NPWS

Mweelrea/Sheeffry/Erriff Complex SAC (site code: 001932)

Conservation objectives supporting document- Coastal habitats

Version 1

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Contents

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

Please note that this document should be read in conjunction with the following report: NPWS (2017) Conservation Objectives: Mweelrea/Sheeffry/Erriff Complex SAC 001932 Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (European Commission, 2013). 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.

Mweelrea/Sheeffry/Erriff Complex SAC covers a large area of south-west Co. Mayo. The western limit of the SAC is Dooaghtry, south of Kinnadoohy. The southern margin is bounded by Killary Harbour and the Erriff River. The Aille River forms the eastern limit, and to the north the SAC includes the main massifs of the Sheeffry Hills and the Mweelrea Mountains. Several river catchments are encompassed within the SAC, including the Bundorragha and Glenummera Rivers, as well as Fin Lough, Doo Lough and Glencullin Lough, the upper catchment of the Bunowen River and parts of the Derrycraff and Owenmore Rivers (NPWS, 2016).

The geology of the SAC is dominated by sandstones, shales and slates of Ordovician and Silurian age. Steep-sided mountains dominate most of the SAC and the tallest of these is Mweelrea which reaches an altitude of 814m. Particularly fine examples of corrie lakes occur in this SAC (NPWS, 2016).

This large SAC is of great scenic value and contains a particularly good area of coastal habitats along its westernmost boundary. The coastal area of Dooaghtry contains a range of different coastal habitats in a relatively small area and these include sand dunes, machair, lagoons, and also calcareous fen (NPWS, 2016).

Petalwort (*Petalophyllum ralfsii*), a liverwort listed on Annex II of the EU Habitats Directive, has been recorded from the machair in the SAC (Campbell *et al.*, 2015). This species is also protected in Ireland under the Flora (Protection) Order, 2015 (Statutory Instrument No. 356 of 2015).

The whorl snails, *Vertigo angustior* and *V. geyeri*, both of which are listed on Annex II of the EU Habitats Directive, occur at Dooaghtry also (NPWS, 2016).

Dooaghtry is also a nesting area for chough (*Pyrrhocorax pyrrhocorax*), a bird species listed on Annex I of the EU Birds Directive. The shallow lakes at Dooaghtry are used by a great variety of wintering waterfowl, waders and passage migrants (NPWS, 2016).

Mweelrea/Sheeffry/Erriff Complex SAC (site code: 001932) is a large SAC, containing a wide range of habitats and species. It is selected for the EU Habitats Directive Annex I habitats coastal lagoons, saltmarsh habitats, sand dune habitats, oligotrophic lakes, dystrophic lakes, floating river vegetation, wet heath, dry heath, Alpine and Boreal heaths, juniper (*Juniperus communis*) formations, blanket bog, transition mires, *Rhynchosporion* depressions, petrifying springs, alkaline fens, calcareous rocky slopes and siliceous rocky slopes and screes. Five of these habitats are listed with priority status – active blanket bog, petrifying springs, coastal lagoons and the sand dune habitats machair and decalcified dune heath. The SAC is also selected for the Annex II species narrow-mouthed whorl snail (*Vertigo angustior*), Geyer's whorl snail (*V. geyeri*), freshwater pearl mussel (*Margaritifera margaritifera*), Atlantic salmon (*Salmo salar*), otter (*Lutra lutra*), petalwort (*Petalophyllum ralfsii*) and slender naiad (*Najas flexilis*) (NPWS, 2016).

The following eight coastal habitats are included in the list of Qualifying Interests for Mweelrea/ Sheeffry/Erriff Complex SAC (* denotes a priority habitat):

1210	Annual vegetation of drift lines
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1410	Mediterranean salt meadows (Juncetaliea maritimi)
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria*
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
2170	Dunes with *Salix repens* subsp. *argentea* (Salix arenariae)
21A0	Machairs (* in Ireland)

Habitats 1330 and 1410 are saltmarsh habitats and the remaining six are associated with sand dune systems. All eight habitats are typically found in close association with each other. The distribution of the saltmarsh habitats within Mweelrea/Sheeffry/Erriff Complex SAC is presented in Appendix I and that of the sand dune habitats in Appendix II.

2 Conservation Objectives

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

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

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

The Saltmarsh Monitoring Project (SMP) surveyed, mapped and assessed two sub-sites associated with Mweelrea/Sheeffry/Erriff Complex SAC (McCorry, 2007; McCorry and Ryle, 2009):

1. Dooaghtry (SMP site ID: SMP0010)
2. Aasleagh Falls (SMP site ID: SMP0106)

The distribution of saltmarsh habitats within Mweelrea/Sheeffry/Erriff Complex SAC is presented in Appendix I. As part of the SMP, detailed individual reports and habitat maps were produced for the Dooaghtry and Aasleagh Falls sub-sites and these are included in Appendix III and Appendix IV respectively. The conservation objectives for the saltmarsh habitats in Mweelrea/Sheeffry/Erriff Complex SAC are based primarily on the findings of the SMP.

Nearly all of the saltmarsh habitat area in the Dooaghtry sub-site is located within the boundary of Mweelrea/Sheeffry/Erriff Complex SAC (McCorry, 2007). Most of the saltmarsh habitats mapped in the Aasleagh Falls sub-site are located within the SAC boundary (McCorry and Ryle, 2009).

There are additional areas of saltmarsh known to be present within the SAC. However, it is estimated that the Dooaghtry and Aasleagh Falls sub-sites as surveyed by the SMP represents approximately 81% of the total area of saltmarsh within Mweelrea/Sheeffry/Erriff Complex SAC.

The targets set for the **sand dune habitats** are based primarily on the results of the Sand Dunes Monitoring Project (SDM) (Delaney *et al*., 2013) and this document should be read in conjunction with that report. Crawford *et al*. (1998) and Gaynor (2006, 2008) provide additional information on machair in Ireland. Bekkers *et al*. (1976) and Bassett (1983) also provide further information on the machair habitat within Mweelrea/Sheeffry/Erriff Complex SAC.

It is also recommended that this document be read in conjunction with the final report from the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. The sub-site Dooaghtry, which is associated with Mweelrea/Sheeffry/Erriff Complex SAC, was surveyed, mapped and assessed during the CMP (Ryle *et al*., 2009). The SDM reviewed and modified the methodology used during the CMP to map and assess the conservation status of dune habitats. A subset of 40 sites, including Dooaghtry, was selected as a representative sample of the national dune resource for the SDM survey.

The distribution of sand dune habitats within Mweelrea/Sheeffry/Erriff Complex SAC is presented in Appendix II. As part of the SDM, detailed individual reports and habitat maps (a revised baseline habitat map and an updated habitat map) were produced for all sub-sites and those for Dooaghtry (SDM site ID: 108) are included in Appendix V.

The conservation objectives for the sand dune habitats in Mweelrea/Sheeffry/Erriff Complex SAC are based on the findings of the SDM, combined with the results of Crawford *et al*. (1998), Gaynor (2006, 2008) and Ryle *et al*. (2009). It is thought that the sub-site as surveyed by the SDM represents the entire area of sand dune habitats within Mweelrea/Sheeffry/Erriff Complex SAC.

3 Saltmarsh habitats

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

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

The two habitats indicated in bold above, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM), are listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC. The last habitat is restricted in its distribution to sites in the south-east of the country.

The Saltmarsh Monitoring Project (SMP) surveyed, mapped and assessed the following sub-sites associated with Mweelrea/Sheeffry/Erriff Complex SAC (McCorry, 2007; McCorry and Ryle, 2009):

1. Dooaghtry (SMP site ID: SMP0010; see Appendix III)
2. Aasleagh Falls (SMP site ID: SMP0106; see Appendix IV)

The known distribution of saltmarsh habitats within Mweelrea/Sheeffry/Erriff Complex SAC is presented in Appendix I.

3.1 Overall Objectives

The overall objective for 'Atlantic salt meadows' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*restore the favourable conservation condition*'.

The overall objective for 'Mediterranean salt meadows' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*restore the favourable conservation condition*'.

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

3.2 Area

3.2.1 Habitat area

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is no decrease from the baseline which was established by McCorry (2007) and McCorry and Ryle (2009). Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is assessed subject to natural processes, including erosion and succession.

A habitat map of all known saltmarsh habitats in Mweelrea/Sheeffry/Erriff Complex SAC, based on the findings of the SMP (McCorry, 2007; McCorry and Ryle, 2009) and potential saltmarsh habitat identified using aerial photography, is presented in Appendix I. A total of 19.9ha of saltmarsh habitat was mapped by the SMP within the boundary of the SAC and an additional 4.7ha of potential saltmarsh habitat was identified using aerial photographs, to give a total estimated area of 24.6ha within Mweelrea/Sheeffry/Erriff Complex SAC.

The total areas of each saltmarsh habitat in the Dooaghtry and Aasleagh Falls sub-sites as mapped by the SMP and the total areas of each habitat within the boundary of Mweelrea/Sheeffry/Erriff Complex SAC are presented in the following tables.

There are a number of differences in the figures below. Most of the differences can be explained by the fact that the SMP mapped the total saltmarsh resource and not all of the saltmarsh mapped is contained within the SAC boundary. In addition, at Dooaghtry, the SMP included 75% of the mapped 1330/1410 mosaic and 50% of the 1330/grassland mosaic in their calculations for the area of ASM habitat, and included 25% of the 1330/1410 mosaic in their calculations for the area of MSM habitat. The following rules were applied when calculating the areas for the SAC's conservation objectives:

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

Source	**Total area (ha) of ASM from SMP**	**Total area (ha) of ASM within SAC boundary**
Dooaghtry - Atlantic salt meadows (1330)	17.77	16.23
Aasleagh Falls - Atlantic salt meadows (1330)	0.35	0.31
Potential ASM	-	4.63
50% of potential ASM/MSM mosaic	-	0.03
Total	**17.12**	**21.20**

A small area of ASM habitat (0.15ha estimated from the 2000 aerial photo) had been lost in the Dooaghtry sub-site at the time of the SMP survey due to the construction of a car park. A small area of habitat in the southern section has also been lost due to natural erosion. There has been accretion in both sections, but particularly along the Corragaun Lough channel (McCorry, 2007).

Source	**Total area (ha) of MSM from SMP**	**Total area (ha) of MSM within SAC boundary**
Dooaghtry - Mediterranean salt meadows (1410)	1.17	1.13
Aasleagh Falls - Mediterranean salt meadows (1410)	2.33	2.20
50% of potential ASM/MSM mosaic	-	0.03
Total	**1.17**	**3.36**

A small area of MSM habitat (0.10ha estimated from the 2000 aerial photo) has been lost due to the construction of a car park in the southern section of the Dooaghtry sub-site (McCorry, 2007).

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

3.3 Range

3.3.1 Habitat distribution

Atlantic and Mediterranean salt meadows are largely confined to the Dooaghtry sub-site area, which is located at the foot of Mweelrea Mountain, about 10km south-west of Louisburgh. This is a moderately sized saltmarsh that is divided into two sections (McCorry, 2007).

The northern section of saltmarsh is mainly located around the seaward side of Corragaun Lough, to the east of the Dooaghtry machair and sand dune system (see Habitat map 1 of 2 at the end of the Dooaghtry site report from the SMP in Appendix III). ASM is present on both sides of the entrance/outflow from Corragaun Lough with the largest area of saltmarsh vegetation being located to the south. Saltmarsh is also present on the northern side of the lake and along the channel. Small patches of saltmarsh have developed between rocky outcrops, where the topography allows (McCorry, 2007).

The southern (main) section of saltmarsh occurs to the south-east of Dooaghtry machair at Trawleckachoolia Bay (see Habitat map 2 of 2 at the end of the Dooaghtry site report in Appendix III). A small sheltered plain at the back of the bay has developed saltmarsh. This area is mainly dominated by ASM on a sandy substrate. There is a thin band of MSM habitat along the back of the saltmarsh. Clumps of sea rush (*Juncus maritimus*) are scattered through the ASM but are most common closer to the back of the saltmarsh. There are several areas mapped as mosaics between MSM/ASM, where there are frequent small clumps. Some of the largest clumps are mapped as MSM (McCorry, 2007).

The two main sections of saltmarsh are dominated by ASM habitat, but are distinctly different. The southern section contains well-developed ASM and species diversity is relatively high. The MSM habitat is predominantly present in the southern section and is mainly located along the landward boundary. This habitat is also relatively diverse (McCorry, 2007).

The saltmarsh habitat at Aasleagh Falls is relatively small and located in a narrow (<5m to 25m) strip of land between a regional road (the R335 between Louisburgh and Leenane) and the uppermost shore of Killary Harbour, where the sides of the fjord are less steep and suitable topography allows saltmarsh to develop. The sub-site extends from just south of Aasleagh Bridge, where the river becomes tidal, along the shoreline for 1.5km. The sub-site also incorporates the shoreline of several small islands, including Letterass Island. The most extensive saltmarsh development is situated around a small peninsula that contains several knolls surrounded by saltmarsh (McCorry and Ryle, 2009).

The saltmarsh in the Aasleagh Falls sub-site is dominated by MSM. The ASM occupies only a small proportion and is generally poorly developed with only small fragments present (McCorry and Ryle, 2009).

The mapped and potential distribution of each saltmarsh habitat within Mweelrea/Sheeffry/Erriff Complex SAC can be found in Appendix I.

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

3.4 Structure and Functions

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

3.4.1 Physical structure: sediment supply

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

In the northern section of the Dooaghtry sub-site, there have been significant changes to the seaward side of Corragaun Lough and the channel connecting it to the sea since the 1920s. A comparison of the 1929 six inch map and the 2000 aerial photo of the saltmarsh indicates that there has been significant amounts of accretion and saltmarsh creation (6.1ha) at the seaward end of Corragaun Lough. This has occurred on both sides of the channel. This new saltmarsh area is in transition due to shifts in the channel bed, wind erosion and further accretion of sediment from the beach and sandflats. Up to half the lough (actually classified as a lagoon) has been in-filled due to sand accretion. This has affected saltmarsh and other vegetation communities that are located in this area. This area has the appearance of being unstable or in transition as the channel is still shifting and sand banks are still accreting. This action (coupled with wind erosion) has created significant areas of pioneer saltmarsh vegetation. A comparison of the 2000 aerial photos to the 2006 SMP survey indicates that some of the relatively recent saltmarsh has actually been eroded since 2000 (0.3ha) (McCorry, 2007).

A comparison of the 1929 six inch map and the 2000 aerial photo indicates that a small area (0.12ha) at the southern end of the saltmarsh in the southern section of the Dooaghtry sub-site has been eroded away. This has probably been caused by shifts in the stream channel at the southern end and this has increased erosion along the seaward edge. However, there has been some corresponding

accretion and new development of saltmarsh (0.14ha) along the southern side of the channel (McCorry, 2007).

A small area of beach adjacent to the southern section of the Dooaghtry sub-site is being colonised by common saltmarsh-grass (*Puccinellia maritima*). This is a transient pioneer saltmarsh zone that probably appears and disappears depending on the local geomorphological cycles and the movement of the sediment along the seaward edge of the saltmarsh (McCorry, 2007).

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

3.4.2 Physical structure: creeks and pans

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

The saltmarsh topography is poorly developed in the northern section of the Dooaghtry sub-site, with few salt pans and creeks. There is one channel to a stream that acts as a creek draining the largest area. Creek and pan formation is poor on the northern side of the channel. Creeks only drain some of the larger areas and several stream channels drain some of the other areas (McCorry, 2007).

Wind-assisted erosion and accretion of sand is important in this area and probably is a factor accounting for the lack of salt pans in the saltmarsh plain in the northern section of the Dooaghtry sub-site (McCorry, 2007).

The southern section of ASM in the Dooaghtry sub-site has an excellent creek and salt pan structure. The salt pans at the front of the saltmarsh contain sand and pebbles. Mud and sand are present in the creeks. There is a saltmarsh cliff at the front of the marsh with some eroded sections. Some of the salt pans contain pioneer vegetation with frequent annual sea-blite (*Suaeda maritima*), sea milkwort (*Glaux maritima*) and common saltmarsh-grass (*Puccinellia maritima*) (McCorry, 2007).

There are few creeks and pans within the MSM in the Dooaghtry sub-site, which did not have a well-developed saltmarsh topography, although this is due to the fact that its area is not extensive and the clumps of sea rush (*Juncus maritimus*) are scattered amongst the ASM salt pan and creek topography. The lack of salt pans is probably a natural phenomenon (McCorry, 2007).

The saltmarsh topography of the ASM in the Aasleagh Falls sub-site is poorly developed, which is typical of these small fragments of saltmarsh. However, several small patches contain a typical mid marsh topography with small eroded pan-like hollows present containing cobbles and pebbles (McCorry and Ryle, 2009).

The saltmarsh topography of the MSM in the Aasleagh Falls sub-site is also poorly developed, although there are some small creeks present in the most extensive area. This section also contains some low mounds and hollows within the MSM that relate to the underlying topography (McCorry and Ryle, 2009).

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

3.4.3 Physical structure: flooding regime

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

In the southern section of the Dooaghtry sub-site, a stream flows from the north-west along the seaward side of the saltmarsh and meets a second stream/river along the south-east side. The second stream enters the back of the saltmarsh at the eastern corner and flows along the edge of the saltmarsh cliff and cuts a channel close to the southern boundary (McCorry, 2007).

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

3.4.4 Vegetation structure: zonation

Saltmarshes are naturally dynamic coastal systems. In order to ensure the ecological functioning of all of the saltmarsh habitats, it is vital to maintain the zonations and transitions to other habitats, including intertidal, shingle and sand dune habitats.

The saltmarsh at Dooaghtry is part of a larger coastal system, which includes machair, sand dune habitats, coastal lagoon, freshwater lake and freshwater marsh. The coastal habitats occur adjacent to wet grassland, wet and dry heath and blanket bog that extends up the steep slopes towards the upland areas that extend up Mweelrea Mountain (McCorry, 2007).

The largest section of saltmarsh in the northern section of the Dooaghtry sub-site is part of a large flat coastal plain and there is a gradual transition to machair vegetation communities towards the west. The saltmarsh plain (and transition to machair) south of the Corragaun Lough channel has a sand-based substrate and geomorphologically probably has closer affinities to machair than to traditional saltmarsh. Wind-assisted erosion and accretion of sand is probably a factor (McCorry, 2007). The transitional area to machair contains small raised hummocks with machair vegetation interspersed with ASM saltmarsh vegetation on the lower areas. Eventually the low hummocks begin to coalesce and machair becomes dominant. The change in vegetation from saltmarsh to machair grassland is not distinctive (McCorry, 2007).

The saltmarsh vegetation to the south of the Corragaun Lough channel is generally quite uniform with some variation towards the landward boundaries where there are transitions to other zones.

There is also a transitional vegetation community present between the saltmarsh and the machair (McCorry, 2007).

