

**Donegal Bay (Murvagh) SAC (site code 133)
Conservation objectives supporting document
-coastal habitats**

NPWS

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Please note that the opinions expressed in the site reports from the Coastal Monitoring Project are those of the authors and do not necessarily reflect the opinion or policy of NPWS.

**Please note that this report should be read in conjunction with the following report:
NPWS (2011) Conservation Objectives: Donegal Bay (Murvagh) SAC 000133. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.**

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (Commission of the European Communities, 2003). 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.

Donegal Bay (Murvagh) SAC is situated in the extreme inner part of Donegal Bay. It is typically estuarine in character, with large expanses of intertidal sand and mud flats, channels, saltmarsh, sand dunes and sandy and shingle beaches. The site is a good example of a sheltered estuarine system. There are two separate dune systems located within the SAC: Mullanasole and Mountcharles. The distribution of the dune habitats in Donegal Bay is presented in Appendix I.

Mullanasole sand dune system occurs in the inner part of Donegal Bay SAC, on the Murvagh Peninsula. The peninsula consists of a large sand dune system, fronted by a wide sandy beach on the seaward side with saltmarsh fringing dunes on the more sheltered eastern side of the peninsula. High sand dune ridges dominate the sand dune system in the north of the peninsula, sloping to flat dune grassland southwards as far as Loughtone Hill at Mullanacross. The northern part of Mullanasole dunes was developed as a golf course by Donegal Golf Club in 1973. A large part of the course was used for potato cultivation prior to the golf course development (Gaynor and Browne, 1999). Most of the southern low-lying dune area is occupied by conifer plantation, planted in the early 1980's by Coillte Teoranta (Ryle *et al.*, 2009).

Mountcharles sand hills occur on the northern shore of Donegal Bay. These sand hills form an island but are joined to the mainland by a narrow neck of land composed of sand and shingle. Shingle appears to form a significant part of the underlying substrate in the sand hills. Despite the degraded nature of the site, there are a number of Annex I habitats at Mountcharles, the most abundant being Fixed dunes. Other Annex I habitats at the site include: Annual vegetation of driftlines, Perennial vegetation of stony banks, Embryonic shifting dunes and Shifting dunes along the shoreline with *Ammophila arenaria* (Ryle *et al.* 2009).

Donegal Bay (Murvagh) SAC is designated for two sand dune Annex I habitats:

- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)
- Humid dune slacks (2190)

The following eight coastal habitats have also been recorded within this SAC:

- Perennial vegetation of stony banks (1220)
- *Salicornia* and other annuals colonising mud and sand (1310)
- Atlantic salt meadows (1330)
- Mediterranean salt meadows (1410)
- Annual vegetation of drift lines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Dunes with *Salix repens* ssp *argentea* (2170)

Perennial vegetation of stony banks (1220) relates to shingle and was recorded from two subsites in the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). The distribution of the known shingle sites in Donegal Bay SAC is presented in Appendix I. The second, third and fourth habitats listed above are saltmarsh habitats and were recorded and mapped at three subsites by the Saltmarsh Monitoring Project (SMP) (McCorry & Ryle, 2009). They were also mentioned and mapped at two subsites of the CMP (Ryle *et al.*, 2009). The distribution of the saltmarsh habitats in Donegal Bay SAC is presented in Appendix II. The last four habitats in the list are associated with sand dunes and were documented and mapped from the two subsites in Donegal Bay surveyed by the CMP (Ryle *et al.* 2009). Although the habitats above are not listed as qualifying interests for the site they form an integral part of the dynamic coastal system in Donegal Bay, as they occur in close association with the fixed dunes and dune slacks.

This backing document sets out the conservation objectives for the two coastal habitats listed as qualifying interests for Donegal Bay (Murvagh) SAC, which are defined by a list of parameters, attributes and targets. The main parameters are (a) Range (b) Area and (c) Structure and Functions, the latter of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **sand dune habitats** are based primarily on the results of the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) and this document should be read in conjunction with that report. As part of the CMP, detailed individual reports and habitat maps were produced for two sub-sites (Mullanasole and Mountcharles) and these are included in a set of Appendices to this document (Appendix III & IV). The conservation objectives for the sand dune habitats in Donegal Bay are based on the findings of the individual reports for each of these sites. It is thought that the two sub-sites as surveyed by the CMP represents the total area of sand dunes within Donegal Bay (Murvagh) SAC.

2 Conservation Objectives

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

3 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 9 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* (2120)
- **Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) ***
- Decalcified dunes with *Empetrum nigrum* (2140) *
- Decalcified dune heath (2150) *
- Dunes with *Salix repens* (2170)
- **Humid dune slacks (2190)**
- Machair (21AO) *

Six of the dune habitats listed above were recorded by Ryle *et al.* (2009), but only the two habitats indicated in bold are listed as Qualifying Interests for Donegal Bay (Murvagh) SAC. Of the four non-listed habitat types, three of these (annual vegetation of drift lines, embryonic shifting dunes and shifting dunes along the shoreline with *Ammophila arenaria*) are associated with the mobile areas at the front of dune systems, while one (dunes with *Salix repens*) occurs in a mosaic with dune slacks.

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.

At the Mullanasole subsite on the Murvagh peninsula, fixed dunes rich in bryophytes occur. The habitat is particularly well developed at the north-eastern end of the peninsula. Most of the interior of the Murvagh peninsula may have been colonised by fixed dune prior to damage by afforestation in the early 1980s by Coillte Teoranta and golf course creation in 1973 by Donegal Golf Club. The fixed dunes are currently eroding (Ryle *et al.*, 2009). Hard coastal protection has been installed in the form of rock armour overlain with sand and planted with lyme grass (*Leymus arenarius*). The dunes are ungrazed and are dominated by rank grasses including marram (*Ammophila arenaria*), false oat grass (*Arrhenatherum elatius*) and red fescue (*Festuca rubra*). Species diversity is low, with the greatest diversity occurring in the fixed dune area next to the south-western boundary of the golf course, where it is associated with dune slack and dunes with *Salix repens*. This mosaic is of high ecological interest due to the rarity of such diverse areas in the sand dune system of Mullanasole (Ryle *et al.*, 2009).

At the Mountcharles subsite, the greater part of the sand dune area supports fixed dunes. However, because of the intensive stock rearing activities that dominate the land usage and have caused damage to the site, the dune grassland is in the form of fragmented habitat remnants (Ryle *et al.*, 2009).

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).

Within Donegal Bay (Murvagh) SAC, humid dune slacks were recorded at the Mullanasole subsite by the CMP. At this site, dune slacks and dunes with *Salix repens* occur in close association with the conifer plantation and fixed dunes next to the south western boundary of the golf course. The Red Data book species round-leaved wintergreen (*Pyrola rotundifolia* ssp. *maritima*) has also been recorded at this site. Preston *et al.* (2002) show this species to have a very restricted distribution, the only other known Irish site being the Raven in County

Wexford. However, this species has recently also been found at Strandhill dunes in County Sligo (K. Gaynor, pers. comm.). The species is associated with coniferous plantation at all three known locations.

Dune slacks were not recorded by the CMP at the Mountcharles subsite, however there are some wet hollows that may have supported such communities before being degraded by intensive stock rearing practices (Ryle *et al.*, 2009).

All of the dune habitats present 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 Coastal Monitoring Project (Ryle *et al.*, 2009) of each sand dune habitat found at Mullanasole and Mountcharles are presented in Appendices III & IV.

3.1 Overall objectives

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Donegal Bay (Murvagh) SAC is to 'restore the favourable conservation condition'.

The overall objective for 'Humid dune slacks' in Donegal Bay (Murvagh) SAC is to 'restore the favourable conservation condition'.

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

3.2 Area

3.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. Baseline habitat maps were produced for the sand dune habitats in Donegal Bay (Murvagh) SAC during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). These maps are included with the individual site reports in Appendices at the end of this document. The total areas of each sand dune habitat within the SAC as mapped by Ryle *et al.* (2009) are presented in the second column in the following table. These figures were subsequently checked and adjusted to take in to account some overlapping polygons and mapping errors. In addition, the CMP mapped the total sand dune resource at each sub-site and not all of the sand dune habitat mapped at Mullanasole is contained within the SAC

boundary. The adjusted figures for the total area of each habitat within the SAC are presented in the final column.

Habitat	Total area (ha) of habitat from CMP	Total area (ha) of habitat within SAC boundary
Fixed coastal dunes with herbaceous vegetation	27.973	27.014
Humid dune slacks	0.123	0.123
Total	28.096	27.137

As losses were reported for both fixed dunes and dune slacks by the CMP, the target for this attribute in the case of both habitats is that they should be increasing. Some areas currently under plantation are within the SAC boundary and could potentially be used to restore these two habitats. 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.

3.3 Range

3.3.1 Habitat distribution

Within Donegal Bay (Murvagh) SAC, fixed dunes occur within both the Mullanasole and Mountcharles subsites, while dune slacks are restricted to Mullanasole. Sand dunes form only a small component of the total SAC area and most of this is accounted for by the Mullanasole (Murvagh) sand dunes which extend along a sand spit on the southern shore of the Bay. Despite the greatly modified nature of the dune area at Mullanasole, resulting from afforestation and development of a golf course, there are areas of interest remaining and these are the focus of sand dune interest within this SAC site (Ryle *et al.*, 2009). The distribution of the two habitats on each sub-site as mapped by Ryle *et al.* (2009) is presented in Appendix III (Mullanasole) and Appendix IV (Mountcharles).

