Tranarossan and Melmore Lough SAC
(site code 194)
Conservation objectives supporting document -coastal habitats

NPWS

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

Please note that this document should be read in conjunction with the following report: NPWS (2015). Conservation Objectives: Tranarossan and Melmore Lough SAC 000194. 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.

Tranarossan and Melmore Lough SAC is located in County Donegal and encompasses the west coast of the Rosguill Peninsula from Gladdaghlahan Bay up to Tranarossan Bay, and the whole of the peninsula north of this point (including Rosses Strand and Gortnalughoge Bay). The site rises from sea level to 163m. Geomorphologically, the site is dominated by calcareous soils overlying acid intrusive bedrock. The main habitats are machair, sand dunes, shingle beach, rocky and sandy coast, heathland and wetland areas.

Machair, a priority habitat on Annex I of the EU Habitats Directive, occurs as extensive, flat to gently undulating plains at both Tranarossan and Melmore. At Melmore, dry grassland vegetation is the dominat vegetation while at Tranarossan, dry grassland is also present, however large areas of the machair plain here comprised extensive wet flats.

Melmore Lough is a good example of a hard water lake. It lies in a highly exposed location at the top of the Rosguill Peninsula, between a flat machair plain and a steep hill of granite.

Of particular importance at this site is the occurrence of decalcified fixed dunes with *Empetrum nigrum*, a rare habitat in Ireland and another priority habitat on Annex I of the EU Habitats Directive. This habitat occurs on calcareous sands amongst the rocky knolls.

Vegetated shingle or stony banks have a restricted distribution within the site, being largely confined to small, enclosed bays, which face in a northerly or westerly direction. The development of the habitat is generally good with the most extensive areas of habitat to be found at Rosses strand and Doagh Bay

Tranarossan and Melmore Lough SAC (site code: 194) is designated for a range of coastal habitats including vegetated shingle, sand dunes and cliffs. The following nine coastal habitats are included in the list of qualifying interests for the site:

- Perennial vegetation of stony banks (1220)
- Annual vegetation of driftlines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)

- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)
- Decalcified fixed dunes with *Empetrum nigrum* (2140)
- Dunes with *Salix repens ssp. argentea* (*Salix arenariae*) (2170)
- Machair (21A0)
- Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)

The first habitat represents vegetated shingle, the next seven are associated with sand dune systems, and the last sea cliff. All nine of these habitats are usually found in close association with each other. The location of the surveyed shingle site and the sand dune habitats are presented in Appendix I and sea cliffs in Appendix II.

This backing document sets out the conservation objectives for the nine coastal habitats listed above in Tranarossan and Melmore Lough 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 **shingle** are based in part on the findings of the National Shingle Beach Survey (NSBS), which was carried out in 1999 on behalf of the National Parks and Wildlife Service (NPWS) (Moore & Wilson, 1999). The distribution of the known shingle site in Tranarossan and Melmore Lough SAC is presented in Appendix I.

The NSBS visited the following 1 sub-sites within Tranarossan and Melmore Lough SAC:

1. Rossguill Peninsula

During the NSBS, profiles and transects were recorded from each shingle beach and each site was assigned a crude High/Medium/Low interest ranking. A ‘high interest’ ranking denotes a site that is of high conservation value. The site may be of interest botanically or geomorphologically. A ‘medium interest’ ranking implies the site may be extensive but not of particular interest either botanically or geomorphologically. A ‘low interest’ ranking is reserved for small sites, highly damaged sites or sites that are of a very common classification. The vegetated shingle at Rossguill Peninsula is rated of high interest owing to the presence of a population of oysterplant (*Mertensia maritima*) (Moore & Wilson, 1999).

The habitat was not mapped at any of the sub-sites, but the vegetation was recorded, as were the human impacts and alterations at the site, which are useful tools for assessing the Structure and Functions of the site.

Rossguill Peninsula consists of a series of deposits between Melmore Head and Rinnafaghla Point. The shingle at this site is classified as a vegetated fringe-type (Moore & Wilson 1999).

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 Tranarossan and Melmore Lough 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 Tranarossan and Melmore Lough SAC. The sub-sites are:

1. Melmore
2. Tranarossan

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for all sub-sites and those compiled for Melmore are included in Appendix III.

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 Tranarossan) 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 Tranarossan are included in Appendix IV.

Tranarossan sand dunes and machair are on the north-facing Rosguill Peninsula in north Donegal. Within the site, there are both east- and west- facing sandy beaches on opposite sides of a broad sand plain that stretches across the peninsula. Machair covers much of this low-lying plain, while low sand hills with fixed dune vegetation lie at the seaward side of the machair at both sides of the flat plain: at Tranarossan Bay (Rosses Strand) in the west side of the site and Gortnalughoge Bay in the east. The flat machair plain between the two bays bears the legend ‘Dundooan Lower’ on the 6” map.

At Melmore, the sand dune habitats occur around the eastern flank of the rocky massif that separates the site from Tranarossan. An Annex II liverwort, *Petallophylum ralfsii*, was recorded at the northern end of the site on the rocky promontory of Melmore Head (Holyoak, 2002). This rare liverwort is also known from flushed on rocky hillside to the north of Rosses Strand (Ryle *et al*., 2009).

The conservation objectives for the sand dune habitats (including machair) in Tranarossan and Melmore Lough 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 Tranarossan and Melmore Lough 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 these objectives will help to ensure that the habitat or species achieves favourable conservation status at a national level.

3 Perennial vegetation of stony banks

Perennial vegetation of stony banks is vegetation that is found at or above the mean high water spring tide mark on shingle beaches (i.e., beaches composed of cobbles and pebbles). It is dominated by perennial species (i.e. plants that continue to grow from year to year). The first species to colonise are annuals or short-lived perennials that are tolerant of periodic displacement or overtopping by high tides and storms. Level, or gently-sloping, high-level mobile beaches, with limited human disturbance, support the best examples of this vegetation. More permanent ridges are formed by storm waves. Several of these storm beaches may be piled against each other to form extensive structures.

3.1 Overall Objective

The overall objective for ‘perennial vegetation of stony banks’ in Tranarossan and Melmore Lough SAC is to ‘maintain the favourable conservation condition’. This objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings (a) Range, (b) Area 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. The target for favourable condition is *'no decrease in extent from the established baseline'*. Bearing in mind that coastal systems are naturally dynamic and subject to change even within a season, this target is assessed subject to natural processes, including erosion and succession.

The exact current extent of this habitat in Tranarossan and Melmore Lough SAC is unknown. The National Shingle Beach Survey recorded vegetated shingle but did not map the extent from one sub-site (Moore & Wilson, 1999):

1. Rossguill Peninsula

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

3.3 Range

3.3.1 Habitat distribution

Donegal contains huge areas of shingle beaches and as a county it is noted for its raised beaches (Moore & Wilson, 1999).

The Rossguill Peninsula consists of a series of small deposits between Melmore Head and Rinnafaghla Point. Altweary Bay contained a shingle deposit which was unvegetated. The NSBS noted that Tranarossan Bay was primarily a sandy beach with a ridge of small cobbles, head-sized scattered boulders and pebbles thrown up on the sand. At Pollnabartan, the small bay southwest of Tranarossan there is a steeply piled, unvegetated cobble ridge. A stream drains through the south west region of the beach. Pollnagurach is a small cobble beach strewn with scree from slopes above. It is surrounded by a rocky headland which affords a surprising amount of shelter. The NSBS recorded a thriving population of oyster plant (*Mertensia maritima*) at this site (Moore & Wilson, 1999).

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

3.4 Structure and Functions

A fundamental aim of shingle conservation is to facilitate natural mobility. Shingle beaches are naturally dynamic systems, making them of geomorphological interest as well as ecological interest. They are constantly changing and shingle features are rarely stable in the long term.

3.4.1 Functionality and sediment supply

The health and on-going development of this habitat relies on a continuing supply of shingle sediment. This may occur sporadically as a response to storm events rather than continuously. Interference with the natural coastal processes, through offshore extraction or coastal defence structures in particular, can interrupt the supply of sediment and lead to beach starvation.

