

**Ballysadare Bay SAC (site code 622)
Conservation objectives supporting document
-coastal habitats**

NPWS

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Please note that the opinions expressed in the site reports from 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 (2013). Conservation Objectives: Ballysadare Bay SAC 000622. 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.

Ballysadare Bay is the most southerly of three inlets of the larger Sligo Bay. The estuarine channel of the Ballysadare River winds its way through the Bay, reaching the open sea near the spit at Strandhill Dunes. The Bay is underlain by sedimentary rocks of limestones, sandstones and shales, which are exposed as low cliffs and small sections of bedrock shore at several locations.

The bay contains extensive intertidal sand and mudflats. Well developed saltmarshes occur at several locations around the bay. There is a large sand dune system at Strandhill, which is highly dynamic, with the tip of the peninsula actively growing and displaying a good, though limited in extent example of embryonic shifting dunes.

The dunes at Strandhill as surveyed and mapped by the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013) are covered under two separate SAC designations. The dunes in the northern section are included in Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (site code: 627), while the dunes in the southern section (which are dealt with in this document) are included in Ballysadare Bay SAC (site code: 622). The seaward side of the southern dunes reach considerable heights (up to 20m). They are very steep on the seaward edge, but to the east there is an undulating expanse of dune hills. The largest proportion of the dune system is made up of fixed dunes. Some humid dune slacks occur amongst the fixed dunes.

Ballysadare Bay SAC (site code: 622) is designated for a range of coastal habitats including estuaries, mudflats and sand flats, as well as sand dunes. The following four sand dune habitats are included in the qualifying interests for the site (* denotes a priority habitat):

- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)*
- Humid dune slacks (2190)*

All of these habitats are associated with sand dune systems, and are found in close association with each other.

The following coastal habitats have also been recorded within this site by the National Shingle Beach Survey (Moore & Wilson, 1999), Coastal Monitoring Project (Ryle *et al.*, 2009) and the Saltmarsh Monitoring Project (McCorry & Ryle, 2009):

- Perennial vegetation of stony banks (1220),
- Annual strandline vegetation (1210),
- Dunes with *Salix repens* (2170),
- Salicornia* and other annuals colonising mud and sand (1310),
- Atlantic salt meadows (*Glauco-Puccinellietalia maritima*) (1330),
- Mediterranean salt meadows (*Juncetalia maritimi*) (1410).

However, these additional habitats are not listed as qualifying interests for this SAC.

This backing document sets out the conservation objectives for the four sand dune habitats listed above as qualifying interests in Ballysadare 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 Sand Dune Monitoring Project (SDM) (Delaney *et al.*, 2013) and this document should be read in conjunction with that report. It is also recommended that this document be read in conjunction with the final report from the Coastal Monitoring Project (CMP) report (Ryle *et al.*, 2009). The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. The SDM reviewed and modified the methodology used during the CMP to map and assess the conservation status of dune habitats. A subset of 40 sites (including Strandhill) 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 site surveyed and the report and maps for Strandhill are included in Appendix II.

The conservation objectives for the sand dune habitats in Ballysadare Bay are based on the findings of the SDM, combined with the results of Gaynor (2008) and Ryle *et al.* (2009). It is thought that the the sub-site as surveyed by the SDM represents the total area of sand dunes within Ballysadare Bay SAC.

2 Conservation Objectives

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

3 Sand dune habitats

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

In Ireland, there are 9 sand dune habitats (including annual vegetation of drift lines) listed under Annex I of the EU Habitats Directive (92/43/EEC) (* denotes a priority habitat):

- Annual vegetation of drift lines (1210)
- **Embryonic shifting dunes (2110)**
- **Shifting dunes along the shoreline with *Ammophila arenaria* (2120)**
- **Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) ***
- Decalcified dunes with *Empetrum nigrum* (2140) *
- Decalcified dune heath (2150) *
- Dunes with *Salix repens* (2170)
- **Humid dune slacks (2190)**
- Machair (21AO) *

The four habitats indicated in bold above are listed as Qualifying Interests for Ballysadare Bay SAC. These habitats include mobile areas at the front, as well as more stabilised parts of dune systems. Humid dune slacks were also recorded at the Strandhill sub-site. The Coastal Monitoring Project (Ryle *et al.*, 2009) also recorded annual vegetation of driftlines and dunes with *Salix repens*, the former of which was confirmed by the Sand Dunes Monitoring Project (Delaney *et al.*, 2013).

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).

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).

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

The SDM surveyed one sub-site within Ballysadare Bay SAC. See Appendix I for map:

1. Strandhill (Appendix II)

Detailed descriptions from the Sand Dunes Monitoring Project (SDM) (Delaney *et al.*, 2013) of each sand dune habitat found at Strandhill are presented in Appendix II. It should be noted, however, that Strandhill

dunes are covered by two separate designations. The northern section of Strandhill dunes are contained within Cummen Strand/Drumcliff Bay (Sligo Bay) SAC (site code: 627), the southern section is within Ballysadare Bay SAC.

