

**Slieve Tooey/Tormore Island/Loughros Beg Bay
SAC (site code 190)
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 (CMP) 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 (2015). Conservation Objectives: Slieve Tooey/Tormore/Loughrops Beg Bay
SAC 000190. Version 1.0. National Parks and Wildlife Service, Department of Arts,
Heritage and the Gaeltacht.**

1 Introduction

Achieving Favourable Conservation Status (FCS) is the overall objective to be reached for all Annex I habitat types and Annex II species of European Community interest listed in the Habitats Directive 92/43/EEC (Commission of the European Communities, 2007). It is defined in positive terms, such that a habitat type or species must be prospering and have good prospects of continuing to do so.

Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is a large site that covers half of the Slieve League peninsula in County Donegal, stretching from Ardara in the east towards Glencolumbkille and Glen Bay in the west. Along its northern side the site is fringed by a range of coastal habitats, including sea cliffs, stacks, islets, caves, sand dunes, the Loughros Beg Bay estuary and saltmarshes. Inland the area is generally mountainous, rising to 511m O.D. south of Lough Croaghballaghdown. The underlying rock is quartzite.

Fringing the northern side of Slieve Tooley are impressive vegetated cliffs. At Maghera, a sand dune system juts into Loughros Beg Bay. The site is notable for the extensive and well developed areas of dune heath. Saltmarsh has developed on shallow shores in sheltered coastal locations. The coastal habitats at this site are intact and of good quality and provide habitat for breeding birds and seals.

Slieve Tooley/Tormore Island/Loughros Beg Bay SAC (site code: 190) is designated for a range of coastal habitats including sand dunes vegetated sea cliffs. The following five coastal habitats are included in the list of qualifying interests for the site (* denotes a priority habitat):

- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Decalcified fixed dunes with *Empetrum nigrum* (2140)*
- Atlantic decalcified fixed dunes (Calluno-Ulicetea) (2150)*
- Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)

The first four habitats are associated with sand dunes; the last is sea cliffs. All five of these habitats are usually found in close association with each other. The distribution of sand dune habitats within the SAC is presented in Appendix I and the distribution of sea cliffs is presented in Appendix II.

Other Annex I habitats that were recorded at the site by the Saltmarsh Monitoring Project (SMP) and Coastal Monitoring Project (CMP) but that are not listed as qualifying interests include, Fixed dunes, Humid dunes slacks, Dunes with *Salix repens*, Perennial vegetation of

stony banks, Atlantic salt meadows and Mediterranean salt meadows (McCorry & Ryle, 2009; Ryle *et al.*, 2009).

The Annex II mollusc, *Vertigo angustior* occurs within the site. This is only one of two known sites in Donegal for this species (Moorkens, 2001).

This backing document sets out the conservation objectives for the five coastal habitats listed above in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC, which is 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 **sand dune habitats** are based primarily on the results of the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013). This document should be read in conjunction with those reports. The distribution of sand dune habitats within Slieve Tooley/ Tormore Island/ Loughros Beg Bay SAC is presented in Appendix II.

The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. A total of two sub-sites were surveyed, mapped and assessed within Slieve Tooley/ Tormore Island/ Loughros Beg Bay SAC. The sub-sites are:

1. Glen Bay
2. Maghera

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for all sub-sites and those compiled for Glen Bay are included in a set of Appendices to this document (Appendix II).

The SDM subsequently 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 Maghera) was selected as a representative sample of the national dune resource for the SDM survey.

As part of the SDM, detailed individual reports and habitat maps (a revised baseline habitat map and an updated habitat map) were produced for each sub-site and the relevant ones for Maghera are included in Appendix III.

Glen Bay sand dunes are adjacent to Glencolumbkille town on the west coast of Donegal. The Mulin River flows along the north edge of the dunes, where the river channel and a wide sand plain separate the dunes from the low hills to the north (Ryle *et al.*, 2009).

Maghera is situated at the foot of Slieve Tooley, a tall hill (472m) which rises to the northwest and has impressive cliffs fringing the northern side (Ryle *et al.*, 2009).

The conservation objectives for the sand dune habitats in Slieve Tooley/Tormore Island Loughros Beg Bay SAC are based on the findings of the individual reports for each of these sites from both the CMP (Ryle *et al.*, 2009) and the SDM (Delaney *et al.*, 2013), combined with the results of Gaynor (2008). It is thought that the two sub-sites as surveyed by the CMP and SDM represent the total area of sand dunes within Slieve Tooley/Tormore Island Loughros Beg Bay SAC.

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

The distribution of vegetated sea cliffs within Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is presented in Appendix II. The ISCS identified and carried out a detailed assessment as per the methodology outlined in Barron *et al.* (2011). This included dividing the cliff length into a series of sections to reflect the variation within the site and to give a more accurate measurement for area. This was carried out for the following three cliff sub-sites:

1. Drumirrin
2. Glenlough
3. Malinmore

The conservation objective for the vegetated sea cliff habitat within the entire SAC is extrapolated from Barron *et al.* (2011) and the sea cliff database, which was produced as part of that project. It is estimated that the sub-sites surveyed by the ISCS represents the total length of vegetated sea cliffs within Slieve Tooley/Tormore Island/Loughros Beg Bay SAC.

2 Conservation Objectives

A conservation objective aims to define the favourable conservation condition of a habitat or species at a particular site. Implementation of the objective 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 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* (2120)**
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)*
- **Decalcified dunes with *Empetrum nigrum* (2140)***
- **Decalcified dune heath Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)(2150)***
- Dunes with *Salix repens* (2170)
- Humid dune slacks (2190)
- Machair (21AO)*

Seven dune habitats were recorded by Ryle *et al.* (2009) but only the four habitats indicated in bold above are listed as Qualifying Interests for Slieve Tooley/Tormore Island/Loughros Beg Bay SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. Fixed dunes, humid dune slacks, Dunes with *Salix repens* and Perennial vegetation of stony banks have also been recorded at Maghera sub-site (Ryle *et al.*, 2009; Delaney *et al.*, 2013). Fixed dunes were also recorded at Glen Bay by the CMP (Ryle *et al.*, 2009).

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, 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 refers 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).

At the older landward edge of the fixed dunes, leaching of basic minerals and nutrients can lower the pH over time and create conditions suitable for colonisation by heath species. 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. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as *Calluna vulgaris* (Heather), and *Erica* spp., that are generally regarded as characterising the habit, are not well represented in Ireland.

Decalcified *Empetrum* dune habitat is also generally found on the landward edge of dune systems where the surface layers of sand have been leached of their calcium content, or where sand has blown up over rock that is siliceous (silica-rich) in nature. It is characterised by the presence of crowberry (*Empetrum nigrum*) which differentiates it from the other dune heath habitat. This heath-like habitat does not appear to be well developed in Ireland and is thought to be restricted to a small number of sites along the north-west coast.

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).

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 *S. repens* 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 *S. repens* are often found on sandy hummocks within slacks, or on the sides of dune ridges adjacent to slacks.

The CMP surveyed two sub-sites within Slieve Tooley/Tormore Island/Loughros Beg Bay SAC:

1. Glen Bay
2. Maghera (including Maghera Island)

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for all sub-sites and those compiled for Glen Bay are included in a set of Appendices to this document (Appendix III). The updated site report and habitat maps for Maghera from the Sand Dunes Monitoring Project (SDM) are included in Appendix IV. Note, the SDM did not visit Maghera Island (a small island off the main Maghera sub-site), so the habitat areas and distribution for this location are from CMP data.

The combined data from the CMP for the Glen Bay sub-site, along with the data from the SDM for the Maghera sub-site is presented in Appendix I. A total of 70.15ha of sand dune habitat was mapped within the Slieve Tooley/Tormore Island/Loughros Beg Bay SAC, of which 43.11ha represents perennial vegetation of stony banks, fixed dunes, dunes with *Salix repens* and humid dune slacks which are not listed as a qualifying interest for this particular site.

3.1 Overall objectives

The overall objective for 'Embryonic shifting dunes' in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)' in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is to 'restore the favourable conservation condition'.

The overall objective for 'Decalcified fixed dunes with *Empetrum nigrum*' in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Atlantic decalcified fixed dunes (Calluno-Ulicetea)' in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is to 'maintain 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. A baseline habitat map was produced for the sand dune habitats at each sub-site in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). The map for Glen Bay is included with the individual site report in Appendix III. The baseline habitat map for Maghera was reviewed and updated during the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013) and these updated maps are included with the individual site reports in the Appendices at the end of this document. The data from the CMP and SDM has been combined to produce the habitat map presented in Appendix I.

The total areas of each sand dune habitat within the SAC are presented in the final column of the following tables.

2110 Embryonic shifting dunes

Sub-site	Data source used	Total area within SAC boundary (ha)
Glen Bay	CMP	0.126
Maghera	SDM	4.754
Maghera Island	CMP	0.435
Total		5.315

2120 Shifting dunes along the shoreline with *Ammophila arenaria*

Sub-site	Data source used	Total area within SAC boundary (ha)
Glen Bay	CMP	0.879
Maghera	SDM	7.108
Maghera Island	CMP	0.496
Total		8.483

2140* Decalcified fixed dunes with *Empetrum nigrum*

Sub-site	Data source used	Total area within SAC boundary (ha)
Glen Bay	CMP	-
Maghera	SDM (CMP)	- (0.47)
Total		(0.47)

Note: 2140 was recorded from Maghera by the CMP but the SDM reclassified the same area as 2150.

2150* Atlantic decalcified fixed dunes (Calluno-Ulicetea)

Sub-site	Data source used	Total area within SAC boundary (ha)
Glen Bay	CMP	-
Maghera	SDM	13.141
Total		13.141

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.

3.3 Range

3.3.1 Habitat distribution

The distribution of sand dune habitats as mapped by Ryle *et al.* (2009) and Delaney *et al.* (2013) is presented in Appendix I.

