Horn Head and Rinclevan SAC (site code 147)
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 (2014). Conservation Objectives: Horn Head and Rinclevan SAC 000147. 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.

Horn Head and Rinclevan SAC is a diverse coastal site that extends northwards at Horn Head into the Atlantic Ocean from Dunfanaghy in County Donegal. The site also extends westwards reaching just beyond Dooros Point. This SAC site contains a wide range of habitats from high rocky quartzite cliffs in the north to mudflats, sandflats and a brackish lake in the south.

The bedrock geology of the site is dominated by quartzite interspersed with smaller amounts of schists and metadolerite bedrock elsewhere. Extensive areas of sand dominate the south-western and eastern portions of the site, while peaty podsols with occasional rock outcrops dominate to the north.

In the south-western part of the site the dune system is impressive in terms of its size, range of dune types and its relatively undisturbed nature. Of particular note is the area of fixed dunes, a priority habitat listed on Annex I of the EU habitats Directive, to the north-east of Dunfanaghy village and to the north-east of Trawmore, especially Lurgabrack. A small area of machair is located in Murroe townland in the north-eastern corner of the site.

The dunes at Lurgabrack are owned and managed by NPWS.

While the sand dunes habitats at this SAC site are generally in good condition, parts have been overgrazed, especially the machair. Overgrazing and other forms of agricultural intensification remains a general threat to the sand dune habitats.

Horn Head and Rinclevan SAC (site code: 147) is designated for a range of coastal habitats including sand dunes. The following six 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)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)*
- Dunes with *Salix repens* ssp. *argentea* (Salix arenariae) (2170)
- Humid dune slacks (2190)
- Machair (21A0)*

All of these habitats are associated with sand dune systems and all are usually found in close association with each other. Other Annex I habitats that occur at the site but that are not listed as qualifying interests include, Vegetated sea cliffs, Atlantic salt meadows and Mediterranean salt meadows. The ISCS (Irish Sea Cliff Survey) recorded one cliff site at Largatreany (Barron *et al*., 2011). The National inventory of Saltmarshes recorded sandflats type saltmarsh at Dunfanaghy (Curtis & Sheehy-Skeffington, 1998) but this site was not surveyed by the SMP (McCorry & Ryle, 2009). The rare Annex II liverwort, petalwort *(Petallophyllum ralfsii*) is recorded from this site.

This backing document sets out the conservation objectives for the six coastal habitats listed above in Horn Head and Rinclevan 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. Crawford *et al*. (1996) and Gaynor (2006, 2008) provide additional information on machair in Ireland. The distribution of sand dune habitats within Horn Head and Rinclevan SAC is presented in Appendix I.

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 Horn Head and Rinclevan SAC. The sub-sites are:

1. Dunfanaghy
2. Rinclevan

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for all sub-sites and those compiled for Dunfanaghy 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 Rinclevan) 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 Rinclevan are included in Appendix III.
Dunfanaghy sub-site is located near Horn Head in northwest Donegal. The fixed dunes and slacks at Dunfanaghy are well developed, however they are declining in condition owing to undergrazing and intense recreational activities at the site (Ryle *et al*., 2009).

Rinclevan (Lurgabrack) sand dunes, on the southwestern side of Horn Head Peninsula in northwest Donegal, are approximately 1km from Dunfanaghy. Rinclevan dunes are notable for their particularly extensive and good quality fixed dunes, which are certainly among the best examples of the habitat in the region if not the country. New Lake, a slightly brackish waterbody to the east of the dunes, was formed in the 1920's when blown sand from the dunes to the west blocked the outlet that had connected Rinclevan Strand to the sea. It is now managed as a wildlife sanctuary and is an important wintering habitat for swans and wildfowl. The northern half of the dunes (that is commonly referred to as Lurgabrack) is owned by NPWS, while the rest is partly privately owned and partly in commonage, with grazing rights held by a number of landowners.

The conservation objectives for the sand dune habitats in Horn Head and Rinclevan 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 Horn Head and Rinclevan 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) ***

The six dune habitats indicated in bold above are listed as Qualifying Interests for Horn Head and Rinclevan SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems (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).

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.

Machair (21A0) is a highly specialised and complex dune habitat that is confined globally to the north-west coasts of Ireland and Scotland. It comprises a flat or gently undulating sandy plain that develops in an oceanic location with a cool moist climate. Machair systems are highly calcareous, the sediments usually containing a high percentage of shell fragments and having pH values in excess of 7. The vegetation is herbaceous, with low frequency of sand-binding species (Gaynor, 2006). Irish machair is a priority habitat under the EU Habitats Directive.

In 1996, the Biomar Machair Survey surveyed all sand dune sites at which machair formed a significant element (Crawford *et al*.,1996). Comparison of the CMP with this 1992 survey revealed considerable degradation of machair habitat which could be attributed to changes in farming practices that has seen many machair commonages being fenced (stripped) resulting in greater concentration of livestock in confined areas, overgrazing, supplementary feeding and poaching of the land (Ryle *et al.,* 2009).

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

The CMP surveyed two sub-sites within Horn Head and Rinclevan SAC:

1. Dunfanaghy
2. Rinclevan

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for both sub-sites and those compiled for Dunfanaghy are included in Appendix II. It should be noted that most of the Dunfanaghy sub-site lies outside the SAC. The updated site report and habitat map for Rinclevan from the Sand Dunes Monitoring Project (SDM) are included in Appendix III.

The combined data from the CMP for the sub-site at Dunfanaghy, along with the data from the SDM for the sub-site at Rinclevan is presented in Appendix I. A total of 390.83ha of sand dune habitat was mapped within the Horn Head and Rinclevan SAC, all of which is considered of qualifying interest for this particular site.

3.1 Overall objectives

The overall objective for ‘Embryonic shifting dunes’ Horn Head and Rinclevan SAC is to ‘maintain the favourable conservation condition’.

The overall objective for ‘Shifting dunes along the shoreline with *Ammophila arenaria* (white dune)’ in Horn Head and Rinclevan SAC is to ‘maintain the favourable conservation condition’.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Horn Head and Rinclevan SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Dunes with *Salix repens ssp argentea*' in Horn Head and Rinclevan SAC is to 'restore the favourable conservation condition'.

The overall objective for 'Humid dune slacks' in Horn Head and Rinclevan SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Machair' in Horn Head and Rinclevan 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 each sub-site in Horn Head and Rinclevan SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). The map for Dunfanaghy is included with the individual site report in Appendix II. The baseline habitat map for Rinclevan 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 report in Appendix III. The data from the CMP and SDM has been combined to the 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)**
Dunfanaghy	CMP	0.388
Rinclevan	SDM	-
Total		**0.388**

2120 Shifting dunes along the shoreline with *Ammophila arenaria*

Sub-site	Data source used	Total area within SAC boundary (ha)
Dunfanaghy	CMP	1.092
Rinclevan	SDM	4.084
Total		**5.176**

2130* Fixed coastal dunes with herbaceous vegetation

Sub-site	Data source used	Total area within SAC boundary (ha)
Dunfanaghy	CMP	14.581
Rinclevan	SDM	277.753
Total		**292.334**

2170 Dunes with *Salix repens* ssp. *argentea*

Sub-site	Data source used	Total area within SAC boundary (ha)
Dunfanaghy	CMP	-
Rinclevan	SDM	9.042
Total		**9.042**

2190 Humid dune slacks

Sub-site	Data source used	Total area within SAC boundary (ha)
Dunfanaghy	CMP	-
Rinclevan	SDM	42.569
Total		**42.569**

21A0* Machair

Sub-site	Data source used	Total area within SAC boundary (ha)
Dunfanaghy	CMP	-
Rinclevan	SDM	41.321
Total		**41.321**

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.

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 Horn Head and Rinclevan 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 Rinclevan, both the CMP and SDM noted that there was no substantial accreting of foredune habitat and embryo dunes were absent from the site at time of survey (Ryle *et al.,* 2009; Delaney *et al*., 2013).
There is good development of mobile dunes at Dunfanaghy, however in some areas they are discontinuous as a result of trampling and overuse which has led to erosion. There is a rock armour wall which protects the golf course at the most easterly end of the beach and fore dunes are absent from here (Ryle *et al*., 2009).

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 Physical structure: hydrological and flooding regime

The conservation of dune slacks, dunes with *S. repens* and machair 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 water, surface water or groundwater. The latter two sources are usually somewhat calcareous while the former is acid.

The most important influence on the nature and vegetation of a dune slack is the groundwater table, which can fluctuate considerably throughout the year. The frequency and duration of periods of flooding or inundation determines the vegetation composition. The water table depth has been identified as the primary determining factor in 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, 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).

At Rinclevan, the dune slack area in the southern half of the dunes is one of the largest slack systems in the country and it is mostly intact and undamaged. Much of the low-lying depression between Tramore Strand and New Lake is occupied by dune slack habitat and the more northerly reaches of which are dominated by (Creeping willow) *Salix repens*. The 'dunes with *Salix repens'* habitat is distinguished at this site from the adjacent dune slack habitat on the basis that it is somewhat drier, mostly due to being on slightly higher ground and therefore not as directly under the influence of the water table as wet dune slack, and because of the greater frequency of *Salix repens*. This habitat is generally thought to represent a drier phase in a succession from previously wetter dune slack vegetation, perhaps due to the raising of the soil level through input of blown sand (Ryle *et al*., 2009).

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

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

Like dune slacks, machair is highly sensitive to human influences on hydrology, either through water abstraction, drainage works or increased nutrient inputs. Water abstraction interferes

with the local hydrology, potentially having serious implications for the plant and animal communities of wet machair communities.

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

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.

A range of coastal habitats occur at both Rinclevan and Dunfanaghy sub-sites (Ryle *et al.,* 2009). The sand dune habitats grade into a small area of saltmarsh at Dunfanaghy (Curtis & Sheehy Skeffington, 1999).

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 applies to fixed dunes, dunes with *S. repens*, dune slacks and machair. 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 such as petalwort (*Petalophyllum ralfsii*) and a range of invertebrates, helping to increase biodiversity.

Petalwort has been recorded at Rinclevan (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 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.

3.4.6 Vegetation structure: vegetation height

This attribute applies to the more fixed habitats (machair, 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 Rinclevan the fixed dunes are overgrazed by both sheep and cattle. A sizable portion of the northern half of the dunes are owned by NPWS and the maintenance of a controlled grazing regime in this area is part of a management plan for the dunes. The proliferation of common ragwort (*Senecio jacobaea*) particularly in the southern portion of the dunes was noted in both surveys (Ryle *et al.,* 2009; Delaney *et al*., 2013).

The machair at Rinclevan is overgrazed by sheep at Pollaguill Bay where 20ha of habitat are either overgrazed or under threat from overgrazing. A particularly large rabbit population adds to the problem (Ryle *et al*., 2009; Delaney *et al*., 2013).

In the Dunfanaghy sub-site at Killahoey Beach, large grazers do not graze the fixed dunes and so some areas are undergrazed. At Dunfanaghy Bay some areas of the fixed dunes are overgrazed by rabbits (Ryle et al., 2009).

