short saltmarshes dominated by Sea Rush (*Juncus maritimus*) or Sharp Rush (*J. acutus*). However, the order Juncetalia maritimi was not recognised as a phytosociological unit by White and Doyle (1982), Adam (1990) or Rodwell (2000). Plant associations dominated by Sea Rush were placed within the alliance Armerion maritimae

(order Glauco-Puccinellietalia) by Rodwell (2000). White and Doyle (1982) include one association containing Sea Rush as a diagnostic species 'Junco maritimi-Oenanthetum lachenalii' within the Armerion maritimae alliance.

Wymer (1984) identified several different communities with Sea Rush as a dominant component including Junco maritimi-Oenanthetum lachenalii. This association only refers to vegetation found in the upper saltmarsh. Other communities include a *Juncus maritimus*-Armerion maritimae community and *Halimione portulacoides-Juncus maritimus* community and these were both placed within the Armerion maritimae alliance. An additional community called species-poor *Juncus maritimus* stands. This community included pioneer Sea Rush vegetation spreading on intertidal mud and this was tentatively placed by Wymer (1984) within the class Astereta Tripolii. In the current survey MSM vegetation was identified according to the description presented in Table 2.5.

Meadow Barley (*Hordeum secalinum*) is listed as a characteristic species of sub-type 15.51 - tall/short saltmarshes dominated by Sea Rush (*Juncus maritimus*) or Sharp Rush (*J. acutus*). However, this species is not found associated with this community in Ireland so it was not used as a diagnostic species for MSM. Some sites containing Borrer's Saltmarsh-grass and Divided Sedge were also included in cSACs that were listed as containing MSM as a qualifying interest with these two species being character species for MSM. Borrer's Saltmarsh-grass is listed as a characteristic species of sub-type 15.53 - Mediterranean halo-psammophile meadows *(*Plantaginion crassifoliae*)*. This order has not been formally recognised in Ireland and saltmarsh vegetation containing Borrer's Saltmarsh-grass was placed within the association Puccinellietum fasciculatae (order Puccinellio-Spergularion) by White and Doyle (1982). While the various phytosociological classifications may not correspond, for the purposes of this survey, saltmarsh with Borrer's Saltmarsh-grass or Divided Sedge was classified as MSM.

Saltmarsh habitats may also occur in mosaics that may also be transitional between various saltmarsh habitats such as *Spartina* swards and ASM. Saltmarshes may also contain other vegetation such as stands of Common Reed, Sea Club-rush, Grey Club-rush and Twitch-dominated vegetation. These communities were not classified as part of the Annex I habitats. They were usually classified and mapped as other saltmarsh vegetation (CM2), although some of the stands of Common Reed and Sea Club-rush in estuaries and associated with saltmarsh should be classified as FS2 (Tall Reed communities) according to the Fossitt (2000) habitat classification.

Table 2.5. 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, although their presence was noted. 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 were commonly found along the seaward edge of saltmarshes and surrounding saltmarsh creeks and salt pans were not classified as this Annex I habitat but

Code	Habitat	Definition
		were classified as pioneer ASM vegetation. Common Cordgrass may be present but must be less than 40%, otherwise it is considered as part of a *Spartina* sward. A sub-type called Ephemeral saltmarsh vegetation with *Sagina maritima* (Sagino maritimae-Cochlearietum danicae) is also classified as this Annex I habitat type. This community is found in the transitional zone of upper saltmarsh and fixed dunes at some sites and may found a very narrow zone (< 1 m wide).
1320	*Spartina* swards (Spartinion)	*Spartina* swards in Ireland are dominated by Common Cordgrass. However, NPWS considers that these stands are not considered worthy of designation as this species is not considered native in Ireland. *Spartina* swards were therefore not classified as the Annex I habitat, 1320. 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. Included 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-Triglochin 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 included any other unique Irish communities as defined by Wymer (1984). Common Cordgrass may be present but must be less than 40%, otherwise it is considered as part of a *Spartina* sward.
1410	Mediterranean salt meadows (Juncetalia maritimi)	Defined by the presence of stands on saltmarsh dominated by Sea Rush and Sharp Rush. Cover of Rushes must be greater than 20%. Vegetation is either dominated by rush species or characterised by scattered tussocks of these species. The distribution of Sea Rush may encroach above the upper saltmarsh boundary and tussocks may be found within adjoining transitional brackish habitats such as wet grassland. The upper zone of the MSM may contain some cover of species such as Purple moor-grass. Sharp Rush is generally distributed along the upper saltmarsh boundary and can be found in adjacent habitats such as fixed dune vegetation or transitional grassland. The upper saltmarsh boundary was taken where other terrestrial dune species become frequent. Vegetation on saltmarsh containing Borrer's Saltmarsh-grass also classified as MSM. Vegetation on saltmarsh containing Divided Sedge also classified as MSM.
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	Defined by the presence of Perennial Glasswort (*Sarcocornia perennis*) on saltmarsh (previously known as *Arthrocnemum perenne*). The extent of Halophilous scrubs was mapped by drawing boundaries around clusters of individual *S. perennis* plants noted by GPS. The fact that this habitat is categorized by a single species that is generally not frequent in cover leads to difficulties in establishing the extent, characteristics and structure of Halophilous scrubs. It is generally found in saltmarsh vegetation that would otherwise be classified as ASM or *Spartina* swards if *Sarcocornia perennis* was not present.

Table 2.6. Relationship between Annex I habitats and Fossitt (2000) habitat classification.

Habitat	Zone	Fossitt (2000) habitat class
1310 (sub-types with *Salicornia* spp. or *Suaeda maritima*)	pioneer	CM1 Lower salt marsh (however can be found in all zones in disturbed areas or in creeks and pans)
1310 (sub-type with Ephemeral saltmarsh vegetation with *Sagina maritima)*	upper transitional	CM2 Upper saltmarsh/ CD3 Fixed dunes
1320	lower lower mid	CM1 Lower salt marsh
1330	lower lower-mid	CM1 Lower salt marsh
1330	mid-upper	CM2 Upper salt marsh. (Communities characterised by prominence of Red Fescue, Creeping Bent and rushes. Generally only submerged by spring tides.)
1410 (sub-type dominated by Sea Rush)	all zones	Mainly CM2 Upper salt marsh. (However MSM dominated by Sea Rush can be classified as CM1 Lower salt marsh at many sites where it dominates the saltmarsh, and/or there is little zonation and is found in the lower zones.)
1410 (sub-type dominated by Sharp Rush)	upper transitional	Mainly CM2 Upper salt marsh. Mainly appears in transitional zone between CM2 Upper saltmarsh and CD3 Fixed dunes.
1410 (sub-types containing Borrer's Saltmarsh-grass or Divided Sedge)	upper transitional	Mainly CM2 Upper salt marsh. However, both species can appear in brackish transitional zones that could be classified as Wet grassland (GS4).
1420	lower	CM1 Lower Salt Marsh. However, Perennial Glasswort can be found in other zones including CM2 Upper salt marsh on shingle (CB1).

2.3 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 2.7). This inventory lists the majority of the larger saltmarshes found in Ireland. Several other small sites were identified during the desktop survey for national Conservation Status Assessment and small patches of habitat were identified at many other sites around the coast, particularly along the western shoreline (see Section 2.7). The overall distribution and extent of saltmarsh including sites surveyed during fieldwork and saltmarsh identified during the desktop survey is presented in a single GIS ESRI shapefile (smp_national_sm_resource.shp, see Table 2.8). Site selection also incorporated a large number of sites (surveillance and operational) that require monitoring by the Environmental Protection Agency (EPA) under the Water Framework Directive An original list of 100 sites was selected for survey in 2007 and 2008. Combined with the 31 sites surveyed in the initial survey (McCorry 2007), this list encompassed the variation in Irish saltmarshes with several different saltmarsh types (fringe, estuary, bay, sand flats) and substrates (mud, sand, gravel peat) included. Geographical variation was 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 of the saltmarsh area may be designated. Several sites originally selected to be surveyed had to be substituted by other sites due to difficulties encountered during fieldwork in obtaining site access. The locations of sites around the coast of Ireland are

shown in Figure 2.1. One site surveyed, Buckroney, is not listed by Curtis and Sheehy-Skeffington (1998). This site was selected as MSM containing Sharp Rush was listed as a qualifying interest for the cSAC (candidate Special Area of Conservation) designation covering this site.

Table 2.7. Site list for the Saltmarsh Monitoring Project 2007-2008 (100 sites). Site names generally follow those in Curtis and Sheehy-Skeffington (1998). Numbers relate to Figure 2.1. Note that site codes SMP0058 and SMP0059 are not used.

Number	Site code	Site name	County	NPWS site name	NPWS code
1	SMP0032	Dundalk	Louth	Dundalk Bay	000455
2	SMP0033	Baltray	Louth	Boyne Coast & Estuary	001957
3	SMP0034	Mornington	Meath	Boyne Coast & Estuary	001957
4	SMP0035	Booterstown	Dublin	Booterstown Marsh (pNHA)	001205
5	SMP0036	Kilcoole	Wicklow	The Murrough	002249
6	SMP0037	Buckroney	Wicklow	Buckroney-Brittas Dunes & Fen	000729
7	SMP0038	Castlebridge	Wexford	Slaney River Valley	000781
8	SMP0039	Ferrycarrig	Wexford	Slaney River Valley	000781
9	SMP0040	Rosslare	Wexford	Wexford Slobs & Harbour (pNHA)	000712
10	SMP0041	Bannow Island	Wexford	Bannow Bay	000697
11	SMP0042	Clonmines	Wexford	Bannow Bay	000697
12	SMP0043	Taulaght	Wexford	Bannow Bay	000697
13	SMP0044	Saltmills	Wexford	Bannow Bay	000697
14	SMP0045	Gorteens	Wexford	Bannow Bay	000697
15	SMP0046	Grange	Wexford	Bannow Bay	000697
16	SMP0047	Fethard	Wexford	Bannow Bay	000697
17	SMP0048	Dunbrody Abbey	Wexford	River Barrow & River Nore	002162
18	SMP0049	Killowen	Wexford	River Barrow & River Nore	002162
19	SMP0050	Rochestown	Kilkenny	River Barrow & River Nore	002162
20	SMP0051	Ringville	Kilkenny	River Barrow & River Nore	002162
21	SMP0052	Little Island	Waterford	Lower Rive Suir	002137
22	SMP0053	Dungarvan	Waterford	Dungarvan Bay (pNHA)	000663
23	SMP0054	Kinsalebeg	Waterford	Blackwater River	002170
24	SMP0055	Ballymacoda	Cork	Ballymacoda (Clonpriest & Pillmore)	000077
25	SMP0056	Jamesbrook Hall	Cork	Rostellan Lough, Aghada & Poulnabibe Inlet (pNHA)	001076
26	SMP0057	Bawnard	Cork	Great Island Channel	001058
27	SMP0060	Carrigtohil	Cork	Great Island Channel	001058
28	SMP0061	Rock Castle, Bandon Bay	Cork	Bandon Valley Below Inishshannon (pNHA)	001515
29	SMP0062	Harbour View	Cork	Courtmacsharry Estuary	001230
30	SMP0063	Seafort	Cork	Roaringwater Bay & Islands	000101
31	SMP0064	Ballybrack	Cork	Roaringwater Bay & Islands	000101
32	SMP0065	Ballyrisode House	Cork	Not Designated	N/A
33	SMP0066	Barley Cove	Cork	Barleycove to Ballyrisode Point	001040
34	SMP0067	Dough	Cork	Barleycove to Ballyrisode Point	001040
35	SMP0068	Dereen House	Kerry	Kenmare River	002158
36	SMP0069	Dinish	Kerry	Kenmare River	002158
37	SMP0070	Tahilla	Kerry	Kenmare River	002158
38	SMP0071	West Cove	Kerry	Kenmare River	002158
39	SMP0072	Rossbehy	Kerry	Castlemaine Harbour	000343
40	SMP0073	Cromane	Kerry	Castlemaine Harbour	000343
41	SMP0074	Whitegate, Fybagh	Kerry	Castlemaine Harbour	000343
42	SMP0075	Inch	Kerry	Castlemaine Harbour	000343
43	SMP0076	Emlagh East	Kerry	Emlagh Salt Marshes (pNHA)	001961

Number	Site code	Site name	County	NPWS site name	NPWS code
44	SMP0077	Ballyheige	Kerry	Akeragh, Banna & Barrow Harbour	000332
45	SMP0078	Carrigafoyle	Kerry	Lower River Shannon	002165
46	SMP0079	Barrigone, Aughinish	Limerick	Lower River Shannon	002165
47	SMP0080	Beagh	Limerick	Lower River Shannon	002165
48	SMP0081	Bunratty	Clare	Lower River Shannon	002165
49	SMP0082	Shepperton, Fergus Estuary	Clare	Lower River Shannon	002165
50	SMP0083	Inishdea, Owenshere	Clare	Lower River Shannon	002165
51	SMP0084	Killadysart, Inishcorker	Clare	Lower River Shannon	002165
52	SMP0085	Knock	Clare	Lower River Shannon	002165
53	SMP0086	Querin	Clare	Lower River Shannon	002165
54	SMP0087	Rinevilla Bay	Clare	Lower River Shannon	002165
55	SMP0088	Scanlan's Island	Clare	Galway Bay Complex	000268
56	SMP0089	Kinvarra-West	Galway	Galway Bay Complex	000268
57	SMP0090	Kileenaran	Galway	Galway Bay Complex	000268
58	SMP0091	Tyrone House-Dunbulcaun Bay	Galway	Galway Bay Complex	000268
59	SMP0092	Kilcaimin	Galway	Galway Bay Complex	000268
60	SMP0093	Oranmore North	Galway	Galway Bay Complex	000268
61	SMP0094	Roscam West & South	Galway	Galway Bay Complex	000268
62	SMP0095	Seaweed Point	Galway	Galway Bay Complex	000268
63	SMP0096	Barna House	Galway	Galway Bay Complex	000268
64	SMP0097	Furbo	Galway	Not Designated	N/A
65	SMP0098	Teeranea	Galway	Kilkieran Bay and Islands	002111
66	SMP0099	Lettermullan West	Galway	Kilkieran Bay and Islands	002111
67	SMP0100	Lettermore South	Galway	Kilkieran Bay and Islands	002111
68	SMP0101	Bealandangan	Galway	Kilkieran Bay and Islands	002111
69	SMP0102	Kinvarra	Galway	Kilkieran Bay and Islands	002111
70	SMP0103	Turloughbeg	Galway	Kilkieran Bay and Islands	002111
71	SMP0104	Erriseask	Galway	Slyne Head Peninsula	002074
72	SMP0105	Cleggan	Galway	Not Designated	N/A
73	SMP0106	Aasleagh Falls	Mayo	Mweelrea / Sheeffry / Erriff Complex	001932
74	SMP0107	North Achill Sound	Mayo	Not Designated	N/A
75	SMP0108	Salia West	Mayo	Not Designated	N/A
76	SMP0109	Owenduff, Corraun	Mayo	Lough Gall Bog	000522
77	SMP0110	Doona	Mayo	Tullaghan Bay & Bog (pNHA)	001567
78	SMP0111	Aughness	Mayo	Tullaghan Bay & Bog (pNHA)	001567
79	SMP0112	Tullaghan Bay	Mayo	Tullaghan Bay & Bog (pNHA)	001567
80	SMP0113	Doolough	Mayo	Mullet / Blacksod Bay Complex	000470
81	SMP0114	Bunnahowen	Mayo	Mullet / Blacksod Bay Complex	000470
82	SMP0115	Elly Harbour	Mayo	Mullet / Blacksod Bay Complex	000470
83	SMP0116	Saleen Harbour	Mayo	Mullet / Blacksod Bay Complex	000470
84	SMP0117	Ballysadare Bay	Sligo	Ballysadare Bay	000622
85	SMP0118	Strandhill	Sligo	Ballysadare Bay	000622
86	SMP0119	Cummeen Strand	Sligo	Cummeen Strand / Drumcliff Bay (Sligo Bay)	000627
87	SMP0120	Drumcliff Bay	Sligo	Cummeen Strand / Drumcliff Bay (Sligo Bay)	000627
88	SMP0121	Streedagh Point	Sligo	Streedagh Point Dunes	001680
89	SMP0122	Mullanasole	Donegal	Donegal Bay (Murvagh)	000133
90	SMP0123	Laghy	Donegal	Donegal Bay (Murvagh)	000133
91	SMP0124	Rossmore	Donegal	Donegal Bay (Murvagh)	000133
92	SMP0125	Maghera	Donegal	Slieve Tooey / Tormore Island / Loughros Beg Bay	000190
93	SMP0126	Glen Bay	Donegal	Slieve Tooey / Tormore Island / Loughros Beg Bay	000190

Number	Site code	Site name	County	NPWS site name	NPWS code
94	SMP0127	Sheskinmore-Beagh	Donegal	West of Ardara / Maas Road	000197
95	SMP0128	Roshin Point	Donegal	West of Ardara / Maas Road	000197
96	SMP0129	Keadew	Donegal	Gweedore Bay & Islands	001141
97	SMP0130	Dooey	Donegal	Ballyness Bay	001090
98	SMP0131	Creeslough	Donegal	Sheephaven	001190
99	SMP0132	Rosapenna	Donegal	Sheephaven	001190
100	SMP0133	Tawny	Donegal	Mulroy Bay	002159

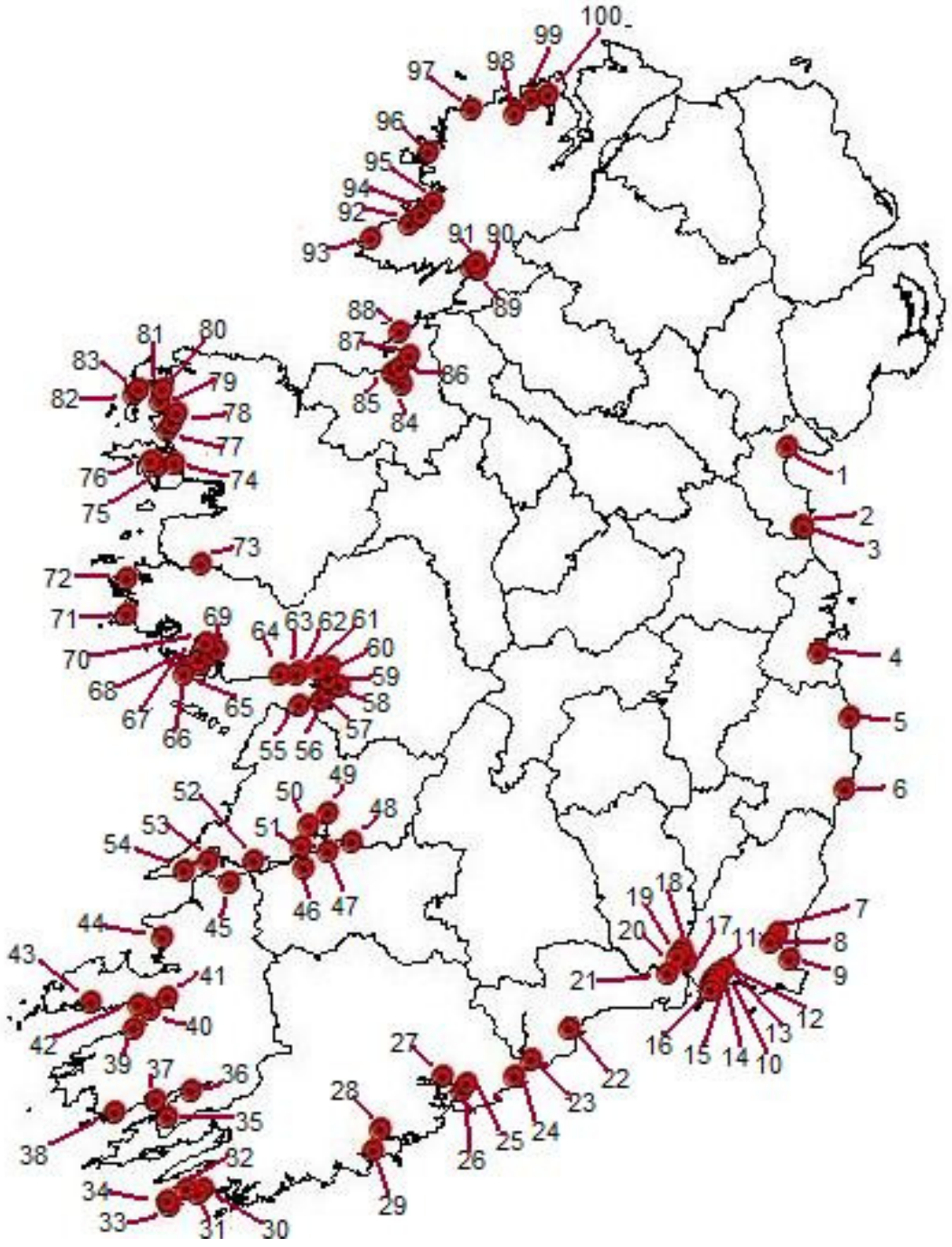

Figure 2.1. Map showing location of sites surveyed in 2007 and 2008 around the coast of Ireland. Numbers relate to the first column in Table 2.6.

2.4 Field Survey

Prior to the field survey, site packs were prepared, which contained aerial photos, 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. Dundalk Harbour) 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. 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 III). Plant species names follow Stace (1997). Other information about management and impacts and activities was recorded during the survey. Any large areas with negative indicators e.g. areas of Common Cordgrass and areas with intensive management or impacts were also mapped using GPS. Positions of notable species were also recorded using GPS. 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.) 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 where habitat change was possible (e.g. in ASM 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.

2.4.1 Boundary mapping and classification of more unusual vegetation types

One of the main issues during habitat mapping was identifying boundaries of habitats. Some boundaries e.g. between ASM and stands of dense MSM were easily identifiable with a distinctive change in vegetation type. However there were other cases where the cover of Sea Rush at the edge of its distribution was quite scattered and sparse. Therefore clumps of Sea Rush could be found within the ASM and the boundary of the MSM was taken when the cover of Sea Rush reached 20%. Larger areas with widespread Sea Rush at low densities were mapped as ASM/MSM mosaics.

There was a similar situation with the boundary between *Spartina* swards and ASM. Sometimes there was a natural transitional zone between these habitats where they were found on a gentle gradient. The boundary of *Spartina* swards was taken were the cover reached 40% so the lower ASM generally contained some Common Cordgrass. At sites where this transitional zone covered a significant area this habitat was sometimes mapped as an ASM/*Spartina* sward mosaic. Most saltmarshes do not have a simple structure with zonation based on a simple seaward gradient. Sites with complicated topographies meant that patches of lower zone vegetation could be surrounded by higher zone vegetation and vice-versa.

At most sites the lower saltmarsh boundary was usually quite distinctive and marked by a small saltmarsh 'cliff' or low pediment created by erosion that varied in height between 0.2->2m high or the boundary between *Salicornia* flats and ASM. Some sites had accretion ridges vegetated with pioneer ASM or *Salicornia* flats. The lower boundary of these areas was taken where the vegetation became too sparse.

Some sites had a distinctive upper saltmarsh boundary that was easily mapped and was marked by features such as embankments or sea walls where adjacent land had been reclaimed. The upper boundary of saltmarsh could also be defined by natural ridges or embankments such as shingle banks, sand dune habitats or naturally steeply-sloping adjacent land. However, many sites had intact transition zones along the upper boundary adjacent to the saltmarsh where there were gentle gradients. Most frequent adjacent habitats included wet grassland and stands of brackish vegetation such as Common Reed and Sea Club-rush. The upper saltmarsh boundary at some of these sites was more difficult to characterise, especially at sites with a low-lying variable topography, where saltmarsh could extend along low-lying channels into adjacent terrestrial land.

Sites with ASM adjacent to the upper boundary at some of these sites were generally easier to survey and identify the upper boundary. Red Fescue may dominate the vegetation on both sides of the upper boundary on a gentle gradient but the appearance of other terrestrial indicators in the vegetation where used to mark the upper boundary such as Mouse-ear (*Cerastium fontanum*) and Birdsfoot (*Lotus corniculatus*). There were occasionally difficulties where heavily grazed saltmarsh transitioned to a machair sward but the latter species and other more typical species were used to characterise the upper boundary.

The upper boundary of MSM on sites with a gentle landward gradient to transitional and terrestrial vegetation was more difficult to characterise. This was quite common on many western sites where MSM had developed on peat adjacent to blanket bog communities. Vegetation with mixed stands of Sea Rush and Purple Moor-grass were common. This transitional vegetation also frequently contained other terrestrial species such as Black Bog-rush (*Schoenus nigricans*). Vegetation in these mixed stands was mapped as MSM where Sea Rush was the dominant part of the community and the upper boundary was taken where Purple Moor-grass or other species became dominant. This classification refers to the original definition of MSM as stands of saltmarsh dominated by Sea Rush.

Several sites were characterised with large areas of MSM saltmarsh vegetation that was positioned at a somewhat higher point above Mean Tide Level than more typical MSM. This vegetation was dominated by Sea Rush but was also characterised by the appearance of other transitional terrestrial species such as Marsh Ragwort (*Senecio aquaticus*), False-Fox Sedge (*Carex otrubae*), Curled Dock (*Rumex crispus*), Creeping Buttercup (*Ranunculus repens*), Jointed Rush (*Juncus articulatus*), Long-leaved Plantain (*Plantago lanceolata*), Ragged Robin (*Lychnis flos-cuculi*), Marsh Thistle (*Cirsium palustre*), Marsh Arrowgrass (*Triglochin palustre*), Birdsfoot (*Lotus corniculatus*), Sea Mayweed (*Tripleurospermum*

maritimum), Yorkshire Fog (*Holcus lanatus*), Sweet-vernal Grass (*Anthoxanthum odoratum*), Bush Vetch (*Vicia sepium*), Marsh Bedstraw (*Galium palustre*), Red Clover (*Trifolium pratense*), Silverweed (*Potentilla anserina*), Twitch, Tall Fescue and Sea Club-rush. Hummocks in the transitional zone also contain frequent moss cover with *Rhytidiadelphus squarrosus* prominent. The appearance of these species did not exclude the vegetation from being classified as saltmarsh as they generally only appeared rarely or occasionally within the vegetation.

2.5 Data collection

A GeoExplorer handheld GPS minicomputer (Trimble GeoXT) was used for recording the locations of the various points. This computer facilitated the collection of data for each point using a data dictionary in the form of drop down menus and text fields that have previously been programmed by the user. Therefore, Habitat points, Monitoring stops, Quadrats, Negative impacts, Features, Photographs and Points of interest could 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.

2.6 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.

Vegetation maps were prepared by dividing a saltmarsh into a series of polygons that represented the distribution of Annex I habitat types and other habitats found along the shoreline. Boundaries between habitats were drawn along GPS points recorded in the field and by using field notes and interpreting aerial photos in other sections. A significant portion of the saltmarsh was mapped as mosaics (See Appendix IV for a full list of mosaics and definitions used during habitat mapping). Percentages for each individual Annex I habitat within a mosaic were usually assigned during fieldwork to calculate final total extents of Annex I habitats at each site. For example, the ASM/MSM mosaic was divided equally between the ASM (50% of the mosaic) and the MSM (50% of the mosaic) when total habitat extents were calculated. The total ASM contained polygons mapped as ASM as well as portions from mosaics such as the ASM/MSM mosaic, ASM/*Spartina* mosaic and ASM/other saltmarsh (CM2) mosaic, where they were mapped (See Appendix IV). Each site report contains an appendix showing how the final habitat extents for each Annex I habitat were calculated.

2.7 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 and a digitised map showing the extent of each habitat.

A GIS project for each site containing 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. For ease of use, the final digitally-based cartographic data was supplied as individual themes that were consolidated into single themes containing all of the particular data fields from all sites (and hence mapping projects) in which it was recorded (Table 2.8).

Table 2.8. List of GIS ERSI shapefiles generated from 2007-2008 fieldwork containing amalgamated GIS site data and other datasets generated during the project.

Name	Description
1310_spp_irl.shp	Contains records (points) of all 2007-2008 quadrats noting species abundance at each monitoring stop that was carried out in this habitat.
1310_stops_irl.shp	Contains records (points) of all 2007-2008 monitoring stops carried out in this habitat.
1330_spp_irl.shp	Contains records (points) of all 2007-2008 quadrats noting species abundance at each monitoring stop that was carried out in this habitat.
1330_stops_irl.shp	Contains records (points) of all 2007-2008 monitoring stops carried out in this habitat.
1410_spp_irl.shp	Contains records (points) of all 2007-2008 quadrats noting species abundance at each monitoring stop that was carried out in this habitat.
1410_stops_irl.shp	Contains records (points) of all 2007-2008 monitoring stops carried out in this habitat.
1420_spp_irl.shp	Contains records (points) of all 2007-2008 quadrats noting species abundance at each monitoring stop that was carried out in this habitat.
1420_stops_irl.shp	Contains records (points) of all 2007-2008 monitoring stops carried out in this habitat.
Notable_species_irl.shp	Contains records (points) of all the locations of notable species (listed in Table 2.3) recorded during 2007-2008 fieldwork.
Photographs.shp	Contains records (points) of all the locations of photographs taken during the 2007-2008 survey.
smp_habitats_2008.shp	Contains all of the saltmarsh and other habitats (polygons) mapped during fieldwork 2007-2008.
smp_national_sm_resource.shp	Contains all of the saltmarsh mapped during the desktop survey for Conservation Status Assessment (polygons) plus polygons mapped and ground-truthed during SMP fieldwork (2006-2008) and from other projects
curtis_ss_sm_inventory	Positions (points) of sites listed in the saltmarsh inventory published by Curtis and Sheehy-Skeffington (1998).
wymer_1984_quadrats	Positions (points) of quadrats recording saltmarsh vegetation listed in Wymer (1984).

Data for each site, including the assessment of conservation status was also imputed into an NPWS Coastal Monitoring Project Access database.

As part of this project several individual reports were prepared to assess the national conservation status of each Annex I habitat in Ireland, including *Spartina* swards (1320) (http://www.npws.ie/en/PublicationsLiterature/ConservationStatusReport/Habitats/.) These reports were prepared as background information for a national conservation assessment for each project and form part of assessment for NPWS (2008). The reports were initially prepared in April 2007 at the beginning of this project using desktop sources and the 2006 SMP survey (McCorry 2007). They have now been updated to include data collected during 2007-2008 fieldwork.

As part of this initial assessment the entire coastline of Ireland was examined during a desktop survey to map general saltmarsh vegetation using OSI 2000 and 2005 series colour aerial photos in conjunction with OSI 6 inch maps. General saltmarsh was mapped using a GIS - Geographic Information System (ESRI Arcview 3.2) by drawing polygons over background aerial photos and/or OSI 6 inch maps. Locations of most saltmarshes (238) were known from the national saltmarsh inventory (Curtis & Sheehy-Skeffington 1998). These include nearly all of the larger sites. Other sites were identified from the survey of aerial photos and information from Wymer (1984), Nairn (1986), the Coastal Monitoring Project (Ryle *et al.* 2009), the NPWS Habitats Assignment Database and other NPWS data sources. These generally included much smaller saltmarshes that were part of other coastal systems, widely dispersed saltmarsh of limited extent that was part of larger coastal systems (such as minor fringing saltmarsh habitat that frequently occurs around the west coast of Ireland) and sites where there have been classification issues (e.g. Buckroney, Co. Wicklow). These newly identified sites were not classified as new sites as part of the national saltmarsh inventory (Curtis and Sheehy-Skeffington 1998) but they were generally named when saltmarsh polygons were drawn as part of the national desktop survey (smp_national_sm_resource.shp). Each mapped polygon was assigned to a potential saltmarsh habitat using the available data sources and best expert opinion. Many polygons were assigned a generic saltmarsh habitat category (e.g. mosaic of Atlantic and Mediterranean salt meadows) where there was no information to identify the specific Annex I habitat present.

This desktop survey was used to prepare a GIS resource that mapped the entire identifiable saltmarsh habitat in Ireland. It was then used to estimate the national distribution and range of each Annex I saltmarsh habitat in Ireland and was also used to estimate total areas for each of these habitats (see Section 3.3). This was then updated at the end of fieldwork (2007-2008) to include more accurate ground-truthed habitat habitats from all of the newly surveyed sites.

Most saltmarsh sites have more than one Annex I saltmarsh habitat present (McCorry 2007). Individual Annex I saltmarsh habitats could only be identified with certainty in conjunction with field-based surveys. *Spartina* swards may be distinguished in some instances from other saltmarsh vegetation from the aerial photos, particularly where the original saltmarsh is mapped on the OSI 6 inch map. By overlaying the OSI 6 inch map over the aerial photos the change in extent of saltmarsh is visible and significant changes usually indicates the spread of *Spartina* swards. Atlantic salt meadows could sometimes be separated from other saltmarsh habitats using aerial photos, but not in all cases, and field surveys were required for establishing habitat boundaries.

3 RESULTS AND DISCUSSION

3.1 Area and distribution of saltmarsh habitats

This section describes the area and distribution of each Annex I habitat recorded at the 100 sites surveyed in 2007-2008 (Table 3.1). The total area of Annex I habitat mapped during this phase of the SMP survey was 1890 ha (100 sites in total). The saltmarsh habitats were dominated by ASM (53.1%) with MSM (22.0%) forming an area the equivalent of less than half of the ASM area. As expected, *Salicornia* flats only form a very minor amount of the overall saltmarsh habitat (3.6%), as this habitat only forms a very small proportion of the overall saltmarsh habitat at most sites. The remaining area (21.3%) was made up of *Spartina* swards.

The total area of saltmarsh habitats (Annex I and *Spartina* sward) at each site was closely related to the overall size of the site and coastal and geographical factors such as the size of the estuary, or bay, length of sand spit etc. There are no significant trends in the overall distribution of saltmarshes (Figure 3.1). More saltmarshes were identified along the western coast of Ireland compared to the southern and eastern coasts (Curtis & Sheehy-Skeffington 1998). This shoreline contains more of the smaller sites but this is probably related to the overall distribution of sites identified in Ireland and the fact that Fringe type saltmarshes, many of which are relatively small, are only found along the west and northern coasts of Ireland. The east coast is less indented and saltmarshes are generally associated with river estuaries and sheltered areas behind sand spits and shingle barriers.

At some of the larger sites only a portion of saltmarsh habitat was mapped due to constraints on the amount of time for surveying. This generally occurred where a narrow band of saltmarsh habitat was situated along the shoreline and continued along the coast away from the main section. It also occurred when the site was actually a sub-site of a larger system, such as Bunratty in the River Shannon Estuary where the saltmarsh is a continuous band along the edge of the estuary and the surveyed section at Bunratty only represents a portion of the total area. The site area covered by these individual surveys had to be constrained to fit in to the project timetable.

Some of these habitats occurred as mosaics, particularly the ASM and MSM. The total Annex I habitat area was calculated at each site by estimating the proportion of each habitat within the mosaic. The totals listed in Table 3.1 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 were 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 where there was a transition habitat present with co-dominance of Common Cordgrass and ASM vegetation.

The general saltmarsh unit also frequently contained other habitats. Examples of these include transitional habitats such as stands of brackish Common Reed or Sea Club-rush, which are found on estuarine type saltmarshes within Annex I vegetation and along its upper and lower limits. Other habitats also include small mounds that may contain habitats such as

dry coastal grassland, scrub and exposed rock, vegetated or unvegetated shingle ridges or eroded sections of coastline that contains beach material or exposed rock.

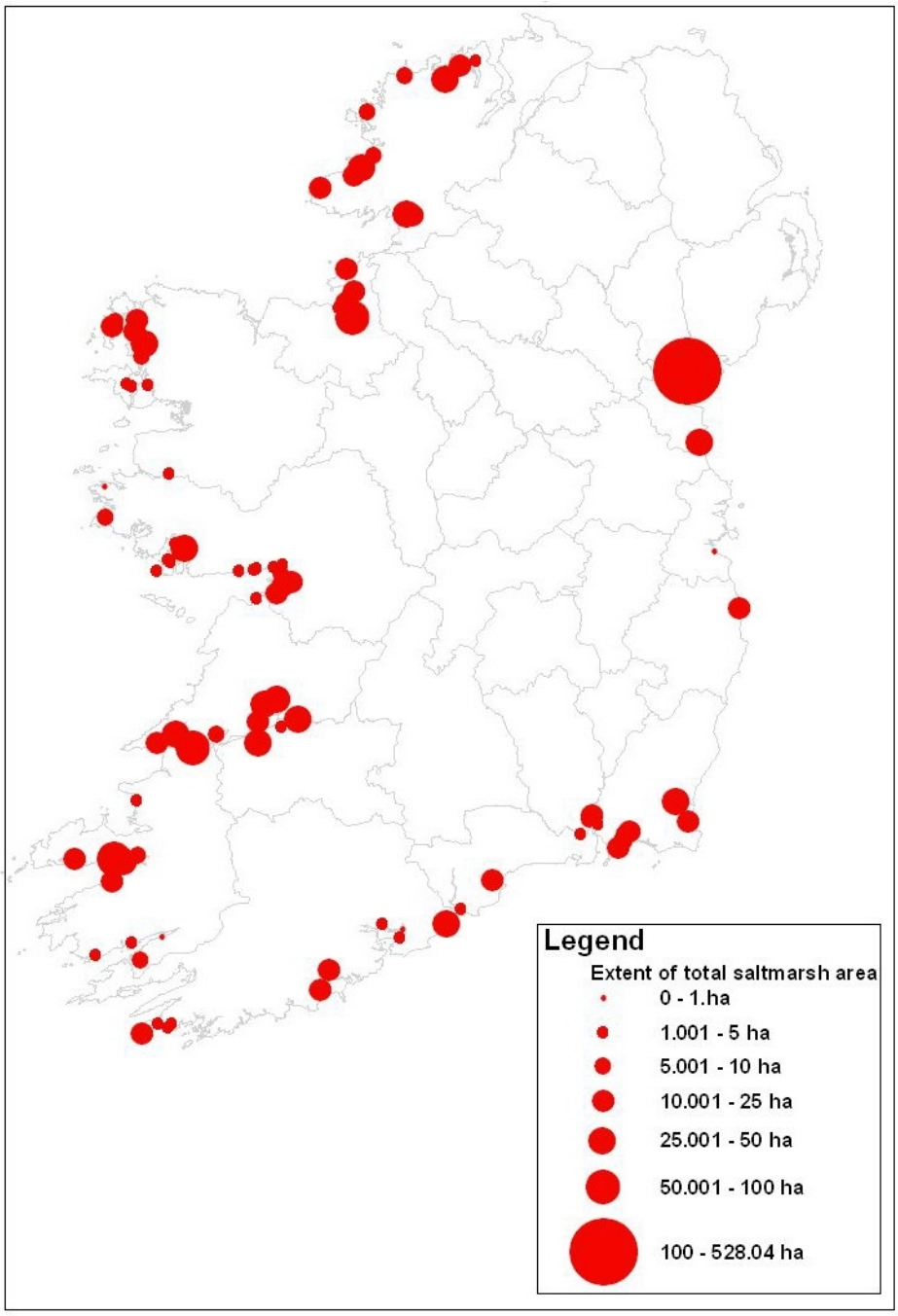

Figure 3.1. Distribution of saltmarshes surveyed in Ireland sorted by overall size (total of all saltmarsh habitats) during 2007-2008.

3.1.1 *Salicornia* flats

As already stated *Salicornia* flats only makes up a very small part of the overall extent of saltmarsh habitats. Further analysis of the data shows that 84% of the overall extent of this habitat was found at only two sites (Dundalk Bay and Creeslough) out of a total of 48 sites (Table 3.1). At most sites *Salicornia* flats only formed a very small area with 35 sites having less than 0.01 ha present and only 7 sites having greater than 1 ha present. The extent of *Salicornia* flats was closely related to the overall size of the site, with some of the largest sites

having the greatest extent of this habitat. However, local environmental variables are also very important in influencing the distribution and extent of *Salicornia* flats with some large sites such as Ballysadare Bay (third largest site at 72 ha of saltmarsh) having very little *Salicornia* flats present (0.012 ha).

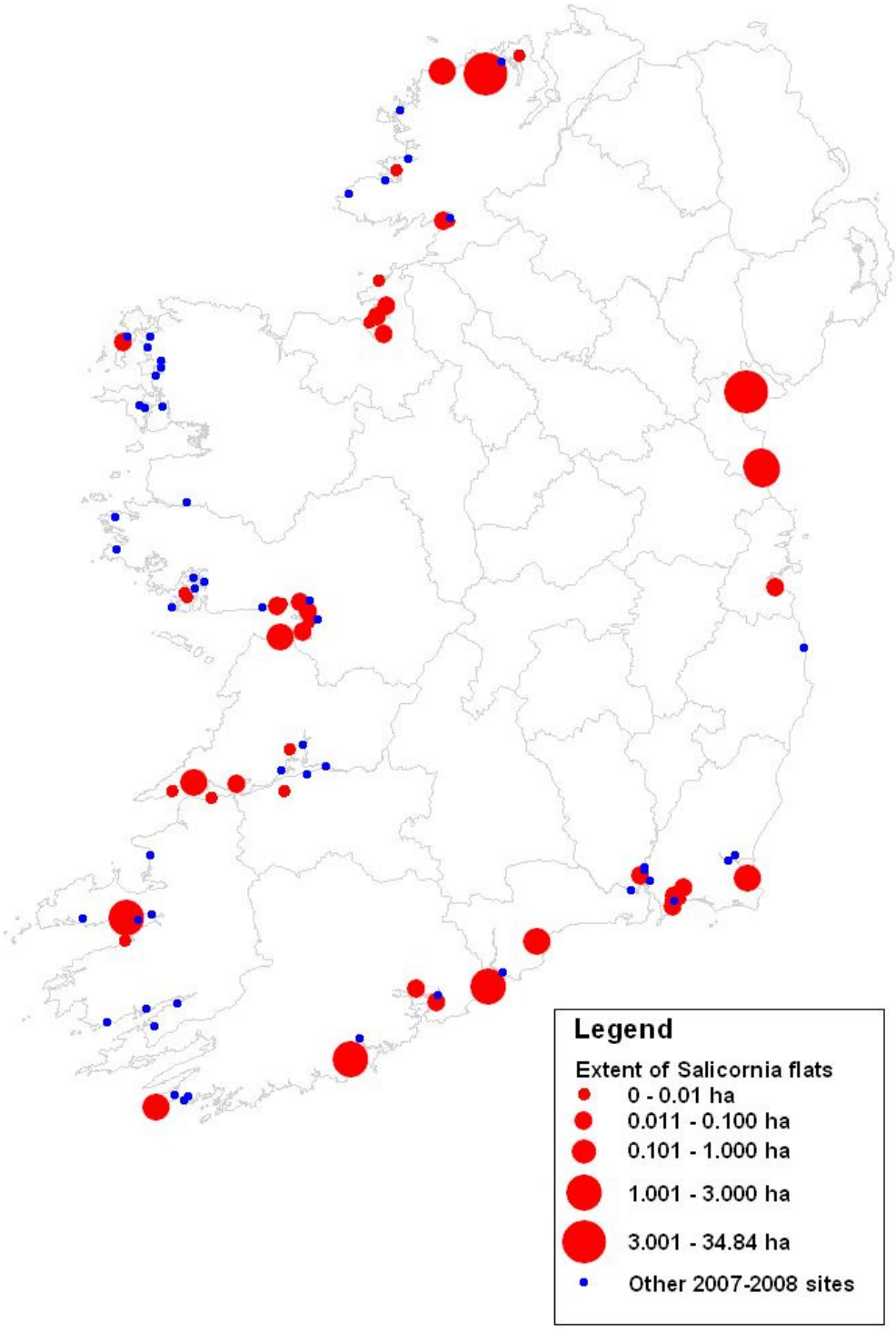

Figure 3.2. Distribution of *Salicornia* flats (1310) surveyed during 2007-2008.

Salicornia flats are generally widely distributed around the coast of Ireland (Figure 3.2). There are fewer large sites along the western coastline and also some gaps in distribution along this shoreline. These trends can probably be related to the overall size and type of the saltmarsh, with saltmarshes along the west coast generally smaller in size. Fringe type saltmarshes are found along the western coastline (Curtis and Sheehy-Skeffington 1998) and *Salicornia* flats tend not to be associated with this type of saltmarsh. Only 4% of *Salicornia* flats surveyed during 2007-2008 were associated with fringe type saltmarshes, compared to 27% of the overall Saltmarsh inventory being Fringe type marshes. *Salicornia* flats are more likely to be associated with Bay, Estuary and Sandflats type marshes. The habitat is not generally found on peat substrates and this can be related to the fact that Fringe type saltmarshes generally have peat-based substrates.

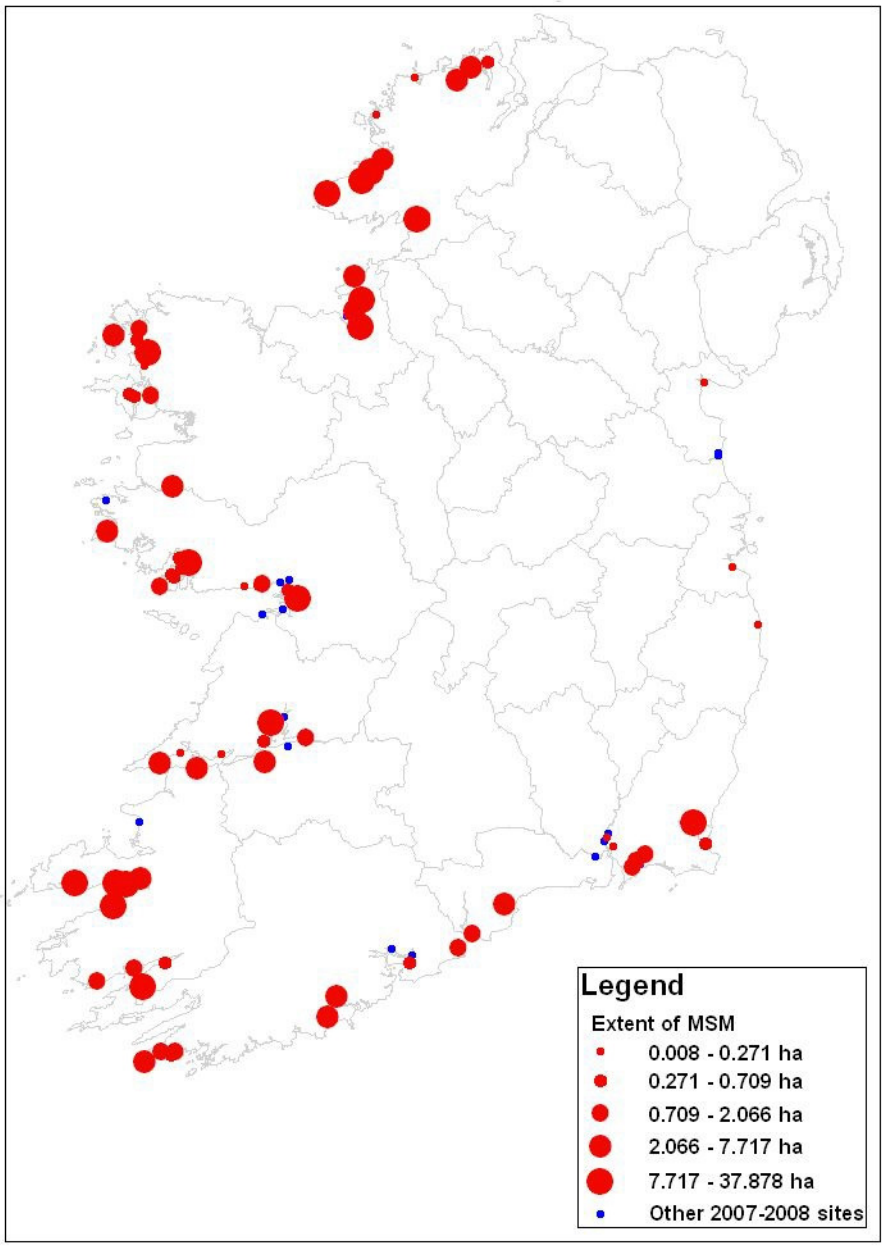

Figure 3.3. Distribution and extent of Mediterranean salt meadows (1410) surveyed during 2007-2008.

It is difficult to understand the main environmental factors affecting the distribution and extent of *Salicornia* flats around the coast of Ireland. The extent of *Salicornia* flats is obviously connected to accretion and the supply of sediment to form suitable areas for colonisation by this species. However, anecdotally there seems to be plenty of suitable intertidal flats adjacent to sheltered saltmarsh sites where *Salicornia* flats was not recorded or only formed a very minor area, even at sites where there is development of *Spartina* swards. The factors that influence the development of significantly large areas of this habitat such as at North Bull Island (McCorry 2007) and Creeslough and not at other sites remain unclear.

3.1.2 Atlantic salt meadows (1330)

Atlantic salt meadows are widely distributed around the coast of Ireland (and a distribution map is not prepared for this habitat as it was found at all the sites). The area of habitat is closely correlated with the overall size of the site.

3.1.3 Mediterranean salt meadows (1410)

Mediterranean salt meadows are widely distributed around the coast of Ireland (Figure 3.3). This habitat is also associated with Fringe type saltmarshes, which are distributed along the western coast of Ireland. Figure 3.3 gives an impression that MSM is found less frequently along the eastern coast. However, there are fewer sites overall along the eastern coast and the addition of sites surveyed in 2006 (McCorry 2007) would show some MSM cover in Co. Dublin.

3.1.4 Halophilous scrub (1420)

The total mapped area of Halophilous scrub from the 2007-2008 survey is very small (0.358 ha) (Table 3.1) and was confined to four sites in Bannow Bay and Fethard Inlet (Figure 3.4). Ballyteige saltmarsh, the only other site containing this habitat, was surveyed in 2006 (McCorry 2007). Halophilous scrub was not recorded from one site previously known to contain this habitat, at Grange. This site has been significantly affected by erosion and the entire former saltmarsh (and much of the associated sand dune system) has been completely washed away.

The distribution of this habitat is associated with the presence of the main indicator species Perennial Glasswort, which is an extremely rare species found on saltmarsh. This species was not found at any new sites where it had not already been recorded previously (Dubsky 2006, NPWS Rare Plant Database (1990). There was a problem assessing the loss of extent at sites where it was previously known to occur but is now extinct, as the former extent is generally unknown. However, its distribution at several sites was extended significantly and it was found to be more frequent than previously known. The measurement of the current extent of this habitat was also vulnerable to the mapping methodology, considering that the habitat is defined by the presence of just one species. It was found in several vegetation communities that would have been classified as several other saltmarsh habitats, were it not for the presence of Perennial Glasswort. The habitat was generally mapped by drawing boundaries around clusters of Perennial Glasswort noted by GPS. There was potential to significantly change the mapped area of Halophilous scrubs by either dividing clusters of plants into separate patches of habitat or including them in one patch of habitat and increasing the area significantly.