There are generally narrow transitions to wet and dry grassland, wet and dry heath, rock outcrops and blanket bog to the landward side of the saltmarsh on moderate to steep slopes along the boundaries of the northern section. The appearance of species such as daisy (*Bellis perennis*), common bird's-foot trefoil (*Lotus corniculatus*), black bog-rush (*Schoenus nigricans*), soft rush (*Juncus effusus*) and sweet vernal grass (*Anthoxanthum odoratum*) mark some of the transitions to these terrestrial habitats (McCorry, 2007).

North of the channel in the northern section of the Dooaghtry sub-site, clumps of sea rush (*Juncus maritimus*) occur on peat, and the saltmarsh vegetation quickly transitions to wet grassland with soft rush (*Juncus effusus*) and black bog-rush (*Schoenus nigricans*) on peat between these rock outcrops. Some zonation is evident in the saltmarsh vegetation on the larger areas with bands dominated by saltmarsh rush (*Juncus gerardii*), red fescue (*Festuca rubra*) and creeping bent-grass (*Agrostis stolonifera*) developing along the landward terrestrial boundaries (McCorry, 2007).

In the southern section of the Dooaghtry sub-site, the saltmarsh is enclosed by steeply sloping land and there is a sudden transition to terrestrial habitats. There is a narrow band of freshwater marsh/wet grassland vegetation with patches of yellow flag (*Iris pseudacorus*) along the landward boundary. There are occasional clumps of sea club-rush (*Bolboschoenus maritimus*) in this transitional zone. Several exposed rock outcrops jut into the saltmarsh. A large sandy beach is present at the front of the bay (McCorry, 2007).

There is some internal saltmarsh zonation along the edges of creeks and salt pans in the southern section of the Dooaghtry sub-site. Here, a lower saltmarsh zone is present, dominated by common saltmarsh-grass (*Puccinellia maritima*) and sea milkwort (*Glaux maritima*) (McCorry, 2007).

In the southern section of the Dooaghtry sub-site, there is some zonation of ASM saltmarsh vegetation with two main zones (mid-marsh and mid-upper) being present. There was a significant area of pioneer saltmarsh developing on the sandy beach at the western side of the stream at the time of survey. There is also internal zonation of saltmarsh plant communities along the edges of the creeks and pans. There are some small patches of transitional habitats between ASM and terrestrial habitats along the landward boundary, but most of the transitional habitats are located alongside the MSM in the southern section (McCorry, 2007).

The MSM generally is located at the back of the southern saltmarsh area and there are narrow patches of transitional (brackish and freshwater marsh) habitats before the development of terrestrial habitats, as the slope is relatively steep at the back of the saltmarsh (McCorry, 2007).

In the Aasleagh Falls sub-site, there is some development of intertidal habitats seaward of the saltmarsh and other shore habitats, with mixed rocky and muddy sediments with or without wrack cover and mudflats present. The saltmarsh eventually peters out further south and the shoreline is dominated by exposed rock as the steep-sided shoreline topography does not allow further development of saltmarsh. The larger terrestrial islands contain scrub and some woodland while the smaller mounds or 'islands' contain heath, wet grassland and exposed rock (McCorry and Ryle, 2009).

The upper saltmarsh boundary in the Aasleagh Falls sub-site is also heterogeneous. Some of the saltmarsh is situated adjacent to mature *Rhododendron*-dominated scrub, which over-hangs the saltmarsh in places. At other locations, the saltmarsh transitions to wet grassland. There is generally very little transitional vegetation as the shoreline topography and slope is relatively steep. This means the upper transition is generally quite obvious and sometimes is marked by a low cliff, above which there is wet grassland with soft rush (*Juncus effusus*) and yellow flag (*Iris pseudacorus*) or vegetation dominated by purple moor-grass (*Molinia caerulea*) with bog myrtle (*Myrica gale*). There are also several minor patches with some purple moor-grass spreading into saltmarsh vegetation dominated by sea rush (*Juncus maritimus*). Common reed (*Phragmites australis*) and sea club-rush (*Bolboschoenus maritimus*) appear at several locations along the saltmarsh where there is a freshwater influence at the outflows of several small streams (McCorry and Ryle, 2009).

In the ASM habitat in the Aasleagh Falls sub-site, typical zonation of the shoreline was poorly developed. However, several ASM vegetation communities were present at different locations in the sub-site including low, mid and upper marsh communities. There is also a transition to upper saltmarsh vegetation dominated by red fescue (*Festuca rubra*) and creeping bent (*Agrostis stolonifera*) and zonation is evident at several locations. Larger or wider sections of ASM have some zonation with common saltmarsh-grass (*Puccinellia maritima*) more abundant at the lower seaward boundary. There are natural transitions to other coastal habitats at both the lower and upper ASM boundaries (McCorry and Ryle, 2009).

Shoreline zonation was relatively poorly developed in the MSM habitat, but this is typical of a small site like Aasleagh Falls. There are natural transitions to other coastal habitats at both the lower and upper MSM boundaries (McCorry and Ryle, 2009).

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

3.4.5 Vegetation structure: vegetation height

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

The main activity at Dooaghtry is sheep grazing and, at the time of survey, this varied significantly in intensity on the two different sections (McCorry, 2007). The northern section around the seaward side of Corragaun Lough was badly affected by overgrazing, creating a low close-cropped sward with frequent bare ground cover. Many of the damaged areas in the ASM had the appearance of pioneer vegetation because they were disturbed (McCorry, 2007).

Small patches of MSM located along the Corragaun Lough channel were negatively affected by overgrazing and poaching (McCorry, 2007).

The ASM in the southern section was grazed by sheep which had created a distinctive low sward (McCorry, 2007), but was varied in the sea rush (*Juncus maritimus*) dominated (MSM) areas (McCorry, 2007).

The ASM sward height in the Aasleagh Falls sub-site varied between 1cm to 10cm high and was light to moderately grazed. Some small sections were overgrazed, but these covered a very minor area. There were several patches of low marsh sward dominated by common saltmarsh-grass (*Puccinellia maritima*) and associated with some of the minor creeks (McCorry and Ryle, 2009).

The sward height of the MSM in the Aasleagh Falls sub-site was typical of the habitat and varied between 5cm and 10cm (McCorry and Ryle, 2009).

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

3.4.6 Vegetation structure: vegetation cover

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

In the northern section of the Dooaghtry sub-site, there were significant amounts of bare sand cover in damaged areas. However, the northern section also contains areas of pioneer saltmarsh vegetation on sand along the Corragaun Lough channel and these patches contain naturally occurring bare sand cover. This whole area seems to be in transition and several large blowouts have appeared along the channel. The channel is shifting and accreting bare sand banks that are being colonised by saltmarsh vegetation. Wind erosion is probably also a significant factor in this area. These recently vegetated areas are also more vulnerable to damage from overgrazing. The sand-based substrate also means the saltmarsh plant communities are more vulnerable to damage from overgrazing and poaching (McCorry, 2007).

The northern section has undergone damage caused by heavy overgrazing by sheep and by vehicle wheel ruts. Significant portions (>10%) of the ground cover are bare, with exposed sand or a green algal mat present. The surface is heavily churned up in places. Species diversity however, has not been affected significantly (McCorry, 2007).

Some of the MSM habitat in the Aasleagh Falls sub-site is quite rocky and the sea rush (*Juncus maritimus*) grows on mixed substrate with a significant amount of natural bare substrate cover (McCorry and Ryle, 2009).

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

3.4.7 Vegetation composition: typical species and sub-communities

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

Below are lists of typical species for the different saltmarsh zones, although some of these specie s have a restricted distribution nationally and may not occur in the Mweelrea/Sheeffry/Erriff Complex SAC area.

Typical species

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

ASM vegetation present on the northern side of the channel in the northern section of the Dooaghtry sub-site is dominated by sea plantain (*Plantago maritima*), saltmarsh rush (*Juncus gerardii*) and sea milkwort (*Glaux maritima*). Other species present include common saltmarsh-grass (*Puccinellia maritima*), red fescue (*Festuca rubra*), thrift (*Armeria maritima*), sea arrowgrass (*Triglochin maritimum*), creeping bent-grass (*Agrostis stolonifera*), brookweed (*Samolus valerandi*) and buck's-horn plantain (*Plantago coronopus*) (McCorry, 2007).

Species found in the southern section of the Dooaghtry sub-site which are associated with ASM on the seaward side of the saltmarsh include saltmarsh rush (*Juncus gerardii*) and sea milkwort (*Glaux maritima*). This zone also contains frequent thrift (*Armeria maritima*) and red fescue (*Festuca rubra*), and occasional creeping bent-grass (*Agrostis stolonifera*), sea plantain (*Plantago maritima*), buck's-horn plantain (*P. coronopus*), long-bracted sedge (*Carex extensa*), sea arrowgrass (*Triglochin maritimum*), autumn hawkbit (*Leontodon autumnalis*) and common saltmarsh-grass (*Puccinellia maritima*) (McCorry, 2007).

Annual sea-blite (*Suaeda maritima*) is present in the lower pioneer zones along the edges of creeks and within some of the pans in the southern section of the Dooaghtry sub-site in conjunction with sea milkwort (*Glaux maritima*) and common saltmarsh-grass (*Puccinellia maritima*) (McCorry, 2007).

MSM is represented by areas dominated by a dense fairly uniform sward of sea rush (*Juncus maritimus*). Some of the larger clumps contain small patches of ASM, but these cover less than 5% of the total area (McCorry, 2007).

In the MSM habitat in the southern section of the Dooaghtry sub-site, species diversity within the clumps of sea rush (*Juncus maritimus*) is relatively high. Other species that occur frequently amongst the sea rush include red fescue (*Festuca rubra*), thrift (*Armeria maritima*), autumn hawkbit (*Leontodon autumnalis*), sea plantain (*Plantago maritima*) and white clover (*Trifolium repens*), along with buck's-horn plantain (*Plantago coronopus*), saltmarsh rush (*Juncus gerardii*), sea aster (*Aster tripolium*), common scurvygrass (*Cochlearia officinalis*), creeping bent-grass (*Agrostis stolonifera*), parsley water-dropwort (*Oenanthe lachenalii*), sea milkwort (*Glaux maritima*) and sand sedge (*Carex arenaria*). Several patches of sea rush (*Juncus maritimus*) are located along the northern side of the channel connecting Corragaun Lough to the sea (McCorry, 2007).

Species diversity in the ASM is typical of the habitat in the Aasleagh Falls sub-site. The vegetation of the small areas of ASM habitat is dominated by mid marsh communities with a thrift (*Armeria*)-plantain (*Plantago*) sward prominent in places. Another community, dominated by saltmarsh rush (*Juncus gerardii*), also occurs. Creeping bent-grass (*Agrostis stolonifera*) sometimes extends down to the seaward boundary. Other species present include saltmarsh-grass (*Puccinellia maritima*), sea plantain (*Plantago maritima*), buck's-horn plantain (*P. coronopus*), thrift (*Armeria maritima*), long-bracted sedge (*Carex extensa*), sea milkwort (*Glaux maritima*), sea aster (*Aster tripolium*), sea arrowgrass (*Triglochin maritimum*), sea spurrey (*Spergularia* sp.) and common scurvy-grass (*Cochlearia officinalis*). The ASM also contains some sea rush (*Juncus maritimus*) at low cover values. Turf fucoids, an indicator of local distinctiveness, were recorded at several locations in the ASM habitat; this is fairly typical of fringe type saltmarshes along the west coast of Ireland (McCorry and Ryle, 2009).

The MSM habitat in the Aasleagh Falls sub-site contained a typical species assemblage with the vegetation generally being dominated by sea rush (*Juncus maritimus*) with around 50% cover and frequent creeping bent-grass (*Agrostis stolonifera*). Other species include red fescue (*Festuca rubra*), saltmarsh rush (*Juncus gerardii*), sea plantain (*Plantago maritima*), thrift (*Armeria maritima*), sea aster (*Aster tripolium*), common scurvy-grass (*Cochlearia officinalis*), autumn hawkbit (*Leontodon autumnalis*), brookweed (*Samolus valerandi*), sea arrowgrass (*Triglochin maritimum*) and sea milkwort (*Glaux maritima*). Turf fucoids are also present in the MSM habitat (McCorry and Ryle, 2009).

The Near Threatened species (Wyse Jackson *et al*., 2016) saltmarsh flat-sedge (*Blymus rufus*) has been recorded in the past in the SAC, but was not recorded during the SMP. This species is mainly confined to saltmarshes along the north-west coast Ireland, but has a fragmented distribution and is found occasionally at other sites around the coast (McCorry and Ryle, 2009).

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

3.4.8 Vegetation composition: negative indicator species

The only invasive and non-native species recorded on saltmarshes during the SMP was common cordgrass (*Spartina anglica*) (McCorry, 2007; McCorry and Ryle, 2009).

Common cordgrass (*Spartina anglica*) was not recorded in the Dooaghtry sub-site by the SMP (McCorry, 2007), nor in the Aasleagh Falls sub-site (McCorry and Ryle, 2009).

The aim is that negative indicators, such as common cordgrass (*Spartina anglica*), should be absent or under control. The current target for this particular SAC is that the establishment of common cordgrass (*Spartina anglica*) is prevented.

4 Sand dune habitats

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

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

- **Annual vegetation of drift lines (1210)**
- **Embryonic shifting dunes (2110)**
- **Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120)**
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) *
- Decalcified dunes with *Empetrum nigrum* (2140) *
- **Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150) ***
- **Dunes with *Salix repens* subsp. *argentea* (Salix arenariae) (2170)**
- Humid dune slacks (2190)
- **Machairs (21A0) ***

Six sand dune habitats, indicated in **bold** above, are listed as Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. Delaney *et al*. (2013) recorded four of these habitats (1210, 2110, 2120 and 21A0) in the Dooaghtry sub-site, as well as two further Annex I sand dune habitats, fixed dunes (2130) and humid dune slacks (2190), which are not listed as Qualifying Interests for this particular SAC. Decalcified dune heaths (2150) and dunes with creeping willow (*Salix repens*) (2170) were not found at Dooaghtry during the SDM (Delaney *et al.*, 2013). The status of dune heath habitat in Ireland is under review.

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

spear-leaved orache (*Atriplex prostrata*), frosted orache (*A. laciniata*), sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*) and prickly saltwort (*Salsola kali*).

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

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

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

Atlantic decalcified fixed dune (Calluno-Ulicetea) (dune heath) occurs at the older landward edge of the fixed dunes, where leaching of basic minerals and nutrients can lower the pH over time, or where sand has blown up over rock that is siliceous (silica-rich) in nature, and conditions suitable for colonisation by heath species are created. As these decalcified or acidic conditions can only form on the older, landward extremes of dune systems, they are often vulnerable to housing or other developments. Decalcified dune heath is characterised by the presence of heathers (*Calluna vulgaris, Erica tetralix, E. cinerea*) and gorse species (*Ulex europaeus* and *U. gallii*) which differentiates it from the other dune heath habitat, decalcified *Empetrum nigrum* dunes. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as heathers, that are generally regarded as characterising the habitat are not well-represented in Ireland.

Dunes with creeping willow (*Salix repens*) occur where this shrub forms a dense ground cover and are found in close association with dune slacks. The distinguishing feature is the proximity of the water table to the surface, which in the case of dunes with creeping willow is below a level where it exerts an influence on the vegetation. As a result, the moisture-loving plants generally associated with dune slacks are noticeably reduced or absent. Dunes with creeping willow are often found on sandy hummocks within slacks, or on the sides of dune ridges adjacent to slacks.

Humid dune slacks are wet or moist depressions between dune ridges. They are characterised by the occurrence of a water table that is maintained by a combination of groundwater (which may or may not be slightly saline), precipitation and an impermeable layer in the soil. In the winter, the water table normally rises above the soil surface and inundation occurs. In spring and summer, the water table drops, but the top layer of the soil remains wet. Proximity of the water table to the surface is evidenced in the vegetation, in which rushes, sedges and moisture-loving herbs such as marsh pennywort (*Hydrocotyle vulgaris*), bog pimpernel (*Anagallis tenella*), grass-of-Parnassus (*Parnassia palustris*), common marsh-bedstraw (*Galium palustre*) and marsh helleborine (*Epipactis palustris*) are obvious features. The frequency and duration of flooding, as well as the level of salinity,

determines the vegetation composition. In addition, nutrient-enrichment can occur as a result of leaching from the surrounding dune ridges (Gaynor, 2008).

Machair is a highly specialised and complex dune habitat that is confined globally to the north-west coasts of Ireland and Scotland. It comprises a flat or gently undulating sandy plain that develops in an oceanic location with a cool moist climate. Machair systems are highly calcareous, the sediments usually containing a high percentage of shell fragments and having pH values in excess of 7. The vegetation is herbaceous, with a low frequency of sand-binding species (Gaynor, 2006). Irish machair is a priority habitat under the EU Habitats Directive.

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

Detailed descriptions from the Sand Dunes Monitoring Project (Delaney *et al.*, 2013) of each sand dune habitat found in the Dooaghtry sub-site are presented in Appendix V. A total of 224.76ha of sand dune habitats was mapped within Mweelrea/Sheeffry/Erriff Complex SAC, 150.15ha (66.8%) of which represents habitats that are listed as Qualifying Interests for this particular SAC.

4.1 Overall objectives

The overall objective for 'Annual vegetation of drift lines' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*maintain the favourable conservation condition*'.

The overall objective for 'Embryonic shifting dunes' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*maintain the favourable conservation condition*'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*maintain the favourable conservation condition*'.

In the absence of information on the status of this habitat, the overall objective for 'Atlantic decalcified fixed dunes (Calluno-Ulicetea)' in Mweelrea/Sheeffry/ Erriff Complex SAC is to '*maintain the favourable conservation condition*'. This objective is subject to review in light of new information.

In the absence of information on the status of this habitat, the overall objective for 'Dunes with *Salix repens* subsp. *argentea* (Salix arenariae)' in Mweelrea/ Sheeffry/Erriff Complex SAC is to '*maintain the favourable conservation condition*'. This objective is subject to review in light of new information.

The overall objective for 'Machairs' in Mweelrea/Sheeffry/Erriff Complex SAC is to '*restore the favourable conservation condition*'.

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

4.2 Area

4.2.1 Habitat area

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats in the Dooaghtry sub-site during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). During the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013), these baseline maps were checked and revised to account for changes in habitat interpretation and omissions. Updated maps were then produced to reflect the recorded situation on the ground. The revised baseline maps and updated habitat maps from the SDM are included with the individual site report in Appendix V.

The total areas of each Qualifying Interest (QI) sand dune habitat in the Dooaghtry sub-site as estimated by Delaney *et al*. (2013) are presented in the second column of the following table. The total areas of each QI sand dune habitat within the boundary of Mweelrea/Sheeffry/Erriff Complex SAC are presented in the final column.