Embryo dunes and Shifting dunes occur at all sub-sites. Decalcified dunes with *Empetrum nigrum* and Atlantic decalcified dunes were only recorded at Maghera by the CMP (Ryle *et al.* 2009). However, the SDM re-classified the previously mapped Decalcified dunes with *Empetrum nigrum* as either Atlantic decalcified dunes or fixed dunes.

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. Maintaining the favourable conservation condition of all of the sand dune habitats in Slieve Tooley/Tormore Island/Loughros Beg Bay 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.

At Glen Bay the CMP noted that the northwest tip of the dunes has a more dynamic zone of foredune development with relatively wide bands of both mobile dunes and embryonic dunes (Ryle *et al.*, 2009).

Significant accretion was noted at the northern edge of Maghera (Delaney *et al.*, 2013).

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

3.4.2 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.

A range of coastal habitats including saltmarshes occur at Glen Bay and Maghera subsites (Ryle *et al.*, 2009, McCorry & Ryle, 2009).

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

3.4.3 Vegetation composition: plant health of dune grasses

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

3.4.4 Vegetation structure: vegetation height

This attribute applies to the more fixed habitats (dune heath, fixed dunes, dunes with *S. repens* 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 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).

At Maghera there is some sheep grazing in the dune heath habitat though some areas are undergrazed allowing the spread of bramble, trees and bracken (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

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

3.4.5 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, while groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* sp.) are also present. The fixed, more stable dune vegetation includes 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*).

The Atlantic decalcified dunes at Maghera is the best example of classic dune heath formation in Ireland. The back of the site consists of a dense canopy of bog myrtle (*Myrica gale*), ling heather (*Calluna vulgaris*), cross-leaved heather (*Erica tetralix*) purple moor-grass (*Molinia caerulea*) and creeping willow (*Salix repens*) (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

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

3.4.6 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 (*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 spread of bracken (*Pteridium aquilinum*) is an issue within the dune heath habitat where in places it forms patches with hazel (*Corylus avellana*) in the higher parts of the dunes and may have spread in to areas that were originally dune heath. Bramble was also recorded in this habitat at Maghera (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

The target is that negative indicators (including non-native species) such as *Hippophae* should make up less than 5% of the vegetation cover.

3.4.7 Vegetation composition: scrub/trees

This attribute only applies to the dune heath, fixed dunes 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.

Hazel, and bramble was recorded in the dune heath habitat at Maghera (Ryle *et al.*, 2009; Delaney *et al.*, 2013).

The target for this attribute therefore is that the cover of scrub and tree species should be under control, or make up less than 5% of the vegetation cover.

4 Vegetated sea cliffs

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

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

"A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the

top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave-cut platform or sand, among other substrates. During this survey where cliffs occur within the subtidal zone the base was considered to be the high water mark. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) or 3m high (soft cliffs), or no longer has a steep slope. To be considered in this study, a cliff had to be a minimum of 100m in length. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others.”

Sheer cliffs, falling steeply from c.250m occur for several kilometres along the northern part of the SAC below Slieve Tooey (460m). Gentler cliffs occur along much of the rest of the site (Browne, 2005; Barron *et al.*, 2011). The sea cliff habitat at this site is most extensive and well-developed to the north of Slieve Tooey peak itself where the quartzite cliffs reach an elevation of just over 400m. In addition to the cliffs on the mainland, a number of large sea-stacks lie just off-shore, e.g. Tormore Island, Gull Island and Toralaydan island and most of these support sea-bird populations, notably kittiwakes and auks. The sea cliffs of the site also provide excellent habitat for chough and peregrine falcon.

The sea cliffs in this SAC are also important for sea bird colonies particularly Cormorant

4.1 Overall Objective

The overall objective for ‘vegetated sea cliffs of the Atlantic and Baltic coasts’ in Slieve Tooey/Tormore Island/Loughros Beg Bay SAC is to ‘maintain favourable conservation condition’. The objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings, (a) Area, (b) Range and (c) Structure and Functions.

4.2 Area

4.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. The target is ‘no decrease in extent from the established baseline’. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

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

The sea cliffs in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC are most extensive and well-developed to the north of Slieve Tooley peak.

As cliffs are linear features on maps, their extent is measured in kilometres rather than hectares, as you would with other habitats. During the ISCS (Barron *et al.*, 2011), each cliff was divided in to sections based on physical characteristics and vegetation cover. Breaks (i.e. non-cliff areas) of between 80m and 500m along a length of cliff were discounted from the calculations. The total length of the cliff sections within each sub-site in Slieve Tooley/Tormore Island/Loughros Beg Bay SAC is presented in the following table. The length of each cliff that is located within the SAC boundary is also presented.

There are a number of differences in the sets of figures below. Most of the differences are explained by the fact that the ISCS mapped the total sea cliff resource at the site and not all of the sea cliff mapped is contained within the SAC boundary. In addition, the county boundary line was used to draw the line for the ISCS, while a different mapping dataset than was used to draw the SAC boundary. As a result the length of cliff inside the SAC boundary may be underestimated. The total length of cliff sections for the ISCS sites was 33.56km (i.e. 2.948km, 27.63km and 2.984km). However when, this dataset was clipped to the SAC boundary 32.99km was included in the boundary. However in reality this figure is likely to be higher as a result of these mapping anomalies.

Site name	Total area/length (km) of desk survey sea cliff from ISCS	Total area/length (km) of sea cliff within SAC boundary
Drumirrin	2.95	2.95
Glenlough	27.63	27.63
Malinmore	2.98	2.41
Totals	33.56	32.99

4.3 Range

4.3.1 Habitat Distribution

The distribution of sea cliffs throughout Slieve Tooley/Tormore Island/Loughros Beg Bay SAC as identified by the Irish Sea Cliff Survey is presented in Appendix II.

Sea cliffs are distributed throughout the coastline of Slieve Tooley/Tormore Island/Loughros Beg Bay SAC (Browne, 2005; Barron *et al.*, 2011). Both hard and soft cliff types are present

within the site, with hard cliffs being more common. The hard cliffs in Slieve League SAC are unlikely to be redistributed through natural processes, unlike more dynamic coastal systems such as sand dunes and saltmarshes.

4.4 Structure and Functions

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

4.4.1 Functionality and hydrological regime

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

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

Hydrological features such as gullies, streams or cascade were identified by the ISCS as occurring at Mallinmore and Drumirrin sub-sites. Streams or cascades were also noted at the Glenlough sub-site (Barron *et al.*, 2011).

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

4.4.2 Vegetation structure: zonation

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

Adjacent habitats in this SAC include sand dune systems, heath, exposed rock, littoral rock and littoral sediment (Barron *et al.*, 2011).

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

4.4.3 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing increases the species diversity and is particularly important for maritime grasslands and coastal heath, which are often associated with sea cliffs.

The target is to maintain the structural variation in the sward height.

4.4.4 Vegetation composition: typical species & sub-communities

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

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

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

exceptions to this horizontal zonation and can occur as a mosaic with the other plant communities. The following tables presents lists of species that are considered typical of the different zones associated with soft cliffs and hard cliffs by Barron *et al.* (2011), such as those found in Slieve Tooley/Tormore Island/Loughros Beg Bay Slieve Tooley/Tormore Island/Loughros Beg Bay SAC.

Low cliffs near Port are colonised by typical sea-cliff species such as *Festuca rubra*, *Armeria maritima*, *Plantago maritima*, *Plantago coronopus* and *Cochlearia officinalis*. In addition to these common species the presence of a couple of rarer plant species has also been noted on the sea-cliffs within the site. The NHA file on the site notes *Rhodiola rosea* on cliffs north of Slieve Tooley, while the presence of the nationally scarce *Saxifraga oppositifolia* was also noted on low sea cliffs influenced by blown sand, close to sea-level near Maghera. Along the tops of the cliffs there are extensive zones of windswept heath (mostly *Calluna*-dominated) which are laden by salt-laden sea-spray.

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

Typical splash zone species on hard cliffs		
<i>Ramalina</i> spp	<i>Verrucaria maura</i>	<i>Xanthoria</i> spp
Typical crevice and ledge species on hard cliffs		
<i>Anthyllis vulneraria</i>	<i>Asplenium marinum</i>	<i>Armeria maritima</i>
<i>Aster tripolium</i> <i>Catapodium marinum</i> <i>Festuca rubra</i> <i>Ligusticum scoticum</i> <i>Plantago maritima</i> <i>Silene uniflora</i>	<i>Atriplex prostrata</i> <i>Cerastium diffusum</i> <i>Inula crithmoides</i> <i>Limonium</i> sp <i>Sedum anglicum</i> <i>Spergularia rupicola</i>	<i>Beta vulgaris</i> ssp. <i>maritima</i> <i>Crithmum maritimum</i> <i>Lavatera arborea</i> <i>Plantago coronopus</i> <i>Sedum rosea</i>

Typical coastal heath species		
<i>Calluna vulgaris</i>	<i>Daboecia cantabrica</i>	<i>Empetrum nigrum</i>
<i>Erica cinerea</i>	<i>Erica tetralix</i>	<i>Scilla verna</i>
<i>Ulex gallii</i>	<i>Vaccinium myrtillus</i>	

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

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

4.4.5 Vegetation composition: negative indicator species

Negative indicator species can include non-native species (e.g. *Hebe* sp., *Carpobrotus edulis*, *Gunnera tinctoria*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered to be typical of the habitat (e.g. *Pteridium aquilinum*).

The target for this attribute is that negative indicator species (including non-native species) should make up less than 5% of the vegetation cover.