The target is that there should be no decline or change in the distribution of these sand dune 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 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. Restoring the favourable conservation condition of all of the sand dune habitats in the Donegal Bay (Murvagh) SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

3.4.1 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, 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.

The target for this attribute is to maintain, or where necessary restore, the natural circulation of sediment and organic matter throughout the entire dune system, without any physical obstructions. The sediment supply has been compromised at Mullansole through the

installation of rock armour prior to the SAC designation, but the system should now be moving towards a more natural state of equilibrium.

3.4.2 Physical structure: hydrological and flooding regime

The conservation of dune slacks is inextricably linked with the local hydrological regime. Dune slacks are characterised by the proximity of the groundwater table that is maintained by the combination of an impermeable layer in the soil, or deeper salt water and precipitation. Most dune slacks are fed by a range of water sources including precipitation water, surface water and groundwater. The latter two sources are usually somewhat calcareous while the former 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 vegetational 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. 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 water table, causing slacks to dry out. It can also lead to saline infiltration in slacks formed close to the front of the dune system and particularly where the underlying substrate is highly permeable (e.g. shingle).

At Donegal Bay (Murvagh) SAC the planting of conifers in the past at Mullanasole has resulted in the destruction of substantial areas particularly of slacks and a drying out of the habitat.

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

3.4.3 Vegetation structure: zonation

The range of vegetation zones on a dune system should be maintained. Gaynor (2008) highlights the highly transitional nature of dune vegetation; therefore, it is important that the transitional communities are also conserved, including those to saltmarsh communities. A range of sand dune habitats have been identified at this site by the CMP (Ryle *et al.*, 2009) and include annual vegetation of driftlines, perennial vegetation of stony banks, embryonic dunes and mobile dunes. Saltmarsh habitats (*Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows and Mediterranean salt meadows) have also been identified by the SMP at this site (McCorry & Ryle, 2009).

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

3.4.4 Vegetation structure: bare ground

This target applies to both the fixed dunes and dune slacks. In these habitats 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 by the actions 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. Mullansole is not grazed by livestock; while Mountcharles is overgrazed, which has resulted in the destruction of 40% of the vegetation cover on the fixed dunes.

The target for the fixed dunes is to achieve up to 10% bare sand. For the dune slacks the target is up to 5% bare sand, with the exception of pioneer slacks which can have up to 20%. This target is assessed subject to natural processes.

3.4.5 Vegetation structure: vegetation height

This attribute applies to both fixed dunes and dune slacks. A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. The ecological benefits of grazing on dunes has been well documented (Gaynor 2008). Mullanasole is not grazed but Mountcharles is overgrazed. Moderate grazing regimes can 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 in the internal movement of sand through the development of small-scale blow-outs, 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).

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

3.4.6 Vegetation structure: vegetation cover

The only habitat where this is a specific attribute is humid dune slacks where that target is to maintain less than 40% cover of *Salix repens*. This species forms a natural component of many dune slack communities in Ireland, however, high cover of this shrub can lower the level of the water table causing the slacks to dry out. It can also form a dense canopy that shades out slack species leading to a reduction in biodiversity.

The target therefore is to keep the cover of *S. repens* below 40%.

3.4.7 Vegetation composition: typical species & 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, with groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* sp.) also present. The fixed, more stable dunes support lady's bedstraw (*Galium verum*), common birdsfoot trefoil (*Lotus corniculatus*), wild thyme (*Thymus praecox*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*), among others.

Donegal Bay (Murvagh) SAC supports a characteristic dune flora, details of which can be found in the site reports in Appendix III and IV. Rare elements of the site flora include round-leaved wintergreen (*Pyrola rotundifolia* ssp. *maritima*), which is an indicator of local distinctiveness.

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

3.4.8 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.

The main invasive species identified in Gaynor (2008) were *Pteridium aquilinum* and *Hippophae rhamnoides*, although the latter has not been recorded from this site. The invasion of non-native species compromises the typical plant community structure. *Pteridium aquilinum* 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 *H. rhamnoides*, which can form dense impenetrable thickets.

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

3.4.9 Vegetation composition: scrub and trees

This attribute applies to fixed dunes and dune slacks. Scrub encroachment leads to reduction in biodiversity and needs to be controlled. The presence of scrub and trees that have deep roots can also lower the groundwater table, which can have significant impacts on the slack communities.

A sizable area in the southwest corner of the Mountcharles subsite is dominated by low-growing blackthorn (*Prunus spinosa*) (Ryle *et al.*, 2009).

A large area of the sand dune in the southern part of the Murvagh peninsula is occupied by a conifer plantation. The influence of forestry management is significant on the fixed dunes and the dune slack principally through the loss of natural area and also through the alteration of the natural development of the dunes with *Salix repens*. The conifer plantation is largely outside the SAC boundary but it has extended in to the SAC in places

The target for this attribute therefore is that the cover of scrub and tree species should be under control or represent no more than 5% of the vegetation cover.

4 References

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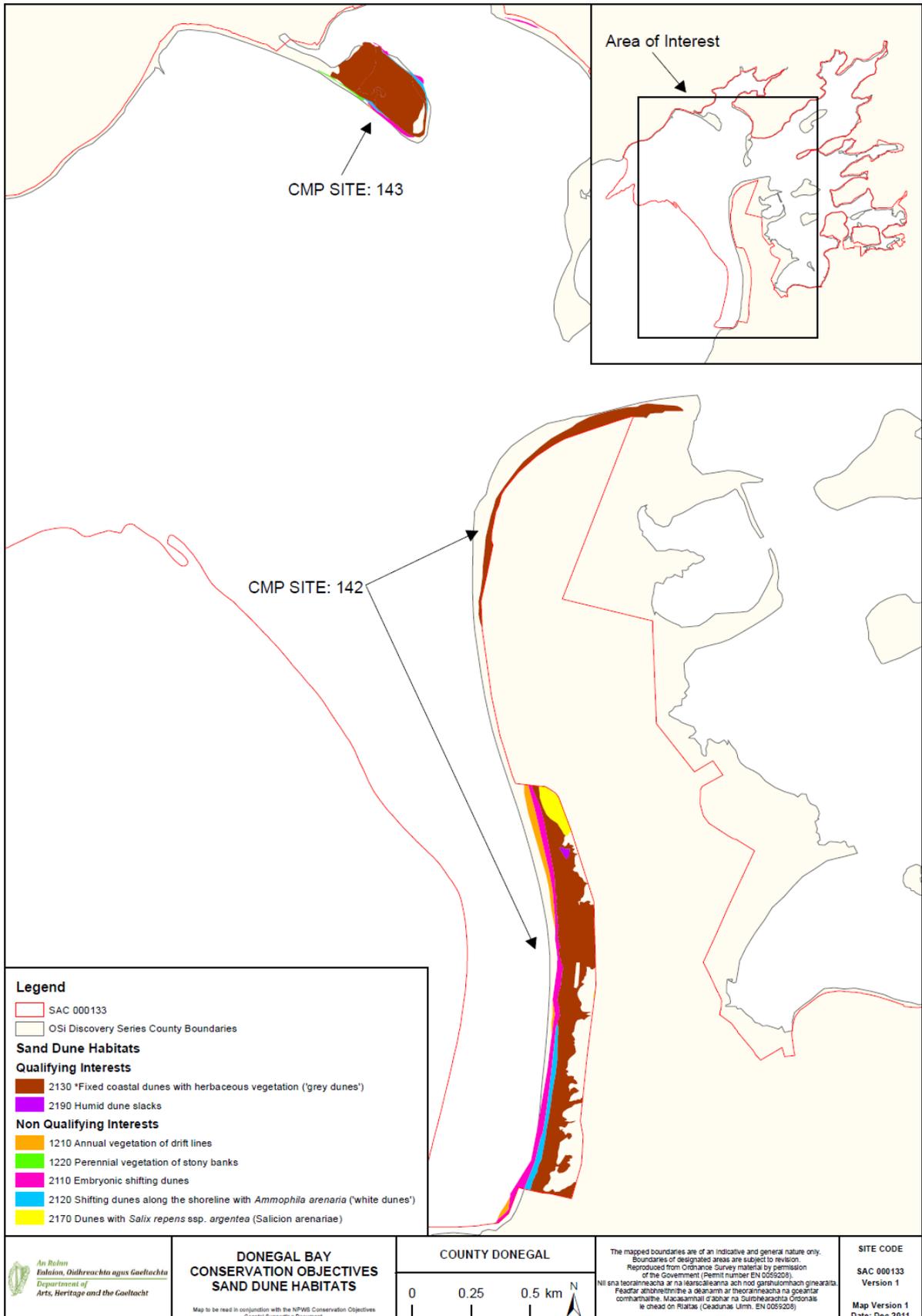
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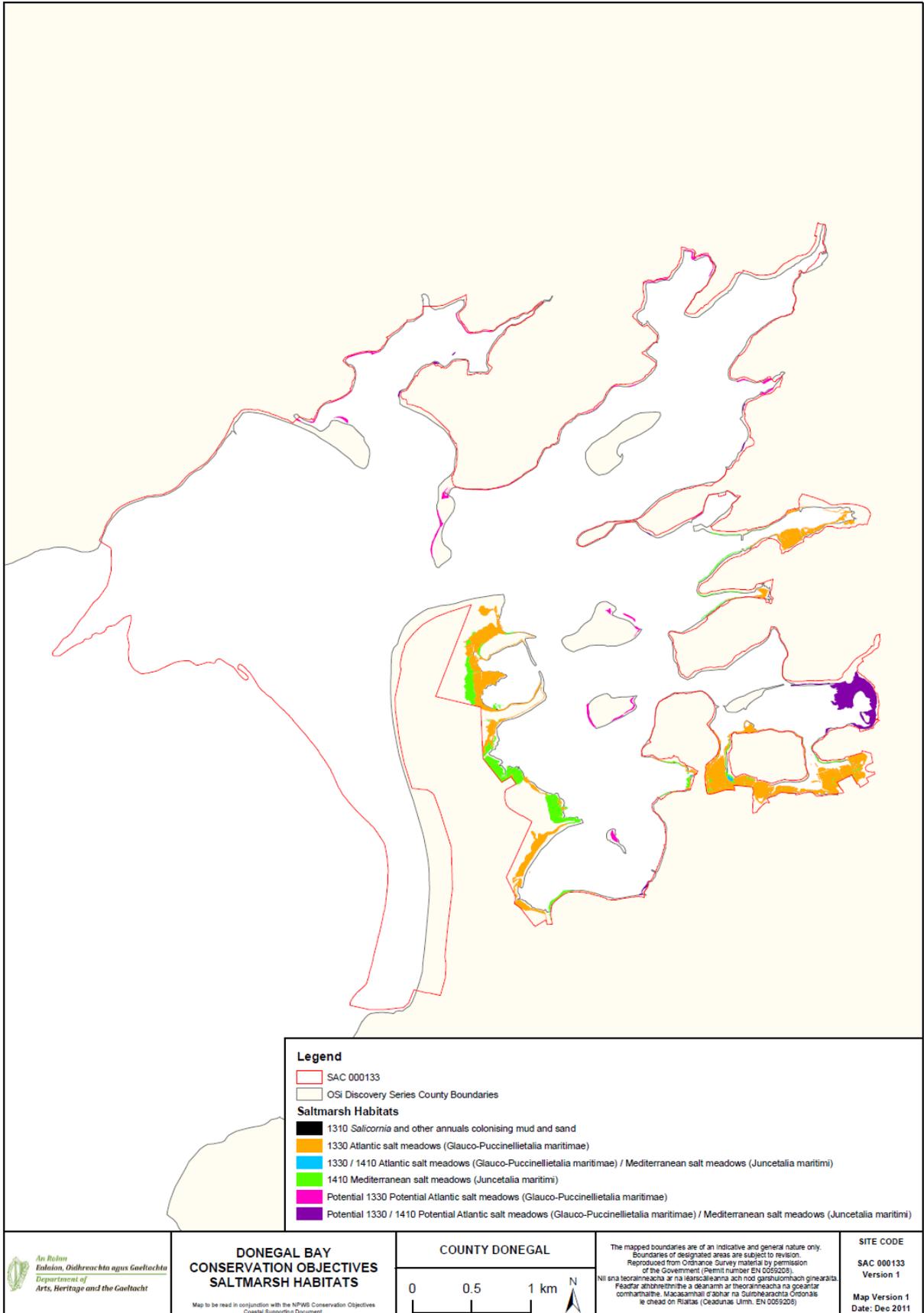
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Appendix I: Dune habitat distribution within Donegal Bay (Murvagh) SAC