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

3.4.2 Vegetation structure: zonation

Ecological variation in this habitat type depends on stability; the amount of fine material accumulating between the pebbles; climatic conditions; width of the foreshore and past management of the site. The ridges and lows also influence the vegetation patterns, resulting in characteristic zonations of vegetated and bare shingle. In the frontal less stable areas of shingle, the vegetation tends to be dominated by annuals and short-lived salt-tolerant perennials. Where the shingle is more stable the vegetation becomes more perennial in nature and may include grassland, heathland and scrub, depending on the exact nature of the site. The presence of lichens indicates long term stability of the shingle structure. At the Rossguill Peninsula site, transitions to machair and cliff occur. Lichens were not recorded by the NSBS (Moore & Wilson, 1999).

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

3.4.3 Vegetation composition: typical species & sub-communities

The degree of exposure, as well as the coarseness and stability of the substrate determines species diversity. The shingle habitat in Tranarossan and Melmore Lough SAC is known to support a typical flora for this habitat type.

At Rossguill Peninsula, species recorded by the NSBS include the following, *Ammophila arenaria* and *Mertensia maritima,* Lichens were not present (Moore & Wilson, 1999).

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

3.4.4 Vegetation composition: negative indicator species

Where the shingle becomes more stabilised negative indicator species can become an issue. Negative indicator species can include non-native species (e.g. *Centranthus ruber, Lupinus arboreus*); species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered to be typical of the habitat (e.g. *Pteridium aquilinum*).

No negative species were recorded by the NSBS at sub-sites within this SAC (Moore & Wilson, 1999).

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

4 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 (2150) *
- **Dunes with *Salix repens* (2170)**
- Humid dune slacks (2190)
- **Machair (21AO) ***

Five dune habitats were recorded by Ryle *et al*. (2009) but seven habitats indicated in bold above are listed as Qualifying Interests for Tranarossan and Melmore Lough SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. Humid dune slacks was also recorded at Melmore by the CMP, but this is not a qualifying interest for this SAC.

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

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

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

Fixed dunes refers to the more stabilised area of dune systems, generally located in the shelter of the mobile dune ridges, where the wind speed is reduced and the vegetation is removed from the influence of tidal inundation and salt spray. This leads to the development

of a more or less closed or ‘fixed’ carpet of vegetation dominated by a range of sand-binding species (Gaynor, 2008).

At the older landward edge of the fixed dunes, leaching of basic minerals and nutrients can lower the pH over time and create conditions suitable for colonisation by heath species. As these decalcified or acidic conditions can only form on the older, landward extremes of dune systems, they are often vulnerable to housing or other developments. Well-developed dune heath communities containing the classic dwarf ericoid shrubs, such as *Calluna vulgaris* (Heather), and *Erica* spp., that are generally regarded as characterising the habitat, are not well represented in Ireland.

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

Humid dune slacks are wet or moist depressions between dune ridges. They are characterised by the occurrence of a water table that is maintained by a combination of groundwater (which may or may not be slightly saline), precipitation and an impermeable layer in the soil. In the winter, the water table normally rises above the soil surface and inundation occurs. In spring and summer, the water table drops, but the top layer of the soil remains wet. Proximity of the water table to the surface is evidenced in the vegetation, in which rushes, sedges and moisture-loving herbs such as marsh pennywort (*Hydrocotyle vulgaris*), bog pimpernel (*Anagallis tenella*), grass of Parnassus (*Parnassia palustris*), common marsh-bedstraw (*Galium palustre*) and marsh helleborine (*Epipactis palustris*) are obvious features. The frequency and duration of flooding, as well as the level of salinity, determines the vegetation composition. In addition, nutrient-enrichment can occur as a result of leaching from the surrounding dune ridges (Gaynor, 2008).

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

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 which 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 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 Tranarossan and Melmore Lough SAC:

1. Melmore
2. Tranarossan

As part of the Coastal Monitoring Project (CMP) detailed individual reports and habitat maps were produced for all sub-sites and those compiled for Melmore are included in Appendix III. The updated site reports and habitat maps for Tranarossan from the Sand Dunes Monitoring Project (SDM) are included in Appendix IV.

The combined data from the CMP for the sub-site at Melmore, along with the data from the SDM for the sub-site at Tranarossan is presented in Appendix II. A total of 139.29ha of sand dune habitat was mapped within the Tranarossan and Melmore Lough, of which 0.05ha represents humid dune slacks, which is not listed as a qualifying interest for this particular site.

4.1 Overall objectives

The overall objective for 'Annual vegetation of driftlines' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Embryonic shifting dunes' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dune)' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Decalcified fixed dunes with *Empetrum nigrum'* in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Dunes with *Salix repens ssp argentea*' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'.

The overall objective for 'Machair' in Tranarossan and Melmore Lough SAC is to 'restore the favourable conservation condition'.

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

4.2 Area

4.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats at each sub-site in Tranarossan and Melmore Lough SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). The map for Melmore is included with the individual site report in Appendix IV. The baseline habitat map for Tranarossan 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 V. The data from the CMP and SDM has been combined to the produce the habitat map presented in Appendix II.

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

1210 Annual vegetation of driftlines

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	-
Tranarossan	SDM	-
Total		**-**

2110 Embryonic shifting dunes

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	0.010
Tranarossan	SDM	0.40
Total		**0.50**

2120 Shifting dunes along the shoreline with *Ammophila arenaria*

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	2.65
Tranarossan	SDM	1.65
Total		**4.30**

2130* Fixed coastal dunes with herbaceous vegetation

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	20.18
Tranarossan	SDM	13.40
Total		**33.58**

2140* Decalcified fixed dunes with *Empetrum nigrum*

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	-
Tranarossan	SDM	-
Total		**-**

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

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	-
Tranarossan	SDM	-
Total		**-**

21A0* Machair

Sub-site	Data source used	Total area within SAC boundary (ha)
Melmore	CMP	20.83
Tranarossan	SDM	80.04
Total		**100.87**

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

4.3 Range

4.3.1 Habitat distribution

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

Annual vegetation of driftlines, Dunes with *Salix repens ssp. argentea* (Salix arenariae) and Decalcified dunes with *Empetrum nigrum* were not recorded at either Tranarossan or Melmore sub-sites by the CMP (Ryle *et al*., 2009). These habitats were not recorded at Tranarossan by the SDM either (Delaney *et al*., 2013).

Embryonic shifting dunes were only recorded at Melmore sub-site. Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) and Fixed dunes with herbaceous vegetation (grey dunes) and Machair occur at both sub-sites (Ryle *et al*., 2009; Delaney *et al*., 2013).

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.

4.4 Structure and Functions

The location, character and dynamic behaviour of sand dunes are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. Sand dunes are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing

mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered. Maintaining the favourable conservation condition of all of the sand dune habitats in Tranarossan and Melmore Lough SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

4.4.1 Physical structure: functionality and sediment supply

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

Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Sediment supply is especially important in the embryonic dunes and mobile dunes, as well as the strandline communities where accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. The construction of physical barriers such as sea defences can interrupt longshore drift, leading to beach starvation and increased rates of erosion. Sediment circulation and erosion also has a role to play in the more stabilised dune habitats. Cycles of erosion and stabilisation are part of a naturally functioning dune system, where the creation of new bare areas allows pioneer species and vegetation communities to develop, increasing biodiversity. The construction of physical barriers can interfere with the sediment circulation by cutting the dunes off from the beach resulting in fossilisation or over-stabilisation of dunes.

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

4.4.2 Physical structure: hydrological and flooding regime

The conservation of dune slacks, 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 water, surface water or groundwater. Generally, the maintenance of a naturally functioning dune slack depends on both the amount of (a) precipitation and (b) groundwater discharge. Water abstraction interferes with the local hydrology, potentially having serious implications for the plant and animal communities of slacks. Abstraction can lower the level of the groundwater-table, causing the slacks to dry out. It can also lead to saline infiltration in slacks formed close to the front of a dune system and particularly where the underlying substrate is highly permeable (e.g. shingle).