4.4.6 Vegetation composition: bracken and woody species

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

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

5 References

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

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

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

Delaney, A., Devaney, F.M., Martin, J.R. and Barron, D.J. (2013). Monitoring survey of Annex I sand dune habitats in Ireland. *Irish Wildlife Manuals*, No. 75. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

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

Gaynor, K. (2008). *The phytosociology and conservation value of Irish sand dunes*. Ph.D. Thesis, National University of Ireland, Dublin.

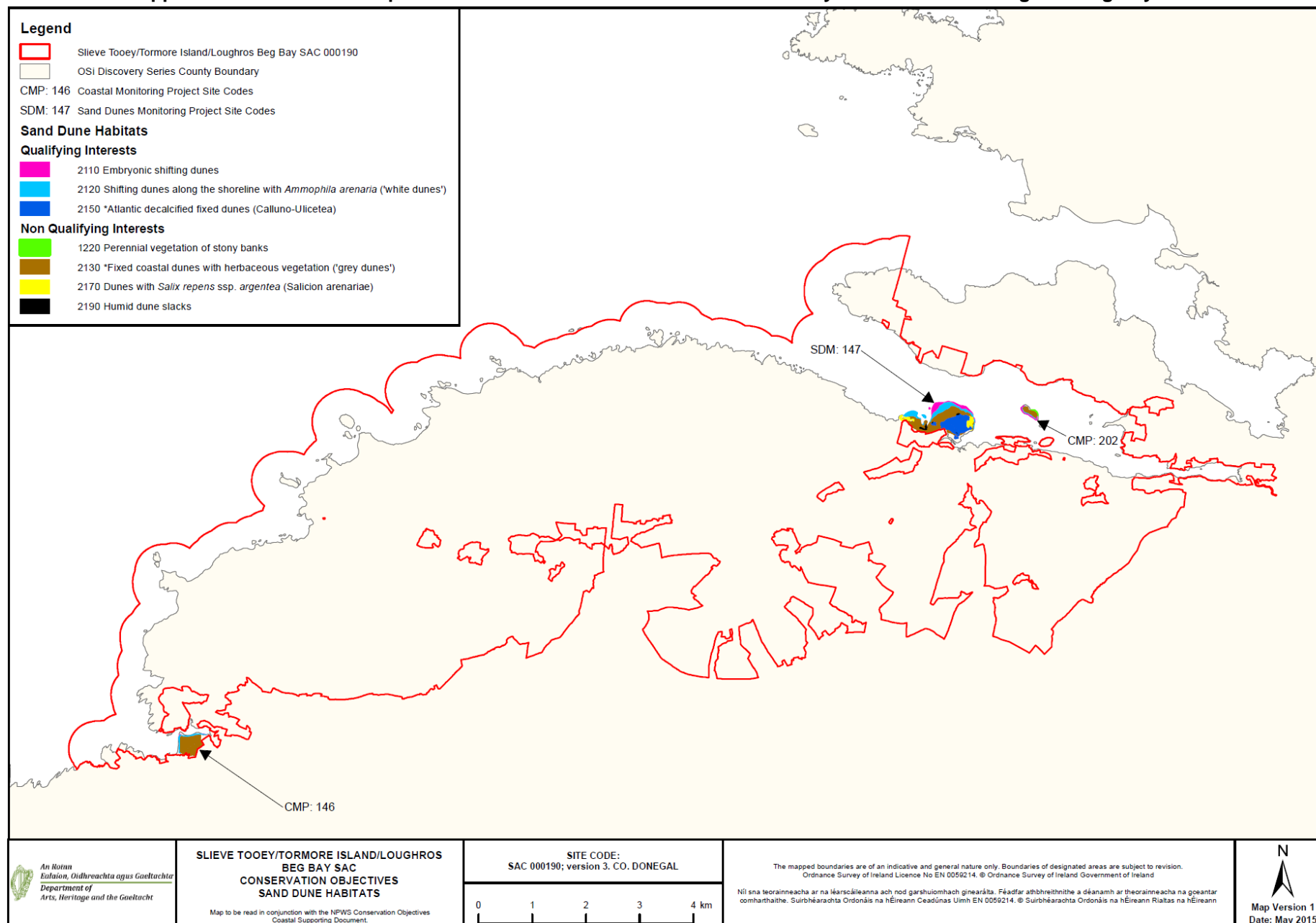
JNCC (2004). *Common standards and monitoring guidance for maritime cliff and slope habitats*. Joint Nature Conservation Committee, Peterborough, UK.

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

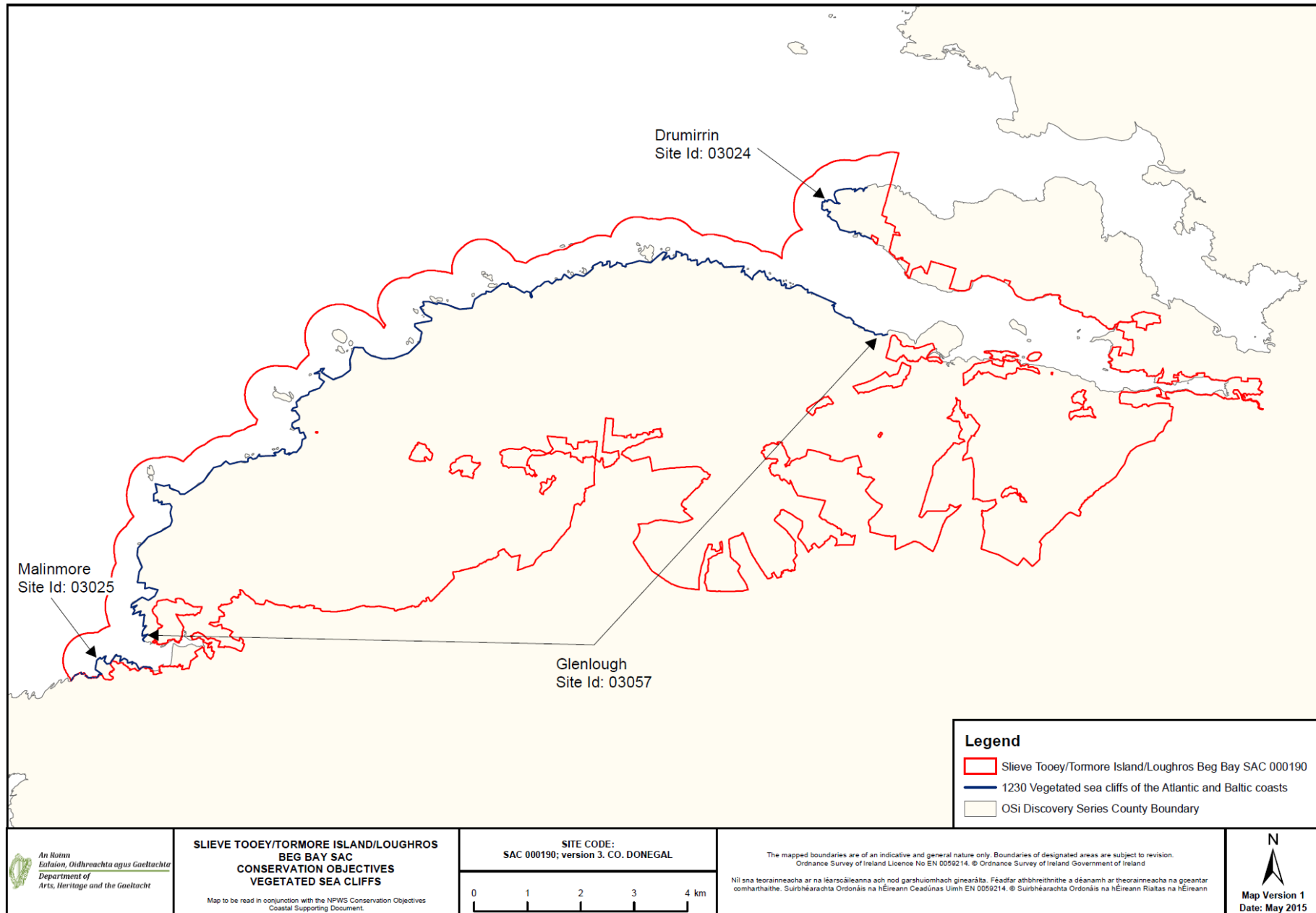
Moorkens, E.A. (2001). An inventory of Mollusca in potential SAC sites, with special reference to *Vertigo* species, 2000 survey. A report to the National Parks and Wildlife Service.

Ryle, T., Murray, A., Connolly, K. and Swann, M. (2009). *Coastal Monitoring Project 2004-2006*. Unpublished report to the National Parks and Wildlife Service, Dublin.

Appendix I: Distribution map of known sand dunes sites within Slieve Tooley/Tormore Island/Loughros Beg Bay SAC



Appendix II. Distribution map of vegetated sea cliff habitats within Slieve Toomey/Tormore Island/Loughros Beg Bay SAC



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

SITE DETAILS

CMP06 site name: **Glen Bay** CMP06 site code: **146** CMP Map No.: **143**

County: **Donegal** Discovery map: **10** Grid Reference: **G 525 850**

6 inch Map No.: **Do 80**

Aerial photographs (2000 series): **O0466-D; O0467-C; O0495-A**

NPWS Site Name: **Slieve Tooley / Tormore Island / Loughros Beg**

NPWS designation: **pNHA: 190 cSAC: 190**

Ranger Area: **Donegal**

MPSU Plan: **No**

SITE DESCRIPTION

Glen Bay sand dunes are adjacent to Glencolumbkille town on the west coast of Donegal. The sand dunes are small, comprising only 14.512ha in area, while the front, west-facing edge of the dunes extends over approximately only 300m.

Most of the sand dune area is comprised of fixed dunes – a priority Annex I habitat, while foredune habitats, most of which are accounted for by mobile dunes, make up the remaining area (Table 146A). Much of the mobile dunes are on the steeply sloping west- and north-facing edges of the dunes, where there is little or no accreting habitat; while the northwest tip of the dunes has a more dynamic zone, where embryonic and mobile dunes are more substantial, and developing on the beach level. However, most of this developing foredune habitat is likely to be of a temporary nature.