Habitat	**Total area (ha) of habitat within the Dooaghtry sub-site from SDM**	**Total area (ha) of habitat within the SAC boundary**
Annual vegetation of drift lines (1210)	0.18	0.18
Embryonic shifting dunes (2110)	0.53	0.53
Shifting dunes along the shoreline with *Ammophila arenaria* (2120)	12.43	12.43
Decalcified dune heath (2150)	-	Unknown
Dunes with *Salix repens* (2170)	-	Unknown
Machairs (21A0)	143.74	137.01
Total	**231.77**	**224.76**

The area of annual vegetation of drift lines increased from 0.07ha during the CMP (Ryle *et al.*, 2009) to 0.18ha during the SDM (Delaney *et al.*, 2013). There was no sign that the development of the habitat had been inhibited or that there was any loss of area due to anthropogenic activities (Delaney *et al.*, 2013).

There has been very little change in the area of the embryonic shifting dunes, which decreased from 0.54ha during the CMP to 0.53ha during the SDM. There was no sign of any anthropogenic cause for the reduction in area (Delaney *et al.*, 2013).

The area of marram (*Ammophila arenaria*) dunes (mobile dunes) has decreased from 18.45ha during the CMP to 12.43ha during the SDM. This reduction in habitat was partly due to recovery of disturbed areas which were previously mapped as mobile dunes to fixed dunes (grey dunes) and machair, and also due to natural erosion (Delaney *et al*., 2013).

Within the surveyed part of the sub-site (it was not possible to survey 6.31ha of the habitat due to access issues), the area of machair increased from 136.33ha recorded during the CMP baseline survey to 137.43ha during the SDM. There was some recovery of damaged habitat, but there was also loss of habitat due to erosion in the northern part of the habitat. The total loss of area was equal to 3.9ha, or 2.7% of the area mapped during the CMP baseline survey, and the SDM noted habitat loss was on-going (Delaney *et al.*, 2013).

Dune heath and dunes with creeping willow (*Salix repens*) habitats were not recorded by the CMP (Ryle *et al*., 2009) or during the SDM (Delaney *et al*., 2013).

It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats (Delaney *et al*., 2013).

The general target for this attribute in the case of each habitat is that the area should be stable, or increasing. Bearing in mind that coastal systems are naturally dynamic and subject to change, this target is always assessed subject to natural processes, including erosion and succession.

4.3 Range

4.3.1 Habitat distribution

The distribution of sand dune habitats in Mweelrea/Sheeffry/Erriff Complex SAC, as mapped by Delaney *et al.* (2013), is presented in Appendix II.

Dooaghtry is a large coastal complex situated at the western limit of the SAC which comprises two sand dune systems that are separated by a large rock outcrop. The larger of the two systems is found to the north and stretches from a small clay and rock headland at Kinnadoohy to another headland (Allaran Point) at Dooaghtry. The Owennadornaun River bisects this sand dune system and discharges onto the beach. A lagoon, Corragaun Lough, is also found in this area (Delaney *et al.*, 2013).

The second sand dune system is to the south of the outcrop in a bay known as Silverstrand, which stretches from Lackakeely to Doovilra (Delaney *et al.*, 2013). This has developed from sand blown over rock ridges, which has accumulated on two stepped, rock platforms as machair sand plains (Crawford *et al.*, 1998). The machair is fronted by fragmented mobile dunes and small patches of annual strandline vegetation along the north of the bay. A saltmarsh lies at the head of the bay (Ryle *et al*., 2009).

The greatest area of annual vegetation of drift lines is found in the southern part of the Dooaghtry sub-site (Delaney *et al.*, 2013).

Embryonic shifting dunes habitat was recorded in two small areas in the Dooaghtry sub-site by the SDM. The habitat was somewhat transitional in character, and marram (*Ammophila arenaria*) was frequent in parts (Delaney *et al.*, 2013).

There is a wide band of mobile marram (*Ammophila arenaria*) dunes (white dunes) along the western side of the system at Dooaghtry and for much of the sub-site it fronts directly onto the beach. The habitat also occurs in areas of recovering damage within the dune system, where it is found at the edges of blowouts (Delaney *et al.*, 2013).

Two distinct areas of machair were identified at Dooaghtry by Bassett (1983), one west of Corragaun Lough and the other at Lackakeely. It is the most extensive habitat at Dooaghtry as recorded by the SDM. For the most part it is fronted by fixed dunes (grey dunes); however, in one area it is directly exposed to high tides and is naturally eroding, exposing the underlying peat. The machair habitat tends to be flat in the northern section of the sub-site, but in the southern section it has developed from sand blown over rock (Delaney *et al.*, 2013).

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

4.4 Structure and Functions

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

4.4.1 Physical structure: functionality and sediment supply

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

Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sediment supply is especially important in the embryonic dunes and mobile dunes, as well as the strandline communities where accumulation of organic matter in tidal litter is essential for trapping

sand and initiating dune formation. The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, thus increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

At Dooaghtry, towards the centre of the bay, the Owenadornaun River discharges onto the beach and alterations to its course during winter storms have contributed to the erosion of the dunes. Beyond the river, the dune system peters out, giving way to saltmarsh on the landward edge of the tidal inlet of Corragaun Lough (a sedimentary lagoon) (Ryle *et al.*, 2009). Coastal defences are present close to the outflow the river, but these appear to be longstanding structures which pre-date the implementation of the EU Habitats Directive (Delaney *et al.*, 2013).

According to the SDM, marram (*Ammophila arenaria*) planting is carried out in two locations. In the north, marram planting has taken place at the edges of a large blowout between the fixed dunes (grey dunes) and machair. The blowout is believed to be of partially anthropogenic origin. The marram is sourced from adjacent dunes and appears to be successfully binding the sand. In this area, marram planting is having a positive impact. There is also evidence of marram planting on a steeply sloping dune section adjacent to the high tide mark. This appears to be an attempt to stabilise the steep dune. The structure of the mobile dunes did not appear to have been undermined by the planting and the presence of marram (*Ammophila arenaria*) is unlikely to prevent processes of coastal erosion due to the action of the sea, but it could help to offset the mobility of sand in blowouts of anthropogenic origin (Delaney *et al.*, 2013).

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

4.4.2 Physical structure: hydrological and flooding regime

The conservation of dune slacks and dunes with creeping willow (*Salix repens*) is inextricably linked with the local hydrological regime. Dune slacks are characterised by the proximity of a groundwater table that is maintained by the combination of an impermeable layer in the soil, or deeper salt water and precipitation. Dunes with creeping willow are closely associated with dune slacks but are distinguished from them by a water table that is at a depth that no longer exerts an influence on the vegetation. Most dune slacks are fed by a range of water sources, including precipitation, surface water or groundwater. The last two sources are usually somewhat calcareous while the first is acid.

The most important influence on the nature and vegetation of a dune slack is the groundwater table, which can fluctuate considerably throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water table depth has been identified as the primary determining factor in vegetation variation, followed by weak trends in calcium and sodium availability. Other contributing factors include stage of development, precipitation, distance from the sea, the grazing regime, recreational pressure, nature of the sediment, soil pH and the porosity of the sediment.

Dune slack habitats should never be considered in isolation, but as part of the larger dune system that functions as an eco-hydrological unit. Dune slacks are highly sensitive to human influences on their hydrology, either through water abstraction or drainage works. Generally, the maintenance of a naturally functioning dune slack depends on both the amount of (a) precipitation and (b) groundwater discharge. Water abstraction interferes with the local hydrology, potentially having serious implications for the plant and animal communities of slacks. Abstraction can lower the level of the groundwater table, causing the slacks to dry out. It can also lead to saline infiltration in slacks formed close to the front of a dune system and particularly where the underlying substrate is highly permeable (e.g. shingle).

Typically, the true machair plain represents the area where wind erosion has eroded a dune system to a level just above the water table, where the wet consistency of the sand prevents further erosion. In general, the degree of flatness depends on the age of the system, as well as the underlying topography, geology, outcropping of local rocks and historical management. Machair plains can be terminated on the landward side by a lake or associated marsh/fen (Gaynor, 2006). Consequently, the condition and conservation of the machair habitat can be inextricably linked to the local hydrology.

Wet machair can essentially be compared to humid dune slacks due to the periodic fluctuations and the proximity of the groundwater table to the surface throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water table depth has been identified as the primary determining factor in vegetation variation, followed by weak trends in calcium and sodium availability. Other contributing factors include stage of development, precipitation, distance from the sea, the grazing regime, recreational pressure, nature of the sediment, soil pH and the porosity of the sediment.

Like dune slacks, machair is highly sensitive to human influences on hydrology, either through water abstraction, drainage works or increased nutrient inputs. Water abstraction interferes with the local hydrology, potentially having serious implications for the plant and animal communities of wet machair communities.

The target is to ensure that the hydrological regime continues to function naturally and that there are no increased nutrient inputs in the groundwater.

4.4.3 Vegetation structure: zonation

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

Almost all of the fixed dunes and machair is edged by wide bands of mobile dunes in the Dooaghtry sub-site. West of Corragaun Lough, the wet machair grades into saltmarsh towards the lough (Ryle *et al*., 2009).

The machair also grades into saltmarsh towards the tidal inlet and to different fen types as it approaches the open water of the lough at Carrickskeewaun (Ryle *et al*., 2009).

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

4.4.4 Vegetation structure: bare ground

This target applies to machair and dunes with creeping willow (*Salix repens*). It does not apply to the other Qualifying Interest habitats present where high levels of bare sand are a natural component of the habitat. In the less exposed and fixed areas, some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions, including invertebrates, helping to increase biodiversity.

Bare sand can be exposed due to the action of grazing animals; however, it must be borne in mind that even with a moderate grazing regime, some localised damage is to be expected, because the impact of grazing animals is not applied at the same intensity throughout the site.

Machair and fixed dunes have been fenced off at Doovilra in an effort to protect this area from recreational activities (Ryle *et al.*, 2009).

During the CMP, the structure of the machair had been undermined by rabbit burrowing and bare ground covered approximately 15-20% of the total machair area (Ryle *et al.*, 2009). However, local landowners described large fluctuations in the rabbit population at Dooaghtry, and stated that there had been a period with extremely high numbers before a population crash in the years between the CMP and the SDM. Some recovery of the habitat in the form of revegetating bare ground was recorded during the SDM (Delaney *et al.*, 2013). Nonetheless, the structure of the habitat is not considered to have recovered to the point where a larger rabbit population can be maintained along with livestock. The degree of damage that rabbits have caused in the past at Dooaghtry shows that they are a threat to the machair in the future (Delaney *et al.*, 2013).

The target is not to exceed 10% bare sand. This target is assessed subject to natural processes.

4.4.5 Vegetation structure: sward height

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

Machairs are extensively used in both Ireland and Scotland as commonage areas for grazing. All machair sites are grazed by cattle, or sheep, or both. Sheep are commonly the grazing animal, but the grazing density and sheep:cattle ratio is vital in determining the quality and diversity of the machair (Angus, 1994).

The fixed dunes and machair at Kinnadoohy are fenced into individual fields and stock feeding was evident during the CMP, with ring feeders seen in some fields (Ryle *et al*., 2009).

Rabbits, cattle and sheep graze the machairs at Dooaghtry. Grazing by cattle and sheep are considered positive and neutral respectively, and the rabbit activity is considered to have a medium negative intensity (Delaney *et al*., 2013). The recommended management for machairs in Ireland is winter grazing by cattle. This type of management allows plants to flower and set seed, but prevents the habitat from becoming rank (Cooper *et al*., 2005). Sheep grazing during the summer months tends to result in a tightly grazed sward which will become less diverse over time if herbaceous species fail to set seed. The intensity of sheep grazing at Dooaghtry is very low, but the benefits sheep provide in preventing the habitat from becoming rank are offset by the fact that they are helping to maintain a shorter sward than is optimal at the site. At the levels recorded during the SDM, sheep grazing may be found to be beneficial if rabbit numbers were controlled (Delaney *et al.*, 2013).

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

4.4.6 Vegetation structure: cover and height of creeping willow (Salix repens)

This attribute only applies to the habitat dunes with creeping willow (*Salix repens*).

The target is that there is more than 10% cover of creeping willow (*Salix repens*) and vegetation height should be in the average range of 5-20cm.

4.4.7 Vegetation composition: plant health of dune grasses

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

The Dooaghtry sub-site was surveyed in June by the SDM, a month before sand couch (*Elytrigia juncea*) generally comes into flower (Webb *et al*., 1996), but as all of the shoots were healthy, the health of the typical species was considered to be good on the basis of expert judgement (Delaney *et al*., 2013).

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

4.4.8 Vegetation composition: typical species and sub-communities

Species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance. In the younger, more mobile dunes, marram (*Ammophila arenaria*) is common, while

groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* spp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (*Galium verum*), common bird's-foot trefoil (*Lotus corniculatus*), wild thyme (*Thymus polytrichus*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).

The vegetation of machair is often composed of both wet and dry communities and although there is generally an obvious distinction between the dry and wet types, transitional communities are common (Gaynor, 2006). No suite of species is unique to machair and the vegetation can best be described as a mosaic of calcareous fixed dune, mesotrophic grassland and dune slack communities (Gaynor, 2006).

The following table lists the dominant species listed in dry and wet Irish machair from Gaynor (2006). Differences in the dominant species between the two types of machair plain are indicated by *.

Dry machair	**Wet machair**
Festuca rubra	*Trifolium repens*
Plantago lanceolata	*Agrostis stolonifera*
Trifolium repens	*Calliergonella cuspidata*
Lotus corniculatus	*Festuca rubra*
Bellis perennis	*Bellis perennis*
*Galium verum**	*Plantago lanceolata*
Carex arenaria	*Carex arenaria*
*Rhytidiadelphus squarrosus**	*Potentilla anserina*
*Leontodon taraxacoides**	*Hydrocotyle vulgaris*
Poa pratensis (*subcaerulea*)*	*Lotus corniculatus*
*Homalothecium lutescens**	*Prunella vulgaris*

Other species typically recorded on Irish machair include common yarrow (*Achillea millefolium*), early hair-grass (*Aira praecox*), common mouse-ear (*Cerastium fontanum*), smooth hawksbeard (*Crepis capillaris*), common stork's-bill (*Erodium cicutarium*), eyebright (*Euphrasia officinalis*), common flax (*Linum catharticum*), red bartsia (*Odontites verna*), yellow rattle (*Rhinanthus minor*), biting stonecrop (*Sedum acre*), wild thyme (*Thymus polytrichus*) and violets (*Viola* spp.) (Ryle *et al*., 2009). The calcareous nature of the substrate can be reflected by the presence of thyme-leaved sandwort (*Arenaria serpyllifolia*), crested hair-grass (*Koeleria macrantha*), ox-eye daisy (*Leucanthemum vulgare*) and squinancywort (*Asperula cynanchica*).

The coastal plain at Dooaghtry represents one of the finest examples of machair habitat in Ireland and supports a rich flora including the orchids marsh helleborine (*Epipactis palustris*), the Vulnerable narrow-leaved helleborine (*Cephalanthera longifolia*) and the Near Threatened Irish lady's-tresses (*Spiranthes romanzoffiana*) (Wyse Jackson *et al*., 2016) which have been recorded from the SAC in the past (NPWS, 2016). The latter two species are protected under the Flora (Protection) Order, 2015.

During the CMP, the annual vegetation of drift lines habitat in the Dooaghtry sub-site was dominated by the typical species prickly saltwort (*Salsola kali*) (Ryle *et al*., 2009).

The embryonic shifting dunes at Dooaghtry were somewhat transitional in character, and marram (*Ammophila arenaria*) was frequent in parts. The typical species sand couch (*Elytrigia juncea*) was also recorded (Delaney *et al*., 2013).

The mobile dunes at Dooaghtry were dominated by marram (*Ammophila arenaria*) and the habitat also commonly included dandelion (*Taraxacum* agg.) (Ryle *et al*., 2009).

The typical machair species present at Kinnadoohy recorded by the CMP were creeping bent-grass (*Agrostis stolonifera*), daisy (*Bellis perennis*), sand sedge (*Carex arenaria*), glaucous sedge (*C. flacca*), common mouse-ear (*Cerastium fontanum*), lady's bedstraw (*Galium verum*), fairy flax (*Linum catharticum*), common bird's-foot trefoil (*Lotus corniculatus*), red bartsia (*Odontites vernus*), ribwort plantain (*Plantago lanceolata*), selfheal (*Prunella vulgaris*) and white clover (*Trifolium repens*). Other species present included crested dog's-tail (*Cynosurus cristatus*), red fescue (*Festuca rubra*), Yorkshire fog (*Holcus lanatus*), cat's ear (*Hypochaeris radicata*) and dandelion (*Taraxacum* agg.) (Ryle *et al*., 2009).

The typical machair species west of Corragaun Lough included creeping bent-grass (*Agrostis stolonifera*), daisy (*Bellis perennis*), glaucous sedge (*Carex flacca*), eyebright (*Euphrasia officinalis* agg.), lady's bedstraw (*Galium verum*), marsh pennywort (*Hydrocotyle vulgaris*), fairy flax (*Linum catharticum*), common bird's-foot trefoil (*Lotus corniculatus*), ribwort plantain (*Plantago lanceolata*), silverweed (*Potentilla anserina*), selfheal (*Prunella vulgaris*) and white clover (*Trifolium repens*). Other species present include bog pimpernel (*Anagallis tenella*), red fescue (*Festuca rubra*), cat's ear (*Hypochaeris radicata*), field wood-rush (*Luzula campestris*), buck's-horn plantain (*Plantago coronopus*), sea plantain (*Plantago maritima*), mouse-ear-hawkweed (*Pilosella officinarum*) and dandelion (*Taraxacum* agg.) (Ryle *et al*., 2009).

The plant species composition (including the typical machair species) at Lackakeely is similar to that found on the machair west of Corragaun Lough (Ryle *et al*., 2009).

Petalwort (*Petalophyllum ralfsii*), a liverwort species listed on Annex II of the EU Habitats Directive, occurs extensively on the machair at Dooaghtry (Campbell, 2013; Campbell *et al*., 2015).

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

4.4.9 Vegetation composition: negative indicator species

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

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

the case unless the original vegetation cover has been completely destroyed, as can happen with sea buckthorn, which can form dense impenetrable thickets.

The presence of perennial rye grass (*Lolium perenne*) in places throughout the machair in the Dooaghtry sub-site is indicative of agricultural improvement (Delaney *et al.*, 2013).

Bracken (*Pteridium aquilinum*) encroachment was also recorded as a negative impact in the machair habitat (Delaney *et al.*, 2013).

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

4.4.10 Vegetation composition: scrub/trees

This attribute applies to dune heath, dunes with creeping willow (*Salix repens*) and machair. Scrub encroachment leads to reduction in dune biodiversity and needs to be controlled. The presence of scrub and trees which have deep roots can also lower the groundwater table which can have significant impacts on the slack communities.

The target for this attribute therefore is that the cover of scrub and tree species, other than creeping willow (*Salix repens*) in the habitat dunes with creeping willow, should be under control, or make up less than 5% of the vegetation cover.

4.4.11 Vegetation composition: bryophytes

This attribute applies to machair. Bryophytes are an important element of the machair flora. Frequently occurring species include *Campylium stellatum, Scorpidium revolvens, Ctenidium molluscum* and *Philontis fontana*, most of which are indicative of wet, base-rich conditions.