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

3.4.7 Vegetation structure: vegetation cover

The only habitat where this is a specific attribute is humid dune slacks where that target is to maintain less than 40% cover of *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.

Creeping willow (*Salix repens*) occurs constantly within the dune slack habitat at Rinclevan (Delaney *et al*., 2013).

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

3.4.8 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 Annex II plant species *Petallophylum ralfsii* was recorded at Rinclevan from a single location in the south end of the site (Holyoak, 2002).

In the fixed dunes at Rinclevan, lesser meadow rue (*Thalictrum minus*) was recorded by the CMP (Ryle *et al*., 2009).

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

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

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

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

Horn Head and Rinclevan SAC supports a characteristic dune flora, details of which can be found in the site reports in Appendices II & III. Notable elements of the site flora include petalwort (*Petalophyllum ralfsii)* which was recorded frequently in previous surveys.

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

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.

At Rinclevan, a large stand of *Hippophae rhamnoides* was recorded in the eastern end of the site (Delaney *et al.,* 2013).

At Dunfanaghy Bay, the CMP estimated that 70% of the fixed dune habitat was covered in bracken (*Pteridium aquilinum*) (Ryle *et al*., 2009).

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

3.4.10 Vegetation composition: bryophytes

This attribute applies to machair. Bryophytes are an important element of the machair flora. Moss cover is well developed within the machair habitat at this SAC and typically attains 90% cover. Frequently occurring species include *Campylium stellatum, Drepanocladus revolvens, Ctenidium molluscum* and *Philontis fontana*, most of which are indicative of wet, base-rich conditions.

At Rinclevan, the bryophyte cover was noted to be generally high (Ryle *et al.,* 2009; Delaney *et al*., 2013).

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

3.4.11 Vegetation composition: scrub/trees

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

At Killahoey Beach (Dunfanaghy) some scattered hawthorn and willow bushes occur in the dunes, especially near the car park. Some gorse bushes were also noted in one area of the dunes. At Dunfanaghy Bay, bramble was widespread in 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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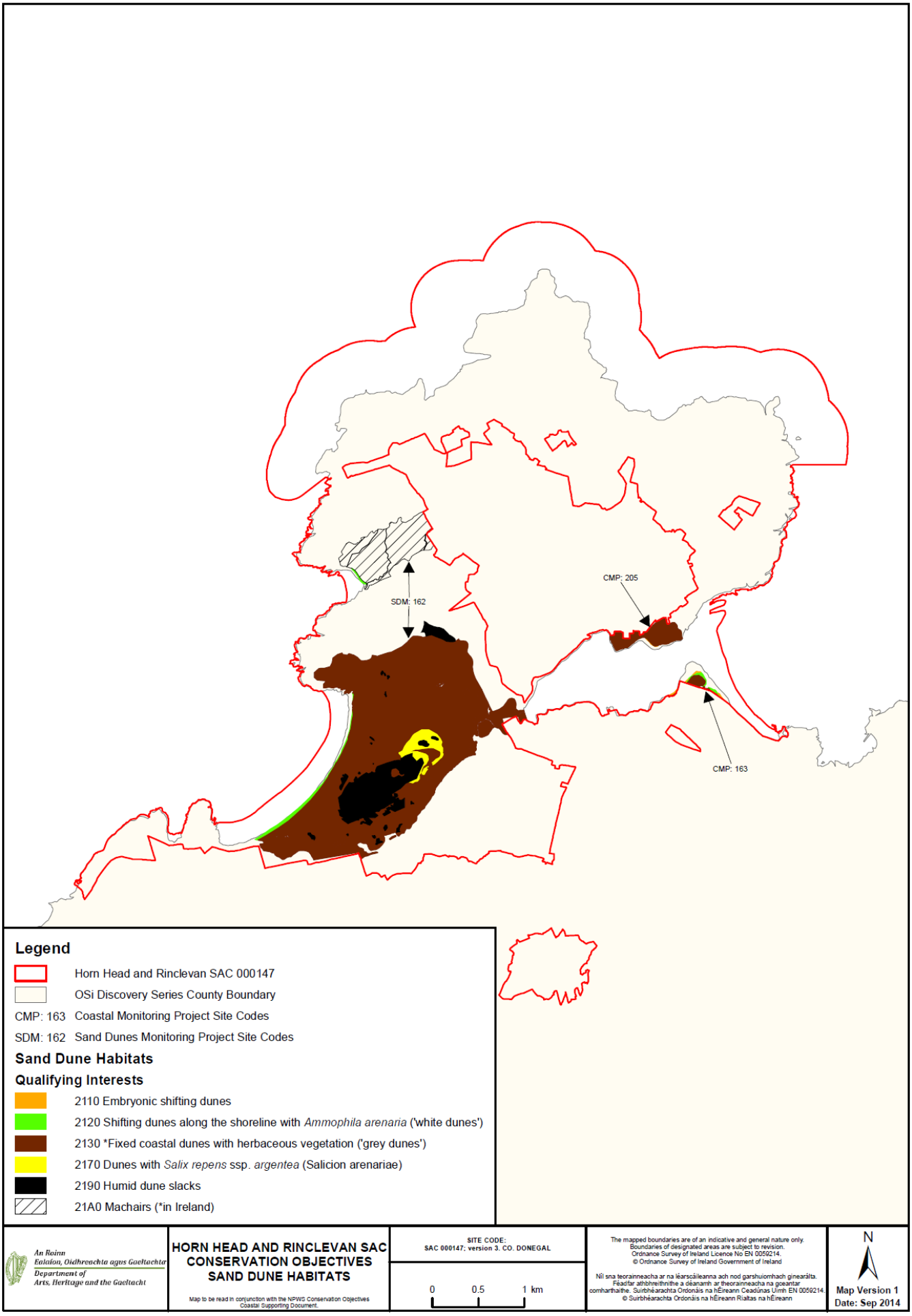
Appendix I: Distribution map of known sand dune habitats within Horn Head and Rinclevan SAC



Appendix II – Dunfanaghy site report and habitat map from the CMP (Ryle *et al*., 2009)

DUNFANAGHY

SITE DETAILS

CMP06 site name: **Dunfanaghy (Killahoey Beach)** CMP06 site code: **163**

Sub-site CMP06 site name: **Dunfanaghy Bay** CMP site code**: 205**

CMP Map No.: **160**

County:**Donegal** Discovery map: **2** Grid Reference: **C 985 375**

6 inch Map No.: **Dg 015 & 016**

Aerial photographs (2000 series): **O 0076-A, B, C, D.**

NPWS Site Name: **Horn Head and Rinclevan**

NPWS designation: pNHA: **147** cSAC: **147** SPA **4059** & **'**New lake' Wildlife Sanctuary

Other Designation **–** Blue Flag**: Killahoey (Dunfanaghy)**

Ranger Area: **West**

MPSU Plan: **Draft 2 Consultation 2000**

Report Author: **Melinda Swann**

SITE DESCRIPTION

Dunfanghy dunes are located near Horn Head in northwest county Donegal. The site is part of cSAC 147 along with Rinclevan, also known as Lurgabrack (CMP site code - 162), further to the west. Horn Head peninsula is situated between Bloody Foreland to the west and Melmore to the east. The cSAC is important, as it has particularly well developed fixed dunes and dune slacks, especially at Rinclevan. The fixed dunes and dune slacks at Dunfanaghy are also well developed, however they are now declining in condition due to undergrazing and intense recreational activities at the site. The mobile dunes and embryonic dunes are moderate examples and the machair is now small in extent as a result of the presence of Dunfanaghy Golf Course. The 18-hole golf course was founded in 1894 and was excluded from the cSAC in 1999. The course is intensively managed and seems to have expanded slightly into the machair and fixed dune habitats. The dunes around Dunfanaghy are of national importance for bryophytes. Furthermore the Red Data Book species *Agrostemma githago* (Corncockle) and *Ligusticum scotivum* (Scottish lovage) have been recorded in the

cSAC, though the former has not been seen in recent times (Gaynor & Brown, 1999). The beach at Dunfanaghy (Killahoey) has blue flag status and therefore attracts many visitors to the area in the summer months.

The cSAC is designated as a result of the presence of the following habitats 'Machair', 'Fixed dunes with herbaceous vegetation (grey dunes)', Dunes with *Salix repens*', 'Humid dune slacks', 'Lagoons', 'Embryonic shifting dunes', 'Shifting dunes along the shoreline with *Ammophila arenaria'* and 'Vegetated sea-cliffs of the Atlantic and Baltic coasts'. Other habitats present include blanket bog, saltmarsh, sandflats and mudflats.

The area is very important, as Horn head cliffs are one of the largest seabird colonies in Ireland and boast the unique factor that the proportion of razorbills (*Alca torda*) to guillemots (*Uria aalge*) is much higher than typically found in most seabird colonies (BirdWatch Ireland, pers comm., 2007). Seabird species that breed include *Fulmarus glacilis* (Fulmar), *Phalacrocorax aristotelis* (Shag), *Rissa tridactyla* (Black-legged kittiwake), *Uria aalge* (Common guillemot), *Alca torda* (Razorbill) and *Fratercula arctica* (Puffin). Species such as *Branta leucopsis* (Brent goose) and *Anser albifrons flavirostris* (Greenland white-fronted goose) over winter in internationally important numbers at New Lake, the latter species being Annex I. Other Annex I species recorded in the cSAC include *Cygnus Cygnus* (Whooper swan), *Falco peregrinus* (Peregrine falcon) and *Pyrrhocorax pyrrhocorax* (Chough). A pair of choughs nest on the cliffs east of Dunfanaghy golf course and are known to use the golf course from time to time to feed (BirdWatch Ireland, pers comm., 2007).

Important bird sites on Horn Head and at 'New Lake' (near Rinclevan) are encompassed within the SPA 4059 (Dunfanaghy/Rinclevan SPA). Furthermore the cSAC is also designated due to presence of the Annex II liverwort species *Petalophyllum ralfsii* (Petalwort) and the Annex II mammal species *Halichoerus grypus* (Grey seal) and the Annex II plant species *Najas flexilis* (Slender naiad).

The current survey concentrates on Annex I sand dune habitats found at Dunfanaghy and include fixed dunes (Priority), humid dune slacks, mobile dunes and embryonic dunes. The areas of Annex I sand dune habitats recorded at Dunfanaghy are shown in

Table 163A. Note there is a sub-site described in this report, as there is an area of fixed dunes located across the bay west of Dunfanaghy, the sub-site is therefore referred to as 'Dunfanaghy Bay' and the main site as 'Dunfanaghy – Killahoey Beach'.