Both the west-facing front edge and the northern edge of the dunes rise steeply from the beach level, while the southern edge of the dunes grades into wet grassland and improved agricultural grassland, and rises quite steeply towards the adjacent public road. The interior of the sandhills are quite level, without any substantial ridges.

The Murlin River flows along the north edge of the dunes, where the river channel and a wide sand plain separate the dunes from the low hills to the north. A smaller stream in the southwest corner of the dunes supports some wet grassland species such

as *Iris pseudacorus* (Yellow Iris), *Filipendula ulmaria* (Meadowsweet) and *Lythrum salicaria* (Purple-loosestrife) around its margins. A sizeable patch of *Phragmites australis* (Common reed) was mapped and indicated on the site digital map with a ‘miscellaneous’ information point.

Table 146A Areas of EU Annex I habitats mapped at Glen Bay

EU Code	EU Habitat	Area (ha)
H2110	Embryonic shifting dunes	0.126
H2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i>	0.939
H2130	Fixed coastal dunes with herbaceous vegetation	13.447
Total Sand dune		14.512

Glen Bay dunes are within the very large Slieve Tooley/Tormore Island/Loughros Beg cSAC, which covers the northern half of the Slieve League peninsula in Donegal. The only other significant sand dune system is that at Maghera in Loughros Beg Bay (included in the present report as site 147), where one of the finest examples of dune heath in the country is found. The dune system at Maghera is larger, and has a greater diversity of dune habitats than Glen Bay, and as a consequence, has received the greater amount of comment and observations in reports relating to the cSAC. The most extensive habitats within the cSAC are blanket bog, heath, open marine areas and sea-cliffs. Sand dunes and beaches were estimated in the NATURA 2000 data form as covering 3% of the total cSAC habitat area.

A football field and clubhouse in the northeast corner of the site have been excluded from the cSAC, although the current inaccuracy of the exclusion boundary can be seen on the site digital map. The triangular field to the north of the football pitch has not been excluded, although it is now quite improved, and of very little conservation value.

The dunes are framed by the low rocky hills at Garveross (Garbhros) to the north and Dooley and Cill Fhathnaid to the south and make a picturesque location. The beach and dunes are readily accessible to visitors, and a car park, which also serves the adjacent Glencolumbkille Folk village and museum, adjoins the site and provides for large numbers of visitors. Amenity use of the site is high, although the dunes are less

heavily used than the beaches, in part probably because of the steeply sloped front dune face, which makes access to the interior of the dunes somewhat difficult.

In addition to the Annex I sand dune habitats and their associated typical dune flora, there are other elements of conservation value associated with the site. A large flock of Choughs was seen during the site visit, while a population of the rare mollusc *Vertigo angustior* was discovered at the dunes in 2000 (Moorkens, 2001).

Fixed Dunes (H2130)

Most of the dune grassland is unenclosed and ungrazed by livestock. Grazing stock during the site visit consisted of only a small number of sheep, most of which were confined to a number of small fenced enclosures in the southern part of the site. The large rabbit population is probably playing a significant role in maintaining the short turf areas through their grazing activities, although in some areas where they appear to be particularly common, the vegetation cover has become somewhat eroded. A very bare, large hollow near the front west-facing edge of the dunes has a particularly large number of rabbit burrows.

The fixed dunes contain a mix of short turf areas with high species diversity and other more rank, undergrazed or agriculturally impacted areas. Most of the northern part of the dunes contains species-rich short turf, while the southern half, and some of the eastern part adjacent to the football pitch has long, ungrazed areas dominated by grass species. The eastern end of the fixed dune area, adjacent to the football field, is particularly undergrazed.

Some of the short turf areas contain a reasonably impressive diversity of species. Among the typical species noted were *Anacamptis pyramidalis* (Pyramidal orchid), *Anthyllis vulneraria* (Kidney vetch), *Campanula rotundifolia* (Harebell), *Daucus carota* (Wild carrot), *Euphrasia officinalis* agg. (Eyebright), *Festuca rubra* (Red fescue), *Galium verum* (Lady's bedstraw), *Luzula campestris* (Field wood-rush), *Pilosella officinarum* (Mouse-ear-hawkweed), *Plantago lanceolata* (Ribwort plantain), *Rhinanthus minor* (Yellow rattle) and *Thymus polytrichus* (Wild thyme).

The more common moss species included *Climacium dendroides*, *Rhytidiadelphus squarrosus*, *R. triquetrus*, *Scleropodium purum* and *Tortula ruraliformis*.

There are several potato plots in the fixed dune area, all of which are shown on the site digital map. One plot included a small corner of other vegetables. Most of the plots have adjacent fallow areas of similar dimensions, where crops have been planted in previous years. These fallow plots were mostly very weedy and had not regained a typical dune grassland flora following cultivation. The areas of the current potato plots, which amounted in total to 0.178ha, have been included in the total fixed dune area of 13.447ha.

There are a few low-growing shrub-sized *Acer pseudoplatanus* (Sycamore) throughout the dune grassland, although the total shrub and tree cover throughout the site is insignificant.

A small grazing field on the north side of the Murlin River channel (identified with a 'miscellaneous' point on the site digital map) appeared to be quite sandy, although it is not within the cSAC - presumably due to the degree of agricultural improvement - and need not be considered as part of the functioning sand dune system.

The cSAC boundary line also defines the fixed dune boundary over much of the southern part of the site. The improved fields to the southeast of the cSAC boundary may to a small extent have replaced some natural sand dune area, but such is the degree of agricultural improvement here, that sand substrate was not detectable in the fields. Some of the more southerly reaches of the fields are also quite wet, and clearly not part of the natural dune area.

The most southerly projection of the cSAC boundary that extends to the adjacent road supports some wet grassland that lies beyond the limit of fixed dune habitat. This wet area, which slopes steeply up towards the road and contains species such as *Iris pseudacorus* (Yellow Iris), *Filipendula ulmaria* (Meadowsweet) and *Lythrum salicaria* (Purple-loosestrife), is indicated with a 'miscellaneous' point on the site digital map. Erosion is affecting the sand hills along the northern edge, where fixed

dune vegetation has, in places, slumped over the steep face of the dunes, sometimes to be stabilised by *Ammophila arenaria* (Marram).

There were no dune slacks within the fixed dunes, although a small hollow in the eastern end of the site had a number of species typical of damp ground such as *Prunella vulgaris* (Selfheal) and the moss *Climacium dendroides*. Also present around the edge of the hollow was *Salix repens* (Creeping willow).

Mobile Dunes (H2120)

Mobile dunes were mostly confined to the steep west- and north-facing front faces of the dunes, with little or no habitat development on the beach level. The habitat on the higher parts of the dune ridges was dominated by a rather rank growth of *Ammophila arenaria* (Marram). Lower down on the steep slopes and occasionally on the beach level, a more robust and healthy Marram-dominated vegetation occurred, probably reflecting the greater mobility of sediment at the lower elevations. Other species in the mobile dunes along the front face of the dunes included *Eryngium maritimum* (Sea-Holly), *Daucus carota* (Wild carrot) and *Senecio jacobaea* (Common ragwort).

Occasional small patches of *Elytrigia juncea* (Sand couch) were noted at the seaward edge of the mobile dunes, although only in two areas were they substantial enough to warrant mapping as embryonic dune.

The northwest tip of the dunes has a more dynamic zone of foredune development, with relatively wide bands of both mobile dunes and embryonic dunes, although it is probable that such accretion is of a temporary nature, likely to be removed during winter storms. A greater amount of sediment recycling may occur here due to the tidal movements and the action of the Murlin River in this area. Erosion along the north-facing dune edge will also lead to the local re-working of sediment.

Embryonic Dunes (H2110)

Embryonic dunes, characterised by the presence of *Elytrigia juncea* (Sand couch), are present in only small patches in the northeast and northwest corners of the dunes. The northwest tip of the dunes supports a relatively wide band of foredunes, although this

habitat is likely to be only temporary in nature and may have represented a summer build-up.

IMPACTS

Activities observed or known to be impacting on the sand dune habitats at Glen Bay are shown in Table 146B.

Table 146B Intensity and impact of various activities on sand dune habitats at Glen Bay

EU Habitat Code ¹	Activity Code ²	Intensity ³	Impact ⁴	Area affected/ha	Location of Activity ⁵
H2130	100	A	-1	0.3	Inside
H2130	103	A	-1	1.5	Inside
H2130	140	B	0	7	Inside
H2130	149	B	-1	5	Inside
H2130	300	A	-2	0.2	Inside
H2130	423	C	-1	0.1	Inside
H2110	622	B	-1	0.1	Inside
H2120	622	B	-1	0.9	Inside
H2130	622	C	-1	10	Inside
H2110	900	A	0	0.1	Inside
H2120	900	A	0	0.1	Inside
H2130	900	A	0	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 sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

Most of the dune grassland is unenclosed and ungrazed by livestock. Grazing stock during the site visit consisted of only a small number of sheep, most of which were confined to the small fenced enclosures in the southern part of the site. Although there are substantial areas of species-rich short turf within the dune grassland, some parts of the fixed dunes, particularly in the east side, near the football field and also in the south-central area are currently undergrazed (code 149). Rabbits, which are clearly abundant at the site, as was clear from the numbers of burrows and scrapes throughout the fixed dunes, are probably playing a significant role in maintaining the short turf areas in the dune grassland through their grazing activities, although they may be also at least partly responsible for a sizeable bare area in a hollow near the seaward edge of the fixed dunes. For this reason, their activities - indicated by code 140 - are considered neutral in their impact.