The CMP recorded the following mosses from the machair habitat in the Dooaghtry sub-site: *Climacium dendroides, Homalothecium lutescens*, *Rhytidiadelphus triquetrus, Thuidium tamariscinum* and *Syntrichia ruralis* subsp. *ruraliformis* (Ryle *et al.*, 2009).

During the SDM, the cover of bryophytes was very low at one monitoring stop in the machair (Delaney *et al.*, 2013).

As mentioned earlier, the Annex II liverwort petalwort (*Petalophyllum ralfsii*) occurs extensively at Dooaghtry and has been recorded on the flat machair plain, on the sides of low sandy hummocks and in areas of flushed machair (Campbell *et al.*, 2015).

The target for this attribute therefore is that the cover of bryophytes should and should always be at least an occasional component of the vegetation.

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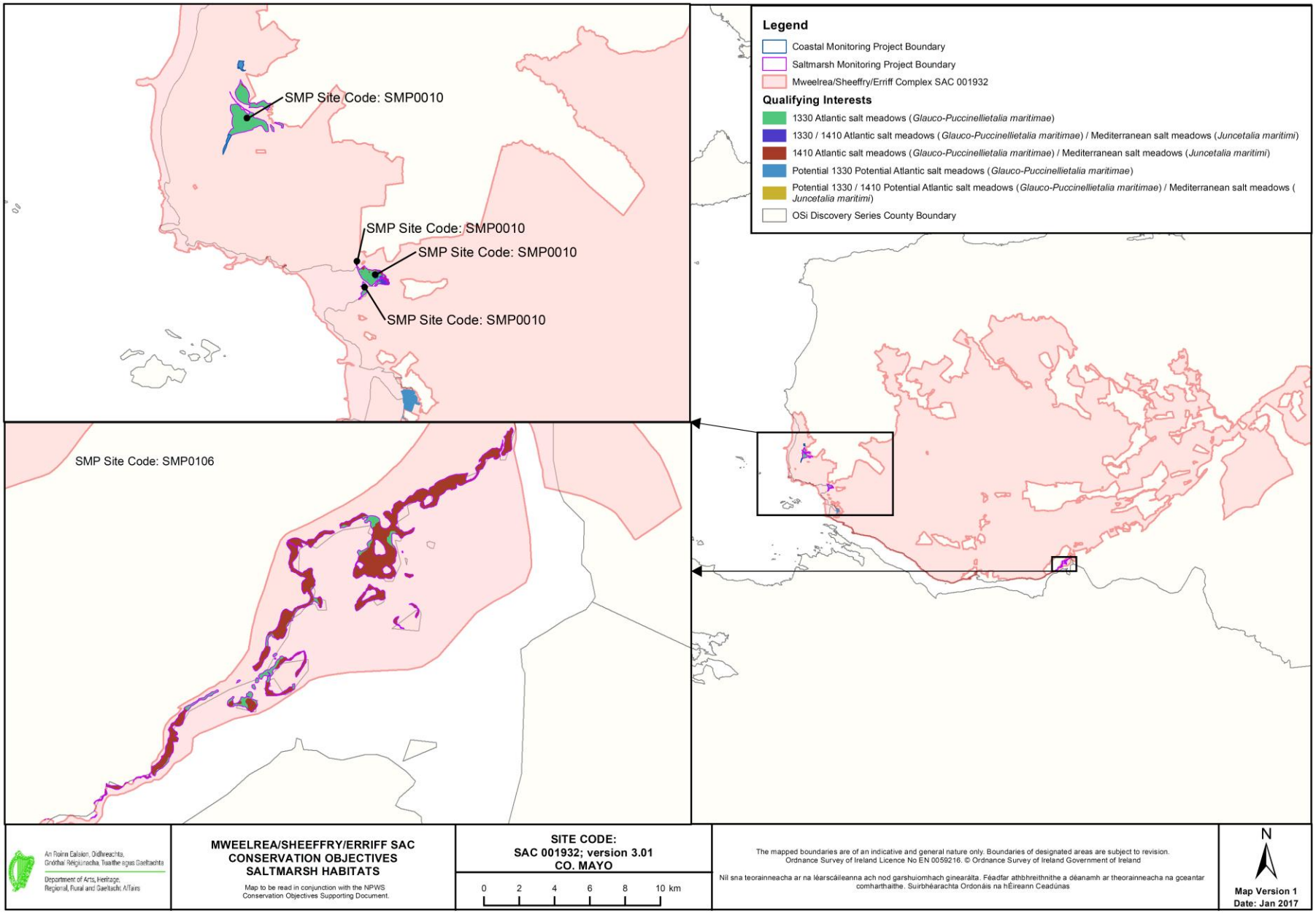
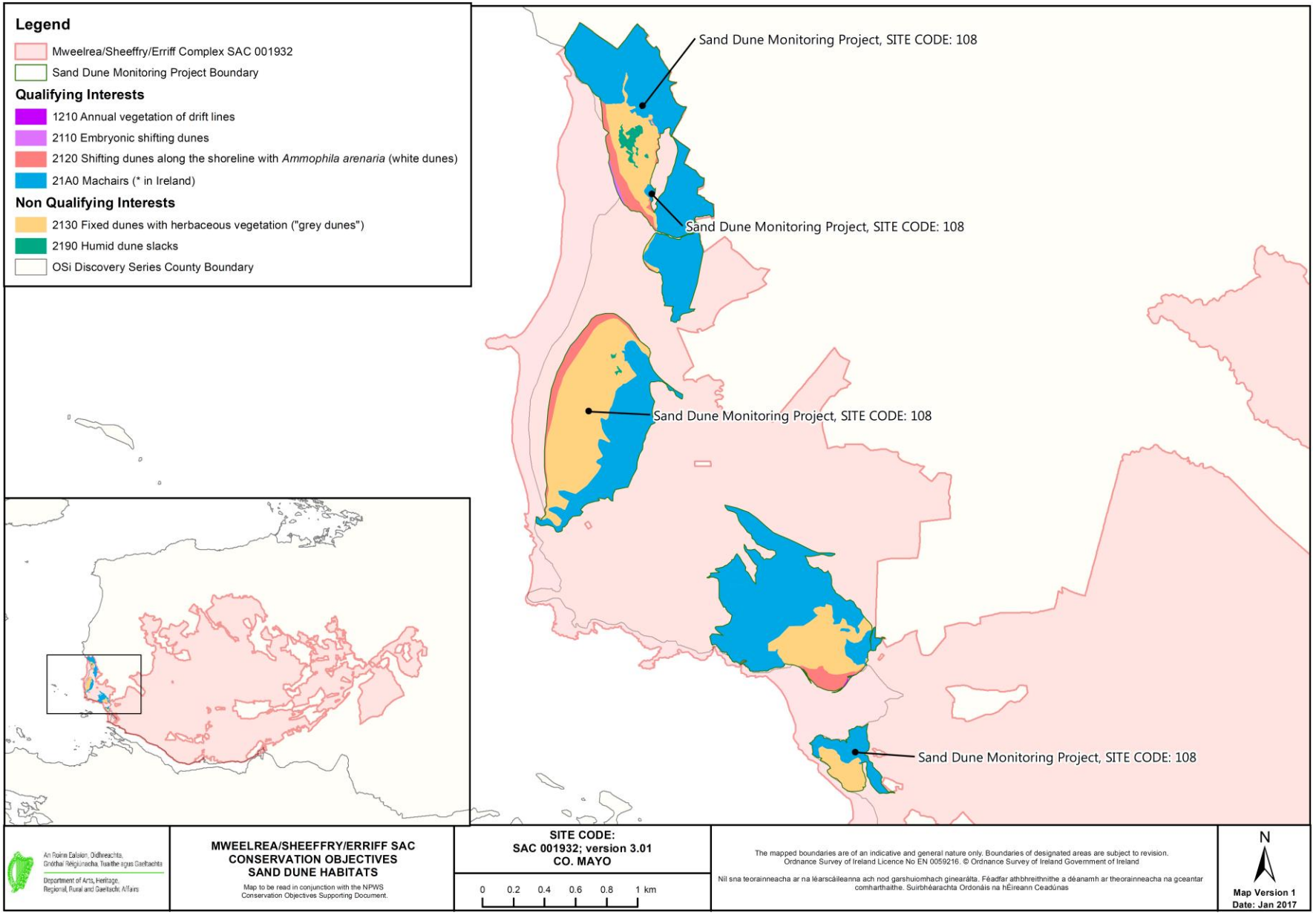
Appendix I – Distribution map of saltmarsh habitats within Mweelrea/Sheeffry/Erriff Complex SAC



Appendix II – Distribution map of sand dune habitats within Mweelrea/Sheeffry/Erriff Complex SAC



Appendix III – Dooaghtry site report and habitat map from the Saltmarsh Monitoring Project (McCorry, 2007)

1 SITE DETAILS

SMP site name: Dooaghtry	**SMP site code:** SMP0010
Site name (Curtis list): Dooaghtry	**CMP site code:** 108
	Site No: (Curtis list): 82
NPWS Site Name: Mweelrea/Sheeffry/Erriff Complex	**Dates of site visit:** 12/07/2006
NPWS designation **cSAC:** 001932 **pNHA:** 001932	**MPSU Plan:** old version
County: Mayo	**Discovery Map:** 37 **Grid Ref:** 075760, 268190
6 inch Map No: Ma105	**Aerial photos (2000 series):** 02385-b, 02385-c, 02386-c, 02453-b
Annex I habitats currently designated for Mweelrea/Sheeffry/Erriff Complex cSAC: Atlantic salt meadows (Glauco-Puccinellietalia maritimae) (1330)	
Saltmarsh type: Sandflats	**Substrate type**: Sand

2 SITE DESCRIPTION

Dooaghtry is located at the foot of Mweelrea Mountain, about 10 km south-west of Louisburgh in south-west County Mayo. The site is also located near the northern side of the mouth of Killary Harbour. The saltmarsh is part of a larger coastal system of significant conservation value, which includes machair, sand dune habitats, coastal lagoon, freshwater lake and freshwater marsh. The machair and sand dune system were surveyed by the Coastal Monitoring Project in 2006. The vegetation of Dooaghtry has been surveyed in the past (Bekkers *et al.* 1976; Crawford *et al.* 1996) along with surveys of many of the other habitats. A vegetation map of the saltmarsh is available from Crawford *et al.* (1996) survey. The coastal habitats occur adjacent to wet grassland, wet and dry heath and blanket bog that extends up the steep slopes towards the upland areas that extend up Mweelrea Mountain.

There have been significant changes to the seaward side of Corragaun Lough and the channel connecting it to the sea since the 1920s. The Mweelrea/Sheeffry/Erriff Complex cSAC conservation plan noted that up to half the lough (actually classified as a lagoon) has been infilled due to accretion. This has affected saltmarsh and other vegetation communities that are located in this area. This area has the appearance of being unstable or in transition at present as the channel is still shifting and sand banks are still accreting. This action (coupled with wind erosion) has created significant areas of pioneer saltmarsh vegetation.

The Annex I habitat Atlantic salt meadows (ASM) present at this site is listed as a qualifying interest for this cSAC. However, a second Annex I habitat Mediterranean salt meadows (MSM) is also present at Dooaghtry. Nearly all of the saltmarsh habitat area is located within the boundary of Mweelrea/Sheeffry/Erriff Complex cSAC. There is a minor area (0.1 ha) excluded from the northern section due to an inappropriate boundary line.

This site is accessed by minor roods via Killadoon that lead to extensive beaches at Trawleckachoolia and Corragaun. There are car-parks at the end of both roads.

3 HABITATS

3.1 General description

This is a moderately sized saltmarsh that is divided into two sections (Table 3.1). The main section of saltmarsh occurs to the south-east of Dooaghtry machair (Trawleckachoolia Bay). A small sheltered plain at the back of the bay has developed saltmarsh. This area is mainly dominated by Atlantic salt meadows (ASM) (1330) on a sandy substrate. There is a thin band of Mediterranean salt meadow habitat (MSM) (1410) along the back of the saltmarsh. Clumps of sea rush (*Juncus maritimus*) are scattered through the ASM but are most common closer to the back of the saltmarsh. There are several areas mapped as mosaics between MSM/ASM, where there are frequent small clumps. A stream flows from the north-west along the seaward side of the saltmarsh and meets a second stream/river along the south-east side. This second stream enters the back of the saltmarsh at the eastern corner and cuts a channel close to the southern boundary. A large sandy beach is present at the front of the bay. This area of saltmarsh is enclosed by steeply sloping land and there is a sudden transition to terrestrial habitats. There is a narrow band of freshwater marsh/wet grassland vegetation with patches of yellow flag (*Iris pseudacorus*) along the landward boundary. There are occasional clumps of sea club-rush (*Bolboschoenus maritimus*) in this transitional zone. Several exposed rock outcrops jut into the saltmarsh.

Saltmarsh also occurs around the seaward side of Corragaun Lough. This area of saltmarsh occurs to the east of the Dooaghtry machair and sand-dune system. The saltmarsh is dominated by ASM. It is present on both sides of the entrance/outflow from Corragaun Lough with the largest area being located to the south. The largest section of saltmarsh is part of a large flat coastal plain and there is a gradual transition to machair vegetation communities towards the west. The saltmarsh plain (and transition to machair) has a sand-based substrate and geomorphologically probably has closer affinities to machair than to traditional saltmarsh. Wind-assisted erosion and accretion of sand is important in this area and probably is a factor accounting for the lack of salt pans in the saltmarsh plain. This area is badly affected by overgrazing. The saltmarsh plant communities found in this area differ from traditional saltmarsh zones and this is probably related to the mode of development and to the disturbance from overgrazing.

There are generally narrow transitions to wet and dry grassland, wet and dry heath, rock outcrops and blanket bog to the landward side of the saltmarsh on moderate to steep slopes along the boundaries of the northern section. The appearance of species such as daisy (*Bellis perennis*), common bird's-foot trefoil (*Lotus corniculatus*), black bog-rush (*Schoenus nigricans*), soft rush (*Juncus effusus*) and sweet vernal grass (*Anthoxanthum odoratum*) mark some of the transitions to these terrestrial habitats.

Table 3.1. Area of EU Annex I habitats listed at Dooaghtry.

EU Code	Habitat	Area (ha)
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	17.77[1]
1410	Mediterranean salt meadows (Juncetalia maritimi)	1.17[2]
	Total	**18. 94**

[1] this total includes 75% of the 1330/1410 mosaic and 50% of the 1330/coastal grassland mosaic.
[2] this total includes 25% of the 1330/1410 mosaic.

3.2 Atlantic salt meadows (H1330)

3.2.1 Southern Section

The two main areas of saltmarsh are dominated by this habitat but are distinctly different. The southern section contains well-developed ASM. Sheep grazing has created a very low sward with miniature versions of salt marsh plants occurring. However, species diversity is relatively high. The vegetation is dominated by mid-high zone species and there is some zonation evident. There is a band of vegetation at the seaward side of the saltmarsh that is dominated by saltmarsh rush (*Juncus gerardii*) and sea milkwort (*Glaux maritima*). This zone also contains frequent sea pink (*Armeria maritima*) and red fescue (*Festuca rubra*), and occasional creeping bent-grass (*Agrostis stolonifera*), sea plantain (*Plantago maritima*), buck's-horn plantain (*Plantago coronopus*), long-bracted sedge (*Carex extensa*), sea arrowgrass (*Triglochin maritimum*) and common saltmarsh-grass (*Puccinellia maritima*). This zone may be on a low ridge with the ASM being dominated by a sea pink/sea plantain-dominated sward behind the ridge. This zone also contains many of the above species. There is some internal saltmarsh zonation along the edges of creeks and salt pans. Here a lower saltmarsh zone is present, dominated by common saltmarsh-grass and sea milkwort. Some of the salt pans contain pioneer vegetation with frequent annual sea-blite (*Suaeda maritima*), sea milkwort and common saltmarsh-grass. Some of these pans are badly poached and disturbed. Small clumps of sea rush are scattered through the ASM area. Some of the larger clumps are mapped as MSM. The sward height is fairly uniform but is varied in the sea rush (MSM) dominated areas. Notable absences from the plant flora include lax-flowered sea lavender (*Limonium humile*) and glasswort (*Salicornia* sp.).

This main section has an excellent creek and salt pan structure. The salt pans at the front of the marsh contain sand and pebbles. Mud and sand is present in the creeks. There is a saltmarsh cliff at the front of the marsh with some eroded sections. A stream flows along the edge of the saltmarsh cliff.

A small area of beach adjacent to the southern area is being colonised by common saltmarsh-grass. This is a transient pioneer saltmarsh zone that probably appears and disappears depending on the local geomorphological cycles and the movement of the sediment along the seaward edge of the saltmarsh.

3.2.2 Northern Section

The northern area of saltmarsh is mainly located between Dooaghtry sand-dune system and Corragaun Lough. The main area of saltmarsh vegetation is located on the southern side of the outflow from Corragaun Lough. This area of saltmarsh has developed on a sandy plain and there is a natural transition to machair at the western side. This area has been badly damaged by sheep overgrazing and vehicle tracks. Saltmarsh vegetation is also present on the northern side of the channel, though in smaller amounts. The vegetation is dominated by sea plantain, saltmarsh rush and sea milkwort. Other species present include common saltmarsh-grass, red fescue, sea pink, sea plantain, sea arrowgrass, creeping bent-grass, brookweed (*Samolus valerandi*) and buck's-horn plantain. Many of the damaged areas have the appearance of pioneer vegetation because they are disturbed. The heavy grazing has created a low close-cropped sward with frequent bare ground cover. There are several sandy channels and large pools along the eastern side that contain spike-rush sp. (*Eleocharis* sp.). The saltmarsh topography is poorly developed in this area with few salt pans and creeks. There is one channel acting as an outflow to a stream that acts as a creek draining the largest area.

There are significant amounts of bare sand cover in the badly damaged areas. However, the northern section also contains areas of pioneer saltmarsh vegetation on sand along the Corragaun Lough

channel and these patches contain naturally occurring bare sand cover. This whole area seems to be in transition and several large blowouts have appeared along the channel since the 2000 aerial photo. The channel is shifting and accreting bare sand banks that are being colonised by saltmarsh vegetation. Wind erosion is probably also a significant factor in this area. These recently vegetated areas are also more vulnerable to damage from overgrazing. The vegetation is dominated by common saltmarsh-grass and sea milkwort. There is occasional buck's-horn plantain. There are frequent low hummocks containing sea pink.

The transitional area to machair contains small raised hummocks with machair vegetation interspersed with ASM saltmarsh vegetation on the lower areas. Eventually the low hummocks begin to coalesce and machair becomes dominant. The change in vegetation from saltmarsh to machair or other coastal grassland is not distinctive.

Saltmarsh is also present on the northern side of the lake and along the channel. Small patches of saltmarsh have developed between rocky outcrops, where the topography allows. The ASM vegetation on this side is similar, being dominated by common saltmarsh-grass and sea milkwort. A similar closely-cropped sward has developed. Grazing is moderate-heavy in this area. Clumps of sea rush occur on peat and the saltmarsh vegetation quickly transitions to wet grassland with soft rush and black bog-rush on peat between these rock outcrops. Some zonation is evident in the saltmarsh vegetation on the larger areas with bands dominated by saltmarsh rush, red fescue and creeping bent-grass developing along the landward terrestrial boundaries. Creek and pan formation is also poor on this side of the channel. Creeks only drain some of the larger areas and several stream channels drain some of the other areas.