Table 163A Areas of EU Annex I habitats mapped at Dunfanaghy

EU Code	EU Habitat	Area (ha)
Dunfanaghy – Killahoey Beach		
H21AO	Machair	2.23
H2130	Fixed Dunes	17.6
H2190	Humid dune slack	1.2
H2120	Shifting dunes along the shoreline with *Ammophila arenaria*	2.2
H2110	Embryonic Dunes	1.2
	Total Sand dune area excluding developments/modifications*	**24.45**
	Sandy substrate area including developments/modifications	**39.2**
Dunfanaghy Bay		
H2130	Fixed Dunes	12.7
H2110	Embryonic Dunes	0.086
	Total Sand dune area	**12.8**

*Developments/modifications in this case include golf course (38.7ha), clubhouse (0.34ha) and car park (0.16ha).

Dunfanaghy – Killahoey Beach

Machair (H21A0)

The machair habitat comprises 2.23ha (approximately 9%) of the total sand dune habitat at Dunfanaghy (Table 163A). The machair has been fragmented at this site and there is only one small area remaining. This consists of a field, which has been fenced off from the surrounding golf course. The habitat that is left has a rich diversity of species and a characteristic short sward appearance. The field is sheep grazed, although no animals were present on the survey day. The golf course was constructed on the original machair plain and it seems that it has expanded further in recent times, as it now extends beyond the cSAC boundary. This last remaining piece of machair habitat is surrounded on three sides by the golf course and may be under threat in the future if the golf course further expands.

The typical species found in the machair at Dunfanaghy include *Lotus corniculatus* (Common bird's-foot trefoil), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Carex arenaria* (Sand sedge), *Prunella vulgaris* (Selfheal), *Cerastium fontanum* (Common mouse-ear), *Thymus polytrichus* (Wild thyme), *Trifolium repens* (White clover), *Carex flacca* (Glaucous sedge), *Linum catharticum*

(Fairy flax), *Hydrocotyle vulgaris* (Marsh pennywort) and *Euphrasia officinalis agg.* (Eyebright).

Other species of the machair include *Hypochaeris radicata* (Cat's ear), *Ranunculus repens* (Creeping buttercup), *Plantago maritima* (Sea plantain) and *Festuca rubra* (Red fescue).

Mosses noted include *Rhytidiadelphus squarrosus* and *Climacium dendroides*

There were no negative indicators recorded in the habitat.

Fixed Dunes (H2130)

The fixed dune habitat comprises 17.6ha (approximately 72%) of the total sand dune habitat at Dunfanaghy (Table 163A). The fixed dunes at Dunfanaghy have been affected by the presence of a golf course and intense recreation. Some areas of the fixed dunes have been taken over by the course especially at the western end where expansion seems to have occurred since designation. At present the remaining habitat can be described as a mainly ungrazed system with, in places a high moss cover, but with good overall species diversity. In places *Ammophila arenaria* (Marram grass) dominates however, and the sward is relatively rank. Some areas of the fixed dunes are undulating in appearance but are mainly composed of one dune ridge that grades into flat grassland landward, with a number of dune slacks situated here. An access road cuts through the habitat to a car park near the beach and there are fenced areas in the eastern part of the fixed dunes. On the southeast side of the road the fixed dunes are quite disturbed with patches of bare sand. There is an eroded sandy track, which has been caused by a tractor entering and exiting the beach to extract sand for the golf course. The track runs along the northern edge of the golf course and cuts through the fixed dunes to the beach. There is also a large population of rabbits, which, further adds to the erosion, and horse riding and walking is also causing tracks through the habitat. Willow trees (*Salix* spp.) occur in the fixed dunes near to the car park and there were a few gorse bushes (*Ulex europaeus*) scattered nearby. A small dump was recorded in the dunes in the eastern part of the site. There was a high population of caterpillars of the 6-spot Burnet moth and the Cinnabar moth noted on the *Senecio jacobaea* (Common ragwort), which was scattered in places through the habitat. Overall the habitat is declining in condition due to the lack of grazing and as a result

of recreational impacts, but some areas of the habitat still retain a high diversity of species and are of conservation value.

The typical species found in the fixed dune at Dunfanaghy include *Anthyllis vulneraria* (Kidney vetch), *Festuca rubra* (Red fescue), *Lotus corniculatus* (Common bird's-foot trefoil), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Thymus polytrichus* (Wild thyme), *Carex arenaria* (Sand sedge), *Euphrasia officinalis* agg. (Eyebright), *Campanula rotundifolia* (Harebell), *Peltigera* spp. (*Peltigera* lichen), *Pilosella officinarum* (Mouse-ear-hawkweed), *Trifolium repens* (White clover), *Linum catharticum* (Fairy flax) and *Arrhenatherum elatius* (False oat-grass).

Other species found in the fixed dune include *Ammophila arenaria* (Marram grass), *Taraxacum agg.* (Dandelion), *Ranunculus* spp. (Buttercup spp.), *Phleum arenarium* (Sand cat's-tail), *Equisetum* spp. (Horsetail), *Daucus carota* (Wild carrot), *Leontodon saxitilis* (Lesser hawkbit), *Holcus lanatus* (Yorkshire fog), *Anacamptis pyramidalis* (Pyramidal orchid), *Ulex europaeus* (Gorse) and *Salix* spp. (Willow spp.).

Mosses found in the fixed dune habitat include *Rhytidiadelphus squarrosus, Rhytidiadelphus triquetrus, Calliergonella cuspidata, Homalothecium* spp., *Tortula ruraliformis* and the typical moss *Hypnum cumpressiforme.*

The negative indicator *Senecio jacobaea* (Common ragwort) was recorded in the habitat.

Humid Dune Slack (H2190)

The dune slack habitat comprises 1.2ha (approximately 5%) of the total sand dune habitat at Dunfanaghy (Table 163A). There are a number of large dune slacks located in the fixed dunes east and west of the car park. In fact it seems that the car park was built on what was once a larger slack. The dune slacks at Dunfanaghy are important examples of the habitat and botanically very interesting as there is a diverse flora associated with them. They are unfenced and extremely species-rich and important mosaics of bryophytes occur. There is some disturbance of the dune slack east of the car park. This slack is a wet, mature dune slack and the edge nearest to the car park

has been affected by some dumping of rubble. The other slacks are also wet, mature and species-rich and are quite extensive examples. The slacks are lightly grazed by rabbits but are generally becoming undergrazed. This will have an adverse affect on the habitat in the future. In some areas of the slacks *Salix repens* (Creeping willow) occurs and is generally low-growing. In order to maintain the floristic diversity of the habitat some large grazers would be beneficial, especially in the winter months. There are a number of willow trees present in the fixed dunes north of the slacks and these may begin to seed elsewhere if no grazers are introduced.

The typical species found in the dune slacks include *Trifolium repens* (White clover), *Lotus corniculatus* (Common bird's-foot trefoil), *Anthyllis vulneraria* (Kidney vetch), *Galium verum* (Lady's bedstraw), *Prunella vulgaris* (Selfheal), *Carex arenaria* (Sand sedge), *Salix repens* (Creeping willow), *Plantago lanceolata* (Ribwort plantain), *Potentilla anserina* (Silverweed), *Hydrocotyle vulgaris* (Marsh pennywort), *Carex nigra* (Common sedge), *Equisetum* spp. (Horsetail), *Festuca rubra* (Red fescue), *Carex flacca* (Glaucous sedge), *Euphrasia officinalis agg.* (Eyebright), *Epipactis palustris* (Marsh helleborine), *Thymus polytrichus* (Wild thyme), *Campanula rotundifolia* (Harebell), *Hypochaeris radicata* (Cat's ear), *Veronica chamaedrys* (Germander speedwell), *Crepis capillaris* (Smooth hawk's beard), *Rhinanthus minor* (Yellow-rattle), *Linum catharticum* (Fairy flax*)* and *Juncus* spp., (Rush spp.).

Other species present include *Dactylorhiza* spp. (Marsh-orchid spp.), *Pinguicula vulgaris* (Common butterwort), *Euphorbia portlandica* (Portland spurge), *Taraxacum agg.* (Dandelion), *Anacamptis pyramidalis* (Pyramidal orchid), *Arrhenatherum elatius* (False oat-grass), *Angelica sylvestris* (Wild angelica), *Leontodon autumnalis* (Autumn hawkbit), *Leontodon saxitilis* (Lesser hawkbit), *Filipendula ulmaria* (Meadowsweet), *Agrostis stolonifera* (Creeping bent), *Ranunculus acris* (Meadow buttercup), *Ranunculus* spp. (Meadow spp.), *Trifolium pratense* (Red clover), *Ranunculus repens* (Creeping Buttercup), *Vicia* spp. (Vetch spp.), *Plantago maritima* (Sea plantain), *Centaurea nigra* (Common Knapweed), *Heracleum sphondylium* (Hogweed), *Daucus carota* (Wild carrot), *Peltigera* spp. (*Peltigera* lichen) and the typical moss *Calliergonella cuspidata,* as well as *Bryum pseudotriquetrum, Homalothecium lutescens, Plerozium schreberi, Rhytidiadelphus squarrosus, Rhytidiadelphus triquetrus* and *Tortula ruraliformis.*

The negative indicators *Senecio jacobaea* (Common ragwort) and *Cirsium arvense* (Creeping thistle) were recorded in the habitat.

Mobile Dunes (H2120)

The mobile dune habitat comprises 2.2ha (approximately 9%) of the total sand dune habitat at Dunfanaghy (Table 163A). There is good development of mobile dunes at Dunfanaghy, however in some areas they are discontinuous as a result of trampling and overuse, which has led to erosion. There is accretion at the entrance to the bay and mobile dunes have built up here. Near the main access to the beach, however there is an eroded fixed dune face and mobile dunes are absent. There is a tendency for people to sit amongst the habitat and thus trample the *Ammophila arenaria* (Marram grass). Further east along the beach the habitat is also discontinuous but growth of the marram grass is healthy. There are tracks through to the fixed dunes due to walking and horse riding and the sand extraction being carried out by the golf course has caused a large break in the dunes. At the most easterly end of the beach there is a rock armour wall, which protects the golf course. Foredunes are absent from here. There is a rocky headland beyond this wall.

The mobile dunes are composed of typical species *Ammophila arenaria* (Marram grass) as well as other species such as *Tussilago farfara* (Colt's-foot), *Phleum arenarium* (Sand cat's-tail), *Daucus carota* (Wild carrot), *Festuca rubra* (Red fescue), *Cerastium fontanum* (Common mouse-ear), *Hypochaeris radicata* (Cat's ear), *Taraxacum agg.* (Dandelion), *Equisetum* spp. (Horsetail) and some *Elytrigia juncea* (Sand couch) in places.

The negative indicator *Senecio jacobaea* (Common ragwort) was recorded in the habitat.

Embryonic Dunes (H2110)

The habitat comprises 1.2ha (approximately 5%) of the total sand dune habitat at Dunfanaghy (Table 163A). As the beach has Blue Flag status trampling and walking by visitors has affected this habitat. There is also regular horse riding along the beach,

which has further exacerbated erosion. The habitat is also discontinuous in appearance but is intact where the mobile dunes occur.

The dominant species of the embryonic dunes is *Elytrigia juncea* (Sand couch). There was some *Equisetum* spp. (Horsetail) near the golf course in the western part of the site and *Atriplex prostrata* (Spear-leaved orache) was scattered in places on small hummocks. The *E. juncea* (Sand couch) was healthy with extensive flowering and fruiting and there were no negative indicators recorded in the habitat.