Amenity pressures at the site (code 622) are certainly significant. There were many bathers, walkers and other users present during the site visit, despite the fact that the weather, although reasonably good, was not exceptional. Visitor numbers to the dunes are inflated by the proximity of Glencolumbkille Folk village and museum, which itself is a popular visitor attraction. However, damage to the dunes may be limited by the fact that recreational activities seem to be largely concentrated on the beaches, which may be due to the very steep front face of the dunes near the main access point and around much of the dune edge, that makes access to the dunes moderately difficult.

There are numerous small potato plots (code 100) in the fixed dunes, particularly in the southern half, many of which have adjacent fallow plots that have become re-vegetated by weed species.

Most of the dunes are unenclosed and largely unimproved from an agricultural perspective. However, there are several small fenced plots in the southern portion of the site, particularly in the central area where the cSAC boundary extends to the road. Much of this area, and some adjacent unenclosed ground, has seen a significant degree of improvement (code 103), with significant areas dominated by coarse grasses such as *Lolium perenne* (Perennial rye-grass) and *Dactylis glomerata* (Cock's-foot). There is also a sizeable *Pteridium aquilinum* (Bracken)-dominated area in this part of the site, and some very weedy patches, dominated by species such as *Cirsium arvense* (Creeping thistle), *Rumex crispus* (Curled dock) and *Urtica dioica* (Common nettle).

The triangular field to the north of the football pitch is quite improved (code 103), although its current usage is unclear, while an adjacent narrow strip on the northern edge of the field has been highly disturbed by the dumping of rubble, grass clippings and large banks of soil.

A small bare area in the fixed dunes, identified with a 'miscellaneous' point on the site digital map, appeared to be a location for sand extraction (code 300), although this could not be confirmed. Nevertheless, it is included among the list of impacts at the site.

Some small scale dumping of material such as scrap metal and tyres (code 423) was noted in the fixed dunes.

There were several stunted, shrub-sized *Acer pseudoplatanus* (Sycamore) throughout the site, but their total combined cover was not significant. Along the north-south running fence that adjoins the football field, there were some *Fuchsia magellanica* (Fuchsia) bushes, although as a percentage of the entire dune area, their combined cover was also barely significant. These bushes were probably planted and are not considered to represent the spread of an invasive species.

The affects of natural erosion (code 900) are particularly evident along the north-facing edge of the dunes where fixed dune vegetation has, in places, slumped onto the steep front face.

CONSERVATION STATUS

The overall conservation status assessment of each habitat at Glen Bay is based on a combination of *Habitat Extent, Structure & Functions*, and *Future Prospects* assessments (Table 146C). The structure and functions assessment is based on the pass/failure rates of monitoring stops, which are shown in Table 146D.

Glen Bay is within the Slieve Tooey/Tormore Island/Loughros Beg cSAC (cSAC 190), with the result that a certain amount of information on the site has been previously generated. However, the cSAC also includes the larger dunes at Maghera in Loughros Beg Bay, and habitat ratings and explanatory notes in the relevant NATURA 2000 documents refer to the total habitat areas within the cSAC. There are, therefore, no data that may be directly compared with those produced here, and consequently, habitat conservation status assessments are based largely on the current condition of habitats.

Of the Annex I sand dune habitats at Glen Bay, only embryonic dunes (H2110) and mobile dunes (H2120) were included in the ecological information in the relevant NATURA 2000 standard data form. No explanation is given for the omission of fixed dunes, which comprise the greater part of the dune area at Glen Bay.

Fixed Dunes (H2130)

There are no conclusive indications that an apparent loss of area (extent) due to erosion is not attributable to natural causes. Slumping of fixed dune vegetation onto a steep front face was noted on the northern edge of the dunes, although this was not a factor along the western edge of the dunes, where recreational pressures are probably most keenly felt.

Table 146C Conservation status of Annex I sand dune habitats at Glen Bay

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 - Inadequate	Unfavourable - unchanged
Embryonic Dunes (2110)	Structure & functions	Extent/ Future prospects		Unfavourable - Inadequate	Unfavourable - unchanged
Mobile Dunes (H2120)		Extent/ Future prospects	Structure & functions	Unfavourable - Bad	Unfavourable - unchanged

¹EU Codes as per Interpretation Manual

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

However, a triangular field to the north of the football field has been improved to such an extent that it is mapped here as ‘improved grassland’, and can no longer be considered as part of the functioning dune system. The recent history of this corner of the site is unclear, although the fact that it remains within the cSAC boundary, may indicate a recent loss to the dune area. For this reason, habitat extent (area) is considered *unfavourable-inadequate*. Another improved field to the north of the Murlin River channel also appeared to be somewhat sandy in nature, although its exclusion from the cSAC suggests it has been in this condition for some time, and should not be considered as a loss to the dune area in the present context.

All four monitoring stops carried out in the fixed dunes passed the overall target criteria. Although all of the stops had an element of longish sward, there was sufficient short turf in each to support reasonably high species diversity – over 20

species in one instance. The negative species indicator component of each was also non-existent or low, consisting, where when present of *Cirsium arvense* (Creeping thistle) or *Senecio jacobaea* (Common ragwort). A 100% pass rate for monitoring stops should indicate *favourable* structure and functions. However, because of the fairly extensive agriculturally improved areas, in which grasses such as *Lolium perenne* (Perennial rye-grass) and *Dactylis glomerata* (Cock's-foot) were major components of the flora; and adjacent *Pteridium aquilinum* (Bracken)-dominated or weedy patches, the assessment is revised to *unfavourable-inadequate*. Had eight or more monitoring stops been carried out, it is highly likely that at least one would have failed and consequently resulted in the more appropriate *unfavourable-inadequate* conservation status assessment.

Table 146D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Glen Bay

Habitat	Monitoring stops		Conservation status
	Pass	Fail	
Fixed Dunes (H2130)	4	0	*Favourable
Embryonic Dunes (2110)	1	0	Favourable
Mobile Dunes (H2120)	1	3	Unfavourable - Bad

* Modified to *unfavourable-inadequate* (See above)

The future prospects of the fixed dunes cannot be regarded as favourable, as the current existence of cultivation plots, and the loss of quality of some areas through recreational use, or agricultural management practices, suggests that the site will continue to suffer a significant degree of degradation. For this reason, the future prospects are regarded as *unfavourable – inadequate*. An *unfavourable-bad* rating is avoided, as the system is not under such pressure as to be in severe decline.

The overall conservation status is *unfavourable-inadequate*, as all three individual elements of the assessment are also *unfavourable-inadequate*.

The assessment thought most appropriate under the proposed Irish system is *unfavourable-unchanged*, reflecting the probable long-term existence of several negative impacts in the habitat.

Mobile Dunes (H2120)

Mobile dunes are currently distributed around almost the entire seaward boundary of the site, indicating good zonation of habitat. However, there were signs of erosion, particularly around the northern side of the sand hills, where the remaining habitat appears particularly rank. Although probably largely due to natural causes, erosion is likely to be exacerbated by amenity use of the site and habitat extent is therefore considered *unfavourable-inadequate*.

Four monitoring stops, only one of which passed, were used in the assessment of mobile dunes structure and functions. The 75% failure rate indicates an *unfavourable-bad* assessment. Two of the failed stops had an excess of rank, unhealthy *Ammophila arenaria* (Marram), while the third failed stop was due to the excessively sparse cover of typical species – in this case *Ammophila arenaria* (Marram) – in the area.

Much of the current mobile dune area consists of rather rank vegetation, probably reflecting a lack of mobility within the system. The small area of foredune accretion in the northwest corner of the site is unlikely to represent a long-term development of habitat, and future prospects are therefore considered *unfavourable-inadequate*.

The inclusion of an *unfavourable-bad* assessment among the individual conservation status parameters dictates an overall *unfavourable-bad* assessment.

The corresponding assessment thought most appropriate under the proposed Irish conservation system is *unfavourable-unchanged*, as the compromised condition and restricted development of the habitat is likely to have existed for some time.

Most of the assessments of ecological criteria in the NATURA 2000 standard data form and accompanying explanatory notes reflected the somewhat compromised structure and prospects of mobile dunes.

Embryonic Dunes (H2110)

Information concerning embryonic dunes in the relevant NATURA 2000 standard data form and accompanying explanatory notes is quite scant, and the various ratings

of ecological criteria such as ‘Relative Surface’ and ‘Conservation Status’ are clearly based as much on conjecture as collected data. Although there are no indications of a recent loss of extent (area), the absence of the habitat from much of the dune edge represents poor zonation and dictates an *unfavourable-inadequate* assessment for extent.