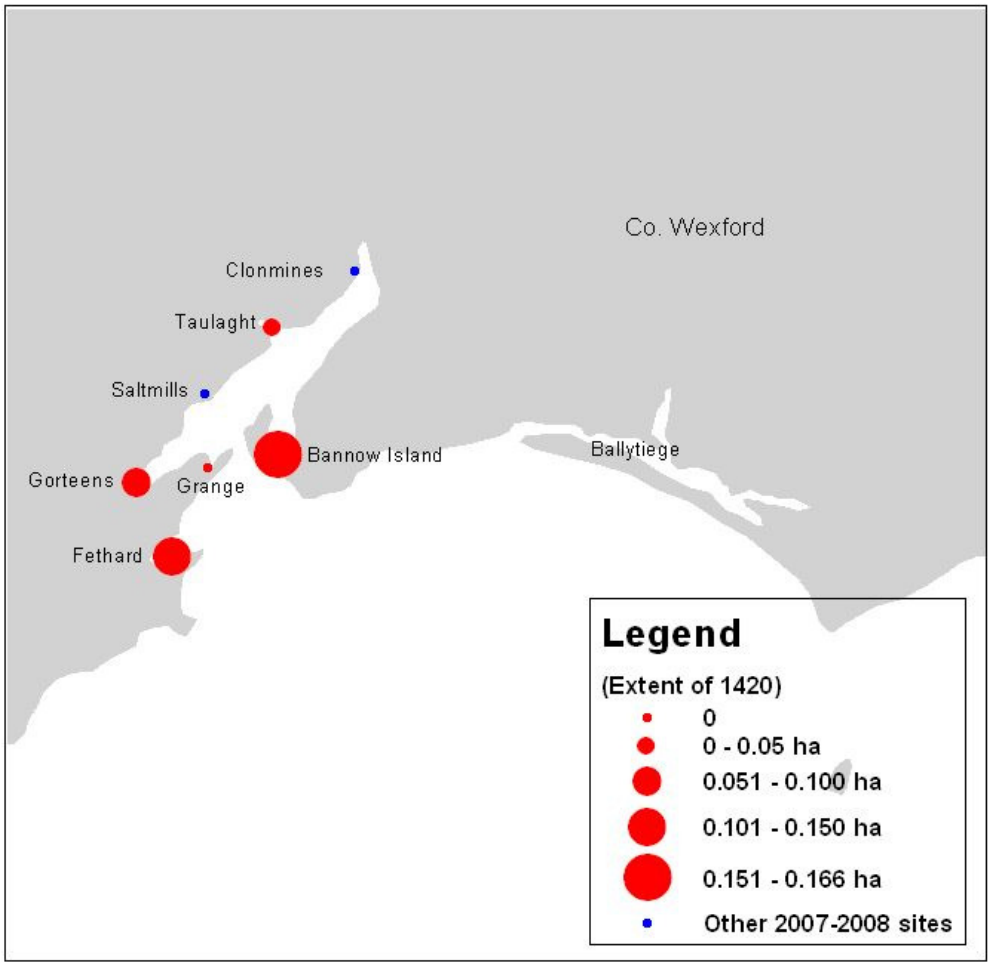

Figure 3.4. Distribution of Halophilous scrub (1420) in Co Wexford surveyed during 2007-2008. (Ballyteige surveyed in 2006).

3.1.5 *Spartina* swards

The total area of *Spartina* swards (403 ha) surveyed during the SMP was 21% of the total combined saltmarsh habitat area and approximates to the total area of MSM mapped during the project. This gives some impression of the vigour and success of Common Cordgrass in the past 90 years in colonising and spreading mainly on mudflats at many sites around Ireland.

The distribution of *Spartina* swards surveyed during 2007-2008 (Figure 3.5) largely approximates with the known distribution of Common Cordgrass in Ireland (Preston *et al.* 2002). This habitat was not found in any new estuaries or bays where it was not already known to be present during this survey. The extent of *Spartina* swards related to the overall size of the site, with the largest measured area located in Dundalk Bay and extensive habitat cover in the Shannon Estuary. The extent of the habitat is also related to the length of time since the site was colonised. However, this habitat has not developed at the same rate at all sites. An example of this is Castlemaine Harbour (Co Kerry), where there is a large area of *Spartina* swards at Inch but much smaller total areas found at other sites in this estuary such at Rossbehy and Cromane. There are also several sites along the south coast, where the area of *Spartina* swards is still quite low.

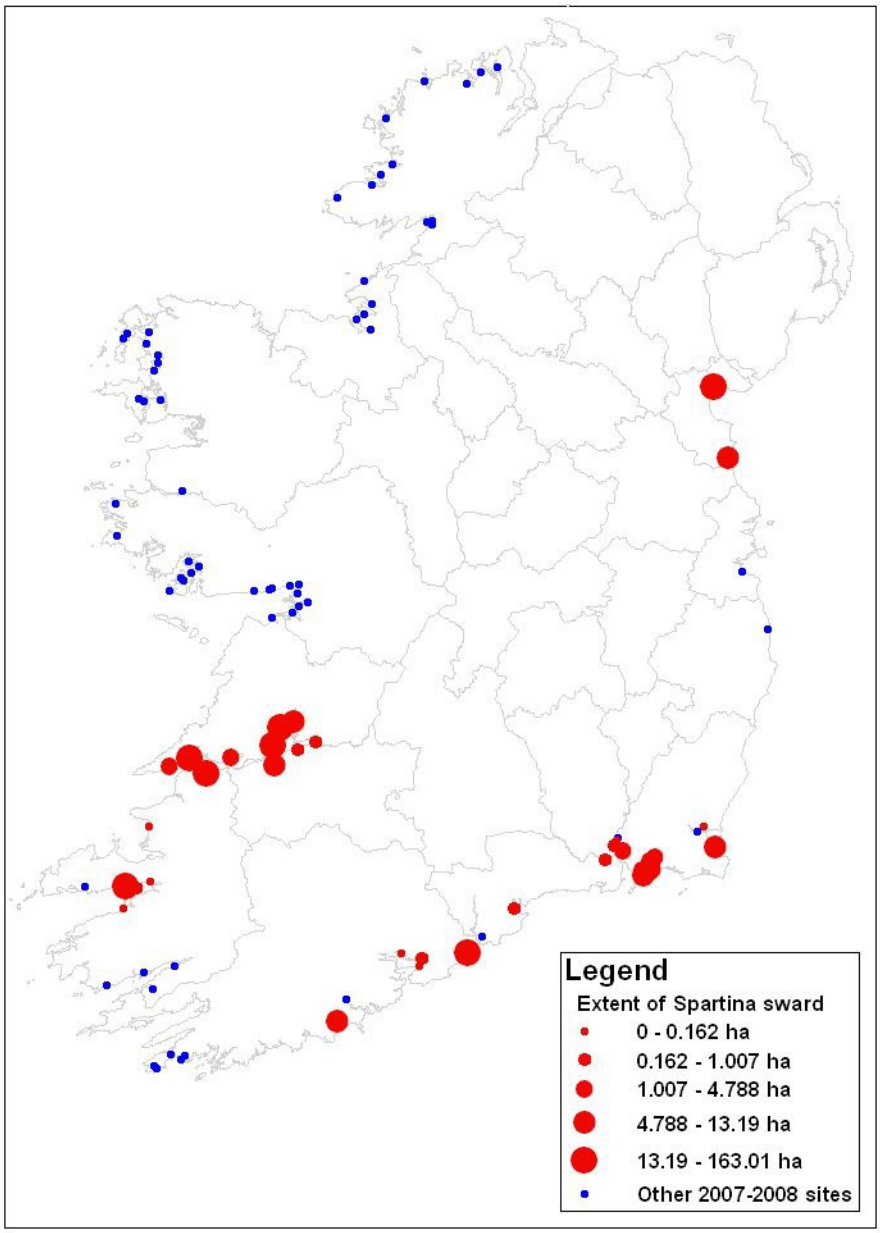

Figure 3.5. Distribution and extent of *Spartina* swards surveyed during 2007-2008.

Table 3.1. Summary statistics showing area in hectares of each Annex I habitat and area of *Spartina* swards at each site.

SMP Code	Site Name	County	Area (Ha)					
			H1310	H1330	H1410	H1420	*Spartina* sward	Site Total
SMP0032	Dundalk	Lo	34.840	330.150	0.040		163.010	528.040
SMP0033	Baltray	Lo	2.840	14.370			13.190	30.400
SMP0034	Mornington	Me	1.327	11.242			4.322	16.891
SMP0035	Booterstown	Du	0.022	0.062	0.018			0.102
SMP0036	Kilcoole	Wi		13.058	0.216			13.274
SMP0037	Buckroney	Wi		0.085	0.084			0.169
SMP0038	Castlebridge	Wx		2.876	23.391		0.015	26.282
SMP0039	Ferrycarrig	Wx		0.026	0.060			0.086
SMP0040	Rosslare	Wx	0.172	7.535	0.426		9.237	17.370
SMP0041	Bannow Island	Wx	0.002	1.981		0.166	5.789	7.938
SMP0042	Clonmines	Wx	0.023	15.870	1.922		1.215	19.030
SMP0043	Taulaght	Wx	0.006	2.547	0.491	0.012	2.133	5.189
SMP0044	Saltmills	Wx	0.015	1.127	0.843		0.002	1.987
SMP0045	Gorteens	Wx	0.008	0.997	0.785	0.059	2.906	4.755
SMP0046	Grange	Wx		0.014	0.040			0.054
SMP0047	Fethard	Wx	0.100	4.276		0.121	5.658	10.155
SMP0048	Dunbrody	Wx		1.713	0.129		1.208	3.050
SMP0049	Killowen	Wx		2.697				2.697
SMP0050	Rochestown	Kk		17.499	0.040		0.049	17.588
SMP0051	Ringville	Kk	0.028	6.335			0.760	7.123
SMP0052	Little Island	Wa		3.616			0.378	3.994
SMP0053	Dungarvan	Wa	0.541	8.212	7.046		0.175	15.974
SMP0054	Kinsalebeg	Wa		3.187	1.591			4.778
SMP0055	Ballymacoda	Co	1.565	27.058	1.704		15.570	45.897
SMP0056	Jamesbrook Hall	Co	0.082	4.140	0.287		0.144	4.653
SMP0057	Bawnard	Co		0.388			0.246	0.634
SMP0060	Carrigtohil	Co	0.038	1.245			0.162	1.445
SMP0061	Rock Castle, Bandon Bay	Co		5.357	5.044			10.401
SMP0062	Harbour View	Co	1.183	11.040	3.937		4.926	21.086
SMP0063	Seafort	Co		0.470	1.944			2.414
SMP0064	Ballybrack	Co		0.887	0.426			1.313
SMP0065	Ballyrisode House	Co		0.025	1.106			1.131
SMP0066	Barley Cove	Co	0.004	0.783	0.108			0.895
SMP0067	Dough	Co	0.480	5.495	5.509			11.484
SMP0068	Dereen House	Ke		0.748	9.021			9.769
SMP0069	Dinish	Ke		0.302	0.344			0.646
SMP0070	Tahilla	Ke		0.073	2.066			2.139
SMP0071	West Cove	Ke		0.246	1.952			2.198
SMP0072	Rossbehy	Ke	0.002	7.286	16.096		0.147	23.531
SMP0073	Cromane	Ke		13.907	29.315		1.007	44.229
SMP0074	Whitegate, Fybagh	Ke		2.553	2.605		0.147	5.305
SMP0075	Inch	Ke	1.241	9.483	29.112		43.354	83.190
SMP0076	Emlagh East	Ke		0.979	10.220			11.199
SMP0077	Ballyheige	Ke		1.309			0.001	1.310
SMP0078	Carrigafoyle	Ke	0.003	7.589	4.559		40.124	52.275
SMP0079	Barrigone, Aughinish	Li	0.000	10.200	2.410		12.670	25.280
SMP0080	Beagh	Li		0.538			0.521	1.059
SMP0081	Bunratty	Cl		26.968	0.865		0.284	28.117
SMP0082	Shepperton, Fergus Estuary	Cl		35.935			7.524	43.459
SMP0083	Inishdea, Owenshere	Cl	0.003	19.636	11.553		13.236	44.428
SMP0084	Killadysart, Inishcorker	Cl		2.940	0.709		15.310	18.959
SMP0085	Knock	Cl	0.029	0.740	0.144		4.788	5.701
SMP0086	Querin	Cl	0.190	3.560	0.008		31.420	35.178
SMP0087	Rinevilla Bay	Cl	0.001	11.730	2.450		1.530	15.711
SMP0088	Scanlan's Island	Cl	0.113	4.457				4.570

SMP Code	Site Name	County	Area (Ha)					
			H1310	H1330	H1410	H1420	*Spartina* sward	Site Total
SMP0089	Kinvarra-West	Ga	0.018	13.295				13.313
SMP0090	Kileenaran	Ga	0.008	15.166	0.271			15.445
SMP0091	Tyrone House-Dunbulcaun Bay	Ga		9.933	8.409			18.342
SMP0092	Kilcaimin	Ga	0.015	7.818	0.503			8.336
SMP0093	Oranmore North	Ga		4.838				4.838
SMP0094	Roscam West & South	Ga	0.023	3.302				3.325
SMP0095	Seaweed Point	Ga	0.003	1.416	0.948			2.367
SMP0096	Barna House	Ga	0.067	2.240	0.418			2.725
SMP0097	Furbo	Ga		2.716	0.136			2.852
SMP0098	Teeranea	Ga	0.001	2.024	0.653			2.678
SMP0099	Lettermullan West	Ga		0.533	2.011			2.544
SMP0100	Lettermore South	Ga	0.002	3.541	0.463			4.006
SMP0101	Bealandangan	Ga		3.634	0.285			3.919
SMP0102	Kinvarra	Ga		6.390	37.878			44.268
SMP0103	Turloughbeg	Ga		0.624	0.413			1.037
SMP0104	Erriseask	Ga		1.418	4.517			5.935
SMP0105	Cleggan	Ga		0.312				0.312
SMP0106	Aasleagh Falls	Ma		0.352	2.331			2.683
SMP0107	North Achill Sound	Ma		1.272	0.394			1.666
SMP0108	Salia West	Ma		0.832	0.588			1.420
SMP0109	Owenduff, Corraun	Ma		0.485	0.921			1.406
SMP0110	Doona	Ma		8.717	0.124			8.841
SMP0111	Aughness	Ma		2.678	0.178			2.856
SMP0112	Tullaghan Bay	Ma		16.580	29.572			46.152
SMP0113	Doolough	Ma		12.789	0.354			13.143
SMP0114	Bunnahowen	Ma		12.455	1.374			13.829
SMP0115	Elly Harbour	Ma	0.024	7.205	4.158			11.387
SMP0116	Saleen Harbour	Ma		8.236	0.011			8.247
SMP0117	Ballysadare Bay	Si	0.012	37.114	34.911			72.037
SMP0118	Strandhill	Si	0.001	1.478				1.479
SMP0119	Cummeen Strand	Si	0.050	10.512	2.309			12.871
SMP0120	Drumcliff Bay	Si	0.037	7.015	13.739			20.791
SMP0121	Streedagh Point	Si	0.001	13.138	7.717			20.856
SMP0122	Mullanasole	Do	0.060	17.350	11.520			28.930
SMP0123	Laghy	Do	0.000	19.800	1.980			21.780
SMP0124	Rossmore	Do		4.620	0.930			5.550
SMP0125	Maghera	Do		5.850	8.980			14.830
SMP0126	Glen Bay	Do		2.332	12.600			14.932
SMP0127	Sheskinmore-Beagh	Do	0.000	15.900	28.970			44.870
SMP0128	Roshin Point	Do		2.180	4.760			6.940
SMP0129	Keadew	Do		9.229	0.089			9.318
SMP0130	Dooey	Do	0.851	7.494	0.025			8.370
SMP0131	Creeslough	Do	21.490	19.610	5.760			46.860
SMP0132	Rosapenna	Do		9.160	3.920			13.080
SMP0133	Tawny	Do	0.006	1.686	0.387			2.079
	Total surveyed habitat area (ha)		**67.527**	**1002.811**	**416.123**	**0.358**	**403.158**	**1889.977**
	% of total surveyed area		3.6	53.1	22.0	0.02	21.3	

3.2 Conservation status assessment

This section summarises results of conservation status assessment (numbers or total percentage of individual site assessments) for habitats at all the sites surveyed during 2007-2008 (100 sites in total) (Table 3.2). Mediterranean salt meadows (MSM) were most frequently in favourable conservation status of the five Annex I habitats. Less than 50% of sites containing both Atlantic salt meadows (ASM) and *Salicornia* flats had these habitats in favourable conservation status. The conservation status of each site is further broken down for assessment of *extent*, *structure and functions* and *future prospects* in Table 3.3. The main features of each site are summarized in Appendix V. The main reasons for assessments of *extent*, *structure and functions* and *future prospects* of habitat as *Favourable*, *Unfavourable-inadequate* or *Unfavourable-bad* at each site are summarized in Appendix VI (Tables 7.1-7.4).

Table 3.2. Summary of conservation status assessment (traffic light system) of saltmarsh habitats assessed during 2007-2008 (100 sites) showing total numbers of sites (and percentages) in each category. Green – Favourable (F); Amber – Unfavourable-inadequate (UI); Red – Unfavourable-bad (UB); Number (No).

Habitat	Conservation Status	Attribute							
		Extent		SF		FP		Overall	
		No.	%	No.	%	No.	%	No.	%
1310	F	48	98.0	43	87.8	25	51.0	25	51.0
	UI	0	0.0	5	10.2	22	44.9	22	44.9
	UB	1	2.0	1	2.0	2	4.1	2	4.1
	Total	49	100	49	100	49	100	49	100
1330	F	81	81.0	35	35.0	27	27.0	25	25.0
	UI	13	13.0	39	39.0	49	49.0	44	44.0
	UB	6	6.0	26	26.0	24	24.0	31	31.0
	Total	100	100.0	100	100.0	100	100.0	100	100.0
1410	F	78	94.0	54	65.1	51	61.4	50	60.2
	UI	1	1.2	19	22.9	22	26.5	22	26.5
	UB	4	4.8	10	12.0	10	12.0	11	13.3
	Total	83	100	83	100	83	100	83	100
1420	F	4	80.0	4	80.0	3	60.0	3	60.0
	UI	0	0.0	0	0.0	1	20.0	1	20.0
	UB	1	20.0	1	20.0	1	20.0	1	20.0
	Total	5	100.0	5	100.0	5	100.0	5	100.0

Table 3.3. Conservation status of each category at each site surveyed during 2007-2008 (100 sites). Green – *Favourable* (F); Amber - *Unfavourable-inadequate* (UI); Red - *Unfavourable-bad* (UB). 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; Ex – Extent; S & F – Structure and functions; FP – Future Prospects; Ov – Overall Conservation Assessment.

Site name	County	Conservation Status Assessment															
		1310				1330				1410				1420			
		Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov
Dundalk	Lo	F	UI	UI	34.840	F	F	F	330.150	F	F	F	0.040				
Baltray	Lo	F	UI	UI	2.840	F	F	UI	14.370								
Mornington	Me	F	F	UI	1.327	F	F	UI	11.242								
Booterstown	Du	F	F	F	0.022	UB	UB	UB	0.062	UB	UB	UB	0.018				
Kilcoole	Wi					F	UB	UB	13.058	F	UB	UB	0.216				
Buckroney	Wi					F	F	UI	0.085	F	F	F	0.084				
Castlebridge	Wx					F	F	F	2.876	F	UI	UI	23.391				
Ferrycarrig	Wx					F	UB	UB	0.026	F	F	F	0.060				
Rosslare	Wx	F	F	UI	0.172	UI	UB	UB	7.535	F	F	F	0.426				
Bannow Island	Wx	F	F	UI	0.002	F	F	F	1.981					F	F	F	0.166
Clonmines	Wx	F	F	UI	0.023	F	UI	UI	15.870	F	UI	UI	1.922				
Taulaght	Wx	F	F	UI	0.006	F	F	UI	2.547	F	F	F	0.491	F	F	UI	0.012
Saltmills	Wx	F	F	UI	0.015	F	F	UB	1.127	F	F	UB	0.843				
Gorteens	Wx	F	F	UI	0.008	F	F	F	0.997	F	F	F	0.785	F	F	F	0.059
Grange	Wx	UB		UB		UB	UB	UB	0.014	UB	UB	UB	0.040	UB		UB	0
Fethard	Wx	F	F	UI	0.100	F	F	UI	4.276					F	F	F	0.121
Dunbrody	Wx					UB	UI	UI	1.713	UB	UB	UB	0.129				
Killowen	Wx					F	F	F	2.697								
Rochestown	Kk					F	F	F	17.499	F	UB	F	0.040				
Ringville	Kk	F	F	F	0.028	F	F	UI	6.335	UB		UB					
Little Island	Wd					UI	UI	UI	3.616								
Dungarvan	Wd	F	F	UI	0.541	F	UI	UI	8.212	F	F	F	7.046				
Kinsalebeg	Wd					F	UB	UB	3.187	F	F	F	1.591				
Ballymacoda	Co	F	UI	UI	1.565	F	UI	UI	27.058	F	F	UI	1.704				
Jamesbrook Hall	Co	F	F	UI	0.082	F	F	F	4.140	F	F	F	0.287				
Bawnard	Co					F	UI	UI	0.388								
Carrigtohil	Co	F	F	UI	0.038	UB	F	F	1.245								
Rock Castle, Bandon Bay	Co					F	UI	UI	5.357	F	F	F	5.044				
Harbour View	Co	F	F	UI	1.183	F	UI	UI	11.040	F	F	F	3.937				
Seafort	Co					F	UI	UI	0.470	F	F	F	1.944				
Ballybrack	Co					UB	UB	UB	0.887	F	F	F	0.426				
Ballyrisode House	Co					F	F	F	0.025	F	F	F	1.106				
Barley Cove	Co	F	F	F	0.004	F	F	F	0.783	F	F	F	0.108				
Dough	Co	F	UI	UI	0.480	F	UB	UB	5.495	F	UB	UB	5.509				
Dereen House	Ke					F	F	F	0.748	F	F	F	9.021				
Dinish	Ke					F	F	F	0.302	F	F	F	0.344				
Tahilla	Ke					F	F	F	0.073	F	F	F	2.066				
West Cove	Ke					F	F	F	0.246	F	F	F	1.952				
Rossbehy	Ke	F	F	F	0.002	F	UB	UB	7.286	F	F	F	16.096				
Cromane	Ke					UI	UI	UB	13.907	F	F	UI	29.315				
Whitegate, Fybagh	Ke					F	UB	UB	2.553	F	UB	UB	2.605				
Inch	Ke	F	F	UI	1.241	F	F	UI	9.483	F	F	F	29.112				
Emlagh East	Ke					F	UI	UI	0.979	F	F	UI	10.220				
Ballyheige	Ke					UI	UI	UI	1.309								
Carrigafoyle	Ke	F	F	UI	0.003	UI	UB	UB	7.589	F	UI	UI	4.559				
Barrigone, Aughinish	Li	F	F	UB	0.000	UI	UB	UB	10.200	F	F	F	2.410				
Beagh	Li					F	F	F	0.538								

Site name	County	Conservation Status Assessment															
		1310				1330				1410				1420			
		Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov	Ex	S & F	FP.	Ov
Bunratty	Cl					F	UI	UI	26.968	F	UI	UI	0.865				
Shepperton, Fergus Estuary	Cl					UI	UI	UI	35.935								
Inishdea, Owenshere	Cl	F	F	UI	0.003	F	UI	UI	19.636	F	UB	UB	11.553				
Killadysart, Inishcorker	Cl					F	F	F	2.940	F	F	F	0.709				
Knock	Cl	F	UI	UI	0.029	UB	UI	UI	0.740	UI	UI	UI	0.144				
Querin	Cl	F	F	UI	0.190	F	UI	UI	3.560	F	F	F	0.008				
Rinevilla Bay	Cl	F	F	UI	0.001	F	UI	UI	11.730	F	F	F	2.450				
Scanlan's Island	Cl	F	F	F	0.113	F	UI	UI	4.457								
Kinvarra-West	Ga	F	F	F	0.018	F	UB	UB	13.295								
Kileenaran	Ga	F	F	F	0.008	F	UI	UI	15.166	F	F	F	0.271				
Tyrone House-Dunbulcaun Bay	Ga					F	UI	UI	9.933	F	UI	UI	8.409				
Kilcaimin	Ga	F	F	F	0.015	F	UI	UI	7.818	F	UI	UI	0.503				
Oranmore North	Ga					UI	UB	UI	4.838								
Roscam West & South	Ga	F	F	F	0.023	F	F	F	3.302								
Seaweed Point	Ga	F	F	F	0.003	F	F	F	1.416	F	F	F	0.948				
Barna House	Ga	F	F	F	0.067	F	UB	UB	2.240	F	UI	UI	0.418				
Furbo	Ga					F	F	F	2.716	F	F	F	0.136				
Teeranea	Ga	F	F	F	0.001	UI	UI	UI	2.024	F	F	F	0.653				
Lettermullan West	Ga					F	UB	UB	0.533	F	UI	UI	2.011				
Lettermore South	Ga	F	F	F	0.002	F	UI	UI	3.541	F	F	F	0.463				
Bealandangan	Ga					F	UB	UI	3.634				0.285				
Kinvarra	Ga					F	UI	UI	6.390	F	F	F	37.878				
Turloughbeg	Ga					F	UB	UB	0.624	F	UB	UB	0.413				
Erriseask	Ga					F	UB	UB	1.418	F	UI	UI	4.517				
Cleggan	Ga					F	F	F	0.312								
Aasleagh Falls	Ma					F	F	F	0.352	F	F	F	2.331				
North Achill Sound	Ma					F	UB	UB	1.272	F	F	F	0.394				
Salia West	Ma					F	UB	UB	0.832	F	F	F	0.588				
Owenduff, Corraun	Ma					F	UB	UB	0.485	F	F	F	0.921				
Doona	Ma					F	UI	UI	8.717	F	F	F	0.124				
Aughness	Ma					F	UI	UI	2.678	F	F	F	0.178				
Tullaghan Bay	Ma					F	UB	UB	16.580	F	UI	UI	29.572				
Doolough	Ma					F	UB	UI	12.789	F	F	F	0.354				
Bunnahowen	Ma					F	UB	UB	12.455	F	UI	UI	1.374				
Elly Harbour	Ma	F	F	F	0.024	F	UI	UI	7.205	F	UI	UI	4.158				
Saleen Harbour	Ma					UI	UI	UI	8.236	F	F	F	0.011				
Ballysadare Bay	Si	F	F	F	0.012	F	UI	UI	37.114	F	UI	UI	34.911				
Strandhill	Si	F	F	F	0.001	F	F	F	1.478								
Cummeen Strand	Si	F	F	F	0.050	F	UI	UI	10.512	F	F	F	2.309				
Drumcliff Bay	Si	F	F	F	0.037	F	F	F	7.015	F	F	F	13.739				
Streedagh Point	Si	F	F	F	0.001	F	UI	UI	13.138	F	UI	UI	7.717				
Mullanasole	Do	F	F	F	0.060	F	F	F	17.350	F	F	F	11.520				
Laghy	Do	F	F	F	0.000	F	UI	UI	19.800	F	F	F	1.980				
Rossmore	Do					F	F	F	4.620	F	F	F	0.930				
Maghera	Do					UI	UI	UI	5.850	F	F	F	8.980				
Glen Bay	Do					F	UI	UI	2.332	F	UI	UI	12.600				
Sheskinmore-Beagh	Do	F	F	F	0.000	F	UI	UI	15.900	F	UI	UI	28.970				
Roshin Point	Do					F	UI	UI	2.180	F	F	F	4.760				
Keadew	Do					F	F	F	9.229	F	F	F	0.089				
Dooey	Do	F	F	F	0.851	UI	F	F	7.494	F	F	F	0.025				
Creeslough	Do	F	F	F	21.490	F	UI	UI	19.610	F	UI	UI	5.760				
Rosapenna	Do					F	UI	UI	9.160	F	F	F	3.920				
Tawny	Do	F	F	F	0.006	UI	UB	UB	1.686	F	UI	UI	0.387				

Conservation status assessment can also be summarised by totalling the area of habitat at each site that has been assessed as either *Favourable*, *Unfavourable-inadequate* or *Unfavourable-bad* (Table 3.4). Assessing the overall habitat status in this way gives more weight to the actual extent of habitat at the various sites. For example, when examining ASM a small site like Barley Cove (0.8 ha) and Dundalk Bay (330 ha) has the same weight in Table 3.2. At both sites the ASM was assessed as *Favourable*. In Table 3.3, Dundalk Bay carries much more weight compared to small sites like Barley Cove. This effects the assessment of the overall status of the habitat. Table 3.4 shows that the percentage ASM habitat area on a site by site basis that is assessed as *favourable* is 41% compared to only 25% when considering numbers of sites (Table 3.2).

Assessing the overall status of the habitat by habitat area instead of by numbers of sites in each category can also have the opposite effect of lowering the overall percentage of the habitat that is assessed as *Favourable*. This is what has happened with both *Salicornia* flats and MSM. A greater proportion of the larger sites with these habitats obviously were assessed as *unfavourable* when comparing Table 3.2 and Table 3.4 so that the percentage overall habitat area assessed as *favourable* decreases.

Table 3.4. Summary of conservation status assessment (traffic light system) of saltmarsh habitats assessed during 2007-2008 (100 sites) according to total habitat area within each category. Green – *Favourable* (F); Amber – *Unfavourable-inadequate* (UI); Red – *Unfavourable-bad* (UB).

Habitat	Conservation Status	Attribute							
		Extent		Structure & Functions		Future Prospects		Overall	
		Area (Ha)	%	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
1310	F	67.5	100.0	27.8	41.1	22.8	33.8	22.8	33.8
	UI	0	0	39.8	58.9	44.7	66.2	44.7	66.2
	UB	0	0	0	0	0	0	0	0
	Total	67.5	100.0	67.5	100.0	67.5	100.0	67.5	100.0
1330	F	887.9	88.5	472.0	47.1	422.5	42.1	413.8	41.3
	UI	110.2	11.0	400.2	39.9	458.2	45.7	439.7	43.8
	UB	4.7	0.5	130.6	13.0	122.1	12.2	149.3	14.9
	Total	1002.8	100.0	1002.8	100.0	1002.8	100.0	1002.8	100.0
1410	F	415.8	99.9	223.4	53.7	181.4	43.6	181.3	43.6
	UI	0.1	0.0	172.2	41.4	213.4	51.3	213.4	51.3
	UB	0.2	0.0	20.5	4.9	21.3	5.1	21.366	5.1
	Total	416.1	100.0	416.1	100.0	416.1	100.0	416.1	100.0
1420	F	0.358	100.0	0.358	100.0	0.346	96.6	0.346	96.6
	UI	0	0	0	0	0.012	3.4	0.012	3.4
	UB	0	0	0	0	0	0.0	0	0
	Total	0.358	100.0	0.358	100.0	0.358	100.0	0.358	100.0

The above results can also be compared to amalgamated monitoring stop data sets (Table 3.5). This assessment specifically looks at the habitat structure and functions. The overall failed number of monitoring stops is generally much lower compared to the actual area assessed as *favourable* or *unfavourable*. The disparity between these different comparisons is explored in more detail in Section 3.6.4, which evaluates the methods used to formulate these conservation assessments.

Table 3.5. Total number of monitoring stops and failed stops recorded for each habitat during the SMP 2007-2008 (100 sites).

Habitat	Code	Number of sites	Monitoring stops		
			total	number failed	% failed
Salicornia flats	1310	49	95	4	4.2
Atlantic salt meadows	1330	100	915	146	16.0
Mediterranean salt meadows	1410	88	409	25	6.1
Halophilous scrubs	1420	5	8	0	0.0

3.3 Overall national assessment of Annex I habitat conservation status

The overall habitat conservation status of the four main attributes have been assessed either as *Favourable*, *Unfavourable Inadequate* or *Unfavourable Bad* at national level using the combined data from McCorry (2007) and this project as part of the recent reporting of the status of EU protected habitats and species in Ireland (NPWS 2008) (Table 3.6).

Table 3.6. Assessment of conservation status of Annex I saltmarsh habitats at a national level based on data from 2006 to 2008 (131 sites in total). Green – *Favourable* (F); Amber – *Unfavourable-inadequate* (UI); Red – *Unfavourable-bad* (UB).

Habitat	Attribute		Main rationale
1310	Range	Fv	No loss in range
	Extent	UI	Assessed as UI due to reported loss of habitat at one site during monitoring period. Loss likely to be < 1%. Potential for losses due to spread of Common Cordgrass but lack of accurate baseline data means no accurate assessment of this impact on extent can be made.
	Structure and functions	UI	About 4% of monitoring stops failed due to the spread of Common Cordgrass or over-grazing (McCorry 2007, McCorry & Ryle 2009). (However, when examining conservation status by site area 36.9% of the total national area had an unfavourable status).
	Future Prospects	UB	Common Cordgrass has the potential to colonise this habitat in the future with significant negative impact on the extent of 1310 *Salicornia* flats.
	Overall	UB	One or more attributes assessed as UB
1330	Range	Fv	No loss in range
	Extent	UI	The Area of Atlantic salt meadow habitat has decreased by about 0.4% in the fourteen year reporting period (1995-2009).
	Structure and functions	UI	About 16% of monitoring stops carried out during fieldwork (2006-2008) had a damaged sward cover with < 5% bare ground and/or heavy poaching, mainly caused by heavy grazing with some other negative impacts. However, about 55% of surveyed ASM area has an unfavourable habitat structure and functions (assessed on a site-by-site basis) with damaged sward cover due to several different impacts, indicating these monitoring stops were widely distributed.
	Future Prospects	UI	Unsustainable grazing levels are likely to only decrease slowly.
	Overall	UI	One or more attributes assessed as UI
1410	Range	Fv	No loss in range
	Extent	Fv	The Area of MSM habitat has decreased by an estimated 0.07% in a fourteen year reporting period (1995-2009). This attribute was assessed as Favourable due to a negligible loss.
	Structure and functions	UI	About 6% of monitoring stops carried out during fieldwork (2006-2008) had a damaged sward cover with < 5% bare ground and/or heavy poaching caused by over-grazing. (However, when examining conservation status by site area, over 54% of the total surveyed MSM had an unfavourable status, indicating these stops were widely dispersed. See Section 3.6.4 for discussion of different methods of assessment and relevance of various data.)
	Future Prospects	UI	Unsustainable grazing levels are likely to only decrease slowly.
	Overall	UI	One or more attributes assessed as UI
1420	Range	Fv	No loss in range
	Extent	UB	The Area of Halophilous scrubs habitat is estimated to have decreased by about 20-30% in a fourteen year reporting period (1995-2009). This habitat has disappeared from 2 of the 7 sites known to have contained this habitat.
	Structure and functions	Fv	Where present, this habitat is in relatively good condition at all of the remaining sites.
	Future Prospects	UI	This habitat is quite vulnerable to even small changes in the distribution and frequency of Perennial Glasswort in the future as it is only found at 5 sites
	Overall	UB	One or more attributes assessed as UB

Statistics presented in these reports were calculated using the combined data from the 131 sites surveyed during 2006-2008. The methods for national assessment were the same as those used on a site-by-site basis and were applied to the national dataset. More emphasis was placed on the combined data (monitoring stops and areas affected by various impacts) rather than the accumulated site-by-site conservation status assessments. The main rationale for each assessment was presented in individual reports for each Annex I habitat (see http://www.npws.ie/en/PublicationsLiterature/ConservationStatusReport/Habitats/).

Habitat Range was also assessed as an attribute at a national level. This attribute was assessed on a 10 km square grid basis. The habitat range at the beginning of the assessment period (i.e. 1995 when the Irish Ordnance Survey first produced a nationwide series of digital aerial photos) was taken as the favourable reference range (FRR) and all of the Annex I habitats suffered no losses in range during this period. The range of some habitats may have contracted somewhat in the past due to historical infilling and reclamation of saltmarsh.

The overall national area and distribution of each habitat was estimated as part of the national conservation status assessment (Table 3.7) (see Section 2.7). Overall area and distribution was estimated using the data collected in the ESRI shapefile smp_national_sm-resourse.shp (Table 2.8). The distribution data was used to plot Habitat Range. The total area of Annex I saltmarsh habitats is just under 5300 ha. This is considerably lower than other estimates of the total area of saltmarsh habitat in Ireland. However, it is likely to be more accurate than other remote-sensing techniques such as the CORINE land-use survey. The actual area of general saltmarsh habitat (CM1 & CM2) will be higher as this total does not consider the area of brackish vegetation forming mosaics within the Annex I saltmarsh. The desktop GIS survey was reasonably accurate in identifying generic saltmarsh habitat (including some transitional vegetation communities not classified as Annex I saltmarsh vegetation). The main difficulty was identifying the upper saltmarsh boundary or transition to brackish habitats at some of the larger sites. Estimates of *Salicornia* flats were based on proportions of overall habitat surveyed during fieldwork during 2007-2008. Mediterranean salt meadows could sometimes be separated from ASM in the aerial photos, but not in all situations, and field surveys are generally required to establish habitat boundaries.

Table 3.7. Estimates of national range and area of Annex I habitats in Ireland.

Habitat	National Range	National Area (ha)
1310	14, 400 km² (144 grid cells x 100 km²)	183 ha (based on a proportion of the total estimated national area of saltmarsh)
1330	20,400 km² (204 grid cells x 100 km²)	2590 ha
1410	19,100 km² (191 grid cells x 100 km²)	1000 ha
1420	400 km² (4 grid cells x 100 km²)	1.1 ha
Spartina swards	7200 km² (72 grid cells x 100 km²)	1520 ha (current area of polygons estimated to contain this habitat)

The current national area of MSM as estimated by the desktop survey is 1000 ha (calculated by summing the area of polygons assigned to this habitat category). This figure is 27% of the total national saltmarsh area (total area of polygons), not including *Spartina* swards. It was difficult to estimate the area of MSM due to problems of distinguishing Annex I habitats from aerial photographs alone. However, McCorry (2007) and this survey mapped 2171 ha of Annex I saltmarsh habitat at 131 sites during fieldwork and MSM mapped during fieldwork also made up 27% of this area (589 ha).

3.4 Impacts and activities

3.4.1 Impacts and activities on *Salicornia* flats (1310)

Salicornia flats are subject to fewer impacts and activities (Appendix VII, Tables 7.5 & 7.6) compared to more established saltmarsh (MSM and ASM). This is related to the general location of the habitat at the seaward side of the saltmarsh where there is likely to be much less human-induced disturbance. This zone is not easily accessible and the substrate can be quite soft. This means the habitat is generally not affected by amenity or development activities. The limited extent of the habitat at many sites was also significant. *Salicornia* flats generally formed very small patches at many sites that were not affected by specific impacts and activities, which were perhaps affecting other parts of the site. At several sites there are no recorded impacts on the habitat at all.

The habitat is, however, vulnerable to disturbance, and this may include accretion, erosion and trampling. Disturbance in the ASM zones can also provide a bare substrate niche that this habitat can develop in as a pioneer habitat. The impacts of disturbance to this habitat can be temporary as *Salicornia* sp. are annual species, so patches of the habitat reappear in areas that were disturbed the previous year. The habitat is also transient in nature and vulnerable to changes in erosion and accretion. In total, nine impacts and activities were recorded acting on this habitat within the saltmarshes and a further three were recorded as acting on the habitat from outside or adjacent to the saltmarsh. Not all impacts and activities were assessed as having a negative impact with some having positive impacts such as accretion and the promotion of suitable substrate for colonisation by Glasswort. Very few monitoring stops carried out in this habitat actually failed (4 out of 95) and the various attributes used for assessment of structure and functions generally reached their targets.

3.4.1.1 Impacts of Common Cordgrass on *Salicornia* flats

The most common impact affecting this habitat is the spread of invasive Common Cordgrass (954), which was noted at 18 out of 48 sites with *Salicornia* flats (Appendix VII, Table 7.5). This pioneer species occupies the same saltmarsh zone as *Salicornia* sp. As it is a perennial grass it has the capacity to spread and form dense clumps within the pioneer zone, which limits the extent of *Salicornia* habitat. These clumps of Common Cordgrass have the capacity to coalesce and form dense *Spartina* swards, which has the capacity to replace *Salicornia* flats as a pioneer saltmarsh habitat or significantly lower the density of Glasswort. This invasive species has a significant impact on the habitat structure and function.

Common Cordgrass is associated with *Salicornia* flats habitat in many sites along the eastern, south-eastern and southern coasts where this species was present. However, there is a large section of coastline along the west coast where Common Cordgrass is not present and there is no impact from invasive species. The impact and cover of Common Cordgrass within the *Salicornia* flats habitat varies significantly at these sites. For example, in Dundalk Bay *Salicornia* flats habitat is found seaward of extensive *Spartina* swards and clumps of Common Cordgrass are often frequently found within this habitat forming a mosaic with Glasswort and algae. Elsewhere *Salicornia* flats may also be found adjacent to *Spartina* swards with few or no clumps within them (Knock is a good example).

While Common Cordgrass is widely distributed in the pioneer zone of many of sites visited during 2007-2008 there is little evidence from this survey that this species has actually displaced or decreased the extent of *Salicornia* flats habitat at these sites. This is mainly due to the lack of baseline data showing the distribution of *Salicornia* flats prior to the colonisation of Common Cordgrass. Only one monitoring stop in *Salicornia* flats actually failed (out of 95) due to the assessment of significant spread of *Spartina* swards greater than 10%, although

Common Cordgrass with present in over half of these monitoring stops (49). (In reality this assessment was very difficult to make and anecdotal without baseline data). McCorry (2007) showed that there is some evidence of replacement of *Salicornia* flats by *Spartina* swards at some sites like North Bull Island, Rogerstown and Broadmeadow Water Estuary. So it can be inferred that Common Cordgrass has had a negative impact on the extent of *Salicornia* flats at some sites and its presence was used as a negative indicator for future prospects.

Quantifying this impact is quite difficult. For example, while there is extensive development of *Spartina* sward habitat in the pioneer zone of saltmarshes in Dundalk Bay, the fact that this site is actively accreting has promoted the development of the pioneer zone and the development of an extensive band of *Salicornia* flats habitat seaward of the *Spartina* swards, creating the largest extent of this habitat recorded during the survey. There is no relationship between the extent of *Salicornia* flats and the extent of *Spartina* swards, other than the fact that both habitats are greater in extent at larger sites. Habitat mapping during this project will provide an accurate baseline for the future assessment of the impact of invasive Common Cordgrass on the extent of *Salicornia* flats.

The impact of a few clumps of Common Cordgrass within the *Salicornia* flats habitat probably does not have a very significant impact on the structure and functions of this habitat during the early stages of colonisation. Small clumps of Common Cordgrass generally are not very dense and *Salicornia* sp. plants are able to grow amongst the sparse stems of this plant. The impact of this species was therefore assessed as neutral or as having a low (C) influence at some sites. Where clumps of Common Cordgrass were found more frequently within the *Salicornia* flats habitat and occupied 20-40% of the area then the intensity of the impact was assessed as having a medium (B) influence.

While at some sites there may only have been a few clumps of Common Cordgrass within the *Salicornia* flats habitat, it was generally located adjacent to *Spartina* swards. So the potential for further invasion by Common Cordgrass is significant and this was the main reason for the assessment of *Future Prospects* of this habitat as *unfavourable* at most sites where Common Cordgrass was present (and therefore overall assessment of conservation status as *unfavourable*). However, the invasion of Common Cordgrass does not seem to have the capacity to totally exclude *Salicornia* flats. At several sites patches of *Salicornia* flats were found within the *Spartina* swards on bare patches of mud at the seaward end of the habitat.

3.4.1.2 Impacts of grazing on *Salicornia* flats

Another common impact is grazing by cattle or sheep (14 out of 48 sites). However, this activity is rarely of any significance. There may be some signs of trampling, but rarely is it damaging. For the most part, cattle are the only grazing livestock. However, overgrazing and poaching (143) was noted at some sites including, Rinevilla Bay and Tawny (which was largely grazed by sheep rather than cattle). Trampling by livestock breaks and damages or kills the plants. Sheep may also graze the plants. However, the long-term impact of overgrazing on populations of Glasswort is not known.

One factor also noted during the first SMP survey (McCorry 2007) was of some large pans or areas with no established vegetation within the ASM/MSM being heavily trampled by cattle at sites where there was very heavy overgrazing (Dough). While the trampling was generally assessed as having a negative impact, the disturbance to the substrate also created suitable substrate that could be colonised by this pioneer habitat. The impact of overgrazing was assessed as having a positive impact due to this effect. Reducing the grazing intensity may mean some of these hollows that are not frequently flooded will develop lower ASM saltmarsh vegetation.

3.4.1.3 Impacts of erosion, accretion and natural processes on *Salicornia* flats

This habitat is also affected by natural geo-morphological cycles including both erosion (900) and accretion (910). Both these factors can have a significant impact on this pioneer habitat, creating suitable bare substrate for colonisation by Glasswort. Accretion doesn't always occur in conjunction with erosion. These factors also mean that the habitat is quite ephemeral and its extent can change significantly from year to year. It is quite vulnerable to storms. The impact of erosion was generally assessed as having a neutral impact while accretion was assessed as having a positive impact.

It is difficult to quantify accurately the impacts of erosion/accretion on *Salicornia* flats from a single visit to the site. Again the lack of accurate baseline data made it difficult to accurately assess any changes in extent of *Salicornia* flats. Often, as the site reports describe, signs of erosion were easily recognised but it is not possible to say predict if there has been any significant habitat loss to the extent of *Salicornia* flats.

The Coastal Monitoring Project (Ryle *et al.* 2009) did map *Salicornia* flats at sites during the first year of that project. A comparison to this data showed that *Salicornia* flats mapped at Grange in 2004 had disappeared by the time the site was visited in 2007 during the SMP, as the whole saltmarsh has been affected by erosion. However, there were no other sites where similar comparisons could be made during this survey although similar trends were noted at some sites by McCorry (2007) where *Salicornia* flats mapped by the CMP had disappeared or moved by the time these sites were mapped by the SMP (Rogerstown Estuary). These examples show that the distribution and extent of *Salicornia* flats can be very ephemeral. In contrast, at other sites (North Bull Island) the extent and distribution of *Salicornia* flats has been quite consistent over the recent past (McCorry 2007).

Accretion is a significant factor at all of the sites containing the largest extent of *Salicornia* flats. However, accretion is not the only impact influencing the distribution and extent of *Salicornia* flats as there were several sites where active accretion was present but there was no or very little development of *Salicornia* flats habitat.

Natural processes in sand dune systems (990) can also create suitable conditions for the development of this habitat in transitional areas. Natural transition from embryonic dunes to pioneer saltmarsh vegetation (*Salicornia* flats and pioneer ASM) was noted at several sand dune systems that were quite dynamic. The peaks of mounds of sand were being vegetated by embryonic sand dune vegetation while the edges contained strips of *Salicornia* sp. Natural processes (990) such as sediment redistribution result in sand banks moving or disappearing quickly so a site like Dooey is likely to show significant variation in distribution and extent of *Salicornia* flats from year to year.

3.4.1.4 Other impacts on *Salicornia* flats

Several other impacts were assessed as affecting this habitat. These impacts are not wide-spread and were only noted at one or a few sites. In some situations, discharges from poorly maintained sewerage treatment systems (701) or wastewater from roads (424) were recorded entering the intertidal zone (Appendix VII, Tables 7.5 & 7.6). These impacts were not readily quantified via a visual assessment of the vegetation although eutrophication was noted as affecting the size and biomass of stands of Annual Sea-blite occurring at Fethard.

Salicornia flats can also be affected by disturbance from motorised vehicles (623) such as quad bikes, tractors and cars often leave trails by crushing the vegetation. *Salicornia* flats were being damaged by 'recreational' car use at two sites associated with sand dunes. The long-term impact of this activity is probably quite low.

Construction of sea walls and coastal protection has had an impact at two different sites. Spoil from the seawall was present within the habitat at one site and was having a negative impact whereas the construction of a wall at a second site was deemed to have enhanced accretion, which promoted the development of *Salicornia* flats.

The development of *Salicornia* flats can be influenced by other human-induced disturbance such as the extraction of sediment from the purposes of maintaining sea walls (820, 871). This occurred at several sites where sediment dug from saltmarsh left shallow pits, some of which were suitable for colonisation by Glasswort.

3.4.1.5 Impacts on ephemeral vegetation with *Sagina maritima* (rarer sub-type of *1310 Salicornia flats*

This rarer vegetation community was only found at three sites in the transition zone between sand dunes and ASM. It generally occupied small patches (in the 5-50 m^2 range) in a zone about only 1-5 m wide along the sand dune-saltmarsh interface. It was therefore subject to impacts of different intensities compared to the more typical *Salicornia* flats communities found in the lower pioneer zone. This zone was generally moderately or heavily grazed by cattle, sheep and Rabbits. However, this did not have a significant negative impact on this vegetation.

3.4.2 Impacts and activities on Atlantic salt meadows (1330)

This habitat is the most frequently disturbed of all the saltmarsh habitats and also had the widest range of impacts and activities affecting it, 35 in total (Appendix VII, Tables 7.7 & 7.8). Most activities were assessed as either having a repairable negative impact or no significant impact. Impacts or activities that caused irreparable damage and loss of saltmarsh extent affected 8.002 ha of this habitat during this monitoring period (about 0.8% of the overall surveyed area of ASM). The most common impacts causing irreparable damage include infilling and reclamation, the creation of permanent tracks, erosion and dumping. The most frequent impact was grazing and this also affected the largest area of saltmarsh. Erosion and accretion was also a common impact. Sometimes several impacts and activities combined to cause negative impacts. For example, excessive long-term grazing or over-stocking can lead to erosion by continually exposing bare mud.

3.4.2.1 Impacts of grazing on ASM

Atlantic salt meadows are commonly used for grazing by livestock, particularly on the south and west coasts. Some saltmarshes are only grazed during the summer, while some sites along the west coast may be grazed all year around. Atlantic salt meadows are vulnerable to damage from heavy grazing levels, which were exacerbated by the unseasonably wet summers during 2007-2008 (Figure 3.6). Both cattle and sheep can create low sward levels within the ASM. In fact, the stocking rate does not need to be too heavy to create a uniform low sward in some sections of the ASM, particularly the middle marsh communities, which have a naturally low sward height. Heavier stocking rates for a more prolonged period of time can also create a uniform sward height in the upper marsh, which is generally dominated by grasses and rushes such as Saltmarsh Rush, Red Fescue and Creeping Bent. However, there were very few sites where overall species diversity was affected by high grazing intensities from either cattle or sheep, so negative impacts were mainly on the physical environment.

Figure 3.6. Heavily poached ASM at Streedagh Point, Co. Sligo (2008).

Grazing was noted as an impact at 82 sites out of 100 sites containing ASM, although not all the ASM at these sites was grazed (Appendix VII, Table 7.7). Several sites contained ASM that was extended across one or more management units and some sections were grazed while other sections were not grazed at all. The assessment of impacts data shows that 57.6% of the ASM area surveyed during this project was grazed (140, 142, and 143) and this grazing was spread across 82 of the sites (Table 3.8). This data can be compared to data collected during assessment of monitoring stops, where grazing was recorded from 52.2% of monitoring stops (915 stops in total). Curtis and Sheehy-Skeffington (1998) noted that grazing was much more prevalent on west coast saltmarshes compared to the east coast. However, ungrazed ASM was scattered around all coasts of Ireland with a greater proportion on the east coast.

Overgrazing by cattle and or sheep was noted in this habitat at 62 sites (Table 3.8) (at some sites there was overgrazing by both sheep and cattle), although the whole habitat was only considered to be overgrazed at only 6 sites. Overgrazing by cattle was by far the more common impact (50 sites) compared to overgrazing by sheep (15 sites). Assessments of the areas damaged by overgrazing showed that only 3.1% of the overall ASM area was being overgrazed by sheep, while 11.9% was being overgrazed by cattle. These results can be compared to data from the monitoring stops carried out in ASM, where 14.5% of stops failed due to overgrazing and related impacts.

Cattle (and horses) generally cause more damage compared to sheep and this is related to associated poaching damage. However, this was generally confined to sections of the saltmarsh or restricted to areas where there was increased traffic, such as access points and tracks. Some sections of the saltmarsh are more vulnerable to poaching damage, particularly the wetter lower marsh and sections along creeks and pans. There were few sites where the whole saltmarsh was badly damaged from overgrazing. Some sites contained enclosures where the management varied and some of these areas were badly damaged with over-stocking for a prolonged period of time. This creates a badly disturbed saltmarsh surface with the cover dominated by bare mud and much less plant cover. Other features such as salt pans, creeks and the lower saltmarsh boundary can also be badly damaged, with mud mounds appearing at some sites where the entire layer of vegetation has been stripped away and the saltmarsh substrate has also been eroded away in patches.