3.1 Overall objectives

The overall objective for 'Embryonic shifting dunes' in Ballysadare Bay SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria*' in Ballysadare Bay SAC is to 'restore the favourable conservation condition'.

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

The overall objective for 'Humid dune slacks' in Ballysadare Bay SAC is to 'restore the favourable conservation condition'.

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

3.2 Area

3.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats at Strandhill during the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009). During the Sand Dunes Monitoring Project, this baseline map was checked and revised to account for changes in habitat interpretation and omissions. An updated map was then produced to reflect the current situation on the ground. The revised baseline habitat map and updated habitat map from the SDM are included with the individual site report in the Appendices at the end of this document (Appendix II).

The total areas of each sand dune habitat within the SAC as estimated by Delaney *et al.* (2013) are presented in the following table.

Habitat	Total area (ha) of habitat within SAC boundary following SDM
Embryonic shifting dunes	1.08
Shifting dunes along the shoreline with <i>Ammophila arenaria</i>	5.47
Fixed coastal dunes with herbaceous vegetation	56.07
Humid dune slacks	1.83
Total	64.45

The dunes at Strandhill are highly susceptible to erosion and a series of severe storms in 2010/2011 damaged a significant section of the frontal dunes in the area adjacent to the existing hard coastal protection measures.

Losses have been recorded from all the dune habitats since the Habitats Directive came into force, which would suggest that the target for area should be increasing. However, as these losses are permanent and restoration is not a possibility it is essential that no additional losses are recorded. 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

Embryo dunes, mobile dunes, fixed dunes and dune slacks, were recorded at Strandhill. The mobile dune habitat edges the seaward side of the spit in the southern part of Strandhill and is particularly well developed at the growing tip. The embryonic dunes are found at the western extremity of Strandhill dunes. They are absent towards the eastern end mainly due to a combination of natural erosion and recreational pressure (Ryle *et al.*, 2009). The remainder of the dune area is dominated by fixed dunes, with two low-lying dune slacks. The distribution of sand dune habitats as mapped by Delaney *et al.* (2013) is presented in Appendix I.

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, 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 Ballysadare 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.

Coastal protection works in the form of rock armour have been installed on the seaward edge of the carpark and golf course (Ryle *et al.*, 2009). Severe storms in 2010/2011 damaged a significant section of the frontal dunes in the adjacent to these works (Delaney *et al.*, 2013). Repair works should not have a further negative impact on the sediment circulation throughout the system or exacerbate the on-going erosional problem.

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

3.4.2 Physical structure: hydrological and flooding regime

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

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

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

It is not known how regularly the slacks at Strandhill flood and there are some signs of desiccation (particularly in the larger of the two slacks), which may or may not be accelerated by human interference with the local water-table.

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

3.4.3 Vegetation structure: zonation

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

At Strandhill transitional communities can be found between a range of sand dune habitats, as well as some saltmarsh habitats (Moore & Wilson, 1999; Ryle *et al.*, 2009; McCorry & Ryle, 2009; Delaney *et al.*, 2013).

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

3.4.4 Vegetation structure: bare ground

This target only applies to fixed dunes and dune slacks. It does not apply to the other habitats present where high levels of bare sand are a natural component of the habitat. In the fixed and slack areas some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions including invertebrates, helping to increase biodiversity.

A large blowout occurs within the fixed dunes just south of the Golf Course and has been named Shelly Valley. This substantial blowout covers an area of 5.4ha. Trampling in the southern part of Strandhill has created numerous tracks. These tracks are concentrated around Shelly Valley as well as the large dune slack adjacent to the blowout (Ryle *et al.*, 2009).

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

3.4.5 Vegetation structure: vegetation height

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

The fixed dunes at Strandhill are subject to low intensity grazing by rabbits and the site is not grazed by cattle or sheep. This has reduced the species richness of the site. The lack of grazing as also led to the potential problem of the natural spread of wild clematis (*Clematis vitalba*) and sycamore (*Acer pseudoplatanus*).

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

3.4.6 Vegetation composition: plant health of dune grasses

This attribute applies to foredunes and mobile dunes, where blowing sand is a natural feature. The health of the dune grasses (particularly *Ammophila arenaria* and *Elytrigia juncea*) is 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.

3.4.7 Vegetation composition: typical species & sub-communities

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

Ryle *et al.* (2009) recorded typical flora from the embryo and mobile dunes. They also noted an abundance of orchids particularly pyramidal orchid (*Anacamptis pyramidalis*), marsh helleborine (*Epipactis palustris*) and *Dactylorhiza* species in the southern part of the fixed dunes at Strandhill. Within the slacks, they recorded typical pioneer bryophyte species such as *Bryum pseudotriquetrum* and *Homalothecium lutescens*, as well as the locally important orchid species marsh helleborine (*Epipactis palustris*).

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

3.4.8 Vegetation structure: cover of *S. repens*

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

The CMP noted that although *Salix repens* is absent from the dune slacks at Strandhill it is present within the fixed dune habitat elsewhere in the site (Ryle *et al.*, 2009).