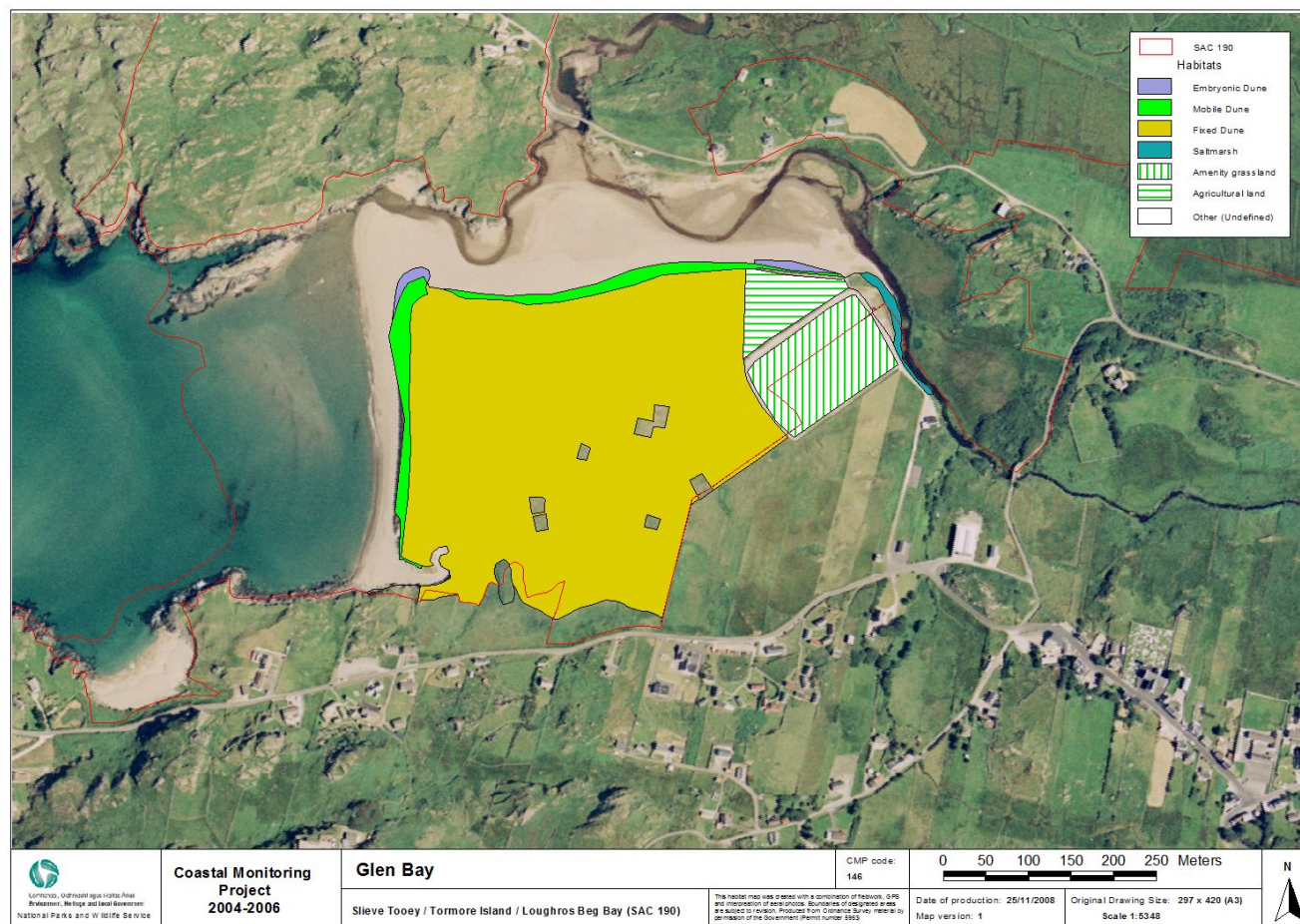
A single monitoring stop, which passed the overall required standard, indicating *favourable* structure and functions, was carried out in the embryonic dunes. One stop was deemed sufficient for the very small area of habitat, which was quite homogenous in vegetation structure and composition throughout.

As erosion seems to be a current factor in the lack of actively developing foredune habitat at the site, future prospects are considered *unfavourable-inadequate*. The outlook is less negative than would warrant an unfavourable-bad assessment.

A combination of *favourable* and *unfavourable-inadequate* ratings for the individual elements of conservation status assessment indicates an overall *unfavourable-inadequate* assessment.

The assessment thought most appropriate under the proposed Irish system is *unfavourable-unchanged*, reflecting the probable long-term existence of restricted habitat extent and zonation.

The habitat is discussed in the explanatory notes that accompany the cSAC NATURA 2000 data form, although most of the remarks were qualified with an acknowledgement that little was known of the habitat at either Maghera or Glen Bay. The rankings of conservation status, global assessment etc. refer to the total amount of habitat in the cSAC, which, as it also includes Maghera, is of little use for the purposes of comparison with the present report.



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

SITE 147 MAGHERA

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

Maghera is a small site located close to the town of Ardara in West Donegal. It forms part of Slieve Tooey/Tormore/Loughros Beg Bay SAC (SAC 000190). Although the site is less than 50 ha in size it contains a considerable diversity of Annex I sand dune habitats. Seven Annex I sand dune habitats (* indicates a priority habitat) were recorded here during the CMP: **2110 Embryonic shifting dunes**, **2120 Marram dunes (white dunes)**, ***2130 Fixed dunes (grey dunes)**, ***2140 Decalcified *Empetrum* dunes**, ***2150 Decalcified dune heath**, **2170 Dunes with creeping willow** and **2190 Humid dune slacks** (Ryle *et al.*, 2009). The sand dunes occur in a network of coastal habitats of high conservation value including **1230 Vegetated sea cliffs of the Atlantic and Baltic coasts** (Barron *et al.*, 2011), **1410 Mediterranean salt meadows** and **1330 Atlantic salt meadows** (McCorry & Ryle, 2009). The ***2150 Decalcified dune heath** is particularly well-developed here, occurring on old fixed dunes which have become decalcified through leaching. There are mature acidic dune slacks within the dune heath. Grey seal (*Halichoerus grypus*), otter (*Lutra lutra*) and whorl snail (*Vertigo angustior*) are listed in the conservation objectives for Slieve Tooey/Tormore/Loughros Beg Bay SAC (SAC 000190), and Chough (*Pyrrhocorax pyrrhocorax*), Ring ouzel (*Turdus torquatus*), Twite (*Carduelis flavirostris*) and Curlew (*Numenius arquata*) have been recorded from habitats surrounding the dune system. Some of them may use the dunes for foraging (Ryle *et al.*, 2009).

The dunes at Maghera are located in an area of scenic beauty and are attractive to visitors. A car park and paths facilitate access to the dunes and nearby caves, strand and waterfall. The main land-use locally is agriculture, and there is a small settlement south of the site. Maghera Island (CMP Site 202) is a small sand dune site located 900 m to the west of site 147 Maghera. It was treated as a sub-site during the baseline survey (Ryle *et al.*, 2009), but was not visited during the current survey as it was cut off by the tide.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Maghera was surveyed on the 17th and 18th of June 2012. Of the seven Annex I habitats recorded on the site during the baseline survey, only six were recorded in 2012. The habitats found at Maghera in 2012 and the results of the conservation assessments are presented in Table 1. Assessing the conservation status of the ***2150 Decalcified dune heath** habitat is not included within the remit of this project. ***2140 Decalcified *Empetrum* dunes** habitat was not found on the site in 2012. Three of the habitats, **2110 Embryonic shifting dunes**, **2120 Marram dunes (white dunes)** and **2190 Humid dune slacks**, were assessed as Favourable. The remaining habitats were assessed as Unfavourable-Inadequate, indicating that with correct management they could attain Favourable conservation status, and that they are not in danger of disappearing. **2110 Embryonic shifting dunes** were not assessed in the baseline survey; therefore no trends could be established for this habitat.

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

Habitat	Area	Structure & Functions	Future Prospects	Overall result
2110 Embryonic shifting dunes	Favourable	Favourable	Favourable	Favourable
2120 Marram dunes (white dunes)	Favourable (Stable)	Favourable (Improving)	Favourable (Stable)	Favourable (Improving)
*2130 Fixed dunes (grey dunes)	Favourable (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)
2170 Dunes with creeping willow	Favourable (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)
2190 Humid dune slacks	Favourable (Stable)	Favourable (Improving)	Favourable (Improving)	Favourable (Improving)

2.1.1 Area

The area of each habitat according to the baseline maps, the revised baseline maps and the Sand Dunes Monitoring Project are presented in Table 2. Baseline areas of **2120 Marram dunes (white dunes)**, ***2130 Fixed dunes (grey dunes)** and ***2150 Decalcified dune heath** decreased after revision due to the exclusion of areas of agricultural grassland, heath and bare rock from the ***2130 Fixed dunes (grey dunes)** and ***2150 Decalcified dune heath**. The site has increased in size since the CMP due to the expansion of **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** in a seaward direction. Despite this, the total area of **2120 Marram dunes (white dunes)** had increased by less than a hectare as the landward parts of these dunes had stabilised since the CMP and were now included in the ***2130 Fixed dunes (grey dunes)**. ***2150 Decalcified dune heath** had also expanded into an area previously mapped as ***2130 Fixed dunes (grey dunes)**. The boundary between ***2150 Decalcified dune heath** and ***2130 Fixed dunes (grey dunes)** was very diffuse and some of the change in size may be due to interpretation of the habitat. Five areas of **2190 Humid dune slacks** were enlarged or newly added in the revised baseline maps. There was a significant increase in the area of **2170 Dunes with creeping willow** recorded in the original baseline maps compared with that presented in the revised baseline maps. Well-grazed *Salix repens* can be difficult to see from a distance, and could easily have been missed during the baseline survey. As the site was grazed and the *Salix repens* was mature, it seems unlikely that the **2170 Dunes with creeping willow** newly

mapped in 2012 represents a genuine increase. ***2140 Decalcified *Empetrum* dunes** habitat was not found during the SDM.

Table 2. Areas of Annex I dune habitats originally mapped at Maghera 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)
2110 Embryonic shifting dunes	0.43	0.43	4.75
2120 Marram dunes (white dunes)	6.69	6.51	7.11
*2130 Fixed dunes (grey dunes)	21.52	20.96	23.06
*2140 Decalcified <i>Empetrum</i> dunes	0.47	0.47	0.00
*2150 Decalcified dune heath	16.56	11.91	13.14
2170 Dunes with creeping willow	0.58	3.12	3.12
2190 Humid dune slacks	0.34	1.10	1.10
Total	46.59	44.50	52.28

2.1.2 Structure and Functions

Structure and Functions were assessed for five habitats at Maghera. Table 3 shows the results of the Structure and Functions assessment for the habitats assessed as part of the SDM. The Structure and Functions of **2110 Embryonic shifting dunes**, **2120 Marram dunes (white dunes)** and **2190 Humid dune slacks** were assessed as Favourable, but ***2130 Fixed dunes (grey dunes)** and **2170 Dunes with creeping willow** were all assessed as Unfavourable-inadequate. The Structure and Functions of these habitats were compromised due to the presence of excessive *Pteridium aquilinum* and woody species such as *Rosa spinosissima*.