Appendix II - Saltmarsh habitat distribution within Donegal Bay (Murvagh) SAC



Appendix III – Mullanasole site report and habitat map from the Coastal Monitoring Project (Ryle *et al.*, 2009)

SITE DETAILS

CMP06 site name: **Mullanasole** CMP06 site code: **142** CMP Map No.: **139**

County: **Donegal** Discovery map: **11** Grid Reference: **G 917 737**

6 inch Map No.: **Do 99**

Aerial photographs (2000 series): **O0588 A,BC&D; O0611A&B**

NPWS Site Name: **Donegal Bay (Murvagh)**

NPWS designation: pNHA: **133** cSAC: **133**

Other designation: **Blue Flag**

Ranger Area: **Donegal**

MPSU Plan: **None available**

Report Author: **Anne Murray**

SITE DESCRIPTION

Mullanasole sand dune system occurs in the inner part of Donegal Bay cSAC, on the Murvagh Peninsula. Donegal Bay cSAC is designated for the EU Annex I sand dune habitats - Fixed dunes (priority habitat) and Dune slack. The site is also designated for the EU Annex I habitat – Mudflats and sandflats not covered by seawater at low tide. Areas of saltmarsh are frequent within the site, but the site is not selected for the habitat (NATURA 2000).

The peninsula comprises a large sand dune system, fronted by a wide sandy beach on the seaward side with saltmarsh fringing the dunes on the more sheltered eastern side of the peninsula. High sand dune ridges dominate the dune system in the north of the peninsula, sloping to flat dune grassland southwards as far as Loughtone Hill at Mullanacross. The northern part was developed as a golf course by Donegal Golf Club in 1973. A large part of the course was used for potato cultivation prior to the golf course development (Gaynor and Browne, 1999). Most of the southern lowlying dune area is occupied by a conifer plantation, planted in the early 1980s by Coillte Teoranta.

The remaining intact area of habitat flanks the western side of the plantation. It consists of low lying, rank fixed dune dominated by tall grasses. Dune slack and Dunes with *Salix repens* occur in close association with the conifer plantation and fixed dunes, next to the southwestern boundary of the golf course. This area is of ecological interest, as it contains the greatest diversity of species within the sand dune habitat and also due to the presence of the Red Data Book species *Pyrola rotundifolia* (Round-leaved wintergreen). The discovery of this species at this site represents a considerable extension of the species range in Ireland (NATURA 2000). This plant was most recently recorded at the site in 2006. The sand dune area directly adjacent to Loughtone Hill is overlying shingle substrate, while a vegetated shingle beach borders the seaward edge of the hill.

Mullanasole sand dunes are very popular for recreational activities and the beach was awarded the Blue Flag in 2006. The dunes can be accessed by road, and a car park is provided in the southern part of the peninsula next to the conifer plantation.

The EU Annex I sand dune habitats recorded at Mullanasole during this survey include Fixed dunes (priority habitat), Dune slack, Dunes with *Salix repens*, Mobile dunes, Embryonic dunes, Perennial vegetation of stony banks and Annual vegetation of driftlines. The total area of sand dune habitat (including the golf course and conifer plantation) at Mullanasole is 186ha and the remaining intact sand dune habitat excluding the developments but including the mosaic of dunes with *Salix repens*/conifer plantation is 37ha (Table 142A).

Table 142A Areas of EU Annex I habitats mapped at Mullanasole

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	2.200
H1220	Perennial vegetation of stony banks	0.640
H2110	Embryonic shifting dunes	3.935
H2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i>	2.101
H2130	Fixed coastal dunes with herbaceous vegetation	20.152
H2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (Salicion arenaria)	7*
H2190	Humid Dune Slacks	0.123
	Total sand dune area excluding developments/modifications	37**
	Total sand dune area including developments/modifications	186**

*This is an underestimation of the area of Dunes with *Salix repens*, as part of this habitat occurs in a mosaic with the conifer plantation (see text)

**This total includes the estimation of Dunes with *Salix repens*.

Fixed Dunes (H2130)

The fixed dunes are undergoing natural erosion. Hard coastal protection has been installed, in the form of rock armour, overlain with sand and planted with *Leymus arenarius* (Lyme grass). This forms a manmade embryonic habitat along the entire frontline of the sand dunes. This is fronted in places by accreting embryonic dunes and annual strandline habitat.

The dunes are ungrazed and are dominated by rank grasses including *Ammophila arenaria* (Marram grass), *Arrhenatherum elatius* (False oat-grass) and *Festuca rubra* (Red fescue). It is likely that changes in hydrology, due to the presence of the conifer plantation, have impacted on the species composition of the dunes. Species diversity is very low with the greatest diversity occurring in the fixed dune area next to the southwestern boundary of the golf course, where it is associated with dune slack and dunes with *Salix repens*. This mosaic is of high ecological interest due to the rarity of such diverse areas in this sand dune system of Mullanasole. This area is also described under the dune slack and dunes with *Salix repens* habitats below.

The typical fixed dune species include the following: *Arrhenatherum elatius* (False oat-grass), *Carex arenaria* (Sand sedge), *Crepis capillaris* (Smooth hawk's-beard), *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Taraxacum* agg. (Dandelion), *Trifolium repens* (White clover) and *Veronica chamaedrys* (Germander speedwell).

Additional typical species recorded in the fixed dune occurring in a mosaic with dune slack and dunes with *Salix repens* are *Anacamptis pyramidalis* (Pyramidal orchid), *Anthyllis vulneraria* (Kidney vetch), *Euphrasia officinalis* agg. (Eyebright), *Thymus polytrichus* (Wild thyme) and *Viola tricolor* subsp. *curtisii* (Wild pansy). The typical moss *Rhytidiadelphus squarrosus* and lichen *Cladonia* spp. are very common in this area.