3.3 Mediterranean salt meadows (H1410)

This habitat is present in the southern section and is mainly located along the landward boundary. This habitat is also relatively diverse. The larger clumps have been mapped as MSM. There are several areas mapped as mosaic between MSM/ASM, where there is frequent small sea rush clumps interspersed amongst ASM vegetation. These are dominated by a dense fairly uniform sward of sea rush. Some of the larger clumps contain small patches of ASM but these cover less than 5% of the total area. The small ASM areas within the sea rush clumps are also well grazed with a low sward. Other species that occur frequently amongst the sea rush include red fescue, sea pink, autumn hawkbit (*Leontodon autumnalis*), sea plantain and white clover (*Trifolium repens*), along with buck's-horn plantain, saltmarsh rush, sea aster (*Aster tripolium*), common scurvygrass (*Cochlearia officinalis*), creeping bent-grass, parsley water-dropwort (*Oenanthe lachenalii*), sea milkwort and sand sedge (*Carex arenaria*). The MSM does not contain many salt pans.

Several patches of sea rush are located along the northern side of the channel connecting Corragaun Lough to the sea.

4 IMPACTS AND ACTIVITES

4.1 Southern section

There are several different activities at this site (Table 4.1). The activity codes used in Table 4.1 are given in brackets in the following text. The main activity is grazing and this varies significantly on the two different main areas. The southern section is grazed by sheep and has created a distinctive very low sward (140). However, the vegetation is still diverse and the plant ground cover is high. There

are only small minor areas of poaching and overgrazing in the southern section. The sea pink zone has some low light poaching. There is some minor cattle poaching on the southern area (143).

A small area of saltmarsh (0.25 ha) in the southern section has been covered by a car-park (490), which was built by Mayo County Council. This is located at the north-west corner of the saltmarsh. The saltmarsh was previously used as a car-park and for access to the beach (Mweelrea/Sheeffry/Erriff Complex cSAC conservation plan). The creation of a car-park was one of the objectives listed in the conservation plan. It was hoped that the development of this car-park will lower the impact of car-parking on the remaining saltmarsh. There are still some wheel ruts (501) on the saltmarsh, but these affect a very small area. There is a line of telegraph poles across the southern section (511).

A comparison of the 1929 6 inch map and the 2000 aerial photo indicates there a small area (0.12 ha) at the south end of the saltmarsh (Trawleckachoolia Bay) has been eroded away (900). This has probably been caused by shifts in the stream channel at the southern end, and this has increased erosion along the seaward edge. However, there has been some corresponding accretion (910) and new development of saltmarsh (0.14 ha) on the opposite side of the channel along the southern side of Trawleckachoolia Bay.

4.2 Northern section

The northern section around seaward side of Corragaun Lough is badly affected by overgrazing via sheep (142) (Table 4.1). The damage is being made worse by frequent wheel ruts (501). An access track infilled with hardcore is located along the edge of the transition area (501).

A comparison of the 1929 6 inch map and the 2000 aerial photo indicates that there has been significant amounts of accretion and saltmarsh (and other habitats) creation (6.1 ha) at the seaward end of Corragaun Lough. This has occurred on both sides of the channel. This new saltmarsh area is in transition due to shifts in the channel bed, wind erosion and further accretion of sediment from the beach and sand flats. A comparison of the 2000 aerial photos to the 2006 fieldwork indicates that some of the relatively 'new' area has actually been eroded since 2000 (0.3 ha).

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

EU Habitat Code[1]	Activity code[2]	Intensity[3]	Impact[4]	Area affected (ha)	Location of activity[5]
13s	140	C	0	18.94	Inside
1330	143	A	-1	13	Inside
13s	490	A	-2	0.25	Inside
1330	501	A	-1	5	Inside
1330	511	C	0	< 0.1	Inside
1330	900	C	0	1	Inside
1330	910	C	0	1	Inside

[1] EU codes as per Interpretation Manual. Code 13s is an additional code used to signify the entire saltmarsh habitat.
[2] Description of activity codes are found in Appendix III summary report.
[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.
[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.
[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

5 CONSERVATION STATUS

5.1 Overall Conservation Status

Overall, the conservation status of this site is poor (Table 5.1). A conservation plan is available for this cSAC. The current main activity is sheep grazing and the intensity of this activity is high. However, the two main areas of saltmarsh have significantly different status. The southern section has a favourable conservation status while the northern section is unfavourable. No common cordgrass (*Spartina anglica*) was recorded at this site.

The Mweelrea/Sheeffry/Erriff Complex cSAC conservation plan noted that overgrazing is a problem for much of the site but only localised areas of the coastal habitats (saltmarsh and machair) were overgrazed. This seems to indicate that damage from overgrazing has worsened during this period (1999-2006). One of the management objectives is to manage grazing levels.

The medium-term future prospects of natural landward saltmarsh migration in response to sea level rise are poor-moderate. The southern section has very limited scope for migration of saltmarsh habitats landward in response to seal-level rise. This is because of steeply sloping land at the terrestrial boundaries. Much of the saltmarsh is enclosed by rocky outcrops. In the northern section there is a significant transition area from saltmarsh to machair south to the Corragaun Lough channel. This will allow some migration of saltmarsh, but at the expense of machair. The rest of the saltmarsh is enclosed by moderately or steeply sloping land so the opportunities for migration are poor. The northern section is likely to change in the short-term in response to further accretion in Corragaun Lough and its channel. Changes in the sand-dune system will also have an impact on the saltmarsh.

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

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

5.2 Atlantic salt meadows (H1330)

5.2.1 Extent

Overall, the extent of this habitat is assessed as *favourable*. A small area of habitat (~0.15 ha estimated from 2000 aerial photo) has been lost due the construction of a car-park but this is only 3% of the overall area of the southern section and 0.8% of the total ASM habitat. A small area of habitat in the southern section has also been lost due to natural erosion. There has been accretion in both sections, but particularly along the Corragaun Lough channel, since 1929.

A comparison of the 2006 habitat map to 1996 habitat map (Crawford *et al.* 1996) shows some changes in extent (and classification) to the northern section during this period. A relatively large area of saltmarsh (ASM) that was located north of the road (and car park) on the 1996 map is now significantly reduced. A large part of this area has now been classified as machair, dry grassland and wetland habitats (see CMP 2006 survey). A large section of the saltmarsh plain to the south of the Corragaun Lough channel was previously classified as mesotrophic grassland (MGXI) in 1996 but is now classified as ASM. Some land to the south-east of the fence marking the south-east boundary was classified as saltmarsh on the 1996 map. However the 2006 survey indicates that this area was wet grassland/wet heath. These changes in classification have increased the overall extent of ASM

5.2.2 Habitat structure and functions

Overall, the structure and functions of this habitat are assessed as *unfavourable-bad*. The two saltmarsh sections can be assessed separately.

The southern section can be assessed as *favourable*. Four monitoring stops were carried out in this area and they all passed. Sheep grazing has created a characteristic low uniform ASM sward. However, this sward is species rich with most of the characteristic species being present. There is some zonation of ASM saltmarsh vegetation with two main zones (middle-marsh and mid-upper) being present. There was a significant area of pioneer saltmarsh developing on the sandy beach at the western side of the stream. The creek and pan structure is also well-developed. There is also internal zonation of saltmarsh plant communities along the edges of the creeks and pans. Some of the salt pans show signs of poaching but the area involved is minor. There are some small patches of transitional habitats between ASM and terrestrial habitats along the landward boundary, but most of the transitional habitats are located alongside the MSM in the southern section.

The absence of glasswort is notable, but this is probably a natural phenomenon. Annual sea-blite is present in the lower-pioneer zones along the edges of creeks and within some of the pans in conjunction with sea milkwort and common saltmarsh-grass.

The northern section can be assessed as *unfavourable-bad*. Seven stops were carried out in this area and five stops failed. The area affected means that the overall status is *unfavourable-bad*. These failed stops were located on both the northern and southern sides of the Corragaun Lough channel. The failed stops failed to reach targets for 90% plant cover and sward height. This damage was caused by heavy overgrazing by sheep and by vehicle wheel ruts. Significant portions (> 10%) of the ground cover are bare with exposed sand or a green algal mat present. The surface is heavily churned up in places. Species diversity however, has not been affected significantly and the failed stops are generally as diverse as the passed stops. This section did not have a well-developed saltmarsh topography, although the lack of salt pans is probably a natural phenomenon. The saltmarsh vegetation to the south of the Corragaun Lough channel is generally quite uniform with some variation towards the landward boundaries where there are transitions to other zones. There is also a transitional vegetation community present between the saltmarsh and the machair.

A large section of the saltmarsh/machair plain to the south of the Corragaun Lough channel was previously classified as containing a *Juncus bufonius-Agrostis stolonifera* mesotrophic grassland community (MG10) in 1996. This area is now ASM saltmarsh. The area mapped as a transitional machair-saltmarsh habitat was previously mapped as saltmarsh in 1996. It is possible that the vegetation has changed between 1996-2006, as this area is so disturbed. However, differences due to

habitat classification between the two surveys should not be ruled out as the habitats in this area are not distinctive and there are gradual transitions between them.

The overgrazing damage is exacerbated by the fact that a significant part of this area seems to be in natural transition due to wind-assisted accretion in the Corragaun Lough channel and on the adjacent coastal areas. This is affecting the plant communities that are colonising the newly accreting areas. The saltmarsh plain (and transition to machair) to the south of the Corragaun Lough channel has a sand-based substrate and geomorphologically probably has closer affinities to machair than the traditional saltmarsh. Wind-assisted erosion and accretion of sand is important in this area and probably is a factor accounting for the lack of salt pans in the saltmarsh plain. The sand based substrate also means the saltmarsh plant communities are more vulnerable to damage from over-grazing and poaching.

5.2.3 Future prospects

The future prospects of this habitat are assessed as *unfavourable-bad*. This assessment assumes that the current management practises and stocking rates continue in the near future. The current stocking rates and management practises are causing overgrazing, specifically in the northern section.

5.3 Mediterranean salt meadows (H1410)

5.3.1 Extent

Overall, the extent of this habitat is assessed as *unfavourable-bad*. This habitat is mainly found in the southern section. A small area of habitat (~0.10 ha estimated from the 2000 aerial photo) has been lost due the construction of a car park on the southern section. This area is only 3% of the overall area of the southern section but is 8% of the total MSM habitat.

5.3.2 Habitat structure and functions

This habitat is mainly located in the southern section. Four monitoring stops were carried out in this habitat and they all passed. All targets were reached. Sheep grazing in this area is not having a significant impact on the clumps of sea rush. The dense stands of sea rush actually protect the other plants from grazing to some extent and species such as sea plantain and red fescue grow much larger in these clumps. This also increases the overall sward height diversity of the whole saltmarsh. Species diversity within the clumps of sea rush are relatively high. There are few creeks and pans within the MSM but this is due to the fact that its area is not extensive and the clumps of sea rush are scattered amongst the ASM salt pan and creek topography. The MSM generally is located at the back of the southern saltmarsh area and there are only narrow patches of transitional (brackish and freshwater marsh) habitats before the development of terrestrial habitats, as the slope is relatively steep at the back of the saltmarsh.

Small patches of MSM that are located along the Corragaun Lough channel have been negatively affected by overgrazing and poaching in this area. This is due to the high level of overgrazing in the overall area.

5.3.3. Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management practises and stocking rates continue in the near future. The current sheep stocking rates are not having a significant impact on the sea rush dominated (MSM) areas in the southern section.

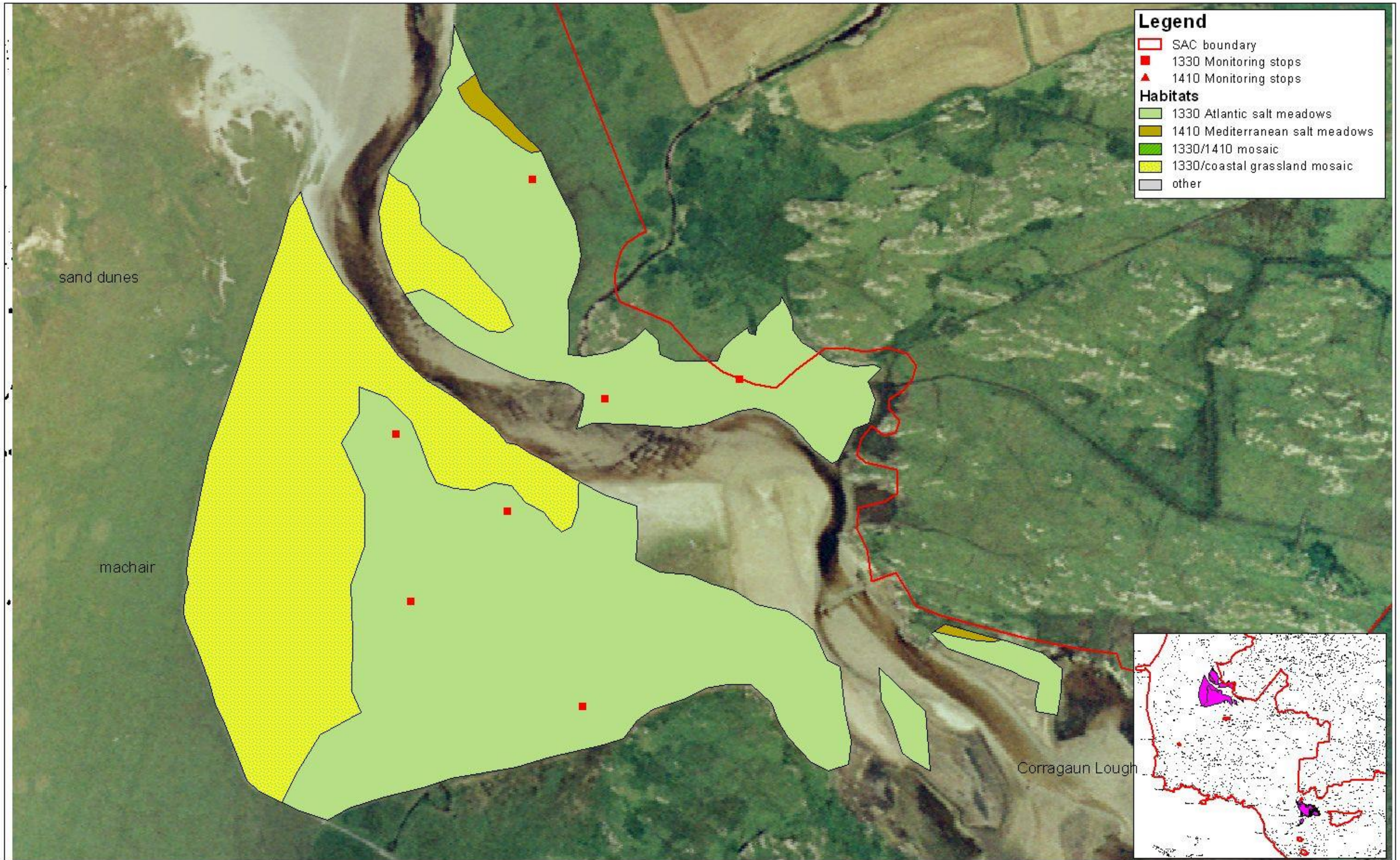
6 MANAGEMENT RECOMMENDATIONS

Overgrazing in the northern section is the most significant activity affecting the saltmarsh at this site. Sheep stocking rates need to be lowered significantly in the short term and for an extended period to allow the vegetation to recover.

7 REFERENCES

Beckers, A., Brock, T. & Klerkx, J. (1976). *A vegetation study of some parts of Dooaghtry, Co. Mayo, Republic of Ireland*. Thesis, Laboratory for Geobotany, Catholic University of Nijmegen.

Crawford et al. (1996). Machair survey. A Report for NPWS.



Saltmarsh Monitoring Project

Dooaghtry (north) (Map 1 of 2)

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government. (Permit number 5953)

Níl sna teorainneacha ar an léarscáil seo ach nod garshuíomhach ginearálta. Féadfar athbhreithniú a dhéanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordanáis le chead ón Rialtas. (Ceadúnas Uimh. 5953)

Mweelrea/Sheefry/Erriff complex cSAC (001932)

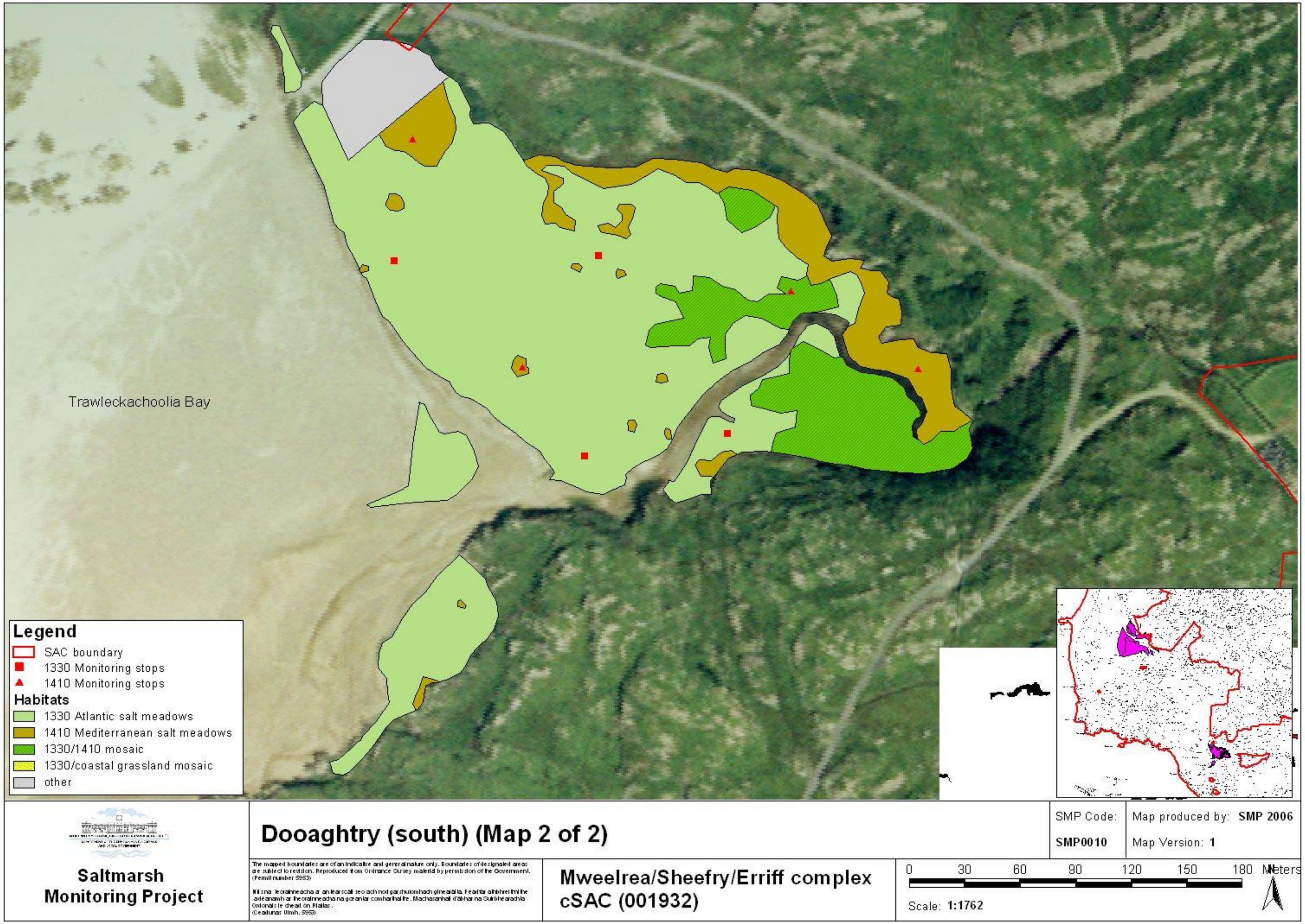
SMP Code: **SMP0010**

Map produced by: **SMP 2006**

Map Version: **1**

0 50 100 150 200 250 Meters N

Scale: **1:2768**


Trawleckachoolia Bay
Legend
SAC boundary
1330 Monitoring stops
1410 Monitoring stops
Habitats
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1330/1410 mosaic
1330/coastal grassland mosaic
other
Saltmarsh Monitoring Project
Dooaghtry (south) (Map 2 of 2)
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government. (Permit number 5953)
(Ceadunas Uimh. 5953)
SMP Code: SMP0010
Map produced by: SMP 2006
Map Version: 1
Mweelrea/Sheefry/Erriff complex cSAC (001932)
0 30 60 90 120 150 180 Meters
Scale: 1:1762