Table 3.8. Grazing data (2007-2008) summarised from assessment of impacts and activities on ASM (100 sites).

Impact	Code	Number of sites	Area (ha)	% of total area
Grazing (not having a negative impact)	140	71	427.4	42.6
Over-grazed by sheep	142	15	31.0	3.1
Overgrazing by cattle	143	50	119.6	11.9
(overall grazing) [1]		82	578.0	57.6
Overall not grazed			424.8	42.4
Total ASM			1002.8	

[1] combined sites with grazing 140, 142 and 143. Note there is overlap between sites with habitat assessed as grazed and habitat assessed as overgrazed.

Sheep tend to create a uniform low sward height, particularly in the lower and mid marsh zones. Sheep will selectively graze this vegetation to a closely cropped height where available and sometimes leave abundant foliage in the upper and adjacent coastal grassland. Sheep grazing at heavy intensities can 'dwarf' the saltmarsh vegetation, as plants are continually grazed. This can create miniature versions of saltmarsh plants and there is very little flowering. Long-term or excessive sheep grazing can also have physical impacts in the lower and mid-lower zones where the edges of creeks and pans and the lower saltmarsh boundary can be eroded with patches of bare mud appearing.

Different types of saltmarsh show varying resistance to the impacts of grazing. Fringe type saltmarshes, particularly those with shallow peat depths near the lower saltmarsh boundary are particularly vulnerable to impacts of long-term grazing or heavy stocking rates. This habitat can have widespread low levels of bare substrate cover.

The impact of under-grazing (149) on ASM was difficult to assess during the project and was not actually recorded at any sites. It was estimated that there was no grazing (by livestock) on 42.4% of the total ASM area. Much of this saltmarsh is grazed naturally by mammals and wintering waterbirds. However, during the project some differences in biomass or vegetation height could be seen from different sites where there was no grazing, particularly in the upper zone, and some 'rank' vegetation had developed at some sites. This is only an anecdotal observation. While there were observations of impacts on physical structure of the ASM, there were few indications of any impacts on species diversity from data collected within the ASM during this survey.

Under-grazing is more likely to affect the surveyed extent of ASM as it may allow other vegetation types to develop, so this impact is not likely to be recorded until the next monitoring survey. Some differences in vegetation type (e.g. development of typical ASM and development of other vegetation communities) were observed along fence-lines during this survey that could be related to the impact of grazing on one side and under-grazing on the other side. Stands of Twitch, Sea Club-rush or Common Reed were noted at some locations to be better developed in sections that were ungrazed compared to adjacent areas that were grazed. However, this impact would not be recorded by the monitoring stop assessments, as these communities were not classified as ASM.

3.4.2.2 Impacts of other agricultural management on ASM

There are a number of activities recorded during the project that can be classified as types of agricultural management. These were generally not common or extensive and include mowing (102) and fertilisation (120). These activities were generally focused on adjacent agricultural grassland or other habitats and generally only affected a minor portion of the ASM located at the landward end of the saltmarsh. For example, a small portion of ASM vegetation is located within the fence line of a golf course located at Mullanasole, (Murvagh Peninsula), Co. Donegal and is mown as part of a practice range.

Some ASM was affected by agricultural improvement (102) with re-seeding and/or drainage at one site (Dunbrody Abbey, Co. Wexford) combining to significant affect the habitat, although some of this improved ground was reverting back to ASM vegetation.

3.4.2.3 Impacts of tracks on ASM

Tracks are quite frequent on saltmarshes (501). They were noted at 59 out of 100 sites containing ASM. These tracks are created by livestock to access other parts of the saltmarsh. They are also used by farm vehicles to access other parts of the saltmarsh and to access the shoreline and intertidal area. Some tracks have been created by amenity use and

are used by walkers or by horse-riders. This category also includes wheel ruts caused by 'amenity use' of some sand dune systems for car racing such as at Dooey, Co. Donegal. 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 tracks that were assessed as having an irreparable impact on ASM habitat were noted at 6 sites. However, this was only estimated to have affected 0.078 ha of ASM. Most of the tracks were either assessed as having a low negative impact (32 sites) or a neutral impact on the ASM (21 sites). Tracks generally do not cover significant areas of saltmarsh so their footprint is generally quite small. Other impacts such as habitat fragmentation and wildlife disturbance were not considered during this assessment.

3.4.2.4 Impacts of Common Cordgrass on ASM

The deliberate introduction of Common Cordgrass into estuarine sites from the 1920's onwards has resulted in its rapid expansion along much of the eastern, south-eastern, southern and south-western coasts. This is an invasive species (954) and has been considered by some to have a negative impact on saltmarsh and mudflat habitats. This species is now a characteristic part of the lower saltmarsh zone of many sites where it is now present. It has spread into the ASM and also onto adjacent unvegetated mudflats and sand flats. 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 and/or Sea Purslane, and also containing frequent Glasswort and Annual Sea-blite. It has significantly altered the sward structure (sward height is higher and denser) in this zone. However, the overall plant diversity of the lower zone was generally not affected. It also has the capacity to colonise low-mid communities, although at lower densities, and also spreads into salt pans and along creeks in these zones and higher zones (Figure 3.7).

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%. The cover of Common Cordgrass varies within ASM from site to site and even within sites varied significantly. There were 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. Patches of saltmarsh with greater than 40% cover of Common Cordgrass were classified as *Spartina* sward and sections of saltmarsh were it was still frequent (20-40%) but there was also substantial ASM vegetation were classified as ASM/*Spartina* sward mosaic. Common Cordgrass had spread into former saltmarsh (ASM) and replaced significant areas of this habitat with *Spartina* sward. At other sites, clumps of Common Cordgrass are scattered over the ASM at densities too low to be mapped as *Spartina* sward or mosaics.

The SMP survey considered the presence of Common Cordgrass in ASM as a negative indicator during assessment of structure and functions of this habitat. The main target for the assessment of this attribute during monitoring stops was no evidence of recent expansion of Common Cordgrass into ASM during the current monitoring period (or a < 10% increase in cover during the reporting period). For sites with no previously known Common Cordgrass cover, the target was no new sites with this species. Fieldwork during 2007-2008 only found this species at one site (Emlagh East, Co. Kerry) where it was not already known to be present. Even though *Spartina* swards are well-developed at many sites, there was very little quantitative evidence of the spread of this species into ASM at any other sites during the current monitoring period.

Figure 3.7. Common Cordgrass within ASM at Harbourview, Co. Cork (2008).

It was very difficult to assess if Common Cordgrass had spread without accurate and detailed baseline data showing the cover of this species at the beginning of this monitoring period. Most descriptions of sites recorded during the pNHA Survey generally only indicate if Common Cordgrass is present or if it is frequent. There was some additional data available from some sites where NPWS Rare Plant Surveys were carried out, such as Fethard, Co. Wexford. Observations from this survey (in 1990) show that the cover of Common Cordgrass had significantly increased since then at several locations on the saltmarsh.

Aerial photos can show the change in distribution and extent of Common Cordgrass over mudflats and sand flats. The continued spread of this species was noted at several sites such as Inch, Co. Kerry and Bannow Island, Co. Wexford. However, comparisons of various aerial photo series did not generally give any indication of the spread of Common Cordgrass within ASM due to difficulties of interpreting the relative distributions of various vegetation communities in these photos. There were physical signs indicating the recent spread of this species noted during fieldwork at these sites, such as the appearance of frequent seedlings or new small clumps. However, these were only ever recorded at the seaward edge of *Spartina* swards where it was spreading on mudflats and not within ASM. It was very difficult to explain the occurrence of small clumps of Common Cordgrass with the ASM was an indicator of invasion as it is known that these clumps can remain quite small for some time (McCorry 2002).

Common Cordgrass was recorded as an impact during assessment of impacts and activities from 36 sites from Dundalk Bay in Louth to Rinevilla Bay at the mouth of the Shannon Estuary in Co. Clare during this survey. However, it was only recorded as a negative impact at 21 of these sites. This influenced the assessment of Future Prospects of ASM at some of these sites where it as thought this species had the capacity to continue to spread and threaten the extent of this habitat. Common Cordgrass was assessed as having a neutral impact at 15 sites where it was either quite sparse or it was thought to have other positive impacts.

Despite being considered as an invasive species and in general as having a negative impact on saltmarsh, the spread of Common Cordgrass can have some indirect positive impacts on the development of ASM. There were several sites visited during the survey where there were signs of succession of *Spartina* swards into ASM (newly developed saltmarsh appearing

where there was no previously mapped saltmarsh). Some saltmarsh habitat probably developed at Knock and Querin in Co. Clare after invasion by Common Cordgrass and the development of dense *Spartina* swards. Neither of these saltmarsh sites appear on the 6 inch map, but have since developed in association with the *Spartina* sward. This trend was also noted at sites such as Dundalk Bay, Co. Louth, Harbourview, Co. Cork, and Bannow Island, Fethard and Gorteens in Co. Wexford.

The actual area of former ASM that was replaced by *Spartina* sward and ASM/*Spartina* sward mosaic at sites surveyed during 2007-2008 was assessed using GIS by examining the current SMP habitat maps and classifying habitats with Common Cordgrass as either developed within established saltmarsh or developed on adjacent mudflats and sandflats (Table 3.9). This assessment took account of information from the OSI 2nd edition 6 inch map indicating positions of established saltmarsh and trends in saltmarsh growth or erosion. This comparison estimated that 74.3 ha of saltmarsh overall at the sites surveyed during 2007-2008 had been replaced by habitats with Common Cordgrass. This represents about 6.9% of the overall amount of former established ASM. The actual proportion of ASM that has been invaded by ASM varies significantly from site to site with over 50% of the former established saltmarsh at Killadysart, Inishcorker, Fergus Estuary, Co. Clare now replaced by *Spartina* sward. Other sites containing Common Cordgrass show no actual replacement of ASM habitat, as it has either not colonised the ASM yet or was considered too sparse to be considered *Spartina* sward or ASM/*Spartina* sward mosaic.

It should be noted that some sites listed in Table 3.9 such as Castlebridge, Co. Wexford were not considered vulnerable to colonisation by Common Cordgrass as this site was dominated by upper saltmarsh vegetation. This reflects the length of time since different sites were initially colonised by Common Cordgrass, with some sites only being colonised in the 1960's-70's, and other site-to-site variation in environmental factors. There may be further expansion of Common Cordgrass into ASM at some of these sites that are more vulnerable to invasion by this species and that have also only been colonised relatively recently.

This assessment does not take into account the amount of ASM that now contains Common Cordgrass of lower densities (< 20%). This assessment also does not consider saltmarsh succession of *Spartina* swards into ASM during this period. This process has undoubtedly occurred at some of the sites examined in the assessment and therefore the estimate of 6.9% of overall ASM being replaced by habitats with Common Cordgrass is likely to be too high. For example, 43.9 ha of *Spartina* sward and ASM/*Spartina* sward mosaic in Dundalk Bay (Table 3.9) are considered now to be within established saltmarsh. However, nearly all of this marsh has developed relatively recently and only 1.4 ha was actually within established saltmarsh marked on the OSI 2nd edition 6 inch map. Therefore, a substantial portion of this *Spartina* sward is likely to have initially developed as a pioneer habitat on sandflats, and not actually replaced ASM habitat, and the marsh has further developed so that these communities now appear as part of the established saltmarsh. Unfortunately the lack of baseline information on former extent of saltmarsh habitats and former habitat development at these sites means that this assessment should be treated with some caution. The actual amount of ASM saltmarsh that has been invaded by Common Cordgrass and created replacement habitats of *Spartina* swards or ASM/*Spartina* sward mosaic may be less than 5%.

The amount of habitat that was replaced by Common Cordgrass colonisation of the ASM during the current monitoring period is not known, but is likely to be quite small.

Table 3.9. Summary table showing area of mapped *Spartina* sward and area of mapped *Spartina* sward and *Spartina* sward/ASM mosaic that had developed within former established saltmarsh (mainly ASM) at sites mapped during 2007-2008 (100 sites) (as indicated from OSI 2nd 6 inch map).

Site Name	County	ASM (ha)	Total *Spartina* sward (ha)	Site Total (ha)	*Spartina* sward & *Spartina*/ASM mosaic developed in established saltmarsh	
					Ha	% of former ASM
Dundalk	Lo	330.150	163.010	493.160	43.890	11.7
Baltray	Lo	14.370	13.190	27.560	4.743	24.8
Mornington	Me	11.242	4.322	15.564	0.426	3.7
Castlebridge	Wx	2.876	0.015	2.891		0.0
Rosslare	Wx	7.535	9.237	16.772	0.899	10.7
Bannow Island	Wx	1.981	5.789	7.770	0.344	14.8
Clonmines	Wx	15.870	1.215	17.085	0.824	4.9
Taulaght	Wx	2.547	2.133	4.680	1.385	35.2
Saltmills	Wx	1.127	0.002	1.129		0.0
Gorteens	Wx	0.997	2.906	3.903	0.030	2.9
Grange	Wx	0.014		0.014		0.0
Fethard	Wx	4.276	5.658	9.934	2.415	36.1
Dunbrody	Wx	1.713	1.208	2.921	0.080	4.5
Killowen	Wx	2.697		2.697		0.0
Rochestown	Kk	17.499	0.049	17.548		0.0
Ringville	Kk	6.335	0.760	7.095	0.801	11.2
Little Island	Wa	3.616	0.378	3.994	0.117	3.1
Dungarvan	Wa	8.212	0.175	8.387	0.072	0.9
Kinsalebeg	Wa	3.187		3.187		0.0
Ballymacoda	Co	27.058	15.570	42.628	1.228	4.3
Jamesbrook Hall	Co	4.140	0.144	4.284	0.035	0.8
Bawnard	Co	0.388	0.246	0.634		0.0
Carrigtohil	Co	1.245	0.162	1.407		0.0
Harbour View	Co	11.040	4.926	15.966	1.307	10.6
Rossbehy	Ke	7.286	0.147	7.433	0.005	0.1
Cromane	Ke	13.907	1.007	14.914	0.522	3.6
Whitegate, Fybagh	Ke	2.553	0.147	2.700	0.049	1.9
Inch	Ke	9.483	43.354	52.837	2.804	22.8
Emlagh East	Ke	0.979		0.979	0.000	0.0
Ballyheige	Ke	1.309	0.001	1.310	0.003	0.2
Carrigafoyle	Ke	7.589	40.124	47.713	1.321	14.8
Barrigone, Aughinish	Li	10.200	12.670	22.870	3.175	23.7
Beagh	Li	0.538	0.521	1.059		0.0
Bunratty	Cl	26.968	0.284	27.252		0.0
Shepperton, Fergus Estuary	Cl	35.935	7.524	43.459	1.870	4.9
Inishdea, Owenshere	Cl	19.636	13.236	32.872	0.670	3.3
Killadysart, Inishcorker	Cl	2.940	15.310	18.250	3.736	56.0
Knock	Cl	0.740	4.788	5.528	0.019	2.5
Querin	Cl	3.560	31.420	34.980		0.0
Rinevilla Bay	Cl	11.730	1.530	13.260	1.510	11.4
Total Area (ha)		**635.468**	**403.158**	**1038.626**	**74.280**	

3.4.2.5 Infilling, reclamation, drainage and related impacts

Polderisation (801), reclamation (802), infilling (803) and coastal protection (870) in the past has had a very significant impact on the extent of saltmarsh and ASM around the country, with some very large saltmarshes reclaimed behind seawalls in estuaries like the Shannon Estuary. Seawalls and embankments were built to reclaim land for agriculture and also to provide flood relief in adjacent low-lying land. At other locations saltmarsh was infilled for other purposes such as urbanisation. Most of this reclamation took place in the past 200 years (Curtis 2003). These impacts are not considered where they were carried out prior to this monitoring period and only works carried out within the monitoring period were assessed. While older reclamation schemes and embankments are continuing to exert a significant influence, these impacts were not considered.

There are subtle differences in the classification of these activities. Infilling (803) was noted where spoil or other material was dumped on the saltmarsh, sometimes in indiscriminate piles. At some sites this material was profiled. Sometimes small areas were totally infilled. Reclamation (802) was defined when there were attempts to infill and convert an area of saltmarsh to a different use such as agricultural grassland. This activity was sometimes classified as dumping (422/423) when small amounts or single piles of material were dumped on the saltmarsh. Waste material was frequently used for infilling. Spoil (soil, clay, hardcore and construction and demolition waste) was generally classified as inert material during this survey.

It was sometimes difficult to assess what type of habitat had been damaged by these impacts, particularly if a whole section had infilled. This assessment was usually made after examining aerial photos showing the original saltmarsh extent, other sources such as OSI 6 inch maps and adjacent vegetation types. Assessment of the timing of the damage and whether it was usually carried out in the current monitoring period could be made using the 1995 aerial photo series as a baseline. If infilling or reclamation showed up on these aerial photos then it generally pre-dated the current monitoring period.

The rate of reclamation and infilling during the current monitoring period has significantly decreased compared to this historical period. However, these impacts are continuing to affect saltmarshes around the coast and are the main factors having an irreparable influence on saltmarsh and causing a loss of extent. Only a small area of habitat in total has been estimated to be lost around the country (7.94 ha or 0.8% of the total surveyed ASM area) due to these destructive activities. This loss is spread across 24 sites so the average area of habitat loss was generally quite small.

The largest area estimated to be lost (0.8 ha) was at Carrigtohil, Fota Island, Co. Cork, where a small area of saltmarsh located behind a seawall had been infilled. This infilling was related to development of a private golf course and related amenity facilities. A relatively small area of saltmarsh near Dunbrody Abbey, Co. Wexford had also been reclaimed near the start of the monitoring period, by building a new seawall around the lower boundary and draining and reseeding the former saltmarsh located behind this new seawall. Land reclamation (800) was largely carried out by private landowners either in an effort to curtail erosion/flooding damage or to reclaim previously underutilised land such as at Ballybrack, Co. Cork.

Existing coastal defences, embankments and dykes (870, 871) are still largely maintained by the Office of Public Works and some significant destructive damage was also caused by maintenance works. These works can have a negative impact on ASM as they can involve dredging of sediment from the saltmarsh (820, 860) to cap embankments and repair damaged sections. This process can leave relatively deep pits within the saltmarsh (0.5-2 m deep) that may not re-colonise with ASM vegetation and may actually leave the ASM vulnerable to

invasion by Common Cordgrass. Examples of this were at Shepperton, Fergus Estuary where 2.5 ha of former ASM had been lost and at Barrigone, Aughinish, both in the Shannon Estuary. It was also noted at some sites in the Castlemaine Harbour (Cromane, Whitegate-Fybagh).

Damage was also caused by related impacts such as dumping spoil dredged from drainage channels on ASM (860) (Ballyheige, Co. Kerry) and laying a pipeline (512) along the upper saltmarsh (Little Island, Co. Waterford). This latter impact was quite significant as this was a known site for Meadow Barley, a Flora Protection Order species, which was not recorded possibly due to disturbance from this pipeline construction.

Not all these works had irreparable impacts (-2) and resulted in losses of saltmarsh extent. Some reclamation works were only assessed as having a negative repairable impact (-1) or a neutral impact in cases where there was evidence that the reclamation was not successful and/or the damaged surface was re-vegetating with ASM. This was also the case where small amounts of material were removed from the saltmarsh or damage was caused indirectly to the saltmarsh structure by machinery working on adjacent embankments, such as ruts and tracks. This was the case at 15 sites containing ASM.

Drainage of the saltmarsh (810) was noted as an impact at 9 sites containing ASM. This habitat has frequently been modified by drainage in the past. In most cases recent drainage work usually was focused on cleaning or deepening existing drains. Usually drains were cut through the saltmarsh or creeks were channelised in the past to link drains from adjacent agricultural land to the intertidal area and enhance drainage in this adjacent land. The overall impact of drainage work on the saltmarsh was usually difficult to assess. Drainage obviously changed the physical structure of the saltmarsh but there were few obvious impacts on various habitats within the saltmarsh. Drumcliff Bay was one site where there were clear impacts of drainage on the distribution of Annex I habitats. Strips of ASM had developed along these drains where material dredged from the drain had probably been profiled and smoothed, and revegetated with ASM vegetation. It should be noted that some land-owners indicated that drainage works were being carried in advance of an application for inclusion in REPS.

3.4.2.6 Impacts of erosion, accretion and natural processes on ASM

Erosion (900) and accretion (910) also affects this habitat. Both of these are natural processes and ASM as a coastal habitat will attempt to adjust or reach equilibrium in response to climatic and local changes. Erosion and accretion is site specific and the two processes can compensate each other. Some sites are quite dynamic with short periods of erosion and accretion and relatively rapid shifts in saltmarsh extent. These processes can be affected by human activities that limit the volume of sediment entering or moving about in the system, such as the construction of hard sea defences.

Erosion was recorded as an impact affecting ASM at 82 sites. However, in most cases (62 sites) erosion was assessed as having a neutral impact where there was no evidence of any loss of extent during the current monitoring period. In general while there were frequent physical signs of erosion observed at many sites, there was very little evidence of actual measurable saltmarsh loss or saltmarsh retreat during the current monitoring period, indicating that rates of erosion of saltmarsh are relatively low. Physical signs included tall smooth saltmarsh cliff faces, undercutting of perched terraces, slumping and the creation of mud mounds (Figure 3.8). These physical signs were exacerbated at sites with the greatest erosional pressure.

However, these physical signs were not a useful indicator of saltmarsh loss as they were quite common and can be considered as features of natural erosion. In many cases there was no indication the position of these saltmarsh cliffs had moved when comparing their position to the OSI 2nd edition 6 inch maps. While erosion may have occurred in the past, the rate of erosion at present may be neutral or quite low.

Figure 3.8. Indicators of erosion such as eroded mud platforms at Fybagh, Co. Kerry (top left), runnels in the front of the marsh at Aughness Co. Mayo (top right) and fragmented mud at Cummeen Strand (bottom) (2008).

Many western sites have saltmarsh vegetation developing on a thin layer of substrate that may overlay loose beach material or glacial drift. These patches of saltmarsh are vulnerable to erosion, especially if they are grazed heavily, and patches of bare rocky material within the saltmarsh or ASM/rocky mosaics were frequently recorded. However, these features may not be interpreted as signs of an erosional trend as this saltmarsh may have developed on substrate that is being continually reworked.

The current monitoring period may be too short to record measurable changes due to erosion at most sites using the methods employed by the Saltmarsh Monitoring Project 2007-2008. It was only when comparing the current habitat extent to the older maps (OSI 6 inch maps) that saltmarsh retreat could be noted at most sites and this was usually of the scale of 5-20 m. The method of assessment does not consider natural erosion as *unfavourable*. Erosion was considered *unfavourable* or having a negative impact when it was related to other factors (construction of hard sea defences) or there was no capacity of natural saltmarsh retreat in response to erosion. There were several sites (6) where erosion was assessed as having an irreparable influence (-2) with measurable erosion and actual saltmarsh retreat during the current monitoring period. Erosion was most significant at Grange, Bannow Bay, where the remaining saltmarsh and a large part of an associated sand dune spit had been washed away during the current monitoring period. All that remains of the ASM at this site was a small patch of re-developing pioneer saltmarsh vegetation around a new saline pool. This was the only example encountered during the SMP project of an entire saltmarsh being washed away. Erosion at this site was thought to have been promoted by extraction of sand and gravel in the past.

There were several other examples of significant erosional pressure and measurable saltmarsh retreat during the monitoring period at other sites in Bannow Bay and also in Castlemaine Harbour. Saltmarsh retreat was noted at Saltmills, Cromane, Whitegate-Fybagh, Ringville and Kilcamin. In all cases there was measurable saltmarsh loss and the sites were also constrained by sea defences or hard barriers such as roads, so there is no capacity for landward retreat. This impact is threatening these saltmarsh sites in the long-term (however, accretion at other sites in some of these estuaries and bays was not considered.

Erosion was assessed as less significant (-1) at 14 other sites where there was a measurable retreat of saltmarsh, but there was also potential for saltmarsh habitats to retreat landwards into adjacent transitional habitats. Examples of this include Castlebridge, Co Wexford and Rossbehy, Castlemaine Harbour, Co. Kerry. At some of these sites erosion was being compensated somewhat by accretion at the same site.

Erosion was also induced by moderate-heavy grazing levels at several sites. Some sections of sites were more vulnerable to erosion because the ASM was developed on a 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 or peat layer. This means the substrate is more easily eroded by the tide and water currents.

Accretion (910) was noted as an impact at 34 sites containing ASM. This coastal process was generally recorded as a neutral or positive impact on ASM and frequently occurred at sites where there was also erosion. While some parts of a site was being eroded, at other sections there may be build up of sediment and new growth of saltmarsh vegetation. Some of these sites are quite dynamic and some of the recent saltmarsh growth noted during the current reporting period may be ephemeral and is likely to be continually re-worked. Examples of these sites include Dooey, Co. Donegal. However, saltmarsh growth at other sites is likely to be part of long term accretion trend, which can also be seen when comparing current habitat maps to the older map series (OSI 2nd edition 6 inch maps, drawn between 1910-1925).

Figure 3.9. Development of accretional mounds at Strandhill, Co. Sligo (2008).

Accretion was generally recorded where new saltmarsh had recently developed (in comparison to the OSI 2nd edition six inch map) or where there physical indications of accretion. The main physical indication was an accretion ridge usually vegetated with pioneer communities along the seaward edge of the saltmarsh (Figure 3.9).

The lack of accurate baseline information on saltmarsh extent at the beginning of the monitoring period meant that despite physical indications that saltmarsh may be expanding through sediment build-up (910), it was very difficult to quantify the growth of saltmarsh within the current monitoring period. This could be assessed at some sites using the 1995 aerial photo series as a baseline. However, it was sometimes quite difficult to demarcate the lower saltmarsh boundary of pioneer communities from aerial photos. The 1995 aerial photo series is also poor in quality and incomplete. Therefore it was difficult to make an accurate assessment of saltmarsh growth during the current monitoring period.

Erosion and accretion was sometimes associated with physical changes to the coastline such as the construction of seawalls or other structures. Growth of saltmarsh at Bannow Island, Co. Wexford was promoted after the construction of a causeway to the island. Growth of saltmarsh in the Boyne Estuary in the past 100 years may have been related to sediment build up behind seawalls used to maintain the main navigation channel. Sediment dredged from the channel may have been dumped behind these seawalls in the past.

Accretion also had an important interaction with the development of *Spartina* swards. At several sites continued accretion has promoted the development of *Spartina* swards (e.g. Dundalk Bay). At other sites it is not known if accretion of substantial sediment occurred after colonisation by Common Cordgrass, or in combination with it or even before it (e.g. Bannow Island or Fethard, Co. Wexford).

It was generally very difficult to assess the actual area of habitat that erosion or accretion was affecting during the site assessment. These processes were generally thought to act on the lower saltmarsh boundary, although they can impact on other parts of the saltmarsh. Usually this was a function of the length of the lower saltmarsh boundary and also considered the extent of saltmarsh that was eroded or newly developed. The area of saltmarsh that was

actually eroded away or newly developed was generally estimated in the individual site reports.

Overall geomorphological changes in the past 100 years were assessed for each site by comparing the current extent of saltmarsh to the former extent as indicated by the OSI 2nd edition 6 inch maps using GIS (Table 3.10). The area of new saltmarsh or any saltmarsh loss was calculated by drawing new polygons to represent this area. This table generally compared the current extent of established ASM to the former saltmarsh area, and assumed that the former saltmarsh was also ASM. Most growth of established saltmarsh at these sites has produced new ASM and also *Spartina* swards, where Common Cordgrass is present. While the spread of this species can also promote the build up of sediment and the development of saltmarsh, the area of *Spartina* swards (newly developed since the drafting of these OSI 2nd edition six inch maps) was not considered in this table.

These data gave some indication of gross trends in coastal dynamics at these saltmarshes and around the coast of Ireland. However, they can not be used for assessments during the current monitoring period as the method is too imprecise. These data estimates that an overall 17.55 ha of saltmarsh was eroded away at the surveyed sites during this period. However, 255.6 ha of saltmarsh were also newly developed in the past 90-100 years. This data is skewed by the very significant saltmarsh growth in Dundalk Bay, where it was estimated that there has been growth of saltmarsh by 200 ha, more than doubling the size of the overall saltmarsh area in Dundalk Bay. Even when this site is not considered, there has been much more saltmarsh growth than saltmarsh loss during this period. There is also a trend of saltmarsh accretion towards the northern part of the country, with significant growth in several of the sites surveyed in Donegal.

Sites with overall erosion were scattered along the western coast and include some areas such as Castlemaine Harbour. There is also an overall trend towards erosion in Bannow Bay, with several sites suffered saltmarsh loss.

These data and the trends they indicate should be considered with caution as they only indicate general trends in one habitat and changes at the lower saltmarsh boundary. Changes at the upper saltmarsh boundary are not considered. The position of the upper ASM boundary is also likely to have changed at some of these sites in response to various geomorphological factors affecting erosion or accretion at the lower saltmarsh boundary. This upper boundary is also likely to have been affected by reclamation works at many of these sites. While the lower boundary of the established saltmarsh (generally the ASM boundary) is more easily defined on the older maps, it is much more difficult to ascertain the upper boundary of these Annex I saltmarsh habitats.

Other natural processes (990) can also have a significant impact on the extent of saltmarsh. These have been recorded at 15 sites and were assessed as having a range of negative, neutral or positive impacts. At many saltmarshes associated with sand dune systems or shingle spits, there is frequently some natural transition from saltmarsh to sand dune habitats as sand or shingle is blown over onto the saltmarsh. Shifts in the position of sand dune or shingle ridges are natural geomorphological processes. Examples of these processes can be found at Inch, Co. Kerry and Streedagh Point, Co. Sligo. A significant portion of land marked as saltmarsh at Inch on the OSI 2nd edition six inch map is now sand dune and transitional habitat as the saltmarsh habitats migrate seaward. These impacts were generally assessed as neutral.

Table 3.10. Summary table showing sites (2007-2008) with significant geo-morphological changes (overall erosion and accretion) in the past 100 years. The change in area (ha) is estimated (red - indicates loss of saltmarsh, green - indicates expansion of saltmarsh).

Site Name	County	ASM Area (Ha)	Significant geomorphological changes to saltmarsh in past 100 years	Estimated change in extent (ha)
Dundalk	Lo	330.15	Very significant growth. Significant *Spartina* sward development. [1]	+ 200.0
Baltray	Lo	14.37	Very significant growth, Significant *Spartina* sward development. [1]	+ 10.0
Mornington	Me	11.24	Significant growth, *Spartina* sward development. [1]	+ 1.5
Castlebridge	Wx	2.88	Erosion, retreat of 10-20 m	- 0.5
Rosslare	Wx	7.54	Overall growth, some recent erosion	+ 1.0
Bannow Island	Wx	1.981	Overall growth, Significant *Spartina* sward development. [1]	+ 0.6
Clonmines	Wx	15.870	Significant erosion	- 1.0
Saltmills	Wx	1.127	Very significant erosion, Retreat of shingle ridge over SM by 10-50 m [2]	- 1.0
Grange	Wx	0.014	Very significant erosion, loss of whole saltmarsh	- 2.5
Fethard	Wx	4.276	Very significant growth, Significant *Spartina* sward development. [1]	+ 3.5
Rochestown	Kk	17.499	Overall growth	+ 2.0
Ringville	Kk	6.335	Minor growth, now eroding	+ 0.5
Little Island	Wa	3.616	Overall minor growth	+ 0.1
Dungarvan	Wa	8.212	Minor erosion	- 0.25
Ballymacoda	Co	27.058	Significant growth, Significant *Spartina* sward development. [1]	+ 1.5
Harbour View	Co	11.040	Significant growth, Significant *Spartina* sward development. [1]	+ 2.0
Ballybrack	Co	0.887	Minor erosion	- 0.1
Dough	Co	5.495	Dynamic, significant erosion and accretion, neutral overall. [3]	0
Rossbehy	Ke	7.286	Overall growth, some erosion	+ 2.5
Cromane	Ke	13.907	Some erosion, 5-10 m retreat	- 1.5
Whitegate, Fybagh	Ke	2.553	Erosion	- 0.5
Emlagh East	Ke	0.979	Some erosion, induced by extraction of material	- 0.5
Querin	Cl	3.560	Significant growth, Significant *Spartina* sward development. [1]	+ 2.0
Rinevilla Bay	Cl	11.730	Very significant erosion, retreat of shingle bank over saltmarsh by 115 m [2]	- 6.0
Kilcaimin	Ga	7.818	Some erosion, retreat of 10-15 m	- 0.25
Roscam West & South	Ga	3.302	Minor growth	+ 0.1
Bealandangan	Ga	3.634	Minor erosion, retreat of 10-20 m	- 0.25
Owenduff, Corraun	Ma	0.485	Minor erosion	- 0.1
Doona	Ma	8.717	Minor erosion, retreat of 5-10 m	- 0.5
Aughness	Ma	2.678	Some erosion	- 0.1
Doolough	Ma	12.789	Significant growth	+ 2.0
Elly Harbour	Ma	7.205	Some growth	+ 1.0
Ballysadare Bay	Si	37.114	Minor growth, quarry waste	+ 0.5
Strandhill	Si	1.478	Minor growth	+ 0.5
Cummeen Strand	Si	10.512	Significant erosion, retreat of saltmarsh by 20 m [2]	- 1.5
Drumcliff Bay	Si	7.015	Some erosion 10 m retreat	- 1.0
Streedagh Point	Si	13.138	Minor growth	+ 1.0
Laghy	Do	19.800	Significant growth	+ 2.5
Rossmore	Do	4.620	Significant growth	+ 4.0
Maghera	Do	5.850	Significant growth, dynamic	+ 2.5
Sheskinmore-Beagh	Do	15.900	Significant growth	+ 2.5
Roshin Point	Do	2.180	Some growth	+ 0.3
Keadew	Do	9.229	Very significant growth, dynamic	+ 7.0
Dooey	Do	7.494	Neutral, dynamic [3]	0
Creeslough	Do	19.610	Very significant growth	+ 4.0
Rosapenna	Do	9.160	Minor growth	+ 0.5

[1] The presence of Common Cordgrass may promote accretion and saltmarsh expansion.

[2] 'Retreat' means retreat of saltmarsh in a landward direction. Other sites not listed were assessed as neutral with no significant geo-morphological change.

[3] 'Dynamic' indicates some losses and gains at the same site that compensate each other.

Other processes such as the natural redevelopment of saltmarsh in formerly reclaimed areas located behind seawalls that have been reflooded have been included under this category. Sea Walls have been damaged by erosion and/or poor maintenance creating breaches that allow the tide to re-enter reclaimed land. Lack of maintenance to sluices or poorly constructed drains can also allow sea water to enter into this formerly reclaimed land. Examples of this are found at Ballymacoda, Co. Cork, Cromane, Co. Kerry and Creeslough, Co. Donegal. Not all of these breaches occurred during the current monitoring period and analysis of aerial photos was used to date these breaches. These impacts were assessed as generally positive. Some natural processes such as the spread of dense stands of brackish vegetation (Sea Club-rush and Common Reed) were assessed as having a negative impact on the ASM habitat.

3.4.2.7 Other impacts on ASM

The remaining impacts and activities occur quite infrequently or were only recorded as occurring at a single site. These include roads (502); Electricity Lines across a saltmarsh (511) (Dough; Co. Cork) and the development of a Sports Pitch (607) (on saltmarsh/machair at Co. Donegal).

The effects of water pollution (701) were noted at several sites. Eutrophication from primary sewage treat plants had various indirect impacts including promoting the spread of Common Cordgrass at Fethard, Co. Wexford and the spread of Common Reed at Ballysadare. Pollution from private septic tanks seemed to having a significant direct negative impact on the saltmarsh at Rosslare, with dieback of vegetation attributed to this impact. Dumping of various categories of waste including Disposal of household waste (422), Industrial waste (423) and Inert material (424) were also recorded at several sites. The waste ranged from household and garden refuse to commercial or fly tipping debris as well as construction and demolition rubble (classed as inert material). Some of this material was also used for infilling and this activity was considered in Section 3.4.2.5. Generally the amount of dumped waste was quite small but there were several sites such as Cromane, Co. Kerry, where there was a significant amount of waste scattered around the site. On occasion the impact was significant such as at Taulaght where mixed waste was dumped and has possibly leaked out untold chemical pollutants into the Bannow Bay.

Some saltmarshes are also used for amenity and recreation. This includes walking, horse-riding (622) and the use of all-terrain vehicles and scrambler bikes (623). These activities can create tracks and can damage the surface of the saltmarsh. Other activities include Fishing (210 & 220) as well as shooting wildfowl (230). Saltmarshes in several estuaries were used for mooring small fishing boats. Adjacent activities such as aquaculture (200) can have direct impacts on the saltmarsh such as the creation of access tracks and dumping of waste.

3.4.3 Impacts and activities on Mediterranean salt meadows (1410)

Mediterranean salt meadows are affected by a similar range of impacts and activities compared to ASM. However, many of these impacts and activities occur less frequently and also have less intensive impacts compared to ASM. This is due to several reasons, the main one being that MSM is less extensive overall compared to ASM and is found at fewer sites. Its general location at the landward side of the saltmarsh also affords it some protection from various impacts and activities acting on the seaward side of the saltmarsh such as erosion.

Most impacts and activities having a negative influence on MSM have a reparable influence such as overgrazing (142/143). Those impacts that were assessed as having an irreparable influence include infilling, reclamation, development of tracks and erosion at some sites (where there is a significant erosional trend that will threaten the saltmarsh).

3.4.3.1 Impacts of grazing on MSM

The most common impacts on MSM recorded during the survey were related to grazing by livestock (140). Natural grazing probably occurs to some extent as well at most sites in this habitat. The overall impact of grazing by livestock was generally lower compared to ASM. This is because the Sea Rush is generally unpalatable and not grazed by sheep or cattle, unless there is no alternative fodder when young shoots and the tops of rushes will be grazed. Sheep will generally avoid dense tall vegetation dominated by Sea Rush.

Grazing (140, 142, 143) was noted as an impact at 62 sites (although not all of the MSM at these sites was being grazed). Grazing affected nearly 70% of the overall MSM area so 30% of this area was not being grazed at all by livestock (Table 3.11). This data can be compared to data collected during assessment of monitoring stops, which showed that of a total of 409 stops, grazing was recorded from 214 stops (52.3%). Curtis and Sheehy-Skeffington (1998) noted that grazing was much more prevalent on the west coast compared to the east coast. However, ungrazed MSM was scattered along both the eastern and western coasts (although the proportion that is ungrazed is probably greater on the east coast).

Table 3.11. Grazing data (2007-2008) summarised from assessment of impacts and activities on MSM (100 sites).

Impact	Code	Number of sites	Area (ha)	% of total area
Grazing (not having a negative impact)	140	53	250.3	60.1
over-grazed by sheep	142	4	1.3	0.3
Overgrazing by cattle	143	30	37.3	9.0
(overall grazing) [1]		62	288.8	69.4
Overall not grazed		20	127.3	30.6
total MSM [2]		82	416.1	100

[1] combined sites with grazing 140, 142 and 143. Note there is overlap between sites with habitat assessed as grazed and habitat assessed as overgrazed.
[2] 82 sites listed in total in this table. Ringville is not considered here as no MSM was present, although it was considered during assessment (Table 3.3), as a rare sub-type of MSM previously known at this site was not recorded during 2007 survey.

Overgrazing by cattle and/or sheep was noted in this habitat at 32 sites (Table 3.11). Overgrazing by cattle was by far the more common impact (30 sites) compared to overgrazing by sheep. It should be noted that at two-thirds of these sites only a portion of the habitat was assessed as overgrazed as the site was spread over several different management units with different management regimes. Assessments of the areas damaged by overgrazing showed that only 0.3% of the overall MSM area was being overgrazed by sheep, while 9% was being overgrazed by cattle. These results can be compared to data from the monitoring stops carried out in MSM, which showed that of a total of 409 stops, 24 (5.9%) failed due to over-grazing and associated damage.

Overgrazing was mainly related to damage in dense Sea Rush-dominated vegetation caused by trampling, with livestock confined to an area for a relatively long time. Cattle and sheep also create tracks through dense vegetation. Sections of MSM where Sea Rush has less cover also show signs of excessive grazing at these sites with other more palatable saltmarsh species grazed to a very low height. At sites where there was excessive over-stocking (e.g. Dough, Co. Cork) vegetation within the MSM was stripped from the surface of the saltmarsh between tussocks of Sea Rush.

The impact of under-grazing (149) on MSM was difficult to assess during the project. This habitat can naturally be quite 'rank' and species poor, which gives the impression it is 'under-grazed' or that grazing has a significant impact on species diversity. Several sites (6) were assessed during the project as under-grazed (e.g. Castlebridge, Rock Castle-Bandon Estuary) where there has been no grazing by livestock for some time. Several Farmers at these sites had not grazed the saltmarshes due to a range of reasons including the treacherous nature of the ground and the excessive wet summers during 2007-2008 that created poor ground conditions. At one site grazing was excluded due to REPS criteria, with the REPS Planner stating that the marsh should not be grazed at all. However, one noticeable factor at these sites was the abundance or biomass of grasses such as Red Fescue and Creeping Bent, compared to grazed sites. There was no noticeable impact on the cover or frequency of Sea Rush. The lack of grazing probably also has an impact on the cover of species such as Common Reed and Sea Club-rush. The spread of these brackish species into MSM vegetation was noticeable at some sites with no grazing. However, the overall species diversity of sites that are grazed compared to sites that are ungrazed is probably quite similar.

3.4.3.2 Impacts of other agricultural management on MSM

There are a number of activities recorded during the project that can be classified as types of agricultural management. These were generally not common or extensive and include cutting/mowing (102) – Sheskinmore-Beagh, Agricultural improvement (103) – Dunbrody Abbey, forestry (160) – Mullanasole and burning (180) – Kinvarra, Doolough. These activities were generally focused on adjacent agricultural grassland and affected a minor portion of the MSM located at the landward end of the saltmarsh. The most significant activity was agricultural improvement which occurred at one location at Dunbrody Abbey. This impact is rated as significant (A) and irreparable (-2), having resulted in a loss of both MSM habitat as well as potential habitat for colonisation by Borrer's Saltmarsh-grass, an indicator of a rarer sub-type of MSM.

3.4.3.3 Impacts of tracks on MSM

Several other impacts associated with grazing and agricultural management were noted from the MSM. These included the creation of tracks of various types, sometimes created from trampling (501). This impact was noted at 30 sites containing MSM, and was assessed as an

irreparable influence (-2) at one site (Streedagh Point, Co. Clare), where a permanent track was constructed. Although the MSM is largely avoided by cattle and sheep, they often traverse the habitat in search of better fodder. This is evident in larger, unenclosed saltmarshes where there is a clear vegetation mosaic or where the MSM is not abundant and occurs as discrete patches. Linear tracks created by livestock are also common along the shoreline, crossing saltmarsh habitats. Tracks also cross saltmarsh including MSM to provide access to the shoreline for aquaculture and fishing.

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 from heavy use. Some of these tracks have been exacerbated from use by pedestrians and horse-riding, particularly in easily accessible commonage sites or areas where tourists/holidaymakers congregate/traverse (adjacent to sand dune systems). Some permanent tracks constructed with hardcore or gravel were created to facilitate access onto saltmarsh by livestock and farm machinery.

3.4.3.4 Impacts of erosion and accretion on MSM

After grazing, erosion (900) was the next most frequent impact that was recorded from this habitat. Erosion was listed as an impact on MSM at 45 sites, although erosion is not having a significant influence on habitat extent. However, the impact of erosion was assessed as neutral and having a low impact at most (37) of these sites. There may have been signs of erosion on the saltmarsh at these sites but it may not have been directly affecting the MSM. Erosion was assessed as having a negative impact when there some signs of saltmarsh retreat or physical signs along the lower seaward boundary such as cliff toppling. Other physical signs of erosion such as tall saltmarsh cliffs with bare peat face-banks and the development of lower platforms or mud mounds were frequently observed on Fringe type saltmarshes along the west coast of Ireland. However, these are natural features of saltmarsh at these sites and may not represent indicators of short-term or medium-term erosion.

In general there was very little evidence of actual measurable saltmarsh loss or saltmarsh retreat during the current monitoring period, indicating that rates of erosion of saltmarsh are relatively low. The monitoring period may be too short to record measurable changes due to erosion using the methods employed by the Saltmarsh Monitoring Project 2006-2008. It was only when comparing the current habitat extent to the older maps (OSI 6 inch maps) that significant saltmarsh retreat could be measured.

Erosion was assessed as having an irreparable influence (-2) at only 4 sites in Castlemaine Harbour, Co. Kerry and Bannow Bay, Co. Wexford. There was evidence from comparisons of habitat extent to aerial photos and the 2nd edition OSI six inch map that showed that there was a significant erosional trend at these sites and they were also constrained by sea defences or hard barriers such as roads, so there is no capacity for landward retreat. This was threatening the saltmarsh in the long-term and there was no accretion and saltmarsh growth to balance this loss.

Examples of saltmarsh retreat include Cromane where there was an estimated 5-10 m retreat of saltmarsh that represented a loss of about 0.5 ha of saltmarsh (ASM and MSM). Mediterranean salt meadows were not being directly affected by erosion at Saltmills, Bannow Bay but a natural gravel ridge protecting the outer boundary has retreated by between 15-50 m in the past 100 years (comparison to OSI 2nd edition six inch map). A saltmarsh at the mouth of Bannow Bay (Grange) containing some MSM has nearly been completely eroded away. Other sites such as Drumcliff Bay also had measurable saltmarsh retreat but this was

compensated somewhat by accretion at other locations on site and the development of new saltmarsh. Erosion was assessed as a 'repairable influence' (-1) or less significant at some sites where there was a measurable retreat of saltmarsh but there was potential for saltmarsh habitats to retreat landwards into adjacent transitional habitats. Examples of this include sites like Castlebridge, Co Wexford.

Accretion (910) was much less frequently recorded as an impact on MSM. This impact in general rarely has a direct impact on MSM. However, there are some sites where there has been development of 'pioneer' MSM or MSM expansion at the lower seaward boundary of the habitat. Sea Rush in general is associated with the upper saltmarsh but at some sites it was noted as colonising bare mud seaward of the existing lower saltmarsh boundary, sometimes some distance seaward of established saltmarsh. The best example of this phenomenon was in Castlemaine Harbour (Fybagh, Whitegate), but it was also noted at sites such as Kinsalebeg, Blackwater River Estuary, Co. Waterford. Sea Rush is creating a pioneer community in this situation. These stands are generally mono-specific and are quite open with frequent bare mud cover. At other sites Sea Rush was spreading slowly seaward (by several metres) at the base of older saltmarsh cliffs. Some of this growth was related to accretion at some sites but not at others where there sediment build-up was related to colonisation by Sea Rush.

3.4.3.5 Impacts of Common Cordgrass on MSM

The impact of Common Cordgrass on MSM was generally much lower compared to its impacts on ASM. It was assessed as a low or medium negative impact at 6 sites (out of 88 sites) and assessed as a neutral impact at only 6 more sites. Only 7.1 ha in total were assessed as being negatively affected by Common Cordgrass (including MSM in mosaics with *Spartina* sward). This is related to the fact that MSM generally occupies the upper saltmarsh zone and Common Cordgrass generally does not successfully invade this type of saltmarsh, as it prefers to colonise lower and pioneer saltmarsh and bare mudflats. Common Cordgrass was usually confined to creeks and pans within the habitat.

Common Cordgrass was rarely extensive within the MSM and mosaics between MSM and *Spartina* sward were quite rare. One example was at Rossbehy, Co. Kerry, where saltmarsh was establishing within enclosures formerly protected from the tide by seawalls. These embankments had been breached and the reclaimed land was inundated by the tide again. Some of this land was developing an unusual community with Sea Rush and Common Cordgrass co-dominant in places. This community is probably related to the fact that both species had re-colonised in this area. Other examples of mixed communities of MSM and *Spartina* sward were found at Taulaght, Co. Wexford, Inch, Co. Kerry and Barrigone, Aughinish, Co Limerick. The site at Inch was also found behind a former embankment that had since been breached. Mediterranean salt meadows seem to be more vulnerable to invasion when it is located in the lower-middle zones of the saltmarsh and when it is quite open with frequent deep creeks and pans. This seems to be a feature of the invasion of MSM by Common Cordgrass at the three sites mentioned above.

Occasionally MSM was found along the seaward end of the saltmarsh in the lower zone and Common Cordgrass is associated with this habitat. This was encountered at Inch (a different section than that described above) and Whitegate, Fybagh, both in Castlemaine Harbour, Co. Kerry. The habitat at Inch shows signs of Sea Rush actually spreading into the newly developed *Spartina* sward along the former saltmarsh cliff rather than invasion of the MSM by Common Cordgrass.

In general, invasion by Common Cordgrass does not pose a significant threat to MSM.

3.4.3.6 Impacts of infilling, reclamation, drainage and related impacts on MSM

The general position of this habitat at the upper landward boundary of the saltmarsh means that it is vulnerable to related impacts such as polderisation (801), reclamation (802), infilling (803) and work on dykes and embankments (870). Infilling and reclamation probably had a much greater impact on saltmarshes in the 19th and 20 centuries prior to this monitoring period, when large areas of saltmarsh were reclaimed for agricultural land or infilled for other purposes. These impacts and activities were only assessed where there was evidence of active management within the current monitoring period. While older reclamation schemes and embankments are continuing to exert a significant influence, these impacts were not considered.

These impacts are continuing affect saltmarshes around the coast and are the main factor having an irreparable influence and causing a loss of extent. However, these activities have not occurred frequently or have not affected extensive areas during the current assessment period. It was estimated that only 0.358 ha of MSM was lost from the surveyed sites due to these activities during the monitoring period. The largest area of MSM lost was at Cromane, Co. Kerry where 0.3 ha was destroyed by the creation of a new embankment and infilling behind this embankment. Very small losses of habitat were noted at 5 other sites.

Dumping was noted at 6 sites containing MSM. The disposal of industrial waste (422) including machinery, batteries and tyres was recorded on saltmarsh at Cromane and small piles were distributed over a relatively large area (2 ha).

These impacts are sometimes associated with the maintenance or repair of pre-existing coastal protection defences and flood relief schemes (870). Mediterranean salt meadows that had developed at the base of some embankments had been damaged by the use of this area to repair these embankments. This was noted at Barrigone, Aughinish, Co. Limerick. Breaches of an embankment that allowed MSM to develop in previously reclaimed land were assessed as a positive impact at one site (Creeslough, Co. Donegal).

Recent drainage (810) was noted as an impact at 6 sites containing MSM. This habitat has frequently been modified by drainage in the past. Usually drains were cut through the saltmarsh or creeks were channelised in the past to link drains from adjacent agricultural land to the intertidal area and enhance drainage in this adjacent land. Drainage of the MSM was also carried out to help drainage of large sections of saltmarsh used for grazing by livestock. Recent drainage work during the current monitoring period usually was focused on cleaning or deepening existing drains. The overall impact of drainage work on the saltmarsh was usually difficult to assess. Drainage obviously changed the physical structure of the saltmarsh but there were few obvious impacts on various habitats within the saltmarsh. Drumcliff Bay was one site where there were clear impacts of drainage on the distribution of Annex I habitats. Strips of ASM had developed along these drains where material dredged from the drain had probably been profiled and smoothed, and revegetated with ASM vegetation.

3.4.3.7 Other impacts on MSM

Several other impacts and activities were only encountered on MSM quite rarely during the survey. Most of these impacts had a low or neutral impact on the MSM. These include impacts such as Fishing (210) and shooting of wildfowl (230). Some saltmarshes are also used for amenity use (622) such as walking and horse-riding. However, the impact of amenity use is generally minor.

Water pollution (701) was noted at two sites (Rosslare and Ballysadare Bay) as having a negative impact on the saltmarsh. Pollution from a sewage treatment plant at Ballysadare

seems to be promoting the development of Common Reed beds and the invasion of Common Reed into MSM due to eutrophication.