Other species present include: *Ammophila arenaria* (Marram grass), *Daucus carota* (Wild carrot), *Heracleum sphondylium* (Hogweed), *Listera ovata* (Common twayblade) and the moss *Homalothecium lutescens*.

The area of fixed dunes excluding the developments is 20ha (Table 142A). Additional to this are areas of the golf course that have not been intensively managed comprising approximately 25% (18ha) of the total golf course area.

Dune Slacks (H2190)

The ASI survey noted the occasional dune slack along the exposed edge of the conifer plantation where tree cover is sparse. Only one large dry mature slack was noted during this survey. The slack occurs in a mosaic with the fixed dunes, dunes with *Salix repens* and the conifer plantation. The species recorded during the ASI survey were *Salix repens* (Creeping willow), *Carex* spp.(Sedge spp.) and *Luzula campestris* (Field wood-rush).

The dune slack area comprises 0.1ha (Table 142A). The typical slack species present are *Campanula rotundifolia* (Harebell), *Carex arenaria* (Sand sedge), *Holcus lanatus* (Yorkshire fog) and *Salix repens* (Creeping willow) along with other typical species of fixed dunes *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Taraxacum* agg. (Dandelion), *Viola* spp. (Violet spp.) and the moss *Rhytidiadelphus squarrosus*.

Other species present include: *Agrostis stolonifera* (Creeping bent), *Filipendula ulmaria* (Meadowsweet) and *Ranunculus repens* (Creeping buttercup).

The Red Data Book species *Pyrola rotundifolia* (Round-leaved wintergreen) was recorded in the dune slack habitat southeast of the car park in 1995. However, as discussed above, dunes with *Salix repens* may have been classified under the dune slack category at the time.

No negative indicator species were recorded in the dune slack areas.

Dunes with *Salix repens* (H2170)

The EU Annex I habitat - Dunes with *Salix repens* is considered a dune slack type community and is typical of older drier slacks. It often occurs in a mosaic with fixed dunes and dune slack where it develops on the drier slopes of the dune slack. This habitat has not been noted previously at this site.

The dunes with *Salix repens* occur in a mosaic with fixed dune, dune slack and the conifer plantation just southwest of the golf course boundary. The pine cover here is patchy as growth is stunted by salt and wind, leaving clearings where the dune system remains relatively intact. There is some difficulty in discerning boundaries between the habitats, as they all occur close together. Although, it was possible to map some discrete areas of dunes with *Salix repens* totalling 1.6ha, the overall area which includes the mosaic habitat is estimated at 7ha.

The typical species of the dunes with *Salix repens* at Mullanasole include: *Salix repens* (Creeping willow), *Carex arenaria* (Sand sedge), *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Lotus corniculatus* (Bird's foot trefoil) and *Pilosella officinarum* (Mouse-ear hawkweed) along with other typical species of fixed dune including: *Arrhenatherum elatius* (False oat-grass), *Prunella vulgaris* (Selfheal), *Thymus polytrichus* (Wild Thyme) and the mosses *Hypnum cupressiforme*, *Rhytidiadelphus triquetrus* and *Rhytidiadelphus squarrosus*. The orchid *Listera ovata* (Common twayblade) occurs throughout this habitat. The diversity of plant species is good and the habitat appears to be functioning fairly well under the current conditions.

Other species present include: *Agrostis stolonifera* (Creeping bent), *Ammophila arenaria* (Marram grass) and the moss *Pleurozium schreberi*.

The Red Data Book species *Pyrola rotundifolia* (Round-leaved wintergreen) was recorded in dune slack habitat southeast of the car park in 1995 (NATURA, 2000) and is considered an *Indicator of local distinctiveness* for Mullanasole. In 2006 the area was searched for this species again and it was recorded in a patchy area of forestry with an understorey of dunes with *Salix repens*. The dunes with *Salix repens* may have been described under the dune slack category in 1995.

A lack of grazing and the presence of the conifer plantation and golf course have impacted on this habitat. As the conifer plantation does not occur naturally on the dunes, its development is considered a damaging activity. Nonetheless, the presence of *Pyrola rotundifolia* (Round-leaved wintergreen) may be due to the conditions created, in part, by the conifer plantation. In Ireland *Pyrola rotundifolia* ssp. *maritima*

has been recorded in similar conditions to those at Mullanasole, in the sand dune system/conifer plantation at the Raven in Co. Wexford. However, the subspecies is considered to be of doubtful value by Stace (2001).

It is likely that the ‘drying’ conditions caused by the presence of the conifer plantation, in particular, may be providing ideal conditions for the dunes with *Salix repens* to expand. The pine trees lower the level of the watertable causing the site to become drier. This ‘drying’ may also accelerate the development of scrub, at the expense of the wetter dune slack habitat.

This habitat requires more detailed study throughout Ireland to assess the impacts of the conifer plantations on sand dunes. The removal of, at least part of the plantation and the introduction of an appropriate grazing regime would improve the condition of the sand dune and perhaps slow the development of dunes with *Salix repens*. Any management changes would have to take into account the presence of *Pyrola rotundifolia* (Round-leaved wintergreen). This plant requires a certain level of shade, similar to the conditions created by the conifer plantation, although experiments have found its growth rate lowers under dense canopy (Roderick and Hope-Simpson, 1990). Therefore a balance is needed between the requirements of the sand dune ecosystem and the conditions required for *Pyrola rotundifolia* (Round-leaved wintergreen).

Mobile Dunes (H2120)

The mobile dune habitat edges the fixed dunes south of the car park towards Loughtone Hill. The mobile dunes have been impacted mainly by natural erosion and are absent from the northern section of the site. The natural erosion is compounded by recreational activity. The total mobile dune habitat comprises 2.1ha in area (Table 142A).

The typical species *Ammophila arenaria* (Marram grass) dominates with *Leymus arenarius* (Lyme grass), the latter coming from the coastal protection works along the frontline. The negative indicator species *Senecio jacobaea* (Common ragwort) occurs in this habitat but is rare.

Embryonic Dunes (H2110)

The embryonic dunes are largely manmade and stretch the length of the beach edging the fixed and mobile dunes. The manmade ridge reaches a height of 1.5m and is approximately 2m wide and is fronted by accreting embryonic dunes south of the car park. These are heavily trampled next to the car park where visitors gain access to the beach. The embryonic dunes cover a total area of 4ha (Table 142A).

The typical species of embryonic dunes recorded are *Leymus arenarius* (Lyme grass) and *Elytigia juncea* (Sand couch) along with other species typical of disturbed ground *Sonchus oleraceus* (Smooth sow-thistle), *Taraxacum* agg. (Dandelion) and *Senecio jacobaea* (Common ragwort). The latter is considered a negative indicator species in the embryonic zone.

Typical species of annual strandline vegetation *Cakile maritima* (Sea rocket), *Salsola kali* (Prickly saltwort) and *Atriplex* spp. (Orache spp.) also occur in the embryonic area.

Perennial vegetation of stony banks (H1220)

The perennial vegetation of stony banks is confined to the southern end of the beach where a wide vegetated shingle ridge backs onto agriculturally improved fields. The shingle ridge has become stable in places and a narrow strip of fixed dune grassland occurs, dominated by *Festuca rubra* (Red fescue) with other typical species *Campanula rotundifolia* (Harebell), *Crepis capillaris* (Smooth hawk's-beard), *Hypochaeris radicata* (Cat's-ear), *Lotus corniculatus* (Bird's foot trefoil), *Pilosella officinarum* (Mouse-ear hawkweed), *Taraxacum* agg. (Dandelion) and *Trifolium repens* (White clover).

Other species present are *Agrostis stolonifera* (Creeping bent), *Holcus lanatus* (Yorkshire fog), *Geranium robertianum* (Herb-Robert) and *Sagina nodosa* (Knotted pearlwort). This is fronted by pioneer perennial vegetation and a wide band of annual shingle strandline vegetation. Further south the pioneer perennial vegetation continues along the base of the clay cliffs at Loughtone Hill. The total area of perennial vegetation of stony banks comprises 0.6ha (Table 142A).

The typical species recorded in the pioneer perennial vegetation of stony banks are *Honckenya peploides* (Sea sandwort), *Rumex crispus* (Curled dock), and *Tripleurospermum maritimum* (Scentless mayweed) along with other species *Sonchus oleraceus* (Smooth sow-thistle) and *Atriplex* spp (Orache spp.).

The negative indicator species *Senecio jacobaea* (Common ragwort) is common in this habitat and is invading the area from the adjacent agricultural fields. Dumping of silage on the shingle was evident during this survey.

Annual Strandline (H1210)

The annual vegetation of strandline occurs on sand along the beach, north of the car park. It occurs on shingle in the southern part of the site where it overlies a shingle ridge above a band of perennial vegetation. The area of strandline totals 2.2ha (Table 142A).

The typical species of annual strandline on sandy substrate recorded at Mullanasole are *Atriplex prostrata* (Spear-leaved orache), *Cakile maritima* (Sea rocket), *Honckenya peploides* (Sea sandwort) and *Salsola kali* (Prickly saltwort). The typical embryonic species – *Elytrigia juncea* (Sand couch) and *Leymus arenarius* (Lyme grass), were also recorded in the strandline area. No negative indicator species were recorded in this part of the habitat.