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

3.4.9 Vegetation composition: negative indicator species

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

The main invasive species identified in Gaynor (2008) were bracken (*Pteridium aquilinum*) and sea buckthorn (*Hippophae rhamnoides*). The invasion of non-native species compromises the typical plant community structure. Bracken (*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.

Ryle *et al.* (2009) recorded the following negative indicator species, common ragwort (*Senecio jacobaea*), creeping thistle (*Cirsium arvense*) and wild clematis (*Clematis vitalba*), but at no more than occasional.

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

3.4.10 Vegetation composition: scrub/trees

This attribute only applies to the fixed dunes and dune slacks. 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.

There are patches of fixed dunes at Strandhill that are dominated by creeping willow (*Salix repens*). As these areas are removed from the dune slacks they are classified as the Annex I habitat 'dunes with *S. repens*'. Sycamore (*Acer pseudoplatanus*) has also been noted from the fixed dunes (Ryle *et al.*, 2009).

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 References

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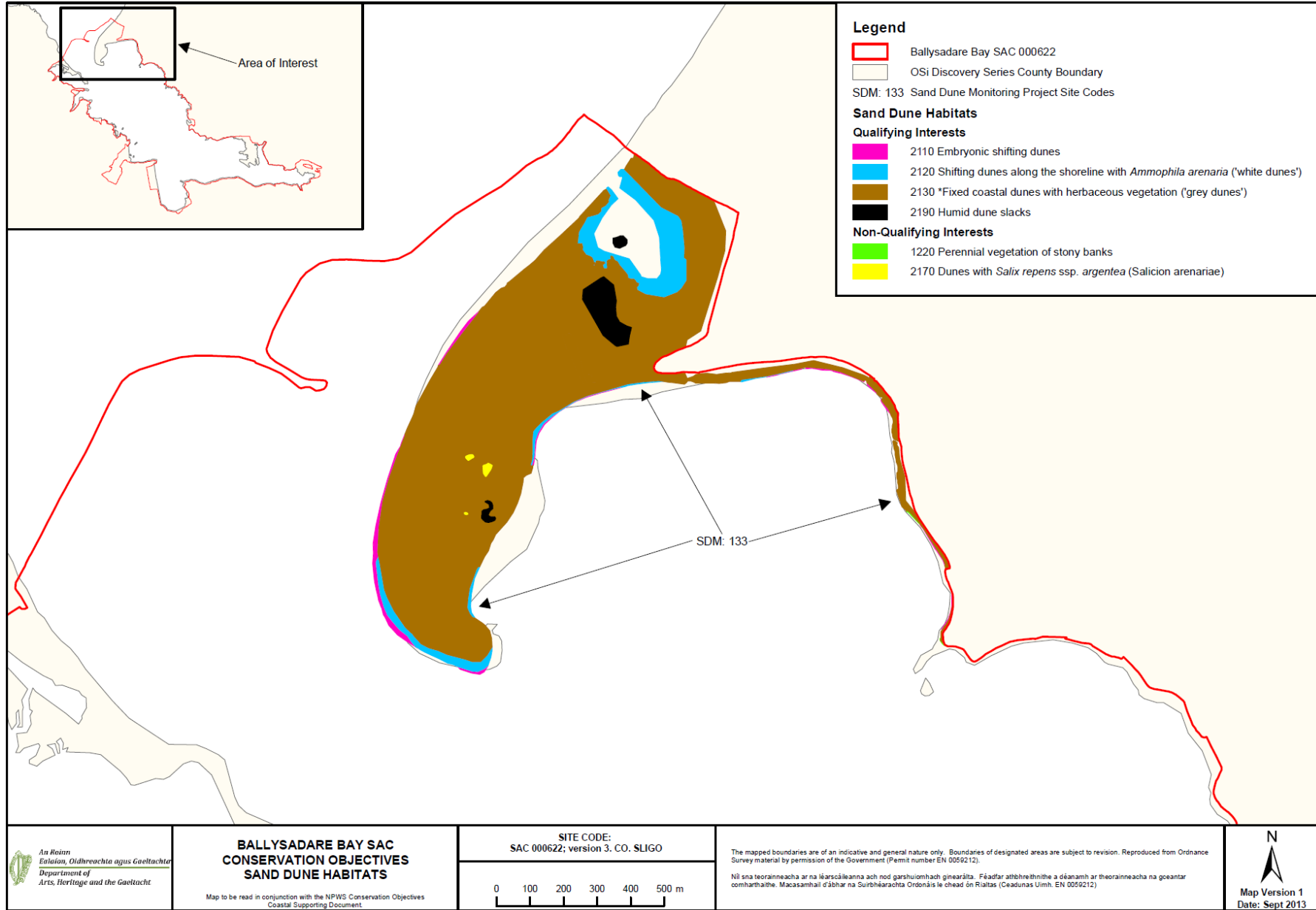
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Appendix I – Distribution map of sand dune habitats within Ballysadare Bay SAC



Appendix II – Strandhill site report and habitat maps from the SDM (Delaney *et al.*, 2013)