Sub-site - Dunfanaghy Bay (CMP –205)

Fixed Dunes (H2130)

The fixed dune habitat comprises 12.7ha (approximately 99.3%) of the total sand dune habitat at Dunfanaghy Bay (Table 163A). This area of fixed dunes has been abandoned, as there were no signs of recent use by large grazers. Bracken is widespread and accounts for 70% of the habitat. The dunes are fenced into fields and there are signs of past use as there were a number of ring feeders in the habitat. There are a number of cars dumped in the fields as well as some household appliances. There is a large population of rabbits that have tightly grazed any open areas of fixed dunes and *Ammophila arenaria* (Marram grass) dominates the higher ground. The rabbit burrows are also undermining the structure of the habitat and there were eroded sandy areas noted. Although the habitat has been affected by the bracken and by overgrazing by rabbits there are still areas that are species-rich. Overall the monitoring process found that a large proportion of the typical species were present in the habitat and that in places there was an abundance of Dog Lichens (*Peltigera* spp.). However there is such a large area of the site covered in both bracken as well as agricultural weeds that it is inevitable that these species will further spread and any intact areas of fixed dunes will not remain species-rich for much longer. Breeding sites of *Riparia riparia* (Sand martin) were recorded in the bare sand in the fixed dunes and four birds of prey *Buteo buteo* (Buzzard) were noted flying over the site, furthermore *Oenanthe oenanthe* (Wheatear) were also seen on the day of survey.

The typical species found in the fixed dune at Dunfanaghy Bay include *Thymus polytrichus* (Wild thyme), *Linum catharticum* (Fairy flax), *Carex flacca* (Glaucous

sedge), *Hypochaeris radicata* (Cat's ear), *Festuca rubra* (Red fescue), *Lotus corniculatus* (Bird's-foot trefoil), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Viola tricolor* ssp. *curtisii* (Wild pansy), *Cerastium fontanum* (Common mouse-ear), *Veronica chamaedrys* (Germander speedwell), *Viola* spp. (Violet spp.), *Prunella vulgaris* (Selfheal), *Polygala vulgaris* (Common milkwort), *Carex arenaria* (Sand sedge), *Euphrasia officinalis* agg. (Eyebright), *Campanula rotundifolia* (Harebell), *Ranunculus* spp. (Buttercup spp.), *Peltigera* spp. (Dog lichen), *Pilosella officinarum* (Mouse-ear-hawkweed) and *Trifolium repens* (White clover).

Other species found in the fixed dune include *Ammophila arenaria* (Marram grass), *Bellis perennis* (Daisy), *Achillea millefolium* (Yarrow), *Trifolium pratense* (Red clover), *Poa annua* (Annual meadow-grass), *Poa* spp. (Meadow-grass spp.), *Ranunculus* spp. (Buttercup spp.), *Daucus carota* (Wild carrot), *Rosa pimpinellifolia* (Burnet rose), *Leontodon saxitilis* (Lesser hawkbit), *Taraxacum agg.* (Dandelion), *Phleum arenarium* (Sand cat's-tail), *Equisetum* spp. (Horsetail), *Holcus lanatus* (Yorkshire fog), *Anacamptis pyramidalis* (Pyramidal orchid) and *Salix* spp. (Willow spp.).

Mosses were abundant in the fixed dune habitat and include *Rhytidiadelphus squarrosus, Rhytidiadelphus triquetrus,* Rhytidiadelphus loreus, *Bryum* spp. *Calliergonella cuspidata, Homalothecium* spp., *Tortula ruraliformis* and the typical moss *Hypnum cumpressiforme.*

The negative indicators *Pteridium aquilinum* (Bracken), *Senecio jacobaea* (Common ragwort), *Urtica dioica* (Common nettle), *Cirsium arvense* (Creeping thistle) and *Rubus fruticosus* (Bramble) were widespread.

Embryonic Dunes (H2110)

The embryonic dune habitat comprises 0.086ha (approximately 0.7%) of the total sand dune habitat at Dunfanaghy Bay (Table 163A). There is a small band of embryonic dunes fronting an eroded fixed dune face in one area at Dunfanaghy Bay. The habitat was deemed too small to monitor, although a list of the species was taken.

A band of unvegetated cobble fronts the habitat and there is a small area of salt marsh nearby.

The typical species present was *Elytrigia juncea* (Sand couch) with other species such as *Ammophila arenaria* (Marram grass), *Atriplex laciniata* (Frosted orache), *Cakile maritima* (Sea rocket), *Sonchus arvensis* (Perennial sow-thistle spp.) and the negative indicator *Senecio jacobaea* (Common ragwort).

IMPACTS

Dunfanaghy – Killahoey Beach

The main impacts on the site are found in Table 163B. The machair habitat has been fenced off (Code 150) from the golf course and fixed dunes and is grazed by sheep (Code 140), although no grazers were noted on the survey day. The habitat is fragmented as a result of the presence of a golf course, which has been constructed on the original machair plain. The remaining piece of machair may be under threat if the golf course expands.

The fixed dunes are affected by the presence of the golf course (Code 601) (outside cSAC), which has altered the structure of the habitat in places and decreased the extent of the original habitat. The golf course was extensively drained (Code 810) in the past (Gaynor & Brown, 1999) and the greens and tees are mown (Code 102) and fertilised (Code 120). These activities may impact the surrounding habitats but are difficult to quantify. There is a car park (Code 490) and there are temporary toilet facilities provided. There is some dumping and littering (Code 421) in the car park. Large grazers do not graze the fixed dunes and so some areas are undergrazed (Code 149). There are rabbits present (Code 140) and there are some scattered hawthorn and willow bushes in the dunes (Code 971), especially near the car park. Some gorse bushes were also noted in one area of the dunes. Trampling (Code 720) and walking (Code 622) at the front of the habitat is apparent, as there are tracks through the dunes. There is also regular horse riding (Code 622) along the beach and up through the dunes further adding to the erosion. There is sand being removed (Code 300) from the beach by the golf course and there is an eroded track (Code 501) where the tractor drives from the beach to the course. The fixed dunes are fenced in some areas and

there is an animal corral at the eastern end with a number of household and farm items dumped nearby (Code 190). The habitat is also affected by natural erosion (Code 900) compounded by intense recreational use.

The dune slacks are probably lightly grazed by rabbits (Code 140) but some of the slacks are undergrazed (Code 149) and there is probably some walking (Code 622) through the habitat. There is also some disturbance (Code 790) to the edge of the slack nearest to the car park. The slacks may also be affected by the drainage carried out in the golf course.

The mobile dunes have been naturally eroded (Code 900) in the past, especially at the main access point to the beach, where they are now absent. Trampling by horses (Code 720) and walking (Code622) has compounded the erosion here. There was some burning noted (Code 690) in the habitat and there is rock armour (Code 871) present at the eastern end of the beach.

The embryonic dunes are affected by walking (Code 622), trampling by horses (Code 720) and natural erosion (Code 900).

Dunfanaghy Bay

Some areas of the fixed dunes are overgrazed by rabbits (Code 146) and there are eroded bare areas (Code 900) as a result. Seventy percent of the habitat is covered in *Pteridium aquilinum* (Bracken), which is spreading. There are also areas that are covered in agricultural weeds, such as *Senecio jacobaea* (Common ragwort) and *Cirsium* spp. (Thistle spp.) and clumps of *Urtica dioica* (Common nettle) (Code 971). There are a number of old ring feeders in these areas indicating past supplementary feeding. The area seems to have been abandoned now and there are no large grazers present. There were a number of old cars (Code 423) and household appliances (Code 421) dumped in the hollows of the dunes.

There is a very small area of embryonic dune present across the bay that is undisturbed except for some walking (Code 622) and natural erosion (Code 900).

Table 163B Intensity and impact of various activities on sand dune habitats at Dunfanaghy

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
Dunfanaghy - Killahoey Beach					
H21A0	140	B	+2	2.2	Inside*
H21A0	150	A	-1	2.2	Inside*
H2130	102	A	-1	Unknown	Outside
H2130	120	A	-1	Unknown	Outside
H2130	140	C	+2	2	Inside
H2130	149	B	-1	15	Inside
H2130	190	B	-1	0.1	Inside
H2130	300	A	-2	Unknown	Inside
H2130	421	A	-1	0.1	Inside
H2130	490	A	-1	0.161	Inside
H2130	501	A	-1	Unknown	Inside
H2130	601	B	-1	38.7	Outside
H2130	622	A	-1	1	Inside
H2130	720	B	-1	1	Inside
H2130	810	A	-1	38.7	Outside
H2130	900	A	0	Unknown	Inside
H2130	971	B	-1	0.1	Inside
H2190	140	C	+2	0.5	Inside
H2190	149	C	-1	1.125	Inside
H2190	622	C	-1	1.125	Inside
H2190	790	A	-1	0.1	Inside
H2120	622	A	-1	0.5	Inside
H2120	720	A	-1	0.5	Inside
H2120	690	B	-1	Unknown	Inside
H2120	871	A	-1	Unknown	Inside
H2120	900	B	0	Unknown	Inside
H2110	622	B	-1	Unknown	Inside
H2110	720	B	-1	Unknown	Inside
H2110	900	C	0	Unknown	Inside
Dunfanaghy Bay					
H2130	146	A	-1	4	Inside
H2130	421	C	-1	0.1	Inside
H2130	423	B	-1	0.1	Inside
H2130	900	B	0	Unknown	Inside
H2130	971	A	-1	2.9	Inside
H2110	622	C	-1	Unknown	Inside
H2110	900	C	0	Unknown	Inside

[1]EU 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 the cSAC and directly impacting the sand dune habitat. Outside = activities recorded outside the cSAC but adjacent to sand dune habitat that are impacting the sand dune habitat
*Note the machair is mostly outside the cSAC boundary so in this case "Inside" refers to inside the habitat.

CONSERVATION STATUS

The conservation status of a site is assessed on the condition of the site with regards to extent, structure & functions and future prospects (Table 163C). The main source of baseline information for this site was from the ASI Survey (1994) and the NATURA 2000 report (1999).

Table 163C Conservation status of Annex I sand dune habitats at Dunfanaghy

Habitat[1]	EU Conservation Status Assessment			**Overall EU conservation status assessment**	**Proposed Irish conservation status system**[2]
	Favourable	**Unfavourable - Inadequate**	**Unfavourable – Bad**		
Machair (H21AO)	Structure & functions	Extent Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Unchanged
Fixed Dune (H2130)	Structure & functions	Extent Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining
Humid dune slack (H2190)	Structure & functions	Extent Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Unchanged
Mobile Dunes (H2120)		Extent Structure & functions Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining
Embryonic Dunes (H2110)	Structure & functions	Extent Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Unchanged
Dunfanaghy Bay					
Fixed Dune (H2130)	Extent	Structure & functions Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining

[1]EU 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)

Details of the numbers and pass/failure rates of monitoring stops used to assess habitat structure & functions at Dunfanaghy are shown in Table 163D.