Dune Slack though not a qualifying interest for this SAC, was recorded at Melmore sub-site by the CMP. The dune slacks at Melmore had a 30% cover of (creeping willow) *Salix repens* ssp. *argentea* were recorded by the CMP. At Tranarossan, *Salix repens* (*S.arenaria*) was noted by the CMP to form a significant element of the wet machair habitat (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.

4.4.3 Vegetation structure: zonation

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

At both sub-sites, a range of coastal habitats occur in close proximity to the dunes, details of which can be found in Appendix III and IV (Ryle *et al*., 2009; Delaney *et al.*, 2013).

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

4.4.4 Vegetation structure: bare ground

This target applies to machair, fixed dunes, dunes with *S. repens* and dune slacks. It does not apply to the other habitats present where high levels of bare sand are a natural component of the habitat. In the fixed and slack areas some degree of instability is vital. Constant cycles of erosion and stabilisation provide the necessary conditions for the establishment of pioneer species and species that favour open conditions such as petalwort (*Petalophyllum ralfsii*) and a range of invertebrates, helping to increase biodiversity.

Petalwort has been recorded at both Tranarossan and Melmore.

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.

4.4.5 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.

4.4.6 Vegetation structure: vegetation height

This attribute applies to the more fixed habitats (fixed dunes, dunes with *S. repens*, dunes with *Empetrum*, dune slacks and machair). 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 Tranarossan, although the site had been associated with intensive sheep grazing in the past (Bassett, 1983), the CMP noted that grazing levels were not as high at time of survey and overgrazing by sheep was not included among the recorded impacts at the site (Ryle *et al*., 2009). The SDM considered the management to be appropriate for the most part with only localised damage caused by animals (Delaney *et al*., 2013).

Grazing at Melmore is mostly associated with the machair sward. The area is grazed which benefits the maintenance of the short sward and relative diversity. The CMP noted at time of survey that a small area (approximately 1.1ha) had been fenced off and is showing obvious

signs of damage from excessive stocking which is exacerbated by the concentration of rabbits in the area (Ryle *et al*., 2009).

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

4.4.7 Vegetation composition: typical species & sub-communities

Species diversity and plant distribution in dunes is strongly controlled by a range of factors, including mobility of the substrate, grazing intensities, moisture gradients, nutrient gradients and human disturbance. In the younger, more mobile dunes, marram (*Ammophila arenaria*) is common, while groundsel (*Senecio vulgaris*), sea rocket (*Cakile maritima*) and dandelion (*Taraxacum* sp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (*Galium verum*), common birdsfoot trefoil (*Lotus corniculatus*), wild thyme (*Thymus praecox*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).
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*).

Tranarossan and Melmore Lough SAC supports a characteristic dune flora, details of which can be found in the site reports in Appendices IV & V. Notable elements of the site flora include petalwort (*Petalophyllum ralfsii)* which was recorded frequently in previous surveys.

Species diversity was reportedly low throughout much of the fixed dune at Tranarossan (Ryle *et al*., 2009; Delaney *et al*., 2013).

At Melmore, a number of orchids were recorded in the older parts of the fixed dunes, including pyramidal orchid (*Anacamptis pyrimidalis*), frog orchid (*Coeloglossum viride*) and marsh orchid species (*Dactylorhiza* species) (Ryle *et al*., 2009).

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

4.4.8 Vegetation composition: negative indicator species

Negative indicators include non-native species (e.g. *Hippophae rhamnoides*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered characteristic of the habitat. 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 Melmore, bracken (*Pteridium aquilinum*) occurs on maturing fixed dunes and on the landward side of the upper slopes of the eastern half of the site and covers an area of approximately 2ha. Sea buckthorn (*Hippophae rhamnoides*) has spread from the perimeters of caravan parks (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.

4.4.9 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.

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.

4.4.10 Vegetation composition: scrub/trees

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

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.

5 Vegetated sea cliffs

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

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

"A sea cliff is a steep or vertical slope located on the coast, the base of which is in either the intertidal (littoral) or subtidal (sublittoral) zone. The cliff may be composed of hard rock such as basalt, or of softer substrate such as shale or boulder clay. Hard cliffs are at least 5m high, while soft cliffs are at least 3m high. The cliff top is generally defined by a change to an obvious less steep gradient. In some cases the cliff may grade into the slopes of a hillside located close to the coast. In these cases the cliff is defined as that part of the slope which was formed by processes of coastal erosion, while the cliff top is where there is the distinct break in slope. Both the cliff and the cliff top may be subject to maritime influence in the form of salt spray and exposure to coastal winds. A cliff can ascend in steps with ledges, and the top of the cliff is taken to occur where erosion from wave action is no longer considered to have been a factor in the development of the landform. The cliff base may be marked by a change in gradient at the bottom of the cliff. Where the base is exposed it can be characterised by scree, boulders, a wave-cut platform or sand, among other substrates. During this survey where cliffs occur within the subtidal zone the base was considered to be the high water mark. A cliff is considered to have reached its end point where it is no longer over 5m high (hard cliffs) of 3m high (soft cliffs), or no longer has a steep slope. To be considered in this study, a cliff had to be a minimum of 100m in length. Sea cliffs may support a range of plant communities such as grassland, heath, scrub and bare rock communities, among others."

Sea cliffs form an important habitat within this relatively small but varied, maritime SAC site. The habitat is widely distributed throughout (forming c.70% of the coastline) with the best developed areas of habitat at Melmore Head, Rosses Point and in the south-west of the site, to the north of Claddaghlahan bay. The cliffs are composed of alternating bands of Fanad

granite and Falcarragh peltic schists and which have resulted in rather low cliffs that typically attain heights of 10 to 50m. Bird species which utilise the cliffs for nesting include fulmar (*Fulmarus glacius*), shag (*Phalacrocorax aristotelsis*), great black-backed gull (*Larus marinus*) and the Annex I species chough (*Pyrrhocorax pyrrhocorax*) and peregrine falcon (Falco peregrinus).

Both hard and soft cliffs have been noted in this SAC (Browne, 2005; Barron *et al.,* 2011). However, it is estimated that over 90% of the cliffs are of the hard type.

5.1 Overall Objective

The overall objective for 'vegetated sea cliffs of the Atlantic and Baltic coasts' in Tranarossan and Melmore Lough SAC is to 'maintain the favourable conservation condition'. The objective is based on an assessment of the recorded condition of the habitat under a range of attributes and targets. The assessment is divided into three main headings, (a) Area, (b) Range and (c) Structure and Functions.

5.2 Area

5.2.1 Habitat extent

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

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

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

There are a number of differences in the sets of figures below. Most of the differences are explained by the fact that the ISCS mapped the total sea cliff resource at the site and not all

of the sea cliff mapped is contained within the SAC boundary. In addition, the county boundary line was used to draw the line for the ISCS, while a different mapping dataset than was used to draw the SAC boundary. As a result the length of cliff inside the SAC boundary may be underestimated. The total length of cliff sections for the ISCS sites was 22.64km. However, when this dataset was clipped to the SAC boundary 20.86km was included in the boundary. However in reality this figure is likely to be higher as a result of these mapping anomalies.

Site name	**Total area/length (km) of sea cliff within SAC boundary**
Melmore	1.19
Dundooan Lower	3.32
Downies	12.14
Crocknamurleog	0.83
Gortnalughoge	3.39
Total	**20.87**

5.3 Range

5.3.1 Habitat Distribution

The distribution of sea cliffs throughout Tranarossan and Melmore Lough SAC as identified by the Irish Sea Cliff Survey is presented in Appendix II.