Appendix IV – Aasleagh Falls site report and habitat map from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009)

SITE DETAILS

SMP site name: Aasleagh Falls **SMP site code:** SMP0106
Date of site visit: 23/04/2008 **CMP site code:** N/A
SM inventory site name: Aasleagh Falls **SM inventory site code:** 83

NPWS Site Name: Mweelrea/Sheeffry/Erriff Complex
NPWS designation **cSAC:** 001932 **MPSU Plan:** N/A
pNHA: 001932 **SPA:** N/A

County: Galway/Mayo **Discovery Map:** 37 **Grid Ref:** 089167, 263880

Aerial photos (2000 series): O 2526-A,C **6 inch Map No:** Ma 116

Annex I habitats currently listed as qualifying interests for Mweelrea/Sheeffry/Erriff Complex cSAC:
H1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
H1410 Mediterranean salt meadows (Juncetalia maritimi)

Other SMP sites within this SAC/NHA: Dooaghtry
Saltmarsh type: Fringe **Substrate type:** Wood peat/ stumps

SITE DESCRIPTION

Aasleagh Falls saltmarsh is located along the south Co. Mayo border at the uppermost part of Killary Harbour on the northern side of the fjord. This is an upland area with steep sided slopes on both sides of the fiord meaning that there is little or no saltmarsh development along most of the fiord until suitable topography where the slopes become somewhat less steep at the head of the fiord. The northern side of the fiord is the lower slopes of Ben Gorm Mountain. The Erriff River flows into Killary Harbour from the east. A regional road (R335) between Louisburgh and Leenane is situated along the lower slope of this mountain and follows the shoreline. The main habitats adjacent to the shoreline are dominated by bracken, wet grassland and Dry heath and Wet heath on the adjacent mountain slopes and are typical upland habitats. There are some small low-lying fields containing acid grassland that are grazed. Scrub also develops along the coast where the road is positioned quite close to the shoreline.

The saltmarsh habitat is located in the narrow strip of land between the road and the shore. The site extends from just south of Aasleagh Bridge, where the river becomes tidal, along the shoreline for 1.5 km. The site also incorporates the shoreline of several small islands including Letterass Island. There is some development of intertidal habitats seaward of the saltmarsh and other shore habitats with mixed rocky and muddy sediments with or without wrack cover and mud flats present. The saltmarsh eventually peters out further south and the shoreline is dominated by exposed rock as the steep-sided shoreline topography does not allow further development of saltmarsh.

The site is located within the Mweelrea/Sheeffry/Erriff complex cSAC. Two Annex I saltmarsh habitats are present at this site, Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). Both these habitats are listed as Qualifying Interests for this cSAC. Most of the saltmarsh habitats mapped at this site is located within the cSAC boundary. There are several fragments of Annex I habitats located outside the boundary towards the southern end of the site. These are

unintentional exclusions, as the lower shoreline boundary from the 6 inch map was used to draw the cSAC site boundary and the saltmarsh extends higher than this boundary as indicated from the aerial photos. Some of these habitat fragments are found in adjacent fields marked on the map that are excluded from the cSAC. There is a second SM inventory site in Killary Harbour located on the southern side at Leenane (Curtis and Sheehy-Skeffington 1998) but this site was unsurveyed during this project.

Turf fucoids are the only species of local distinctiveness recorded at this site and these are typical of saltmarsh found along the western coast of Ireland.

The shoreline was easily accessed from the adjacent road. Due to the relatively narrow development of saltmarsh habitat along the shore there were no access issues.

SALTMARSH HABITATS

General description

Aasleagh Falls is a relatively small saltmarsh. The saltmarsh is dominated by Mediterranean salt meadows (MSM) (Table 3.1). Atlantic salt meadows (ASM) only form a minor portion of the saltmarsh habitat. The saltmarsh is mainly a relatively narrow band of habitat that extends along the shoreline. This band is sometimes quite narrow (< 5 m wide) and extends up to 25 m wide. The most extensive saltmarsh development is situated around a small peninsula that contains several knolls surrounded by saltmarsh. The larger terrestrial islands contain scrub and some woodland while the smaller mounds or 'islands' contain heath, wet grassland and exposed rock.

The saltmarsh substrate also varies somewhat. There are several sections with tall steep saltmarsh cliff with exposed peat faces (0.5-1 m high). Other sections have much thinner substrate which is eroding in places and the saltmarsh vegetation forms a mosaic with exposed rock and cobbles. Scattered rocks and cobbles are present on several portions of saltmarsh. There is also some exposed rock in places. The saltmarsh generally transitions to mixed substrate with abundant Wrack cover at the seaward boundary.

The upper saltmarsh boundary is also heterogeneous. Some of the saltmarsh is situated adjacent to mature rhododendron-dominated scrub in places, which over-hangs the saltmarsh in places. At other locations the saltmarsh transitions to wet grassland. There is generally very little transitional vegetation as the shoreline topography and slope is relatively steep. This means the upper transition was generally quite obvious and was sometimes marked by a low cliff above which there was wet grassland with soft rush (*Juncus effusus*) and yellow flag (*Iris pseudacorus*) or vegetation dominated by purple moor-grass (*Molinia caerulea*) with bog myrtle (*Myrica gale*). There are also several minor patches with some purple-moor-grass spreading into saltmarsh vegetation dominated by sea rush (*Juncus maritimus*). Common reed (*Phragmites australis*) and sea club-rush (*Bolboschoenus maritimus*) appears at several locations along the saltmarsh where there is freshwater influence at the outflows of several small streams. These stands have been classified and mapped as CM2 or other Non-Annex saltmarsh vegetation in accordance with the SMP project classification.

Table 3.1. Area of saltmarsh habitats mapped at Aasleagh Falls.

EU Code	Habitat	Area (ha)
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	0.352
1410	Mediterranean salt meadows (Juncetalia maritimi)	2.331
	Total*	**2.683**

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

Atlantic salt meadows (H1330)

The ASM at this site is generally poorly developed with only small fragments present. The vegetation of these small areas is dominated by mid marsh communities with the *Armeria-Plantago* sward prominent in places. A second community also develops that is dominated by saltmarsh rush (*Juncus gerardii*). Some of the fragments are so small that only one community is present with a mixture of species such as common saltmarsh-grass (*Puccinellia maritima*) and saltmarsh rush and zonation is poorly developed. Creeping bent (*Agrostis stolonifera*) sometimes extends down to the seaward boundary. Other species present include sea plantain (*Plantago maritima*), buck's-horn plantain (*Plantago coronopus*), sea pink (*Armeria maritima*), long-bracted sedge (*Carex extensa*), sea milkwort (*Glaux maritima*), sea aster (*Aster tripolium*), sea arrow-grass (*Triglochin maritimum*), sea spurrey sp. (*Spergularia* sp.) and common scurvy-grass (*Cochlearia officinalis*). Larger or wider sections of ASM have some zonation with common saltmarsh-grass more abundant at the lower seaward boundary.

The ASM also contains some sea rush at low cover values. Turf fucoids are also present at several locations. There is also a transition to upper saltmarsh vegetation dominated by red fescue (*Festuca rubra*) and creeping bent (*Agrostis stolonifera*) and zonation is evident at several locations. There are several patches of low marsh sward dominated by common saltmarsh-grass within the ASM and associated with some of the minor creeks.

The ASM sward height is variable (1-10 cm) and is light to moderately grazed. Some small sections are overgrazed but these cover a very minor area. The saltmarsh topography is poorly developed, which is typical of these small fragments of saltmarsh. However several small patches contain a typical mid marsh topography with small eroded pan-like hollows present containing cobbles and pebbles.

Mediterranean salt meadows (H1410)

The MSM habitat contained a typical species assemblage with the vegetation generally being dominated by sea rush with around 50% cover and frequent creeping bent. Other prominent species include red fescue, saltmarsh rush and sea plantain with cover of these species varying. Other species present include sea pink, sea aster, common scurvy-grass, autumn hawkbit (*Leontodon autumnalis*), brookweed (*Samolus valerandi*), sea arrow-grass (*Triglochin maritimum*) and sea milkwort. Zonation in this habitat was generally poorly developed and the habitat was generally homogenous, although it varies in different locations on the site. One monitoring stop contained common saltmarsh-grass amongst sea rush at the seaward boundary of the saltmarsh. Turf fucoids are also present in the MSM habitat.

The sward height of this habitat was typical of this habitat and varied between 5-10 cm. Some of the MSM is quite rocky and the sea rush is growing on mixed substrate with a significant amount of

natural bare substrate cover. Other sections are growing on deeper peaty substrates. The saltmarsh topography is also poorly developed in this habitat although there are some small creeks present in the most extensive area. This section also contains some low mounds and hollows within the SM that relate to underlying topography.

IMPACTS AND ACTIVITIES

A few impacts and activities affect this site with generally low intensities (Table 4.1). This is typical of a relatively small site where the saltmarsh has developed as a relatively narrow strip along the shoreline. The shoreline is grazed by sheep and there is also likely to be some natural grazing (140). The grazing intensity was generally low-moderate with some small minor patches being overgrazing (142).

There has been some recent infilling of spoil (800) along the road that has spilled over onto the shoreline and the saltmarsh. However the area affected is quite minor.

Erosion (900) is not a significant impact at this site and would not be expected as the upper part of Killary Harbour is quite sheltered. However there are some signs of erosion with saltmarsh cliffs present and patches of habitat with a mosaic of saltmarsh and mixed substrate. However this probably reflects the variation in topography and substrate depth along the site rather than an erosional trend. Some of the sea rush has colonised mixed substrate and this may be an indication of re-colonisation of the shoreline. A comparison of the OSI 2nd edition 6 inch map to the OSI 2005 series aerial photos shows that there have been no significant changes along the edge of the saltmarsh during this period. Erosion is assessed as having a neutral impact on a small portion of the saltmarsh.

Impacts and activities adjacent to the site include dispersed habitation (403) grazing (140) and a regional road (502). These activities have little or no measurable impact on the saltmarsh habitats.

Table 4.1. Intensity of various activities on saltmarsh habitats at Aasleagh Falls.

EU Habitat Code[1]	Activity code[2]	Intensity[3]	Impact[4]	Area affected (ha)	Location of activity[5]
1330	140	B	0	0.350	Inside
1330	142	B	-1	0.002	Inside
1330	900	C	0	0.015	Inside
1410	140	C	0	2.331	Inside
1410	800	C	-1	0.001	Inside
1410	900	C	0	0.1	Inside

[1] EU codes as per Interpretation Manual.
[2] Description of activity codes are found in Appendix III, Summary Report 2007-2008.
[3] Intensity of the influence of an activity is rated as A = high, B = medium, C = low influence and D unknown.
[4] Impact is rated as –2 = irreparable negative influence, -1 = reparable negative influence, 0 = neutral, +1= natural positive influence and +2 = strongly managed positive influence.
[5] Location of activity: Inside = activities recorded within and directly impacting the saltmarsh habitat, outside = activities recorded outside but adjacent to saltmarsh habitat that are impacting the saltmarsh habitat.

CONSERVATION STATUS

Overall Conservation Status

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the NHA survey, the 1995, 2000 and 2005 OSI aerial photo series. The baseline information from the NHA survey is generally limited to some descriptions of saltmarsh habitat and does not record the specific condition of the saltmarsh during the survey at this site.

The overall conservation status of this site is assessed as *favourable* (Table 5.1). This site is a typical small western saltmarsh with few significant features of conservation interest that is in relatively good condition. There few impacts and activities significantly affecting this site. Grazing is the most obvious activity but the grazing intensity is low to moderate with very minor patches being overgrazed. The saltmarsh has developed along a rather inaccessible part of the shoreline and is therefore less vulnerable to damaging activities. There is also very little grassland adjacent to the site so grazing intensity is likely to remain low.

The NHA survey notes recorded some grazing on this saltmarsh. This survey (1993) also noted the presence of saltmarsh flat-sedge (*Blymus rufus*) which is a feature of local distinctiveness. This species is mainly confined to saltmarshes along the north-west coast Ireland but has a fragmented distribution and is found occasionally at other sites around the coast. This species was not recorded during this survey.

The medium-term future prospects of natural landward saltmarsh migration in response to sea level rise are poor. The saltmarsh is located on a relatively steep slope with limited possibilities for extensive saltmarsh development on higher slopes.

This site is located within the Mweelrea/Sheeffry/Erriff complex cSAC. A NPWS Conservation Plan is not available for this cSAC.

Table 5.1. Conservation status of Annex I saltmarsh habitats at Aasleagh Falls.

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

Atlantic salt meadows (H1330)

Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to erosion or to land-use changes within the current monitoring period. There are some signs of erosion present but there is no evidence that a significant amount of habitat has been lost during the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Three monitoring stops were carried out in this habitat and all passed. All of the attributes required for the structure and functions of this habitat reached their targets. Grazing was assessed as having a low-moderate intensity and the sward height varied between 1-10 cm high. Typical zonation of the shoreline was poorly developed. However, several ASM vegetation communities were present at different locations on the site including low, mid and upper marsh communities. Species diversity was typical of this habitat. Turf fucoids, an indicator of local distinctiveness, were recorded in this habitat, although this is fairly typical of fringe type marshes along the west coast of Ireland.

The saltmarsh topography was poorly developed although this is also typical of these small ASM fragments. There are natural transitions to other coastal habitats at both the lower and upper ASM boundaries. The ASM form part of a larger coastal ecosystem in Killary Harbour.

Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. There are few impacts or activities significantly affecting this site. There are few prospects for the loss of habitat due to erosion in the future. The site is within a cSAC so the habitat should not be affected by land-use changes such as development.

Mediterranean salt meadows (H1410)

Extent

The extent of this habitat is assessed as *favourable*. There are no indications of any loss of habitat due to erosion or to land-use changes within the current monitoring period. There are some signs of erosion present but there is no evidence that a significant amount of habitat has been lost during the current monitoring period.

Habitat structure and functions

The structure and functions of this habitat are assessed as *favourable*. Five monitoring stops were carried out in this habitat and all passed. All of the attributes required for the structure and functions of this habitat reached their targets. The species assemblage and diversity of this habitat was typical. Shoreline zonation and saltmarsh topography were relatively poorly depended but this is typical of a small site like Aasleagh Falls. There are natural transitions to other coastal habitats at both the lower and upper MSM boundaries. The MSM forms part of a larger coastal ecosystem in Killary Harbour.

Future prospects

The future prospects of this habitat are assessed as *favourable*. This assessment assumes that the current management activities and level of impacts such as grazing continue in the near future. There are few impacts or activities significantly affecting this site. The saltmarsh has developed along a rather inaccessible part of the shoreline and is therefore less vulnerable to damaging activities. There is also very little grassland adjacent to the site so grazing intensity is likely to remain low. There are few prospects for the loss of habitat due to erosion in the future. The site is within a cSAC so the habitat should not be affected by land-use changes such as development.

MANAGEMENT RECOMMENDATIONS

There are no management recommendations for this site.

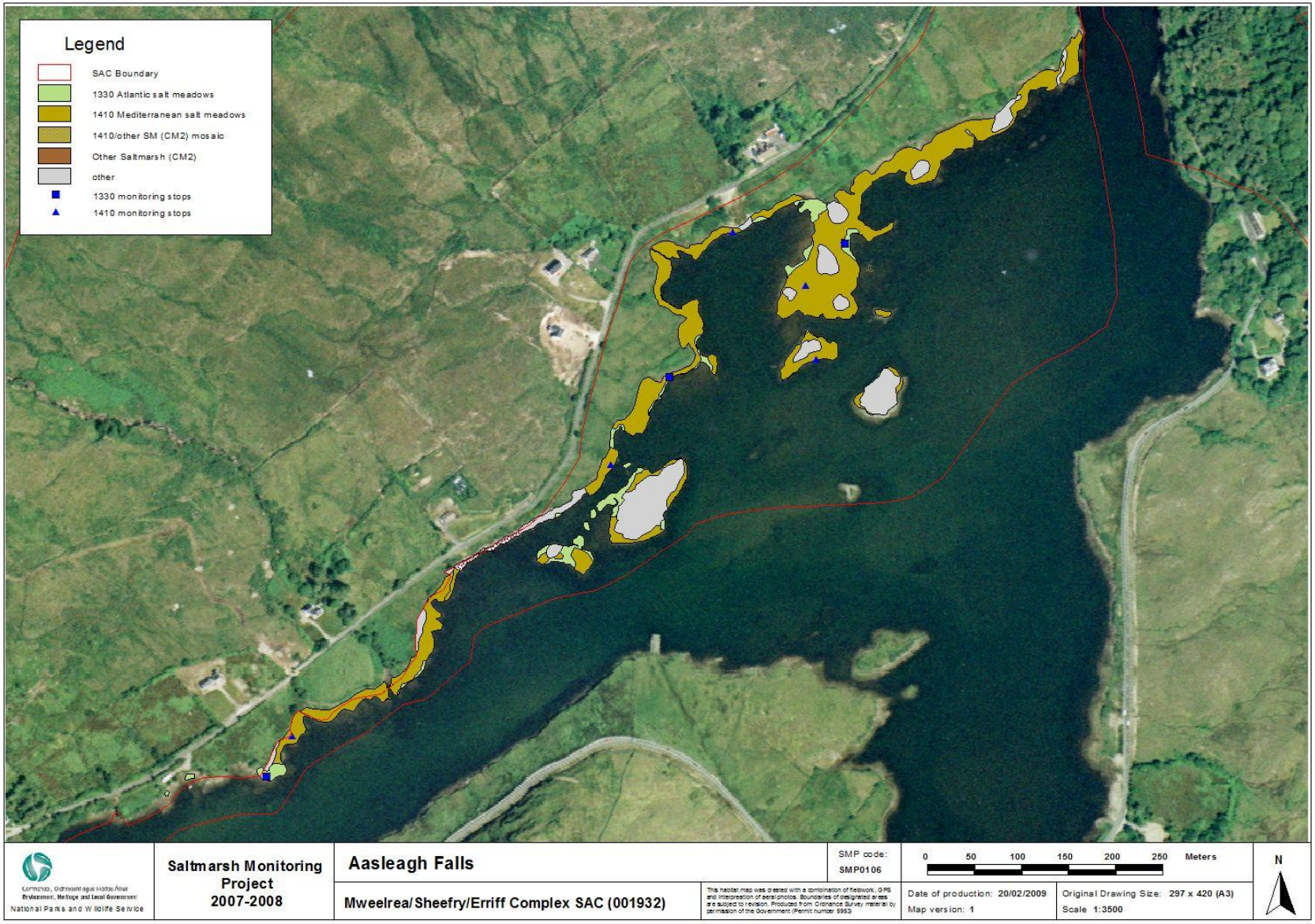
REFERENCES

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

APPENDIX I

Table 8.1. Areas of SMP habitats mapped using GIS.