Machair (H21AO)

The machair habitat is now relatively small in area at this site, as it has been fragmented as a result of the presence of the golf course, which has been constructed on previous machair habitat. The golf course seems to have expanded into the machair

area. As a result the extent of the habitat is rated as *unfavourable-inadequate*. The NATURA 2000 assessment for machair within the cSAC is *significant representativity*, meaning that the representativity appears to be low.

The structure and functions parameter is rated as *favourable.* One monitoring stop was placed in the machair habitat, as the area was so small (Table 163D). This stop passed all the monitoring criteria and the habitat was intact. The NATURA 2000 report gives a ranking of *average or partially degraded structure*.

Table 163D Pass/fail results of monitoring stops in Annex I sand dune habitats at Dunfanaghy

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Dunfanaghy – Killahoey Beach			
Machair (H21A0)	1	0	**Favourable**
Fixed Dunes (H2130)	4	0	**Favourable**
Humid dune slack (H2190)	4	0	**Favourable**
Mobile dunes (H2120)	3	1	**Unfavourable- Inadequate**
Embryonic Dunes (H2110)	4	0	**Favourable**
Dunfanaghy Bay			
Fixed Dunes (H2130)	5	0	***Unfavourable- Inadequate**

*Although all stops passed the structure of the fixed dunes is inadequate

The future prospects of the machair at Dunfanaghy are rated as *unfavourable-inadequate*. The habitat may be under threat from expansion by the golf course, which now surrounds the habitat on three sides. The NATURA 2000 ranking is *average or unfavourable prospects.*

According to the MPSU management plan for the cSAC, the main threats to the priority habitats arise from recreational pressures and unsuitable grazing regimes. The objectives set out in the plan for this site are as follows:

1. To maintain the extent and if possible, improve the quality of the priority habitats – Machair and Fixed Dunes with Herbaceous Vegetation.
2. To maintain and if possible, improve the integrity, extent and ecological value of the non-priority habitats.
3. To maintain populations of breeding and over-wintering bird species.

4. To ascertain the status of the listed rare plants and, if possible, improve this status.
5. To continue and develop effective liaison between NPWS, relevant authorities and interested parties in order to effectively manage the site.
6. To provide information to the public explaining the status of the site and highlighting the important habitats, plants and animals found within it.

The principal management strategies involve the establishment of suitable grazing regimes, the regulation of recreational usage and liaison with relevant interested parties. As there is very little machair left at Dunfanaghy, the objectives of the MPSU management plan may not be feasible, however in order to maintain the small area of habitat that still remains, this plan should be adhered to where possible.

An overall EU conservation status of *unfavourable-inadequate* is assigned to the machair (Table 163C). The overall Irish conservation status is *unfavourable-unchanged.*

Fixed Dunes (H2130)

The extent of the fixed dunes is rated as *unfavourable-inadequate.* The golf course seems to have expanded into the habitat by as much as 3.7 hectares. The NATURA 2000 report ranks the fixed dunes in this cSAC as *excellent representativity.*

The structure and functions parameter is rated as *favourable.* A total of four monitoring stops were placed in the fixed dunes. All the monitoring stops passed overall, although two stops failed the sward height criteria and were taller than the target height (Table 163D). The NATURA 2000 report ranks the fixed dunes in this cSAC as *excellent structure.*

The future prospects of the fixed dune at Dunfanaghy are rated as *unfavourable-inadequate* as there is currently very little grazing. The lack of large grazers will lead to a taller sward and a decline in species diversity. There is also some sand extraction being carried out on the beach, which has caused tracks through the fixed dunes. There is also a high degree of recreational pressure at the site, which causes trampling of vegetation and erosion through the habitat. The NATURA 2000 report ranks the fixed dunes in this cSAC as *excellent prospects.* The objective of enhancing the ecological status of the priority habitats set out in the MPSU management plan should

be followed with respect to the problems of sand extraction and horse riding as soon as possible as the habitat is declining in condition as a result.

An overall EU conservation status of *unfavourable-inadequate* is assigned to the fixed dune (Table 163C). This is attributable to the *unfavourable-inadequate* extent, structure and functions and future prospects of the habitat as a whole at this site.

The overall Irish conservation status is *unfavourable-declining*.

Humid Dune Slack (H2190)

There are very good examples of extensive areas of dune slacks present at this site. There seems to have been some decline in area as a result of the building of the car park. Therefore the extent of the dune slack habitat is rated as *unfavourable-inadequate*. The NATURA 2000 report ranks the dune slacks as *excellent representativity* with this cSAC.

Four monitoring stops were placed in the habitat and all passed the monitoring criteria overall, although one stop failed the cover of *S. repens* target, i.e. the cover was greater than 40% indicating a lack of grazing. At present, overall the habitat is functioning well. Therefore a conservation rating of *favourable* is given for structure and functions of the dune slack. The NATURA 2000 survey gives a ranking of *excellent structure.*

As the dune slack habitat is mostly ungrazed its future prospects are rated as *unfavourable-inadequate.* The lack of grazing at the site means the habitat will become overgrown and decline in condition. The NATURA 2000 report ranks the dune slacks as having excellent prospects for the cSAC. The MPSU management plan states that all non-priority habitats should be ecologically enhanced. Therefore no further development of the car park should be allowed and dumping, sand extraction and lack of grazing at the site should be addressed.

An overall EU conservation assessment of *unfavourable-inadequate* is assigned to the dune slack habitat. The overall Irish rating is *unfavourable-unchanged*.

Mobile Dunes (H2120)

The extent of the mobile dunes at the site is considered to be *unfavourable-inadequate*. Erosion has occurred near the main access point to the beach compounded by trampling and overuse. The NATURA 2000 report gives an assessment of *good representativity* for the mobile dunes in this cSAC.

The conservation assessment for structure and functions is rated as *unfavourable-inadequate*. A total of four monitoring stops were placed in the habitat and three passed and one failed. This accounts for 25% of the habitat that is in decline. The stops failed because there was a high cover of dead or dying *A. arenaria* and some areas were heavily trampled with no flowering or fruiting. There is also rock armour at the southeastern end of the beach, which will prevent the build up of the habitat here. The NATURA 2000 report gives an assessment of as *structure well conserved* for the mobile dunes in this cSAC. According to the MPSU management horse riding within a cSAC is a notifiable action and therefore this should be investigated as to why this activity is still being allowed in the area, as it is causing damage to the foredunes and fixed dunes.

The high recreational pressure at this site (it was a blue flag, although it lost this in 2006) means there is little chance for recovery of the mobile dunes. There is a tendency for people to sit amongst the mobile dunes and horse riding occurs at the site. Therefore the future prospects of the habitat are rated as *unfavourable-inadequate.* The NATURA 2000 report gives an assessment of *good prospects* for the mobile dunes in this cSAC.

The overall EU assessment is rated as *unfavourable-inadequate* as a result of *unfavourable-inadequate* extent, structure and functions and future prospects of the habitat. The overall Irish assessment is *unfavourable-declining.*

Embryonic dunes (H2110)

Embryonic dunes are patchy in distribution at this site and they may be prevented from developing as a result of trampling and perhaps by past cleaning of the beach. Therefore the extent of the habitat is rated as *unfavourable-inadequate* for the habitat

as a whole. The NATURA 2000 report gives an assessment as *good representativity* for the embryonic dunes in the cSAC.

A total of four monitoring stops were placed in the habitat. All four stops passed and therefore the structure and functions is rated as *favourable.* Healthy *Elytrigia juncea* (Sand couch) was present with plenty of flowering and fruiting and no negative indicators were recorded. The NATURA 2000 report assesses the embryonic dunes as *structure well conserved* for the cSAC.

The future prospects for the embryonic dunes at this site are mainly good, as there seems to be windblown sand entering the system. However there is the threat of trampling by visitors and horses therefore the future prospects for the habitat are rated as *unfavourable-inadequate* at present. The NATURA 2000 report gives an assessment of *good prospects* within the cSAC.

The overall EU conservation assessment is rated as *unfavourable-inadequate,* while the Irish conservation assessment is *unfavourable-unchanged*.

Dunfanaghy Bay

Fixed Dunes (H2130)

The extent of the fixed dunes is rated as *favourable* as there is nothing to indicate that there has been any decline in area.

The structure and functions parameter is rated as *unfavourable-inadequate.* A total of four monitoring stops were placed in the fixed dunes and all passed their targets, however two stops failed the sward height criteria and so the area is overgrazed in places. There are high numbers of rabbits, and burrowing is having an affect on the structure of the habitat. Furthermore 70% of the habitat is covered in *Pteridium aquilinum* (Bracken) and there are large areas dominated by agricultural weeds. This also affects the structure of the dunes (Table 163D).

The future prospects of the fixed dune at Dunfanaghy Bay are rated as *unfavourable-inadequate* as the area seems to have been abandoned. There are no large grazers and

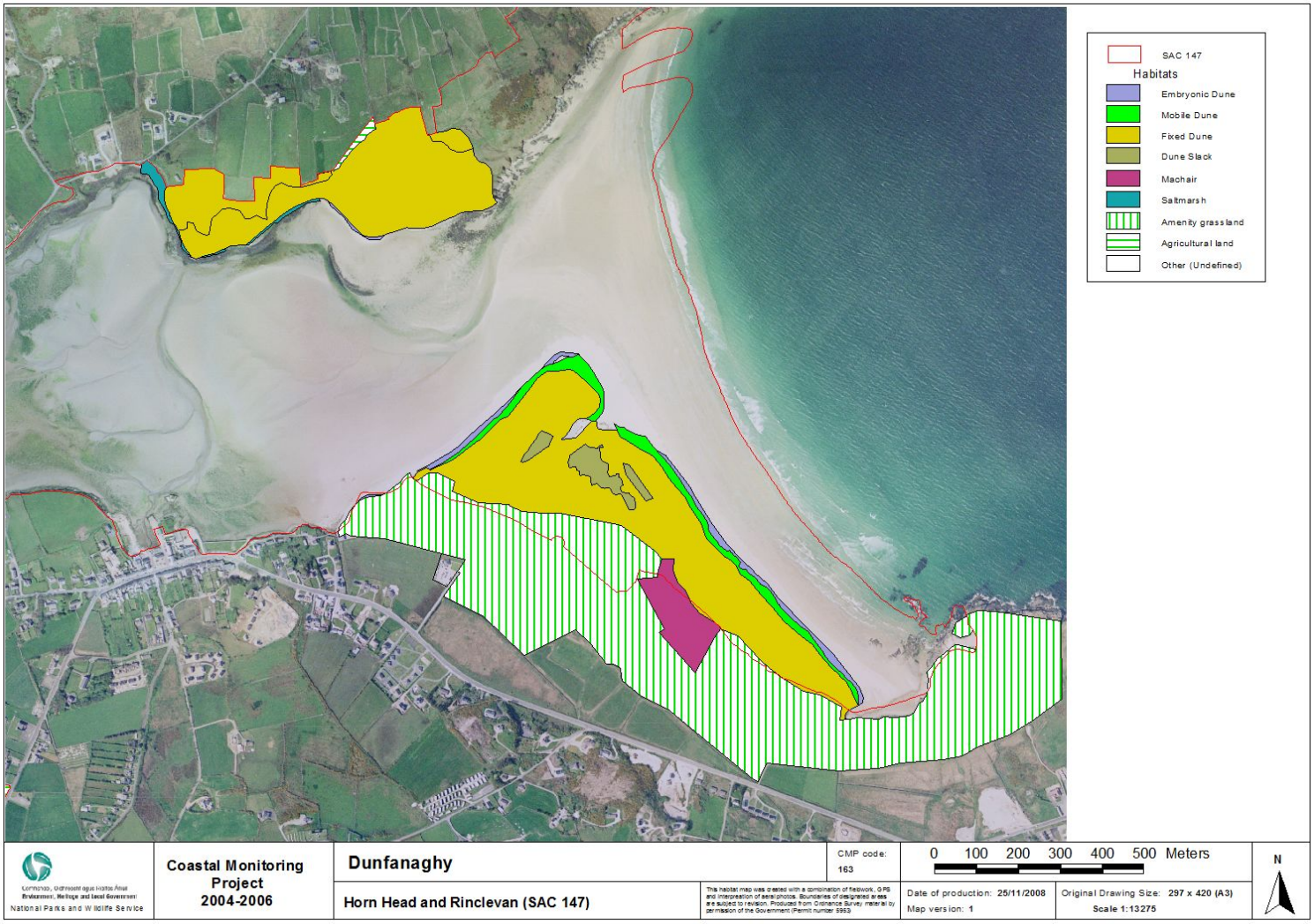
rabbits overgraze the habitat. The burrows are undermining the structure of the dunes and the bracken is spreading.