The spread of Common Reed into MSM was assessed as a negative impact by an invasive species (954) at two other sites. However, this is probably related to natural environmental factors or other factors such as a change in the grazing regime. It also means that a natural and native brackish vegetation type is spreading at the expense of Annex I vegetation, so it may not necessarily be a negative impact. It could be assessed as a natural process (990).

Other natural processes (990) were recorded on MSM in six sites. This impact includes natural transition of saltmarsh to a different habitat such as sand dune, where sand was being blown onto the saltmarsh. This has occurred at Inch, Co. Kerry, where the landward MSM boundary has significantly retreated seawards since the drafting of the OSI 2nd edition 6 inch map. Other natural processes include the development of brackish vegetation such as stands of Common Reed and Sea Club-rush, which is occurring at Rinavella Bay, Co. Clare. Other sites like Kilcoole, Co. Wicklow are quite dynamic and are affected by periodic flooding caused by natural blocking of the outflow by shifting gravel from this 'Lagoon' type site. These impacts are generally assessed as having a neutral impact as they are natural ecological processes, even though they may cause a reduction in extent of Annex I habitat.

3.4.3.8 Impacts on the rarer sub-types of MSM characterised by the presence of Sharp Rush and Borrer's Saltmarsh-grass.

Mediterranean salt meadows habitat was characterised by vegetation dominated by Sharp Rush at several sites such as Dungarvan Bay, Harbourview and Seafort. These habitats were not affected by any significant impacts and cattle and sheep were noted as grazing on shorter vegetation between the large tussocks of Sharp Rush where possible.

The rarer Mediterranean salt meadows sub-type characterised by the presence of the indicator species Borrer's Saltmarsh-grass was noted at several sites such as Booterstown, Castlebridge, Rosslare, Dunbrody Abbey and Ballymacoda. This species is found in more brackish conditions than found in ASM. One significant factor affecting the distribution of this species (and this habitat) is that it is a pioneer species that prefers disturbed brackish conditions near the landward extent of saltmarsh distribution, such as cattle tracks. Therefore impacts and activities that create disturbance at these sites can have a very important influence on the conservation status of this rare species and habitat.

It was found at several locations in Castlebridge and Rosslare that would generally be assessed as badly damaged by cattle grazing and trampling. Therefore attributes normally used for the assessment of habitat structure and functions in this habitat sub-type such as heavy poaching and grazing being a negative factor should be revised. These sites should also be managed in a different way with heavier stocking rates to keep the vegetation along these tracks open and maintain suitable conditions for this species. It was notable that Borrer's Saltmarsh-grass could be re-located in one section of Castlebridge saltmarsh was had not been grazed, whereas it was still present in the other half that was continually grazed. The absence of any grazing at these sites could be classed as under-grazing (149), while the intensity of grazing, which would be assessed as over-grazing (142/143) for ASM or the more typical form of MSM, should be assessed as grazing (140) with a positive impact.

A new population of Borrer's Saltmarsh-grass was recorded in Ballymacoda, Co. Cork. This population was developing in a recently reflooded area, where an embankment had collapsed and allowed previously reclaimed agricultural land to revert back to saltmarsh and intertidal habitats. This area is obviously quite disturbed and the sward still has not closed, so the conditions suit a pioneer species such as Borrer's Saltmarsh-grass. However, this area was

not being grazed and this could have a negative impact on the conservation status of this population in the future as the vegetation matures and develops more typical saltmarsh communities, which would not favour this species as it promotes the development of denser closed sward. The long-term absence of grazing would have a negative impact on the status of this species. This species and habitat is also threatened if the embankments are repaired and the land behind the embankments is reclaimed again in the future.

The population of Borrer's Saltmarsh-grass at Booterstown was more extensive in the past. However it is now confined to a narrow open zone between dense stand of Sea Club-rush and a band of Twitch that has developed along the edges of the marsh. Changes in the environmental conditions of the site in the recent past have favoured the spread of Sea Club-rush. It is not known if flooding of this enclosed marsh can be manually controlled at present (853). Flooding has also occurred accidentally in the past when the sluice sticks in a closed position and this restricts tidal inundations and promotes brackish conditions. Both Twitch and Sea Club-rush has the capacity to out-compete Borrer's Saltmarsh-grass by creating a closed dense sward. The current extent of Sea Club-rush stands indicate that brackish conditions are most typically found at this site. The changes in the cover of Sea Club-rush can be assessed as natural change (990) that may be having a negative impact on the Annex I saltmarsh habitats.

3.4.4 Impacts and activities on Mediterranean & thermo-Atlantic halophilous scrubs (1420)

Few impacts and activities affect this habitat, which is not surprising given the relative paucity of this habitat in Ireland (Tables 3.12 & 3.13). The habitat was recorded at four sites during the 2007-2008 survey, whilst a fifth site, Grange at the mouth of Bannow Bay, has in the past number of years been completely modified due to coastal erosion.

Table 3.12. Summary of impacts and activities on Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420) at each site (Inside) (at sites surveyed during 2007-2008).

Site name	County	Habitat area (ha)	Impacts and activities											
			803			900			910			954		
			Infilling of Marshes			Erosion			Accretion of Sediment			Invasion by *Spartina*		
			Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Bannow Island	Wx	0.166							C	0	0.166	C	0	0.166
Taulaght	Wx	0.012	B	0	0.001	C	0	0.01				C	0	0.012
Gorteens	Wx	0.059										C	0	0.059
Fethard	Wx	0.121										C	0	0.121

Table 3.13. Summary of impacts and activities on Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi) (1420) at each site (Outside or adjacent) (at sites surveyed during 2007-2008).

Site name	County	Habitat area (ha)	Impacts and activities					
			200			701		
			Fish & Shellfish aquaculture			Water Pollution		
			Intensity	Impact	Area affected	Intensity	Impact	Area affected
Taulaght	Wx	0.012	C	-1	0.5			
Fethard	Wx	0.121				C	0	0.121

3.4.4.1 Impacts of Common Cordgrass on Halophilous scrubs

The most frequent impact affecting this habitat at these four sites has been the spread of Common Cordgrass. This species is widely distributed around Bannow Bay, often forming extensive areas of *Spartina* swards on the intertidal flats. Perennial Glasswort was frequently found in the transition zone between *Spartina* sward and adjacent ASM. It is associated with densely growing Common Cordgrass, Common Saltmarsh-grass and Glasswort that has vegetated soft mud. While Glasswort was found associated with other vegetation types such as tussocks of Sea Rush and banks of shingle, it was found more frequently in *Spartina* sward/ASM zone than in adjacent saltmarsh where Common Cordgrass was absent.

Previous NPWS draft management plans, surveys and assessments of this habitat have noted the colonisation of Common Cordgrass as a potentially negative impact on this habitat. However, while invasive Common Cordgrass is generally thought to colonise saltmarsh and smother other saltmarsh species, it seems to have provided new habitat for colonisation by Perennial Glasswort.

Perennial Glasswort is found in recently developed areas of *Spartina* sward/ASM mosaic at Gorteens and Bannow Island, which have only developed since the establishment of these swards within the past 60 years. Sediment accretion (910) has benefited this species at both these sites in association with colonisation by Common Cordgrass. This suggests that it has reproduced and colonised newly developing saltmarsh during this period. This is a positive indicator for structure and functions. The population structure of Perennial Glasswort at Fethard also seems to have changed and there are more frequent smaller clumps of younger plants. This is also taken as a positive indicator for structure and functions. However, Perennial Glasswort seems to happily co-exist with Common Cordgrass. The impact of this invasive species is likely to be much less significant than previously thought and is not now considered as a negative impact for this assessment. The impact of Common Cordgrass was assessed as neutral on this habitat during the survey (Table 3.12).

3.4.4.2 Other impacts on Halophilous scrubs

None of the sites visited during 2007-2008 were being grazed by cattle, so grazing was not an impact. Several clumps of Perennial Glasswort were being threatened by infilling of construction and demolition waste and spent oyster shells (803) along a track at Taulaght. This was associated with aquaculture industry in the area, which used the tracks along the shoreline (and saltmarsh) to access shellfish trestles (Table 3.13).

The saltmarsh in Fethard inlet is affected by water pollution from a sewage treatment plant, which has had some eutrophication impacts on other saltmarsh vegetation. However, this does not seem to have any significant impact on the Perennial Glasswort.

Bannow Bay is affected by significant coastal erosion pressure (900), and this has had a very significant impact on the saltmarsh located at the mouth of the bay (Grange). This site has been extensively modified by erosion and all of the former saltmarsh along with a large portion of the associated sand dune habitats has now been washed away. This erosion may have been promoted by extraction of beach material (302) in the past. There are signs of coastal erosion at some of the other sites in Bannow Bay (Taulaght and Gorteens) but there are no signs of any direct impact on Halophilous Scrub. Accretion (910) has already been mentioned as an important process that has created new saltmarsh for colonisation by these species.

3.5 Sites with notable species and features of particular interest found during the survey

3.5.1 Notable species

Several rare species listed in the Flora Protection Order, Anon. (1999), or listed in the Red Data Book, Curtis & McGough (1988) were recorded during the 2007-2008 survey (Table 3.14). This table also includes records of uncommon species (not listed as rare but are recorded less frequently or have a distinctive fragmented distribution around the coast of Ireland). Both these categories of species are described as notable species during the SMP and their presence can be recorded as a feature of local distinctiveness.

The distribution of rare species in Ireland is generally quite well known and most records made during this survey were reconfirmations of species that were previously known at various sites visited during 2007-2008. Prior to commencing fieldwork, preparatory work included compiling a list of known rarities from Ireland that are associated with saltmarshes and adjacent coastal communities from sources such as The NPWS Rare Plant Database. There were few 'new' records of rare species made during the survey.

Figure 3.10. Borrer's Saltmarsh-grass at Ballymacoda, Co. Cork (2008).

One of the most notable 'new' records made during the survey was the large population of Borrer's Saltmarsh Grass (*Puccinellia fasciculata*) recorded at Ballymacoda in east Cork (Figure 3.10). This species has only been found from seven 10 km^2 squares along the Barrow Estuary, Wexford and Dublin shorelines since 1960, with the most westerly record in the past 20 years thought to be the Barrow Estuary (Wexford) (Preston *et al.* 2002) so this population significantly extends the range of this species in Ireland. It has also been recently re-confirmed at another site in east Cork near Kinsale (O'Mahony 2007).

An extensive population of Borrer's Saltmarsh Grass was noted in a recently re-flooding area located behind an embankment near Crompaun Bridge at Ballymacoda. The embankment has been breached for nearly 10 years and reclaimed farmland has flooded and is now reverting back to mudflats and saltmarsh. A band of immature saltmarsh between 10-20 m

wide with a fairly open sward was developing around the edge of the new area inundated by the tide. This type of pioneer or disturbed habitat seems to be most favoured by this rare species. It thrives on ground which is heavily disturbed, often occurring on ground that is poached by large concentrations of cattle. This record is of interest as it was the largest population of this species noted during the survey (although not all known populations were surveyed during the SMP). It is also one of the most westerly populations present along the southern coast of Ireland. Previously there were records for this species further west in Co. Cork (Commoge Lagoon, Kinsale), although it has not been reconfirmed for some time since the 1950s. It was subsequently re-discovered in 2006 when several plants were noted (O'Mahony 2007).

Other notable records made during the SMP were an extensive survey of the populations of Perennial Glasswort (*Sarcocornia perennis*) in Bannow Bay and Fethard inlet, Co. Wexford. This species is confined to these sites and Ballyteige Burrow in Co. Wexford. No new sites were recorded but these species was found to be much more extensive than previously known at several surveyed sites.

Meadow Barley (*Hordeum secalinum*) is generally found in brackish situations and in unimproved meadows close to estuaries. It is known from 21 10 km^2 squares in Ireland mainly distributed around the coastline. An extensive population of this species was found at Inishdea, Owenshere Fergus Estuary, Co. Clare. Meadow Barley was found on dry mounds within the saltmarsh and was also frequent in a zone including the upper boundary of the saltmarsh and the adjacent semi-natural grassland community. There were no known records for this species at this site although it was recorded in this 10 km^2 grid square previously (Preston *et al.* 2002). Meadow Barley was previously recorded at another site visited during the survey (Little Island, Co. Waterford) but it was not refound during the survey and may be extinct at this site due to pipe-laying in the recent past along the upper saltmarsh boundary.

Table 3.14. List of notable species that were recorded during 2007-2008 fieldwork.

Species	Site Name	County	Comment
Atriplex portulacoides	Scanlan's Island	Clare	Recorded in ASM. Occasional
Atriplex portulacoides	Kinvarra-West	Galway	Recorded in ASM. Occasional
Atriplex portulacoides	Kileenaran	Galway	Recorded in ASM. Rare
Atriplex portulacoides	Tyrone House – Dunbulcaun Bay	Galway	Recorded in ASM. Rare
Atriplex portulacoides	Kilcaimin	Galway	Recorded in ASM. Rare
Atriplex portulacoides	Seaweed Point	Galway	Recorded in ASM. Rare
Atriplex portulacoides	Barna House	Galway	Recorded in ASM. Rare
Blysmus rufus	Tullaghan Bay	Mayo	Recorded in ASM/MSM. Rare
Blysmus rufus	Doolough	Mayo	Recorded in ASM/MSM. Rare
Blysmus rufus	Bunnahowen	Mayo	Recorded in ASM/MSM. Rare
Blysmus rufus	Elly Harbour	Mayo	Recorded in ASM/MSM. Rare
Blysmus rufus	Ballysadare Bay	Sligo	Recorded in ASM/MSM. Rare
Blysmus rufus	Cummeen Strand	Sligo	Recorded in ASM/MSM. Occasional
Blysmus rufus	Drumcliff Bay	Sligo	Recorded in ASM/MSM. Rare
Blysmus rufus	Streedagh Point	Sligo	Recorded in ASM/MSM. Occasional
Blysmus rufus	Mullanasole	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Rossmore	Donegal	Recorded in ASM/MSM. Occasional

Species	Site Name	County	Comment
Blysmus rufus	Maghera	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Sheskinmore-Beagh	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Roshin Point	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Keadew	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Dooey	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Creeslough	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Rosapenna	Donegal	Recorded in ASM/MSM. Rare
Blysmus rufus	Tawny	Donegal	Recorded in ASM/MSM. Rare
Carex divisa	Dunbrody Abbey	Wexford	FPO species. Not re-found
Carex divisa	Ringville	Kilkenny	FPO species. Not re-found
Carex riparia	Bunratty	Clare	Patch at upper part of saltmarsh. Rare
Carex riparia	Shepperton, Fergus Estuary	Clare	Patch at upper part of saltmarsh. Rare
Elytrigia pycnanthus	Little Island	Waterford	Recorded as patches within ASM. Occasional
Elytrigia pycnanthus	Bawnard	Cork	Recorded on embankment. Rare
Heracleum mantegazzanium	Ballysadare Bay	Sligo	One plant noted on mound in Reedbeds (CM2). Common at mouth of Ballysadare River.
Hordeum secalinum	Dunbrody Abbey	Wexford	FPO species. Recorded on embankment. Rare. Not recorded in pasture.
Hordeum secalinum	Rochestown	Kilkenny	FPO species. Not re-found in saltmarsh. Small clumps present in adjacent agricultural land behind embankment. Rare.
Hordeum secalinum	Ringville	Kilkenny	FPO species. Not re-found.
Hordeum secalinum	Little Island	Waterford	FPO species. Not re-found.
Hordeum secalinum	Inishdea, Owenshere	Clare	FPO species. Widespread. Found within MSM along raised tracks and low embankments. Also present (frequent) in transitional zone along upper SM boundary.
Juncus acutus	Buckroney	Wicklow	Very extensive & expanding mainly in area mapped as brackish dune slack. Dominant.
Juncus acutus	Rosslare	Wexford	Several large clumps along old embankment in ASM. Rare
Juncus acutus	Bannow Island	Wexford	Several clumps in re-flooding area in brackish area (CM2). One clump on adjacent dunes. Rare
Juncus acutus	Grange	Wexford	Occasional in disturbed former saltmarsh/dune slack area.
Juncus acutus	Dungarvan Bay	Waterford	Some MSM with *J. acutus* mapped. Dominant. Scattered clumps in other habitats.
Juncus acutus	Harbourview	Cork	Some MSM with *J. acutus* mapped. Dominant. Scattered clumps in other habitats.
Juncus acutus	Seafort	Cork	Some MSM with *J. acutus* mapped. Dominant. Scattered clumps in other habitats.
Limonium binervosum	Booterstown	Dublin	Recorded in ASM. Rare/Occasional
Parapholis strigosa	Dundalk	Louth	Recorded in ASM. Rare
Parapholis strigosa	Baltray	Louth	Recorded in ASM. Rare
Parapholis strigosa	Castlebridge	Wexford	Recorded in ASM. Rare
Parapholis strigosa	Rosslare	Wexford	Recorded in ASM. Rare
Parapholis strigosa	Grange	Wexford	Recorded in former saltmarsh area. Rare
Parapholis strigosa	Seafort	Cork	Recorded in ASM. Rare
Parapholis strigosa	Barley Cove	Cork	Recorded in ASM. Occasional
Parapholis strigosa	Carrigafoyle	Kerry	Recorded in ASM. Rare
Parapholis strigosa	Ballysadare Bay	Sligo	Recorded in ASM. Rare
Parapholis strigosa	Cummeen Strand	Sligo	Recorded in ASM. Rare
Puccinellia distans	Booterstown	Dublin	Recorded in ASM. Rare

Species	Site Name	County	Comment
Puccinellia distans	Kilcoole	Wicklow	Recorded in ASM. Frequent
Puccinellia fasciculata	Booterstown	Dublin	FPO species. Declined in distribution and frequency since 1980's. Rare
Puccinellia fasciculata	Castlebridge	Wexford	FPO species. Re-recorded in several of the former known locations and in one new location. Possible decline in distribution and frequency due to under-grazing? Rare.
Puccinellia fasciculata	Rosslare	Wexford	FPO species. Re-recorded in former known locations. Rare.
Puccinellia fasciculata	Dunbrody Abbey	Wexford	FPO species. Re-recorded in former known locations and found at several new locations along embankment. Rare.
Puccinellia fasciculata	Ringville	Kilkenny	FPO species. Not re-found
Puccinellia fasciculata	Ballymacoda	Cork	FPO species. New site – Largest population recorded during 2007-2008 survey in newly establishing saltmarsh. Occasional in this area. Some frequent patches.
Ruppia maritima	Dough	Kerry	A band on intertidal channel. Rare.
Ruppia spp.	Bunratty	Clare	In salt pan. Rare.
Ruppia spp.	Inishdea	Clare	In salt pan. Rare.
Ruppia spp.	Sheskinmore-Beagh	Donegal	In creek. Rare
Sarcocornia perennis	Bannow Island	Wexford	FPO species. Significantly expanded its distribution and frequency. Rare
Sarcocornia perennis	Taulaght	Wexford	FPO species. Expanded its distribution and frequency. Rare
Sarcocornia perennis	Saltmills	Wexford	FPO species. One plant recorded during Coastwtach survey. Not re-located during this survey
Sarcocornia perennis	Gorteens	Wexford	FPO species. Recently found site. Expanded its range, occurs on variety of substrates. Rare
Sarcocornia perennis	Grange	Wexford	FPO species. Not re-recorded, probably extinct. Saltmarsh destroyed due to erosion.
Sarcocornia perennis	Fethard	Wexford	FPO species. Significantly expanded its distribution and frequency. Rare/Occasional
Seriphidium maritimum	Barrigone, Aughinish	Limerick	Found along upper ASM boundary. Frequent
Seriphidium maritimum	Inishdea, Owenshere	Clare	Found along upper ASM boundary. Rare
Seriphidium maritimum	Killadysart, Inishcorker	Clare	Found along upper ASM boundary. Rare
Seriphidium maritimum	Kinvarra-West	Galway	Found along upper ASM boundary. Occasional/Frequent
Seriphidium maritimum	Kileenaran	Galway	Found along upper ASM boundary. Occasional
Seriphidium maritimum	Tyrone House – Dunbulcaun Bay	Galway	Found along upper ASM boundary. Occasional
Seriphidium maritimum	Roscam West & South	Galway	Found along upper ASM boundary. Occasional
Seriphidium maritimum	Furbo	Galway	Found along upper ASM boundary. Occasional

Other species such as Saltmarsh Flat Sedge (*Blysmus rufus*), Sea Wormwood (*Seriphidium maritimum*) or Sea Purslane (*Atriplex portulacoides)* are not necessarily rare, but are notable in that their distribution in Ireland is local or found mainly in one region. Several records were made in new 10 km^2 grid squares where these species were not recorded previously. Saltmarsh Flat Sedge is mainly confined to saltmarshes in the north-west of Ireland but has a scattered distribution around the rest of Ireland's coast. Sea Wormwood is mainly confined to the Shannon Estuary, Galway Bay and a few other scattered locations around the coast. Sea Purslane is mainly distributed along the eastern coast of Ireland but is only found in six 10 km^2 squares along the west coast. Curtis and Sheehy-Skeffington (1998) have discussed the distribution of this species and hypothesised that its lack of abundance on the west coast compared to the east coast is related to the higher levels of grazing on west coast

saltmarshes. The lack of grazing on some of the saltmarshes in Galway Bay may be one of its reasons for its presence on saltmarshes in this area.

Other notable species include Sharp Rush (*Juncus acutus*), which has a scattered distribution along the southern and south-east coasts of Ireland. Sharp Rush is listed as an indicator species of a rarer sub-type of the Annex I Mediterranean salt meadows (Juncetalia maritimi) where it is dominant on saltmarsh. However, it was quite rare to find this species dominating vegetation on saltmarsh in Ireland and it was mainly found distributed in the zone along the upper boundary of the saltmarsh and adjacent terrestrial or sand dune vegetation. Several small patches dominated by Sharp Rush were found at several sites (Harbourview and Seafort). The site at Buckroney Fen and Brittas Dunes in Co. Wicklow is unusual and difficult to classify as it has transitional features of both saltmarsh and dune slack. This cSAC was listed with Mediterranean salt meadows as a qualifying interest due to the presence of Sharp Rush but the SMP survey concluded that at present the site could not be classified as saltmarsh (due to the absence of regular tidal inundation and dune slack indicators in the vegetation).

Sea Pearlwort (*Sagina maritima*) was recorded from only 3 sites during the SMP. This species is indicative of a rarer sub type of the Annex I - *Salicornia* and other annuals colonizing mud and sand (1310). The Sagino maritimae-Cochlearietum danicae is a transient community often associated with a narrow transitional zone between saltmarsh and sand-dune vegetation. This rare habitat variant is often ephemeral in nature as it occurs on unstable substrates that are affected by erosion or sediment accretion. Both the habitat and the species were probably under-recorded during the SMP and both would probably require a very specific survey to increase records.

Reflexed Saltmarsh-grass (*Puccinellia distans*) is probably another species that was under-recorded during the survey. This species is a character species of the less common association Puccinellietum distantis (White & Doyle 1982). This species (and probably the plant community) was only recorded at one site, Kilcoole in Co. Wicklow. Reflexed Saltmarsh-grass is difficult to identify unless it is in flower so it would be difficult to spot at many grazed sites.

Several notable species were not recorded during the survey. These include Divided Sedge (*Carex divisa*), which had previously been recorded at two sites visited in the River Barrow Estuary, Ringville in Co. Kilkenny and Dunbrody Abbey in Co. Wexford). Searches were made for this rare sedge at both locations. There was evidence at both sites of habitat change or disturbance that had changed the appearance of both sites compared to previous descriptions for the NPWS Rare Plant Survey.

Several species listed as being found in Irish saltmarshes (Curtis 2003) were not recorded during this survey. One of these species was Strawberry Clover (*Trifolium fragiferum*), which has a rather uncommon and has a scattered distribution around the coast. It had been recorded previously on some of the sites visited during the 2007-2008 survey and it is not known why it was not recorded (perhaps it was overlooked). A second species that was not recorded - Dotted Sedge (*Carex punctata*) – is quite rare and found scattered along the south-west coast of Ireland. This species was more likely to be over-looked if present or mistakenly classified as one of the more common sedges. Several Glasswort species were also not recorded during the survey. This genus posed difficulties with identification and plants were generally identified as either *S. pusilla*, *S. procumbens* agg. or *S. europaea* agg. according to Stace (1997). Further identification of sub species was very difficult during fieldwork, especially early in the field season when plants were not fully developed. The

taxonomic status of this genus has also under-gone some revision creating difficulties in identification of species.

One species which is not typically associated with the saltmarsh is the Giant Hogweed (*Heracleum mantegazzanium*). Ordinarily this distinctive and tall growing umbellifer species is found along freshwater watercourses. However, a healthy population was noted around the mouth of Ballysadare River, below Ballysadare in Co. Sligo and one plant was recorded on a mound within the brackish Reedbeds in this area.

3.5.2 Notable sites

In addition to notable species, some sites exhibit unusual geomorphological, developmental or ecological features of interest (Table 3.15). Most saltmarshes can generally be classified into different types according to Curtis and Sheehy-Skeffington (1998) and have many typical features of saltmarsh such as zonation and transitions with other coastal habitats. However, some sites have unusual features that should be considered features of local distinctiveness and increase the conservation value of the site. Several saltmarshes were found in partially enclosed tidal areas classified as lagoons that have already been identified by Healy *et al*. (1997), Oliver (2005) and NPWS (2007).

The occurrence of exposed or outcropping rock in saltmarshes is generally not noteworthy. However, one physical feature which was confined to the south-west and western parts of the country is karst limestone. The development and extent of several sites has been influenced by the presence of outcropping limestone, most of which is similar in appearance and origin to that found on exposed pavement in the Burren. Several saltmarsh sites had areas with exposed limestone pavement where saltmarsh vegetation had colonised the grikes in the pavement, forming an unusual environment where the saltmarsh vegetation was partially shaded (the best example being Kileenaran, Co. Galway). Other sites had mosaics of saltmarsh vegetation on eroding thin layers of sediment overlaying limestone pavement or loose beach material (Figure 3.11). One site (Inishdea, Owenshere, Co. Clare) found on limestone also contained several swallow holes within the saltmarsh.

It is worth highlighting some of the features of saltmarsh that have developed beside or within areas of blanket bog habitat. Many sites along the west coast of Ireland have varying development of blanket bog along the coastline. Saltmarsh vegetation developed along the edge blanket bog on peat is generally classified as a Fringe type saltmarsh and is quite common (Curtis & Sheehy-Skeffington 1998). Some of these sites have distinctive tall bare peat faces up to 3 m high that mark the boundary between the saltmarsh/blanket bog and the adjacent intertidal habitats. Other sites have saltmarsh developing on peat platforms at a lower height compared to the adjacent blanket bog. Exposed pine stumps were visible in a saltmarsh at Owenduff, Corraun, Co. Mayo, where erosion (and peat cutting) of the blanket bog exposed the stumps along the shore and allowed saltmarsh development.

Some Fringe type saltmarshes were difficult to map and it was difficult to classify some of the vegetation due to the generally flat morphology of the landscape, which meant that transitional vegetation was well-developed. Tidal inundation could influence vegetation quite far inland along natural channels within the blanket bog so that patches of saltmarsh could be surrounded by blanket bog vegetation. At some sites blanket bog had been modified by peat cutting in the past and this feature was exacerbated. This activity influenced the development of saltmarsh vegetation at some sites where peat cutting and the creation of face-banks and drains allowed tidal inundation much further inland compared to prior to cutting. An example of this is in Kinvarra, Co. Galway where large sections adjacent to the tidal inlet were mapped as a mosaic of saltmarsh and cutover or modified blanket bog. Peat cutting possibly allowed

tidal inundation from several directions into several small lagoons within the peat (Lough Fhada complex) at Bealandangan, Co. Galway.

Figure 3.11. Saltmarsh developing over limestone pavement at Scanlan's Island, Co. Clare (2007).

Some sites visited during the survey are changing quite rapidly at present. This includes Grange at the mouth of Bannow Bay in Co. Wexford where much of the sand spit and all of the saltmarsh has been eroded away. This site now contains transitional brackish vegetation developing in the former freshwater marsh area. Buckroney, Co. Wicklow is another example where recent modifications to a tidal inlet have potentially affected the vegetation and development of a brackish area vegetated by Sharp Rush. Anecdotally there have been fewer seawater inundations along the inlet as it was blocked for a period and this may be influencing the development of more brackish (compared to saltmarsh) vegetation. This trend may reverse in the future if and when the channel is unblocked.

Other sites where there have been quite significant changes in the recent past include those sites where sea walls have been breached, allowing inundation of the sea into previously reclaimed land. This has occurred at sites like Ballymacoda, Co. Cork and Cromane, Co. Kerry and saltmarsh vegetation is rapidly developing on former agricultural grassland. Recent aerial photographs of these sites show that the geomorphology of these sites is rapidly changing and there is development of pioneer saltmarsh communities. Sites like Rossmore in Donegal Bay were also reclaimed in the past but have had a longer period to revert back to typical saltmarsh vegetation. Man-made features such as drainage channels are a feature of these sites.

Table 3.15. List of sites with features of interest recorded during 2007-2008 fieldwork.

Feature of Note	Site Name	County	Comment
Enclosed brackish marsh	Booterstown	Dublin	Managed brackish marsh with limited development of Annex I habitats at present but some MSM with *Puccinellia fasciculata* present. Significant changes in habitat development over the years related to control of inundation.
Lagoon	Kilcoole	Wicklow	Modified lagoons. Blockages at 'The Breaches' inflow means that saltmarsh is temporally flooded, creating significant disturbance to saltmarsh vegetation. Some recently reclaimed land reverting back to saltmarsh.
Lagoon	Ballyrisode House (Toormore lagoon)	Cork	Artificial lagoon created by landlocked waterbody behind road.
Lagoon	Dough (Lissagriffin lake)	Cork	Large artificial lagoon which is bisected by road bridge, under which tidal water passes. Notable transition of habitats and vegetation from saltmarsh to brackish conditions.
Lagoon	Tahilla (Drongawn lake)	Kerry	Rock/Peat lagoon enclosed by a narrow cobble barrier.
Lagoon	Rinevilla Bay (Cloonconeen pool)	Clare	Lagoon developed by a cobble bank. Significant retreat in cobble bank infilling lagoon and associated saltmarsh and leading to changes in habitat development.
Lagoon	Bealandangan (Lough Fhada upper pools – 2 sites)	Galway	Rare saltmarsh type lagoon adjacent to saltmarsh and inundated by natural channels through peat (probably modified by peat cutting) creating mosaic of saltmarsh and blanket bog habitats.
Lagoon	Kinvarra (Lough an Aibhnin)	Galway	Rare saltmarsh type lagoon at upper end of long tidal inlet
Lagoon	Cleggan (Lough Anilliun)	Galway	Minor development of saltmarsh associated with lagoon behind a cobble bank
Lagoon	Ballysadare Bay (Portavaud – 2 sites)	Sligo	Two saltmarsh type lagoons located in the north-west corner of the site near the mouth of the bay.
Saltmarsh/Blanket Bog Transition	Kinvarra	Galway	Development of complex mosaic of MSM, cutover blanket bog and transitional vegetation related to peat cutting in past.
Saltmarsh/Blanket Bog Transition	Tullaghan Bay	Mayo	Fringe saltmarsh development along edge of extensive blanket bog.
Saltmarsh/Blanket Bog Transition	Maghera	Donegal	MSM has developed in large cutover depressions in former blanket bog
Saltmarsh/Blanket Bog Transition Extent of transitional brackish vegetation communities	Glen Bay	Donegal	Development of a large area of saltmarsh and cutover blanket bog mosaic. Substantial development of transitional vegetation and brackish habitats.
Saltmarsh/Blanket Bog Transition	Bealandangan	Galway	Saltmarsh vegetation has developed in cutover peat and has extended inland along series of very deep drainage channels/man-made creeks.
Extent of transitional brackish vegetation communities	Drumcliff Bay	Sligo	Large saltmarsh developed at head of estuary with significant development of diverse transitional saltmarsh vegetation and mosaics with wet grassland and brackish vegetation including Reedbeds.
Extent of transitional brackish vegetation communities	Castlebridge	Wexford	Large saltmarsh with significant development of diverse transitional saltmarsh vegetation and mosaics with wet grassland and brackish vegetation including Reedbeds.
Extent of transitional brackish vegetation communities	Ballysadare Bay	Sligo	Several saltmarshes within this site display a wide range of saltmarsh and transitional brackish communities are well represented.
Swallow Holes	Inishdea, Owenshere	Clare	Several swallow holes associated with exposed limestone present within saltmarsh.
Karst Limestone	Kileenaran	Galway	Unusual development of saltmarsh within grikes of outcropping limestone pavement.
Karst Limestone	Scanlan's Island	Clare	Patchy saltmarsh developing among the eroded clints and grykes.
Karst Limestone	Kinvarra West	Galway	Saltmarsh sitting atop limestone, which is occasionally exposed.
Karst Limestone	Roscam West and South	Galway	Outcropping limestone at southern end of site.

Feature of Note	Site Name	County	Comment
Vegetated Mud/Sandflats	Creeslough	Donegal	Largest extent of *Salicornia* flats recorded in the country with no Common Cordgrass colonisation.
Exposed Tree Stumps	Owenduff, Corraun	Mayo	Remnant Pine tree stumps from eroded blanket bog being exposed within the saltmarsh. .
Reflooding	Ballymacoda	Cork	A number of breaches in sea walls along the upper part of the Ballymacoda Estuary have resulted in the rapid change of agricultural land to saltmarsh and bare mudflats and the establishment of a significant new *Puccinellia fasciculata* population. Also being colonised by Common Cordgrass.
Reflooding	Cromane	Kerry	Serious erosion and breaches of seawall has resulted in significant habitat change with large areas of bare mud and pioneer saltmarsh vegetation developing in former wet grassland and agricultural grassland. Standing dead trees along hedgerows.
Reflooding	Creeslough	Donegal	Undermining of one-way gate at one location has resulted in saltmarsh becoming re-established in an area behind seawall (formerly abandoned wet grassland and wet scrub). .
Desiccation of remnant saltmarsh	Buckroney	Wicklow	Area east of large *Juncus acutus*-dominated area is affected by changes in hydrological management of Buckroney small river draining Buckroney Fen.
Erosion	Grange	Wexford	Almost complete loss of saltmarsh habitat and considerable reduction in sand-dune habitat due to natural erosion in recent past.
Transitional estuarine vegetation	Bunratty	Clare	Excellent diverse transition from saltmarsh communities to brackish communities along a linear estuarine shoreline.
Size of saltmarsh	Dundalk	Louth	Largest saltmarshes in Ireland. Significant growth of saltmarsh in past 100 years and considerable development of pioneer communities.
Shading of saltmarsh	Carrigtohil	Cork	Saltmarsh communities and vegetation on a narrow saltmarsh affected by shading from adjacent mature woodland on Fota Island.
Saltmarsh-sand dune zonation	Inch	Kerry	One of the best examples of natural unmodified (mainly) zonation of transitional habitats between fixed dune and saltmarsh.
Dynamic saltmarsh development	Dooey	Donegal	Dynamic area at tip of sand spit with large area of dynamic pioneer and early successional saltmarsh communities related to sand accretion/erosion.

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). One of the main issues related to the use of a system of '*targets*' for various '*attributes*' or indicators for saltmarsh habitats was trying to decide what is '*good habitat condition*' and what are the actual indicators or targets that should be set for '*favourable conservation status*'. These targets were set at the beginning of the project and were based on guidelines for targets set by JNCC (2004) and were adapted by NPWS staff for use in Ireland. However, for some attributes there was very limited data available to actually set a realistic target. For example, targets for typical species found in various Annex I habitats or rates of spread of Common Cordgrass that would be considered unfavourable. Therefore, some quite arbitrary targets were used during the assessment that may not have realistically considered the actual variability in condition of various habitats. Some targets may have been set too 'high' (too hard to reach) or too 'low' (easily reached so not useful for assessment) to indicate a favourable condition.

An example of a target for an attribute that was probably set too high was 'Vegetation structure, physical height' where the target was maintaining a diverse sward structure.

However, many sites grazed as one management unit frequently had a uniform sward height and therefore would have failed for this attribute. An example of a target for an attribute that was set too low was typical species for *Salicornia* flats, which was dominated by *Salicornia* spp. or Suaeda spp. All monitoring stops carried out in this habitat passed for this attribute so it provided no useful information. However, it may be more useful during the next monitoring period when there is individual baseline data for various monitoring stops for comparison to previous conditions.

Various attributes or indicators used by JNCC (2004) are much more applicable to the assessment of the saltmarsh as one single unit rather than as a series of Annex I habitats. For example it was very difficult to assess the impacts of erosion or accretion on *Salicornia* flats compared to assessing the impact on the saltmarsh as a whole. Zonation was another attribute that was difficult to assess within some individual Annex I habitats as the actual zonation at some sites was represented by the presence of more than one Annex I habitat.

Several other issues related to the use of this monitoring methodology are raised in the sections below.

3.6.1 Assessment of extent

This assessment is likely to be quite accurate for ASM and MSM 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 with indicators such as vegetated piles of spoil. In some cases these impacts have occurred quite recently (< 5years) and do not show up on the 2000 aerial photos. Some estimation had to be made regarding the amount of Annex I habitat formerly present in these damaged sections and the location of former boundaries between saltmarsh and transitional habitats.

Older habitat maps (MPSU conservation plans and Natura 2000 database maps) varied in accuracy. They were useful as an indicative guide to the presence of saltmarsh habitats on sites. However they were not accurate enough to be used for quantitative comparisons. The current extent was generally taken as a baseline measurement (and was compared to extent as indicated by the 1995 aerial photo series) unless there was information available or indications that there had been a loss of extent.

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 (i.e. measure extent from 1995 aerial photos) could be made. However, some data from this project indicates that the extent of this habitat may be quite ephemeral at some sites and its distribution and extent can change quite significantly from year to year due to natural processes.

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.

The presence of erosion and or accretion was also recorded at each monitoring stop. However, this information was not useful as there were generally no obvious signs of erosion or accretion at individual stops accept when they were located along the lower seaward

boundary. Physical signs of erosion along the lower saltmarsh boundary were observed quite frequently but the question then was this erosion due to natural changes or was the erosion related to some other factor. Measurable retreat of saltmarsh due to natural changes or other factors was generally not recorded very frequently during the project. Erosion was assessed as a negative impact when seawalls were assumed to prevent the landward retreat of saltmarsh due to natural erosion.

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 generally passed for most monitoring stops and was not very useful as an indicator of saltmarsh condition. There was generally no major disturbance to the creek and pan structure observed during the survey. Several stops failed due to recent drainage work.

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.

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. 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. Sometimes the individual Annex I habitats represented the overall saltmarsh zonation (*Salicornia* flats-ASM-MSM), 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. Zonation of other saltmarsh species could be seen within the areas dominated by or characterised by Sea Rush with species such as Sea Pink and Sea Plantain being more frequent at the lower MSM boundary and other species such as Creeping Bent and transitional species such as Purple Moor-grass being more frequent or appearing at the upper boundary.

The attribute is more suitable to be applied to the whole of the saltmarsh rather than individual Annex I habitats. It was not possible to assess if any individual zones were narrowing in width due to impacts such as landward retreat, due to the lack of baseline data. However the data on habitat extent collected during this project could be used to assess this impact in future monitoring periods.

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. It was decided during the original SMP project (McCorry 2007) not to use this attribute to pass or fail individual monitoring stops, as it was felt that it would fail some moderate-good quality sites. However, it was considered when assessing the habitat overall. Some sites with one management unit,

and therefore have the same sheep grazing intensity over the whole habitat, had a uniform closely-cropped sward height that may not have been significantly damaged. 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 at some sites).

Sites with no livestock grazing had a more diverse sward height that was related to natural 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 be more useful if applied to the whole of the saltmarsh and different targets should be used for small saltmarshes that are managed as one unit and are therefore more likely to have a uniform sward height.

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.

However, it was quite difficult to set suitable targets to assess when a saltmarsh was actually being over-grazed. Some consideration should be given to the fact that some minor damage on saltmarshes is typical when they are grazed by cattle, even at low stocking rates. Perhaps a threshold should be set for the actual overall area (a proportion of the whole marsh) that is considered damaged and the damaged area should be quantified rather than just using individual monitoring stops as a guide to whether a site is damaged by over-grazing. Monitoring stops placed at locations like access points or tracks that are quite damaged may not represent the condition of the whole marsh and may over-emphasise the influence of the damaged area on assessment of overall conservation status.

3.6.2.5 Vegetation composition (typical species)

This attribute assessed species diversity at each monitoring stop. Targets were set at the beginning of the SMP project for typical species in the low middle and upper saltmarsh zones (using JNCC 2004 guidelines). Generally these targets were always reached. At several sites the grazing intensity was so high it had affected species diversity. In retrospect, the actual targets may have been too low (too few species). However it is very difficult to set typical targets for each Annex I habitat as species diversity is very dependant on zonation, with different zones of communities containing different species diversities.

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 1-3 species and also contained several other species at lower frequencies. Setting targets too high would have also unnecessarily failed monitoring stops where there was naturally low diversity. Most sites are likely to have similar species diversities with overall diversity related to the size of the site. Larger sites tend to contain a greater range of environmental factors and therefore contain more communities (although this has not been analysed in detail). It was therefore difficult to detect subtle changes in diversity due to any negative impacts.

This attribute was generally not useful as an indicator of saltmarsh condition. This was mainly because natural variation in species diversity due to a range of factors was quite significant and it would be difficult to separate differences in species diversity due to natural factors from differences due to negative impacts. Generally sites that were very heavily grazed may have suffered a loss of diversity but monitoring stops failed anyway due to the failure of attributes such as Vegetation Structure.

Quadrats recording species composition will provide a very useful baseline in the future for future assessment of changes in saltmarsh zonation and assessing processes such as coastal squeeze, and the impact of various activities on species diversity such as grazing or the spread of Common Cordgrass.

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 were considered *unfavourable*.

However, this target proved very difficult to assess with any accuracy due to the lack of baseline data on the former distribution of Common Cordgrass. While this species was present at many sites and was obviously having some ecological impact on the saltmarsh habitats, generally this attribute 'passed' as *favourable*, as there was very little evidence that the cover of Common Cordgrass had actually increased significantly. 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. Only one site (Emlagh East) was recorded with Common Cordgrass where it had not been recorded in the past.

More detailed studies of the former cover of Common Cordgrass were available for North Bull Island that showed that the extent of Common Cordgrass is slowly increasing within the *Salicornia* flats (McCorry 2002, McCorry 2007). At some sites where there was additional data available (NPWS Rare Plant Surveys indicating former cover of Common Cordgrass, distinctive differences in cover between the 1995, 2000 and 2005 aerial photography coverage) this attribute 'failed' and the conservation status of the habitat was assessed as unfavourable.

Common Cordgrass may have spread into former *Salicornia* flats habitat at many sites during the current assessment period, but due to the lack of baseline information about the former extent of *Salicornia* flats, no assessment was made about the spread of this indicator species during assessment of structure and functions. Common Cordgrass was present within and adjacent to small patches of this habitat at several sites. However, the presence of Common Cordgrass was used as an indicator for the unfavourable assessment of Future Prospects of this habitat.

Hopefully the SMP survey 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 at many of the monitoring stops recorded with this species present. However, when reviewing the methods used at the end of this survey, this was generally an unsatisfactory way to assess the impact of Common Cordgrass on other saltmarsh habitats during this monitoring period.

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. Impacts such as infilling and reclamation were considered during assessment of extent. The most frequent 'other' damaging impact was wheel ruts created by vehicles using the saltmarsh for amenity use or agricultural vehicles. This was treated in much the same way as poaching from overgrazing, and the target for Vegetation Structure was used to assess damage.

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 rare species such as Borrer's Saltmarsh-grass or uncommon species such as Sea Wormwood or Saltmarsh Flat-rush (see Table 3.14). This attribute was useful when there was some baseline data previously available such as the NPWS Rare Plant Survey. Comparisons to this survey were able to assess the current condition of these rare species. However, these data was only available for a handful of sites and most indicators of local distinctiveness were only identified during the actual field survey. In addition other features of local distinctiveness were identified during the survey (Table 3.14). Hopefully these data will prove useful in future assessments of the conservation status of Annex I habitats.

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 generally assessed that these activities would continue in the future and the future prospects was assessed as *unfavourable*. Therefore a site where the structure and functions of a habitat had failed due to unsustainable grazing would have also failed for future prospects as it was assumed that these impacts would continue.

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).

3.6.4 Comparisons of different methods of assessment of overall condition of saltmarsh habitats

The overall condition of each Annex I habitat was assessed by examining *the number of sites* where the habitats were assessed as *favourable* or *unfavourable* on a site by site basis (Section 3.2, Table 3.2). However, this analysis provided somewhat different results when the *overall habitat area* assessed as *favourable* or *unfavourable* on a site by site basis was examined (Table 3.4). For example, 75% of sites with ASM (2007-2008) were assessed as *unfavourable* when the number of failed sites was examined. This contrasts with 59% of the total area of ASM assessed as *unfavourable* when the total habitat assessed as *favourable* or *unfavourable* was examined. Examining numbers of sites assessed as *favourable* or *unfavourable* gives equal weight to both small and large sites when making an overall assessment.

Another way of summarizing the data and looking at the overall status of these habitats is by examining the total number of monitoring stops that passed or failed in each habitat during the survey (2007-2008) (Table 3.5). This assessment specifically looks at the habitat

structure and functions. A comparison between Tables 3.4 and 3.5 shows that the overall percentage of failed monitoring stops is generally lower compared to the overall percentage of habitat that is assessed as *unfavourable*. For example, 53.7% of the overall MSM habitat area (Table 3.4) has a *favourable* assessment for structure and functions so 46.3% of the overall habitat area is *unfavourable* (2007-2008). However, only 6% of the MSM monitoring stops actually failed (Table 3.5). This means that these failed MSM monitoring stops have a disproportionately greater impact on the assessment of structure and functions on a site by site basis.

Assessment of the overall condition of Annex I habitats by habitat area therefore places much more weight on the monitoring stops that failed rather than the monitoring stops the passed. One failed stop out of four at some (small) sites would mean that the whole of the site was assessed as *unfavourable*, although the majority of the habitat was in good condition. The statistics from the SMP show that 56% of the MSM is assessed as being in an *unfavourable* condition. However, this does not really represent an accurate picture of the actual condition of the overall MSM and the overall percentage of failed monitoring stops (6%) probably gives a better picture of the actual condition of the MSM where less than 10% is likely to be in an *unfavourable* condition (2007-2008).

This evaluation is supported by examining data recorded in the impacts and activities section of the assessment. The actual habitat area that is affected by each impact or activity was also estimated during this part of the assessment (Appendix VII, Tables 7.5-7.10). The main reason for failed monitoring stops within MSM was damage by unsustainable grazing. It was estimated that 9% of the MSM habitat was assessed as being overgrazed (2007-2008) (Table 3.11). This reflects the overall number of monitoring stops that failed within MSM (6%).

This is probably the main reason why there is some disparity between statistics from examining overall conservation status assessment of habitats on a site by site basis and examining the entire habitat as one data set (looking at the total number of monitoring stops that passed or failed or the total area affected by various impacts and activities such as over-grazing by cattle). The current method of assessment on a site by site basis probably over-emphasises the impact of damaged habitat. Both ASM and MSM are in better condition than statistics from Section 3.2 (Tables 3.2 & 3.4) would suggest. Examining the overall data set (monitoring stops or impacts and activities data) is a much better way of assessing the overall condition of saltmarsh habitats.

There was some discrepancy between assessment using monitoring stops and assessment of the impact of various impacts and activities. For example, 6% of MSM monitoring stops failed due to over-grazing and associated damage but 9% of the habitat were assessed as being overgrazed by cattle (2007-2008). The variation in these data is due to the fact that the positions of monitoring stops were selected using a stratified random method during fieldwork. This method meant that monitoring stops were placed at random positions to represent variations in the habitat condition and represent the overall habitat extent, distribution and condition. Some pre-planning of monitoring stop selection was possible at some sites but for the most part this was left to during fieldwork. This was because it was very difficult prior to fieldwork to identify the actual extent and distribution of the MSM and to plan the actual number of monitoring stops that would adequately represent the condition of the habitat. However, this meant that failed monitoring stops may have under or over-represented the actual area of damaged habitat if they were placed too close together or if too many monitoring stops were positioned in the damaged sections. There is no easy way to resolve this situation but the existence of habitat maps showing the extent and distribution of the various habitats will mean that monitoring surveys in the future could be planned with more efficiency.

3.6.5 Mapping and assessment of Halophilous scrubs (1420)

This habitat was defined by the presence of a single rare species, Perennial Glasswort. Halophilous scrubs are defined by the EU Habitats Interpretation Manual (Commission of the European Communities 2003) as perennial vegetation of saline muds that belongs to the phytosociological class (Sarcocornetea fruticosi). Three British NVC communities listed include the "SM 21 *Suaeda vera-Limonium binervosum* saltmarsh community", "SM25 *Suaeda vera* saltmarsh community" and "SM7 *Arthrocnemum perenne* stands" (Rodwell 2000). However, the phytosociological class Sarcocornetea fruticosi is not listed in White and Doyle (1982) and there is no one distinctive vegetation community containing Perennial Glasswort that could be classified as this habitat.

Issues with mapping and defining this habitat, which is based on one species, should also be considered, as these has a huge potential to affect the total habitat area. The habitat was generally mapped by drawing boundaries around clusters of individual plants noted by GPS. There was potential to significantly change the mapped area of Halophilous scrubs by either dividing clusters of plants into separate patches of habitat or including them in one patch of habitat and increasing the area significantly. This issue is exacerbated by the fact that the national total for this habitat is so small, so even relatively small changes in the way the habitat is mapped can have significant impacts on the overall total.

In Ireland Perennial Glasswort was found amongst lower saltmarsh zone vegetation and is mostly associated with Common Saltmarsh-grass, Lax-flowered Sea Lavender, Common Cordgrass, Glasswort, Annual Sea-blite, Sea Pink, Sea Plantain with smaller amounts of Sea Purslane, Sea Aster and Greater Sea-spurrey. Perennial Glasswort was rarely frequent or abundant in cover in quadrats surveyed by McCorry (2007) and from this project and is mainly found at low cover values less than 5%. The saltmarsh vegetation where this species was found would be classified as mainly ASM or *Spartina* swards if Perennial Glasswort was not present.

Perennial Glasswort is most commonly associated with Sea Plantain, Annual Sea-blite, Sea Purslane, Glasswort, Common Sea Lavender, Sea Aster and Common Cordgrass in Britain and had a mean cover of 26% (Davy *et al.* 2006). The main habitat of this species in Britain was described as being gravely or sandy foreshores and relatively well-drained sediments of coastal saltmarshes. Perennial Glasswort is therefore a much more prominent part of the Halophilous scrubs in Britain, begin found at much higher cover values compared to Ireland and also forming distinctive plant communities. This species is also a dominant part of a pioneer-low marsh community in saltmarshes in Spain (Davy *et al.* 2006).

The actual amount of vegetation in Ireland with cover values at similar levels to other Halophilous scrub vegetation in Britain and Spain is actually very low and much lower than the overall extent as mapped by this survey and the preceding survey (1.1 ha) (McCorry 2007). Due to its rarity in Ireland, no distinctive vegetation communities have developed and Perennial Glasswort is associated with several different communities, some of which approximate to vegetation communities described in other countries.

4 CONCLUSIONS

4.1 The current conservation status of saltmarsh habitats

The SMP survey has now assessed the conservation status of Annex I saltmarsh habitats at 131 sites around the entire coast of Ireland (including McCorry 2007). Considering that Curtis and Sheehy-Skeffington (1998) identified 238 saltmarshes in the ROI, the SMP survey has examined a substantial portion of the entire saltmarsh resource of Ireland. It can therefore give an accurate indication of the overall national status of Annex I Irish saltmarshes. It will also provide a very accurate baseline for any future monitoring with nearly 1900 ha of Annex I habitat and *Spartina* sward mapped during the 2007-2008 and 1429 monitoring stops recorded (including quadrats recording species cover) between all the habitats. This will provide an excellent resource for the future monitoring of Irish saltmarshes.