SM Habitat code	SM habitat description	Mapped Area (ha)	Area (ha)				
			1310	1330	1410	1420	*Spartina* swards
1	1310 *Salicornia* flats						
2	*Spartina* swards						
3	1330 Atlantic salt meadow	0.320		0.320			
4	1410 Mediterranean salt meadow	2.330			2.330		
5	ASM/MSM mosaic (50/50)						
6	ASM/*Spartina* mosaic						
7	1330/other SM (CM2) mosaic						
8	1330/coastal grassland mosaic						
9	Other (non saltmarsh)	0.834					
10	*Spartina* clump/mudflat mosaic (50/50)						
11	Isolated *Spartina* clumps on mud (5%)						
12	pioneer 1330/1310/*Spartina* mosaic						
13	1410/other SM (CM2) mosaic	0.003			0.001		
14	*Spartina* sward dominated, with some ASM						
15	1310/*Spartina* mosaic						
16	ASM dominated with some *Spartina*						
17	1330/sand dune mosaic						
18	Other SM (CM2)						
19	1330/rocky shore mosaic	0.032		0.032			
20	1420 Mediterranean scrub						
21	1310/1330 mosaic						
	Total	**3.519**		**0.352**	**2.331**		


Legend
SAC Boundary
1330 Atlantic salt meadows
1410 Mediterranean salt meadows
1410/other SM (CM2) mosaic
Other Saltmarsh (CM2)
other
1330 monitoring stops
1410 monitoring stops
Saltmarsh Monitoring Project 2007-2008
Aasleagh Falls
SMP code: SMP0106
0 50 100 150 200 250 Meters
N
Mweelrea/Sheefry/Erriff Complex SAC (001932)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
Date of production: 20/02/2009
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:3500
National Parks and Wildlife Service

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

SITE 108 DOOAGHTRY

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

1 SITE DESCRIPTION

Dooaghtry is a large site located 11 km south-west of Louisburgh, and just north of Killary Harbour in the south-west of Co. Mayo. It comprises two sand dune systems which are separated by a large rock outcrop. The larger of the two systems is found to the north of the outcrop and stretches from a small headland at Kinnadoohy to another headland at Dooaghtry. The Owennadornaun River bisects this sand dune system and empties on to the beach. A lagoon, Corragaun Lough, is also found in this area. The second sand dune system is to the south of the outcrop in a bay known as Silverstrand, which stretches from Lackakeely to Doovilra. The site forms part of the Mweelrea/Sheeffry/Erriff Complex SAC (SAC 001932). Six Annex I sand dune habitats (* indicates a priority habitat) were recorded during the CMP: **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes), 2190 Humid dune slacks** and ***21A0 Machairs** (Ryle *et al*., 2009). Other Annex I habitats associated with the sand dunes at Dooaghtry include ***1150 Coastal lagoons, 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), 1410 Mediterranean salt meadows (*Juncetalia maritimi*), *2150 Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), 4010 Northern Atlantic wet heaths with *Erica tetralix*, 4030 European dry heaths** and **5130 *Juniperus communis* formations on heaths or calcareous grasslands.** The rare Annex II liverwort species, *Petalophyllum ralfsii* (petalwort) has been recorded from the ***21A0 Machairs** habitat, but it was not found during the CMP or SDM. A bird species, *Pyrrhocorax pyrrhocorax* (chough) listed on Annex I of the E.U. Birds Directive and the Annex V species the Irish hare (*Lepus timidus hibernicus*) and common frog (*Rana temporaria*) were observed on site during the SDM. The site is used primarily for agriculture (grazing), with the majority of ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs** fenced into separate land holdings.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Dooaghtry was surveyed from the 11th to the 13th of June 2012. Of the six habitats recorded on the site during the baseline survey, all were recorded again during the SDM. The habitats found at Dooaghtry in 2012 and the results of the conservation assessments are presented in Table 1. **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes)**

and **2190 Humid dune slacks** were assessed as Favourable while ***2130 Fixed dunes (grey dunes)** was assessed as Unfavourable-Bad and ***21A0 Machairs** was assessed as Unfavourable-Inadequate. No trend could be established for **1210 Annual vegetation of drift lines** or **2110 Embryonic shifting dunes** as neither habitat was assessed during the CMP due to the small extent of these habitats at the time.

Table 1. Conservation assessment results for all Annex I dune habitats surveyed at Dooaghtry, Co. Mayo.

Habitat	Area	Structure & Functions	Future Prospects	Overall result
1210 Annual vegetation of drift lines	Favourable	Favourable	Favourable	Favourable
2110 Embryonic shifting dunes	Favourable	Favourable	Favourable	Favourable
2120 Marram dune (white dunes)	Favourable (Improving)	Favourable (Stable)	Favourable (Improving)	Favourable (Improving)
*2130 Fixed dunes (grey dunes)	Unfavourable-Bad (Deteriorating)	Unfavourable-Inadequate (Improving)	Unfavourable-Inadequate (Stable)	Unfavourable-Bad (Stable)
2190 Humid dune slacks	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)
*21A0 Machairs	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Improving)	Unfavourable-Inadequate (Improving)	Unfavourable-Inadequate (Improving)

2.1.1 Area

The areas of Annex I sand dune habitats at Dooaghtry are presented in Table 2. Some revisions were made to the baseline areas. The area of **2120 Marram dunes (white dunes)** was altered to take account of a stream that runs through it. The reduction in the area of ***2130 Fixed dunes (grey dunes)** for the revised baseline was the result of more detailed mapping of the boundary with ***21A0 Machairs** and the discovery of a large dune slack in the north of the site. Although the overall area of ***21A0 Machairs** was increased in the revised baseline map, some of the habitat was excluded when the boundary with the adjacent salt marsh was revised. The overall area of the site has increased slightly because of partial recovery of Annex I habitats in the southern part of the site. Due to difficulties in obtaining permission to access a small part of the site in the south, 6.31 ha of ***21A0 Machairs** and 4.69 ha of ***2130 Fixed dunes (grey dunes)** which were mapped during the CMP were not surveyed. A further area of 4.19 ha of ***21A0 Machairs** could only be surveyed from the field boundaries and this area was marked as having been surveyed externally. These areas were mapped as though there was no change in area and are included in the areas shown in Table 2.

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

Habitat	Baseline survey (ha)	Revised baseline (ha)	Sand Dunes Monitoring Project (ha)
1210 Annual vegetation of drift lines	0.07	0.07	0.18
2110 Embryonic shifting dunes	0.54	0.54	0.53
2120 Marram dune (white dunes)	18.71	18.45	12.43
*2130 Fixed dunes (grey dunes)	75.56	66.06	72.89
2190 Humid dune slacks	0.67	2.00	2.00
*21A0 Machairs	137.11	142.64	143.74
Total	232.66	229.76	231.77

2.1.2 *Structure and Functions*

Structure and Functions were assessed for all six Annex I sand dune habitats mapped at Dooaghtry. Table 3 shows the results of the Structure and Functions assessment. All the criteria passed for **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes)** and **2190 Humid dune slacks.** These habitats were therefore assessed as having Favourable Structure and Functions. ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs** were assessed as Unfavourable-Inadequate having one and two criteria fail respectively.

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

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
1210 Annual vegetation of drift lines	2	6	0
2110 Embryonic shifting dunes	4	7	0
2120 Marram dune (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	12	11	1
2190 Humid dune slacks	8	11	0
*21A0 Machairs	16	10	2

2.1.3 *Future Prospects*

Impacts and activities recorded at Dooaghtry are presented in Table 4. Impact codes are assigned according to Ssymanck (2010). Only neutral impacts were recorded in **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes** and **2190 Humid dune slacks.** The negative impacts of off-road driving/vehicle tracks, campfires and dumping were common to **2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes)** and ***21A0 Machairs**. Rabbit grazing was also recorded as a negative impact for ***2130 Fixed dunes (grey dunes)**. Grazing by sheep and cattle was recorded as either a neutral or positive impact for the habitats where they occurred. Active restoration and management of the dune system was evident during the SDM as highlighted by the positive impacts of Marram planting in the **2120 Marram dunes (white dunes)** and ***2130 Fixed dunes (grey dunes)**, and shooting to control the rabbit population. Coastal defences are present close to the outflow the Owenadornaun river, but these appear to be longstanding structures which predate the implementation of the Habitats Directive.

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

Habitat code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
1210	J02.12.01	Rock armour	-	Neutral	0	Outside
2110	J02.12.01	Rock armour	-	Neutral	0	Outside
2120	A04.02.02	Non intensive sheep grazing	Low	Neutral	10	Inside
2120	G01.02	Walking	Low	Neutral	5	Inside
2120	G01.03.02	Tractors	Medium	Negative	1	Inside
2120	G05	Campfires	High	Negative	1	Inside
2120	H05.01	Historic dumping	Medium	Negative	1	Inside
2120	J02.12.01	Rock armour	-	Neutral	0	Outside
2120	J03.03	Marram planting	Medium	Positive	1	Inside
*2130	A04.02.02	Non intensive sheep grazing	Medium	Positive	90	Inside
*2130	F03.01	Shooting (gun shells)	Low	Positive	35	Inside
*2130	G01.02	Horse riding, walking	Low	Neutral	1	Inside
*2130	G01.03.02	Off-road driving (tracks)	High	Negative	1	Inside
*2130	G05	Campfires	High	Negative	1	Inside
*2130	H05.01	Dumping	Medium	Negative	1	Inside
*2130	J02.12.01	Rock armour	-	Neutral	0	Outside
*2130	J03.03	Marram planting	Low	Positive	5	Outside
*2130	K01.01	Erosion	High	Negative	5	Inside
*2130	K04.05	Rabbit damage	Low	Negative	100	Inside
2190	A04.02.02	Non intensive sheep grazing	Low	Neutral	100	Inside
2190	I02	*Iris pseudacorus* dominating small area	Low	Neutral	1	Inside
2190	J02.12.01	Rock armour	-	Neutral	0	Outside
2190	K04.05	Rabbit grazing	Low	Neutral	100	Inside
*21A0	A04.02.01	Non intensive cattle grazing	Medium	Positive	5	Inside
*21A0	A04.02.02	Non intensive sheep grazing	Medium	Neutral	95	Inside
*21A0	D01.01	Gravel track	High	Neutral	1	Inside
*21A0	G01.02	Walking	Low	Neutral	1	Inside
*21A0	G01.03.02	Off-road driving (tracks)	Medium	Negative	1	Inside
*21A0	G05	Campfires	High	Negative	1	Inside
*21A0	H05.01	Historic dumping	Low	Negative	1	Inside
*21A0	I02	*Pteridium aquilinum* encroachment	Low	Negative	1	Outside
*21A0	I02	*Iris pseudacorus* dominating small area	Low	Neutral	1	Inside
*21A0	J02.12.01	Rock armour	High	Neutral	1	Outside
*21A0	K01.01	Erosion	High	Negative	5	Inside
*21A0	K04.05	Rabbit damage	Medium	Negative	100	Inside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Dooaghtry is discussed below. The present conservation status in 2012 is compared with the baseline status and if a habitat is not in Favourable status, the main reasons for the Unfavourable assessment are given. Areas recorded in 2012 are

compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

2.2.1 1210 Annual vegetation of drift lines

The greatest area of habitat is found in the southern part of Dooaghtry. During the CMP, the habitat was not assessed because it covered a small area. No trend could be given for the conservation status of the habitat.

Area

The area of **1210 Annual vegetation of drift lines** increased from 0.07 ha during the CMP to 0.18 ha during the SDM. There was no sign that the development of the habitat had been inhibited or that there was any loss of area due to anthropogenic activities, and Area was assessed as Favourable.

Structure and Function

Two stops were recorded in this habitat. All of the criteria passed during the assessment, and Structure and Functions were assessed as Favourable.

Future Prospects

No negative impacts were recorded in this habitat during the SDM. Future Prospects were assessed as Favourable.

Overall conservation assessment

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

2.2.2 2110 Embryonic shifting dunes

2110 Embryonic shifting dunes were recorded in two small polygons at Dooaghtry. It was somewhat transitional in character, and *Ammophila arenaria* was frequent in parts. The habitat was mapped during the baseline survey, but it was not assessed because of its limited extent. No trend could be established in the conservation assessment.

Area

There has been very little change in the area of **2110 Embryonic shifting dunes**, which decreased from 0.54 ha during the CMP to 0.53 ha during the SDM. There was no sign of any anthropogenic cause for the reduction in area, and Area was assessed as Favourable.

Structure and Functions

All of the criteria passed in the Structure and Functions assessment. The site was surveyed in June, a month before *Elytrigia juncea* comes into flower (Webb *et al.*, 1996), but as all of the shoots were healthy, the health of the typical species was considered to be good on the basis of expert judgement. Structure and Functions were assessed as Favourable.

Future Prospects

No negative impacts were recorded for this habitat, and Future Prospects were assessed as Favourable.

Overall conservation assessment

All of the parameters were assessed as Favourable. The conservation status of **2110 Embryonic shifting dunes** was assessed as Favourable.

2.2.3 2120 Marram dunes (white dunes)

There is a wide band of **2120 Marram dunes (white dunes)** along the western side of the dunes at Dooaghtry, and for much of the site, it fronts directly onto the beach. The habitat also marks recovering damage within the dune system, where it occurs at the edge of blowouts.

Area

The area of **2120 Marram dunes (white dunes)** has decreased from 18.45 ha during the CMP to 12.43 ha during the SDM. This reduction in habitat was partly due to recovery of disturbed areas which were previously mapped as **2120 Marram dunes (white dunes)** to ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs**, and also due to natural erosion. During the baseline survey, Area was assessed as Unfavourable-Inadequate because natural erosion was exacerbated by rabbit burrowing, recreational pressure and trampling by livestock. These were not considered to have had an impact during the SDM and Area was assessed as Favourable (improving).

Structure and Function

Eight stops were recorded in **2120 Marram dunes (white dunes)**, with all passing the Structure and Functions assessment. The decision was taken to pass the habitat despite evidence that marram planting had taken place in one area. The structure of the mobile dunes did not appear to have been undermined by the planting and the presence of marram is unlikely to prevent processes of coastal erosion due to the action of the sea, but it could help to offset the mobility of sand in blowouts of anthropogenic origin. During the baseline survey, Structure and Functions were assessed as Favourable. Structure and Functions were assessed as Favourable (stable) during the SDM.

Future Prospects

Old rock armour, non-intensive sheep grazing and walking represent neutral impacts on **2120 Marram dunes (white dunes)** at Dooaghtry. Marram planting is carried out in two locations. In the north, marram planting has taken place at the edges of a large blowout between the ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs**. The blowout is believed to be of partially anthropogenic origin. The *Ammophila arenaria* here is sourced from adjacent dunes and appears to be successfully binding the sand. In this area, marram planting is having a positive impact. There is also evidence of marram planting on a steeply sloping dune section adjacent to the high tide mark. This appears to be an attempt to stabilise the steep dune. It is considered to be a neutral impact because a very small area is affected and this represents sympathetic coastal management.

Negative impacts include campfires, off-road driving and historic dumping, all of which affect up to 1% of the site. Campfires are considered to be of high intensity because they destroy all of the vegetation binding the substrate and expose the dunes to wind erosion. Off-road driving and historic dumping have a medium impact. Dumping ceased prior to designation, but it is included here as erosion has exposed the rubbish. Burying rubbish is likely to have exacerbated erosion in the past, contributing to the large blowout.

The damage caused by historic dumping is partly ameliorated by marram planting. Campfires and tyre tracks were very rare. During the CMP, rabbit burrowing, livestock trampling and amenity use resulted in the Future Prospects being assessed as Unfavourable-Inadequate. Future Prospects were assessed as Favourable (improving) during the SDM.

Overall conservation assessment

All of the parameters were assessed as Favourable during the SDM. This represented an improvement on the CMP assessment for Area and Future Prospects, while Structure and Functions remained stable. During the CMP, the conservation status was assessed as Unfavourable-Inadequate. The conservation status of **2120 Marram dunes (white dunes)** was assessed as Favourable (improving) during the SDM.

*2.2.4 *2130 Fixed dunes (grey dunes)*

***2130 Fixed dunes (grey dunes)** are extensive at Dooaghtry. They are used as pasture and provide habitat for rabbits. A large warren is present in the ***2130 Fixed dunes (grey dunes)** west of Corragaun Lough. Although rabbits were frequent in 2012, the number of burrows indicates that a far larger rabbit population was present at the site in previous years.

Area

The area of ***2130 Fixed dunes (grey dunes)** increased from 66.06 ha during the CMP to 72.89 ha during the SDM. The main reason for the increase in area was the natural recovery in the south of the site of parts of the habitat which were badly degraded during the baseline survey. Although there has been some recovery in the south of the site, a blow-out in the northern part of the site has expanded into the ***2130 Fixed dunes (grey dunes)**, resulting in a loss of 4.09 ha, or 6.19% of the habitat present during the CMP. This blowout resulted from a combination of natural processes and human activity. Area was assessed as Unfavourable-Inadequate during the CMP. During the SDM, Area was assessed as Unfavourable-Bad (deteriorating) because although some areas of the habitat had recovered through natural processes habitat loss had occurred as a result of anthropogenic activity.