An overall EU conservation status of *unfavourable-inadequate* is assigned to the fixed dune (Table 163C). This is attributable to the *unfavourable-inadequate* structure and functions and future prospects of the habitat at this site.

The overall Irish conservation status is *unfavourable-declining*.

Embryonic dunes (H2110)

There is currently no conservation assessment for the embryonic dunes on the other side of the bay, as the habitat was deemed too small to place a monitoring stop.


SAC 147
Habitats
Embryonic Dune
Mobile Dune
Fixed Dune
Dune Slack
Machair
Saltmarsh
Amenity grassland
Agricultural land
Other (Undefined)
Coastal Monitoring Project 2004-2006
Dunfanaghy
Horn Head and Rinclevan (SAC 147)
CMP code: 163
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
0 100 200 300 400 500 Meters
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:13275
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National Parks and Wildlife Service

Appendix III – Rinclevan site report and habitat maps from the Sand Dunes Monitoring Project (Delaney *et al*., 2013)

SITE 162 RINCLEVAN

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

Rinclevan is a large site located approximately 1.5 km west of Dunfanaghy, north Donegal, at the base of Horn Head. The majority of the site lies between the headlands Dooros Point in the south and Marfagh in the north. An additional area of ***21A0 Machairs** habitat is found to the north of this, between Pollaguill and Cloghernagh. Two beaches are found adjacent to the site - Tramore Strand adjacent to the larger section of the site, and a small beach at Pollaguill Bay where the smaller section is situated. A large lake, New Lake, forms a boundary with the south-eastern edge of the site. New Lake was formed in the 1920s when sand cut off the entrance to the inlet near Dunfanaghy (Ryle *et al.,* 2009). The site forms part of the Horn Head and Rinclevan SAC (SAC 000147). Five Annex I sand dune habitats (* indicates a priority habitat) were recorded during the CMP: **2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willow, 2190 Humid dune slacks** and ***21A0 Machairs** (Ryle *et al.,* 2009). Another Annex I habitat associated with the sand dunes at Rinclevan, which was not recorded during the CMP, is **2110 Embryonic shifting dunes**. The presence of *Thalictrum minus* (Lesser Meadow-rue) is notable because of its rarity in Donegal, and *Thalictrum minus* was recorded again during the SDM. The rare bryophytes *Thuidium abietinum, Bryum marratii* and *Distichum inclinatum,* have previously been recorded within the ***2130 Fixed dunes (grey dunes)** at the site (NPWS, 2003). The Annex II liverwort species *Petalophyllum ralfsii* (Petalwort) has also been recorded as present but was not found during the CMP or SDM. The Annex I bird species, Chough (*Pyrrhocorax pyrrhocorax*) was noted in both the CMP and SDM. Although the site is found in a very scenic area, the main land use for much of the site is for agriculture (grazing). The northern part of the main dune system, at Corgannive Glebe is owned by NPWS. There are some tracks and paths, but the site is not intensively used for recreation.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Rinclevan was surveyed from the 26th to 29th of July 2011. Of the five Annex I habitats recorded on the site during the baseline survey, all were recorded again in 2011. The habitats found at Rinclevan in 2011 and the results of the conservation assessments are presented in Table 1. **2120 Marram dunes (white dunes)** and **2190 Humid dune slacks** had Favourable conservation assessments, while ***2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willow** and ***21A0 Machairs** had Unfavourable-Inadequate conservation assessments.

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

Habitat	Area	Structure & Functions	Future Prospects	Overall result
2120 Marram dunes (white dunes)	Favourable (Stable)	Favourable (Stable)	Favourable (Improving)	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 (Deteriorating)	Unfavourable-Inadequate (Deteriorating)	Unfavourable-Inadequate (Deteriorating)
2190 Humid dune slacks	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)	Favourable (Stable)
*21A0 Machairs	Favourable (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)	Unfavourable-Inadequate (Stable)

2.1.1 Area

The area of each Annex I sand dune habitat at Rinclevan according to the baseline maps, the revised baseline maps and the Sand Dunes Monitoring Project are presented in Table 2. When the site was visited in 2011, several of the baseline areas were altered because of the more detailed approach to mapping and changes in the interpretation of habitats during the SDM. There was a considerable reduction in the area of ***2130 Fixed dunes (grey dunes)** as parts of the site composed of coastal grassland, cliff, wet grassland associated with the New Lake and dry, neutral grassland were excluded. The boundaries of **2170 Dunes with creeping willow** were altered to reflect the distribution of *Salix repens* and several **2190 Humid dune slacks** were added to the baseline map. In the northern part of the site, the ***21A0 Machairs** habitat was extended. Part of the newly mapped ***21A0 Machairs** (4.98 ha) habitat was located within a field system, and this was viewed from the field boundaries. There was a very slight reduction in the area of Annex I sand dune habitats from 375.47 ha during the baseline survey to 375.07 ha during the SDM, and this was due to natural erosion.

Table 2. Areas of Annex I dune habitats originally mapped at Rincleven 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)

2120 Marram dunes (white dunes)	5.75	5.74	4.08
*2130 Fixed dunes (grey dunes)	298.56	276.77	277.96
2170 Dunes with creeping willow	14.71	9.04	9.04
2190 Humid dune slacks	38.23	42.57	42.57
*21A0 Machairs	30.43	41.35	41.42
Total	387.68	375.47	375.07

2.1.2 Structure and Functions

Structure and Functions were assessed for all five Annex I sand dune habitats at Rinclevan. Table 3 shows how many monitoring stops were placed in each habitat, number of criteria assessed and how many of the criteria failed the assessment. All of the criteria passed for **2120 Marram dunes (white dunes)** and **2190 Humid dune slacks**, therefore resulting in a Favourable status for Structure and Functions. One criterion failed for each of ***2130 Fixed dunes (grey dunes)**, **2170 Dunes with creeping willow** and ***21A0 Machairs**, resulting in Unfavourable-Inadequate Structure and Functions.

Table 3. Annex I sand dune habitats at Rinclevan 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
2120 Marram dunes (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	16	11	1
2170 Dunes with creeping willow	8	10	1
2190 Humid dune slacks	8	11	0
*21A0 Machairs	8	10	1

2.1.3 Future Prospects

Impacts and activities recorded at Rinclevan are presented in Table 4. Impact codes are assigned according to Ssymank (2010). The majority of the impacts recorded are related to agriculture, the main land-use for the site. **2120 Marram dunes (white dunes)** and **2190 Humid dune slacks** had no negative impacts recorded during the SDM. Damage due to grazers, particularly sheep and rabbits, were recorded as negative impacts for ***2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willow** and ***21A0 Machairs. *2130 Fixed dunes (grey dunes)** had the highest number of negative impacts recorded for any of the Annex I sand dune habitats present at Rinclevan. Non-intensive horse grazing was seen as a positive impact where it occurred on site in 2011.

Table 4. Impacts recorded in Annex I sand dune habitats at Rinclevan 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
2120	G01.02	Walking	Medium	Neutral	5	Inside
2120	K01.01	Erosion	Medium	Neutral	20	Inside
*2130	A02.01	Agricultural intensification	Medium	Negative	1	Inside
*2130	A04.01.02	Intensive sheep grazing	Medium	Negative	1	Inside
*2130	A04.02.03	Horse grazing	Low	Positive	1	Inside
*2130	A04.03	Undergrazing	Low	Neutral	20	Inside
*2130	A05.02	Stock feeding	High	Negative	1	Inside
*2130	B02	Conifer plantation	Low	Negative	1	Inside
*2130	E05	Storage of building materials	High	Negative	1	Inside
*2130	G01.02	Walking	Low	Neutral	20	Inside
*2130	G05.01	Trampling	Medium	Negative	1	Inside
*2130	G05.09	Fencing	Medium	Neutral	1	Inside
*2130	H05.01	Dumping	Medium	Negative	1	Inside
*2130	I01	*Hippophae rhamnoides*	High	Negative	1	Inside
*2130	I02	Problematic native species	Low	Neutral	1	Inside
*2130	K04.05	Rabbit damage	Medium	Negative	1	Inside
2170	A04.02.01	Cattle grazing	Low	Negative	20	Inside
2170	D01.01	Paths, Tracks	Medium	Neutral	1	Inside
2170	G05.09	Fencing	Medium	Neutral	1	Inside
2190	A04.02.01	Cattle grazing	Medium	Positive	80	Inside
2190	A04.02.03	Horse grazing	Medium	Positive	20	Inside
2190	G01.02	Walking	Low	Neutral	5	Inside
2190	G05.09	Fencing	Medium	Neutral	1	Inside
*21A0	A04.02.02	Non intensive sheep grazing	Low	Negative	70	Inside
*21A0	G01.02	Walking	Low	Neutral	1	Inside
*21A0	G01.03.02	Off-road driving	Low	Negative	1	Inside
*21A0	G05	Fire (on beach)	Low	Neutral	1	Outside
*21A0	G05.09	Fencing	Medium	Neutral	1	Inside
*21A0	K04.05	Damage by herbivores (Rabbits)	Low	Negative	10	Inside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Rinclevan 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 2120 Marram dunes (white dunes)

2120 Marram dunes (white dunes) form the seaward boundary of the sand dune system at Rinclevan. At the large southern beach, Tramore Strand, a trend of erosion in the north and

deposition in the south was detected. The **2120 Marram dunes (white dunes)** are very steep and unstable in parts, particularly at the northern section of Tramore Strand.