The typical species of annual strandline on shingle substrate include: *Atriplex* spp. (Orache spp.), *Cakile maritima* (Sea rocket), *Galium aparine* (Cleavers), *Honckenya peploides* (Sea sandwort), *Salsola kali* (Prickly saltwort) and *Tripleurospermum maritimum* (Scentless mayweed). The negative indicator species *Senecio jacobaea* (Common ragwort) occurs in this part of the habitat but is rare.

IMPACTS

The impacts for Mullanasole are listed in Table 142B. The site has a well developed recreational infrastructure. There is easy access to the site by a road (code 502) that runs through the fixed dunes on the western side. A car park is located in the dunes between the beach and conifer plantation. The facilities of the Blue Flag beach, golf course (code 601), along with the added interest of the woodland for walkers (code

622) make this site very attractive for visitors. The golf course covers approximately 72 ha of the fixed dune area which is now excluded from the cSAC. The area of the cSAC impacted by the golf course is difficult to assess and is given as ‘unknown’.

Heavy trampling (code 720) associated with visitors gaining access to the beach for activities such as walking (code 622), swimming, sun bathing and/or picnicking, is confined to the sand dune area fronting the car park, where tracks are evident. More dispersed light trampling is impacting positively throughout the rank fixed dunes by providing disturbance and increasing habitat diversity.

The fixed dunes and dune slack are impacted by undergrazing (code 149) due to the absence of stock grazers at this site and the low population of rabbits. This has resulted in a gradual decline in the quality of the fixed dune, where there is a predominance of rank grasses and low species diversity. The introduction of a grazing regime for this site would require consideration of the recreational activities of the site but would improve the condition of this habitat. Given the limited extent of the intact fixed dune, it may not be currently feasible to graze the dunes.

Table 142B Intensity and impact of various activities on sand dune habitats at Mullanasole

EU Code ¹	Habitat	Activity Code ²	Intensity ³	Impact ⁴	Area affected/ha	Location of Activity ⁵
H2130		149	A	-1	21	Inside
H2190		149	A	-1	0.1	Inside
H2130		160	A	-1	21	Inside/Outside
H2170		160	B	-1	3	Inside/Outside
H2190		160	A	-1	0.1	Inside/Outside
H2130		502	A	-1	1	Inside
H2130		601	A	-2	Unknown	Outside
H2130		622	A	-1	2	Inside
H2120		622	A	-1	0.5	Inside
H2130		720	A	-1	3	Inside
H2130		720	C	+1	10	Inside
H2120		720	A	-1	1	Inside
H2130		790	C	-1	2	Inside
H2130		870	B	-1	5	Inside
H2120		870	A	-1	2	Inside
H2110		870	A	-1	2	Inside
H2130		900	B	-2	10	Inside
H2120		900	B	-2	1	Inside

¹EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.

² Description of activity codes are found in Appendix 3

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 = repairable 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 cSAC. Outside = activities recorded outside but impacting the cSAC.

However in the future, if all or part of, the conifer plantation is removed, grazing could be introduced. Littering and burning from beach parties is evident in the fixed dunes and within the plantation, this has been classed under the category ‘other pollution or human activities’ (code 790).

A large area of the sand dune in the southern part of the Murvagh peninsula is occupied by a conifer plantation. The influence of forestry management (code 160) is significant on the fixed dunes and dune slack principally through loss of natural area and also through the alteration of the natural development of the dunes with *Salix repens*. Impacts associated with the modification of hydrographic functioning or management of water levels arising from forestry management regimes, are not included in the impact assessment, as the affects of these activities are not reliably estimated. The conifer plantation is largely located outside the cSAC boundary, but it is has extended into the cSAC in places, hence the location of the impacting activity is listed as inside/outside the cSAC.

Natural erosion (code 900) is most notable at the northern part of the site, where mobile habitat is largely absent and the fixed dunes are fronted by a hard coastal protection in the form of a manmade embryonic zone (code 870) that extends the length of the beach. The coastal protection has failed in places north of the car park and the underlying rock armour is exposed.

CONSERVATION STATUS

The conservation status of a site is assessed on the current condition of the site and on baseline information. The main source of baseline information for this site was from the ASI survey and the NATURA 2000 report.

Dunes with *Salix repens*, Mobile dunes, Annual vegetation of strandlines and Perennial vegetation of stony banks are not listed for the cSAC and are not assessed in NATURA 2000. The embryonic habitat is manmade and is therefore not listed for the site. As a result, best scientific judgement was used to assess some of the parameters of conservation status for these habitats.

Fixed Dunes (H2130)

The extent of the fixed dune is *unfavourable-inadequate*. Currently the main impact on the extent of the fixed dunes is natural erosion and this appears to be compounded by recreational activities.

The EU conservation status for structure and function is *unfavourable – bad*. Four monitoring stops were placed in the fixed dune area (Table 142D), three of these failed to reach the targets for typical species and sward height, resulting in each stop failing overall. It is likely that the conifer plantation has affected the functioning of the fixed dunes by altering the hydrology of the habitat. The lack of grazing has resulted in a rank and poor quality sward.

Table 142C Conservation status of Annex I sand dune habitats at Mullanasole

Habitat ¹	EU Conservation Status Assessment			Overall EU conservation status assessment	Proposed Irish conservation status system ²
	Favourable	Unfavourable - Inadequate	Unfavourable - Bad		
Fixed Dunes (H2130)		Extent, Future prospects	Structure & Functions	Unfavourable-bad	Unfavourable-declining
Dune Slack (H2190)	Structure & Functions	Extent, Future prospects		Unfavourable-inadequate*	Unfavourable-declining
Dunes with <i>Salix repens</i> (H2170)	Structure & Functions	Extent, Future prospects		Unfavourable-inadequate	Unfavourable-declining
Mobile Dunes (H2120)		Extent, Structure & Functions	Future prospects	Unfavourable-bad	Unfavourable-declining
Embryonic Dunes (H2110)	Structure & Functions	Extent, Future prospects		Unfavourable-inadequate	Unfavourable-declining
Perennial vegetation of stony banks (H1220)	Extent, Structure & Functions Future prospects			Favourable	Favourable-maintained
Annual vegetation of strandlines (H1210)	Extent, Structure & Functions, Future prospects			Favourable	Favourable-maintained

¹EU Codes as per Interpretation Manual

²Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

*This rating is based on best scientific judgement see text

Table 142D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Mullanasole

Habitat	Monitoring stops		Conservation status
	Pass	Fail	
Fixed Dunes (H2130)	1	3	Unfavourable-bad
Dune Slack (H2190)	1	0	Favourable
Dunes with <i>Salix repens</i> (H2170)	1	0	Favourable
Embryonic Dunes (H2110)	2	0	Favourable
Perennial vegetation of stony banks (H1220)	2	0	Favourable
Annual vegetation of strandlines (H1210)	8	0	Favourable

There is currently no conservation plan for the cSAC. The results of the monitoring program as part of this project indicate that the fixed dune condition is declining and active conservation management of the dunes is required to restore the habitat to a more favourable condition. Consideration should be given to the purchase of part of the forestry to remove the trees and restore part of the habitat.

A sustainable grazing regime should be implemented, with consideration given to the recreational activities. Perhaps a horse or pony could be used, some grazing would be better than none at all. Until the issues of undergrazing and the conifer plantation are actively managed, the future prospects are considered *unfavourable-inadequate*.

The fixed dunes are given a rating of *average or reduced* conservation (NATURA, 2000). Currently, the overall EU conservation status of the entire fixed dune habitat is *unfavourable – bad* (Table 142C). This is mainly due to impacts of afforestation and undergrazing.

Under the Irish scheme, the conservation status for fixed dune at this site is *unfavourable – declining*.

Dune Slack (H2190)

Historically, there may have been a greater area of dune slack prior to the development of the conifer plantation. The remaining dune slacks occur occasionally along the edge of the conifer plantation where the forest is more open (exposed to

wind and salt) and the conditions are less favourable for tree growth. The extent of the remaining dune slack is rated as *unfavourable-inadequate*, this is based on the observation of areas that previously appeared to be dune slack, have dried due to the presence of the adjacent plantation and also due to some tree/scrub invasion into the slacks.

The structure and functions parameter is rated as *favourable*. One monitoring stop was placed in dune slack and this passed (Table 142D). However, it failed to reach the target for the ratio of forbs to grasses. It is a dry mature slack and grasses dominated the slack as a result of undergrazing and ‘drying out’ compounded by the presence of the plantation.

The future prospects for this site are considered *unfavourable-inadequate* on the basis that there is currently no management plan for this site. Currently, the viability of this habitat is threatened by the presence of the plantation and the golf course. Restoration of some the areas of dune slack would be possible, if part of the plantation was purchased and the trees removed.

The conservation status of this habitat was described as *good* in the NATURA form. The current overall EU conservation status of dune slack at Mullanasole is *unfavourable-inadequate* (Table 142C).

Under the Irish scheme, the conservation status for dune slack at this site is *unfavourable – declining*.

Dunes with *Salix repens* (H2170)

The assessment is based on best scientific judgement as there is no previous information available on this habitat at Mullanasole. This habitat is small and occurs in a mosaic with fixed dunes, dune slack and the conifer plantation. It is likely that the presence of the plantation may have inhibited the extent of this habitat due to the closed canopy but may have also increased the extent of this habitat in more open areas at the expense of the wet dune slacks. Nevertheless, until this habitat is better understood in an Irish context, the extent of the dunes with *Salix repens* is rated as *unfavourable-inadequate* (Table 142C).