The results of this project show that the majority of saltmarsh habitats were assessed as being in *unfavourable* condition on a site by site basis (Section 3.2). The overall assessment of habitat condition on a national level for ASM and MSM was *unfavourable-inadequate* (Section 3.3) while both *Salicornia* flats and Halophilous scrubs were assessed as *unfavourable-bad*. This seems to indicate that overall, the conservation status of saltmarshes is under significant threat. However, this is not the case and the methods of conservation assessment should be re-analysed and their usefulness evaluated for future monitoring. This report has shown that method of assessing each site individually meant that much more emphasis was placed on failed monitoring stops and damaged habitat than when these data were examined collectively (either on the basis of number of sites that had failed or area of saltmarsh habitat assessed as *unfavourable* – Section 3.2).

The majority of habitat at many of those sites assessed as having an *unfavourable* conservation status was actually in good condition. When the entire monitoring stop data set was amalgamated (2007-2008) the estimated area of damaged habitat was significantly reduced with only 6% of MSM and 16% of ASM estimated to be in poor condition (estimated from amalgamated monitoring stops, Table 3.5). These figures are supported by data from assessment of areas affected by various impacts and activities that indicated < 15% of the ASM and 9% of the MSM was damaged by overgrazing.

Some of the various cut off points for considering a habitat as either *unfavourable-inadequate* or *unfavourable-bad* also seem quite severe. The cut off point for assessment of extent was *unfavourable-inadequate* for any loss of habitat and *unfavourable-bad* was > 1% loss per year (Table 2.1). The overall loss of ASM was estimated to be about 0.8% of the total ASM area. This is equivalent to a loss of 0.057% per year during the monitoring period, which seems quite low. Assessment during this project considered any loss of habitat due to damaging activities as *unfavourable*. However, it should be noted that some new habitat was likely to have been created during the project due to accretion and breaches of sea walls allowed re-establishment of saltmarsh on previously reclaimed land. New development of habitat was not considered during this assessment of extent.

Similarly, assessment of structure and functions assesses 1-25% decline in condition as *unfavourable-inadequate,* and greater than this (> 25% decline) as *unfavourable-bad*. Much of the ASM habitat at various sites was assessed as *unfavourable-inadequate* due to the failure of one monitoring stop caused by some damage related to grazing However, some of this 'damage' caused by grazing seems to be a typical feature of saltmarshes grazed by cattle and perhaps is not as significant as previously thought (see Section 4.2.1).

Applying the assessment matrix (Table 2.1) to the amalgamated monitoring stop data means that over 80% of the ASM and MSM habitat is likely to be a good condition. The fact that over 80% of saltmarsh habitat is in 'good' condition is actually somewhat encouraging when compared to the current status of some other Annex I habitats (NPWS 2008). The methods of assessment used during this project may have over-emphasised some negative indicators, especially damage from over-grazing (see Section 4.2.1), so that the amount of saltmarsh habitat that is in 'good' condition is actually higher than that assessed by the traffic light system (Tables 3.2 & 3.4). It was quite difficult to decide what 'good habitat condition' was at the beginning of the project and to set suitable indicators and targets to measure the condition of these habitats.

Another important point is that the use and application of a standard set of targets at a national level means that variability in habitat structure and condition could be reduced if these saltmarshes are managed to reach these targets. However, variability in saltmarsh condition such as sward height and ground cover should be considered as part of the overall diversity of saltmarsh habitats around the country and some of the variability in the intensity of grazing of saltmarsh could even be considered as a positive feature, even though on a site by site basis it may be considered as damaging. For example, a site like Kileenaran, Co. Galway is grazed quite heavily by sheep and this has created a uniform closely cropped sward with patches of damaged sward in places. This was assessed as *unfavourable*. However, this management has created a sward with dwarfed saltmarsh plants that could be considered as a feature of local distinctiveness when considering the overall status of the saltmarsh habitat. While species diversity of saltmarshes is quite uniform in general there are some examples of saltmarshes with naturally low species diversity and substantial area of single-species stands. This should not necessarily be considered as a negative feature when considering the overall condition of saltmarshes around the country. It should also be considered that some damaging impacts such as unsustainable grazing or a significant erosional trend can have positive impacts such as introducing disturbance that creates niches for pioneer communities such as *Salicornia* flats.

The overall extent of saltmarsh habitats is not decreasing very significantly due to development-related impacts. This project found that only 8.3 ha of saltmarsh had been infilled, reclaimed or destroyed by other related activities during the project and this represents only 0.5% of the overall area of surveyed Annex I saltmarsh habitat. There was also very little measurable loss of habitat due to erosion and natural processes such as transition to sand dunes during the monitoring period. Other impacts on extent of saltmarsh habitats such as the invasion of invasive Common Cordgrass were also difficult to assess due to lack of baseline data. While this species is probably spreading at some sites, most likely within *Salicornia* flats, it was impossible to assess the extent of Annex I habitat lost within the current monitoring period due to transformation to *Spartina* swards or *Spartina* sward/saltmarsh mosaics.

The structure and functions of saltmarsh habitats were much more frequently assessed as being in *unfavourable* condition compared to saltmarsh extent. The most common damaging impact was overgrazing by cattle and this tended to have a greater effect on ASM compared to MSM. Other common impacts were related to agricultural and amenity use of the saltmarsh. Common Cordgrass was probably having a significant impact at some sites, especially on *Salicornia* flats, although again it was very difficult to quantify the spread of this species during the current monitoring period.

The assessment of conservation status in this survey was 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 disturbance to wildlife by damaging activities. This also presents some limitations to conservation assessment using the SMP methods as some sites assessed as *unfavourable* due to some grazing damage by livestock may be more valuable to feeding and roosting waders and wildfowl, compared to sites were there was no grazing by livestock.

4.2 Current threats to saltmarsh habitats

Many of the damaging activities recorded during the survey 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 saltmarshes by national and European nature conservation designations.

4.2.1 Grazing

Grazing was probably the most common activity affecting saltmarshes and overgrazing was the commonest damaging activity. Curtis and Sheehy-Skeffington (1998) noted that the one of the main threats to saltmarshes was overgrazing, particularly to sand flat type saltmarshes, whose substrate makes it more vulnerable to heavy grazing intensities (Figure 4.1). Curtis and Sheehy-Skeffington (1998) also noted that west coast saltmarshes tended to be over-grazed and grazing was much less frequent along the east coast. Similar trends were also noted by the SMP survey, although this survey also found that a significant proportion of saltmarsh (42% of ASM, 30% of MSM) at sites all around the around the coast was not grazed at all, so the impact of grazing may be decreasing.

Both cattle and sheep create low closely cropped uniform swards, depending on grazing intensity. The main 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 able to cope with higher sheep stocking levels better than higher cattle stocking levels. Natural grazing can also be significant. This survey also noted that ASM were more vulnerable to the impacts of overgrazing compared to MSM.

Most studies and reports on the impact of grazing on saltmarshes and the management of saltmarshes suggest that grazing has a positive influence on saltmarshes (Boorman 2003, Doody 2008a, 2008b). 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 tends to 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 1984). However (Doody 2008b) points out that historically heavy-grazed marsh with low sward heights attract populations of Brent Geese and Widgeon.

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 mentioned 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 can be caused by heavy stocking rates of both cattle and sheep and was noted at several sites. Recent recommendations and guidelines to farmers about the implementation of the EU Nitrates Directive also mention that heavy poaching is to be avoided (Anon. 2005).

Figure 4.1. Badly damaged saltmarsh at Rossbehy, Co. Kerry, due to heavy grazing levels and access by vehicles (2008).

Different levels of grazing on saltmarsh have been shown to benefit birds, mammals, invertebrates, and plants differently. The JNCC (2004) advise the promotion of a varied sward structure on saltmarshes. Higher invertebrate diversity has been related to diversity in sward height as found in ungrazed saltmarshes (Boorman 2003). Moderately grazed salt meadows can favour a structurally diverse sward that promotes invertebrate diversity (Doody 2008b). Less intensive grazing can also create tussocky areas in the upper saltmarsh that are favoured by breeding wildfowl and by a variety of passerines. Even ungrazed sites can have high species diversities and favour rare plant populations (Doody 2008b). This can create a conflict of management objectives on sites where the saltmarsh is grazed as one single management unit. Sheep in particular and cattle tend to create uniform closely-cropped swards and it would be very difficult to maintain a varied sward structure on some small sites.

Several different authors have recommended similar stocking rates for grazing of livestock. Lambert (2000) recommends a grazing regime of 0.33 cattle/ha or 2 sheep /ha for all year around grazing or 0.6 cattle/ha or 4 sheep /ha for summer grazing. Doody (2008b) describes how different grazing regimes of ASM have different benefits to various components of the

habitat and outlines some management recommendations to promote different conservation objectives. These stocking rates relate back to earlier research on grazing of saltmarsh (Beeftink 1977) and similar stocking rates are also recommended by Adnitt *et al.* (2006) and Natural England (English Nature 2003). Heavy grazing was described as the removal of all the standing crop and having a sward height of > 10 cm tall. Heavily grazed salt meadows have stock densities of up to 6.5 sheep per ha year round or 9-10 sheep or 2 cows per ha in summer. Doody (2008b) recommended maintaining this regime if this was the way that the salt meadows had been grazed historically and when the sites attracted large populations of wintering waders and wildfowl.

Moderately grazed salt meadows have stocking densities of 5-6 sheep or 1.0-1.5 young cattle per ha from April - October (Beeftink 1977) or 0.6 cattle year round (Kleyer *et al.* 2003). At these levels, the saltmarsh has the best chance of supporting a wide range of species with reasonable structural diversity. Lightly grazed salt meadows have stocking densities of 2-3 sheep or 0.7-1.0 young cattle per ha from April - October (Beeftink 1977). Doody (2008b) does not recommend the introduction of grazing to historically ungrazed sites, as these sites tended to have the greatest species diversity (although not always so in Ireland). Doody (2008b) states that abandonment of formerly grazed salt meadow is probably the most common management regime and favours the re-introduction of livestock to reverse adverse trends in structural diversity. English Nature (2003) note that setting grazing levels for a particular marsh can be difficult. Prevailing weather conditions, previous stocking rates and other environmental considerations must all be taken into account. The optimum conditions on any given site can only be determined as a result of trial and error (Lambert 2000).

No major differences in overall species biodiversity could be observed between grazed and ungrazed saltmarshes. Some species such as Sea Purslane have been shown to prefer ungrazed saltmarshes (Sheehy-Skeffington & Curtis 2000). It was also observed that some species such as Sea Lavender tended to be more prominent on ungrazed saltmarsh. Grazing has been shown to influence the extent of various different saltmarsh communities (Doody 2008a). However, a detailed analysis is probably required to establish if there are any significant differences.

Guidelines produced for farmers entering the REPS4 Agri-Environment scheme (in Ireland do not mention salt marsh specifically but do have some conditions for sand dunes and machair (Anon 2009). These guidelines state that where conditions warrant, grazing levels must not exceed 1 Livestock Unit (LU) per hectare on a year round average and must never exceed 2 LU at any one time. (A livestock unit was defined as 1 cattle over 2 years old and is also equivalent to 6.6 Ewes with or without lambs.) The guidelines also state that there may also be additional conditions for habitat within pNHAs, cSACs or Commonage areas.

A significant proportion of saltmarshes are grazed as commonages. Commonage Framework Plans to manage grazing on these commonages recommended de-stocking at many of these sites including coastal sites such as saltmarshes. For example, a portion of Streedagh Point Dunes in Co. Sligo is grazed as commonage including the saltmarsh (Streedagh Point Dunes NPWS Conservation Plan, www.npws.ie). The CFP for this area recommended de-stocking of between 0%-65% in different sections.

The impact of under-grazing on saltmarshes (or abandonment of grazing practises) was probably not assessed adequately during the SMP. This was because vegetation communities that tend to be promoted by the lack of grazing, such as Twitch, Sea Club-rush and Common Reed-dominated vegetation, were not actually classified as ASM. The lack of baseline information about the previous distribution of these communities at the assessed sites means that no assessment could be made about the impact of under-grazing on the

extent of these communities. However, there were frequent observations made during the project that these communities tended to become more prominent in ungrazed saltmarsh. This was particularly prominent along fences where Twitch-dominated vegetation extended further down the marsh in ungrazed saltmarsh compared to grazed sections on the other side of the fence. The absence of grazing or under-grazing has been shown to promote the dominance of Twitch and other 'rank' grasses in the upper saltmarsh in Britain and Europe (Dijkema 1984, Boorman 2003).

Grazing is therefore an important management tool for the continued maintenance of biodiversity and function of saltmarshes. However, it is quite easy to damage the saltmarsh with over-stocking. It can be difficult to get the balance right between light grazing and the prevention of damage from over-grazing and associated poaching, particularly as sheep and cattle tend to preferentially graze saltmarsh. This is highlighted at several large coastal sites grazed as commonage where it was noted that while the saltmarsh was heavily grazed with a low closely cropped sward height, adjacent fixed dune vegetation or coastal grassland had substantial foliage still available. It would be very difficult to manage the different habitats separately and the adjacent species-rich coastal grassland probably benefits from the heavier grazing levels.

It should be noted that some damage is inevitable if the saltmarsh is grazed by cattle, even at low stocking rates. Small vulnerable patches of saltmarsh such as at access points to the marsh, along tracks and in softer sections along creeks and pans tend to be prone to damage even if the majority of the saltmarsh was in good condition. This was noted by Lambert (2000). Some of this damage led to failed monitoring stops at some sites where the overall grazing intensity was light. Some reassessment of the level of poaching and the amount of bare substrate surface that can be assessed as *favourable* during monitoring of saltmarshes may be required during future surveys as this project has probably over-emphasized the extent of saltmarsh damaged by over-grazing somewhat. As stated above, some disturbance of the saltmarsh surface by livestock can have positive impacts and while damage from grazing may be significant it is repairable and the saltmarsh can quickly recover from damage from grazing and poaching.

When considering the impact of grazing it must be remembered that these saltmarshes have probably been grazed to some extent since livestock was first introduced to Ireland. Some of the saltmarsh such as sections of the lower marsh that are flooded more regularly is naturally more vulnerable to damage from even grazing at low intensities. Therefore some localised 'damage' from poaching is probably a typical feature of saltmarshes grazed by livestock, particularly cattle.

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 many of the larger sites where the shoreline is divided up into different management units adjacent to different farms, although may not be found in many small sites grazed as one unit. There is a significant variation in intensity of grazing around the country and this could be considered as a positive feature that enhances overall diversity of sward structure and habitat condition compared to uniform grazing intensities around the coastline.

4.2.2 Common Cordgrass

The impact of Common Cordgrass in Ireland and across the world has been the subject of considerable research, interest and debate amongst ecologists, conservationists and land managers since it began to appear on shorelines around the turn of the 20th century There have been several useful reviews of the ecology and various impacts of Common Cordgrass (Doody 1984, Nairn 1986, Adam 1990, Thompson 1990, Grey & Benham 1990, McCorry *et al.* 2003, Lacambra *et al.* 2004, Doody 2008a). Many of the older studies and reviews (e.g. Doody 1984) about the management of this species concluded that Common Cordgrass had an overall negative impact on the conservation value of saltmarshes. But this general view was formulated in the 1960-1990's and now attitudes towards Common Cordgrass have changed somewhat, particularly its impact on saltmarsh.

Data from this survey was inconclusive in showing any significant spread of Common Cordgrass within established saltmarsh communities such as ASM and MSM during the current monitoring period due to lack of accurate baseline information. The only site where some baseline data is available for Common Cordgrass on the ASM (North Bull Island, (McCorry 2002), a comparison indicates that its cover has not increased significantly in the past 7 years. However, relatively large areas of *Spartina* swards and *Spartina* sward/saltmarsh mosaics were mapped at many sites in association with established saltmarsh. The main ecological impact of Common Cordgrass on ASM is that it has the capacity to dominate in much of the pioneer and lower ASM zones and has replaced Common Saltmarsh-grass as the dominant species in this zone, significantly altering the sward structure (sward height is higher and denser). Common Cordgrass is also a prominent part of the lower-mid zone ASM saltmarsh at most sites where it is present, although small clumps may be scattered through the saltmarsh vegetation with overall low cover values.

The actual extent of ASM and MSM that has actually been replaced by Common Cordgrass-dominated habitats is actually relatively low. It was estimated that only 6.9% of ASM at sites visited during 2007-2008 had been replaced by the Common Cordgrass-dominated habitats, since this species began to colonise these sites (Section 3.4.2.4). Much of Common Cordgrass-dominated habitat is also likely to have developed as pioneer saltmarsh at some sites and has since developed into more mature saltmarsh. So the actual amount of established saltmarsh replaced by Common Cordgrass-dominated habitats in Ireland is quite small and probably less than 5%.

These conclusions are corroborated by some recent reviews of the ecology and management of British saltmarshes. 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 more established mid and upper saltmarsh communities is generally limited. Many of the concerns expressed in Britain in the 1960-1980's about the possible loss of large areas of mixed species-rich marsh to stands dominated by Common Cordgrass have proved to be unfounded. Lacambra *et al.* (2004) in a review of the status and management of Common Cordgrass in Britain now state that the general consensus is Common Cordgrass can be acceptable in the right environment. The Joint Nature Conservation Committee also state that there is no reason to control Common Cordgrass to protect established saltmarsh vegetation such as the ASM as it has a limited potential to invade the majority of this habitat (JNCC 2004).

Common Cordgrass does have the potential to spread into *Salicornia* flats and lower their extent. This has also been noted in Britain. Adam (1990) noted that extensive stands of

Salicornia spp. are now rare in estuaries with abundant Common Cordgrass. Davy *et al.* (2001) also noted that *Spartina* swards have now replaced Glasswort communities as the main coloniser of saltmarshes around the south-east coast of England. The SMP survey was inconclusive in showing significant invasion of Common Cordgrass into *Salicornia* flats during the current monitoring period due to lack of accurate baseline data. Where there is some baseline data present (North Bull Island, McCorry 2002), a comparison shows slow invasion of Common Cordgrass into this habitat. A significant proportion of the *Salicornia* flats mapped by O'Reilly & Pantin (1957) in some Dublin estuaries have been replaced by *Spartina* swards. It can be presumed that Common Cordgrass is likely to increase in extent at the expense of some of these *Salicornia* flats at these sites in the future. However, it should be noted that other geomorphological processes such as continued accretion could mean that *Salicornia* flats will continue to persist at sites where there is also significant extent of *Spartina* swards. This is the case in Dundalk Bay where there is an extensive band of *Salicornia* flats at the seaward side of the *Spartina* swards.

Positive impacts of colonisation by Common Cordgrass were also noted during the SMP survey. For example it has provided suitable pioneer habitat for colonisation by new populations of Perennial Glasswort in Bannow Bay, a very rare species in Ireland. Signs of natural succession of *Spartina* swards into vegetation more typical of ASM with more frequent cover of species such as Common Saltmarsh-grass and Sea Purslane were also noted during the survey. The ability of Common Cordgrass to accrete large amounts of sediment and change the sedimentation regime is well known (Gray *et al.* 1991). Common Cordgrass was acting as the primary saltmarsh coloniser at these sites. Doody (2008b) now takes the view that non-native stands of Common Cordgrass may become an acceptable precursor to the Atlantic salt meadow community. Perhaps *Spartina* swards in Ireland should now be considered as a pioneer saltmarsh community that can take part in the natural ecosystem functioning and succession of Irish saltmarsh communities.

Various other impacts of Common Cordgrass such as its perceived impact on wildlife using these coastal sites were not assessed during the SMP. Attempted control programmes to eradicate Common Cordgrass have been carried out due to the perception that these newly developed dense stands of this grass were of low intrinsic value for wintering waders and wildfowl and were covering bare mudflats that were important feeding grounds for these bird species (Gray *et al.* 1991). It was suggested that the spread of Common Cordgrass reduced the size of the feeding area and the amount of feeding time available to wintering waders and wildfowl (Goss-Custard & Moser 1988).

A causal relationship between the loss of feeding grounds and impacts on waterbird populations may be difficult to establish. Goss-Custard and Moser (1988) demonstrated a correlation between the spread of Common Cordgrass and the decline of Dunlin in British estuaries. This correlation may not necessarily be causal however, because waders have declined in some sites in spite of decreases in Common Cordgrass cover (Tubbs *et al.* 1992). Raybould (2000) presented data that showed that wader numbers eventually responded positively to significant die-back of *Spartina* swards in Poole Harbour, Southampton. A lag period between the reduction in *Spartina* sward and recolonisation by wader prey species in the mudflats has been noted (Boorman *et al.* 1989). These types of impacts on birds caused by invasive *Spartina* species are currently being studied in other countries.

Common Cordgrass has spread over areas of mudflats formerly used as feeding grounds by waders and wildfowl and is now estimated to cover a very extensive area (1520 ha, Table 3.7). This now represents 28% of the total saltmarsh area in Ireland (Annex I + *Spartina* swards). Gray *et al.* (1997) estimated that nearly 10,000 ha of *Spartina* saltmarsh in Britain represented nearly 25% of the total saltmarsh. 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, total wintering bird numbers in Dublin Bay 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.

Nairn (1986) discussed the spread of Common Cordgrass in Ireland and its impact on wintering waders and wildfowl and presented anecdotal evidence that populations of waterfowl had been negatively affected in some estuaries colonised by Common Cordgrass. This species has replaced large areas of mudflats in Ireland with dense swards of Common Cordgrass in many estuaries that are used by significant numbers of wintering waders and wildfowl. It is estimated that 1520 ha of *Spartina* swards have now developed in Ireland with the majority of this developing on mudflats. Crowe (2005) also lists the spread of Common Cordgrass as one of the main threats facing waterbirds and wetlands in Ireland. The development of *Spartina* swards in Ireland has probably had some impact on waders and wildfowl in Ireland but more specific bird studies are probably required to properly measure and quantify these impacts on wintering birds.

Another 'negative' impact associated with the spread of Common Cordgrass is the invasion and replacement of Eelgrass (*Zostera* spp.) beds, which are also an important food source for some wintering waders and wildfowl (Adam 1990). Mudflats vegetated by Eelgrass can be classified as part of another Annex I habitat, mudflats (1140). There are some reports that Common Cordgrass has invaded and replaced some of this vegetation in Ireland (Rogerstown Estuary) (Madden *et al.* 1993). There are other anecdotal accounts that this has happened at other sites in Ireland. Common Cordgrass was observed present adjacent to stands of Eelgrass (*Zostera* spp.) at other sites such as Inch, Kerry during the SMP (Figure 4.2), and is likely to have replaced some of this vegetation as stands of *Spartina* sward have developed, although there is no baseline data indicating former distribution of Eelgrass stands. Guiry and Kilty (1972) stated that the Eelgrass beds found in Dungarvan Bay, Co. Waterford were at risk from invasion by Common Cordgrass. However, the recent SMP survey showed that *Spartina* swards not very extensive at this site and shows no signs of invading these Eelgrass beds.

Data from this survey shows that the majority of *Spartina* swards in Ireland have developed on intertidal mudflats and not on saltmarsh. So while impacts on established saltmarsh may not be as significant as previously thought, this species may be having impacts on other Annex I habitats such as mudflats (1140). Anecdotal observations from various sites visited during the project indicate that this species is still spreading on mudflats with numerous seedlings and small clumps spreading along the seaward boundary of the more established stands. This trend is also shown by analysis of various aerial photo series at several sites, which shows that the extent of *Spartina* swards increased measurably during the current assessment period. At other sites the *Spartina* sward seems quite mature and there are no indications of any continued colonisation of mudflats. This species is still in the early stages of colonisation at many sites and has not reached equilibrium yet.

Figure 4.2. *Spartina* swards spreading into Eelgrass beds on adjacent mudflats at Inch, Co. Kerry (2008).

Common Cordgrass does have the capacity to increase its distribution around the coast of Ireland although it is not spreading as significantly as during its initial period of colonisation. Fieldwork during 2007-2008 only found this species at one site (Emlagh East, Co. Kerry) where it was not already known to be present and this was in a bay that already contained this species (Dingle Bay - Castlemaine Harbour). This may be due to the fact that much of its initial spread in Ireland was due to planting instead of natural colonisation. It is generally quite difficult to establish if a population of Common Cordgrass was established by planting or by natural colonisation, although there are some planting records for some sites (Cummins 1930, Doyle 1934). Carrothers (1960) noted that Common Cordgrass may have spread to Dundalk Bay by natural means.

An examination of the records of Common Cordgrass indicate that it has continued to be recorded in new 10 km^2 grid squares in the Republic of Ireland since records began. Common Cordgrass was present in 13 grid squares prior to 1962, in 31 grid squares prior to 1987 and in 56 grid squares up to 1999 (Preston *et al.* 2002). The current habitat distribution is estimated to cover 66 grid squares and this estimation is mainly based on a combination of the fieldwork carried out between 2006-2008 and the desktop survey also carried out for the national assessment of conservation status of *Spartina* swards (1320) (NPWS 2008).

It is noticeable that Common Cordgrass is still only present in two estuaries in Co. Donegal (Lough Swilly & Lough Foyle) and has been present here since it was planted in 1950 (Boyle 1972). There is one record from Donegal Bay (Preston *et al.* 2002) but it is not known if the species is still present and no records were made during the SMP surveys of this area. *Spartina* swards were recorded during SMP fieldwork and noted during related desktop survey work from fifteen 10 km grid squares where there was no record of *S. anglica* in Preston *et al.* (2002). However, this is likely to be related to some under-recording during collection of data for the BSBI Atlas. There were also several grid squares noted as containing Common Cordgrass by Preston *et al.* (2002) where no Common Cordgrass was recorded during extensive fieldwork.

4.2.3 Infilling, reclamation and related impacts

Some of the most significant damaging activities affecting saltmarsh in the past have been agricultural reclamation, flood relief schemes and infilling for industrial use (Curtis 2003). Very large areas of former saltmarsh are now located behind embankments and have been reclaimed for mainly agricultural use. Healy and Hickey (2002) estimated that 6500 ha of land had been reclaimed in the Shannon Estuary and much of this would have been mudflats, saltmarsh and brackish marsh. Devoy (2008) stated that 9000-15,000 ha of land was reclaimed by the 19th century. This gives some indication of the area of potential saltmarsh habitat that has been lost, when considering the current total area of Annex I saltmarsh habitats and *Spartina* swards is estimated to be 5300 ha. However, these activities have not occurred as frequently within the current monitoring period. It was estimated that about 8 ha of Annex I saltmarsh had been destroyed by activities such as reclamation, infilling (Figure 4.3) and other activities such as maintenance work on embankments. Large-scale agricultural reclamation was not a significant impact during this monitoring period although Dunbrody Abbey, an important site in a national context due to the presence of several rare species, has been affected by drainage and re-seeding. Reclamation is generally quite small scale with small areas being infilled. The development of new embankments to exclude the tide during the project was not significant.

Figure 4.3. Infilling from development along landward saltmarsh boundary in Dundalk Bay, Co. Louth (2007).

This probably reflects increased awareness of the value of saltmarshes and lower emphasis in the agricultural industry to 'improve' unproductive land such as saltmarshes. It is also likely to reflect the increased protection given to saltmarshes by national and European nature conservation designations and the fact that most reclamation works or infilling using waste material requires licensing from local authorities or other government departments. Much of the damaging activities noted during this survey were probably unlicensed.

Issues related to ownership of the intertidal zone and fore-shore can create difficulties. The impact of a marina on saltmarsh at Fahan (Lisannon) Co. Donegal was noted during the first SMP survey (McCorry 2007). McKenna *et al.* (2000, 2003) 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. Saltmarsh at Fahan had developed since these maps were drawn so issues related to the planning and development of this marina could not be pursued by the Department of the Environment.

4.2.4 Impacts of erosion, accretion and potential sea-level rise

It should be remembered that erosion and accretion are natural processes and saltmarsh will attempt to adjust or reach equilibrium in response to climatic and local changes. These processes can be affected by human activities that limit the volume of sediment entering or moving about in the system, such as the construction of hard sea defences. The supply of sediment plays an important role in the vulnerability of saltmarsh to erosion (Allen and Pye 1992). The physical structure of the salt marsh varies considerably. Under favourable conditions (abundant sediment and a sheltered shoreline), salt marsh can accrete rapidly both vertically and horizontally. Tidal movement and wave energy drive sediment along the shore and landward. The final position of the salt marsh depends on the balance between these forces and the amount of sediment available for deposition (Doody 2008b). These types of activities were very difficult to assess during the project as construction of hard sea defences or flood relief schemes some distance away from the actual saltmarsh may be having a significant impact.

Data from this survey was generally not accurate enough to show any significant or measurable erosion (natural or otherwise) of saltmarsh at most sites during the current monitoring period (Sections 3.4.2.6 & 3.4.3.4). Erosion may be occurring at many sites around the coast but the rate is either very low or there is no current erosion at present and the measurable geomorphological cycles are currently neutral. The reporting period was likely to have been too short to record measurable changes due to erosion using the methods employed by the SMP. There are some indications of an overall erosional trend along particular parts of the coast (such as parts of Bannow Bay) when a longer period was considered, although retreat was rarely extensive and generally was between 5-30 m over a roughly 100 year period (Section 3.4.2.6).

Accretion and measurable growth of saltmarsh during the current monitoring period was actually recorded more frequently than measurable erosion. Accretion also had a significant interaction with the development of *Spartina* swards. Some of these sites are quite dynamic and some of the recent saltmarsh growth noted during the current reporting period is likely to be ephemeral. However, saltmarsh growth at other sites is likely to be part of long term accretional trend at these sites. An examination of gross changes in geomorphology of the lower boundary of saltmarshes surveyed during 2007-2008 shows that overall accretion and saltmarsh growth more than compensates overall saltmarsh erosion (Section 3.4.2.6). Accretional saltmarshes seemed to be concentrated in the northern half of Ireland. This is likely to be related to a north-to-south gradient in isostatic crustal movements in Ireland, resulting in predominantly emergent coasts in northern areas and changing southwards to coastal environments that are submergent to stable (Devoy 2008). However, the data presented should be treated with some caution due to the methods and accuracy of the maps used.

It is quite difficult to extrapolate changes in geomorphology at some individual saltmarshes as an overall indication of coastal erosion and any changes are more likely to be associated with

local conditions that are related to general shoreline morphology. For example, several sites in Castlemaine Harbour, Co. Kerry are suffering form erosion. However, when the overall extent of ASM in Castlemaine Harbour is considered, there has actually been some equilibrium between ASM loss and growth, due to significant saltmarsh growth in the past century at Rossbehy.

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 along the south-west coast of the UK are being lost to erosion at a rate of 100 ha a year and that an estimated 20% of saltmarsh extent in Essex has been lost in the past 50 years. 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).

There are no indications from data collected by the SMP project of an overall trend towards coastal erosion of saltmarshes or any climate-change induced erosion in Ireland. Devoy (2008) also states that at present there are no apparent impacts of climate-warming on coastal changes in Ireland. There is no evidence that Irish saltmarshes are eroding at similar rates compared to the south-east coast of Britain. Given an adequate supply of sediment, up to a point, salt marsh can keep pace with sea level rise (Doody 2008b). The specific factors affecting the overall erosional/accretional trends of saltmarshes in Ireland are likely to be different compared to Britain.

Doody (2008b) discusses various management options to promote accretion and to prevent erosion of saltmarshes such as the use of a variety of barriers, although these methods have been largely abandoned. Adnitt (2006) also lists the planting of Common Cordgrass as one way to re-establish vegetation on an eroding saltmarsh, although this would be a drastic step considering its invasive nature. Managed retreat or realignment has been very successful as the main management tool in counter-acting saltmarsh loss due to erosion, by recreating saltmarsh with many of the attributes of the former habitat reappearing after only a few years (Burd 1995).

4.3 The impact of cSAC/pNHA designation on saltmarsh conservation status

The majority of saltmarsh habitat mapped during the 2007-2008 survey is located within cSACs and pNHAs (Tables 4.1 & 4.2). This summary data shows that 87% of the Annex I habitat extent mapped during the project was located in cSACs and an additional 5.6% was located within pNHAs at sites not designated as SACs. Sites that are only designated as pNHAs include Booterstown Marsh, Co. Dublin, Rosslare, Co. Wexford, Dungarvan Bay, Co. Waterford, Jamesbrook Hall, Co. Cork, Rockcastle, Bandon Estuary, Co. Cork, Emlagh East, Co. Kerry, Doona, Co. Mayo and Tullaghan Bay, Co. Mayo.

Table 4.1. Summary data showing area and percentage of each Annex I saltmarsh habitat within cSACs, other Annex I habitat in pNHAs (not including pNHAs that are also designated as cSACs) and undesignated Annex I habitat at sites surveyed during 2007-2008.

Habitat	Habitat extent						
	Total area (ha)	cSAC		pNHA		Undesignated	
		Area (ha)	%	Area (ha)	%	Area (ha)	%
1310	67.4	62.6	92.9	0.8	1.2	4.0	5.9
1330	1002.8	888.9	88.6	42.9	4.3	71.0	7.1
1410	416.1	341.6	82.1	42.7	10.3	31.8	7.6
1420	0.358	0.356	99.4	0.0	0.0	0.002	0.6
***Spartina* sward**	403.1	388.5	96.4	9.3	2.3	5.3	1.3
Total	1486.7	1293.1	87.0	86.4	5.8	106.8	7.2

The remaining 7.2% of Annex I saltmarsh habitat was found in undesignated areas. The majority of this proportion actually is found adjacent to designated areas but outside the cSAC or pNHA boundaries. There were only a few sites that were located along undesignated shoreline. These include Ballyrisode House, Co. Cork, Furbo Co. Galway, Cleggan, Co. Galway, Owenduff, Corraun, Co. Mayo, Salia West, Co. Mayo and North Achill Sound, Co. Mayo. All these sites were relatively small and had few features of particular interest.

There were no saltmarshes visited during 2007-2008 that should be newly designated for their conservation value. However, there are a frequent number of sites where boundary changes would be required to include significant patches of undesignated Annex I habitat. There is also justification for the upgrading of some pNHAs to cSACs due to the presence of significant areas of Annex I habitats with significant conservation value (see Section 5.1.2).

The impact of cSAC/pNHA designation on saltmarsh conservation status can also be analysed using some the data collected for this project (Tables 4.2 & 4.3). Analysis of all the monitoring stops used for assessment of conservation status shows that 11.3% were carried out on undesignated saltmarsh. Pass and failure rates for designated and undesignated saltmarsh could also be compared. This comparison shows that there is no significant difference in conservation status of MSM in designated and undesignated saltmarsh. This analysis shows that 6.5% of stops in designated saltmarsh failed and this compares to 4.8% of stops in undesignated saltmarsh. However there is a significant difference in the conservation status of ASM between saltmarsh located within cSACs and pNHAs and undesignated saltmarsh. The percentage failure rate within undesignated saltmarsh (39.7%)

was over double of the failure rate in designated saltmarsh (17.1%). This mainly reflects differences in grazing regimes between designated and undesignated ASM, with designated sites in better condition. The amount of monitoring stops assessed as being heavily grazed in undesignated ASM (17.9%) was also about double the number assessed as being heavily grazed in designated ASM (8.3%). This is one indication that designation of saltmarsh habitats in cSACs or pNHAs does enhance the conservation status of some Annex I saltmarshes, particularly ASM.

Table 4.2. Summary data showing numbers and percentages of monitoring stops carried out within cSACs, in pNHAs (not including pNHAs that are also designated as cSACs) and undesignated areas at sites surveyed during 2007-2008 (100 sites).

Habitat	Monitoring stops						
	Total	Stops in cSACs		Other stops in pNHAs		Stops in undesignated areas	
		No.	%	No.	%	No.	%
1310	92	83	90.2	9	9.8	0	0
1330	918	769	83.8	54	5.9	95	10.3
1410	412	304	73.8	42	10.2	66	16.0
1420	10	9	90.0	0	0.0	1	10.0
Total	**1432**	**1165**	**81.4**	**105**	**7.3**	**162**	**11.3**

Table 4.3. Summary data showing numbers and percentages passed and failed monitoring stops carried out in designated (cSACs & pNHAs) and undesignated areas at sites surveyed during 2007-2008 (100 sites).

Habitat	Monitoring stops Overall				Monitoring stops in designated areas			Monitoring stops in undesignated areas		
	Total	Pass	Fail	% Fail	Pass	Fail	% Fail	Pass	Fail	% Fail
1310	92	89	3	3.4	89	3	3.4	0	0	0.0
1330	918	771	147	19.1	703	120	17.1	68	27	39.7
1410	412	388	24	6.2	325	21	6.5	63	3	4.8
1420	10	10	0	0.0	10	0	0.0	0	0	0.0

This is a notable observation and is in contrast with some of the anecdotal observations made during the survey. Some of the more badly damaged saltmarshes such as at Dough, Co. Cork and Rossbehy Co. Kerry were located within cSACs. There were few obvious other indications of any impact of cSAC/pNHA designation on ASM saltmarsh in particular, from anecdotal observations made during the survey.

The designation of saltmarsh as cSAC or pNHA does not seem to have provided as much protection from damage by infilling, reclamation and related impacts. Most of ASM and MSM damaged by infilling and reclamation (Sections 3.4.2.5 & 3.4.3.6) was located within cSACs and in most instances were very unlikely to be licensed by local authorities or other statutory bodies. In some cases it was the local authority or another government body such as The Office of Public Works that actually caused the damage. This analysis is made more difficult by the fact that most of the damage was close to or extended across the digital cSAC boundaries, occasionally affecting saltmarsh habitat extending outside the designation boundary. Annex I habitat along the upper saltmarsh boundary was especially vulnerable to this type of damage. Discrepancies between the digital cSAC boundaries and the OSI 2nd edition six inch maps meant that in many cases it would be difficult to prove that the damage

actually occurred within the designated area, especially as the scale of the damage was relatively small at some sites

Some observations were made during the project related to conservation-related management on saltmarshes. It was noted that drainage and reclamation works were carried out at several sites by landowners in advance of placing the site into the REPS scheme. At other sites, single-wire fences erected as part of the REPS scheme to exclude livestock from saltmarsh and separate saltmarsh from adjacent grazing pasture had fallen and were generally inadequate for this role. Several land-owners had also indicated that their REPS planner had stated that saltmarsh should not be grazed for ecological reasons.

4.4 The future prospects of Irish saltmarsh habitats

Only 19 out of the 100 sites assessed during the SMP survey had *favourable* future prospects for all the habitats present. This site-specific assessment was based mainly on the assumption that current management regimes and intensity of impacts affecting the saltmarsh habitats would continue in the future. The overall future prospects of *Salicornia* flats at a national level were all assessed as *unfavourable-bad*, while those of ASM and MSM were assessed as *unfavourable-inadequate* (Table 3.6). The Commission of European Communities (2006) definition of *unfavourable-bad* future prospects is '*habitat prospects are bad, with severe impact from threats expected; long-term viability not assured*'.

Part of this assessment is a consequence of the methods by which the conservation status of these saltmarshes is assessed including assessment on a site-by-site basis. These methods can over-emphasise the impact of damaging activities such as over-grazing and the assumption that intensity of damaging impacts will remain at similar levels in the future is not practical. The intensity and influence of impacts on saltmarshes such as grazing intensity, erosion and the spread of Common Cordgrass are all likely to change in the future.

Climate change predictions of increases in sea-level in the future are predicted to increase erosion of saltmarsh in Ireland (Fealy 2003). Devoy (2008) states that accelerated sea-level rise is likely to reduce the resilience of coastal marshes in the west of Ireland to inundation. Saltmarsh is predicted to move landward in response to sea-level rise and may be subject to 'coastal squeeze' where this migration is impeded by artificial defensive structures such as sea walls and there is an inadequate supply of sediment (Boorman 2003). This is predicted to increase the area of lower saltmarsh communities such as *Salicornia* flats and reduce the area of upper saltmarsh communities (JNCC 2004). Future climate change may actually increase the area of *Salicornia* flats but at the expense of ASM, another Annex I saltmarsh habitat. It seems likely that increased storminess due to climate change will put greater pressure on individual areas, which will in turn increase the rates of erosion. There is evidence to suggest that an individual storm can initiate erosion, after which the salt marsh enters a state where erosion continues through internal processes (Doody 2008b).

Erosional trends were assessed as having an irreversible negative impact on only 4 sites visited during 2007-2008 where there were hard structures along the landward boundary such as sea walls to prevent natural retreat. A substantial amount of the saltmarsh surveyed during this project was constrained to some extent by artificial structures along the landward boundary. There is some capacity for Annex I saltmarsh habitats to retreat into adjacent transitional and terrestrial habitats where there are natural transitions. However, it is very difficult to quantify the risk to saltmarshes in the future from sea level rise, particularly as the current rates of erosion to saltmarshes seem to be quite low. There is little data in Ireland to assess with accuracy the potential impacts of climate change on saltmarshes.

While erosion may decrease the overall extent of saltmarshes, the area of some habitats such as ASM is likely to increase at some sites due to other processes as *Spartina* swards mature and natural succession occurs. *Spartina* swards in this situation are acting as a pioneer saltmarsh community. This process has already been noted at several sites around Ireland. Erosion may actually have a positive impact on the overall extent of saltmarsh at some sites as neglected sea walls collapse and are breached by the tide, so that reclaimed farmland reverts back to saltmarsh. Several examples of this process creating new saltmarsh habitat were noted during the survey.

Common Cordgrass still has the capacity to spread to new sites, particularly in the larger estuaries and bays of the west coast, and affect pioneer and low zone saltmarsh communities, particularly *Salicornia* flats and low marsh ASM. Sites such as Donegal Bay, Mulroy Bay, Sligo Bay and Killala Bay are likely to be prone to colonisation by this species, naturally or deliberately in the future. Common Cordgrass is also likely to continue to consolidate at sites where it has only colonised relatively recently (past 50-60 years) with some increases in the extent of *Spartina* swards at the expense of *Salicornia* flats or ASM, and particularly at the expense of mudflats (Figure 4.4). Cooper *et al.* (2006) predict that *Spartina* swards will continue to increase in area on mudflats at their lower boundaries at sites in Northern Ireland. This prediction is based on the fact that *Spartina* swards have not reached their potential niche limit in most of the sites in Northern Ireland. *Spartina* swards in the Republic of Ireland are likely to follow the same trends, particularly swards that have established more recently.

Figure 4.4. Common Cordgrass spreading over sandflats in Dundalk Bay (2007).

Some research has indicated that Common Cordgrass may respond positively to the impacts of climate change due to changes in its competitive interactions with Common Saltmarsh-grass and to increased temperatures (Long 1990, Loebl *et al.* 2006). This may promote further colonisation of low and low-mid zones of ASM by this species leading to further losses of ASM area. Climate change is also predicted to have other impacts on the species composition of saltmarsh in response to increased temperatures (Harrison *et al.* 2001). Saltmarsh Flat-rush was predicted to go extinct in Ireland while Sea Purslane was predicted to extend its range around the coast.

Natural die-back of *Spartina* swards in Ireland has also been noted with swards reverting back to bare mudflat cover or mudflats with patchy Common Cordgrass distribution (McCorry 2007). Die-back of *Spartina* swards is quite common on many older established sites in Britain (Lacambra *et al.* 2004), although the causes of die-back are not known. Die-back is thought to be connected to the development of highly anaerobic soils by Common Cordgrass accretion and is thought to be an indication that this relatively young habitat is still adjusting to its environment (Gray *et al.* 1991, Gray *et al.* 1995). Doody (2008a) estimates that there has been an overall reduction by 11% in the area of *Spartina* marsh in Britain. There is likely to some natural reduction in area of mature *Spartina* swards due to die-back at the seaward edge and natural transition to other saltmarsh at its landward edge.

A significant portion of the saltmarsh visited during 2006-2008 was located within cSACs and or pNHAs (Section 4.3). Notifiable actions have been set for saltmarsh habitats within cSACs. Actions such as alteration of watercourses, reclamation, and the use of the saltmarsh for commercial activities require consent from the Department of Environment, Heritage and Local Government. Local authorities are much more aware of the conservation value of these sites and will take them into consideration when making planning decisions. Infilling of non-designated sites should be regulated by local authorities as this normally requires a waste licensing permit. However, many damaging activities such as infilling and reclamation occurred within these cSACs in spite of their designation for nature conservation and protection from development. More work is required to enforce the conservation of Annex I habitats and prevent damaging activities within these protected areas.

Grazing is the most common impact affecting the future prospects of this habitat. Currently some stocking rates and grazing practises outside and within cSACs are still unsustainable and are affecting the structure and functions of saltmarsh. Saltmarsh can, however, recover from heavy grazing relatively quickly (several years). Some NPWS Conservation Plans and Department of Agriculture Farm Plans are setting sustainable grazing levels for designated areas (cSACs and pNHAs) and for farms working in the Rural and Environment Protection Scheme (REPS). Over-grazing should decrease as these stocking rates are enforced, although this does not always occur in practise on many coastal sites. Stocking rates of livestock in Ireland in general are predicted to decrease in the future due to the decoupling of livestock stocking rates from EU subsidies and the introduction of a Single Farm Payment (FAPRI-Ireland Partnership 2003). This is also likely to have a significant effect on future numbers of livestock grazing on marginal land such as saltmarsh. Care should be taken not to completely remove livestock from saltmarshes due to the potential impact of under-grazing, which may increase in the future.

Several large infrastructural road projects in Ireland have had to mitigate the environmental impact of development on saltmarsh. These mitigation measures have significantly reduced the impact of some large-scale developments like motorway bridges on saltmarsh habitat (Murray 2003). Some restoration works at one site in the Boyne Estuary are also mitigating for the loss of saltmarsh habitat due to large-scale development within a cSAC (Robertson & Associates 2005). These restoration works may redevelop ASM habitat.

Saltmarsh habitats remain vulnerable to damaging activities and natural processes such as erosion. However, while many of the impacts are significant, there is no evidence of a serious threat to the conservation status of these Annex I saltmarsh habitats as compared to other Annex I habitats in Ireland such as Raised Bogs. The most common damaging impacts on saltmarsh are related to agricultural use and the intensity of these impacts should be alleviated with proper management. The SMP survey has shown that some perceived impacts such as invasion by Common Cordgrass has had much less of an impact on ASM and MSM than previously thought, although there is still a series threat to *Salicornia* flats from

this invasive species. Some saltmarsh is being destroyed by a range of impacts but the best method to reduce the rate of loss is to enforce current conservation designations and prevent damaging activities within these protected areas through site covalence by NPWS staff.

4.5 The classification of *Spartina* swards

The habitat classification of *Spartina* swards has proven problematic in the past. The Interpretation Manual of EU Habitats (Commission of the European Communities 2003) describes *Spartina* swards (1320) as pioneer grasslands that colonise coastal saline muds and belong to the phytosociological order, Spartinion maritimae, (which belongs to the class Spartinetea maritimae). There are several sub-types listed that are dominated by *Spartina alterniflora, S. anglica, S. maritima* and *S. x townsendi*.

Some *Spartina* swards in Ireland had originally been classified as the Annex I habitat *1320 - Spartina* swards *(Spartinion maritimae)* during the initial 'Natura 2000' site selection process. At a subsequent National Parks and Wildlife Service (NPWS) meeting it was decided only to list sites with Small Cordgrass (*S. maritima*) or other rare species (Internal NPWS memo 1999). However, sites with stands of Common Cordgrass remain listed and *Spartina* stands remain a qualifying interest for 3 cSACs in Ireland, with a further 12 cSACs assigned a rating D (non-significant presence).

While it has been planted at many sites around Britain it should be noted that the last BSBI Atlas of plant distribution stated that Common Cordgrass was native in both Britain and Ireland. Preston *et al.* (2002) considered that deliberately planted populations and naturally developed populations could not be separated and therefore considered all populations to be 'native'. This reclassification was based on the view that Common Cordgrass was now old enough to be considered a 'natural' component of saltmarsh vegetation (Doody 2008a). There is an argument for this in Britain as Common Cordgrass originated at Hythe, Southampton. However, all populations of Common Cordgrass in Ireland should be considered non-native or 'alien' as it was definitely introduced to this country. One of the first reports of this species in Ireland was by Cummins (1930) who described planting the grass in Cork Harbour.

There have been some definite records of other forms of Cordgrass in Ireland. Boyle (1977) identified Townsend's Cordgrass (*S. x townsendi*) on the saltmarsh at North Bull Island. This species is thought to be extinct at North Bull Island as all the original clumps were dug up during the 1970's. Boyle (1976) also noted a dwarf form of Cordgrass at North Bull Island, Baldoyle and in the Broadmeadow Water Estuary and named it *Spartina maritima* forma *dublinensis*. A picture of this plant is present in Boyle (1977). The origin and taxonomic status of this species is uncertain although Boyle stated that it was indigenous and had originated in some of these Irish sites. Both rare Cordgrass species have not been recorded in the recent past at these sites (Doogue *et al.* 1998) although Rinus Otte (formerly of Department of Botany, University College Dublin) did note a dwarf form of *Spartina* at North Bull Island in the 1990's that was never refound. McCorry has also noted dwarf forms of Cordgrass at Baltray, Drogheda in the 1990's but these sites were also not refound.

Townsend's Cordgrass was also recorded at many sites around Ireland in the past but these records are now thought to be dubious and related to the developments in the taxonomy of *Spartina* over the years that created uncertainties in the status of the two main species, Common Cordgrass and Townsend's Cordgrass. All stands of Cordgrass in ROI are now thought to be Common Cordgrass (McCorry *et al.* 2003). (However, it was noted during the SMP that there is some variation in morphology and vigour of some stands of Cordgrass around the country. A research project examining the genetics and morphology of Cordgrass

populations around the country could also turn up some interesting data about the origin and possible uniqueness of any populations.)

The possibility of new forms of Cordgrass originating in Irish estuaries due to various types of hybridization such as back-crossing should not be discounted. These plants would have a significant value for research into Cordgrass genetics, hybridization speciation. Hybrid swarms between California Cordgrass (*S. foliosa*) and Smooth Cordgrass (*S. alterniflora*) have recently been recorded in San Francisco Bay (Ainouche *et al.* 2003).

There is no justification to classify stands of Common Cordgrass in Ireland as the Annex I habitat – 1320 *Spartina* swards. Stands of Common Cordgrass that are found around the country do not qualify as the Annex I habitat and should be de-selected as qualifying interests for cSACs. There are no ecological grounds to specifically conserve this habitat in Ireland apart from the fact that it is generally found in conjunction with other Annex I saltmarsh and intertidal habitats. There are no specific impacts or activities threatening this habitat. This habitat is not likely to be threatened in the short-term, although it is perhaps vulnerable to long-term sea level rise.

Sites where other forms of Cordgrass have been recorded in the past should perhaps be considered differently as these forms of Cordgrass do have some conservation value and may be indigenous. However, there is no data to indicate that *1320 Spartina swards* should still be listed as a qualifying interest at several sites. A specific survey to search for these rarer forms could perhaps turn up new records.

5 RECOMMENDATIONS

5.1 General recommendations

After the completion of this project, several recommendations can be made regarding the management and conservation of Annex I saltmarsh habitats in Ireland. It should be noted that these habitats rarely occur in isolation of each other and are also frequently associated with other coastal habitats of significant conservation interest such as sand dune systems, machair and other transitional habitats. It is not advisable to set specific conservation or management objectives for any specific Annex I saltmarsh habitat without first taking into consideration these other habitats, especially as they can not be managed separately at many coastal sites. Heavy grazing levels may benefit species diversity of dune habitats but may cause some damage to adjacent saltmarsh. Cattle and sheep seem to prefer to graze saltmarsh habitats at some of these coastal sites.