SITE 133 STRANDHILL

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

The site at Strandhill, Co. Sligo, is divided between two SACs: Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC (SAC 000627) and Ballysadare Bay SAC (SAC 000622). It is also adjacent to Castlemaine Harbour SPA (SPA 004029) and Cummeen Strand SPA (SPA 004035). According to the SAC synopses, the rare snail *Vertigo angustior* occurs in the dune slacks and during the monitoring survey in 2011, the rare plant *Pyrola rotundifolia* ssp. *maritima* was found. The dunes form a well-developed system with considerable habitat diversity, and seven Annex I sand dune habitats (* indicates a priority habitat) were recorded during the CMP: **1210 Annual vegetation of drift lines, 1220 Perennial vegetation of stony banks, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willow, and 2190 Humid dune slacks** (Ryle *et al.*, 2009). Other habitats of conservation interest in the vicinity include **1130 Estuaries and 1140 Mudflats and sandflats not covered by seawater at low tide.**

The dunes at Strandhill are the focus of considerable activity. A golf course, waste water treatment plant and airport have been developed on the dunes. There are car parks and camping facilities, and the location is promoted as a surfing destination. As a result, the dunes are subject to considerable amenity use and there is a strong motivation to construct coastal protection measures to protect the infrastructure when erosion events take place (RPS, 2012). Parts of the dunes were planted with conifer forestry in the last century, and the drying effect of woodland is likely to have altered the character of the dunes in the vicinity of the plantations.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Strandhill was surveyed on the 4th and 5th of August and 2nd and 3rd of October, 2011. Table 1 shows the habitats present at Strandhill with their conservation status as assessed in 2011. Of the seven Annex I habitats recorded on the site, four were assessed as Unfavourable-Inadequate and two as Unfavourable-Bad during the 2011 monitoring survey. The trend over most of the habitats is deteriorating, and the main reasons for this are the construction of a large sea wall and continuing effects of recreation. Pressures associated with undergrazing have also contributed to the Unfavourable assessments.

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

Habitat	Area	Structure & Functions	Future Prospects	Overall result
1210 Annual vegetation of drift lines	Unfavourable-Bad (deteriorating)	Favourable (stable)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Bad (deteriorating)
1220 Perennial vegetation of stony banks	Favourable (stable)	Favourable (stable)	Unfavourable-Inadequate (stable)	Unfavourable-Inadequate (stable)
2110 Embryonic shifting dunes	Favourable (stable)	Favourable (stable)	Favourable (stable)	Favourable (stable)
2120 Marram dunes (white dunes)	Favourable (stable)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)
*2130 Fixed dunes (grey dunes)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Bad (deteriorating)	Unfavourable-Bad (deteriorating)	Unfavourable-Bad (deteriorating)
2170 Dunes with creeping willow	Favourable (stable)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (stable)	Unfavourable-Inadequate (deteriorating)
2190 Humid dune slacks	Favourable (stable)	Favourable (stable)	Unfavourable-Inadequate (stable)	Unfavourable-Inadequate (stable)

2.1.1 Area

Table 2 shows the areas of the habitats mapped at Strandhill in 2011 as well as the areas recorded during the baseline and the revised baseline areas. The sand dunes surveyed in 2011 cover an area of 111.68 ha, which is a larger area than was surveyed during the baseline survey. The increase in area is partly due to the inclusion of a large blow-out in the fixed dunes and partly because the site was extended to include an area that was formerly described as amenity grassland. Some new areas of **2190 Humid dune slacks** and **2170 Dunes with creeping willow** were also found within the area formerly recorded as ***2130 Fixed dunes (grey dunes)**. Because of the maturity of these communities, it was considered most likely that they were present, but went unrecorded, during the baseline survey, and the areas were altered in the revised baseline maps accordingly. The small change in the area of **2120 Marram dunes (white dunes)** is an artefact of mapping. Conifers were planted on the dunes in the past, but the plantations date to the 1950s at the latest and the areas of the site which were dominated by conifer plantations are not included in Table 2.

Table 2. Areas of Annex I dune habitats originally mapped at Strandhill during the baseline survey (Coastal Monitoring Project), the revised baseline areas and areas mapped during the Sand Dune Monitoring Project in 2011.

Habitat	Baseline survey (ha)	Revised baseline (ha)	Sand Dunes Monitoring Project (ha)
1210 Annual vegetation of drift lines	0.99	0.99	0.12
1220 Perennial vegetation of stony	1.53	1.53	0.79
2110 Embryonic shifting dunes	0.94	0.94	1.33
2120 Marram dunes (white dunes)	5.48	5.47	5.47
*2130 Fixed dunes (grey dunes)	95.57	87.92	90.71
2170 Dunes with creeping willow	0.68	11.28	11.26
2190 Humid dune slacks	2.05	1.88	2.00
Total	107.24	110.01	111.68

2.1.2 Structure and Functions

Table 3 shows the number of monitoring stops carried out in each habitat, number of criteria assessed and how many criteria failed the assessment. The Structure and Functions of **1210 Annual vegetation of drift lines**, **1220 Perennial vegetation of stony banks**, **2110 Embryonic shifting dunes** and **2190 Humid dune slacks** were assessed as Favourable. **2170 Dunes with creeping willow** were assessed as Unfavourable-Inadequate for reasons relating to undergrazing. **2120 Marram dunes (white dunes)** were assessed as Unfavourable-Inadequate because of the effects of the sea wall. ***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Bad for reasons relating to recreational use of the dunes and the presence of the sea wall.