The structure and functions parameter is rated as *favourable*. One monitoring stop was placed in the dunes with *Salix repens* and it passed (Table 142D). However, it is important to note that monitoring stops for this habitat are on a trial basis as further studies are required for the development of targets for this habitat (See main report).

The future prospects for this habitat are considered *unfavourable-inadequate*. At present, there is no conservation management of this habitat. The most urgent action needed is the removal of some of the trees to maintain the openness of the habitat. The occurrence of the Red Data Book species - *Pyrola rotundifolia* (Round-leaved wintergreen) raises the conservation interest of this habitat but the presence of the pine trees may be significant in maintaining the habitat suitable for this plant. This rare species is considered an *Indicator of local distinctiveness* for this site.

The conservation status of this habitat was not assessed in the NATURA 2000 survey. The current overall EU conservation status of dunes with *Salix repens* at Mullanasole is *unfavourable-inadequate* (Table 142C). It should be noted that further study of this habitat in Ireland is required in order to assess it fully.

The Irish conservation status is rated as *unfavourable-declining*.

Mobile Dunes (H2120)

Most of the mobile dune habitat has been removed by natural erosion as it is absent from the northern section of the site where the fixed dunes are fronted by a manmade embryonic ridge. Mobile dunes are not described in the ASI and the NATURA surveys. Natural erosion is compounded by human disturbance in the southern part of the site, mainly due to the susceptibility of this habitat to trampling. The installation of the hard coastal protection has also impacted on the extent of the mobile dunes. Therefore, extent is considered *unfavourable-inadequate*.

Monitoring stops were not placed in the mobile habitat given its limited area. The structure and functions parameter is given a conservation status rating of *unfavourable-inadequate*, as the functioning and the structure of the habitat has been altered by the presence of coastal protection.

The future prospects are considered *unfavourable-bad*, due to the on-going threats from recreational activities and the management of the foredune area in relation to coastal protection. There are currently, no plans to manage the remaining mobile dune habitat for conservation.

The mobile dunes are currently regarded as *unfavourable-bad* under the overall EU conservation status and *unfavourable-declining* under the Irish conservation status system (Table 142C). This unfavourable rating is due to the poor future prospects for this habitat.

Embryonic Dunes (H2110)

The extent of the embryonic habitat is rated as *unfavourable-inadequate* (Table 142C). This is attributable to the presence of hard coastal protection which comprises approximately half of the area of the embryonic habitat.

The structure and functions parameter is rated as *favourable*. Two monitoring stops were placed in the embryonic habitat south of the car park (where it has formed in front of the manmade embryonic zone) and these passed (Table 142D). North of the car park there is no embryonic habitat fronting the manmade embryonic zone.

There is no conservation management of the embryonic dunes at Mullanasole. The future prospects of the embryonic habitat are considered *unfavourable-inadequate*, mainly due to the potential threat from recreational pressures at this site and the management of the foredune area for coastal protection.

The present overall EU conservation status for embryonic dunes is considered *unfavourable-inadequate*.

The overall Irish conservation status is *unfavourable-declining* (142C).

Perennial vegetation of stony banks (H1220)

There is no previous data available for this habitat. There is no obvious decline in the extent of this habitat and therefore it is rated as *favourable*. Given the lack of detailed

information on this habitat at Mullanasole, the assessment is based on best scientific judgement.

Two monitoring stops were placed in this habitat and these passed. Based on an overall visual assessment of this habitat and presence/absence of typical species, the conservation status of the structure and functions is rated as *favourable*.

Future prospects are considered *favourable*. The habitat is located away from most of the human activities on the site. Impacting human activities, such as, trampling from walkers and dumping of farm waste are evident, but appear minor. There are no manmade structures impeding the movement of the shingle.

The overall EU conservation status is currently regarded as *favourable* and the Irish conservation status is *favourable-maintained* (Table 142C).

Annual vegetation of strandlines (H1210)

The extent is rated as *favourable* as the strandline was present along most of the length of the beach during this survey. Maintenance of the beach as a result of its Blue Flag status does not appear to have impacted on this habitat, as cleaning of the beach is carried out manually. Therefore, most of the nutrients, organic matter and seed sources, necessary for the maintenance of the strandline vegetation, are retained within the system.

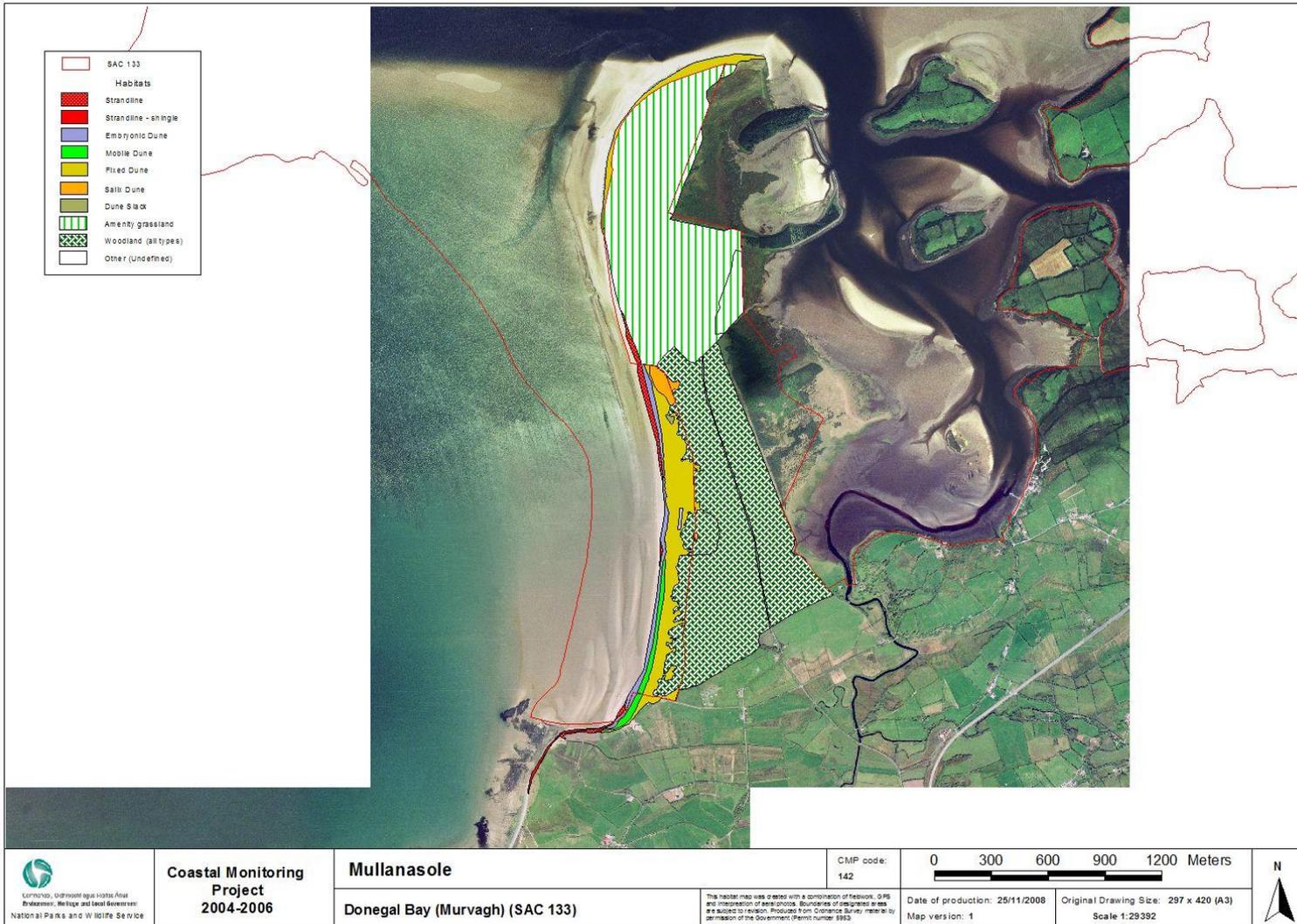
The structure and functions parameter is rated as *favourable*. Eight monitoring stops were placed in the strandline vegetation, four in the sand based strandline north of the car park and four in the shingle based strandline south of the car park. All of the monitoring stops passed. The habitat appears to be functioning well, with plenty of diversity of annual species present on the day of survey.

The future prospects for this site are considered *favourable*. The strandline habitat is extensive, which is uncommon for western coastal sites of Ireland, as most beaches here, are exposed to the Atlantic Ocean. The current management of the beach for the Blue Flag Award system is not impacting on the strandline. The guidelines for Blue

Flag beaches, in relation to tidal litter states: ‘Algae or other vegetation should be left to decay on the beach unless it constitutes a nuisance’.

The overall EU conservation status of the strandline habitat is considered *favourable*. The assessment of the EU conservation status of a habitat that is ephemeral in nature is not exact. The total area of the strandline will vary from year to year and its location may also shift in response to coastal processes.

The Irish conservation status is rated as *favourable-maintained*.