Sea cliffs are distributed throughout the coastline of Tranarossan and Melmore Lough SAC (Browne, 2005; Barron *et al*., 2011). Both hard and soft cliff types are present within the site, with hard cliffs being more common. Soft cliffs were identified from two sub-sites by the ISCS: Dundooan Lower and Crocknamurleog. The hard cliffs in Tranarossan and Melmore Lough SAC are unlikely to be redistributed through natural processes, unlike more dynamic coastal systems such as sand dunes and saltmarshes.

5.4 Structure and Functions

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

5.4.1 Functionality and hydrological regime

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

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

At Gortnalughoge, freshwater seep was noted by the ISCS (Barron *et al.,* 2011).

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

5.4.2 Vegetation structure: zonation

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

At sub-sites Melmore, Dundooan Lower, adjacent habitats include, sea cliffs and islets (CS), Littoral rock, (LR), Littoral sediment (LS). Internal habitats at Melmore include exposed rock (ER), semi-natural grassland (GS), Littoral rock (LR) and littoral sediment (LS). Internal habitats at Dundooan Lower include sand dune systems (CD), improved grassland (GA), Littoral rock (LR) and littoral sediment (LS).

At Downies, adjacent habitats include built land (BL) and Littoral rock (LR). Internal habitats at Downings include watercourses (FW), littoral rock (LR), littoral sediment (LS).

At Gortnalughoge, adjacent habitats include, sand dune systems (CD), improved grassland (GA), semi-natural grassland (GS), heath (HH), littoral rock (LR), littoral sediment (LS). Internal habitats include littoral rock (LR), and littoral sediment (LS).

At Crocknamurleog, adjacent habitats include built land (BL), littoral rock (LR), littoral sediment (LS). Internal habitats at this site include littoral rock (LR).

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

5.4.3 Vegetation structure: vegetation height

A varied vegetation structure is important for maintaining species diversity and is particularly important for invertebrates and birds. Grazing increases the species diversity and is particularly important for maritime grasslands and coastal heath, which are often associated with sea cliffs. The target is to maintain the structural variation in the sward height.

5.4.4 Vegetation composition: typical species & sub-communities

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

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

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

different zones associated with soft cliffs and hard cliffs by Barron *et al*. (2011), such as those found in Tranarossan and Melmore Lough SAC.

The threatened plant Scots lovage (*Ligusticum scoticum*) has been reported from sea cliffs at Melmore Head, Dualty's Isle and west of Downings Pier. The relatively unusual plant roseroot *Rhodiola rosea* has also been recorded on sea cliffs within this site.

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

Typical splash zone species on hard cliffs		
Ramalina spp	*Verrucaria maura*	*Xanthoria spp*
Typical crevice and ledge species on hard cliffs		
Anthyllis vulneraria	*Asplenium marinum*	*Armeria maritima*
Aster tripolium	*Atriplex prostrata*	*Beta vulgaris ssp. maritima*
Catapodium marinum	*Cerastium diffusum*	*Crithmum maritimum*
Festuca rubra	*Inula crithmoides*	*Lavatera arborea*
Ligusticum scoticum	*Limonium sp*	*Plantago coronopus*
Plantago maritima	*Sedum anglicum*	*Sedum rosea*
Silene uniflora	*Spergularia rupicola*	
Typical coastal heath species		
Calluna vulgaris	*Daboecia cantabrica*	*Empetrum nigrum*
Erica cinerea	*Erica tetralix*	*Scilla verna*
Ulex gallii	*Vaccinium myrtillus*	

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

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

5.4.5 Vegetation composition: negative indicator species

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

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

5.4.6 Vegetation composition: bracken and woody species

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

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

6 References

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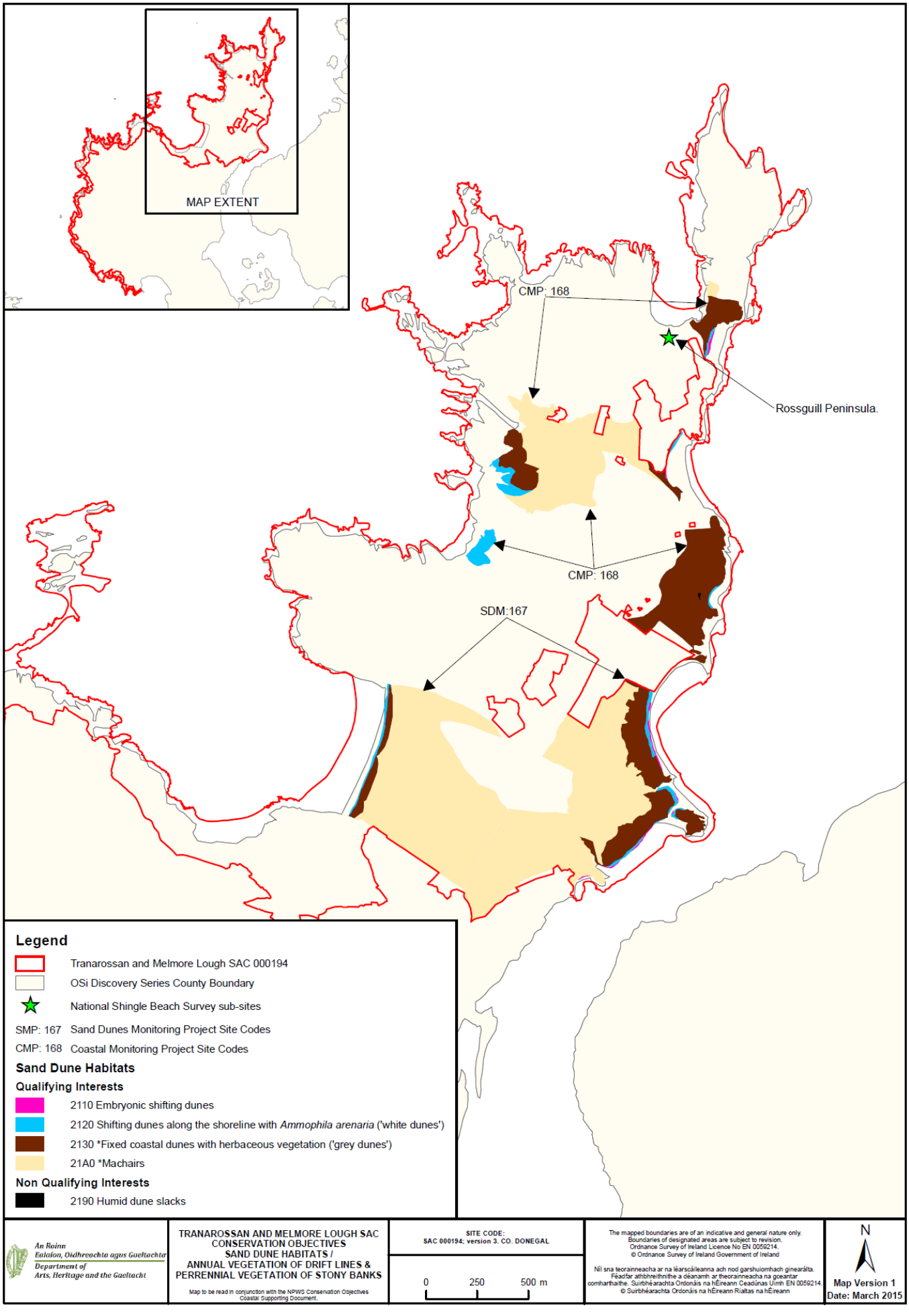
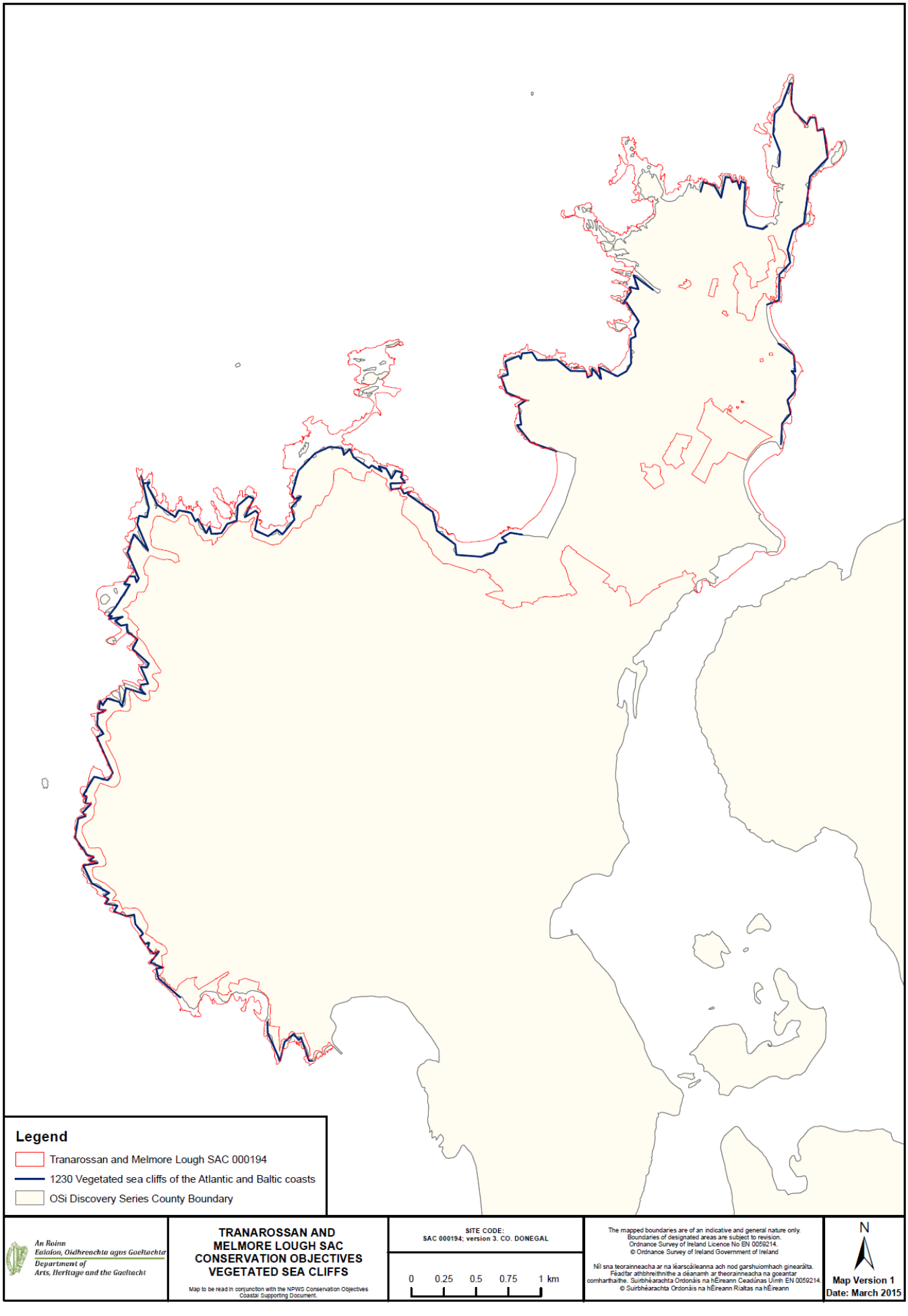
Appendix I: Distribution map of sand dune habitats within Tranarossan and Melmore Lough SAC**.**