Structure and Function

Twelve monitoring stops were recorded in ***2130 Fixed dunes (grey dunes)**. The habitat passed most of the assessment criteria, but failed the assessment due to having a consistently short sward. Vegetation in ten of the assessment stops was shorter than 5 cm and only one stop had a vegetation height of over 10 cm. This is a sign that overgrazing has diminished the structural diversity of the habitat. Although the other criteria passed the assessment, some of them were close to a fail. There were flowers or fruit in all of the monitoring stops, but the average cover of flowering or fruiting vegetation was only 7.6% and four negative indicator species were recorded. During the CMP, Structure and Functions were assessed as Unfavourable-Bad because of the short sward and disturbance of the habitat. Structure and Functions was assessed as Unfavourable-Inadequate (improving) during the SDM.

Future Prospects

There was extensive sheep grazing carried out at Dooaghtry, with low stocking densities, during the SDM. This in itself is considered to have a positive effect on the habitat. The interaction of sheep grazing with damage by rabbits, however, will exacerbate the issues of low sward height, low average flowering and high bare soil. Current levels of grazing by rabbits are having a low negative impact over the whole site, but if the rabbit population increases to the levels indicated by old, currently disused burrows, the quality of the ***2130 Fixed dunes (grey dunes)** at Dooaghtry will be further degraded. Shotgun shells were found on the site. As rabbits are the most common game present, the impact of shooting was considered to be positive. Erosion was considered to be negative rather than neutral as human activities, such as dumping and agriculture, have exacerbated the problem. Marram planting on bare sand in the north of the site has allowed succession to **2120 Marram dunes (white dunes**) at the edges of a large blowout, and the presence of this habitat acts as a buffer, protecting the ***2130 Fixed dunes (grey dunes)** from further storm damage.

Horse-riding, walking, dumping, vehicle tracks and campfires were also recorded as negative impacts affecting 1% of the site each. The vehicle tracks and campfires were considered to be high intensity impacts as they damage the vegetation, exposing the bare sand beneath. Future prospects were assessed as Unfavourable-Inadequate during the CMP because of threats due to rabbit activity, grazing and recreational use. Stock feeding and erosion were also recorded. During the SDM, Future Prospects were assessed as Unfavourable-Inadequate (stable).

Overall conservation assessment

Area was assessed as Unfavourable-Bad, while Structure and Functions and Future Prospects were assessed as Unfavourable-Inadequate. Conservation status was assessed as Unfavourable-Bad during the CMP because Structure and Functions were assessed as Unfavourable-Bad and Area and Future Prospects were assessed as Unfavourable-Inadequate. During the SDM, the conservation assessment of ***2130 Fixed dunes (grey dunes)** at Dooaghtry was assessed as Unfavourable-Bad (stable).

2.2.5 2190 Humid dune slacks

Part of the **2190 Humid dune slacks** habitat which was mapped during the baseline survey was reclassified as ***21A0 Machairs** because it corresponded well with wet machair and did not have the typical dune slack morphology. However, this was balanced by the discovery of a large slack in the northern section of the site. This slack is unusual because a small stream runs through it; therefore the slack is fed both by ground water and surface water. The landowner has observed winter flooding of this slack.

Area

There was no change in the area of **2190 Humid dune slacks** (2.00 ha). During the CMP, Area was assessed as Favourable. During the SDM, area was assessed as Favourable (stable).

Structure and Function

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

Future Prospects

Three low intensity, neutral impacts were recorded within this habitat: non-intensive sheep grazing and rabbit grazing each affect 100% of the habitat and a problematic native species (*Iris pseudacorus*) affects 1% of the habitat. None of these impacts poses a threat to the **2190 Humid dune slacks** habitat at current levels. Future prospects were assessed as Favourable during the CMP. During the SDM, Future Prospects were assessed as Favourable (stable).

Overall conservation assessment:

All three parameters were assessed as Favourable during the SDM, as they were during the CMP. The conservation status of **2190 Humid dune slacks** was assessed as Favourable (stable) during the SDM.

*2.2.6 *21A0 Machairs*

***21A0 Machairs** is the most extensive habitat at Dooaghtry. For the most part it is fronted by ***2130 Fixed dunes (grey dunes)**, however in one area it is directly exposed to high tides and is naturally eroding, exposing the underlying peat. The ***21A0 Machairs** habitat tends to be flat in the northern section of the site, but in the southern section, it has developed from sand blown over rock.

Area

Within the surveyed part of the site; it was not possible to survey 6.31 ha of the habitat, the area of ***21A0 Machairs** increased from 136.33 ha during the baseline survey to 137.43 ha during the SDM. There was some recovery of damaged habitat, but there was also loss of habitat due to erosion in the northern part of the habitat. The total loss of area was equal to 3.9 ha, or 2.7% of the area mapped during the baseline survey. Area was assessed as Unfavourable-Inadequate during the CMP because of erosion exacerbated by overgrazing. During the SDM, Area was assessed as Unfavourable-Inadequate (stable) because habitat loss continued to occur.

Structure and Functions

Two criteria failed in the Structure and Functions assessment, and these assessed the presence of agricultural species and low sward height. Grazing pressure and trampling by animals is high at Dooaghtry, and there are signs of agricultural improvement in the ***21A0 Machairs** habitat. The presence of *Lolium perenne* in five stops is indicative of agricultural improvement. This is detrimental to the plant diversity of the ***21A0 Machairs**. During the CMP, Structure and Functions were assessed as Unfavourable-Bad because the sward was uniformly very short and there was little flowering or fruiting. The cover of bryophytes was also very low at one monitoring stop, and negative indicator species cover was high at another. Structure and Functions were assessed as Unfavourable-Inadequate (improving) during the SDM.

Future Prospects

Rabbits, cattle and sheep graze the ***21A0 Machairs** at Dooaghtry. Grazing by cattle and sheep are considered positive and neutral respectively, and the rabbit activity is considered to have a medium intensity negative effect.

While grazing affects 100% of the habitat, each of the other impacts, except erosion, only affects 1% of the ***21A0 Machairs**. Campfires represent the most serious threat with a high intensity negative effect. Campfires pose a threat as they destroy the vegetation where they are lit and leave bare sand exposed which can result in the development of blowouts. Erosion was recorded as a high intensity negative effect, which is exacerbated by rabbit burrowing. Other negative impacts recorded during the SDM included bracken encroachment and vehicle tracks.

Future Prospects were assessed as Unfavourable-Bad during the CMP because of overgrazing by rabbits and sheep, recreational use and erosion exacerbated by rabbit burrowing. During the SDM, Future Prospects were assessed as Unfavourable-Inadequate (improving).

Overall conservation assessment

Area, Structure and Functions and Future Prospects were all assessed as Unfavourable-Inadequate during the SDM. This is more favourable than the conservation assessment during the CMP, when two of the parameters were assessed as Unfavourable-Bad. The conservation status of ***21A0 Machairs** was assessed as Unfavourable-Inadequate (improving) during the SDM.

3 DISCUSSION

3.1 Qualifying interests for SAC

The Natura 2000 standard data form for Mweelrea/Sheeffry/Erriff Complex SAC (SAC 001932) records over twenty Annex I habitats as Qualifying Interests, of these six are Annex I sand dune habitats. These habitats are shown in Table 5. ***2130 Fixed dunes (grey dunes)** are not included on the list of Qualifying Indicators. ***2150 Decalcified dune heaths** and **2170 Dunes with creeping willow** were not found during the CMP or SDM at Dooaghtry. Of the other four Annex I sand dune habitats, the conservation status of **1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed more favourably during the SDM than compared to the Natura 2000 standard data form, and ***21A0 Machairs** was assessed less favourably during the SDM.

Table 5. Relevant Qualifying Interests for Mweelrea/Sheeffry/Erriff Complex SAC 001932 (NPWS, 1997)

Habitat	Area (%)	Representativity	Relative surface	Conservation status	Global assessment
1210 Annual vegetation of drift lines	1	C	C	B	C
2110 Embryonic shifting dunes	1	C	C	B	C
2120 Marram dunes (white dunes)	1	B	C	B	B
*2150 Decalcified dune heath	1	B	C	B	B
2170 Dunes with creeping willow	1	B	C	B	C
*21A0 Machairs	2	A	B	B	A

3.2 Rabbit population

Local landowners described large fluctuations in the rabbit population at Dooaghtry, and stated that there had been a period with extremely high numbers before a population crash in the years between the CMP and the SDM. Rabbits were frequent on the site, but the number of rabbit burrows observed

supports claims that the population was much larger previously. Rabbits graze ***21A0 Machairs** and ***2130 Fixed dunes (grey dunes)** very tightly and disturb the substrate by burrowing and scraping. In the absence of other grazers, they can be beneficial to sand dune habitats by adding structural diversity and providing bare sand. Some recovery of the habitat can be seen in the form of revegetating bare ground, and local people stated that the rabbit population crashed several years ago and began to recover in 2012. Currently, the structure of the habitat is not considered to have recovered to the point where a larger rabbit population can be maintained along with livestock. The degree of damage rabbits have caused in the past at Dooaghtry shows that they are a threat to the ***21A0 Machairs** and ***2130 Fixed dunes (grey dunes)** habitats in the future.

3.3 Agriculture

Cattle grazing has a positive impact on the ***21A0 Machairs** at Dooaghtry, and sheep grazing has a neutral impact. The recommended management for ***21A0 Machairs** in Ireland is winter grazing by cattle. This type of management allows plants to flower and set seed, but prevents the habitat from becoming rank (Cooper *et al*., 2005). Sheep grazing during the summer months tends to result in a tightly grazed sward which will become less diverse over time if herbaceous species fail to set seed. The intensity of sheep grazing at Dooaghtry is very low, but the benefits they provide in preventing the habitat from becoming rank are offset by the fact that they are helping to maintain a shorter sward than is optimal at the site. At current levels, sheep grazing may be found to be beneficial if rabbit numbers were controlled.

3.4 Erosion

Although the exact reason for the erosion cannot be stated with certainly, it is likely to relate to the disturbance of the substrate by diggers when the area was used for dumping prior to designation along with the impact of grazing by rabbits and domestic animals. One landowner has had some success in reducing erosion on his land by aiding the spread of *Ammophila arenaria* to bare sand within the dunes. However, wind erosion is causing further losses to the ***2130 Fixed dunes (grey dunes)** habitat in adjacent land, and there appears to be no strategy in place to arrest the erosion.

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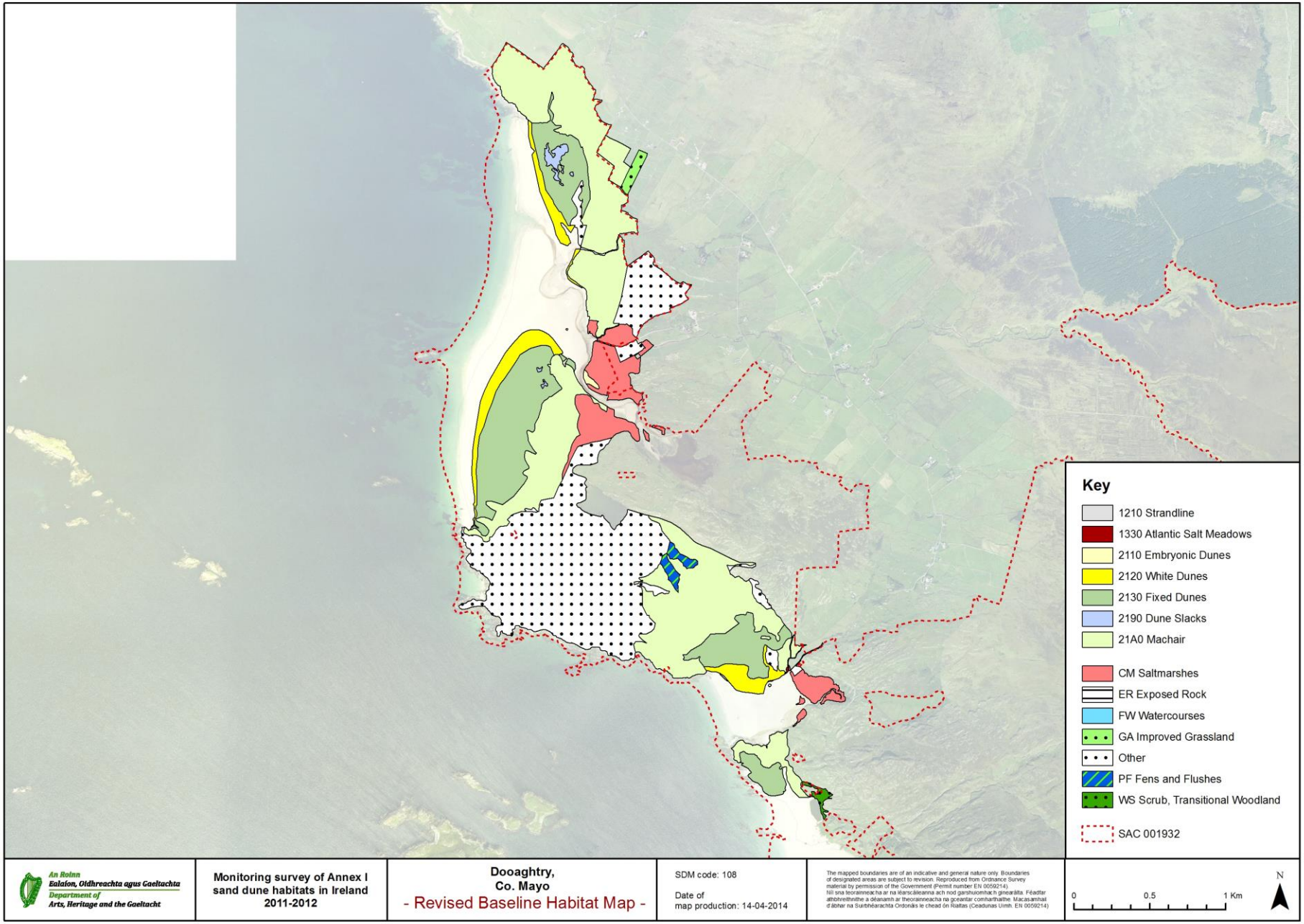
Key
1210 Strandline
1330 Atlantic Salt Meadows
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
2190 Dune Slacks
21A0 Machair
CM Saltmarshes
ER Exposed Rock
FW Watercourses
GA Improved Grassland
Other
PF Fens and Flushes
WS Scrub, Transitional Woodland
SAC 001932
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
Dooaghtry, Co. Mayo
- Revised Baseline Habitat Map -
SDM code: 108
Date of map production: 14-04-2014
The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059214).
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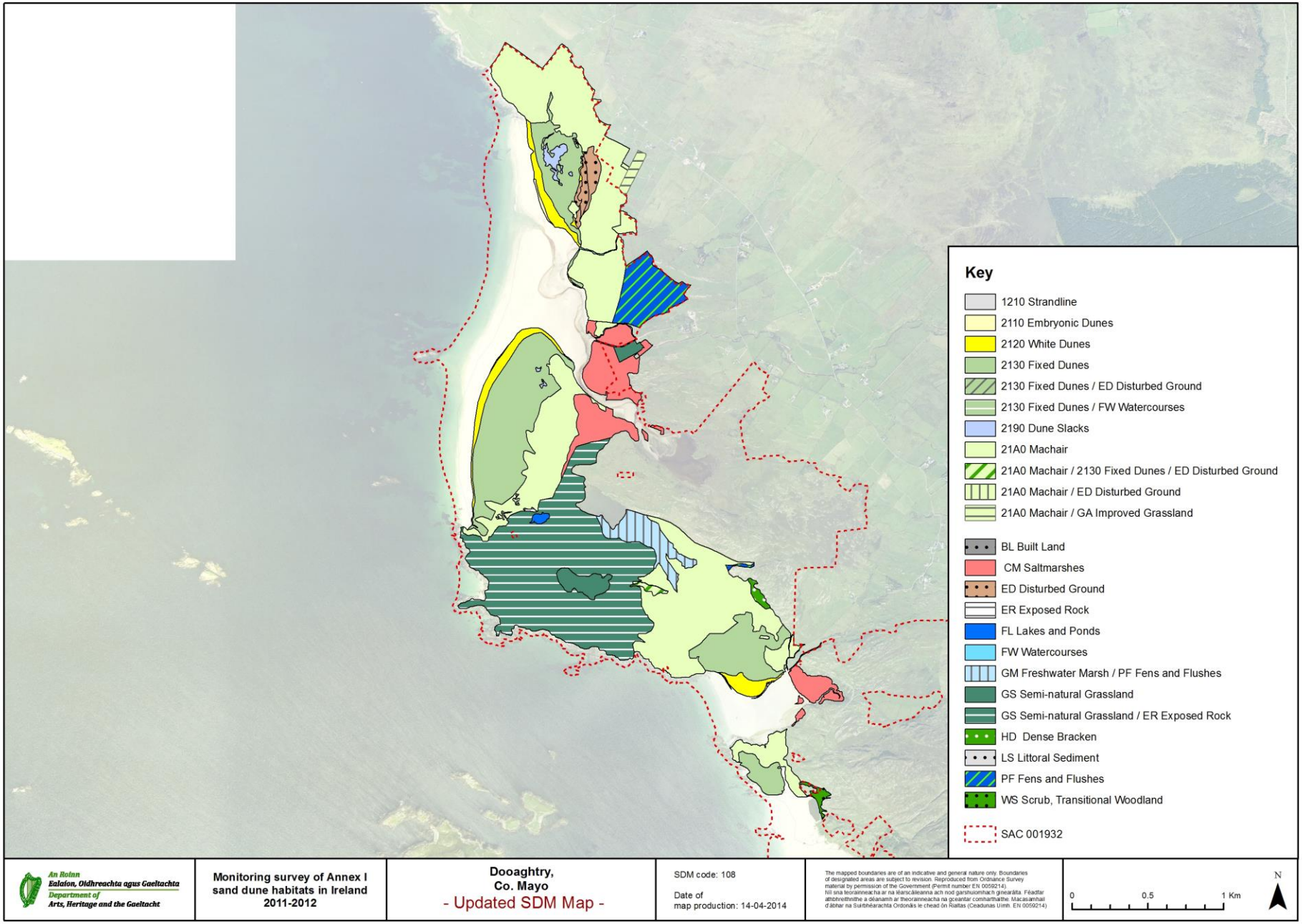
Key
1210 Strandline
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
2130 Fixed Dunes / ED Disturbed Ground
2130 Fixed Dunes / FW Watercourses
2190 Dune Slacks
21A0 Machair
21A0 Machair / 2130 Fixed Dunes / ED Disturbed Ground
21A0 Machair / ED Disturbed Ground
21A0 Machair / GA Improved Grassland
BL Built Land
CM Saltmarshes
ED Disturbed Ground
ER Exposed Rock
FL Lakes and Ponds
FW Watercourses
GM Freshwater Marsh / PF Fens and Flushes
GS Semi-natural Grassland
GS Semi-natural Grassland / ER Exposed Rock
HD Dense Bracken
LS Littoral Sediment
PF Fens and Flushes
WS Scrub, Transitional Woodland
SAC 001932
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
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- Updated SDM Map -
SDM code: 108
Date of map production: 14-04-2014
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