Appendix IV – Mountcharles site report and habitat map from the Coastal Monitoring Project (Ryle *et al.*, 2009)

SITE DETAILS

CMP06 site name: **Mountcharles** CMP06 site code: **143** CMP Map No.: **140**

County: **Donegal** Discovery map: **11** Grid Reference: **G 767 888**

6 inch Map No.: **Dg099**

Aerial photographs (2000 series): **O0561-C**

NPWS Site Name: **Donegal Bay (Murvagh)**

NPWS designation: pNHA: **133** cSAC: **133**

Ranger Area: **Donegal**

MPSU Plan: **No**

Report Author: **Kieran Connolly**

SITE DESCRIPTION

Mountcharles sandhills, on the northern shore of Donegal Bay, are approximately 6km west of Donegal town. The sandhills, covering 8.651ha in total, almost form an island but are joined to the mainland by a narrow neck of land composed of sand and shingle. Shingle appears to form a significant part of the underlying substrate in the sand hills.

Mountcharles was not included on the NPWS sand dune inventory from which the current site list was derived, but was added to the current list on the advice of local conservation staff. Its omission from the original list may be taken as an indication of the limited conservation value that now attaches to the site. Intensive cattle grazing and supplementary feeding, together with severe rabbit grazing, have caused serious damage throughout the site.

The site is part of Donegal Bay (Murvagh) cSAC, which is largely estuarine in nature, encompassing large expanses of sand flats and mud flats in the inner reaches of Donegal Bay. Sand dunes form only a small component of the total cSAC area, and most of this is accounted for by Mullanasole (Murvagh) sand dunes (site 142 in the present report), which extend along a sand spit on the southern shore of the Bay. Despite the greatly modified nature of the natural dune area at Mullanasole, resulting

from afforestation and the development of a golf course, there are areas of interest remaining and these are the focus of sand dune interest within the cSAC.

The limited conservation value of Mountcharles was illustrated by its omission from the ASI Survey report of 1993. It was also dealt with in a cursory manner in the cSAC NATURA 2000 report. Referred to there under the local townland name of Beefpark, there is little content relating to the site, except for a few comments in the explanatory notes describing the damaged nature of the dunes caused by intensive cattle grazing and feeding.

Despite the degraded nature of the site, there are a number of Annex I sand dune habitats at Mountcharles, and the greater part of the total sand dune area is accounted for by fixed dunes (Table 143A) – a priority Annex I habitat. However, because of the intensive stock rearing activities that dominate the land usage and have caused damage to the site, the dune grassland is in the form of fragmented habitat remnants. The other Annex I sand dune habitats mapped were ‘Shifting dunes along the shoreline with *Ammophila arenaria*’, ‘Embryonic shifting dunes’, ‘Perennial vegetation of stony banks’, and ‘Annual vegetation of driftlines’. A small patch of saltmarsh vegetation on the northwest side of the site was also mapped.

Table 143A Areas of EU Annex I habitats mapped at Mountcharles

EU Code	EU Habitat	Area (ha)
H1210	Annual vegetation of driftlines	0.012
H1220	Perennial vegetation of stony banks	0.108
H2110	Embryonic shifting dunes	0.411
H2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i>	0.299
H2130	Fixed coastal dunes with herbaceous vegetation	7.821
	Total Sand dune	8.651

Recreational use of the sand hills is probably insignificant, due to its agricultural nature. Visitors are also discouraged from entering the dunes by continuous fencing around the edge, and signage indicating that entering the dunes is regarded as trespass. There is no dedicated car-parking area, although the site can be accessed relatively easily via a track (marked on the site digital map) that terminates near the shore on the adjacent mainland.

It was thought unnecessary to carry out monitoring stops as part of the habitats conservation status assessments, as the degraded condition of habitats was consistent more or less throughout the site. Visual assessments were deemed sufficient to record the main forms of damage.

Fixed Dunes (H2130)

The fixed dune area of the site is largely degraded through intensive stock rearing activities and the detrimental affects of an uncontrolled rabbit population. There are, however, some remnants of a typical fixed dune flora present, including species such as *Anacamptis pyramidalis* (Pyramidal orchid), *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Lotus corniculatus* (Common Bird's-foot trefoil), *Thymus polytrichus* (Wild thyme) and *Veronica chamaedrys* (Germander speedwell). Particularly common was *Centaureum erythraea* (Common centaury), while *Carex arenaria* (Sand sedge) was frequent throughout the more bare areas. Much of the dunes – estimated at about 40% - are bare, while scrub, dominated by *Prunus spinosa* (Blackthorn), occupies a significant area in the south end of the site. The remaining vegetated areas have been severely overgrazed by cattle and rabbits, to the extent that the sward height rarely exceeds 1cm. The site 6'' map (included as a theme on the site digital map) indicates that the site was formerly a rabbit warren.

Agricultural weed species – particularly *Cirsium arvense* (Creeping thistle), *Senecio jacobaea* (Common ragwort) and *Urtica dioica* (Common nettle) - are common throughout the dunes.

In places around the edge of the sandhills, the fixed dunes are eroding, and vegetation is slumping onto a steep face at the seaward edge of the dunes. Some of this slumped vegetation has taken hold on the front face, where occasional *Ammophila arenaria* (Marram) helps to stabilise the vegetation.

Dune Slacks (H2190)

Although there are currently no dune slack plant communities at the site, there are some small wet hollows that may possibly have supported such communities, before being degraded by intensive stock rearing practices. The largest of these areas is

dominated by *Persicaria maculosa* (Redshank), *Filago* (Cudweed) sp. and *Plantago major* (Greater plantain). Around the edges of the hollow, both *Cirsium arvense* (Creeping thistle) and *Senecio jacobaea* (Common ragwort) are common. The ground in wet hollows tends to be particularly badly poached, due partly to the natural shelter they provide, the presence of stock feeders, and structures designed to provide shelter.

Mobile Dunes (H2120)

Two separate areas of mobile dunes, including an almost continuous strip along the northern side were mapped at the site. Amounting in total to 0.299ha, the habitat was characterised by the presence of *Ammophila arenaria* (Marram). However, a certain portion of the habitat on the southern side was clearly not very mobile in nature, with little sign of accreting sand, and a certain amount of exposed shingle throughout. It is also mapped as mobile dune due to the dominance of *Ammophila arenaria* (Marram).

Embryonic Dunes (H2110)

Embryonic dunes amounting to 0.411ha in total were mapped at the site. Most of this is accounted for by a quite substantial stretch of habitat along the southeastern side of the dunes. Up to 15m wide in places, the vegetation was dominated by *Leymus arenarius* (Lyme-grass). However, like some of the vegetation mapped as mobile dune, only a certain amount of this area seemed to be receiving sand, and in the process of accreting. The landward edge of the zone was quite immobile in nature, with grasses, and weed species such as *Cirsium arvense* (Creeping thistle), forming a significant presence. The entire zone was mapped as embryonic dune due to dominance of *Leymus arenarius* (Lyme-grass)

Shingle Vegetation (H1220)

A narrow band of vegetated shingle extends along the south shore of the site for approximately 230m. Species present included *Ammophila arenaria* (Marram), *Honckenya peploides* (Sea sandwort), *Potentilla anserina* (Silverweed) and *Tripleurospermum maritimum* (Sea mayweed). Parts of the habitat were also quite weedy, with *Cirsium arvense* (Creeping thistle) and *Urtica dioica* (Common nettle) especially common.

Annual Strandline (H1210)

A small stretch of annual strandline vegetation of approximately 30m length was mapped along the southern shore of the site. Consisting mostly of a narrow band of *Honckenya peploides* (Sea sandwort), the habitat also contained some sparse *Salsola kali* (Prickly saltwort).

IMPACTS

Activities observed or known to be impacting on the sand dune habitats at Mountcharles are shown in Table 143B.

Table 143B Intensity and impact of various activities on sand dune habitats at Mountcharles

EU Habitat Code ¹	Activity Code ²	Intensity ³	Impact ⁴	Area affected/ha	Location of Activity ⁵
H2130	143	-1	A	6	Inside
H2130	146	-1	A	5	Inside
H2130	171	-1	A	1.5	Inside
H2130	422	-1	A	1	Inside
H1220	423	-1	A	0.1	Inside
H2120	424	-1	C	0.1	Inside
H2130	622	-1	C	2	Inside
H1220	623	-1	B	0.1	Inside
H2120	623	-1	A	0.1	Inside
H2130	623	-1	A	1.5	Inside
H2130	954	-1	B	1	Inside

¹EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.

²Description of activity codes are found in Appendix 3

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

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

⁵Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

The site has been severely damaged by agricultural activities, to the point where there little conservation interest remains. Chief among these damaging practices is the supplementary feeding of stock (code 171) – mostly provided in ring feeders or troughs in the fixed dune area. Animal shelters, in the form of corrugated metal sheet huts are also found in the same areas, and a combination of these factors has led to severe poaching, due to the crowding of animals in small areas. Nitrophilous weed species also tend to proliferate as feed remnants and dung are concentrated in confined areas. Seeds of coarse grasses may also be introduced in feed and exacerbate the decline in typical dune grassland flora. Supplementary feeding is typically used to support a year-round stocking regime, which, combined with high stocking densities

(code 143) can lead to erosion in the dune grassland. Bare sand accounted for approximately 40% of the fixed dune area on the survey date. A number of wet hollows were particularly badly poached, and dominated by weed species such as *Persicaria maculosa* (Redshank).