Area

The area of **2120 Marram dunes (white dunes)** has decreased from 5.74 ha during the baseline survey to 4.08 ha during the SDM. The reduction in area was due to natural erosion and cannot be ascribed to any human interference. Area was assessed as Favourable during the CMP. During the SDM, Area was assessed as Favourable (stable).

Structure and Functions

All of the criteria passed in the Structure and Functions assessment. Damage was recorded at two monitoring stops, but when the site photographs and satellite images (Google, 2012) were consulted, damage did not appear to be widespread and this criterion passed on expert judgement. During the CMP, Structure and Functions were assessed as Unfavourable-Bad because the health of the vegetation on the upper slopes of the **2120 Marram dunes (white dunes)** was poor. The presence of unhealthy material was ascribed to a lack of mobile sediment and human activities were not implicated. There are no coastal constructions in the area which would result in reduction of sediment in the system. Under the current methodology Structure and Functions would probably have been assessed as Favourable, as the changes in the **2120 Marram dunes (white dunes)** are a response to the naturally dynamic processes affecting the coast. Structure and Functions were assessed as Favourable (stable) during the SDM.

Future Prospects

Erosion and walking were recorded as neutral impacts. There are access points to the beach, but their extent is limited and they have not affected the structural integrity of the habitat. During the CMP Future Prospects were assessed as Unfavourable-Inadequate because of the threat of recreational pressure and lack of sediment for continued dune building. The only impact listed for the habitat during the CMP was walking/horse riding. Future Prospects were assessed as Favourable (improving) during the SDM.

Conservation assessment

All of the parameters were assessed as Favourable during the SDM. If the current methodology had been applied during the CMP, Structure and Functions would have been assessed as Favourable. Area was assessed as Favourable and Future Prospects were assessed as Unfavourable-Inadequate during the CMP. The conservation status of **2120 Marram dunes (white dunes)** was assessed as Favourable (improving) during the SDM.

*2.2.2 *2130 Fixed dunes (grey dunes)*

This site had very extensive ***2130 Fixed dunes (grey dunes)** habitat, much of which was in good condition. Plant diversity was generally high. Nineteen positive indicator species were recorded in the monitoring stops and the fewest positive indicators species in any stop was eight. Orchids were plentiful, and *Anacamptis pyramidalis*, *Gymnadenia conopsea*, *Coeloglossum viride* and *Listera ovata* were seen during the survey. *Listera ovata* was particularly associated

with the mature conifer plantation on shallow sand over mineral soil and rock just outside the site.

Area

The area of ***2130 Fixed dunes (grey dunes)** increased from 276.77 ha during the CMP to 277.96 ha during the SDM. This was due to stabilisation of **2120 Marram dunes (white dunes)**. There was no evidence of anthropogenic loss of area. During the CMP Area was assessed as Favourable. Area was assessed as Favourable (stable) during the SDM.

Structure and Functions

Only one criterion failed in the Structure and Functions assessment. There was some quite extensive damage to the habitat close the southern access point, as well as small localised damaged areas scattered through the habitat. Several factors account for the damage. A densely populated rabbit warren in the south has resulted in structural damage to the ***2130 Fixed dunes (grey dunes)**, and construction materials are stored close by. Supplementary feeding is carried out in this area and agricultural weeds such as *Senecio jacobaea* have become established. Elsewhere, trampling occasionally affects the habitat. During the CMP, Structure and Functions were assessed as Unfavourable-Inadequate because of factors associated with agricultural improvement. Structure and Functions were assessed as Unfavourable-Inadequate (stable) during the SDM.

Future Prospects

Negative impacts recorded at Rinclevan included agricultural improvement, stock feeding, trampling, storage of building materials, dumping and rabbit damage. Most of the negative impacts were focussed in the south of the site, but the conifers and *Hippophae rhamnoides* were located in the northern part of the site which is managed by NPWS. Undergrazing was recorded for part of the habitat, but this added to the structural diversity and had not yet resulted in scrub encroachment. Part of the habitat close to the access point at Hornhead Bridge was managed as intensive sheep pasture and ruderal species were found here. During the CMP, Future Prospects were assessed as Unfavourable-Inadequate because of overgrazing, rabbit damage, dumping of inert materials and damage from recreational activities. Other impacts listed for the site included the conifer plantation, stock feeding, camping and caravans, driving on the dunes, pollution (using clay to block rabbit holes) and invasion by a species. Future Prospects were assessed as Unfavourable-Inadequate (stable) during the SDM.

Conservation assessment

Area was assessed as Favourable while Structure and Functions and Future Prospects were assessed as Unfavourable-Inadequate. There had been no change in the status of any of the parameters since the baseline survey. The conservation status of ***2130 Fixed dunes (grey dunes)** was assessed as Unfavourable-Inadequate (stable) during the SDM.

2.2.3 2170 Dunes with creeping willow

2170 Dunes with creeping willow are associated with a large dune slack at Rinclevan. The **2170 Dunes with creeping willow** are located on a flat area with some hummocks, which may well have been composed of **2190 Humid dune slacks** in the past, but are now slightly raised above the main dune slack area. There is a mixture of species typical of dry conditions such as *Galium verum* and *Pilosella officinarum* with species more tolerant of wet condition such as *Carex panicea*.

Area

There was no change in the area of **2170 Dunes with creeping willow** which remained the same at 9.04 ha. There was no indication of anthropogenic loss to the habitat. During the CMP, Area was assessed as Favourable. Area was assessed as Favourable (stable) during the SDM.

Structure and Functions

Only one criterion failed in the Structure and Functions assessment. The negative indicator *Senecio jacobaea* was found in six of the eight monitoring stops, although it was never present in abundance. During the CMP, Structure and Functions were assessed as Favourable, and no mention was made of frequent *Senecio jacobaea* in the habitat description. Future Prospects were assessed as Unfavourable-Inadequate (deteriorating) during the SDM.

Future Prospects

Cattle grazing was recorded as a negative impact and unpaved tracks and fencing were recorded as neutral impacts in the **2170 Dunes with creeping willow**. Cattle grazing is generally an appropriate management for the habitat, but it is likely to be responsible for the distribution of *Senecio jacobaea.* Unpaved tracks are generally negative, but here, the traffic appears to be very light. During the CMP, Future Prospects were assessed as Favourable and no impacts were recorded. Future Prospects were recorded as Unfavourable-Inadequate (deteriorating) during the SDM.

Conservation assessment

Two of the parameters were assessed as Unfavourable-Inadequate and one as Favourable. During the CMP, all of the parameters were assessed as Favourable. The conservation status of **2170 Dunes with creeping willow** was assessed as Unfavourable-Inadequate (deteriorating) during the SDM.

2.2.4 2190 Humid dune slacks

This site contains the greatest area of **2190 Humid dune slacks** recorded at any individual site during the CMP and SDM. There are several small dune slacks located between New Lake and Tramore beach at Rinclevan. Seven of the eight monitoring stops were recorded in a single slack which is 36.10 ha in size, and this is almost certainly the largest single area of **2190 Humid dune slacks** habitat within the Irish State. In addition to positive indicator species for this habitat, *Filipendula ulmaria*, *Parnassia palustris* and *Carex panicea* were recorded.

Area

There was no change in the area of **2190 Humid dune slacks** which remained at 42.57 ha. There was no indication of anthropogenic loss to the habitat. Area was assessed as Favourable during the CMP. During the SDM, Area was assessed as Favourable (stable).

Structure and Functions

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

Future Prospects

No negative impacts were recorded for **2190 Humid dune slacks.** The habitat is managed as horse and cattle pasture and grazing represents a positive impact as it has maintained the habitat in good condition. There are fences to control movement of stock and a track used by walkers, but it has not resulted in erosion of the vegetation. Fencing and tracks were recorded as neutral impacts. During the CMP, Future Prospects were recorded as Favourable, although overgrazing by rabbits was recorded as a negative impact. Future prospects were recorded as Favourable (stable) during the SDM.

Conservation assessment

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

*2.2.5 *21A0 Machairs*

During the CMP, an area of ***21A0 Machairs** was found close to the main dune system in the Pollaguill townland. It had not previously been identified, and this may have been due to its remote location and poor accessibility. The habitat is composed of two distinct ***21A0 Machairs** types. Close to the **2120 Marram dunes (white dunes)** ridge, higher dunes grade into small, dry hillocks of sand over the ***21A0 Machairs** plain. Inland of this part of the habitat, a flatter sandy plain slopes gently upwards towards the hills.

Area

The area of ***21A0 Machairs** increased from 41.35 ha during the CMP to 41.42 ha during the SDM due to succession from **2120 Marram dunes (white dunes)**. There was no indication of habitat loss due to human activities. During the CMP, Area was assessed as Favourable. Area was assessed as Favourable (stable) during the SDM.

Structure and Functions

One of the criteria failed in the Structure and Functions assessment, and this assessed sward height. The habitat was uniformly grazed and the average sward height was 5 cm. A short sward is the first sign of overgrazing and this can lead to problems with negative indicator species and erosion due to human activities and storm events. During the CMP, Structure and Functions were assessed as Unfavourable-Inadequate due to the presence of negative

indicator species. Although the sward height was considered acceptable, the target range for sward height during the CMP was 2-10cm. It is not possible to detect whether there has been a general deterioration of the grazing level or whether the stops were consistently in the lower part of the acceptable range during the CMP. Although negative species were recorded during the SDM, they were not excessively frequent and had a very low cover. Structure and Functions were assessed as Unfavourable-Inadequate (stable) during the SDM.

Future Prospects

Sheep grazing and damage by rabbits were recorded as negative impacts in the ***21A0 Machairs**. Although the habitat benefits from grazing, the intensity of grazing is slightly higher than optimal. Rabbit warrens are not necessarily a negative impact, but here they combine with the overgrazing by sheep to cause some structural damage. During the CMP, Future Prospects were assessed as Unfavourable-Inadequate because of the grazing regime and rabbit damage. Future Prospects were assessed as Unfavourable-Inadequate (stable) during the SDM.

Conservation assessment

Area was assessed as Favourable, while Structure and Functions and Future Prospects were assessed as Unfavourable-Inadequate. There was no change in the status of any of the parameters since the baseline survey. The conservation status of ***21A0 Machairs** was assessed as Unfavourable-Inadequate (stable) during the SDM.

3 Discussion

3.1 Significance of the site

Rinclevan is a site of national conservation importance, particularly for ***2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willows** and **2190 Humid dune slacks.** The site contains the fifth largest areas of ***2130 Fixed dunes (grey dunes)** and **2170 Dunes with creeping willows** and the largest area of **2190 Humid dune slacks** recorded during the CMP. Water abstraction appears to be minimal, with no caravan facilities, golf courses or holiday homes associated with the dune system. Pressures associated with recreation are lower than could be expected for a site with a large sandy beach. The transitions to maritime cliff-top grassland, wet grassland, heath, marsh and a lake are largely intact. New Lake appears to be infilling, which may result in the development of machair-type grassland in the long term. The vast majority of the site is managed non-intensively, with no evidence of fertiliser or reseeding. The entire system is located within the SAC, and a large portion of the site is publicly-owned. This is one of the most well-preserved examples of sand dune habitats visited during the SDM in 2011.