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

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
1210 Annual vegetation of drift lines	4	6	0
1220 Perennial vegetation of stony banks	4	6	0
2110 Embryonic shifting dunes	4	7	0
2120 Marram dunes (white dunes)	4	7	1
*2130 Fixed dunes (grey dunes)	12	11	3
2170 Dunes with creeping willow	8	10	2
2190 Humid dune slacks	4	11	0

2.1.3 Future Prospects

The impacts and activities recorded at Strandhill are presented in Table 4. Impact codes are assigned according to Ssymank (2010). The main threats and pressures affecting the Annex I habitats are recreation and associated damage due to these activities, the presence of conifer plantations, sea defences and lack of grazing.

Table 4. Impacts recorded in Annex I sand dune habitats at Strandhill in 2011. Source refers to whether the impact being scored originates inside or outside the Annex I habitat being assessed.

Habitat code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
1210	J02.12.01	Coastal protection	High	Negative	Unknown	Outside
1220	J02.12.01	Coastal protection	Low	Negative	Unknown	Outside
2110	G01.02	Walking	Medium	Neutral	1	Inside
2110	J02.12.01	Coastal protection	Low	Neutral	100	Outside
2110	K01.01	Erosion	Medium	Neutral	5	Inside
2120	G01.02	Walking	Medium	Negative	70	Inside
2120	G05.01	Trampling	High	Negative	30	Inside
2120	J02.12.01	Coastal protection	Low	Neutral	30	Outside
2120	K01.01	Erosion	Medium	Neutral	1	Inside
*2130	A04.03	Undergrazing	Low	Negative	80	Inside
*2130	B02	Forestry	Low	Negative	20	Outside
*2130	D01.02	Roads	Low	Neutral	1	Outside
*2130	D01.03	Car parks	Low	Neutral	1	Outside
*2130	D04.01	Airport	Medium	Neutral	5	Outside
*2130	G01.02	Walking	Medium	Neutral	10	Inside
*2130	G02.01	Golf course	Low	Neutral	5	Outside
*2130	G02.08	Camping and caravans	Low	Negative	1	Outside
*2130	G05.01	Trampling	High	Negative	10	Inside
*2130	H05.01	Litter	Low	Negative	1	Inside
*2130	J01.01	Burnt area	High	Neutral	5	Inside
*2130	J02.12.01	Coastal protection	High	Negative	1	Outside
*2130	K01.01	Erosion	Medium	Neutral	10	Inside
*2130	K04.05	Rabbits	Low	Neutral	5	Inside
2170	A04.03	Undergrazing	Low	Negative	90	Inside
2170	B02	Forestry	Low	Negative	75	Outside
2170	E05	Stored Building materials	High	Negative	1	Inside
2170	G01.02	Walking	Medium	Neutral	5	Inside
2170	H05.01	Litter	Low	Negative	1	Inside
2170	I01	Invasive non-native species	Low	Negative	25	Inside
2170	J02.12.01	Coastal protection	-	Neutral	0	Outside
2190	B02	Forestry	Medium	Negative	10	Outside
2190	G01.02	Walking	Medium	Neutral	1	Inside
2190	G05	Campfires	High	Negative	1	Inside
2190	J02.12.01	Coastal protection	-	Neutral	0	Outside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Strandhill is discussed below. The present conservation status in 2011 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 2011 are compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

2.2.1 1210 Annual vegetation of drift lines

1210 Annual vegetation of drift lines occurs on the shore of a sheltered bay north of the runway of Sligo Airport. There is very little disturbance in this part of the site.

Area

The area of **1210 Annual vegetation of drift lines** recorded at Strandhill has decreased from 0.99 ha during the baseline survey in 2006 to 0.12 ha in 2011. This is a decrease of 88% over five years. The loss is very likely to be directly related to the construction of a large sea-wall with rock-armour close to the previous location of the habitat. As a result, Area assessment was assessed as Unfavourable-Bad (deteriorating).

Structure and Functions

All of the criteria passed in the Structure and Functions assessment. The remaining area of **1210 Annual vegetation of drift lines** is located to the north of the site, on the opposite side of a peninsula from the location of the new sea defences. This part of the site is influenced by coastal processes within a sheltered bay, where the erosion and deposition cycles are functioning well. The Structure and Functions were assessed as Favourable during the baseline assessment and were assessed as Favourable (stable) in 2011.

Future Prospects

No impacts were recorded from within the remaining area of **1210 Annual vegetation of drift lines**. However, the construction of the sea-wall is likely to inhibit the habitat from increasing to cover its former area. **1210 Annual vegetation of drift lines** is an ephemeral habitat and monitoring will be required to fully understand whether it has been lost permanently from the western part of the site. The Future Prospects were assessed as Favourable during the baseline assessment and were assessed as Unfavourable-Inadequate (deteriorating) in 2011.