The damaging affects of erosion were exacerbated by the presence of an obviously very large and uncontrolled rabbit population. Where vegetation cover remains, the sward is generally grazed extremely short (code 146), and burrowing activities are also adding to erosion. The site was referred to as a rabbit warren on the relevant 6' map (included as a theme on the site digital map).

Tracks of agricultural vehicles (code 623) were noted in a number of habitats. Use of heavy machinery in the dunes appears to be adding to erosion of the vegetation.

There were several items of dumped agricultural vehicles and machinery, such as trailers and fuel tanks in the fixed dunes (code 422). In the mobile dunes in the southern half of the site, the stumps of a considerable number of felled trees were dumped. The stumps, most of which were clearly from mature trees, were most likely dumped from a nearby construction site (code 424). Some dumped clay soil and other disturbance was noted in the vegetated shingle zone (code 423).

A sizeable area in the southwest corner of the site was dominated by low-growing *Prunus spinosa* (Blackthorn). The area of densest growth is mapped as scrub (code 954) on the site digital map, although it was also sparsely spread over some adjacent ground.

Walking and associated activities (code 622) are unlikely to be of major significance, as the site is relatively inaccessible and uninviting to recreational users. There are signs on gates advising the public that entering the fenced dune area is regarded as trespass.

CONSERVATION STATUS

The conservation status of habitats is based on a combination of assessments of habitat extent, vegetation structure and functions, and future prospects (Table 143C).

As there are no useful previous data or information with which the current survey results may be compared, the assessments at Mountcharles are based on the current condition of habitats.

Monitoring stops were not carried out as part of the vegetation structure and functions assessment, as they were thought unnecessary due to the severely degraded nature of the dunes, and the lack of conservation interest associated with the site.

Fixed Dunes (H2130)

Despite the severely degraded nature of the fixed dunes at the site, there was no compelling evidence of a major recent loss of overall extent. However, erosion is currently affecting the dunes on the southern side, where fixed dune vegetation is slumping onto the steep front face of the dunes. Vehicular damage, trampling by stock and the grazing and burrowing activities of rabbits have almost certainly exacerbated this situation, and consequently habitat extent is regarded as *unfavourable-inadequate*.

An estimated 40% of the fixed dune area at the site is currently comprised of bare sand, while much of the vegetated area is dominated by scrub or weed species. Those areas that do support reasonably intact vegetation comprised of typical dune species are severely overgrazed. Consequently, habitat structure and functions must be regarded as *unfavourable-bad*.

In view of the degraded nature of the dunes, due to ongoing intensive agricultural activities, and the unlikelihood of the site becoming the focus of a conservation management plan, the future prospects are considered *unfavourable-bad*.

As 2 of the individual elements of conservation status – in this case vegetation structure and functions, and future prospects – are *unfavourable-bad*, that is also the overall assessment that applies to the habitat.

As the condition of the fixed dunes has probably deteriorated consistently over time, the most appropriate Irish conservation status assessment is *unfavourable-declining*.

Table 143C Conservation status of Annex I sand dune habitats at Mountcharles

Habitat ¹	EU Conservation Status Assessment			Overall EU conservation status assessment	Proposed Irish conservation status system ²
	Favourable	Unfavourable - Inadequate	Unfavourable - Bad		
Fixed Dunes (H2130)		Extent	Structure & functions/ Future Prospects	Unfavourable - Bad	Unfavourable-Declining
Annual Strandline (H1210)	Extent/ Structure & functions	Future Prospects		Unfavourable - Inadequate	Unfavourable- Unchanged
Perennial Shingle (H1220)	Extent	Structure & functions	Future Prospects	Unfavourable - Bad	Unfavourable-Declining
Embryonic Dunes (H2110)	Extent	Structure & functions/ Future Prospects		Unfavourable - Inadequate	Unfavourable- Unchanged
Mobile Dunes (H2120)	Extent		Structure & functions/ Future prospects	Unfavourable - Bad	Unfavourable-Declining

¹EU Codes as per Interpretation Manual

²Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

Annual Strandline (H1210)

There are no data as to the general trend of annual strandline habitat at the site, so although only a small area was mapped, habitat extent may be considered *favourable*.

The area mapped was dominated by *Honckenya peploides* (Sea sandwort) and free of any negative indicator species, so vegetation structure and functions may be considered *favourable*.

As is the case with all habitats at the site, the unlikelihood of a conservation management plan being implemented means that future prospects may be regarded as no more than *unfavourable-inadequate*.

A combination of *favourable* and *unfavourable-inadequate* individual parameters indicates an overall *unfavourable-inadequate* EU conservation status assessment for the habitat.

As there is no evidence of a recent trend of decreasing extent, the corresponding Irish assessment is *unfavourable-unchanged*.

Perennial Shingle (H1220)

As there are apparently no data relevant to the extent of the habitat at the site in recent times, and in the absence of any other evidence to the contrary, habitat extent may be considered *favourable*.

As with all the other habitats at the site, monitoring stops were not carried out due to the general lack of conservation interest attaching to the habitats. Although there are a number of typical species present, the presence of a significant cover of negative indicator species such as *Cirsium arvense* (Creeping thistle) and *Urtica dioica* (Common nettle) is sufficient to signify *unfavourable-inadequate* habitat structure and functions.

As the vegetated shingle habitat is near the area of the site most vulnerable to disturbance, through earth moving and associated activities, and has in fact suffered some recent disturbance, the future prospects are regarded as *unfavourable-bad*.

As future prospects for the habitat are *unfavourable-bad*, the overall conservation status assessment is also *unfavourable-bad*.

Due to the overall unfavourable prospects for the sand dunes and the fact that the shingle habitat is under various threats such as disturbance by heavy machinery, and dumping of soil and other materials, the most apt Irish conservation status assessment is *unfavourable-declining*.

Embryonic Dunes (H2110)

The total area of embryonic dune is not inconsiderable, given the total sand dune area of the site. This may be attributable at least in part to the availability of sediment from the eroding dunes. Because of the relatively large embryonic dune area, and in the absence of any indication of recent loss of area, habitat extent is rated as *favourable*.

Much of the area mapped as embryonic dune was dominated by robust and healthy *Leymus arenarius* (Lyme-grass), although the more easterly (landward) side of the habitat on the west side of the site contained a significant proportion of unhealthy vegetation, indicating a less dynamic movement of sediment. Vegetation structure and functions can consequently be considered *unfavourable-inadequate*. The presence, in places, of a reasonable expanse of embryonic dunes may be due the release and recycling of considerable amounts of sediment through the affects of erosion.

Although a significant amount of embryonic dune, dominated by a stand of robust *Leymus arenarius* (Lyme-grass) was mapped at the site, the future prospects must be considered *unfavourable-inadequate*. The dunes in general are in a highly degraded state due to intensive cattle grazing and feeding operations, and there are no reasons to expect a discontinuation of these practices. Accreting embryonic habitat may be largely attributable to the availability of sediment from local erosion. There would also appear to be little or no prospect of a conservation management plan being implemented.

A combination of *favourable* and *unfavourable-inadequate* ratings for the individual parameters of assessment leads to an overall *unfavourable-inadequate* EU conservation status assessment.

The most appropriate Irish assessment, given the lack of evidence of a recent decline in extent or condition of the habitat, is *unfavourable-unchanged*.

Mobile Dunes (H2120)

As there are apparently no data relevant to the extent of the habitat at the site over recent times, and in the absence of any other evidence to the contrary, habit extent may be considered *favourable* for mobile dunes.

Although a significant area of mobile dunes was included on the site map, much of the area is rather inert, with little input of fresh sand. An excessive amount of *Ammophila arenaria* (Marram) was of unhealthy appearance. Vegetation structure and functions are therefore considered to be *unfavourable-bad*.

In view of the degraded nature of the dunes, due to ongoing intensive agricultural activities, and the unlikelihood of the site becoming the focus of a conservation management plan, the future prospects are considered *unfavourable-bad*.

As both structure and functions and future prospects are *unfavourable-bad*, the overall EU conservation status assessment for the habitat is *unfavourable-bad*.

On the assumption that the conservation value of sand dune habitats has been deteriorating over time, mostly as a result of the intensive stock rearing activities there, the Irish conservation status assigned to mobile dunes is *unfavourable-declining*.

Dune Slacks (H2190)

Dune slack plant communities were not present at the site, and the habitat was considered only insofar as a number of damp hollows topographically resembled slacks. It may be that dune slack communities were formerly present, but such is the degree of damage from agricultural use, that such areas are now badly poached and dominated by weed species.



- SAC 133
- Habitats**
- Strandline
- Strandline - shingle
- Embryonic Dune
- Mobile Dune
- Fixed Dune
- Scrub
- Saltmarsh
- Other (Undefined)

 <small>Gorta, Oidrisce agus Inis Ára Endeamas, Na Tuise agus Leas Gairne National Parks and Wildlife Service</small>	Coastal Monitoring Project	Mountcharles	CMP code: 143		
	2004-2006	Donegal Bay (Murvagh) (SAC 133)	<small>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: 993)</small>	<small>Date of production: 25/11/2008 Map version: 1</small>	<small>Original Drawing Size: 297 x 420 (A3) Scale 1:6785</small>