Appendix II - Distribution map of known sea cliff sites within Tranarossan and Melmore Lough SAC



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

SITE DETAILS

CMP06 site name: **Melmore** CMP06 site code: **168** CMP Map No.: **165**

County: **Donegal** Discovery map: **2** Grid Reference: **C 130 440**

6 inch Map No.: **Dg 007 & 008**

Aerial photographs (2000 series): **O 0041-A, C**

NPWS Site Name: **Tranarossan and Melmore Lough**

NPWS designation: pNHA: **194** cSAC: **194**

Ranger Area: **Donegal**

MPSU Plan: **Short Format: 1998-2003**

Report Author: **Tim Ryle**

SITE DESCRIPTION

Melmore is located at the northern most tip of the Rosguill Peninsula in Northwest Donegal. It is one of two coastal systems, Tranarossan (CMP site 167) being the other that occur within this candidate Special area of Conservation (cSAC 194). Geomorphologically, the cSAC is characterised by rocky terrain including an impressive rocky massif (geographically separating Melmore from Tranarossan). Much of the low-lying ground is overlain with sandy calcareous soils.

Despite a recent planning enforcement by Donegal County Council to remove a number of illegal mobile home parks in the area, particularly at the contiguous coastal site Tranarossan (CMP site 167), considerable numbers of holidaymakers and tourists are still attracted to the area owing to the scenic nature of the area and the fact that it is easily accessible to many from the North of Ireland.

The cSAC is considered of scientific importance owing to the range of habitats including the priority Annex I habitats - Machair, Fixed dune and *Empetrum* dune habitats. NPWS site information (NHA survey, 1994) lists the threatened *Ligusticum scoticum* (Scot's Lovage) and the legally protected *Mertensia maritima* (Oyster Plant) as occurring respectively on rocky and shingle shores. Important bird species previously recorded include Choughs (*Pyrrhocorax pyrrhocorax*) from the cliffs and

relatively unimproved grasslands and a single Peregrine Falcon (*Falco peregrinus*) that was believed to be breeding within the site (NATURA 2000 dataform).

Another Annex II species known to occur is *Petalophyllum ralfsii* (Petalwort), a very small liverwort that is usually located on bare tracks or wet flushes on machair. A population of 15 thalli was located at the northern end of the site on the rocky promontory of Melmore Head (Holyoak, 2002). It was not re-located during the current survey, although a monitoring stop was taken in the general vicinity.

Although described separately, the sand dune habitats that are recorded at Melmore occur around the eastern flank of the massif and continue into Tranarossan. For the purposes of this survey, the divide is taken as the current cSAC boundary (Map 165 & 166), although this may not reflect a physical demarcation on the ground. Table 168A lists the sand dune habitats that were recorded at Melmore. Other habitats that are recorded include amenity grassland - largely caravan parks (18.448ha) which extend uphill into heathland, Scrub (0.481ha) and other undefined habitats (12.020ha). A large portion of these habitats would have previously supported sand dune habitat. These are estimated and when combined with the sand dune habitats that were recorded suggest that the potential area of the sand dune system at Melmore is 55.868ha (Table 168A).

Table 168A Areas of EU Annex I habitats mapped at Melmore

EU Code	EU Habitat	Area (ha)
H2110	Embryonic shifting dunes	0.098
H2120	Shifting dunes along the shoreline with *Ammophila arenaria*	2.513
H2130	Fixed coastal dunes with herbaceous vegetation	20.860
H2190	Humid Dune Slacks	0.500
H21A0	Machair	21.868
	Total Sand dune	**45.689**
	Caravan parks and Developed land (on sandy substrate)	**9.694**
	Scrub (on sandy substrate)	**0.485**
	Potential Sand Dune Habitat	**55.868**

Machair (H21A0)

Machair, at Melmore, occurs as an extensive (~21.9ha) low-lying plain to the north west of the site. It is bounded to its east by an extensive mobile home park. Melmore Lough marks its southern boundary at the foot of a mountainous outcrop. It is also bounded to the north by less steep acidic rocky slopes. Much of the perimeter of the

machair is wet with an intricate mosaic of heath and marsh/flush vegetation. At its eastern boundary, the machair has been altered through the influx of mobile homes and associated land management. Some of the land has since become derelict and reverted to fixed dune grassland.