Table 3. Annex I sand dune habitats at Maghera 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
2110 Embryonic shifting dunes	8	7	0
2120 Marram dunes (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	8	11	1
2170 Dunes with creeping willow	8	10	2
2190 Humid dune slacks	4	11	0

2.1.3 Future Prospects

Impacts and activities recorded at Maghera are presented in Table 4. Impact codes are assigned according to Ssymank (2010). In general, the amount of damage and bare sand present in the dunes appears to have reduced since the baseline survey and some of the blow-outs have revegetated. A boardwalk, which had been put in place since the baseline survey, protects dunes close to the car park. Rabbits were present on the site and there was some bare sand associated with their warrens, but the amount of bare sand associated with rabbit activity was not considered to be problematic during the SDM. Over the site as a whole, bracken and scrub encroachment together represent the most serious threat. While small areas of bracken and scrub add structural diversity to the site, the spread of bracken and scrub over three habitats threatens the diversity of the site.

Table 4. Impacts recorded in Annex I sand dune habitats at Maghera 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
2110	G01.02	Walking	Low	Neutral	20	Inside
2120	G01.02	Walking	Low	Neutral	5	Inside
*2130	A04.02.02	Non-intensive sheep grazing	Low	Positive	100	Inside
*2130	A05.02	Supplementary feeding	High	Negative	1	Inside
*2130	D01.01	Boardwalk	High	Neutral	1	Inside
*2130	G01.02	Walking	Medium	Neutral	1	Inside
*2130	G05	Campfire	High	Negative	1	Inside
*2130	H05.01	Rubbish (littering)	Low	Negative	1	Inside
*2130	I02	Bracken encroachment	High	Negative	15	Inside
*2150	A04.02.02	Non-intensive sheep grazing	Low	Positive	100	Inside
*2150	G05	Campfire	High	Negative	1	Inside
*2150	H05.01	Dumping	Low	Negative	1	Inside
*2150	I02	Bracken encroachment	Medium	Negative	10	Inside
*2150	K02.01	Hazel scrub encroachment	High	Negative	5	Inside
*2150	K04.05	Rabbit grazing and burrows	Low	Neutral	5	Inside
2170	A04.02.02	Non-intensive sheep grazing	Low	Positive	100	Inside
2170	A04.03	Undergrazing	Medium	Negative	10	Inside
2170	I02	Bracken encroachment	Medium	Negative	5	Inside
2170	K02.01	Scrub encroachment	Medium	Negative	5	Inside
2190	A04.02.02	Non-intensive sheep grazing	Low	Positive	100	Inside
2190	G05.09	Fencing	Low	Neutral	5	Inside
2190	H05.01	Dumping	Low	Negative	1	Inside
2190	J02.09.01	Salt water intrusion	Medium	Neutral	5	Outside
2190	K01.03	Drying out	Low	Neutral	50	Inside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Maghera 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 2110 Embryonic shifting dunes

2110 Embryonic shifting dunes were actively accreting at Maghera. The vegetation included both *Ammophila arenaria* and *Elytrigia juncea*, and much of the area was composed of small hummocks under 50 cm in height separated by bare sand. The more seaward hummocks are at least occasionally inundated at high tide. This is a very dynamic habitat and is vulnerable to wind and wave erosion. **2110 Embryonic shifting dunes** were not assessed during the CMP, and therefore no trends could be established for this habitat.

Area

2110 Embryonic shifting dunes have increased from 0.43 to 4.75 ha since the baseline survey was conducted. The Area for this habitat was assessed as Favourable.

Structure and Function

Eight monitoring stops were recorded in **2110 Embryonic shifting dunes** at Maghera, and *Elytrigia juncea* was found in six of them. The other two were composed of *Ammophila arenaria*. Although *Ammophila arenaria* is not typical of this habitat, the dunes were structurally similar and performed the same function as those with *Elytrigia juncea*. There was no flowering in the **2110 Embryonic shifting dunes**, but as the site was surveyed before the flowering season for *E. juncea* (Webb *et al.*, 1996), the presence of healthy, green shoots was used to gauge the health of the vegetation and the habitat passed this criterion. The Structure and Functions for this habitat were assessed as Favourable.

Future Prospects

The only impact recorded was walking, which had a low-intensity, neutral effect on 20% of the habitat. The Future Prospects for this habitat were assessed as Favourable.

Conservation assessment

As this habitat was assessed as Favourable for Area, Structure and Functions and Future Prospects, the overall conservation assessment for **2110 Embryonic shifting dunes** was Favourable.

2.2.2 2120 Marram dunes (white dunes)

There were two main areas of **2120 Marram dunes (white dunes)** at the site. In the west, the **2120 Marram dunes (white dunes)** are the most seaward habitat, while to the east they are located behind **2110 Embryonic shifting dunes**. This site experiences high winds and the sand here is very mobile. There was a lot of bare sand within this habitat in comparison with other sites.

Area

The area of **2120 Marram dunes (white dunes)** has increased from 6.51 to 7.11 ha since the baseline survey. During the CMP, Area was assessed as Favourable. **2120 Marram dunes (white dunes)** were assessed as Favourable (stable) during the SDM.

Structure and Functions

The Structure and Functions of **2120 Marram dunes (white dunes)** were assessed as Favourable on the basis of the eight stops assessed. *Ammophila arenaria* was healthy in all of the monitoring stops and was recorded as frequent across all monitoring stops, but flowering and fruiting of *A. arenaria* was concentrated in the western portion of the habitat. During the baseline survey this habitat failed on this criterion because of a high cover of dead or dying *Ammophila arenaria* at the western end of the site and was assessed as Unfavourable-Inadequate. **2120 Marram dunes (white dunes)** were assessed as Favourable (improving) during the SDM.

Future Prospects

Walking had a low, neutral impact on 5% of the habitat. Future Prospects were assessed as Favourable during the CMP and as Favourable (stable) during the SDM.

Conservation assessment

As this habitat was assessed as Favourable for Area, Structure and Functions and Future Prospects the overall conservation assessment for **2120 Marram dunes (white dunes)** was Favourable. This is an improvement since the baseline survey when the Area and Future Prospects were assessed as Favourable but the Structure and Functions were assessed as Unfavourable-Inadequate due to the presence of unhealthy *Ammophila arenaria*. Conservation status of **2120 Marram dunes (white dunes)** was assessed as Favourable (improving).

2.2.3 *2130 Fixed dunes (grey dunes)

The ***2130 Fixed dunes (grey dunes)** at Maghera included both dunes which have been deposited on flat coastland and sand that has been deposited over rocky outcrops. For the most part, the vegetation was characterised by *Ammophila arenaria*, *Lotus corniculatus*, *Festuca rubra*, *Luzula campestris* and *Trifolium repens*. Other frequent species included *Poa pratensis sens. lat.* and *Hypochaeris radicata*. The most frequent species are not characteristic of acidic dunes, despite the presence of ***2150 Decalcified dune heath** at the site. It is possible that the ***2130 Fixed dunes (grey dunes)** have partially rebuilt with new sand after an erosion event, or that the strong winds are maintaining an input of calcium-rich sand into the ***2130 Fixed dunes (grey dunes)**. There was an area of ***2130 Fixed dunes (grey dunes)** located adjacent to the dune heath which had a high cover of *Pteridium aquilinum*, and a more acidic community was found here.

Area

The area of ***2130 Fixed dunes (grey dunes)** had increased from 20.96 to 23.06 ha since the baseline survey as a result of succession. Area was assessed as Unfavourable-Inadequate during the CMP because of a loss of habitat due to natural erosion and to the presence of an agricultural shed within the habitat. Under current methodology, ***2130 Fixed dunes (grey dunes)** would not fail due to natural erosion as this is seen as a natural process of sand dune habitats. Also, on examination of the 1995 aerial photographs, it appears that all buildings within the site predate designation and therefore should not represent a loss of habitat within the site. The Area for this habitat was therefore assessed as Favourable (stable) during the SDM.

Structure and Function

Although no single negative indicator species is more than frequent, their total cover is 16.9% and the site failed the Structure and Functions assessment. The negative indicator species with the greatest cover was *Pteridium aquilinum*, which had a total cover of 12.6% (calculated on the basis of the Domin mid-range scores in monitoring stops). All the other criteria were within the target values and the Structure and Functions of the habitat were assessed as Unfavourable-Inadequate. This is comparable with the result of the assessment carried out during the baseline survey and the ***2130 Fixed dunes (grey dunes)** habitat was assessed as Unfavourable-Inadequate (stable) during the SDM.

Future Prospects

Non-intensive sheep grazing had a low-intensity positive effect on 100% of the habitat. There were three high-intensity, negative impacts. Bracken encroachment affected 15% of the habitat, while campfires and supplementary feeding affected up to 1% each. There is a boardwalk allowing access to the dunes and the beach beyond. This had a high impact but was considered to be neutral because the damaging effects of its presence on the habitat are balanced by the reduction of the negative effects of trampling. Undergrazing and encroachment by *Pteridium aquilinum* caused the Future Prospects to be assessed as Unfavourable-Inadequate during the baseline survey. The main pressures and management have not changed since the baseline survey, but the quality of the habitat is not deteriorating and the trend appears to be stable. Due to the negative impacts affecting ***2130 Fixed dunes (grey dunes)**, the habitat was assessed as Unfavourable-Inadequate (stable).

Conservation assessment

As this habitat was assessed as Favourable for Area but Unfavourable-Inadequate for both Structure and Functions and Future Prospects, the overall conservation assessment for ***2130 Fixed dunes (grey dunes)** is Unfavourable-Inadequate (stable). There has been no change in the conservation status for this habitat since the baseline survey.