5.1.1 Grazing

A detailed study of the impact of grazing on saltmarshes using exclusion plots and plots with controlled grazing on some heavily grazed sites should be carried out similar to studies that have been carried out on upland and sand dune habitats. This will significantly aid the formulation of a grazing strategy for different types of saltmarsh.

The SMP method of assessment may have over-emphasised the impact of over-grazing at some of these sites due to the placement of monitoring stops. Minor damage like small areas of poaching should be accepted as part of management of saltmarsh habitats. It could be very difficult to manage this issue and eliminate all damage. Saltmarsh can recover quite quickly from this damage.

Data from this survey indicates that the area of saltmarsh that is damaged by overgrazing is relatively small (15% of ASM and 9% of MSM). There are a few sites where the whole saltmarsh was badly over-grazed such as Dough, Co. Cork, and would benefit from reduced stocking rates. At other sites such as Rossbehy, Co. Kerry, a significant portion of the site would benefit from reduced stocking rates. Most other grazed sites would probably benefit from a small reduction in stocking rates. A comparison with targets listed by Doody (2008b) about levels of grazing suggests that many grazed saltmarshes tend towards moderate and heavy levels of grazing as defined by Doody. However, there is still a great deal of variably in grazing intensity of saltmarsh around the Irish coast. Care should be taken that grazing is not abandoned altogether, as this can have as great a negative impact on the overall conservation status of saltmarsh habitats as over-grazing.

This survey also indicates that there is a significant proportion of saltmarsh habitat that is not grazed at all. The impacts of under-grazing were not adequately considered during this survey, due to the lack of baseline data, although there were indications that the absence of grazing was having a significant impact on the extent and structure and functions of various saltmarsh habitats. However, future surveys will be able to use this project as a baseline to examine impacts of long-term-absence of grazing, such as changes in vegetation communities.

Data from this project shows that there does not need to be a huge change in grazing management of Irish saltmarshes. Grazing intensity is quite variable around the coast and therefore means that sward structure and the condition of the saltmarsh surface is also quite

variable. Sites should be assessed on a site-by-site basis and grazing may not be a suitable management tool for some sites.

Stocking rates for Irish saltmarshes within designated areas (cSACs and pNHAs) and for any saltmarsh habitat in future Agri-Environment schemes like REPS should be set in Department of Agriculture and Food Farm Plans. There also should be some flexibility in these stocking rates to take account of historical grazing management and variability in management around the country. Abandonment of salt marsh grazing should not be encouraged and some incentives should also be provided to continue grazing at sustainable levels on historically grazed marshes.

Guidelines for grazing management of saltmarshes should be prepared for the Department of Agriculture and Food.

5.1.2 cSAC and pNHA designations

Mapping of saltmarsh habitats from this survey shows that significant revision of designated boundaries (cSAC and pNHA) is required for many sites. A large proportion of errors relates to discrepancies between the 6 inch map, the aerial photos and the digital cSAC and pNHA boundaries (based on OSI 2nd edition 6 inch maps) due to rectification and cartography issues. Typical errors include digital boundaries that do not overlap with the actual features marking the boundary on the ground such as seawalls or shorelines, meaning that in some cases the saltmarsh is not actually included within the digital boundary. Hopefully many of these errors will be corrected when NPWS converts the digital cSAC and pNHA boundaries to the OSI 1:5000 map format.

Saltmarsh habitat has also been left out of designated areas due to poor or incomplete mapping or interpretation of aerial photos. A typical error was the use of the upper shoreline or boundary with adjacent pasture as the cSAC or pNHA boundary. The saltmarsh frequently extended into the pastures creating small patches of habitat, meaning this area was excluded. Another typical error was the use of the wrong shoreline boundary (the lower shoreline boundary as marked on the OSI 2nd edition six inch maps) as the cSAC or pNHA boundary, meaning that sometimes the whole saltmarsh was excluded. The use of digital habitat maps prepared during the SMP project should help correct many of these errors when the digital cSAC and pNHA boundaries are amended.

Nearly all of the 'best' saltmarshes visited during 2007-2008 were protected by cSAC designation. However, there are a few notable exceptions. The saltmarshes of Dungarvan Bay are probably the most notable exception with this site only designated as a pNHA. Saltmarshes have developed along Cunnigar Point in association with a spit containing sand dune habitats. Notable features of conservation interest include a diverse range of saltmarsh communities, the presence of Sharp Rush on the sand dune saltmarsh boundary and some sections with natural transition between the sand dune and saltmarsh habitats. Other sites that perhaps could be designated as cSAC include Booterstown Marsh, Co. Dublin and Tullaghan Bay, Co. Mayo.

5.1.3 The conservation value of transitional and other habitats associated with Annex I saltmarsh habitats

The majority of saltmarsh vegetation can be classified as either one of the three Annex I saltmarsh habitats or *Spartina* swards. The only other communities found on saltmarshes that were not considered to fit within the various classifications of the Annex I habitats were communities dominated by either Twitch, Sea Couch-grass, Sea Club-rush, Grey Club-rush and Common Reed. However, these communities form an important part of the overall saltmarsh habitat, add to the overall diversity and are important for the overall physical

structure of the saltmarsh. They very often form an important part of the brackish transition, especially in estuarine sites. Transitional vegetation and adjacent vegetation communities along the upper saltmarsh boundary can also form a very important part of the overall diversity of the site, although much of this vegetation may not be classified as Annex I vegetation. For example, transitional wet grassland along the upper MSM boundary of fringe type saltmarshes is generally much more species rich compared to the adjacent MSM and is worthy of conservation along with the saltmarsh habitats. These transitional habitats have largely been destroyed at many sites in Britain due to reclamation (Doody 2008a). There may also be small patches of other habitats such as scrub, rocky outcrops, wet grassland and semi-natural dry grassland on mounds within the saltmarsh.

Care should be taken when drawing designation boundaries around Annex I saltmarsh habitats to include these transitional habitats or other patches of semi-natural habitat, especially at sites where there are natural transitions between the saltmarsh and adjacent habitats.

5.1.4 Management of Common Cordgrass

Control of this species has been carried out in Britain and Ireland using a variety of methods in the past but overall success has been mixed (Gray & Benham 1990, Lacambra *et al.* 2004). Experience has now shown that successful control of this species is very difficult, costly and should only be considered as a long-term and sustained management programme. Control techniques for this species such as the use of herbicide can be quite inefficient. The control of this species is still a complex management issue and different organisations have formulated different objectives.

North Bull Island is a good example of a partially successful Common Cordgrass control programme during the 1980's. Dublin City Council was successful in lowering the extent of this species on the mudflats (and *Salicornia* flats habitat). However, the management policy was re-evaluated during the 1990's (Otte 1994) and the control of this species ceased. However, this species is now widespread again and increasing its cover on *Salicornia* flats at this site irrespective of this former control. Dublin City Council (McCorry & Ryle 2009) has decided to continue a policy of non-intervention at present.

Natural England now has no overall policy regarding Common Cordgrass control and sites are dealt with on a case by case basis (Sue Rees, Natural England, pers. comm. 2008). Stands of Common Cordgrass are still being controlled at some nature reserves and other sites in Britain by a variety of techniques such as roto-burying and spraying herbicide. The Northern Ireland Environment Agency is also continuing its policy of Common Cordgrass control at sites like Strangford Lough, Co. Down, after a long period of no active management, and is currently attempting to get Fusillade (herbicide) licensed for use in intertidal environments (Environment and Heritage Service 2005, Mark Hammond, *Spartina* Working Group, NIEA, pers comm. 2008).

The International Single Species Action Plan for the Conservation of the Light-bellied Brent Goose (Robinson & Hughes 2005) called for an all-Ireland management plan for Common Cordgrass to be formulated. The Northern Ireland Habitat Action Plan for saltmarsh (Environment and Heritage Service, 2005) also lists as one of its targets the formulation of a management strategy to control Common Cordgrass. However, successful management of Common Cordgrass is unlikely without considerable resources. The various motives for control of Common Cordgrass should be questioned in detail before any control is carried out.

Data from this survey shows that Common Cordgrass has the most significant negative impact on *Salicornia* flats and is the main reason for the unfavourable assessment of the

conservation status of this habitat at most sites where this species is present. Control of Common Cordgrass to enhance the conservation status of this habitat could be a valid objective at some sites where there is a large area of *Salicornia* flats. However, the potential for successful eradication at a site like Dundalk Bay or even Baltray, Co. Louth is very low due to the abundance of Common Cordgrass at these sites. A case could also be made for the control of Common Cordgrass at North Bull Island because it threatens one of the largest areas of *Salicornia* flats habitat found in Ireland (McCorry 2007). However, the extent of *Salicornia* flats at North Bull Island is likely to decrease naturally in the future and this is likely to happen even if Common Cordgrass was not present.

A significant area of former established saltmarsh (ASM) has also been replaced by this species (estimated at 6.9%). The actual area of established ASM that has been replaced by *Spartina* swards and *Spartina* sward ASM mosaic is likely to lower than this estimate and a significant proportion of these habitats has developed on mudflats or else has developed in pioneer zones that have subsequently developed into more established saltmarsh. It is now accepted that there is no reason to control Common Cordgrass to protect established saltmarsh vegetation (JNCC 2004) such as the ASM as it has a limited potential to invade the majority of this habitat. However, control in adjacent habitats (such as *Salicornia* flats) may be futile without attempting to manage Common Cordgrass within ASM, as this provides a significant seed source for potential re-establishment. The SMP project has also highlighted some of the positive impacts of colonisation of this species (Section 4.2.2).

A general policy of active Common Cordgrass control in Irish saltmarshes is not recommended when considering the various impacts of this species as highlighted by this survey. Any control should be considered on a site-by-site basis. However, the 'cost' of any Common Cordgrass management programme on Annex I saltmarsh habitats (including the actual amount of resources required and the potential negative impacts of any control programme on non-target species and habitats) is likely to out-weigh potential positive benefits of eradication on these habitats in general. Management of this species in *Salicornia* flats can not be considered without management in the other adjacent saltmarsh habitats and on mudflats. The control of Common Cordgrass within established saltmarsh could also have unexpected impacts, such as the promotion of erosion of this habitat, at some sites. Most control programmes have focused on the control of Common Cordgrass on mudflats and not on saltmarsh and the impacts on non-target species have not been studied in detail. In a period of potential climate change-induced sea level rise and increased erosional pressure on saltmarshes (JNCC 2004), this may not be the best management option. The actual resources required to attempt to eradicate this species even in some of the small-medium sized estuaries and bays in Ireland would be quite significant.

It is recommended that instead of attempting to control or manage established populations of Common Cordgrass in Ireland, the primary policy should be that any available resources should be used to prevent the spread of this species to new sites, specifically along the west coast of Ireland. Cooper *et al.* (2006) have also stated that eradication of larger populations of Common Cordgrass in Northern Ireland is not realistic and that more emphasis should be placed on controlling new populations. There is very little point in attempting to control Common Cordgrass at large sites like the Shannon Estuary or Dundalk Bay where there very little chance of success without considerable outlay of resources. Site-specific control in some of these larger estuaries or bays is likely to be ineffective because of the potential for recolonisation from other sites in these estuaries or bays. The only known successful eradication of Common Cordgrass in the Republic of Ireland was in Drumcliff Bay, Co. Sligo, when several clumps were spotted and were successfully dug out during the 1980's ((Don

Cotton, Sligo Institute of Technology, pers. comm. 2009). This site remains free of this species. So a rapid response to the appearance of this species can be successful.

Currently there is a large section of Irish shoreline between the Shannon Estuary, Co. Clare and Lough Swilly, Co. Donegal where there is very little cover of *Spartina* swards. The only recorded location for *Spartina* swards along this shoreline (during SMP 2006-2008) is in Clew Bay and its cover in Clew Bay is not extensive. There are several other 10 grid squares with records of *S. anglica* in Mayo (Blacksod Bay, Killala Bay) and Donegal (Donegal Bay) from Preston *et al.* (2002) where this species was not recorded during the SMP project. These 10 grid squares should be searched in conjunction with records from the BSBI. This is where any future Common Cordgrass monitoring, management or eradication programmes should be prioritized. Clew Bay is probably one of the largest bays in Ireland with a relatively small and confined population of Common Cordgrass.

The Irish shoreline around the south-west coast between Castlemaine Harbour in Kerry and Clonakilty Bay in west Cork also has no records of Common Cordgrass. This shoreline should be examined in the same way and resources used to prevent the establishment of Common Cordgrass at new sites along this shoreline. If control of this species was ever to be considered in this region then a good place to start would perhaps be in Clonakilty Bay (possibly the most westerly record for this species along the southern coast of Ireland) with control programmes working eastwards along the coast. This site was not visited during the SMP 2006-2008 but desktop data indicated that it was present, although perhaps not very extensive.

During the SMP 2006-2008 131 sites were visited around the coast of Ireland. However, there are significant gaps around the shoreline where there has been no accurate or recent field surveying of saltmarsh habitats. The original desktop survey of the entire shoreline of Ireland carried out for the SMP showed that significant errors can be made in estimating *Spartina* sward cover and distribution just from aerial photos. Ground-truthing during 2007-2008 significantly increased the accuracy of parts of this desktop survey. The estimated total area of *Spartina* swards in Ireland is 1521 ha. However only 1/3 of this area (527 ha) was actually surveyed during fieldwork. It is recommended that any available resources also be spent on surveying the remaining sites containing Common Cordgrass and filling in some of these gaps that were only examined using the desktop survey.

5.1.5 Management of saltmarsh erosion

There is no evidence from this project to conclude that saltmarsh erosion needs to be directly managed. More recent research suggests that the natural dynamism of coastal habitats such as saltmarshes should be preserved (JNCC 2004, Doody 2008a) and that processes such as erosion and accretion should be allowed to occur naturally. Policies that allow natural movement of sediment should be promoted.

Several reviews of the status of European saltmarshes predict that erosion of saltmarsh is likely to be enhanced due to climate change in the future. The best way to mitigate this loss is to re-create saltmarsh habitat using managed retreat or managed realignment. This process has been successfully used in Britain, particularly along the south-east coast that is more prone to erosion, and Europe. While there are no known examples in Ireland of managed retreat there are frequent examples of accidental or unmanaged retreat where breaches in sea-walls have allowed saltmarsh to redevelop in previously reclaimed land. Devoy (2008) described how reclaimed land was 'let go' or abandoned in the early 20th century in response to population loss and emigration and this was an unplanned example of managed retreat in Ireland. There are a lot of sites around the coast where managed retreat

would be a suitable management option, particularly as some of the reclaimed land behind the seawalls is poor in quality, dominated by wet grassland, and has frequently been abandoned (Figure 4.5). The option of managed retreat could be considered within any future Agri-Environment schemes in Ireland with incentives provided for development of new saltmarsh, especially in abandoned reclaimed farmland. A similar scheme has been in operation in England within the Ministry of Agriculture and Food's Habitat Creation Scheme (UK Biodiversity Action Plan for Coastal Saltmarsh - http://www.ukbap.org.uk/UKPlans.aspx?ID=33)

Figure 4.5. Newly developing saltmarsh in formerly reclaimed land at Creeslough Co. Donegal (2008)

5.1.6 Management of *Salicornia* flats (1310)

It is difficult to set specific objectives to directly manage this habitat as it can be quite ephemeral at many sites and vulnerable to the natural dynamics of coastal environments. It may be very difficult to maintain the extent of this habitat at some sites due to these processes and there may be natural losses of extent in a national context in the future. Perhaps the best way to maintain the conservation status of this habitat is to maintain natural dynamism of these coastal systems.

5.1.7 Classification of Halophilous scrub (1420)

The value of using the Halophilous scrub (1420) classification for conservation designations and as qualifying interests for cSACs in Ireland should be re-evaluated. While the one of the primary indicator species Perennial Glasswort is present, it is not a prominent part of the saltmarsh vegetation over most of its distribution, becoming frequent on only a few small areas (Section 3.6.5). A more detailed survey is required to properly describe and classify the various vegetation communities where Perennial Glasswort is present using phytosociological methods and a series of relevés at all the sites where it is present.

5.1.8 Classification of Mediterranean salt meadows (1410)

The use of Mediterranean salt meadows as an Annex I habitat classification in Ireland should also be re-evaluated. The phytosociological classification of tall rush communities dominated by Sea Rush n Ireland is somewhat uncertain.

There is no saltmarsh habitat classified as MSM in the UK, even though Britain does contain similar vegetation dominated by Sea Rush (www.jncc.co.uk). This Annex I habitat type is not considered to occur in Britain although the JNCC indicate that there was considerable debate and examination of phytosociological literature and discussion with specialists prior to decisions on NATURA habitat classifications (McLeod *et al.* 2005). The distinguishing features of Mediterranean salt meadows in the UK have never been clarified. These communities have been classified as ASM in Britain. This has lead to the anomaly that Sea Rush-dominated vegetation is classified as Atlantic salt meadows (1330) in Northern Ireland but Mediterranean salt meadows (1410) in ROI. The use of species such as Borrer's Saltmarsh-grass and Divided Sedge as an indicator of MSM should be re-evaluated.

The phytosociological classification of saltmarsh vegetation should be examined in more detail in Ireland with the Irish vegetation being compared to vegetation classified as Juncetalia maritimi in mainland Europe. The above anomaly is partly a legacy of changes in phytosociological classification over the years and the absence of recent research into saltmarsh vegetation in Ireland. The main phytosociological unit 'Juncetalia maritimi' used by European Commission (2003) was not recognised as a phytosociological unit by any of the main studies of vegetation or saltmarsh classification in Britain and Ireland (White & Doyle 1982, Wymer 1984, Adam 1990, Rodwell 2000). Associations dominated by Sea Rush (Junco-maritimi-Oenanthetum lachenalii) were placed within alliance Armerion maritimae (order Glauco-Puccinellietalia) by White and Doyle (1982), Wymer (1984) and Rodwell (2000), which would mean this vegetation should be classified as Atlantic salt meadows. Wymer (1984) identified several communities dominated by Sea Rush. Some of the vegetation was placed within the association Junco-maritimi-Oenanthetum lachenalii. Some of the vegetation communities described in Wymer (1984) were not assigned a specific phytosociological association but were placed within Armerion maritimae and some of the vegetation remained unclassified. This uncertainly probably reflects the ecological variability of vegetation dominated by Sea Rush in Ireland where it can be found at both the upper and lower saltmarsh zones.

5.2 Recommendations for management of individual sites

This section outlines some specific recommendations for individual sites that were made during the preparation of individual site reports or had been made subsequently after analysis of the data (Table 4.4). These recommendations relate to control of specific damaging activities such as overgrazing at some sites, infilling and dumping, that should be specifically prioritized to limit further damage to saltmarshes at these sites. Other damaging activities are highlighted elsewhere in this report and in the individual site reports and NPWS should also consider management and control of damaging activities on a site-by-site basis. These recommendations also pin-point potential sites where other conservation measures such as managed retreat could be carried out that could enhance the overall conservation status of saltmarsh habitats.

Table 4.4. Recommendations for management of individual sites.

Site	County	Recommendation
Booterstown	Du	Care should be taken with management of water levels at this site. It is suggested that prolonged periods of flooding is one of the main reasons for the reduction in vegetation cover on the bare mudflats in the past 20 years. This may be due to the sluice gate being closed for long periods of time. It is not known if the sluice gates are being actively managed. More regular tidal inundation into the marsh should be promoted and prolonged periods of flooding should be reduced. Active management should consider the conditions that developed during the 1980's when Borrer's Saltmarsh-grass thrived at the site. There is likely to be additional information available for this site held by either the local authority or An Taisce and other environmental factors may also have significant influence. Any management should consider that Borrer's Saltmarsh-grass may be vulnerable to significant changes in the flooding regime.
Kilcoole	Wi	Periods of prolonged flooding at the site should be considered as part of the overall natural environmental process that affects the site. This is a dynamic site and natural transition due to prolonged flooding should be allowed to continue.
Buckroney (and Potters Bar)	Wi	The brackish vegetation at this site should continue to be monitored. The Sharp Rush-dominated vegetation was considered to qualify as the rarer sub-type of MSM at this site and would have been one of the largest areas of this vegetation type in Ireland. However, the SMP survey did not consider that this area qualified as an active saltmarsh, due to the presence of transitional dune slack species and the fact that the area was not being regularly inundated by the tide. The river dividing the nature reserve from the adjacent golf course was blocked in the recent past (it is now opened) and that it has been a number of years since the site had been inundated by the sea. Perhaps this area should not be listed as a qualifying interest for this site as it is not functioning as a typical saltmarsh. However, more regular inundation in the future may promote development of more typical MSM type vegetation. This area is within the cSAC.
Castlebridge	Wx	Borrer's Saltmarsh-grass was recorded at this site. The grazing intensity on both sides of the marsh should be increased compared to its status in 2007. While this may have a negative impact on some of the structure and functions of the ASM and MSM, it would be beneficial to the status of Borrer's Saltmarsh-grass. Both areas are within a cSAC. Consultations should be carried out with landowners and managers of the site regarding drainage works and track improvements. Care should be taken to limit the track improvement works and maintain soil substrates on these tracks to promote suitable habitat for Borrer's Saltmarsh-grass.

Site	County	Recommendation
Rosslare	Wx	Borrer's Saltmarsh-grass was recorded at this site at several sites. Grazing is the main activity directly acting on this site. While the grazing intensity is negatively affecting the ASM in places it is beneficial to the status of Borrer's Saltmarsh-grass, which requires disturbed areas in brackish situations. These sites are not designated as part of a cSAC and several sites also lie outside the adjacent pNHA. The pNHA boundary should be amended to help manage these sites for nature conservation. Action should be taken about the water pollution from the sewage outflows along the eastern side of the site.
Clonmines	Wx	Some of the older dykes at the north end of this site are in a state of disrepair. This could lead to unlicensed repair in places and possible damage to the saltmarsh. This site lies outside but adjacent to the digital cSAC boundary.
Gorteens	Wx	Perennial Glasswort is present at this site. The population of this species should be regularly monitored.
Saltmills	Wx	This site should be surveyed in detail for Perennial Glasswort. A Coastwatch survey (Dubsky 2006) recorded one plant of Perennial Glasswort in 2006, but this species was not recorded during the SMP survey.
Taulaght	Wx	Perennial Glasswort is present at this site at a location adjacent to an access track used by the local aquaculture industry. There has been some dumping close to the location of these plants. NPWS should take measures to make users aware of the presence of this rare plant and its protected status. Further dumping is a threat to the ASM and the distribution of Perennial Glasswort at this site. A sign has been put up by person(s) unknown indicating the presence of a legally protected and rare species and asking that rubble not be dumped along a stretch of track. A small area of Common Cordgrass was also controlled at the site. NPWS should take measures to highlight the fact that this activity may not necessarily enhance the conservation status of Perennial Glasswort.
Bannow Island	Wx	Perennial Glasswort is present at this site. The population of this species should be regularly monitored. There is potential at this site for managed retreat in the area at the west side of the site that is enclosed by the seawall. This could provide suitable habitat for Perennial Glasswort and other saltmarsh habitat, replacing the site at Grange, at the mouth of Bannow Bay. This area contains brackish marsh and improved grassland. This could aid the future prospects of this species and the extent and distribution of Halophilous scrubs (1420) in Bannow Bay. NPWS should consult with the landowner. This whole area is located within a cSAC.
Grange	Wx	The saltmarsh at this site has nearly disappeared due to erosion. Much of the remaining site is in a state of transition with the development of brackish vegetation in former wet grassland and dune slack habitats. This site should be monitored regularly to examine future habitat development as an example of a dynamic site under-going rapid habitat succession.

Site	County	Recommendation
Fethard	Wx	The impact of continued eutrophication from the local sewage treatment plant on this marsh should be monitored. This may be promoting the spread of Common Cordgrass at this site. There are plans by the local authority to remove this treatment plant in the future and this may have a significant impact on the site. Perennial Glasswort is present at this site. A detailed and targeted survey of the whole site may increase the known distribution of this species at this site.
Dunbrody Abbey	Wx	This site is very important in a national context for saltmarsh conservation, as it was the site of three rare species in Kilmannock (Divided Sedge, Borrer's Saltmarsh grass and Meadow Barley). The largest populations of Divided Sedge, an extremely rare species, were found at this site in the past but it was not recorded during the SMP survey. Further monitoring is required to assess the current status of this species. The pNHA survey notes mention that several areas including the large area of immature woodland to the west of the pasture in Kilmannock could revert to saltmarsh if the embankment was breached and this was the reason why they were left in the pNHA/cSAC. Some consideration should be given to actively manage this part of the site (owned by the ESB?) with nature conservation as the primary objective. Perhaps some or all of the relevant land influenced by brackish conditions behind the embankment could be bought by NPWS and then grazed to create a suitable regime (or regimes) for development of saltmarsh and brackish habitats. The narrow strip of grassland that extends along the embankment to the west of the pasture should be heavily grazed to create suitable habitat for Borrer's Saltmarsh grass. A larger scale project could involve breaching the current embankment and/or re-flooding some of the land behind the embankment to re-create saltmarsh and brackish conditions (Managed retreat). All of the former intertidal area does not need to be re-flooded. Some farmland could be protected by a series of secondary embankments.
Ringville	Kk	Divided Sedge was also recorded at this site in the past but was not recorded during the SMP survey. Further monitoring is required to assess the current status of this species.
Little Island	Wa	The sewage discharge from new development at the south-east end of the site into the saltmarsh should be investigated.
Ballymacoda	Co	NPWS should put a management programme in place to protect the new saltmarsh with Borrer's Saltmarsh-grass that is developing behind the breached embankment in the north-west part of the site. NPWS could also look at purchasing this site and leasing it back to farmers for grazing. Grazing levels should be moderate-heavy to help maintain an open and disturbed sward, which is preferred by Borrer's Saltmarsh Grass. The current owner plans to eventually fix the breaches in the berms and this would destroy the saltmarsh at this site by excluding the tidal influence. This area is within the cSAC.
Carrigtohil	Co	A significantly large area of saltmarsh was destroyed at this site by infilling that may be unlicensed. This area was located within the cSAC. This should be investigated to make sure no other patches of saltmarsh are destroyed in the future by infilling.

Site	County	Recommendation
Dough	Co	This saltmarsh at this site was badly damaged by heavy overgrazing. The high level of damage within the MSM is unusual and points to especially high grazing levels during 2008. It can be difficult to adapt a suitable grazing level that is beneficial for both the coastal saltmarsh habitats and the adjacent species rich sand dune habitats and coastal grassland. However, reducing the stocking rate significantly should be considered. This site is within a cSAC.
Rossbehy	Ke	This saltmarsh at this site was badly damaged by heavy overgrazing with some of the worst damage recorded during the 2007-2008 survey. Reducing the stocking rate significantly should be considered. The damaged areas were within a cSAC. The local authority should consider restricting vehicle access to the sand dune complex to reduced damage to the saltmarsh and the saltmarsh/sand dune interface. This is potential at this site for a managed retreat project in formerly reclaimed land to increase the extent of saltmarsh habitat at this site. Some formerly reclaimed land has redeveloped into saltmarsh already due to breaches in the surrounding embankments but there is scope for further development of saltmarsh habitat if other embankments are breached.
Cromane	Ke	There is a significant amount of waste material distributed around this site that should be cleaned up. This is potential at this site for a managed retreat project in formerly reclaimed land to increase the extent of saltmarsh habitat at this site. Breaches in embankments where the spit connects to the mainland have allowed saltmarsh to redevelop in a large area of formerly reclaimed land. However the breaches in the embankment are likely to be mended at some time in the future to reclaim this area again. NPWS could consider purchasing this area and managing it for nature conservation. A large part of this area is within a cSAC.
Fybagh-Whitegate	Ke	This is potential at this site for a managed retreat project in formerly reclaimed land located behind embankments to increase the extent of saltmarsh habitat. A large part of the area behind the embankments is located in a cSAC.
Emlagh East	Ke	Several clumps of Common Cordgrass were noted at this site. These should be eradicated. There is a good chance of preventing further colonisation of this species at this site from Castlemaine Harbour, as it is quite isolated near the mouth of Dingle Bay.
Carrigafoyle	Ke	There is some localised dumping at several locations in this site and infilling of saltmarsh developed in small hollows within shingle ridges. This site is located within a cSAC. NPWS should take measures to restrict this activity.
Barrigone, Aughinish	Li	Recent maintenance work along the embankments at this site has damaged the adjacent saltmarsh. It is recommended that the use of the saltmarsh habitat to supply material for berm maintenance works should limited to prevent further damage. Continued disturbance could encourage colonisation of saltmarsh by Common Cordgrass. Some of the embankments are within a cSAC and some are adjacent to the cSAC.

Site	County	Recommendation
Shepperton, Fergus Estuary	Cl	Recent maintenance work along the embankments at this site has damaged the adjacent saltmarsh. It is recommended that the use of the saltmarsh habitat to supply material for berm maintenance works should be limited to prevent further damage. Continued disturbance could encourage colonisation of saltmarsh by Common Cordgrass. Some of the embankments are within a cSAC and some are adjacent to the cSAC.
Inishdea, Owenshere	Cl	Some reclamation work at this site has the potential to destroy some saltmarsh and adjacent semi-natural grassland that also contains Meadow Barley. NPWS should take action to restrict this activity. Part of this area is within a cSAC and some has been excluded from the cSAC.
Tyrone House – Dunbulcaun Bay	Ga	The construction of a new pier and aquaculture pond has the potential to destroy a portion of saltmarsh at this site. NPWS should take action to restrict this activity. Part of this area is within the cSAC.
Streedagh Point	Si	Part of the saltmarsh at this site was badly damaged by heavy overgrazing with some of the worst damage recorded during the 2007-2008 survey. Reducing the stocking rate significantly should be considered. The damaged areas were within the cSAC.
Dooey	Do	Uncontrolled access to the sand dune spit should be controlled by the local authority to prevent damage from vehicles. This area is within the cSAC.
Creeslough	Do	There is potential at this site for a managed retreat project in formerly reclaimed land to increase the extent of saltmarsh habitat. Breaches in embankments have already allowed saltmarsh to redevelop in a large area of formerly reclaimed land located behind an embankment. NPWS could consider purchasing some of this area and managing it for nature conservation. This site is located within a cSAC.

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Appendices I-VI

Appendix I Attributes and targets of Irish salt marsh habitats

***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 zonation 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 zonation 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 cutting, poaching and overuse. Bare-mud extent < 25%	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.

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.

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

APPENDIX II 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
	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

Appendix III. Field card used during the 2007-2008 SMP survey

Site Name:	Site name from inventory	County:	*name*
Recorder(s):		Survey Date(s):	*date, over several days?*
Annex I habitats present:	list habitats, 1310/1330/1410/1420/*Spartina swards*		
Description of site (details on location, access, landscape, is site part of a larger coastal system like sand dunes etc)			
Vegetation (describe typical communities present, pioneer, low, mid and upper zones, which zone dominates extent? Are there transitional communities between these zones? Reversed vegetation succession? Vegetative structure and sward height, is it uniform? 25% tall/75% short? Cover of bare ground?)			
Topography (note topographic features, micro-relief, creeks and pans, size of pans slope, dominant zone lower/mid/high, any pioneer? Is structure intact?)			
Substrate type? (note substrate? does it vary?)			
Adjacent Habitats (describe transitional terrestrial habitats with Fossit codes? Are there natural transitions to adjacent habitats or are there modified boundaries along upper SM? Describe intertidal habitats seaward of SM. .			
Impacts and Activities (Grazing, poaching? land use, tracks, amenity, dumping, etc land use around site?, intensity?, within current monitoring period? Any signs of older impacts such as land reclamation and drainage channels)			
Spartina (% cover of *Spartina* in other Annex I habitats, extent of *Spartina* swards?, is it fragmented? Natural dieback? any signs of it spreading? > 10% in 10 years?)			
erosion (describe physical erosional features on site, mud mounds, cliff toppling terraced marsh margins?. What is seaward saltmarsh boundary like?, Any indication of measurable erosion within the current monitoring period?, signs of a longer-tern erosional trend?, any indication of accretion? Presence or absence of artificial restraints like sea walls and embankments, any sign of coastal squeeze?, potential for saltmarsh habitats to migrate landwards?)			
Other details (Conservation measures, other features)			
Features of Local distinctiveness (any records from field survey?)			
Pass or Fail habitats (why, extent-subject to natural change? Structure and function – overgrazing? Future prospects –*Spartina*??)			

Appendix IV Description of various habitat codes used during mapping and fieldwork from the SMP project.

SM Habitat code	SM habitat	Description
1	1310 *Salicornia* flats (1310)	Typical communities of *Salicornia* flats.
2	*Spartina* swards	Swards with > 75% cover, dense (not defined as 1320)
3	Atlantic salt meadow (ASM) (1330)	Typical communities of ASM. May have some *Spartina* cover
4	Mediterranean salt meadow (MSM) (1410)	Typical communities of MSM. May have some *Spartina* cover
5	ASM/MSM mosaic (50/50)	Vegetation where cover of Sea Rush is sparse and patchy. Used in areas where it was impractical to map each small patch of Sea Rush clumps as MSM. 50% of total polygons attributed to both ASM and MSM.
6	ASM/*Spartina* sward mosaic	Habitat mosaic with 20-40% *Spartina* cover. Used for areas where it was impractical to map all the patches defined as *Spartina* swards. 50% of total polygons attributed to ASM and *Spartina* sward
7	1330/other SM (CM2) mosaic	Habitat mosaic with ASM containing other SM vegetation. Other SM describes vegetation dominated by Twitch, Common Reed, Sea Club-rush, Grey Club-rush. 50% of total polygons attributed to ASM.
8	1330/coastal grassland mosaic	Habitat mosaic with ASM containing low mounds with other vegetation types. Coastal grassland (GS1) on mounds with fixed dune elements generally *Festuca* dominated. Found at transition zone between ASM and sand dunes or sandy terrestrial grassland. Also found at sites with variable coastal topography such as Galway Bay with frequent mounds and hollows. 50% of total polygons attributed to ASM.
9	Other (non saltmarsh)	Other polygons mapped during the survey. Includes Built Land (BL2) but may refer to other habitats and features such as paths, tracks, roads, football pitches, airports, submarines
10	*Spartina* clump/mudflat mosaic (50/50)	Mosaics of *Spartina* clumps and mudflats where sward is unconsolidated. 50% of total polygons attributed to *Spartina* swards.
11	Isolated *Spartina* clumps on mud (5%)	Scattered clumps of *Spartina* on mudflats or sandflats. 5% of total polygons attributed to ASM.
12	pioneer 1330/1310/*Spartina* mosaic	Pioneer mosaic saltmarsh habitat with elements or patches of 1310, ASM and *Spartina* clumps. 33% of total polygons attributed to 1310, ASM and *Spartina* sward
13	1410/other SM (CM2) mosaic	Habitat mosaic of Sea Rush clumps with other SM vegetation. Other SM describes vegetation dominated by Twitch, Common Reed, Sea Club-rush, Grey Club-rush. 50% of total polygons attributed to MSM.
14	*Spartina* sward dominated, with some ASM	Category of *Spartina* sward with element of ASM vegetation present. Used at some sites to differentiate from *Spartina* swards on mudflats. 25-50% ASM in sward. Not always mapped at larger sites. 100% attributed to *Spartina* sward
15	1310/*Spartina* mosaic	*Salicornia* flats containing frequent *Spartina* clumps (20-40% cover). 50% of total polygons attributed to both 1310 and *Spartina* swards.
16	ASM dominated with some *Spartina*	Category of ASM with element of *Spartina* sward. ASM with < 20% *Spartina* cover, not always mapped at larger sites. 100% of polygons attributed to ASM.
17	1330/sand dune mosaic	ASM with small hummocks of fixed dune or semi-fixed dune. Found in transitional areas. 50% of polygons attributed to ASM.
18	Other SM (CM2)	Other SM describes vegetation dominated by Twitch, Common Reed, Sea Club-rush, Grey Club-rush found on saltmarsh. Tends to indicate transition to brackish or terrestrial conditions. Twitch may be found along terrestrial transition marking splash zone so not always considered within ASM.
19	1330/rocky shore mosaic	ASM found on eroding mud with patches of rocky substrate exposed within the habitat. Generally found as a narrow strip on more exposed shore. 50% of polygons attributed to ASM.
20	1420 Mediterranean scrub	*Sarconemia perennis* present in vegetation
21	1310/ASM mosaic (50/50)	Pioneer ASM with transitions to dense *Salicornia* flats. 50% of polygons attributed to both 1310 and ASM.
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Appendix V Site Summaries

This section summarizes the main features of each site. For further details please consult the individual site reports.

Louth	Dundalk	This site contains several of the largest SMs in ROI and a very substantial area of *Salicornia* flats (1310). It extends southwards from Dundalk Bay to Annagassan. Much of the SM has only developed in the past 100 years with significant accretion and the spread of *Spartina* swards. The SM is in generally good condition and one of the sub-sites is grazed.
	Baltray	This site is located along the northern side of the Boyne Estuary. Some of the SM is partly associated with the sand dune system at Baltray. Much of the SM has developed recently on the intertidal mudflats behind the Boyne navigation channel. A range of SM habitats are represented at this site and the intricate mosaic is influenced by the condition of the old sea walls and the degree of tidal inundation. The SM is in generally good condition but it was disturbed in the recent past by *Spartina* control attempts.
Meath	Mornington	This site is found on the south side of the Boyne Estuary. The greatest extent of SM is located behind Durrow Point, on the southern side of the Boyne River Navigation channel, where it extends upstream as far as Stagrennan Polder and inland along a number of small tributary rivers draining into the Boyne. ASM vegetation dominates with some *Spartina* swards and one large isolated patch of *Salicornia* vegetation. The SM is in good condition.
Dublin	Booterstown	This is an unusual marsh, which developed as result of the construction of the Dublin-Kingstown (Dun Laoghaire) railway. Booterstown is primarily a brackish marsh. There is little development of Annex I SM vegetation at present and the vegetation is dominated by Sea Club-rush. The site is notable for the presence of Borrer's Saltmarsh-grass indicating MSM but its status has declined in recent years.
Wicklow	Kilcoole	Kilcoole is a long, extensive wetland complex located behind a railway embankment/shingle ridge. It is classified as a lagoon type site with channels being fed from one main breach in the shingle ridge. The site is significantly influenced by periodic flooding. The vegetation is characterised by admixtures of wet grassland, brackish vegetation (Reeds and Sea Club Rush) and some SM. The site has been disturbed in the past by reclamation. The site is notable for a large population of Reflexed Saltmarsh-grass.
	Buckroney (and Potters Bar)	Buckroney is the only site not included on the SM inventory (Curtis & Sheehy-Skeffington 1998). The main area is associated with the topographical depression behind the tall dune ridge at Buckroney nature reserve. MSM was listed as a qualifying interest for the SAC at this site due to the presence of Sharp Rush-dominated vegetation. However, this survey classified the majority of this vegetation as a dune slack type community due to the presence of dune slack indicators. The tidal flooding regime of this area has changed in the recent past.
Wexford	Castlebridge	This SM occurs in the upper parts of Wexford Harbour. Dominated by MSM vegetation or admixtures therein, this SM vegetation sits perched atop ground that is bisected by a number of channels which extend inland a considerable distance. The site is notable for the limited presence of Borrer's Saltmarsh-grass, which is found along cattle tracks on the marsh. Another notable feature is the transition from SM to brackish marsh communities, which is quite extensive and diverse. The marsh is in generally good condition.

Wexford	Ferrycarrig	This site is found to the east of the N11 Ferrycarrig road-bridge over the River Slaney. Most of the marsh at this site is dominated by freshwater and brackish communities and the extent of MSM is very limited.
	Rosslare	Situated in the south-eastern part of Wexford Harbour, this SM is located to the leeward side of Rosslare Burrow. Most of the SM developed in an area that was formerly reclaimed. The majority of the SM is confined to a fringe around the shoreline, while the greatest development occurs behind a large area dominated by *Spartina* sward. The site is notable for Borrer's Saltmarsh-grass, which occurs just beyond the upper parts of the SM in cattle tracks. Part of the site is affected by sewage discharges.
	Bannow Island	This SM has developed in the relative shelter behind Bannow Island in Bannow Bay. The majority of the SM occurs on the low-lying intertidal zone, although a smaller patch is found alongside the sand dune system on Bannow Island itself. The site supports a range of SM habitats and *Spartina* swards dominate. Relatively new SM has developed in association with the *Spartina* sward. The site is notable owing to the presence of Perennial Glasswort, which is found associated with the transition zone between *Spartina* sward and ASM. The SM is in good condition.
	Clonmines	Clonmines is located at the upper limits of the tidal influence on Bannow Bay, west of Wellingtonbridge. SM vegetation is recorded on either side of the estuarine channel, although it is quite fragmented. It is best developed on the western side, where it is dominated by ASM with some MSM and transitional vegetation also noted. SM is in generally good condition with some grazing damage.
	Taulaght	The majority of the SM has developed behind a shingle bar, nestled in a small inlet in Bannow Bay. All of the Annex I SM habitats are found at this site including Halophilous Scrubs. There is some damage from dumping along tracks that threatens some of the Perennial Glasswort.
	Saltmills	This is a relatively small SM which has developed behind a shingle ridge. The land still retains the features of its past management and modification history. It supports both ASM and MSM habitats. Erosion is threatening this site and the shingle ridge around it has retreated significantly over the SM in the past 100 years.
	Gorteens	Gorteens is found in the south-western corner of Bannow Bay in a narrow estuarine inlet that extends inland towards Pollfur Bridge, north of the village of Fethard. SM vegetation is poorly developed along both sides of the inlet and is dominated by *Spartin*a sward which fronts much of the SM. The site is of interest however, owing to the presence of Perennial Glasswort where it is found on shingle-dominated substrates. Further upstream however, it was also found on muddier substrates at the transition between the *Spartina* sward and the ASM or MSM habitats. The SM is in good condition.
	Grange	The established SM, as well as the sand dune system at this site has all but been devastated in the past few years due to natural erosion and the natural redistribution of sediment from the mouth of Bannow Bay. Previously, Grange was one of a small number of sites in which Perennial Glasswort was recorded. There has been some recent re-development of embryonic dunes and brackish vegetation around a newly formed pool, but the site is in flux.

Wexford	Fethard	The SM at Fethard is situated behind a sandy spit. Most of it has developed over the past 100 years. The marsh is dominated by *Spartina* swards that have nearly infilled former intertidal mudflats. The older marsh is now dominated by ASM vegetation. Small patches of Halophilous Scrub are also present. The SM is in good condition but there is some impact from sewage discharges into the bay.
	Dunbrody Abbey	This SM is located along a tributary (Campile River) of the River Barrow. The SM is rarely extensive and its development has largely been constrained through the presence of the embankments along either side of the river. Some SM vegetation, however, does occur on the landward side of the embankments, particularly where there tidal influence from drainage channels. The site is noteworthy as it supports Saltmarsh-grass and Meadow Barley. It is also 1 of 3 sites in Ireland where Divided Sedge was recorded in the past, but this species was not recorded during this survey. The site behind the embankment has been affected by drainage and land improvement in the past.
	Killowen	This is a small isolated SM is located in the upper reaches of the River Barrow Estuary. The marsh contains ASM vegetation and brackish marsh dominated by Reeds. The SM is in generally good condition and there is significant estuarine influence on this site.
Kilkenny	Rochestown	This site is also located in the upper part of the River Barrow Estuary, opposite to Kilowen. The dominant SM habitat is ASM, although there are significant stands of Sea Club Rush particularly towards the northern half of the site and bands of Twitch-dominated vegetation, indicating a significant estuarine influence. Meadow Barley is one feature of interest at this site. The SM is in good condition.
	Ringville	This site is also found in the River Barrow Estuary. There is some development of *Spartina* swards and brackish influence in the form of Reeds and Sea Club Rush. The site is noteworthy owing to the previous records of a number of rare plant species at Ballinlaw Ferry. These species including Divided Sedge were not recorded during this survey. The SM is in good condition.
Waterford	Little Island	This site is confined to the mainland, on the southern half of Little Island in the Lower Suir River. It is relatively narrow and in places is constrained by an embankment. It is sub-divided into three sub-sites, although they are not extensive. ASM is the dominant SM habitat, although it is often overwhelmed by brackish vegetation with large stands of Reeds. The site has been damaged in the past from development and pipe-laying and Meadow Barley, which was previously recorded at two of the sub-sites, was not recorded during the 2007 survey. Part of the site is also affected by sewage discharges.
	Dungarvan Bay	The main part of the SM is found along the inner part of Cunnigar Point and extends along the southern side of Dungarvan Bay. The site is characterised by both ASM and MSM in near equal portions with some *Salicornia* flats and *Spartina* sward vegetation. Sharp Rush (*Juncus acutus*) was recorded at this site, both on the SM (rarer MSM sub-type) and damp dune hollows. The SM is in generally good condition with some pressure on parts from over-grazing and aquaculture development.

Waterford	Kinsalebeg	This low-lying SM is nestled in two narrow inlets connected to the main Blackwater River Estuary. Kinsalebeg is a relatively small marsh that is dominated by ASM and some MSM. Common Cordgrass is present but does not form any *Spartina* sward. The SM is considerably damaged by over-grazing in places.
Cork	Ballymacoda	This is a relatively large site and SM has developed in several locations throughout this winding estuarine site. There is a great deal of habitat variation both pure and mosaic, although ASM overwhelmingly predominates. Some of the saltmarsh is expanding and accreting in association with the colonisation of *Spartina* sward. There is also some succession from *Spartina* sward to ASM. The embankment around the estuary has been breached at one location and land that had previously been reclaimed is now been recolonised by SM vegetation. This area supports a large population of Borrer's Saltmarsh-grass, which was not previously known from this site. This is a very notable population of this rare species. The site is generally in good condition with some minor damage.
	Jamesbrook Hall	Jamesbrook Hall is a small SM which has developed in the narrow Poulnabibe Inlet on the eastern side of Cork Harbour, near Midleton. The majority of the SM occurs as 3 separate patches along the southern side of the Inlet with only a minor fringe along the northern shores. These areas are located behind old embankments, where attempts were made in the past to reclaim them. The vegetation is dominated by ASM with some other SM habitats including *Spartina* swards, which is not extensive.
	Bawnard	This is a small patchy SM along the north-eastern part of Cork Harbour. The vegetation mostly comprises ASM and some patches of *Spartina* sward, as well as some transitional or brackish vegetation along the upper parts of the marsh. It has been damaged in the past from infilling. The site does not have any notable features. There is some damage from over-grazing.
	Carrigatohil	Carrigatohil is a small fragmented SM located in Cork Harbour along the northern side of Foaty Island, adjacent to a golf course. A number of small disparate patches of SM occur along the mudflats which extend up tot the seawall surrounding the Island. The site has been damaged from infilling. Common Cordgrass is present but not extensive.
	Rock Castle, Bandon Estuary	This site, located below the small village of Inishannon, extends for 6.5 km downstream along the estuary. Although the tidal influence extends upstream towards Inishannon, the brackish gradient along the upper stretches of the site results in little development of typical Annex I SM vegetation. The SM is divided into a number of individual sub-sites, most of which are located on bends along either side of the river channel, where extensive deposition of mud has accrued. Overall, equal amounts of ASM and MSM were recorded. The saltmarsh is generally in good condition. Common Cordgrass is not present.
	Harbourview	Harbourview is a large and varied SM system in Courtmacsherry Estuary. A large part of the SM is associated with Garranateen Strand, but it extends upstream as far as Glanduff. A full range of SM habitats are present and there has been significant growth of the SM in the past 100 years due to accretion and colonisation of *Spartina* sward. The site is notable owing to the presence of a large stand of Sharp Rush, which is largely found in transitional vegetation at the upper parts of the MSM, and the intact transitions between dune and SM vegetation.

Cork	Seafort	This site is located at the head of the small Croagh River Bay. SM is not extensive with both ASM and MSM vegetation present. The site is notable for the presence of the rarer subtype of MSM containing Sharp Rush. The SM is generally in good condition.
	Ballybrack	This small SM is located at the head of a narrow inlet connected to Roaringwater Bay. It is dominated by ASM, with some MSM. The site has been damaged in the recent past by infilling and reclamation along the northern side of the inlet. The remaining SM is in good condition.
	Ballyrisode House	This small and fragmentary SM is characterised by fragmentary patches of MSM scattered among the rocky and boggy landscape. Additional SM was noted in the artificial Toormore lagoon, as well as some fringing vegetation around the intertidal zone. There are few notable features and the SM is in good condition.
	Barley Cove	This SM is located in a narrow inlet known as White Strand. Most of the SM is characterised by ASM, which is found in a small depression behind a shingle sand ridge and is in good condition. There has been some infilling in the past.
	Dough	This SM has developed in association with the extensive sand dune system at Barley Cove. The lower parts of the SM are characterised by ASM, but this gives way to other Annex I habitats including MSM and *Salicornia* flats as the intertidal area opens out before Lissagriffen Lake (lagoon). The intertidal area is bisected by a road-bridge which creates an artificial lagoon to the east of the bridge. SM is much reduced here and is replaced by brackish vegetation dominated by Reeds and minor Sea Club Rush. The site contains a diverse range of SM and brackish communities but has been damaged by severe over-grazing at the time of the survey. The site is notable for the presence of the rare Annex I *Salicornia* subtype community – Sagino maritimae-Cochlearietum danicae, which is confined to a narrow transitional band between the SM and sand dune communities
Kerry	Dereen House	SM is found fringing the head of the Croanshagh River, located on the northern side of the Beara Peninsula. Surrounded by mountains, this rural setting is largely isolated and displays signs of previous management such as drainage and peat cutting, is not currently heavily impacted. The vegetation is largely characterised by MSM, although it transitions into brackish marsh dominated by Reeds or blanket bog. The SM is generally good condition.
	Dinish	This is a small patchy site along the southern shores of the main Kenmare River channel. Owing to the rocky topography, there is little development of any SM vegetation, other than around a small cove to the west of Dinish Island. Elsewhere, small fragments of fringing SM occur.
	Tahilla	This small patchy site is located in a small, enclosed bay (lagoon) along the northern shores of Kenmare River, approximately 5km south-east of Sneem. The landscape is characterised by rocky ground and as a result there is little development of any appreciable MSM vegetation. The SM is generally good condition.
	West Cove	This patchy SM is located in a small sheltered bay known as Cove Harbour, located 2.5 kilometres east of Caherdaniel. The development and distribution of SM vegetation is influenced by the rocky nature of the terrain which is dominated by upland habitats for the most part. The SM, where it occurs is dominated by MSM with some ASM. The SM is generally good condition.