The dry machair grassland is species rich and is characterised by typical species such as *Festuca rubra* (Red fescue), *Bellis perennis* (Daisy), *Lotus corniculatus* (Common bird's-foot-trefoil), *Plantago lanceolata* (Ribwort plantain), *Galium verum* (Lady's Bedstraw), *Trifolium repens* & *T. pratense* (White & Red clover), *Thymus polytrichus* (Thyme), *Prunella vulgaris* (Selfheal), *Odontites verna* (Red bartsia), *Euphrasia officinalis* (Eyebright), *Cerastium fontanum* (Common Mouse-ears). Another grass that is extensively found throughout the dry machair grassland is *Cynosurus cristatus* (Crested dog's tail), whilst other grass species indicative of agricultural or dry grassland situations include *Holcus lanatus* (Yorkshire fog). Commonly recorded bryophyte species include *Scleropodium purum*, *Brachythecium* spp., *Rhytidiadelphus loreus* and *Rhytidiadelphus squarrosus.*

Much of the machair is open and freely grazed, maintaining the low grassy sward. Sward height typically ranges from 2cm. to 10cm. Despite the grazing pressure, and associated poaching, particularly in winter months, negative indicator species such as *Senecio jacobaea* (Common ragwort), *Cirsium arvense* (Creeping thistle) or agricultural grasses such as *Lolium perenne* (Perennial ryegrass) are not abundant, except in a small fenced off area that is highly disturbed. Rabbits have compounded the effects of the concentrated grazing in this area and *Senecio* is locally abundant among the bare ground.

A thin layer of sand has blown up on the outcropping rock. Much of the promontory at Melmore head is a mosaic of coastal and acidic grasslands and heath. Some sand has invariably been blown up onto the land and settled in pockets. Much of the sandy substrate is mapped as fixed dune owing to the dominance of the *Ammophila arenaria* (Marram) and the paucity of features typically associated with machair. However, sand thickness is minimal on the western side of the promontory and the vegetation, mapped as a small patch of machair, is in essence a mosaic of coastal and acidic grassland. Flushes can be distinguished by subtle differences in the colour of the

sward and its composition including species such as *Carex flacca* (Carnation sedge). In 2002, a population of *Petalophyllum ralfsii* consisting of 15 thalli was located at Melmore (Holyoak, 2002). The liverwort was not relocated during this survey, although machair monitoring stop 1 (at this general area) passed favourably on all machair criteria including sward height at 2cm. However, this is confused by the fact that monitoring stop would have also passed as fixed dune criteria. Either way, the conditions were not wholly ideal for *Petalophyllum*, which although recorded from wet slacks in machair, generally prefers bare ground or a tightly cropped sward.

Fixed Dunes (H2130)

Fixed dunes occupy an area similar in size to that of the machair at Melmore, but are different in the pattern of distribution, in that they are more widespread, mirroring suitable geomorphological conditions. They show a greater physiognomic structure than the homogenous machair sward. The calcareous sands overly acidic bedrock and are somewhat removed from appreciable inputs of fresh sand.

Much of the eastern side of Melmore has been populated with permanent mobile home berths or holiday homes. Indeed, local information points to the fact that the eastern side of the Melmore Head consisted of sandhills with luxuriant Marram prior to the 1970's.

Although the vegetation is generally rank and dominated by *Ammophila arenaria* (Marram), 2 of the monitoring stops were taken in short sward. In general there is great diversity in species composition, with between 10 and 16 species per monitoring stop. Only monitoring stop number 1 failed on species composition with 6 species recorded, reflecting the impact of heavy pedestrian traffic in the general area. Commonly recorded species included *Festuca rubra* (Red fescue), *Galium verum* (Lady's Bedstraw), *Achillea millefolium* (Yarrow), *Lotus corniculatus* (Common bird's-foot-trefoil), *Thymus polytrichus* (Thyme), *Linum catharticum* (Flax), *Carex arenaria* (Sand sedge) and *Rhinanthus minor* (Yellow rattle). Mosses are occasionally abundant, particularly in sand-filled bedrock depressions and included such species as *Hylocomium splendens, Scleropodium purum, Rhytidiadelphus loreus* and *Rhytidiadelphus squarrosus*. Lichens were not a common feature of the habitat.

Of note were a number of orchids that were recorded, generally on older parts of the fixed dune. These included the common *Anacamptis pyramidalis* (Pyramidal Orchid), *Coeloglossum viride* (Frog orchid), and an unidentified *Dactylorhiza* species (Marsh orchid). The fixed dunes are maturing and parts of the landward side and upper slopes of the eastern half of the site are characterised by *Pteridium aquilinum* (Bracken), measuring approximately 2ha in extent. Without an appropriate management regime, this negative indicator species will continue to spread. Another negative indicator is *Hippophäe rhamnoides* (Sea buckthorn). It is largely planted at the perimeters of caravan parks and has spread in a number of cases.

Dune Slacks (H2190)

Dune slacks are not extensive within the site despite the evidence of water coming off the hills. Although they are described from Tranarossan (CMP site 166), they had not previously been documented in this part of the cSAC. A single, small (0.50ha) dune slack was recorded within the fixed dunes on the eastern half of the site.

Forbs account for approximately 75% cover with grasses a mere 25%. The typical species include *Carex nigra* (Common sedge), *Agrostis stolonifera* (Creeping bent), *Potentilla anserina* (Silverweed), *Trifolium repens* (White clover), *Ranunculus acris* (Field buttercup) and the moss *Calliergonella cuspidata*. Another typical species, *Hydrocotyle vulgaris* (Marsh pennywort) was occasionally scattered throughout the slack. The only negative indicator species was *Cirsium arvense* (Common thistle) which accounted for less than 5% cover. While these species are typical of slacks, the cover of *Salix repens* spp. *argentea* (Creeping willow) at 30% and the local hydrology indicate that the slack is of the dry, mature type.

Mobile Dunes (H2120)

Shifting dunes dominated by *Ammophila arenaria* (Marram) are not extensive at Melmore (2.813 ha), which is not surprising given the rugged nature of much of the coastline. These dunes were patchily distributed and confined to relatively sheltered coves. The largest and most impressive area of *Ammophila*, however, is located to the north-west of the site in Boyeeghter Bay, where sand is steeply accumulating up against the cliff face.

Floristically, the mobile dunes are characterised by the presence of *Ammophila arenaria* (Marram) along with *Elytrigia juncea* (Sand couch). Occasionally, *Galium verum* (Lady's bedstraw), *Euphorbia paralias* (Sand spurge) and *Tussilago farfara* (Coltsfoot) were recorded. Negative indicator species were not a feature of the habitat and none were recorded in the 4 monitoring stops.

Embryonic Dunes (H1220)

Embryonic dunes are not a major habitat, occupying only 0.098ha or 0.2% of the total sand dune system recorded at Melmore. They only occur on the eastern side of the headland which is more protected from the elements. Sand accumulating in the relative shelter of the small coves has resulted in the establishment of foredune vegetation.

Characterised by *Elytrigia juncea* (Sand couch) with minor amounts of *Leymus arenarius* (Lyme grass). The *Leymus* is mostly confined to an area near a small retaining wall adjacent to the road, and in front of a number of mobile homes that have constructed decking and steps onto the beach. This suggests that it was originally planted and may have spread beyond its original area. No negative indicator species of embryonic dunes were noted.

IMPACTS

The main land uses affecting the site arise from recreational pressures and to smaller degree from agricultural management. These and other activities impacting on the sand dune habitats at Melmore are given in Table 168B. Column 6 of Table 168B refers to activities occurring within the each sand dune habitat.

Much of the north-eastern half of Rosguill Peninsula is taken up with large caravan parks and holiday homes. Many, although not all, of these within the whole peninsula were developed without planning permission and installed without any real mechanisms/facilities for appropriately dealing with the increase in the number of holiday makers. The north-eastern half of Melmore contains a large, licensed caravan park that was established on the dune grassland and expanded northwards around the lower slopes of the rocky hills (code 608). Little remains of the sandhills as evident

from a photograph of the area taken in 1973 (Shown by a long term holiday maker) which showed only sandy grassland plain and no mobile homes.