Conservation assessment

1210 Annual vegetation of drift lines was assessed as Unfavourable-Bad (deteriorating) in 2011 due to the loss of area and the effect of a new sea-wall on its Future Prospects. This has changed from an assessment of Favourable during the baseline survey.

2.2.2 1220 Perennial vegetation of stony banks

This habitat is found close to the **1210 Annual vegetation of drift lines** in the north of the site. There is very little disturbance to the habitat.

Area

Area was assessed as Favourable during the baseline survey. The recorded area of **1220 Perennial vegetation of stony banks** has decreased from 1.53 ha during the CMP to 0.79 ha during the SDM. In the northern part of the site, this appears to be the result of the habitat becoming narrower, which may simply be an artefact of mapping. In the south, however, some of the habitat has been lost and replaced by embryonic dunes. As this cannot be directly linked to anthropogenic factors the habitat was assessed as Favourable (stable).

Structure and Functions

Structure and Functions were assessed as Favourable during the baseline survey. As the habitat passed all of the criteria in the assessment, Structure and Functions were assessed as Favourable (stable) in 2011.

Future Prospects

Future Prospects were assessed as Unfavourable-Inadequate in the baseline survey due to trampling and disturbance. These impacts appear to have become less severe since the CMP, but the recent construction of a large sea-wall has altered the dynamics of erosion and deposition at Strandhill. The area of **1210 Annual vegetation of drift lines** which was adjacent to the western tip of the **1220 Perennial vegetation of stony banks** has been lost since the defences were constructed, making the habitat more exposed to erosion. The effects of coastal constructions are unpredictable, but the new sea wall threatens the fore-dune habitats and Future Prospects were assessed as Unfavourable-Inadequate (stable) in 2011.

Conservation assessment

The conservation status of **1220 Perennial vegetation of stony banks** has not changed since the baseline survey and was assessed as Unfavourable-Inadequate (stable).

2.2.3 2110 Embryonic shifting dunes

Although there is a small area of this habitat in the north of the site, it is most abundant in the dynamic southern area where the dunes form a spit.

Area

The area of **2110 Embryonic shifting dunes** increased from 0.94 ha during the CMP to 1.33 during the SDM. Some of the dunes to the west of the site have been lost, but there has been an increase in the area of the habitat to the south of the site. During the baseline survey, Area was assessed as Favourable. Area was assessed as Favourable (stable) in 2011.

Structure and Functions

All of the assessment criteria passed in the Structure and Functions assessment. The sea-wall is located far away from the recorded location of **2110 Embryonic shifting dunes**. It has altered the sediment cycle in the west of the site, but there was no clear indication of an effect on the functioning of the **2110 Embryonic shifting dunes** at present. During the baseline survey, Structure and Functions were assessed as Favourable. Structure and Functions were assessed as Favourable (stable) in 2011.

Future Prospects

Walking and erosion were noted as medium-intensity, neutral impacts on the habitat. The sea wall was recorded as a neutral impact as it is not affecting the habitat in its current location its implications in the long-term are not fully understood. During the baseline survey, Future Prospects were assessed as Favourable. Future Prospects were assessed Favourable (stable) in 2011.

Conservation assessment

The conservation status of **2110 Embryonic shifting dunes** has not changed since the baseline survey and was assessed as Favourable (stable).

2.2.4 2120 Marram dunes (white dunes)

This habitat is found on the sand spit in the southern part of the site where the processes of erosion and deposition are most active.

Area

This habitat was assessed as Unfavourable during the baseline survey because of recreation activities. The area of **2120 Marram dunes (white dunes)** has remained stable at 5.47 ha over the reporting period. There is no indication of anthropogenic loss and vulnerable parts of the habitat have been fenced off since the CMP, so Area was assessed as Favourable (stable) in 2011.

Structure and Functions

The habitat failed one of the criteria in the Structure and Functions assessment. The habitat has been undermined by excessive trampling and is structurally damaged. During the baseline survey, Structure and Functions were assessed as Unfavourable-Inadequate. Structure and Functions were assessed Unfavourable-Inadequate (deteriorating) in 2011.

Future Prospects

Erosion was recorded as a medium-intensity, neutral impact on the habitat. The recently constructed sea wall was noted as a neutral impact, but it may have an effect in the future if scouring south of the defences starts to undermine the damaged dunes at Shelly valley. Trampling and walking were negative impacts. During the baseline survey, Future Prospects were assessed as Unfavourable-Inadequate due to recreational activities. Future Prospects were assessed Unfavourable-Inadequate (deteriorating) in 2011.

Conservation assessment

The conservation status of **2120 Marram dunes (white dunes)** was assessed as Unfavourable-Inadequate (deteriorating) in 2011 because although the assessment of Area has improved from Unfavourable-Inadequate to Favourable the other parameters have deteriorated since the CMP.

2.2.5 *2130 Fixed dunes (grey dunes)

This is the most extensive habitat at Strandhill. It is subject to considerable disturbance due to recreational activities and part of the habitat was lost, prior to designation, to a golf course.