3.2 Disturbance

The main area of disturbance at Rincleven is in the ***2130 Fixed dunes (grey dunes)** in the south of the site, where extensive rabbit burrows, stock feeding, dumping and storage of construction materials has resulted in damage to the structure of the habitat. Most of the

habitat is in good condition, and addressing the damage in this area would result in a Favourable Structure and Functions assessment for the habitat.

3.3 Non-native species

There is a small, mature conifer plantation in the northern part of the ***2130 Fixed dunes (grey dunes)**, as well as a dense stand of *Hippophae rhamnoides*. The conifers do not appear to be spreading, and currently they are not considered to represent a serious threat to the conservation value of the habitat. Of greater concern is the presence of *Hippophae rhamnoides.* This is a highly invasive species on sand dunes in Ireland, decreasing plant species diversity and excluding rare species (Binggeli *et al*., 1992). While the presence of native scrub and woodland may add to the conservation interest of sand dune sites, non-native species are not considered to be beneficial.

3.4 Agriculture

For the most part, the current management practices of extensive cattle and horse grazing are helping to maintain the sand dune habitats in good condition at Rinclevan. However, the ***21A0 Machairs** habitat in the northern part of the site is tightly grazed by sheep. The recommended management for ***21A0 Machairs** in Ireland is winter grazing by cattle. This type of management allows plants to flower and set seed, but prevents the habitat from becoming rank (Cooper *et al*., 2005). Sheep grazing during the summer months tends to result in a tightly grazed sward which will become less diverse over time if herbaceous species fail to set seed. *Senecio jacobaea*, a negative species associated with agriculture, is frequent in the **2170 Dunes with creeping willows**. The spread of this species is promoted by disturbance and it may indicate past disturbance of the substrate by grazing animals. Cattle find the plant unpalatable, but sheep will graze young rosettes (Wardle, 1987). If the habitat remains undisturbed for several years, the species is likely to decrease in frequency.

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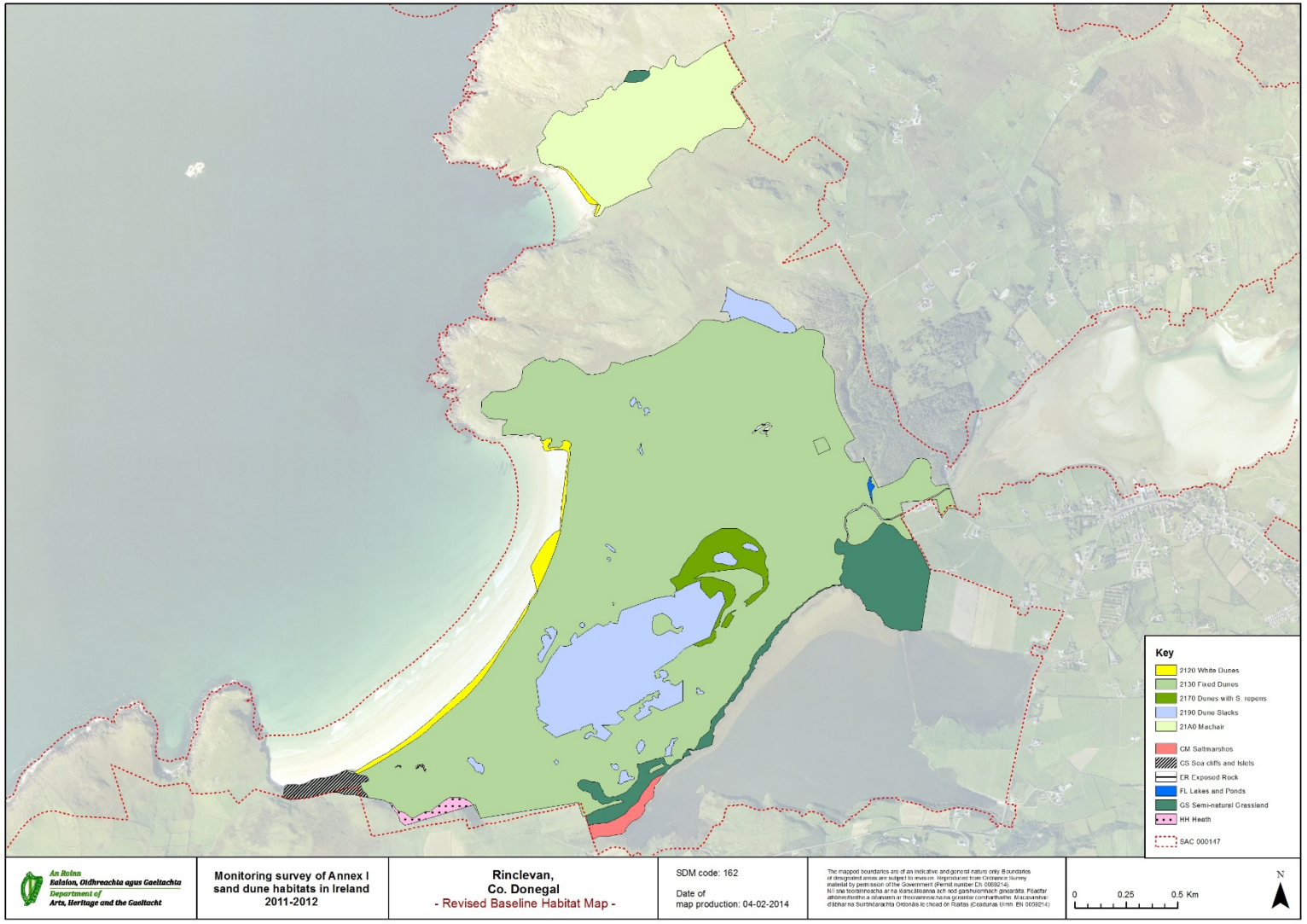
Key
2120 White Dunes
2130 Fixed Dunes
2170 Dunes with S. repens
2190 Dune Slacks
21A0 Machair
CM Saltmarshes
CS Sea cliffs and Islets
ER Exposed Rock
FL Lakes and Ponds
GS Semi-natural Grassland
HH Heath
SAC 000147
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
Rinclevan, Co. Donegal
- Revised Baseline Habitat Map -
SDM code: 162
Date of map production: 04-02-2014
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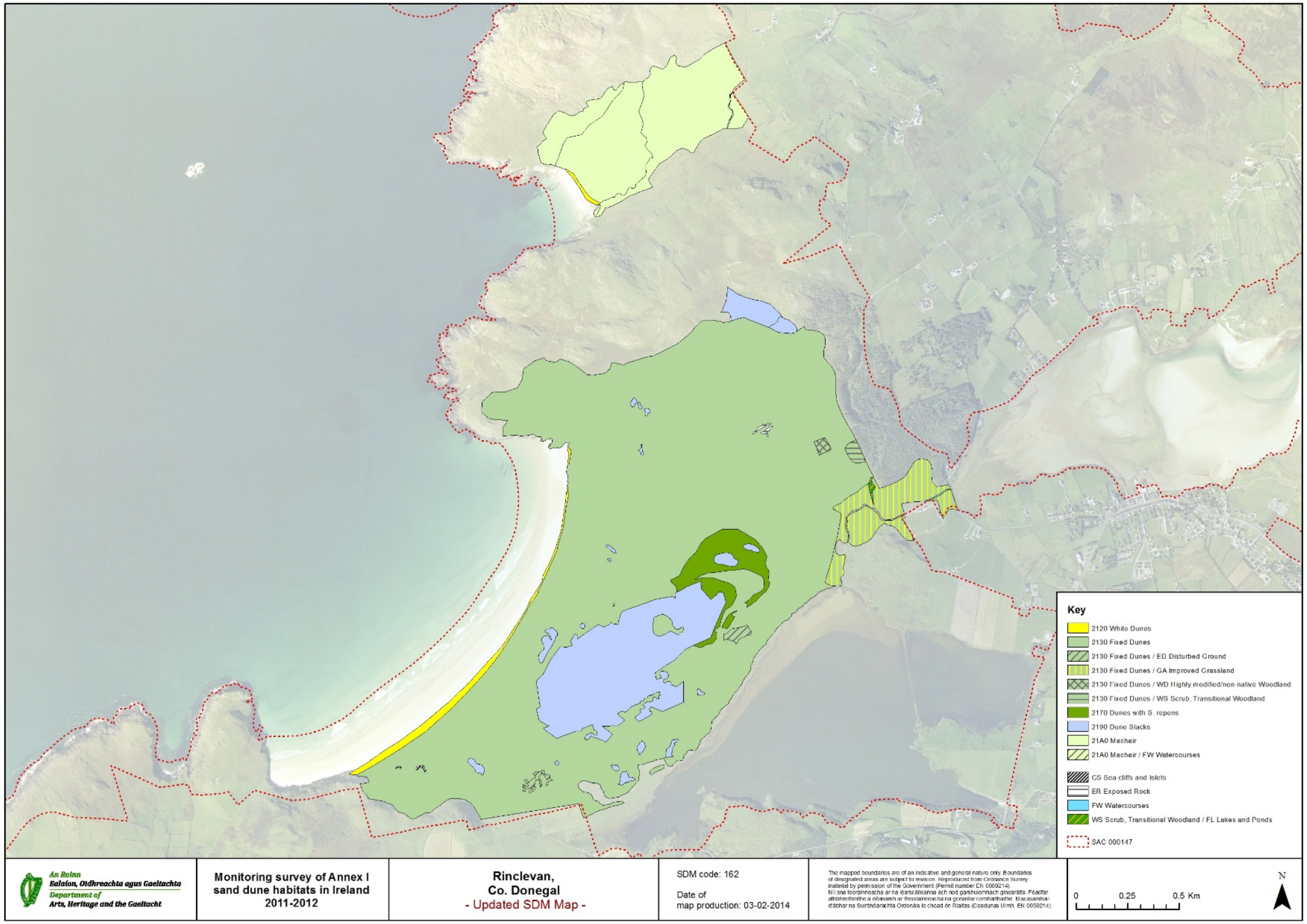
Key
2120 White Dunes
2130 Fixed Dunes
2130 Fixed Dunes / ED Disturbed Ground
2130 Fixed Dunes / GA Improved Grassland
2130 Fixed Dunes / WD Highly modified/non-native Woodland
2130 Fixed Dunes / WS Scrub, Transitional Woodland
2170 Dunes with S. repens
2190 Dune Slacks
21A0 Machair
21A0 Machair / FW Watercourses
CS Sea cliffs and Islets
ER Exposed Rock
FW Watercourses
WS Scrub, Transitional Woodland / FL Lakes and Ponds
SAC 000147
An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
Rinclevan, Co. Donegal
- Updated SDM Map -
SDM code: 162
Date of map production: 03-02-2014
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