Kerry	Rossbehy	The SM at this site is located on the landward side of Rossbehy sand spit and extends eastwards towards the point where the Behy River drains out onto Castlemaine Harbour. There is some *Spartina* sward on the adjacent intertidal mudflats. The SM along the sand-spit is badly damaged by over-grazing. There is also extensive SM, mainly MSM, and extensive brackish marsh developing behind an old breached embankment.
	Cromane	This site is located towards the north-eastern half of Cromane sand spit at in Castlemaine Harbour and along the shoreline east of the spit. The SM at the tip of the spit has developed in a sheltered inlet that was formerly reclaimed. Common Cordgrass is present. The majority of the SM is found as perched MSM 'islands' along the mainland shore. This shoreline shows significant signs of erosion. Previously reclaimed land at the neck of the spit has been re-flooded due to a breach in the embankment and SM is re-developing.
	Whitegate, Fybagh	This site includes approximately 5 kilometres of the north-eastern corner of Castlemaine Harbour and the SM is quite fragmented along an extensively embanked shoreline. There are significant signs of erosion along this shoreline. Sea Rush is colonising the intertidal mudflats and creating an unusual vegetation community. Both ASM and MSM occur as well as some limited *Spartina* sward.
	Inch	This large SM is associated with the extensive intact sand dune system at Inch. The SM extends along the northern half of the dune system and also extends in an easterly direction along the coast before petering out into rocky shoreline. *Spartina* swards predominate, with MSM, then ASM and finally *Salicornia* flats all present. In places the ASM and MSM form a complex mosaic which reflects older reclamation attempts. The site is notable for the presence of the rare Annex I *Salicornia* subtype community – Sagino maritimae-Cochlearietum danicae, which is confined to a narrow transitional band between the SM and sand dune communities. There is also extensive development of natural transitional communities between the sand dune and SM vegetation and zonation of habitats at this site is notable. The SM is in good condition.
	Emlagh East	This site is located along the southern side of the Dingle Peninsula in the relative shelter of a small circular bay which drains almost completely at low tide. The entire bay is fringed by SM vegetation, dominated by MSM with some limited ASM. Common Cordgrass is present but rare. The upper limits of the marsh contain wetland and brackish vegetation including bog, Reeds and wet grassland. The most notable feature of this site is the physical SM structure, where large areas of SM have been excavated or cutaway leaving narrow bands of SM on peat, forming enclosures. Some of these man-made features may have served as aquaculture storage pools in the past. These narrow bands of SM are vulnerable to erosion.
	Ballyheige	This small SM is associated with the far larger sand dune system at stretching along Banna Strand towards Ballyheige town. The SM occurs at the head of a modified river channel that leads from Akeragh Lough further inland and sheltered by the dunes. The SM vegetation is predominantly ASM or mosaics thereof with dune and wet/improved grassland, as well as a small number of *Spartina* clumps. SM was previously more extensive before an embankment was constructed to control flooding of Akeragh Lough. The SM has been damaged from drainage works along the river channel.

Kerry	Carrigafoyle	This extensive SM is located in Ballylongford Creek near the mouth of the Shannon Estuary. The site is notable for the extensive *Spartina* sward that has infilled and covered extensive former intertidal mudflats. In addition to *Spartina* swards, both ASM and MSM are patchily distributed throughout the site, while a negligible amount of *Salicornia* flats occurs at the mouth of the creek. The SM is damaged in places from over-grazing and infilling.
Limerick	Barrigone, Aughinish	This site extends inland along the Robertstown River Channel from the Old Aughinish-Foynes Railway bridge. It has been highly modified in the past such that the intertidal area has been split in two by reclaimed land situated behind a defensive berm. The western part of the site is dominated by extensive *Spartina* swards with some fringing ASM. There is greater diversity on the eastern side where the SM is much more heterogeneous with ASM, MSM occurring behind *Spartina* sward. The site is most notable for the rapid and extensive development of the *Spartina* sward on the sheltered deep estuarine muds, which is less than 80 years old. Some of the site is damaged from embankment maintenance works and reclamation. Sea Wormwood was recorded at this site.
	Beagh	Beagh is one of the smallest SMs visited during this survey. It is found on the southern shores of the Shannon in Limerick directly opposite Rineanna Point in Clare. It occurs discontinuously along estuarine muds and atop soils which have developed in hollows in the limestone rocks which extend along much of this coastline. There is some development of SM on the estuarine mudflats in the southern corner of the site alongside a seawall. *Spartina* swards front brackish vegetation with some ASM comprising the upper limits of the marsh.
Clare	Bunratty	This site is located along either side of the Ratty River and extends in each direction along the northern shore of the River Shannon. This site is predominantly characterised by extensive bands of brackish marsh due to the estuarine influence. Another feature of the site is that much of its upper boundary is embanked to prevent flooding of reclaimed low-lying agricultural land. The majority of the SM, which is dominated by ASM, is found along these embankments. Large areas of Sea Club-rush extend seaward of these embankments. The Triangular Club-Rush (*Schoenoplectus triqueter*), although not occurring in the SM was recently located just above the upper limit of the tidal Ratty River (xxxx). *Spartina* swards are present but not extensive. Some of the saltmarsh is damaged by overgrazing.
	Shepperton, Fergus Estuary	This site is located along the north-eastern half of the Fergus Estuary, and extends along the southern side of the Latoon Creek. Much of the upper part of the SM has been modified in the past through the construction of flood relief berm. This large estuarine SM extends some several kilometres, but is rarely more than 250 m wide. It is dominated by ASM, which is often fronted by *Spartina* swards or occasionally brackish vegetation such as Sea Club Rush. This site has also been damaged by embankment maintenance works, which have promoted the spread of *Spartina* sward into the saltmarsh.
	Inishdea, Owenshere	This site is largely associated with Ballycorrick Creek. It is a large and complex site which has in most places seen its development been influenced through human intervention such as the construction of sea walls or land drainage as well as localised intensive grazing. The vegetation is a complicated mosaic, particularly in the central part of the site and all of the main habitats including ASM, MSM and *Spartina* swards occur as well as a small patch of *Salicornia* flats.

Clare	Inishdea, Owenshere	The conservation value of this site is enhanced by the abundance of Meadow Barley (*Hordeum secalinum*) which was found on dry transitional grassland mounds within the SM as well in parts of the upper marsh transition. The saltmarsh has also developed on limestone bedrock and there are notable intact transitions from SM to dry neutral-calcareous species rich grassland. Sea Wormwood was also recorded. There is some localised damage from over-grazing and recent reclamation.
	Killadysart, Inishcorker	This site is located in the south-western corner of the Fergus Estuary. The SM extends inland from the main estuarine channel around Inishcorker Island along the Killadysart Creek. It is dominated by a large area of *Spartina* sward, which has developed on previously established SM. There are remnant patches of ASM and MSM along the seaward side of embankments built to reclaim low-lying adjacent land.
	Knock	This small site is found in a small inlet, which has largely been infilled by *Spartina* sward. There is some SM located in adjacent low-lying land that is found behind an embankment and was largely re-claimed. Some of this SM has been damaged recently from infilling and reclamation.
	Querin	This site is located on the landward side of sand ridge at Corliss Point, which opens out into the River Shannon. The low-lying, muddy inlet is dominated by an extensive *Spartina* sward with some development of a narrow band of ASM between the sward and the sandy ridge. In addition there is a small isolated patch of *Salicornia* flats. Asides from some indication of limited natural succession of the *Spartina* sward to ASM, there are few noteworthy features. There is some localised damaged from overgrazing.
	Rinevilla Bay	This small SM system is located halfway along the southern side of Loop Head. It has developed behind a shingle ridge and is associated with a lagoon. The SM is small and highly fragmented and the vegetation is complicated by previous attempts at draining the low-lying wet ground. The brackish influence still persists and stands of Reeds and Sea Club-rush are common among the SM mosaic. ASM is the predominant SM habitat, though MSM and *Spartina* swards are also present. There is a significant erosional trend at this site as the shingle ridge has retreated significantly (115 m) in the past 100 years.
	Scanlan's Island	This site is located in the south-western part of Galway Bay. SM is found around the sheltered shoreline of Scanlan's Island. It comprises a narrow fringe of ASM-dominated vegetation, with some limited *Salicornia* flats. The substrates on which the SM occurs, varies from mud to shingle to rocky shore depending on the condition of the outcropping limestone pavement. The SM is generally in good condition.
Galway	Kinvarra West	This SM occurs in the shallow Kinvarra Bay on Clare-Galway border. The SM is highly indented and several islands occur on the shallow intertidal zone, particularly towards the southern half of the site. The intricate shoreline is influenced by the topography, which comprises limestone bedrock overlain by mud and in places muddy peat. Characterised almost exclusively by ASM, small clumps of annual *Salicornia* flats also occur. Sea Purslane and Sea Wormwood are two species of local distinctness recorded from the site. The saltmarsh is in generally good condition.

Galway	Kileenaran	Kileenaran is a small SM that has developed in one of the many narrow inlets (Brandy harbour Inlet) on the eastern side of Galway Bay. With only a single patch of MSM vegetation recorded, the SM is dominated by ASM. Its distribution is largely influenced by the exposure of the limestone pavement, which outcrops all around this area. There is some localised damage from sheep grazing.
	Tyrone House – Dunbulcaun Bay	This SM occurs in Galway Bay in Dunbulcaun Bay. The SM is largely contiguous and occurs along two river inlets within the bay, namely the Clarinbridge River and Kilcolgan River Estuaries. The majority of the SM communities are found in the southern half of the site along both sides of the Kilcolgan river inlet. Both ASM and MSM equally represented, which is unusual in Galway Bay. Given the relative extent of the site, there is considerable variation in the shoreline throughout the site which is reflected in both the sea and terrestrial communities and transitions. Some of the SM has been damaged by recent reclamation and construction of a new pier.
	Kilcaimin	Located in Mweeloon Bay in the north-eastern part of Galway Bay, this SM which occurs in a long narrow inlet is confined to a narrow fringe around much of the inlet. ASM accounts for the majority of the SM and is most extensive in the south-eastern corner of the inlet. Other habitats include minor MSM and *Salicornia* flats also present. A road protection scheme has damaged some of the SM, and other sections were eroding and also damaged by overgrazing.
	Oranmore North	This site occurs largely to the north of the Millplot Stream inlet but some SM does occur to the south of the stream. Most of the SM occurs as a narrow ribbon along the shoreline, although at one location, the SM extends inland into low-lying ground under the Galway-Oranmore Road. In several areas, the SM has been damaged or lost through agricultural improvement and infilling for the development of houses.
	Roscam West and South	This SM is located east of Galway City. It is dominated by ASM with a single patch of *Salicornia* flats. The SM vegetation occurs at the northern and southern tips of a small circular bay. It also extends further south along the coast where it eventually gives way to a rocky shoreline. The site has a number of features of interest such as the natural transition to other coastal or dry grassland habitats and the presence of Sea Wormwood. There has been some recent reclamation at this site.
	Seaweed Point	This small SM, situated 2 kilometres west of Salthill occurs in a narrow inlet between the steeply-sided Blakes Hill and the cobble bar at Seaweed Point. Asides from the fact that the marsh supports both ASM and MSM habitats and is not grazed, there are few features of conservation interest.
	Barna House	This SM occurs around a sheltered sandy intertidal bay known as White Strand. It is dominated by ASM but also supports MSM and some *Salicornia* flats. Much of the land has been modified with the erection of boulder armour to reduce the impacts of winter flooding and to reclaim pastoral land. This site has no noteworthy features, other than the limited presence of Sea Purslane. There is some damage from over-grazing.
	Furbo	This small patchy SM is located along a rocky shoreline approximately 4 kilometres west of Barna House. It is poorly developed and occurs as a narrow, discontinuous fringe of ASM-dominated vegetation. There are no particular features of conservation value.

Galway	Teeranea	This site is located in a narrow inlet off Carraveg Bay (Kilkieran Bay) and extends inland just beyond the road-bridge onto Lettermore Island. The SM is dominated by ASM, although patches of MSM often occur in upper parts of the marsh, while minor *Salicornia* flats also occur. The majority of the SM is fragmented around the rocky inlet and is poorly developed. There has been some damage from reclamation and grazing damage.
	Lettermullan West	This SM is located towards the south-western side of Lettermullan Island, in a channel between the island and an adjacent smaller island of Crappagh (Kilkieran Bay). While some of the SM occurs directly on mudflats or over rocky substrates, the majority of the SM occurs on peat, of varying thickness and is mainly MSM. There is some damage from grazing and poaching.
	Lettermore South	The SM at Lettermore South extends westwards 1.5 kilometres from the Carrigalegaun Bridge, on the southern side of Lettermore Island (Kilkieran Bay). The SM is dominated by ASM, and is quite fragmented, often forming mosaics with the exposed rock along the shoreline. The largest area of marsh occurs at the western end of the site around Muragh Island where MSM and *Salicornia* flats also occurs. There is damage from grazing and poaching.
	Bealandangan	This SM has largely developed along drainage channels and the shallow depressions associated with the cut-away bog beneath the RTE television mast in Bealandangan, 5 kilometres north of Carraroe (Kilkieran Bay). The SM is associated with a series of small lagoons (Loch Fhada). The SM is a mosaic of ASM, MSM, patches of blanket bog and brackish areas. The site has been influenced by the network of drainage features, which are typical of peat cutting in the past. The site is noteworthy owing to the range of transitions between the SM and brackish and blanket bog communities. There is some significant damage from over-grazing at this site.
	Kinvarra	This site occurs along a narrow inland inlet which is connected to Kilkieran Bay at its northern end at Camus Bay. Blanket bog dominates the landscape on both sides of the inlet and the much of the development of SM inland reflects earlier peat cutting. The site is dominated in many parts by MSM, and ASM occasionally fronts it or occurs in mosaic. The site is noteworthy for the upper marsh transitions, particularly among the degraded blanket bog habitat. The site is associated with a lagoon. This is some localised damage from overgrazing.
	Turloughbeg	This small fragmented SM is located approximately 10 kilometres north of Carraroe (Kilkieran Bay). This is an exposed site and the development of SM vegetation is very much influenced by its exposure. Both ASM and MSM habitats as well as numerous mosaic communities occur along the rocky shoreline. There are no features of conservation interest at this site.
	Erriseask	This site is located in a small inlet some 8 km southwest of Clifden in the south-eastern corner of Mannin Bay. There is a strong oceanic influence and the SM has developed in conjunction with Blanket bog, sand dune and transitional grassland, most of which is grazed. The low-lying SM vegetation is characterised by MSM habitat with some ASM, much of which has been damaged by grazing. The SM is typical of the exposed western coasts and there are few features of particular conservation interest.

	Cleggan	This site is located at the head of Cleggan Bay, some 9 kilometres north-west of Clifden and is associated with an enclosed brackish lagoon called Lough Anilluin. It is separated from the sea by a cobble bar and a very small area of Annex I SM vegetation has developed along the back of this ridge. Most of the vegetation surrounding the lagoon is brackish.
Mayo	Aasleagh Falls	This SM is situated at the uppermost part of Killary Harbour. This narrow fringe of fragmented SM is dominated by MSM. The SM is generally in good condition.
	North Achill Sound	This small poorly developed site is located on the northern part of Achill Island. A narrow fringe of SM is characterised in large parts by ASM but with some MSM occurs along the seaward side of an extensive blanket bog/cutover bog complex. There are no features of conservation interest and there is some localised grazing damage.
	Salia west	This SM is located on the eastern side of Achill Island, around a small bay. The SM, which is not extensive, is generally poorly developed. Both ASM and MSM are recorded from the site but with little variation present, except towards the upper parts where the marsh often merges with the blanket bog. There is some damage from over-grazing.
	Owenduff, Corraun	This landscape on the Corraun Peninsula is largely characterised by blanket bog. SM has developed in a small sheltered bay. SM is also found around the base of the bog face, although it is often narrow and there is little development of zonation. Both ASM and MSM are present, with MSM being the most dominant SM habitat. Some erosion of the blanket bog is creating a unique SM structure where SM vegetation is developing on old pine stumps.
	Doona	This SM is located in a sheltered inlet in the outer part of Tullaghan Bay. A large part of the SM is associated with the machair at Trawboy, although it narrows considerably and continues as fringe around the rocky headland towards the Owenbeg River. Dominated by ASM, small discrete patches of MSM also occur. There is some localised grazing damage and indications of erosion.
	Aughness	This SM is located in the south eastern corner of Tullaghan Bay. The landscape associated with this low-lying site is characterised by blanket bog. The SM, which is almost dominated by ASM vegetation, occurs as a fringe along both sides of a river inlet. This site is damaged by erosion and localised over-grazing.
	Tullaghan Bay	This site extends inland from Blacksod Bay towards Bangor. Tullaghan Bay SM occurs discontinuously along either side of the Owenmore River at the head of the bay. Much of the surrounding landscape is characterised by degraded blanket bog, although some has been modified for agriculture or planted with plantation forestry. MSM dominates as a narrow fringe that extends inland along streams entering the bay. This is some localised over-grazing in places.

	Doolough	This SM is found in a small sheltered bay that is connected to Blacksod Bay. It fully empties at low-tide to reveal sand flats and SM is found around its margins. The SM is largely dominated by ASM with minor MSM interposed with acid grassland/modified blanket bog communities. The site is notable as the SM has developed on different substrates ranging from sand to mud to peat and rocky shoreline. The majority of the SM vegetation occurs on the northern half of the site on the landward side of the sand spit projecting southwards across the mouth of the bay and is associated with machair. There is some damaged from overgrazing.
Mayo	Bunnahowen	This site is situated in a narrow inlet of Trawmore Bay in the north-eastern corner of Blacksod Bay. The upper limits of this SM are characterised by the blanket bog, much of it having been modified for harvesting or agricultural purposes through drainage. ASM dominates with isolated patches of MSM. This medium-sized SM has few features of conservation interest and there is some damage from overgrazing and burning of adjacent bog.
	Elly Harbour	This site is located on the Belmullet Peninsula and is found in a small bay. The site is divided in two by the main road. The majority of the SM, which comprises both ASM and MSM occurs to east of the road and is fronted by a shingle/sand bar. This area has been modified by peat-cutting in the past. The remaining SM occurs as a discontinuous fringe around Leam Lough, which as a small bay that drains into the sea via a narrow channel. Some accretion was noted in this area. There is some localised damage from over-grazing.
	Saleen Harbour	This site is also located on the Belmullet Peninsula, the low-lying landscape around Saleen Harbour is characterised by improved fields with some dispersed habitation. The SM occurs mostly along the shoreline, although in places it extends inland via drains. Overwhelmingly dominated by ASM, there is little MSM present. There has been some damage from infilling related to coastal protection.
Sligo	Ballysadare Bay	This bay contains a range of several different SMs that can be considered sub-sites. There is considerable diversity in terms of substrate, management and previous modifications such as seawalls throughout. ASM predominates in the outer part of the bay where the underlying limestone glacial drift influences the saltmarsh structure. MSM is predominates on the inner sections. Some SM is developing on quarry spoil. Some of the site is being affected by sewage discharges from Ballysadare, which may be influencing the spread of Reeds. There is other localised damage around the site including overgrazing and infilling. One notable species present in the bay is the Saltmarsh Flat-sedge.
	Strandhill	This small SM system is located at the southern part of Strandhill sand dune/golf course complex. It is highly fragmented and is poorly developed with some ASM and minor *Salicornia* flats. Some accretion was noted at this site.
	Cummeen Strand	This site is located along the southern side of Sligo Harbour. It is dominated by ASM with patchily distributed MSM vegetation, the upper parts of the marsh are bounded by extensive bands of Reeds and other transitional brackish vegetation. Saltmarsh Flat-rush forms a distinctive community in the upper marsh in places. There are signs of an erosional trend at this site and there is also localised damage from over-grazing.

	Drumcliff Bay	This SM is located approximately 5 kilometres north of Sligo Town. The largest area of marsh is perched quite high above the mudflats (up to 2 m) at the head of the bay and extends inland some distance. It is quite complex, and the distribution of the vegetation is partially influenced by the creeks and mad-made drainage features which have modified the site. The vegetation is dominated by MSM and the site is notable for the extent of transitional type vegetation due to its position somewhat higher above MTL. The site has been damaged in the past by drainage.
Sligo	Streedagh Point	This SM is located behind the sand dune complex at Streedagh Point and fringes this sheltered intertidal area. *Salicornia* flats, ASM and MSM are present. There is considerable variation in the vegetation and transitions between or with brackish communities are not uncommon. Although the largest area of ASM occurs separately alongside the sand dune system, much of the SM is contiguous and is associated with the Grange river channel which flows out to sea at Conor's Island. Some of the saltmarsh is actively accreting. There is localised damage from over-grazing. Saltmarsh Flat-rush is present.
Donegal	Mullanasole	This site is located on the eastern side of the Murvagh Peninsula in Donegal Bay. The SM is dominated by ASM, though there are significant areas of MSM, There are some relics of former attempts at reclamation and management. Most of the site is in good condition.
	Laghy	This SM is located further inland in Donegal Bay. It extends across a number of small interconnected inlets. The structure is characterised by a series of old drains created during attempts at reclamation in the past. The vegetation is characterised almost entirely by mid and upper ASM. There is some localised damage from the impacts of grazing.
	Rossmore	This site is also located within Donegal Bay. This SM has recently developed in the past 100 years was modified and much of the frontline is highly indented by a series of linear drains related to former cultivation, when the site was embanked in the past. The head of the bay has also been modified by road conservation in the past. The SM is in generally good condition.
	Glen Bay	This site is located at Glencolmkille. Much of the SM is found in a low-lying plain that is sheltered from the main bay by a ridge. This area contains a complicated mosaic of MSM, brackish habitats, degraded blanket bog and wet grassland and is influenced by the tide along a river channel. It has been modified in the past by peat-cutting, reclamation and drainage. Most of the site is in good condition with some localised damage.
	Maghera	This site is located in the relative shelter of Maghera sand dune system along the southern side of Loughros Beg Bay. The ASM associated with the sand dunes is actively accreting. Much of the SM is characterised by wet vegetation largely dominated by MSM or blanket bog transitions. Much of the site is relatively derelict with little active management or disturbance. The site has been modified in the past by peat cutting. There is some localised damage from grazing and infilling.

	Sheskinmore-Beagh	The SM is associated with two river plains in Loughros More Bay. Much of the front of the system occurs is low-lying, occurring on the sandflats and is dominated by ASM, some of which is actively accreting. Some of the SM is associated with machair. Further inland, the transition from the sandy plains to the perched blanket bog leads to increased MSM development, which is associated with low-lying channels through blanket bog. The mosaic of transitional vegetation reflects the extent of former peat cutting along these river plains. Most of the site is in good condition.
Donegal	Roshin Point	Roshin Point is a narrow isthmus that provides some shelter Gweebarra Bay. The small fringing SM has developed on the sandy intertidal zone on the eastern side of Roshin Point. Both ASM and MSM are present. Some of the ASM is accreting. MSM is found on peat and has been modified in places in the past by peat-cutting. There is some localised overgrazing in places.
	Keadew	This site is located in the north-western part of The Rosses. There has been significant growth and accretion of this SM over sand flats in the past 100 years. The SM is found in two distinct areas both of which are dominated by ASM. The first area of marsh occurs in the shelter of the Keadew sand dune system, with the second located further west towards Keadew Bridge. One feature of note concerning this site is the presence of Saltmarsh Flat-sedge.
	Dooey	This SM is associated with the extensive sand dune system and intertidal sandflats at Dooey and is located in Ballyness Bay. It is dominated by ASM, with some *Salicornia* flats and minor MSM. There is some dynamic and newly accreting SM at the tip of Dooey sand spit. The SM is generally in good condition but there has been some damage from infilling.
	Creeslough	This extensive SM has developed in the extensive sandflats which occur around the head of the Ards Inlet in Sheephaven Bay. The site is notable for the extent of *Salicornia* flats, which are almost greater in extent than the combined areas of both the ASM and MSM. This is one of the largest extents of this annual vegetation mapped during the survey and is also notable for the absence of Common Cordgrass. It is associated with active accretion in this bay, which has also lead to significant growth of ASM in the past 100 years. Some of the saltmarsh is damaged by overgrazing. A breach in an embankment enclosing some low-lying land has allowed SM to develop in formerly reclaimed land.
	Rosapenna	This site is located in the landward side of the Rosguill Peninsula. The majority of this SM is associated with the sand dune system at Rosapenna, although a narrow fringe extends around the coast towards Carrickart and beyond. Dominated by ASM, with discrete patches of MSM, this low-lying SM is in places heavily impacted by grazing. Saltmarsh Flat-rush is found at this site. There are some notable transitions to brackish and wet grassland at this site.
	Tawny	This small SM is found around the margins of a small included bay called the Wee Sea. The SM is a narrow fringe and is badly damaged by overgrazing.

Appendix VI Comparison of conservation status of individual sites and damaging activities

Table 7.1. Comparison of conservation status assessment of *Salicornia* flats (1310) at sites surveyed during 2007-2008 and the main reasons for unfavourable assessments. Favourable (F) – green; Unfavourable-inadequate (UA) - yellow; Unfavourable–bad (UB) – red; OV – Overall conservation assessment of habitat.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
1310	Dundalk	Lo	34.840	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat. (Largest area of habitat recorded in Ireland during 2006-2008)
	Baltray	Lo	2.840	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Mornington	Me	1.327	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Booterstown	Du	0.022	F	All attributes favourable.
	Rosslare	Wx	0.172	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Bannow Island	Wx	0.002	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Clonmines	Wx	0.023	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Taulaght	Wx	0.006	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Saltmills	Wx	0.015	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Gorteens	Wx	0.008	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Grange	Wx	0	UB	Site destroyed due to erosion. No *Salicornia* flats recorded at site
	Fethard	Wx	0.100	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Ringville	Kk	0.028	F	All attributes favourable.
	Dungarvan	Wd	0.541	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Ballymacoda	Co	1.565	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Jamesbrook Hall	Co	0.082	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Carrigatohil	Co	0.038	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Harbour View	Co	1.183	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Barley Cove	Co	0.004	F	All attributes favourable.
	Dough	Co	0.480	UA	SF and FP assessed as UA due to heavy grazing levels
	Rossbehy	Ke	0.002	F	All attributes favourable.
	Inch	Ke	1.241	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Carrigafoyle	Ke	0.003	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Barrigone, Aughinish	Li	0.000	UB	Very small area within ASM created by site disturbance. Unlikely to persist.
	Inishdea, Owenshere	Cl	0.003	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Knock	Cl	0.029	UA	FP assessed as UA due to potential for Common Cordgrass to

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
					spread into the habitat.
1310 continued	Querin	Cl	0.190	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Rinevilla Bay	Cl	0.001	UA	FP assessed as UA due to potential for Common Cordgrass to spread into the habitat.
	Scanlan's Island	Cl	0.113	F	All attributes favourable.
	Kinvarra-West	Ga	0.018	F	All attributes favourable.
	Kileenaran	Ga	0.008	F	All attributes favourable.
	Kilcaimin	Ga	0.015	F	All attributes favourable.
	Roscam West & South	Ga	0.023	F	All attributes favourable.
	Seaweed Point	Ga	0.003	F	All attributes favourable.
	Barna House	Ga	0.067	F	All attributes favourable.
	Teeranea	Ga	0.001	F	All attributes favourable.
	Lettermore South	Ga	0.002	F	All attributes favourable.
	Elly Harbour	Ma	0.024	F	All attributes favourable.
	Ballysadare Bay	Si	0.012	F	All attributes favourable.
	Strandhill	Si	0.001	F	All attributes favourable.
	Cummeen Strand	Si	0.050	F	All attributes favourable.
	Drumcliff Bay	Si	0.037	F	All attributes favourable.
	Streedagh Point	Si	0.001	F	All attributes favourable.
	Mullanasole	Do	0.060	F	All attributes favourable.
	Laghy	Do	0.000	F	All attributes favourable. (Very small patch recorded at site < 0.001 ha)
	Sheskinmore-Beagh	Do	0.000	F	All attributes favourable. (Very small patch recorded at site < 0.001 ha)
	Dooey	Do	0.851	F	All attributes favourable.
	Creeslough	Do	21.490	F	All attributes favourable. (Significantly large area recorded at this site)
	Tawny	Do	0.006	F	All attributes favourable.

Table 7.2. Comparison of conservation status assessment of Atlantic salt meadows (1330) at sites surveyed during 2007-2008 (100 sites) and the main reasons for unfavourable assessments. Favourable (F) – green; Unfavourable-inadequate (UA) - yellow; Unfavourable–bad (UB) – red; OV – Overall conservation assessment of habitat.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
1330	Dundalk	Lo	330.150	F	All attributes favourable.
	Baltray	Lo	14.370	UA	FP assessed as UA due to potential for Common Cordgrass is spread further into the ASM.
	Mornington	Me	11.242	UA	FP assessed as UA due to potential for Common Cordgrass is spread further into the ASM.
	Booterstown	Du	0.062	UB	Ex, SF and FP assessed as UB. ASM known to be more extensive in past. Reduction in habitat due to impacts of flooding and spread of Sea Club-rush.
	Kilcoole	Wi	13.058	UB	SF and FP assessed as UB due to damage from flooding and from over-grazing.
	Buckroney	Wi	0.085	UA	FP assessed as UA due to potential disturbance from development in future.
	Castlebridge	Wx	2.876	F	All attributes favourable.
	Ferrycarrig	Wx	0.026	UB	SF and FP of small area assessed as UB due to damage from use of site by moored boats.
	Rosslare	Wx	7.535	UB	Ex assessed as UA due to some infilling. SF and FP assessed as UB due to damage from overgrazing and from sewage discharges.
	Bannow Island	Wx	1.981	F	All attributes favourable.
	Clonmines	Wx	15.870	UA	SF and FP of small part of ASM assessed as UA due to grazing damage.
	Taulaght	Wx	2.547	UA	FP assessed as UA due to potential for further damage in future from dumping/infilling along track.
	Saltmills	Wx	1.127	UB	FP assessed as UB due to threat of erosion.
	Gorteens	Wx	0.997	F	All attributes favourable.
	Grange	Wx	0.014	UB	Ex, FP and FP assessed as UB due to erosion, which has destroyed the site.
	Fethard	Wx	4.276	UA	SF and FP assessed as UA due to impact of sewage discharges affecting sward structure.
	Dunbrody	Wx	1.713	UB	Ex assessed as UB due to reclamation. SF and FP assessed as UA due to some damage to a small area of ASM from over-grazing.
	Killowen	Wx	2.697	F	All attributes favourable.
	Rochestown	Kk	17.499	F	All attributes favourable.
	Ringville	Kk	6.335	UA	FP assessed as UA due to threat of erosion and further spread of Common Cordgrass.
	Little Island	Wa	3.616	UA	Ex assessed as UA due to some damage by pipe-laying. SF and FP assessed as UA due to impact from sewage discharges on sward structure that may promote spread of Common Reed and Sea Club-rush in future.
	Dungarvan	Wa	8.212	UA	SF and FP assessed as UA due to some grazing damage to a portion of the ASM.
	Kinsalebeg	Wa	3.187	UB	SF and FP assessed as UB due to significant grazing damage to the ASM.
	Ballymacoda	Co	27.058	UA	SF and FP assessed as UA due to grazing damage to a minor area of ASM.
	Jamesbrook Hall	Co	4.140	F	All attributes favourable.
	Bawnard	Co	0.388	UA	SF and FP assessed as UA due to grazing damage to a small area of ASM.
	Carrigatohil	Co	1.245	UB	Ex assessed as UB due to infilling.
	Rock Castle, Bandon Bay	Co	5.357	UA	SF and FP assessed as UA due to grazing damage to a minor area of ASM.
	Harbour View	Co	11.040	UA	SF assessed as UA due to disturbance from ploughing. FP assessed as UA due to potential for Common Cordgrass to spread in ASM in future.
	Seafort	Co	0.470	UA	SF and FP assessed as UA due to grazing damage to a minor area of ASM.
	Ballybrack	Co	0.887	UB	Ex assessed as UB due to infilling and reclamation. SF and FP assessed as UB due to damage and further risk of infilling and damage from over-grazing.
	Ballyrisode House	Co	0.025	F	All attributes favourable.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
	Barley Cove	Co	0.783	F	All attributes favourable.
1330 continued	Dough	Co	5.495	UB	SF and FP assessed as UB due to significant damage to the majority of the ASM from over-grazing.
	Dereen House	Ke	0.748	F	All attributes favourable.
	Dinish	Ke	0.302	F	All attributes favourable.
	Tahilla	Ke	0.073	F	All attributes favourable.
	West Cove	Ke	0.246	F	All attributes favourable.
	Rossbehy	Ke	7.286	UB	SF and FP assessed as UB due to severe damage to the majority of the ASM from over-grazing.
	Cromane	Ke	13.907	UB	Ex assessed as UA due to infilling. SF assessed as UA due to damage from overgrazing and from maintenance of adjacent embankments. FP assessed as UB due to threat of erosion and further damage from embankment works.
	Whitegate, Fybagh	Ke	2.553	UB	SF and FP assessed as UB due to damage to part of the ASM from over-grazing. There is also a threat to FP from erosion.
	Inch	Ke	9.483	UA	FP assessed as UA due to potential for the spread of Common Cordgrass within ASM.
	Emlagh East	Ke	0.979	UA	SF and FP assessed as UB due to damage from and threat of erosion
	Ballyheige	Ke	1.309	UA	Ex assessed as UA due to damage from dumping of dredged sediment on ASM. SF and FP assessed as UA due to damage from vehicle tracks.
	Carrigafoyle	Ke	7.589	UB	Ex assessed as UA due to damage from infilling. SF and FP assessed as UB due to damage from over-grazing.
	Barrigone, Aughinish	Li	10.200	UB	Ex assessed as UA due to damage from embankment maintenance works. SF and FP assessed as UB due to damage from over-grazing and from damage caused by the maintenance works.
	Beagh	Li	0.538	F	All attributes favourable.
	Bunratty	Cl	26.968	UA	SF and FP assessed as UA due to damage from over-grazing.
	Shepperton, Fergus Estuary	Cl	35.935	UA	Ex assessed as UA due to damage from embankment maintenance works. SF and FP assessed as UA due to damage from over-grazing and from damage caused by the maintenance works.
	Inishdea, Owenshere	Cl	19.636	UA	SF and FP assessed as UA due to damage from over-grazing and from potential damage caused by grazing.
	Killadysart, Inishcorker	Cl	2.940	F	All attributes favourable.
	Knock	Cl	0.740	UB	Ex assessed as UB due to infilling and reclamation. SF and FP assessed as UA due to damaged from overgrazing and threat of further infilling.
	Querin	Cl	3.560	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Rinevilla Bay	Cl	11.730	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Scanlan's Island	Cl	4.457	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Kinvarra-West	Ga	13.295	UB	SF and FP assessed as UB due to damage from overgrazing to a portion of ASM.
	Kileenaran	Ga	15.166	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Tyrone House-Dunbeacan Bay	Ga	9.933	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM. Potential damage in future from construction of new pier and aquaculture pool.
	Kilcaimin	Ga	7.818	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Oranmore North	Ga	4.838	UB	Ex assessed as UA due to infilling. SF and FP assessed as UA due to some damage from overgrazing and pipe-laying to a portion of ASM.
	Roscam West & South	Ga	3.302	F	All attributes favourable.
	Seaweed Point	Ga	1.416	F	All attributes favourable.
	Barna House	Ga	2.240	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Furbo	Ga	2.716	F	All attributes favourable.
	Teeranea	Ga	2.024	UA	Ex assessed as UA due to infilling. SF and FP assessed as

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
					UA due to damage from overgrazing to a portion of ASM.
1330 continued	Lettermullan West	Ga	0.533	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Lettermore South	Ga	3.541	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Bealadangan	Ga	3.634	UB	Ex assessed as UB due to some infilling. SF assessed as UA due to damage from overgrazing to portion of ASM.
	Kinvarra	Ga	6.390	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Turloughbeg	Ga	0.624	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Errisask	Ga	1.418	UB	SF and FP assessed as UB due to some damage from overgrazing and poaching damage to most of ASM.
	Cleggan	Ga	0.312	F	All attributes favourable.
	Aasleagh Falls	Ma	0.352	F	All attributes favourable.
	North Achill Sound	Ma	1.272	UB	SF and FP assessed as UB due to significant damage from overgrazing to the ASM.
	Salia West	Ma	0.832	UB	SF and FP assessed as UB due to significant damage from overgrazing and poaching damage to most of ASM.
	Owenduff, Corraun	Ma	0.485	UB	SF and FP assessed as UB due to damage from overgrazing and poaching to a portion of ASM.
	Doona	Ma	8.717	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Aughness	Ma	2.678	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Tullaghan Bay	Ma	16.580	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Doolough	Ma	12.789	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Bunnahowen	Ma	12.455	UB	SF and FP assessed as UB due to some damage from overgrazing to a portion of ASM.
	Elly Harbour	Ma	7.205	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Saleen Harbour	Ma	8.236	UA	Ex assessed as UA due to infilling and coastal protection. SF and FP assessed as UB due to some damage from overgrazing to a small portion of ASM.
	Ballysadare Bay	Si	37.114	UA	SF and FP assessed as UA due to some damage from overgrazing and poaching to a small portion of ASM. Also minor damage from infilling, tracks. Sewage discharges from Ballysadare also having negative impact.
	Strandhill	Si	1.478	F	All attributes favourable.
	Cummeen Strand	Si	10.512	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Drumcliff Bay	Si	7.015	F	All attributes favourable.
	Streedagh Point	Si	13.138	UA	SF and FP assessed as UA due to some damage from overgrazing to a portion of ASM.
	Mullanasole	Do	17.350	F	All attributes favourable.
	Laghy	Do	19.800	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Rossmore	Do	4.620	F	All attributes favourable.
	Maghera	Do	5.850	UA	Ex assessed as UA due to infilling. SF and FP assessed as UA due to damage from overgrazing to portion of ASM.
	Glen Bay	Do	2.332	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Sheskinmore-Beagh	Do	15.900	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Roshin Point	Do	2.180	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Keadew	Do	9.229	F	All attributes favourable.
	Dooey	Do	7.494	UA	Ex assessed as UA due to infilling.
	Creeslough	Do	19.610	UA	SF and FP assessed as UA due to some damage from overgrazing to a small portion of ASM.
	Rosapenna	Do	9.160	UA	SF and FP assessed as UA due to some damage from overgrazing and wheel tracks to a small portion of ASM.
	Tawny	Do	1.686	UB	Ex assessed as UA due to infilling. SF and FP assessed as UB due to significant damage to ASM from overgrazing.

Table 7.3. Comparison of conservation status assessment of Mediterranean salt meadows (1410) at sites surveyed during 2007-2008 and the main reasons for unfavourable assessments. Favourable (F) – green; Unfavourable-inadequate (UA) - yellow; Unfavourable–bad (UB) – red; OV – Overall conservation assessment of habitat.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
1410	Dundalk	Lo	0.040	F	All attributes favourable.
	Booterstown	Du	0.018	UB	All three attributes assessed as UB due to lack of MSM development containing Borrer's Saltmarsh-grass and decline of this species. Habitat changes maybe related to changes in flooding regime and the spread of Sea Club-rush
	Kilcoole	Wi	0.216	UB	SF and FP assessed as UB due to significant grazing damage to the MSM.
	Buckroney	Wi	0.084	F	All attributes favourable.
	Castlebridge	Wx	23.391	UA	SF and FP assessed as UA due under-grazing and the reduction in overall population of Borrer's Saltmarsh-grass
	Ferrycarrig	Wx	0.060	F	All attributes favourable.
	Rosslare	Wx	0.426	F	All attributes favourable.
	Clonmines	Wx	1.922	UA	SF and FP assessed as UA due to localised damage from livestock grazing.
	Taulaght	Wx	0.491	F	All attributes favourable.
	Saltmills	Wx	0.843	UB	FP assessed as UB due to threat of erosion.
	Gorteens	Wx	0.785	F	All attributes favourable.
	Grange	Wx	0.040	UB	Ex, FP and FP assessed as UB due to erosion, which has destroyed the site.
	Dunbrody Abbey	Wx	0.129	UB	All attributes assessed as UB due to absence of species of local distinctiveness and localized damage from poaching.
	Rochestown	Kk	0.040	UB	SF assessed as UB due to localised damage caused by livestock poaching.
	Dungarvan	Wd	7.046	F	All attributes favourable.
	Kinsalebeg	Wd	1.591	F	All attributes favourable.
	Ballymacoda	Co	1.704	UA	FP rated as UA owing to threats of repairs to embankment impacting the MSM subtype containing Borrer's Saltmarsh-grass
	Jamesbrook Hall	Co	0.287	F	All attributes favourable.
	Rock Castle, Bandon Estuary	Co	5.044	F	All attributes favourable.
	Harbour View	Co	3.973	F	All attributes favourable.
	Seafort	Co	1.944	F	All attributes favourable.
	Ballybrack	Co	0.426	F	All attributes favourable.
	Ballyrisode House	Co	1.106	F	All attributes favourable.
	Barley Cove	Co	0.108	F	All attributes favourable.
	Dough	Co	5.509	UB	SF and FP assessed as UB as the condition and diversity of MSM is damaged by over-grazing.
	Dereen House	Ke	9.021	F	All attributes favourable.
	Dinish	Ke	0.344	F	All attributes favourable.
	Tahilla	Ke	2.066	F	All attributes favourable.
	West Cove	Ke	1.952	F	All attributes favourable.
	Rossbehy	Ke	16.096	F	All attributes favourable.
	Cromane	Ke	29.315	UA	FP assessed as UB due to threat of erosion and further damage from embankment works and localised coastal protection works such as dumping of rubble.
	Whitegate, Fybagh	Ke	2.605	UB	SF and FP assessed as UB due to combination of ongoing erosion and localized poaching damage.
	Inch	Ke	29.112	F	All attributes favourable.
	Emlagh East	Ke	10.220	UA	SF and FP assessed as UA as a result of localised grazing damage
	Carrigafoyle	Ke	4.559	UA	SF and FP assessed as UA due to localised damage by livestock.
	Barrigone, Aughinish	Li	2.410	F	All attributes favourable.
	Bunratty	Li	0.865	UA	SF and FP assessed as UA due excessive poaching by livestock in places.
	Inishdea, Owenshere	Cl	11.553	UB	SF and FP assessed as UB due to ongoing damage such as heavy poaching by cattle.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
1410 continued	Killadysart, Inishcorker	Cl	0.709	F	All attributes favourable.
	Knock	Cl	0.144	UA	All attributes rated as UA due to reduction in the MSM from infilling as well as damage from heavy trampling by livestock.
	Querin	Cl	0.008	F	All attributes favourable.
	Rinevilla Bay	Cl	2.450	F	All attributes favourable.
	Kileenaran	Gl	0.271	F	All attributes favourable.
	Tyrone House - Dunbulcaun Bay	Gl	8.409	UA	SF and FP assessed as UA owing to localised damage from livestock.
	Kilcaimin	Gl	0.503	UA	SF and FP assessed as UA owing to localised damage from farm machinery as well as heavy grazing by sheep.
	Seaweed Point	Gl	0.948	F	All attributes favourable.
	Barna House	Gl	0.418	UA	SF and FP assessed as UA due to overgrazing and poaching.
	Furbo	Gl	0.136	F	All attributes favourable.
	Teeranea	Gl	0.653	F	All attributes favourable.
	Lettermullan West	Gl	2.011	UA	SF and FP assessed as UA due to localised damage and overgrazing.
	Lettermore South	Gl	0.463	F	All attributes favourable.
	Bealandangan	Gl	0.285	F	All attributes favourable.
	Kinvarra	Gl	37.878	F	All attributes favourable.
	Turloughbeg	Gl	0.413	UB	SF and FP rated as UB due to the limited development of typical MSM zonation as well as poaching damage by livestock.
	Errisask	Gl	4.517	UA	SF and FP assessed as UA in part due to localised damage to smaller isolated MSM patches.
	Aasleagh Falls	Ma	2.331	F	All attributes favourable.
	North Achill Sound	Ma	0.394	F	All attributes favourable.
	Salia West	Ma	0.588	F	All attributes favourable.
	Owenduff, Corraun	Ma	0.921	F	All attributes favourable.
	Doona	Ma	0.124	F	All attributes favourable.
	Aughness	Ma	0.178	F	All attributes favourable.
	Tullaghan Bay	Ma	29.572	UA	SF and FP rated as UA. Most of the MSM is in good condition, although there is some localised damage from overgrazing.
	Doolough	Ma	0.354	F	All attributes favourable.
	Bunnahowen	Ma	1.374	UA	SF and FP rated as UA due to localised damage from livestock as well as recent burning at one location.
	Elly Harbour	Ma	4.158	UA	SF and FP rated as UA as a result of localised poaching damage to the north of the main drainage channel.
	Saleen Harbour	Ma	0.011	F	All attributes favourable.
	Ballysadare Bay	Si	34.911	UA	SF and FP rated as UA owing to the localised damage to the MSM in places, whereas in other places there has been a reduction of grazing leading to overly rank, species-poor vegetation.
	Cummeen Strand	Si	2.309	F	All attributes favourable.
	Drumcliff Bay	Si	13.739	F	All attributes favourable.
	Streedagh Point	Si	7.717	UA	SF and FP rated as UA due to bad, albeit, localised damage from grazing levels and poaching.
	Mullanasole	Do	11.520	F	All attributes favourable.
	Laghy	Do	1.980	F	All attributes favourable.
	Rossmore	Do	0.930	F	All attributes favourable.
	Maghera	Do	8.980	F	All attributes favourable.
	Glen Bay	Do	12.600	UA	SF and FP assessed as UA due to localized poaching damage by livestock
	Sheskinmore-Beagh	Do	28.970	UA	SF and FP assessed as UA due to localized damage poaching by livestock.
	Roshin Point	Do	4.760	F	All attributes favourable.
	Keadew	Do	0.089	F	All attributes favourable.
	Dooey	Do	0.025	F	All attributes favourable.
	Creeslough	Do	5.760	UA	SF and FP assessed as UA due to localized poaching damage by livestock.
	Rosapenna	Do	3.920	F	All attributes favourable.
	Tawny	Do	0.387	UA	SF and FP assessed as UA due to severe over-grazing by sheep.

Table 7.4. Comparison of conservation status assessment of Halophilous Scrubs (1420) at sites surveyed during 2007-2008 and the main reasons for unfavourable assessments. Favourable (F) – green; Unfavourable-inadequate (UA) - yellow; Unfavourable–bad (UB) – red; OV – Overall conservation assessment of habitat.

	Site Name	County	Area (ha)	Ov	Main reasons for assessment
1420	Bannow Island	Wx	0.166	F	All attributes favourable. Perennial Glasswort found to be more abundant and widespread than previously known. Most frequent in transition area between *Spartina* swards and ASM. No significantly damaging impacts or activities.
	Taulaght	Wx	0.012	UA	SF and FP assessed as UA as some plants vulnerable to destruction from infilling along a track. Perennial Glasswort reconfirmed at this site and several new locations noted. Found in ASM vegetation and on a small shingle spit.
	Gorteens	Wx	0.059	F	All attributes favourable. Recently discovered site. Perennial Glasswort found to be more abundant and widespread than previously known. Associated with transition areas between *Spartina* swards and ASM. Also found in clumps of Sea Rush s and on a shingle bank with Sea Purslane. No significantly damaging impacts or activities.
	Grange	Wx	0	UB	Ex, SF and FP assessed as UB as Perennial Glasswort thought to be extinct. Perennial Glasswort was previously present at this site. Site has significantly changed due to severe erosion and related habitat changes. Very little typical saltmarsh vegetation now present at the site.
	Fethard	Wx	0.121	F	All attributes favourable. Perennial Glasswort reconfirmed at this site. Found to be more abundant and widespread than previously known. Associated with transition areas between *Spartina* swards and Atlantic salt meadow.

Appendix VII Impacts and activities listed for each Annex I habitat at each site.

Table 7.5. Summary of impacts and activities on *Salicornia* flats (1310) at each site at sites surveyed during 2007-2008. INY – Intensity; IMT – Impact; AREA – Area of habitat affected (Ha).

	Site Name	County	Habitat area (Ha) [1]	Impacts and Activities on *Salicornia* flats (1310) (inside the site)																									
				140			143			623			820			871			900			910			954			990		
				Grazing			Overgrazing by Cattle			Motorised Vehicles			Removal of Sediments (Mud…)			Sea Defence/ Coastal Protection			Erosion			Accretion			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Part 1 of 2 (Louth to Clare)	Dundalk	Lo	34.840																C	0	15.0	C	1	34.84	B	-1	34.84			
	Baltray	Lo	2.840																			C	1	2.84	B	-1	2.84			
	Mornington	Me	1.327																			C	1	1.327	C	-1	1.327			
	Booterstown	Du	0.022																											
	Rosslare	Wx	0.172																C	0	0.172				C	-1	0.172			
	Bannow Island	Wx	0.002																						C	0	0.002			
	Clonmines	Wx	0.023																											
	Taulaght	Wx	0.006																						C	-1	0.006			
	Saltmills	Wx	0.015																						C	0	0.015			
	Gorteens	Wx	0.008																						C	-1	0.008			
	Fethard	Wx	0.100																						C	-1	0.044			
	Ringville	Kk	0.028	C	0	0.028													C	0	0.028									
	Dungarvan	Wa	0.541	C	0	0.541																			B	-1	0.541			
	Ballymacoda	Co	1.565																			C	1	1.565	B	-1	1.0			
	Jamesbrook Hall	Co	0.082																						C	-1	0.082			
	Carrigatoohil	Co	0.038																						C	0	0.038			
	Harbour View	Co	1.183																			C	1	1.183	C	-1	1.183	C	0	0.05
	Barley Cove	Co	0.004	C	0	0.004																								
	Dough	Co	0.480	B	0	0.480																B	1	0.3						
	Rossbehy	Ke	0.002																											
	Inch	Ke	1.241							C	-1	0.250													B	-1	0.2			
	Carrigafoyle	Ke	0.003																						B	-1	0.003			
	Barrigone, Aughinish	Li	0.000										A	1	0.0001															
	Inishdea, Owenshere	Cl	0.003	B	0	0.003																								
	Knock	Cl	0.029																						C	-1	0.029			
	Querin	Cl	0.190																						C	0	0.19			

	Site Name	County	Habitat area (Ha) [1]	Impacts and Activities on *Salicornia* flats (1310) (inside the site)																									
				140			143			623			820			871			900			910			954			990		
				Grazing			Overgrazing by Cattle			Motorised Vehicles			Removal of Sediments (Mud…)			Sea Defence/ Coastal Protection			Erosion			Accretion			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Part 2of 2 (Clare to Donegal)	Rinevilla Bay	Cl	0.001				B	1	0.001																				
	Scanlan's Island	Cl	0.113	C	0	0.113																							
	Kinvarra-West	Ga	0.018	C	0	0.018										C	1	0.018											
	Kileenaran	Ga	0.008	C	0	0.008																							
	Kilcaimin	Ga	0.015	C	0	0.015										C	-1	0.001											
	Roscam West & South	Ga	0.023	C	0	0.023																							
	Seaweed Point	Ga	0.003																										
	Barna House	Ga	0.067	C	0	0.067																							
	Teeranea	Ga	0.001																										
	Lettermore South	Ga	0.002																										
	Elly Harbour	Ma	0.024																			C	1	0.024					
	Ballysadare Bay	Si	0.012	C	0	0.012																							
	Strandhill	Si	0.001																										
	Cummeen Strand	Si	0.050																										
	Drumcliff Bay	Si	0.037																			C	1	0.037					
	Streedagh Point	Si	0.001																										
	Mullanasole	Do	0.060																			C	1	0.03					
	Laghy	Do	0.000																										
	Sheskinmore-Beagh	Do	0.000																			C	1	0.0001					
	Dooey	Do	0.851							C	-1	0.01							B	0	0.400							B	1	0.4
	Creeslough	Do	21.490																			B	1	2.0					
	Tawny	Do	0.006				B	-1	0.006																				

[1] These sites all supported 1310 *Salicornia* flats, though some were very limited as indicated by the area 0.000 ha.

Table 7.6. Summary of impacts and activities on *Salicornia* flats (1310) at each site surveyed during 2007-2008 (Outside or Adjacent).

Site Name	County	Habitat area (Ha) [1]	Impacts and Activities 1310 (outside)								
			424			701			850		
			Other Discharges			Water Pollution			Modification of Hydrographic Functioning (Dredging)		
			Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Mornington	Me	1.327							C	0	1.327
Rosslare	Wx	0.172	B	-1	0.172						
Fethard	Wx	0.100				C	-1	0.05			

Table 7.7. Summary of impacts and activities on Atlantic salt meadows (1330) at each site surveyed during 2007-2008 (Inside). This table is divided into 4 sections due to its size and each section spreads across 4 pages. INY – Intensity; IMT – Impact; AREA – Area of habitat affected (Ha).