Area

The area of ***2130 Fixed dunes (grey dunes)** has reduced from 87.92 ha in 2006 to 90.71 ha in 2011. Part of this loss is due to erosion and part was lost during the building of the sea-wall. Area was assessed as Unfavourable-Inadequate during the baseline survey. Area was assessed as Unfavourable-Inadequate (deteriorating) in 2011 because of the additional loss of habitat.

Structure and Functions

The ***2130 Fixed dunes (grey dunes)** failed three assessment criteria. Although fourteen positive indicator species were at least occasional across the habitat, only two positive indicator species were present in monitoring stops seven and eleven. Damage to the habitat was observed at half of the monitoring stops, including the stops closest to the large blowout southwest of the golf course. Although the bare sand was within the target value, the presence of a blowout of over 5 ha in size, which is maintained by disturbance to the habitat, is of concern as it could represent a focal point for erosion events. There is some evidence that the blowout is revegetating, however. Finally, a sea-wall has been erected adjacent to the fixed dunes. It has yet to be seen what effect the sea-wall is having on the erosion of the ***2130 Fixed dunes (grey dunes)** habitat. The presence of a hard defence structure that terminates in a soft sand dune can be the cause of further erosion close to the end point of the sea-wall (RPS, 2012). Structure and Functions were assessed as Unfavourable-Inadequate during the baseline survey. As the habitat failed three of the eleven criteria, the Structure and Functions of ***2130 Fixed dunes (grey dunes)** at Strandhill were assessed as Unfavourable-Bad (deteriorating).

Future Prospects

Undergrazing has a low-intensity, negative effect on 80% of the habitat. The presence of conifer plantations adjacent to the site represents a low-intensity, external negative influence as it acts as a seed source. Litter and the presence of caravans adjacent to the site are also negative impacts. High-intensity, negative impacts include trampling, which affects 10% of the site, and coastal protection works, which have a high, direct impact on 1% of the habitat. Although there is some evidence of burning having taken place, the vegetation has recovered since it occurred. Future Prospects were assessed as Unfavourable-Inadequate during the CMP. The impacts which resulted in an Unfavourable assessment during the CMP have not been tackled successfully and an additional impact, the sea wall, was recorded during the SDM. Future Prospects were assessed as Unfavourable-Bad (deteriorating) in 2011.

Conservation assessment

The conservation status of Strandhill was assessed as Unfavourable-Bad (deteriorating) due to the deterioration in the Area, Structure and Functions and Future Prospects of the site since the baseline survey.

2.2.6 2170 Dunes with creeping willow

2170 Dunes with creeping willow occurs close to conifer forestry and partly within a clearing in the forestry. The rare plant *Pyrola rotundifolia* ssp. *maritima* is found in the clearing. The habitat suffers from scrub encroachment and undergrazing, although the presence of *Senecio jacobaea* indicated that cattle may have grazed part of the habitat in the recent past.

Area

2170 Dunes with creeping willow was recorded as covering an area of 10 ha during the baseline survey. However, this area was not included on the CMP GIS layer. There is a small discrepancy between the revised baseline area (11.28 ha) and the area recorded in 2011 (11.26 ha), but this is an artefact of mapping rather than a genuine loss of habitat. Although Area was assessed as Unfavourable-Inadequate during the baseline survey, this was due to the presence of conifer plantations adjacent to the *Salix repens* dunes. The conifer plantation predates designation by several decades. **2170 Dunes with creeping willow** are occasionally found associated with conifer plantations (JNCC, 2007), and it cannot be assumed that the trees were planted on a pre-existing area of **2170 Dunes with creeping willow**, or that the conifer plantation has limited the extent of the habitat. Area was assessed as Favourable (stable) in 2011.

Structure and Functions

The habitat failed two of the Structure and Functions criteria. Scrub and trees were frequent within the habitat and there was no bare sand present. The lack of bare sand is an indication of undergrazing. Structure and Functions were assessed as Favourable during the baseline survey. Structure and Functions were assessed as Unfavourable-Inadequate (deteriorating) in 2011.

Future Prospects

The most significant negative impact recorded was undergrazing, which has a negative impact on 90% of the habitat. The woodland adjacent to the habitat is acting as a seed source and this represents a low-intensity negative impact over 75% of the habitat. The trees and scrub within the habitat exert a low-intensity negative impact over 25% of the habitat as they are relatively sparse within that area. Coastal protection works were recorded as an indirect, neutral impact on the entire habitat as their long-term implications for the site as a whole have not yet been understood. Future Prospects were assessed as Unfavourable-Inadequate during the baseline survey. Future Prospects were assessed as Unfavourable-Inadequate (stable) in 2011.

Conservation assessment

The conservation status was assessed as Unfavourable-Inadequate (deteriorating) in 2011 as the continued lack of grazing has led to a degradation of the Structure and Functions of the habitat.