Table 168B Intensity and impact of various activities on sand dune habitats at Melmore

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H21A0	140	A	1	20.4	Inside
H21A0	143	A	-1	1.07	Inside
H21A0	146	A	-1	1.07	Inside
H2130	149	A	-1	16.0	Inside
H21A0	150	B	0	0.336	Inside
H2130	403	C	-1	0.2	Inside
H21A0	501	B	0	0.21	Inside
H2130	501	C	0	0.22	Inside
H21A0	608	B	-1	0.44	Inside
H2130	608	A	-1	1.103	Outside
H2130	871	C	0	Unknown	Inside
H2110	900	B	0	Unknown	Inside
H2120	900	B	0	Unknown	Inside
H2130	954	B	-1	1.988	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 and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

Agricultural management within Melmore is mostly associated with the machair sward. The area is grazed (code 140), which benefits the maintenance of the short sward and relative diversity. A small area (approximately 1.10ha.), however, has been fenced off (within the cSAC) to enable herding of cattle during winter months. It is showing obvious signs of damage from excessive stocking (code 143), which is being compounded by the concentration of rabbits in this area (code 146).

A number of new houses have been constructed inside the cSAC (code 409). They have been constructed some time after the year 2000, as they do not show up on the ortho-aerials of the site. It is estimated that they account for less than 1% of the fixed dune or 0.2ha of the total sand dune system.

Much of the site is traversed by a single public road way with numerous unpaved tracks leading to caravan parks and the like. In general the tracks (code 501) have not had a significant impact on the extant habitats, particularly the fixed dune and machair grasslands. Indeed, whilst the tracks are visible on the orthoaerial photographs, they

have not had a significant impact on the machair grassland, whilst most pedestrian traffic is maintained along predetermined tracks that avoid the rank, Marram-dominated vegetation.

The spread of both bracken and the invasion of *Hippophäe* (code 954) from the boundaries of caravan parks, although of low influence, will be an issue in the future. The bracken, estimated at occupying 2 ha, whilst the *Hippophäe* is found in 3 or 4 patches, has a clearly negative impact on fixed dunes as it results in the loss of a priority habitat.

Another impact, which is less easily quantifiable, is erosion, which is evident in the embryonic and mobile dunes in particular. Whilst erosion is a natural and dynamic function of coastal systems, there is little earlier evidence with which to gauge advances or retreats in either of these habitats. Local anecdotal evidence suggests that the relatively amount of embryonic dunes is typical for the area and that the Marram dunes shift regularly depending on tidal and other environmental conditions. Thus the impact is listed as a natural positive influence. Also, a short strip of retaining wall was constructed to prevent erosion of the road into the sea (code 871). This appears to be acting as a trap for the formation and possible expansion of embryonic dunes in the most north-easterly cove of Melmore.

CONSERVATION STATUS

The conservation assessment of the habitats at Melmore is largely determined on the results of the survey work and monitoring stops taken within each habitat. In arriving at these decisions, data from previous studies has also been interpreted to better understand the sand dune habitats. The baseline data includes the NATURA 2000 information, although the earlier Biomar machair Survey (Crawford *et al.*, 1996) proved more useful as it had relevé data which allowed comparison with some of the monitoring stops from this survey. A total of 123 relevés were taken between Tranarossan and Melmore in the Machair survey. Given the sampling protocol and time requirement of this rapid survey, only a small number of monitoring stops which are indicative of the Annex I sand dune habitats were carried out at Melmore. Where a monitoring stop was carried out adjacent to an earlier relevé, it was used to compare changes (if any) in the structure and functions of the habitat. Table 168C lists the

conservation assessment that is applied to the sand dune habitats that were recorded at Melmore during the current survey.

Table 168C Conservation status of Annex I sand dune habitats at Melmore

Habitat[1]	EU Conservation Status Assessment			Overall EU conservation status assessment	Proposed Irish conservation status system[2]
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**		
Machair (H21A0)	Extent / Structure & Functions / Future Prospects			**Favourable**	**Favourable - Maintained**
Fixed Dunes (H2130)	Extent	Structure & Functions / Future Prospects		**Unfavourable - Inadequate**	**Unfavourable - Declining**
Dune Slacks (H2190)	Extent / Structure & Functions	Future Prospects		**Unfavourable - Inadequate**	**Unfavourable - Unchanged**
Mobile Dunes (H2120)	Extent / Structure & Functions / Future Prospects			**Favourable**	**Favourable - Maintained**
Embryonic Dunes (H2110)	Extent / Structure & Functions* / Future Prospects			**Favourable**	**Favourable - Maintained**

[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)
* Structure and functions assessment is based on Best Scientific Judgement as monitoring stops were not carried out

Machair (H21A0)

The conservation status of extent is rated as *favourable* (Table 168C). The machair plain at Melmore is relatively large and comparison with the Biomar Machair Survey (Crawford *et al*., 1996) suggest that there has not been any great change in extent.

Despite a number of areas of intensive fenced pasturing within the machair plain, overall, the structure and functions are *favourable* and all five monitoring stops passed (Table 168D). Although, Crawford *et al*., 1996 made several relevés throughout the machair, only one (relevé 33) corresponds with a monitoring stop of the current survey (Monitoring stop 2). The earlier relevé was comparable in the attributes of the current survey.

It is unlikely that there be significant change to the condition of the machair habitat in the near future. Thus its future prospects are considered *favourable* (Table 168C).

Overall the conservation assessment for machair habitat at Melmore is *favourable* (Table 168C). The assessment corresponds with the Irish conservation assessment of *favourable-maintained* and is attributable to the extent and condition of the vegetation.

Table 168D Pass/Fail results of monitoring stops for Annex I sand dune habitats at Melmore

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	5	0	**Favourable**
Fixed Dunes (H2130)	4	1	**Unfavourable – Inadequate**
Dune Slacks (H2190)	1	0	**Favourable**
Mobile Dunes (H2120)	4	0	**Favourable**

Fixed Dunes (H2130)

The management plan suggests that fixed dunes are not very extensive and that they occur in mosaic with mobile dunes. At Melmore, the area of fixed dunes (20.860ha) is comparable to that of the machair habitat (21.868ha). The fixed dune habitat is largely located on the eastern half of the peninsula and occurs in mosaic with the machair, mobile, heath and amenity grassland. In terms of its extent, it is rated as *favourable* (Table 168C).

Four of the five monitoring stops taken in this habitat passed on structure and functions, this would indicate an *unfavourable-inadequate* rating (Table 168D). This is due to the general condition of the habitat coupled with the extent of the negative indicator species, bracken and *Hippophae*.

Bracken is widespread throughout the habitat, nearly dominating the landward side on the upper regions. In addition, scrub dominated by the invasive Hippophae was recorded in a number of locations. Without any active management to halt the spread of negative indicator species within the habitat, the future prospects for this habitat are rated as *unfavourable-inadequate* (Table 168C).

The overall EU conservation rating for the fixed dune habitat at Melmore is *unfavourable-inadequate* (Table 168C) and this equates to *unfavourable-declining* rating under the Irish conservation assessment.

Dune Slacks (H2190)

A single newly recorded small area of damp dune vegetation, analogous to dune slack was recorded from Melmore. Thus its extent warrants a *favourable* rating (Table 168C).

Given its limited extent, a single monitoring stop was carried out in the habitat, which passed on structure and functions (Table 168D). Its structure and functions are rated as *favourable* (Table 168C).

As there is no previous information concerning the occurrence of dune slacks at Melmore, the future prospects are unclear. However, it does occur in an area of mature, rank vegetation and would benefit from an increased grazing regime. Thus it is tentatively rated as *unfavourable-inadequate* (Table 168C).

Overall the conservation status of the dune slack habitat at Melmore is *unfavourable-inadequate* (Table 168C) and in view of the lack of previous information, the Irish conservation assessment for the dune slack at Melmore is *unfavourable-unchanged*.

Mobile Dunes (H2120)

Given the nature of the coastline at Melmore, mobile dunes are not generally widespread. Whilst a relatively large area occurs in the north-western part of the site, where Marram is extensive on steeply accreting sand, most mobile dunes are patchily distributed in small sheltered coves. For this reason, its extent is rated as *favourable* (Table 168C).