				Table 7.7 Impacts and Activities on ASM (Section 1 of 4, Impacts 102-230)																								
				102			103			120			140			142			143			210			220			230		
	Site Name	County	Habitat area (ha)	Mowing / Cutting			Agricultural Improvement			Fertilisation			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Professional Fishing			Leisure Fishing			Hunting		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 1, Part 1 od 4 (Louth to Cork)	Dundalk	Lo	330.150										C	0	110.0													C	0	150.0
	Baltray	Lo	14.370																											
	Mornington	Me	11.242																											
	Booterstown	Du	0.062																											
	Kilcoole	Wi	13.058																A	-1	12.5									
	Buckroney	Wi	0.085																											
	Castlebridge	Wx	2.876										C	0	2.876													C	-1	2.876
	Ferrycarrig	Wx	0.026																						C	-1	0.026			
	Rosslare	Wx	7.535																B	-1	2.5	C	-1	0.01						
	Bannow Island	Wx	1.981																											
	Clonmines	Wx	15.870										C	0	11.5				B	-1	0.5									
	Taulaght	Wx	2.547										C	0	0.3															
	Saltmills	Wx	1.127										C	0	1.127															
	Gorteens	Wx	0.997																											
	Grange	Wx	0.014																											
	Fethard	Wx	4.276																											
	Dunbrody Abbey	Wx	1.713				B	-1	0.26										B	-1	0.26									
	Killowen	Wx	2.697										C	0	2.697															
	Rochestown	Kk	17.499										C	0	17.0				B	-1	0.499									
	Ringville	Kk	6.335																									C	0	6.335
	Little Island	Wd	3.616																											
	Dungarvan	Wd	8.212										B	0	7.212				B	-1	1.0									
	Kinsalebeg	Wd	3.187										B	0	1.0	B	-1	1.5	B	-1	0.6									
	Ballymacoda	Co	27.058	C	-1	0.01							C	0	2.5				B	-1	1.3									
	Jamesbrook Hall	Co	4.140																											
	Bawnard	Co	0.388																											
	Carrigatoohil	Co	1.245																											
	Rock Castle, Bandon Estuary	Co	5.357										C	0	0.45				C	-1	0.001									

	Site Name	County	Habitat area (ha)	Table 7.7 Impacts and Activities on ASM (Section 1 of 4, Impacts 102-230)																										
				102			103			120			140			142			143			210			220			230		
				Mowing / Cutting			Agricultural Improvement			Fertilisation			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Professional Fishing			Leisure Fishing			Hunting		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 1, Part 2 of 4 (Cork to Galway)	Harbour View	Co	11.040																										
	Seafort	Co	0.470										C	0	0.449				B	-1	0.021								
	Ballybrack	Co	0.887							C	-1	0.005	C	0	0.837				C	-1	0.05								
	Ballyrisode House	Co	0.025																										
	Barley Cove	Co	0.783										C	0	0.783														
	Dough	Co	5.495																B	-1	5.495								
	Dereen House	Ke	0.748										C	0	0.3														
	Dinish	Ke	0.302										C	0	0.05														
	Tahilla	Ke	0.073										C	0	0.073														
	West Cove	Ke	0.246										C	0	0.05														
	Rossbehy	Ke	7.286													A	-1	4.0											
	Cromane	Ke	13.907										C	0	10.0				B	-1	2.0								
	Whitegate, Fybagh	Ke	2.553										C	0	1.5				C	-1	0.25								
	Inch	Ke	9.483										C	0	9.483														
	Emlagh East	Ke	0.979										C	0	0.05														
	Ballyheige	Ke	1.309										C	0	0.8														
	Carrigafoyle	Ke	7.589										C	0	3.0				B	-1	2.5								
	Barrigone, Aughinish	Li	10.200										C	0	6.0				B	-1	3.5								
	Beagh	Li	0.538										C	-1	0.217														
	Bunratty	Cl	26.968										C	0	14.0				B	-1	11.6								
	Shepperton, Fergus Estuary	Cl	35.935										B	0	30.0				B	-1	3.5								
	Inishdea, Owenshere	Cl	19.636										B	0	8.5				B	-1	8.5								
	Killadysart, Inishcorker	Cl	2.940										C	0	0.5				C	-1	0.2								
	Knock	Cl	0.740																B	-1	0.5								
	Querin	Cl	3.560										C	0	3.06				B	-1	0.5								
	Rinevilla Bay	Cl	11.730										C	0	4.0				C	-1	1.0								
	Scanlan's Island	Cl	4.457										B	0	4.382				B	-1	0.075								
	Kinvarra-West	Ga	13.295										B	0	9.295				B	-1	4.0								
	Kileenaran	Ga	15.166										B	0	10.166	B	-1	5.0											
	Tyrone House- Dunbulcaun Bay	Ga	9.933										C	-1	5.933				B	-1	4.0								

	Site Name	County	Habitat area (ha)	Table 7.7 Impacts and Activities on ASM (Section 1 of 4, Impacts 102-230)																									
				102			103			120			140			142			143			210			220			230		
				Mowing / Cutting			Agricultural Improvement			Fertilisation			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Professional Fishing			Leisure Fishing			Hunting		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 1, Part 3 of 4 (Galway to Donegal)	Kilcaimin	Ga	7.818										C	0	6.818	B	-1	1.0												
	Oranmore North	Ga	4.838										C	0	3.838				B	-1	1.0									
	Roscam West & South	Ga	3.302				B	-1	0.1				B	0	3.301				C	-1	0.001									
	Seaweed Point	Ga	1.416																											
	Barna House	Ga	2.240										B	0	1.477				B	-1	0.763									
	Furbo	Ga	2.716										C	0	2.716															
	Teeranea	Ga	2.024										C	0	1.5				B	-1	0.5									
	Lettermullan West	Ga	0.533																A	-1	0.533									
	Lettermore South	Ga	3.541										C	0	0.5				B	-1	1.5									
	Bealandangan	Ga	3.634										B	0	1.0				B	-1	2.6									
	Kinvarra	Ga	6.390										B	0	5.8	B	-1	0.5												
	Turloughbeg	Ga	0.624										B	0	0.2	B	-1	0.424												
	Errisask	Ga	1.418																A	-1	1.418									
	Cleggan	Ga	0.312										B	0	0.132															
	Aasleagh Falls	Ma	0.352										B	0	0.35	B	-1	0.002												
	North Achill Sound	Ma	1.272													B	-1	1.272												
	Salia West	Ma	0.832										B	0	0.332	A	-1	0.5										C	0	0.832
	Owenduff, Corraun	Ma	0.485													A	-1	0.485												
	Doona	Ma	8.717										B	0	6.7				A	-1	2.0									
	Aughness	Ma	2.678										B	0	2.178	B	-1	0.5												
	Tullaghan Bay	Ma	16.580										B	0	11.08	B	-1	5.0	B	-1	0.5									
	Doolough	Ma	12.789										B	0	2.0				A	-1	5.0									
	Bunnahowen	Ma	12.455										B	0	3.0	B	-1	6.0												
	Elly Harbour	Ma	7.205										B	0	3.0				C	-1	0.1									
	Saleen Harbour	Ma	8.236										C	0	5.874	B	-1	2.362												
	Ballysadare Bay	Si	37.114										C	0	25.0	B	-1	2.5	B	-1	5.0									
	Strandhill	Si	1.478																											
	Cummeen Strand	Si	10.512										C	0	2.0				B	-1	3.0									
	Drumcliff Bay	Si	7.015										C	0	5.0															
	Streedagh Point	Si	13.138										C	0	2.0				A	-1	0.4									
	Mullanasole	Do	17.350							C	-1	0.01	C	0	0.9															

	Site Name	County	Habitat area (ha)	Table 7.7 Impacts and Activities on ASM (Section 1 of 4, Impacts 102-230)																									
				102			103			120			140			142			143			210			220			230		
				Mowing / Cutting			Agricultural Improvement			Fertilisation			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Professional Fishing			Leisure Fishing			Hunting		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section1, Part 4 of 4 Donegal)	Laghy	Do	19.800										C	-1	5.8				B	-1	14.0									
	Rossmore	Do	4.620										C	0	0.5															
	Maghera	Do	5.850										C	0	0.85				B	-1	5.0									
	Glen Bay	Do	2.332										C	0	0.832				B	-1	1.5									
	Sheskinmore-Beagh	Do	15.900										C	0	12.0				B	-1	1.2									
	Roshin Point	Do	2.180										C	0	1.0				B	-1	0.3									
	Keadew	Do	9.229										C	0	2.0															
	Dooey	Do	7.494										C	0	7.0				B	-1	0.49									
	Creeslough	Do	19.610										C	0	12.0				B	-1	4.0									
	Rosapenna	Do	9.160										B	0	8.66				B	-1	0.5									
	Tawny	Do	1.686																A	-1	1.4									

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 2 of 4, Impacts 302-607)																									
				302			421			422			423			501			502			511			512			607		
				Removal of Beach materials			Disposal of Household Waste			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Routes, Autoroutes			Electricity Lines			Pipe Lines			Sports Pitch		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section2, Part 1 od 4 (Louth to Cork)	Dundalk	Lo	330.150													C	0	1.0											
	Baltray	Lo	14.370				C	-1	0.5							C	-1	0.5											
	Mornington	Me	11.242				C	0	0.01							C	0	0.03											
	Booterstown	Du	0.062																										
	Kilcoole	Wi	13.058													C	0	0.5											
	Buckroney	Wi	0.085																										
	Castlebridge	Wx	2.876													B	-1	0.25											
	Ferrycarrig	Wx	0.026																										
	Rosslare	Wx	7.535													C	-1	0.85											
	Bannow Island	Wx	1.981													C	-1	0.005											
	Clonmines	Wx	15.870																										
	Taulaght	Wx	2.547							A	-2	0.001				C	-2	0.005											
	Saltmills	Wx	1.127																										
	Gorteens	Wx	0.997													C	-1	0.01											
	Grange	Wx	0.014																										
	Fethard	Wx	4.276													C	0	0.005											
	Dunbrody Abbey	Wx	1.713																										
	Killowen	Wx	2.697																										
	Rochestown	Kk	17.499													C	-1	0.05											
	Ringville	Kk	6.335																										
	Little Island	Wd	3.616																						A	-2	0.05		
	Dungarvan	Wd	8.212							C	-1	0.001				C	-1	0.5											
	Kinsalebeg	Wd	3.187																										
	Ballymacoda	Co	27.058																										
	Jamesbrook Hall	Co	4.140																										
	Bawnard	Co	0.388																										
	Carrigatoohil	Co	1.245													C	-1	0.001											
	Rock Castle, Bandon Estuary	Co	5.357																										
	Harbour View	Co	11.040																C	-1	0.5								

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 2 of 4, Impacts 302-607)																									
				302			421			422			423			501			502			511			512			607		
				Removal of Beach materials			Disposal of Household Waste			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Routes, Autoroutes			Electricity Lines			Pipe Lines			Sports Pitch		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 2 of 4 (Cork to Galway)	Seafort	Co	0.470																										
	Ballybrack	Co	0.887																										
	Ballyrisode House	Co	0.025																										
	Barley Cove	Co	0.783																			C	0	0.001	C	0	0.003		
	Dough	Co	5.495																C	-1	0.05								
	Dereen House	Ke	0.748																										
	Dinish	Ke	0.302																										
	Tahilla	Ke	0.073																										
	West Cove	Ke	0.246																										
	Rossbehy	Ke	7.286													C	-1	1.2											
	Cromane	Ke	13.907							B	-1	1.0																	
	Whitegate, Fybagh	Ke	2.553																										
	Inch	Ke	9.483													C	0	0.5											
	Emlagh East	Ke	0.979													C	-1	0.005											
	Ballyheige	Ke	1.309													C	-1	0.05											
	Carrigafoyle	Ke	7.589													C	-1	0.1											
	Barrigone, Aughinish	Li	10.200													C	0	0.5											
	Beagh	Li	0.538																										
	Bunratty	Cl	26.968													C	0	0.75											
	Shepperton, Fergus Estuary	Cl	35.935													C	0	0.4											
	Inishdea, Owenshere	Cl	19.636													C	-1	1.0											
	Killadysart, Inishcorker	Cl	2.940													C	0	0.1											
	Knock	Cl	0.740										A	-2	0.214														
	Querin	Cl	3.560													D	0	0.005											
	Rinevilla Bay	Cl	11.730													C	0	0.01											
	Scanlan's Island	Cl	4.457													C	-1	1.0											
	Kinvarra-West	Ga	13.295													C	-1	0.25											
	Kileenaran	Ga	15.166													C	-1	0.1											
	Tyrone House- Dunbulcaun Bay	Ga	9.933				C	-1	0.001							C	-1	0.5											
	Kilcaimin	Ga	7.818				C	-1	0.011							C	-1	0.1											

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 2 of 4, Impacts 302-607)																								
				302			421			422			423			501			502			511			512			607		
				Removal of Beach materials			Disposal of Household Waste			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Routes, Autoroutes			Electricity Lines			Pipe Lines			Sports Pitch		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 3 of 4 (Galway to Donegal	Oranmore North	Ga	4.838																						A	-1	0.478			
	Roscam West & South	Ga	3.302				C	-1	3.302							C	0	0.01												
	Seaweed Point	Ga	1.416													C	-1	0.05												
	Barna House	Ga	2.240													C	0	0.01												
	Furbo	Ga	2.716													C	0	0.001												
	Teeranea	Ga	2.024													C	-2	0.05												
	Lettermullan West	Ga	0.533																											
	Lettermore South	Ga	3.541													B	-2	0.01												
	Bealandangan	Ga	3.634													C	-2	0.001												
	Kinvarra	Ga	6.390																											
	Turloughbeg	Ga	0.624																											
	Errisask	Ga	1.418													C	0	0.001												
	Cleggan	Ga	0.312																											
	Aasleagh Falls	Ma	0.352																											
	North Achill Sound	Ma	1.272													C	-1	0.005												
	Salia West	Ma	0.832				C	0	0.005							C	-1	0.01												
	Owenduff, Corraun	Ma	0.485													C	-1	0.005												
	Doona	Ma	8.717													C	0	0.001												
	Aughness	Ma	2.678																											
	Tullaghan Bay	Ma	16.580																											
	Doolough	Ma	12.789													C	-1	0.005												
	Bunnahowen	Ma	12.455													C	-1	1.0												
	Elly Harbour	Ma	7.205													B	-1	0.005												
	Saleen Harbour	Ma	8.236																											
	Ballysadare Bay	Si	37.114	B	-1	0.15										C	-1	0.5												
	Strandhill	Si	1.478													C	0	0.01												
	Cummeen Strand	Si	10.512													C	-2	0.002												
	Drumcliff Bay	Si	7.015																											
	Streedagh Point	Si	13.138													C	-2	0.01												
	Mullanasole	Do	17.350													C	0	0.5												

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 2 of 4, Impacts 302-607)																									
				302			421			422			423			501			502			511			512			607		
				Removal of Beach materials			Disposal of Household Waste			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Routes, Autoroutes			Electricity Lines			Pipe Lines			Sports Pitch		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 4 of 4 (Donegal)	Laghy	Do	19.800													C	-1	0.01												
	Rossmore	Do	4.620										C	-1	0.	C	-1	0.01												
	Maghera	Do	5.850										C	-1	0.023															
	Glen Bay	Do	2.332													B	0	0.02												
	Sheskinmore-Beagh	Do	15.900													C	0	0.1										C	0	0.25
	Roshin Point	Do	2.180																											
	Keadew	Do	9.229													B	-1	0.01												
	Dooey	Do	7.494										C	-1	0.001	C	0	0.005												
	Creeslough	Do	19.610													C	0	0.02												
	Rosapenna	Do	9.160													C	-1	0.05												
	Tawny	Do	1.686										C	-1	0.01	C	-1	0.15												

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 4, Impacts 622-810)																							
				622 Walking, Horseriding & Non-motorised vehicles			623 Motorised Vehicles			701 Water Pollution			790 Other Pollution or Human Impacts / Activities			800 Landfill, Land Reclamation & Drying Out, General			801 Polderisation			802 Reclamation of Land from Marsh			803 Infilling of Marshes			810 Drainage		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 3, Part 1 of 4 (Louth to Cork)	Dundalk	Lo	330.150																						A	-2	0.2			
	Baltray	Lo	14.370																											
	Mornington	Me	11.242	C	0	0.5	C	-1	0.1																					
	Booterstown	Du	0.062	C	0	0.062																								
	Kilcoole	Wi	13.058																			A	-1	1.2						
	Buckroney	Wi	0.085	C	0	0.085																								
	Castlebridge	Wx	2.876																									C	-1	0.25
	Ferrycarrig	Wx	0.026																											
	Rosslare	Wx	7.535							B	-1	9.237										A	-2	0.5						
	Bannow Island	Wx	1.981																											
	Clonmines	Wx	15.870																											
	Taulaght	Wx	2.547																						A	-2	0.02			
	Saltmills	Wx	1.127																											
	Gorteens	Wx	0.997																											
	Grange	Wx	0.014																											
	Fethard	Wx	4.276																											
	Dunbrody Abbey	Wx	1.713																			A	-2	0.75						
	Killowen	Wx	2.697																											
	Rochestown	Kk	17.499																											
	Ringville	Kk	6.335																									C	-1	2.0
	Little Island	Wd	3.616																			A	-2	0.05						
	Dungarvan	Wd	8.212																									C	-1	0.5
	Kinsalebeg	Wd	3.187																						B	-2	0.001			
	Ballymacoda	Co	27.058																											
	Jamesbrook Hall	Co	4.140																											
	Bawnard	Co	0.388																						C	-1	0.388			
	Carrigatoohil	Co	1.245																						A	-2	0.8			

Section 3, Part 2 of 4 (Cork to Clare)	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 4, Impacts 622-810)																							
				622 Walking, Horseriding & Non-motorised vehicles			623 Motorised Vehicles			701 Water Pollution			790 Other Pollution or Human Impacts / Activities			800 Landfill, Land Reclamation & Drying Out, General			801 Polderisation			802 Reclamation of Land from Marsh			803 Infilling of Marshes			810 Drainage		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
	Rock Castle, Bandon Estuary	Co	5.357																										
	Harbour View	Co	11.040				C	-1	0.5																				
	Seafort	Co	0.470																										
	Ballybrack	Co	0.887																			A	-2	0.47					
	Ballyrisode House	Co	0.025																										
	Barley Cove	Co	0.783																						C	0	0.001		
	Dough	Co	5.495																										
	Dereen House	Ke	0.748																										
	Dinish	Ke	0.302																										
	Tahilla	Ke	0.073																										
	West Cove	Ke	0.246																										
	Rossbehy	Ke	7.286	C	-1	1.2	B	-1	1.2																				
	Cromane	Ke	13.907																						A	-2	0.05		
	Whitegate, Fybagh	Ke	2.553																A	-1	0.1								
	Inch	Ke	9.483	C	0	0.5																							
	Emlagh East	Ke	0.979																										
	Ballyheige	Ke	1.309																										
	Carrigafoyle	Ke	7.589																						A	-2	0.2		
	Barrigone, Aughinish	Li	10.200																						A	-2	0.1		
	Beagh	Li	0.538																										
	Bunratty	Cl	26.968													C	-1	0.2										C	0	0.2
	Shepperton, Fergus Estuary	Cl	35.935																									C	0	0.4
	Inishdea, Owenshere	Cl	19.636																C	-1	1.0							C	-1	0.1
	Killadysart, Inishcorker	Cl	2.940																										
	Knock	Cl	0.740																A	-2	0.214							C	-1	0.2
	Querin	Cl	3.560																										
	Rinevilla Bay	Cl	11.730																									C	-1	0.08
	Scanlan's Island	Cl	4.457																										

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 4, Impacts 622-810)																							
				622			623			701			790			800			801			802			803			810		
				Walking, Horseriding & Non-motorised vehicles			Motorised Vehicles			Water Pollution			Other Pollution or Human Impacts / Activities			Landfill, Land Reclamation & Drying Out, General			Polderisation			Reclamation of Land from Marsh			Infilling of Marshes			Drainage		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section3, Part 3 o4 (Galway to Mayo)	Kinvarra-West	Ga	13.295																										
	Kileenaran	Ga	15.166																										
	Tyrone House- Dunbulcaun Bay	Ga	9.933																										
	Kilcaimin	Ga	7.818																										
	Oranmore North	Ga	4.838																A	-2	0.15	A	-2	0.1						
	Roscam West & South	Ga	3.302	C	0	3.302																								
	Seaweed Point	Ga	1.416	C	-1	0.05																								
	Barna House	Ga	2.240	C	0	0.01																								
	Furbo	Ga	2.716																										
	Teeranea	Ga	2.024																						A	-2	0.05			
	Lettermullan West	Ga	0.533																											
	Lettermore South	Ga	3.541																						A	-2	0.05			
	Bealandangan	Ga	3.634																											
	Kinvarra	Ga	6.390																											
	Turloughbeg	Ga	0.624																											
	Errisask	Ga	1.418																											
	Cleggan	Ga	0.312																											
	Aasleagh Falls	Ma	0.352																											
	North Achill Sound	Ma	1.272																											
	Salia West	Ma	0.832																											
	Owenduff, Corraun	Ma	0.485																											
	Doona	Ma	8.717																											
	Aughness	Ma	2.678																											
	Tullaghan Bay	Ma	16.580																											
	Doolough	Ma	12.789																									C	-1	0.25
	Bunnahowen	Ma	12.455																											
	Elly Harbour	Ma	7.205																											
	Saleen Harbour	Ma	8.236																						A	-2	0.08			

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 4, Impacts 622-810)																							
				622			623			701			790			800			801			802			803			810		
				Walking, Horseriding & Non-motorised vehicles			Motorised Vehicles			Water Pollution			Other Pollution or Human Impacts / Activities			Landfill, Land Reclamation & Drying Out, General			Polderisation			Reclamation of Land from Marsh			Infilling of Marshes			Drainage		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 3, Part 4 of 4 (Sligo to Donegal)	Ballysadare Bay	Si	37.114																						A	-2	0.005			
	Strandhill	Si	1.478	B	0	0.1																								
	Cummeen Strand	Si	10.512																						C	-1	0.005			
	Drumcliff Bay	Si	7.015																									B	-1	4.0
	Streedagh Point	Si	13.138	C	-1	1.0	C	-1	1.0																					
	Mullanasole	Do	17.350	C	0	0.025							C	0	0.001															
	Laghy	Do	19.800																						A	-2	0.01			
	Rossmore	Do	4.620																											
	Maghera	Do	5.850																						A	-2	0.073			
	Glen Bay	Do	2.332																											
	Sheskinmore-Beagh	Do	15.900	C	-1	0.25																								
	Roshin Point	Do	2.180																											
	Keadew	Do	9.229	C	0	0.01	B	-1	0.02																					
	Dooey	Do	7.494				C	-1	0.01																A	-2	0.3			
	Creeslough	Do	19.610																									C	-1	0.01
	Rosapenna	Do	9.160	C	-1	0.05																								
	Tawny	Do	1.686																						B	-2	0.2			

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 4 of 4, Impacts 820-990)																							
				820			860			870			871			900			910			954			990		
				Removal of Sediments (Mud…)			Dumping, Depositing of Dredged Materials			Dykes, Embankments, Artificial Beaches			Sea Defence or Coastal Protection Works			Erosion			Silting Up			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 4, Part 1 of 4 (Louth to Cork)	Dundalk	Lo	330.150													C	0	30.0	C	1	30.0						
	Baltray	Lo	14.370																C	1	1.2						
	Mornington	Me	11.242																C	1	8.0	B	-1	1.0			
	Booterstown	Du	0.062																						B	-1	0.062
	Kilcoole	Wi	13.058																						B	-1	12.5
	Buckroney	Wi	0.085																								
	Castlebridge	Wx	2.876													C	-1	0.02									
	Ferrycarrig	Wx	0.026													C	0	0.001									
	Rosslare	Wx	7.535													C	-1	0.5				B	-1	1.0			
	Bannow Island	Wx	1.981																C	0	1.3	B	0	1.2	C	1	1.2
	Clonmines	Wx	15.870													C	0	0.8				B	-1	0.838			
	Taulaght	Wx	2.547													C	0	0.02				B	-1	1.4			
	Saltmills	Wx	1.127										C	-1	0.01	B	-2	1.127				C	0	0.06			
	Gorteens	Wx	0.997													C	0	0.02				C	0	0.014	C	1	0.02
	Grange	Wx	0.014													A	-2	0.014				C	0	1.1			
	Fethard	Wx	4.276																C	0	0.2	B	-1	0.2	C	1	0.4
	Dunbrody Abbey	Wx	1.713													C	0	0.015				C	-1	0.2			
	Killowen	Wx	2.697													C	0	0.1				C	0	2.697			
	Rochestown	Kk	17.499													C	0	0.8	B	1	0.8	C	0	17.499			
	Ringville	Kk	6.335													C	-2	0.6				B	-1	1.0			
	Little Island	Wd	3.616													C	0	3.616				C	-1	0.5			
	Dungarvan	Wd	8.212													C	0	0.4				C	0	8.212			
	Kinsalebeg	Wd	3.187													C	0	0.15				C	0	3.187			
	Ballymacoda	Co	27.058										C	0	0.005	C	0	0.1	C	1	0.5	B	-1	4.0	A	1	2.4
	Jamesbrook Hall	Co	4.140																			C	-1	1.6			
	Bawnard	Co	0.388													C	0	0.002				C	0	0.388			
	Carrigatoohil	Co	1.245													C	0	0.06				C	0	1.245			
	Rock Castle, Bandon Estuary	Co	5.357																								

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 4 of 4, Impacts 820-990)																						
				820			860			870			871			900			910			954			990		
				Removal of Sediments (Mud…)			Dumping, Depositing of Dredged Materials			Dykes, Embankments, Artificial Beaches			Sea Defence or Coastal Protection Works			Erosion			Silting Up			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 2 of 4 (Cork to Galway)	Harbour View	Co	11.040																C	0	0.5	B	-1	1.5			
	Seafort	Co	0.470													C	0	0.02									
	Ballybrack	Co	0.887													C	-1	0.04									
	Ballyrisode House	Co	0.025																								
	Barley Cove	Co	0.783																								
	Dough	Co	5.495													C	0	0.1	B	1	1.5						
	Dereen House	Ke	0.748																								
	Dinish	Ke	0.302													C	0	0.005									
	Tahilla	Ke	0.073																								
	West Cove	Ke	0.246													C	0	0.01									
	Rossbehy	Ke	7.286													C	-1	0.5	C	1	1.0	C	0	0.001			
	Cromane	Ke	13.907							A	-2	0.3				B	-2	2.0				C	0	2.0			
	Whitegate, Fybagh	Ke	2.553													B	-2	0.25				C	O	0.05			
	Inch	Ke	9.483													C	0	0.2	C	1	0.4	B	-1	3.0	C	0	2.5
	Emlagh East	Ke	0.979													C	-1	0.25				C	-1	0.001			
	Ballyheige	Ke	1.309				C	-2	0.05																		
	Carrigafoyle	Ke	7.589													C	0	0.5				C	-1	1.0			
	Barrigone, Aughinish	Li	10.200	A	-2	0.15										C	0	0.2				B	-1	2.5			
	Beagh	Li	0.538													C	0	0.01				C	0	0.001	C	0	0.001
	Bunratty	Cl	26.968													C	0	1				C	0	26.968			
	Shepperton, Fergus Estuary	Cl	35.935	A	-2	2.5										C	0	1.5				B	-1	3.0	C	1	0.1
	Inishdea, Owenshere	Cl	19.636													C	0	0.15				B	-1	0.5			
	Killadysart, Inishcorker	Cl	2.940													C	0	0.1				B	-1	1.5			
	Knock	Cl	0.740																			C	0	0.74	C	1	0.05
	Querin	Cl	3.560													C	0	0.002				C	0	3.56	C	1	0.18
	Rinevilla Bay	Cl	11.730													C	-1	1.0				B	-1	0.1	C	0	0.1
	Scanlan's Island	Cl	4.457										A	-2	0.02	C	0	4.457	C	0	4.457						
	Kinvarra-West	Ga	13.295													C	0	0.6									
	Kileenaran	Ga	15.166													C	0	0.7									

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 4 of 4, Impacts 820-990)																						
				820			860			870			871			900			910			954			990		
				Removal of Sediments (Mud…)			Dumping, Depositing of Dredged Materials			Dykes, Embankments, Artificial Beaches			Sea Defence or Coastal Protection Works			Erosion			Silting Up			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 4, Part 3 of 4 (Galway to Sligo)	Tyrone House- Dunbulcaun Bay	Ga	9.933										A	-1	0.7	C	0	0.5									
	Kilcaimin	Ga	7.818										B	-2	0.05	C	0	0.35									
	Oranmore North	Ga	4.838										A	-1	0.25												
	Roscam West & South	Ga	3.302													C	0	0.15	C	1	0.05						
	Seaweed Point	Ga	1.416													C	0	0.06									
	Barna House	Ga	2.240													C	0	0.05	C	1	0.12						
	Furbo	Ga	2.716										C	-1	0.01	C	0	0.27									
	Teeranea	Ga	2.024													C	0	0.01									
	Lettermullan West	Ga	0.533													C	0	0.1									
	Lettermore South	Ga	3.541																								
	Bealandangan	Ga	3.634													C	-1	0.05									
	Kinvarra	Ga	6.390													C	0	0.000									
	Turloughbeg	Ga	0.624													C	0	0.03									
	Errisask	Ga	1.418													B	-1	0.5									
	Cleggan	Ga	0.312																								
	Aasleagh Falls	Ma	0.352													C	0	0.015									
	North Achill Sound	Ma	1.272													C	0	0.06									
	Salia West	Ma	0.832													C	0	0.04									
	Owenduff, Corraun	Ma	0.485													C	-1	0.025									
	Doona	Ma	8.717													C	-1	0.4							C	0	0.2
	Aughness	Ma	2.678													B	-1	0.5									
	Tullaghan Bay	Ma	16.580													C	0	0.8									
	Doolough	Ma	12.789													C	0	0.3	C	1	0.25						
	Bunnahowen	Ma	12.455													C	0	0.6	C	0	0.3						
	Elly Harbour	Ma	7.205													C	0	0.005	C	1	0.3				C	0	0.05
	Saleen Harbour	Ma	8.236													C	0	0.4									
	Ballysadare Bay	Si	37.114										C	-1	0.05	C	0	1.5	C	1	0.5						
	Strandhill	Si	1.478													C	0	0.15	C	1	0.15						
	Cummeen Strand	Si	10.512													C	-1	1.0	C	1	0.005						

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 4 of 4, Impacts 820-990)																						
				820			860			870			871			900			910			954			990		
				Removal of Sediments (Mud…)			Dumping, Depositing of Dredged Materials			Dykes, Embankments, Artificial Beaches			Sea Defence or Coastal Protection Works			Erosion			Silting Up			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 4, Part 4 of 4 (Sligo to Donegal)	Drumcliff Bay	Si	7.015													C	0	0.5	C	0	0.5						
	Streedagh Point	Si	13.138													C	0	0.5	C	1	1.0						
	Mullanasole	Do	17.350													C	0	0.05	C	1	0.005						
	Laghy	Do	19.800													C	0	1.0	C	1	1.0						
	Rossmore	Do	4.620													C	0	0.5	C	1	0.03						
	Maghera	Do	5.850													C	0	0.3	A	1	0.03						
	Glen Bay	Do	2.332													C	0	0.02	C	1	0.02						
	Sheskinmore-Beagh	Do	15.900													C	-1	0.05	B	1	0.5						
	Roshin Point	Do	2.180													C	0	0.2	C	1	0.4						
	Keadew	Do	9.229													C	0	0.5	C	1	0.05						
	Dooey	Do	7.494										C	-1	0.001	C	0	2.0	B	1	2.0				B	1	2.0
	Creeslough	Do	19.610													C	0	1.0	B	1	1.4						
	Rosapenna	Do	9.160													C	0	0.45	C	1	0.45						
	Tawny	Do	1.686													C	-1	0.06									

Table 7.8. Summary of impacts and activities on Atlantic salt meadows (Glauco Puccinellietalia maritimae) (1330) at each site surveyed during 2007-2008 (Outside or Adjacent).

Site Name	County	Habitat area (ha)	Table 7.8. Impacts and Activities on ASM (1330) (outside or adjacent to the site)																								
			200			301			422			424			504			700			701			850				
			Fish & Shellfish Aquaculture			Quarries			Disposal of Industrial Waste			Other Discharges			Port Areas			Pollution			Water Pollution			Modification of Hyrdographic Functioning, General				
			INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA		
Mornington	Me	11.242																C	-1	0.9				C	0	11.242	
Rosslare	Wx	7.535										B	-1	9.237													
Taulaght	Wx	2.547	C	-1	0.5																						
Fethard	Wx	4.276																			B	-1	1.0				
Little Island	Wa	3.616										B	-2	0.5													
Dungarvan	Wa	8.212	C	-1	8.212																						
Barna House	Ga	2.240																			C	-1	0.1				
Teeranea	Ga	2.024							B	-1	0.2																
Saleen Harbour	Ma	8.236													B	-1	1.67										
Ballysadare Bay	Si	37.114				C	1	0.1													C	-1	1.0				

Table 7.9. Summary of impacts and activities on *Mediterranean salt meadows (*Juncetalia maritimae*)* (1410) at each site (2007-2008) (Inside). This table is divided into 3 sections due to its size and each section spreads across 3 pages. INY – Intensity; IMT – Impact; AREA – Area of habitat affected (Ha).

	Site Name	County	Habitat area (ha)	Table 7.9, Impacts and Activities on 1410 (inside) (Section 1 of 3, Impacts 102-180)																							
				102			103			140			142			143			149			160			180		
				Mowing/ Cutting			Agricultural Improvement			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Undergrazing			Forestry Management			Burning		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 1. Part 1 of 3, (Louth to Kerry)	Dundalk	Lo	0.040																							
	Booterstown	Du	0.018																							
	Kilcoole	Wi	0.216													C	-1	0.216								
	Buckroney	Wi	0.084																							
	Castlebridge	Wx	23.391							C	0	22.391							B	-1	1.0					
	Ferrycarrig	Wx	0.060							C	0	0.06														
	Rosslare	Wx	0.426							C	0	0.426				B	-1	0.001								
	Clonmines	Wx	1.922							C	0	1.5				C	-1	0.4								
	Taulaght	Wx	0.491																							
	Saltmills	Wx	0.843							C	0	0.843														
	Gorteens	Wx	0.785																							
	Grange	Wx	0.040																							
	Dunbrody Abbey	Wx	0.129				A	-2	0.129							B	-1	0.129	C	-1	0.001					
	Rochestown	Kk	0.040													B	-1	0.04								
	Dungarvan	Wd	7.046							C	0	7.046														
	Kinsalebeg	Wd	1.591							C	0	1.591														
	Ballymacoda	Co	1.704							C	0	0.2														
	Jamesbrook Hall	Co	0.287																							
	Rock Castle, Bandon Estuary	Co	5.044																C	-1	5.044					
	Harbour View	Co	3.973																							
	Seafort	Co	1.944							C	0	0.944				C	-1	0.005								
	Ballybrack	Co	0.426							C	0	0.426														
	Ballyrisode House	Co	1.106													B	-1	0.005								
	Barley Cove	Co	0.108																							
	Dough	Co	5.509													B	-1	5.509								
	Dereen House	Ke	9.021							C	0	2.0				C	-1	0.05								
	Dinish	Ke	0.344							C	0	0.344														

	Site Name	County	Habitat area (ha)	Table 7.9, Impacts and Activities on 1410 (inside) (Section 1 of 3, Impacts 102-180)																							
				102			103			140			142			143			149			160			180		
				Mowing/ Cutting			Agricultural Improvement			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Undergrazing			Forestry Management			Burning		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
	Tahilla	Ke	2.066							C	0	1.566				C	-1	0.05									
Section 1, Part 2 of 3, (Kerry to Mayo)	West Cove	Ke	1.952							C	-2	0.5															
	Rossbehy	Ke	16.096							C	0	5.0															
	Cromane	Ke	29.315							C	0	4.0							C	0	7.5						
	Whitegate, Fybagh	Ke	2.605							C	0	2.0				C	-1	0.25									
	Inch	Ke	29.112							C	0	29.012				C	-1	0.1									
	Emlagh East	Ke	10.220																								
	Carrigafoyle	Ke	4.559							C	0	2.0				B	-1	2.5									
	Barrigone, Aughinish	Li	2.410							C	0	1.85				C	-1	0.15									
	Bunratty	Li	0.865							C	0	0.6				B	-1	0.1									
	Inishdea, Owenshere	Cl	11.553							B	0	5.0				B	-1	6.0									
	Killadysart, Inishcorker	Cl	0.709							B	0	0.1				C	-1	0.001									
	Knock	Cl	0.144							B	0	0.008															
	Querin	Cl	0.008																								
	Rinevilla Bay	Cl	2.450							B	0	1.0															
	Kileenaran	Ga	0.271							C	0	0.271															
	Tyrone House - Dunbulcaun Bay	Ga	8.409							C	-1	5.409				B	-1	3.0									
	KIlcaimin	Ga	0.503										B	-1	0.503												
	Seaweed Point	Ga	0.948																								
	Barna House	Ga	0.418													B	-1	0.418									
	Furbo	Ga	0.136							C	0	0.136															
	Teeranea	Ga	0.653							C	0	0.5															
	Lettermullan West	Ga	2.011							C	0	1.51				C	-1	0.5									
	Lettermore South	Ga	0.463							C	0	0.463															
	Bealandangan	Ga	0.285													B	-1	0.285									
	Kinvarra	Ga	37.878							C	0	32.0													C	0	0.05
	Turloughbeg	Ga	0.413							C	0	0.313	C	-1	0.1												
	Errisask	Ga	4.517							C	0	4.467				B	-1	0.05									
	Aasleagh Falls	Ma	2.331							C	0	2.331															
	North Achill Sound	Ma	0.394										B	-1	0.394												

	Site Name	County	Habitat area (ha)	Table 7.9, Impacts and Activities on 1410 (inside) (Section 1 of 3, Impacts 102-180)																							
				102			103			140			142			143			149			160			180		
				Mowing/ Cutting			Agricultural Improvement			Grazing			Overgrazing by Sheep			Overgrazing by Cattle			Undergrazing			Forestry Management			Burning		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
	Salia West	Ma	0.588							C	0	0.3	A	-1	0.288												
Section 1, Part 3 of 3 (Mayo to Donegal)	Owenduff, Corraun	Ma	0.921							C	0	0.921															
	Doona	Ma	0.124																								
	Aughness	Ma	0.178							C	0	0.178															
	Tullaghan Bay	Ma	29.572							C	0	24.572				B	-1	5.0									
	Doolough	Ma	0.354							C	0	0.354															
	Bunnahowen	Ma	1.374							C	0	1.374													B	-1	0.5
	Elly Harbour	Ma	4.158							C	0	3.158				B	-1	1.0									
	Saleen Harbour	Ma	0.011																								
	Ballysadare Bay	Si	34.911							C		20.0				B	-1	0.5									
	Cummeen Strand	Si	2.309																								
	Drumcliff Bay	Si	13.739							C		10.0															
	Streedagh Point	Si	7.717							C		4.5				A	-1	0.4									
	Mullanasole	Do	11.520																C	-1	6.0	C	-1	0.5			
	Laghy	Do	1.980							C		0.5															
	Rossmore	Do	0.930																								
	Maghera	Do	8.980							C		8.98															
	Glen Bay	Do	12.600							C		10.1				B	-1	2.5									
	Sheskinmore-Beagh	Do	28.970	C	-1	0.75				C		18.0				B	-1	7.0									
	Roshin Point	Do	4.760													C	-1	0.1	C	-1	0.2						
	Keadew	Do	0.089																								
	Dooey	Do	0.025							C	0	0.025															
	Creeslough	Do	5.760							C	0	3.0				B	-1	1.0									
	Rosapenna	Do	3.920							C	0	3.92															
	Tawny	Do	0.387																								

	Site Name	County	Habitat area (ha)	Impacts and Activities 1410 (inside) (Section 2 of 3, Impacts 210-800)																							
				210			230			422			423			501			622			701			800		
				Professional Fishing			Hunting			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Walking, Horseriding & Bicycles			Water Pollution			Landfill, Reclamation & Drying Out,		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 1 of 3 (Louth to Kerry)	Dundalk	Lo	0.040																								
	Booterstown	Du	0.018																C	0	0.018						
	Kilcoole	Wi	0.216																								
	Buckroney	Wi	0.084																								
	Castlebridge	Wx	23.391				C	-1	23.391							B	-1	2.0									
	Ferrycarrig	Wx	0.060																								
	Rosslare	Wx	0.426	C	-1	0.426																C	0	0.426			
	Clonmines	Wx	1.922																								
	Taulaght	Wx	0.491																								
	Saltmills	Wx	0.843																								
	Gorteens	Wx	0.785													C	-1	0.00									
	Grange	Wx	0.040													C	0	0.001	C	0	0.001						
	Dunbrody Abbey	Wx	0.129																								
	Rochestown	Kk	0.040																								
	Dungarvan	Wd	7.046													C	-1	0.5									
	Kinsalebeg	Wd	1.591																								
	Ballymacoda	Co	1.704																								
	Jamesbrook Hall	Co	0.287																								
	Rock Castle, Bandon Estuary	Co	5.044																								
	Harbour View	Co	3.973																								
	Seafort	Co	1.944																								
	Ballybrack	Co	0.426																								
	Ballyrisode House	Co	1.106																								
	Barley Cove	Co	0.108																								
	Dough	Co	5.509																								
	Dereen House	Ke	9.021													C	0	0.05									
	Dinish	Ke	0.344																								
	Tahilla	Ke	2.066																								

	Site Name	County	Habitat area (ha)	Impacts and Activities 1410 (inside) (Section 2 of 3, Impacts 210-800)																							
				210			230			422			423			501			622			701			800		
				Professional Fishing			Hunting			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Walking, Horseriding & Bicycles			Water Pollution			Landfill, Reclamation & Drying Out,		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 2 of 3, (Kerry – Mayo)	West Cove	Ke	1.952																								
	Rossbehy	Ke	16.096													C	0	0.5	C	0	1.0						
	Cromane	Ke	29.315							B	-1	2.0															
	Whitegate, Fybagh	Ke	2.605																								
	Inch	Ke	29.112													C	0	1.0	C	0	0.5						
	Emlagh East	Ke	10.220							C	-1	0.001				C	-1	0.05									
	Carrigafoyle	Ke	4.559																								
	Barrigone, Aughinish	Li	2.410													B	-1	0.15									
	Bunratty	Li	0.865													C	0	0.1									
	Inishdea, Owenshere	Cl	11.553													C	-1	0.5									
	Killadysart, Inishcorker	Cl	0.709													C	0	0.001									
	Knock	Cl	0.144										C	-2	0.05												
	Querin	Cl	0.008																								
	Rinevilla Bay	Cl	2.450													C	0	0.01									
	Kileenaran	Ga	0.271																								
	Tyrone House - Dunbulcaun Bay	Ga	8.409																								
	Kilcaimin	Ga	0.503													C	-1	0.503									
	Seaweed Point	Ga	0.948																								
	Barna House	Ga	0.418																								
	Furbo	Ga	0.136																								
	Teeranea	Ga	0.653																								
	Lettermullan West	Ga	2.011																								
	Lettermore South	Ga	0.463																								
	Bealandangan	Ga	0.285																								
	Kinvarra	Ga	37.878																								
	Turloughbeg	Ga	0.413																								
	Errisask	Ga	4.517													C	0	0.005									
	Aasleagh Falls	Ma	2.331																						C	-1	0.001
	North Achill Sound	Ma	0.394													C	-1	0.002									
	Salia West	Ma	0.588													C	-1	0.01									

	Site Name	County	Habitat area (ha)	Impacts and Activities 1410 (inside) (Section 2 of 3, Impacts 210-800)																							
				210			230			422			423			501			622			701			800		
				Professional Fishing			Hunting			Disposal of Industrial Waste			Disposal of Inert Materials			Paths, Tracks, Cycling Tracks			Walking, Horseriding & Bicycles			Water Pollution			Landfill, Reclamation & Drying Out,		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 2, Part 3 of 3 (Mayo to Donegal)	Owenduff, Corraun	Ma	0.921													C	-1	0.001									
	Doona	Ma	0.124													C	0	0.05									
	Aughness	Ma	0.178																								
	Tullaghan Bay	Ma	29.572																								
	Doolough	Ma	0.354																								
	Bunnahowen	Ma	1.374																								
	Elly Harbour	Ma	4.158																								
	Saleen Harbour	Ma	0.011																								
	Ballysadare Bay	Si	34.911													C	-1	0.1									
	Cummeen Strand	Si	2.309																								
	Drumcliff Bay	Si	13.739																								
	Streedagh Point	Si	7.717													C	-2	0.01	C	-1	0.5						
	Mullanasole	Do	11.520																								
	Laghy	Do	1.980													B	-1	0.05									
	Rossmore	Do	0.930													C	-1	0.01									
	Maghera	Do	8.980										C	-1	0.01	C	0	0.02									
	Glen Bay	Do	12.600													C	0	0.3									
	Sheskinmore-Beagh	Do	28.970													C	0	0.05									
	Roshin Point	Do	4.760																								
	Keadew	Do	0.089																								
	Dooey	Do	0.025													C	0	0.025									
	Creeslough	Do	5.760													C	0	0.02									
	Rosapenna	Do	3.920													C	0	0.05									
	Tawny	Do	0.387										C	-1	0.01	B	-1	0.01									

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 3, Impacts 801 – 990)																						
				801			803			810			870			900			910			954			990		
				Polderisation			Infilling of Marshes			Drainage			Dykes, Embankments			Erosion			Accretion			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 3, Part 1 of 3 (Louth to Kerry)	Dundalk	Lo	0.040																							
	Booterstown	Du	0.018																						B	-1	0.018
	Kilcoole	Wi	0.216																						C	0	0.216
	Buckroney	Wi	0.084																						B	0	0.084
	Castlebridge	Wx	23.391							C	-1	2.0				C	-1	0.5									
	Ferrycarrig	Wx	0.060																								
	Rosslare	Wx	0.426													C	0	0.426									
	Clonmines	Wx	1.922																								
	Taulaght	Wx	0.491																			C	-1	0.1			
	Saltmills	Wx	0.843													B	-2	0.843				C	0	0.843			
	Gorteens	Wx	0.785													C	0	0.02									
	Grange	Wx	0.040													A	-2	0.04									
	Dunbrody Abbey	Wx	0.129																								
	Rochestown	Kk	0.040																								
	Dungarvan	Wd	7.046							C	-1	0.5				C	0	0.35									
	Kinsalebeg	Wd	1.591				B	-2	0.001							C	0	0.025									
	Ballymacoda	Co	1.704																								
	Jamesbrook Hall	Co	0.287																								
	Rock Castle, Bandon Estuary	Co	5.044				C	0	0.001							C	0	0.3	C	0	0.25						
	Harbour View	Co	3.973																			C	0	0.05			
	Seafort	Co	1.944				A	-2	0.01							C	0	0.04									
	Ballybrack	Co	0.426													C	0	0.02									
	Ballyrisode House	Co	1.106													C	0	0.01									
	Barley Cove	Co	0.108																								
	Dough	Co	5.509																								
	Dereen House	Ke	9.021													C	0	0.05									
	Dinish	Ke	0.344													C	0	0.005									
	Tahilla	Ke	2.066																								
	West Cove	Ke	1.952				A	-2	0.001							B	0	0.05									

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 3, Impacts 801 – 990)																							
				801			803			810			870			900			910			954			990		
				Polderisation			Infilling of Marshes			Drainage			Dykes, Embankments			Erosion			Accretion			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 3, Part 2 of 3, (Kerry to Mayo)	Rossbehy	Ke	16.096																			B	-1	2.0			
	Cromane	Ke	29.315										A	-2	0.3	B	-2	3.0									
	Whitegate, Fybagh	Ke	2.605	A	-1	0.1										B	-2	0.26				B	0	0.2			
	Inch	Ke	29.112													C	0	2.0				C	-1	3.0	C	0	7.5
	Emlagh East	Ke	10.220													C	-1	1.0									
	Carrigafoyle	Ke	4.559													C	0	0.5				C	-1	1.0			
	Barrigone, Aughinish	Li	2.410				A	-2	0.005							C	0	0.05				B	-1	1.2			
	Bunratty	Li	0.865																			C	0	0.865			
	Inishdea, Owenshere	Cl	11.553							C	-1	0.03				C	0	0.02									
	Killadysart, Inishcorker	Cl	0.709													C	0	0.01				C	0	0.7			
	Knock	Cl	0.144	C	-2	0.05																C	0	0.14			
	Querin	Cl	0.008																								
	Rinevilla Bay	Cl	2.450							C	-1	0.05				C	-1	0.25				C	-1	0.001	C	0	0.045
	Kileenaran	Ga	0.271																								
	Tyrone House - Dunbulcaun Bay	Ga	8.409													C	0	0.4									
	KIlcaimin	Ga	0.503																								
	Seaweed Point	Ga	0.948																								
	Barna House	Ga	0.418													C	0	0.01									
	Furbo	Ga	0.136													C	0	0.01									
	Teeranea	Ga	0.653													C	0	0.003									
	Lettermullan West	Ga	2.011													C	0	0.2									
	Lettermore South	Ga	0.463																								
	Bealandangan	Ga	0.285																								
	Kinvarra	Ga	37.878													C	0	1.5									
	Turloughbeg	Ga	0.413													C	0	0.02									
	Errisask	Ga	4.517													C	0	4.517									
	Aasleagh Falls	Ma	2.331													C	0	0.1									
	North Achill Sound	Ma	0.394													C	0	0.02									
	Salia West	Ma	0.588													C	0	0.03									
	Owenduff, Corraun	Ma	0.921													B	-1	0.05									
	Doona	Ma	0.124																								

	Site Name	County	Habitat area (ha)	Impacts and Activities (Section 3 of 3, Impacts 801 – 990)																							
				801			803			810			870			900			910			954			990		
				Polderisation			Infilling of Marshes			Drainage			Dykes, Embankments			Erosion			Accretion			Invasion by *Spartina*			Other Natural Processes		
				INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA	INY	IMT	AREA
Section 3, Part 3 of 3 (Mayo to Donegal)	Aughness	Ma	0.178													C	0	0.05									
	Tullaghan Bay	Ma	29.572													C	0	1.5									
	Doolough	Ma	0.354																								
	Bunnahowen	Ma	1.374													C	0	0.06									
	Elly Harbour	Ma	4.158																						C	0	0.5
	Saleen Harbour	Ma	0.011																								
	Ballysadare Bay	Si	34.911													C	0	1.5									
	Cummeen Strand	Si	2.309																								
	Drumcliff Bay	Si	13.739							B	-1	7.0				C	0	0.5	C	0	0.5						
	Streedagh Point	Si	7.717													C	0	0.5									
	Mullanasole	Do	11.520													C	0	0.01									
	Laghy	Do	1.980																								
	Rossmore	Do	0.930																								
	Maghera	Do	8.980													C	0	0.4									
	Glen Bay	Do	12.600																			B	-1	0.3			
	Sheskinmore-Beagh	Do	28.970													C	0	1.5				C	-1	0.2			
	Roshin Point	Do	4.760													C	0	0.5									
	Keadew	Do	0.089																								
	Dooey	Do	0.025																								
	Creeslough	Do	5.760							C	0	0.001	C	+1	2.8												
	Rosapenna	Do	3.920																								
	Tawny	Do	0.387																								

Table 7.10. Summary of impacts and activities on Mediterranean salt meadows (Juncetalia maritimae) (1410) at each site surveyed during 2007-2008 (Outside or Adjacent).

Site name	Habitat area (ha)	Table 7.10, Impacts and activities MSM (outside or adjacent)														
		200			422			424			701			850		
		Fish & Shellfish Aquaculture			Disposal of Industrial Waste			Other Discharges			Water Pollution			Modification of Hydrographic Functioning, General		
		Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected	Intensity	Impact	Area affected
Buckroney	0.084													C	-1	0.100
Rosslare	0.426							B	-1	0.426						
Dungarvan	7.046	C	-1	7.046												
Teeranea	0.653				B	-1	0.200									
Ballysadare Bay	34.911										C	-1	0.500			