2.2.7 2190 Humid dune slacks

There are four areas of dune slack at Strandhill: two on the spit south of the golf course and two north of the golf course. An embryonic dune slack was found in the area known as Shelly Valley. *Juniperus communis* was noted from one of the slacks on the spit. The northern slacks are part of a habitat complex with ***2130 Fixed dunes (grey dunes)**, **2170 Dunes with creeping willow** and conifer plantation.

Area

There has been a small increase in the area of **2190 Humid dune slacks** in the reporting period, from 1.88 ha during the CMP to 2.00 ha during the SDM. The area of dune slack was underestimated during the baseline survey and the area has been altered accordingly. Area was assessed as Favourable (stable) in 2011.

Structure and Functions

All of the criteria were fulfilled and the Structure and Functions were assessed as Favourable. Structure and Functions were assessed as Favourable during the baseline survey. Structure and Functions were assessed as Favourable (stable) in 2011.

Future Prospects

Campfires have a high negative impact on less than 1% of the site. Conifers are adjacent to one of the slacks and represent a medium-intensity, negative effect as they increase the rate of natural drying out in **2190 Humid dune slacks**. Future Prospects were assessed as Unfavourable-Inadequate during the baseline survey. Future Prospects were assessed as Unfavourable-Inadequate (stable) in 2011.

Conservation assessment

The conservation status of **2190 Humid dune slacks** was assessed as Unfavourable-Inadequate (stable) in 2011.

3 DISCUSSION

3.1 Sea defences

The dune system at Strandhill is subject to occasional severe weather and sea conditions. This can result in large, sudden erosion events, which can appear very destructive. The dependence of the local economy on tourism has led to a desire to make the dune system more stable. There is a golf course adjacent to the site and there is a sewage treatment works located within the dune system. These factors increase pressure on local councillors to add coastal protection works to combat a perceived threat of erosion. In 2010, a large sea-wall and associated rock-armour was erected at Strandhill. This resulted in the removal of a large proportion of the **1210 Annual vegetation of drift lines** that previously occurred on the site. The coastal protection works have a general effect on sediment cycling, which could pose a threat to habitat succession and regeneration on the site as a whole.

3.2 Grazing

Undergrazing was noted as a negative impact in two of the habitats at Strandhill: ***2130 Fixed dunes (grey dunes)** and **2170 Dunes with creeping willow**. This can lead to an increase in the uniformity of the habitat, a reduction in diversity of species and micro-habitats and eventually to succession to scrub or woodland. The controlled introduction of grazers to selected parts of the site would help to improve the future prospects of those habitats.

3.3 Conifer plantations

There are two main areas of conifer plantation close to the airport, which are planted on sand. These represent a threat to the **2190 Humid dune slacks**, **2170 Dunes with creeping willow** and to the ***2130 Fixed dunes (grey dunes)** as trees have begun to spread into these habitats. The presence of trees near dune slacks can cause them to dry out at an accelerated rate. The structure of the dune habitats would benefit from management to remove non-native trees from within the habitats. In the long term, the overall integrity of the sand dune habitats would benefit from the removal of the conifer plantations, but wider conservation interests should be investigated before any felling commences.

3.4 Recreation

Trampling, disturbance of the vegetation, campfires and litter have all been recorded at Strandhill. The ***2130 Fixed dunes (grey dunes)** and **2190 Humid dune slacks** are particularly affected, with most pressure focussed on the southern part of the site. Control of access to the dunes, particularly in sensitive areas, would be of benefit to the structure of the dunes. Control of activities such as lighting fires and littering would also enhance the dune habitats.

3.5 Rare species

Pyrola rotundifolia ssp. *maritima* was found in **2170 Dunes with creeping willow** at Strandhill. This rare species was not found at Strandhill during the baseline survey. Further investigation should be carried out to assess the extent of the population at Strandhill and whether it is present beneath the canopy of the forestry.

3.6 Dune Heath

Some *Calluna vulgaris* was found on the dunes, close to the conifer plantation (Grid Ref G60850 36376), and this may represent an early stage in the succession towards ***2150 Decalcified dune heath**.

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Key

- 1210 Strandline
- 1220 Vegetated Shingle
- 2110 Embryonic Dunes
- 2120 White Dunes
- 2130 Fixed Dunes
- 2170 Dunes with *S. repens*
- 2190 Dune Slacks
- BL Built Land
- CM Salt Marshes
- ED Disturbed Ground
- SACs 000622, 000627

An Roinn
Kolafán, Oidhreacht agus Goeltacht
 Department of
Arts, Heritage and the Gaeltacht

**Monitoring survey of Annex I
 sand dune habitats in Ireland
 2011-2012**

**Strandhill,
 Co. Sligo**
- Revised Baseline Habitat Map -

SIDM code: 133
 Date of
 map production: 25-10-2013

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0 0.25 0.5 Km

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An Roinn
Balain, Oidhreachta agus Gaeltachta
 Department of
Arts, Heritage and the Gaeltacht

**Monitoring survey of Annex I
 sand dune habitats in Ireland
 2011-2012**

**Strandhill,
 Co. Sligo**
- Updated SDM Map -

SDM code: 133
 Date of
 map production: 25-10-2013

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