2.2.4 **2140 Decalcified Empetrum dunes*

***2140 Decalcified Empetrum dunes** were mapped on a steep slope overlooking a dune slack during the CMP. Although this habitat was identified as dune heath in 2012, no *Empetrum nigrum* was found here despite a thorough search, and the habitat was therefore reclassified and mapped as ***2150 Decalcified dune heath**. As this area was relatively undisturbed, it was difficult to suggest a reason for the disappearance of *Empetrum nigrum*.

2.2.5 **2150 Decalcified dune heath*

The ***2150 Decalcified dune heath** at Maghera corresponded very well with the description given in the EU Interpretation Manual for Annex I habitats (Commission of the European Communities, 2007). The heath was found on old, decalcified sand dunes and contained frequent *Calluna vulgaris* and *Erica spp.* *Pteridium aquilinum* was occasional. A full assessment of ***2150 Decalcified dune heath** was not carried out during the SDM. However, data on the area and the main impacts affecting the habitat were collected.

The area of ***2150 Decalcified dune heath** had increased by over a hectare from 11.91 ha to 13.14 ha. The increase in area was due to extension of the habitat into areas previously recorded as ***2130 Fixed dunes (grey dunes)** and also due to the reclassification of ***2140 Decalcified Empetrum dunes** to ***2150 Decalcified dune heath**. The most serious negative impact recorded was encroachment by *Pteridium aquilinum* which affected 10% of the habitat. Campfires were also a threat, and although they affected only 1% of the habitat, they were considered a high intensity impact because of the danger of fires spreading over the dunes. Hazel scrub has become established on the dunes and some smaller plants at the edge of the scrub suggest that the scrub may be spreading.

2.2.6 2170 Dunes with creeping willow

2170 Dunes with creeping willow are frequent in the western part of the site close to the ***2150 Decalcified dune heath** and also on the rockier eastern part of the site.

Area

The revised baseline area for this habitat was 3.12 ha. During the CMP, Area was assessed as Favourable. As there has been no recorded change in area, the Area for this habitat was assessed as Favourable (stable).

Structure and Functions

Structure and Functions were assessed as Unfavourable-Inadequate during the CMP due to a lack of grazing at the time of the survey. Parts of the **2170 Dunes with creeping willow** at Maghera showed signs of undergrazing during the SDM too. Two of the criteria failed in the Structure and Functions assesment. *Salix repens* in one of the eight stops was taller than the target height, and *Pteridium aquilinum* affected over 10% of the habitat. *Rosa spinosissima* was present in three of the stops with a cover of over 5%, but it was low-growing in parts of the site, and low-growing *Rosa spinosissima* is not considered to be a threat to Structure and Functions. The Structure and Functions for this habitat were assessed as Unfavourable-Inadequate (stable).

Future Prospects

Future Prospects were assessed as Unfavourable-Inadequate during the CMP. During the SDM, non-intensive sheep grazing was recorded as a low-intensity positive impact for the whole habitat. Undergrazing in the past has allowed scrub encroachment and tall, bushy *Salix repens* to develop on some parts of the habitat. Encroachment by *Pteridium aquilinum* and *Rosa spinosissima* each had a medium-intensity negative effect on 5% of the habitat, but they appeared not to be spreading. The Future Prospects for **2170 Dunes with creeping willow** are therefore assessed as Unfavourable-Inadequate (stable).

Conservation assessment

There has been no change in the conservation status of Area, Structure and Functions or Future Prospects since the baseline survey. As this habitat was assessed as Favourable for Area but Unfavourable-Inadequate for Structure and Functions and Future Prospects, the overall conservation assessment for **2170 Dunes with creeping willow** was Unfavourable-Inadequate (stable).

2.2.7 2190 Humid dune slacks

The dune slacks are of interest at Maghera as they are very varied in character. Some areas contain a typical **2190 Humid dune slacks** vegetation community, while others are more acidic in character with *Molinia caerulea*, *Myrica gale*, *Carex panicea*, *Potentilla erecta* and *Calluna vulgaris*. There is also a slack which is occasionally inundated with salt-water through a breach in the dunes. One of the slacks contains the fern-ally *Ophioglossum azoricum*, which, although not currently protected, is nationally scarce (Webb *et al.*, 1996).

Area

There has been no change in Area since the baseline survey, where it was assessed as Favourable. The Area for **2190 Humid dune slacks** was therefore assessed as Favourable (stable) during the SDM. Although some of the slacks were drying out and becoming dominated by woody species, there was younger slack habitat present on site. There is also potential for new dune slack formation on the site, as active formation and colonisation of new dunes at Maghera was noted in 2012.

Structure and Functions

Structure and Functions were assessed as Unfavourable-Inadequate during the CMP due to undergrazing leading to a dominance of *Salix repens* within the slacks. During the SDM it was noted that some of the dune slacks were very mature at Maghera, and *Salix repens* has become established in them. A dominance of *Salix repens* can be a sign of accelerated drying out, but in the context of this site, it is more likely to be part of the natural processes affecting dune slacks as they age. This criterion was therefore passed on expert judgement for this habitat at Maghera as the dune system found here is quite old. The dune slacks were assessed as Favourable (improving) during the SDM.

Future Prospects

Non-intensive sheep grazing had a low intensity, positive effect on the entire habitat. Dumping had a low-intensity negative effect on 1% of the habitat. The spread of *Salix repens* within the **2190 Humid dune slacks** is part of a natural drying process which affects older dune slacks and there is no evidence to suggest that it has been accelerated by human activity. The current management regime is appropriate to maintain dune slack communities. Future Prospects were assessed as Unfavourable-Inadequate during the CMP due to a lack of grazing. Future Prospects are assessed as Favourable (improving) during the SDM.

Conservation assessment

This habitat was assessed as Favourable for Area, Structure and Functions, and Future Prospects. There has been an improvement in the Future Prospects of the **2190 Humid dune slacks** habitat due to the positive effects of non-intensive sheep grazing. Conservation status was assessed as Favourable (improving) during the SDM.

3 DISCUSSION

3.1 Rare Plants

Ophioglossum azoricum was found in **2190 Humid dune slacks** (Grid ref: G 66362 90858) at Maghera. The identification was made on the basis of the size of the plant and the number of sporangia visible on either side of the spike. The specimens present on site were not very mature, so the identification should be confirmed with another visit to the site later in the year.

3.2 Occurrence of *2140 Decalcified *Empetrum* dunes

Empetrum nigrum was seen associated with rocky outcrops at this site. As the vegetation seemed to be influenced mainly by the acidic nature of the underlying rock rather than the sand, this was not considered to be ***2140 Decalcified *Empetrum* dunes** and was classified as dry heath instead.

3.3 *Pteridium aquilinum* and scrub control

Pteridium aquilinum and scrub encroachment have been identified as problems at Maghera in both the CMP and the SDM. Grazing was recommended as part of the baseline report, and sheep now graze the site. As the *Pteridium aquilinum* and scrub persist, intervention to remove at least some of the *Pteridium aquilinum* cover would benefit the affected habitats. At current levels, scrub does not compromise conservation value of the site, but any increase in the area of scrub would be a negative impact.

3.4 Grazing and agriculture

Overall, grazing has a positive impact at Maghera as it prevents the sand dune habitats from becoming increasingly rank and restricts the expansion of scrub. Parts of the ***2130 Fixed dunes (grey dunes)**, **2190 Humid dune slacks**, **2170 Dunes with creeping willow** and ***2150 Decalcified dune heath** habitats would benefit from a slight increase in grazing. Supplementary feeding occurs in the ***2130 Fixed dunes (grey dunes)** and this can allow the establishment of agricultural weeds and blow-outs. Any alteration in the grazing regime should be managed carefully to prevent negative effects associated with agriculture.

3.5 Recreation

The popularity of Maghera as a location for visitors has resulted in some small-scale dumping and campfires. Campfires pose a threat as they expose bare sand which can result in blowouts and, if left unattended, fire can spread to adjacent vegetation. Educational notices regarding the safe use of sand dune sites may help to reduce the negative effects of tourism.

4 REFERENCES

- Barron, S.J., Delaney, A., Perrin, P.M., Martin, J.R. and O'Neill, F.H. (2011) National survey and assessment of the conservation status of Irish sea cliffs. *Irish Wildlife Manuals*, No. 53. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- Commission of the European Communities (2007) Interpretation manual of European Union habitats – EUR 27. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf. Accessed March 2013.
- Delaney, A., Devaney, F.M, Martin, J.R. and Barron, S.J. (2013) Monitoring survey of Annex I sand dune habitats in Ireland. *Irish Wildlife Manuals*, No. XX. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
- McCorry, M. and Ryle, T. (2009) Saltmarsh Monitoring Project 2007-2008. A report submitted to the National Parks and Wildlife Service, Dublin.

- NPWS (1999) Natura 2000 Standard Data Form, Site 000190. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.
<http://www.npws.ie/media/npwsie/content/images/protectedsites/natura2000/NF000190.pdf>. Accessed March 2013.
- Ryle, T., Murray, A., Connolly, K. and Swann, M. (2009) Coastal Monitoring Project 2004-2006. A report submitted to the National Parks and Wildlife Service, Dublin.
- Ssymank, A. (2010) Reference list threats, pressures and activities (final version).
[http://circa.europa.eu/Public/irc/env/monnat/library?l=/expert_reporting/work-package_revision/sub-group_papers/pressures-threats\(vm=detailed&sb=Title](http://circa.europa.eu/Public/irc/env/monnat/library?l=/expert_reporting/work-package_revision/sub-group_papers/pressures-threats(vm=detailed&sb=Title). Accessed March 2011.
- Webb, D.A., Parnell, J. and Doogue, D. (1996) *An Irish Flora*. Dundalgan Press, Dundalk.