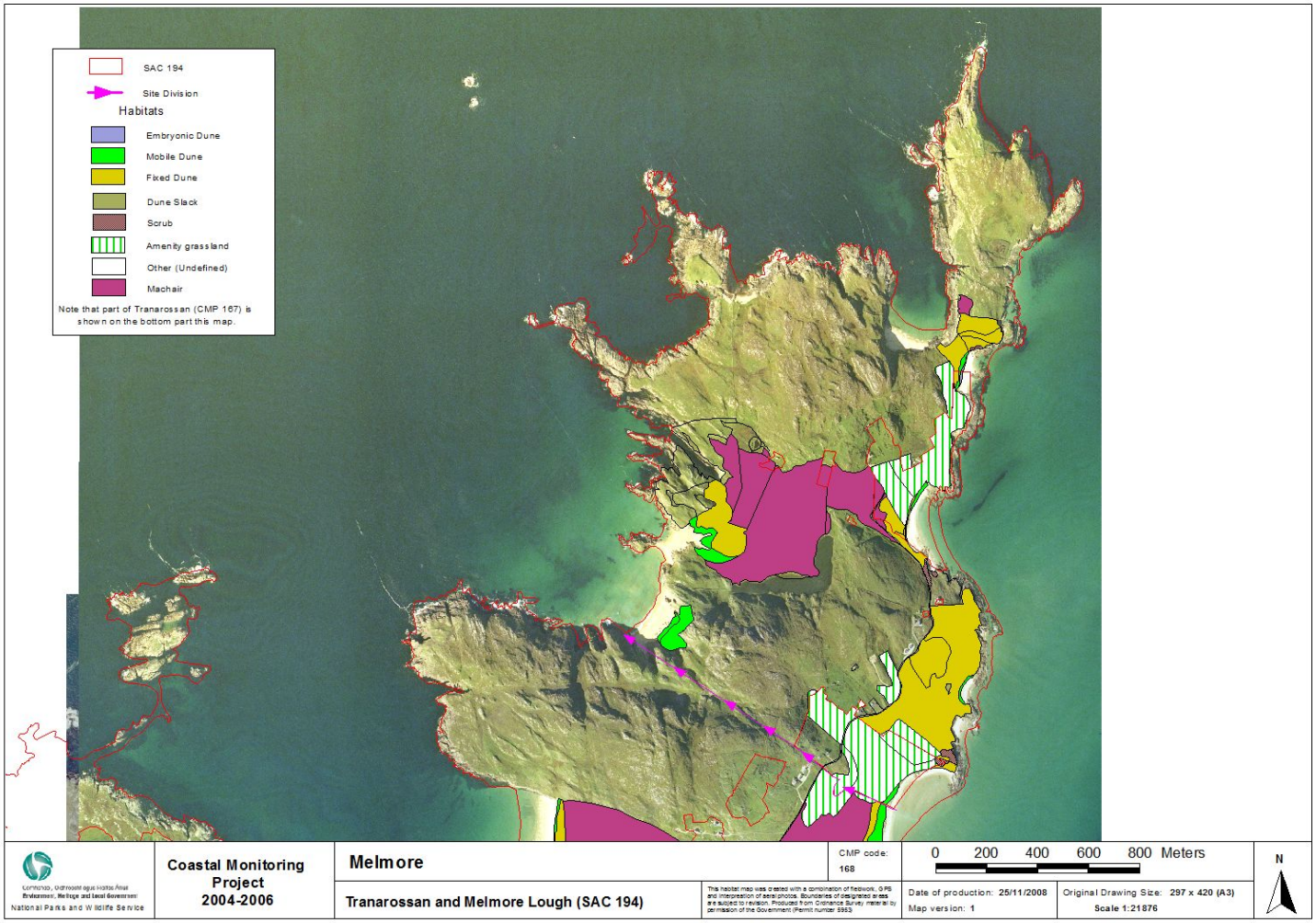
All five monitoring stops (Table 168D) passed on structure and functions, meriting a *favourable* rating.

The future prospects are assessed as *favourable* (Table 168C). Other than natural and dynamic redistribution of sediment, it is unlikely that there will be any great change to the extent of mobile dunes found at Melmore.

Overall the conservation status of the Mobile dunes at Melmore is rated as *favourable* (Table 168C) and the corresponding Irish assessment is *favourable-maintained*.

Embryonic Dunes (H2110)

Although embryonic dunes are patchily distributed and do not comprise any great area, the fact that some are present and were in some cases apparently accreting would warrant an overall *favourable* conservation assessment, based on best scientific judgement (Table 168C). The equivalent Irish conservation rating is *favourable-unchanged*.


SAC 194
Site Division
Habitats
Embryonic Dune
Mobile Dune
Fixed Dune
Dune Slack
Scrub
Amenity grassland
Other (Undefined)
Machair
Note that part of Tranarossan (CMP 167) is shown on the bottom part this map.
National Parks and Wildlife Service
Coastal Monitoring Project 2004-2006
Melmore
Tranarossan and Melmore Lough (SAC 194)
CMP code: 168
0 200 400 600 800 Meters
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:21876
N

APPENDIX IV: Tranarossan site report and habitat maps from Sand Dunes Monitoring Project (Delaney *et al.*, 2013)

SITE 167 TRANAROSSAN

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

Tranarossan is a Machair system located on a coastal plain between two beaches just south of Melmore Head, Co. Donegal. It forms part of Tranarossan and Melmore Lough SAC (SAC 000194). There are rocky hills to the north and south of the site and the site is part of a network of natural and semi-natural habitats including **1230 Vegetated sea cliffs of the Atlantic and Baltic coasts** and **4030 European dry heath.** Three Annex I sand dune habitats (* indicates a priority habitat) were mapped at Tranarossan during the baseline survey: **2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes)** and ***21A0 Machairs** (Ryle *et al.*, 2009)**.** *Draba incana*, *Ligusticum scoticum* and *Mertensia maritima* have been recorded in the SAC (NPWS, 2003), but were not found in the course of the baseline survey or during the monitoring project in 2012. According to the SAC site synopsis (NPWS, 2003), Choughs (*Pyrrhocorax pyrrhocorax)* use the site. The main land uses are agriculture and recreation. Sheep and cattle graze the sand dune habitats and there are several caravan parks in the vicinity.

2 CONSERVATION ASSESSMENTS

2.1 Overview

Tranarossan was surveyed on the 30th and 31st of May 2012. The habitats recorded at Tranarossan in 2012 and their conservation assessments are presented in Table 1. **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed as Favourable, while ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs** were assessed as Unfavourable-Inadequate. No trend was ascribed for **2110 Embryonic shifting dunes** as it was not found during the baseline survey and was therefore not assessed.

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

Habitat	Area	Structure & Functions	Future Prospects	Overall result
2110 Embryonic shifting dunes	Favourable	Favourable	Favourable	Favourable
2120 Marram dunes (white dunes)	Favourable (improving)	Favourable (improving)	Favourable (improving)	Favourable (improving)
*2130 Fixed dunes (grey dunes)	Favourable (stable)	Favourable (stable)	Unfavourable–Inadequate (stable)	Unfavourable–Inadequate (stable)
*21A0 Machairs	Favourable (improving)	Unfavourable–Inadequate (stable)	Unfavourable–Inadequate (stable)	Unfavourable–Inadequate (stable)

2.1.1 Area

The area recorded during the baseline survey, the revised baseline area and the area of habitats recorded during the monitoring survey in 2012 are shown in Table 2. **2110 Embryonic shifting dunes** were not recorded during the baseline survey. A small area of **2110 Embryonic shifting dunes** appeared to have persisted since the baseline survey and the baseline map was revised accordingly. The amount of **2120 Marram dunes (white dunes)** present on the revised baseline map is slightly lower than that present on the original baseline map, as an area of disturbed ***2130 Fixed dunes (grey dunes)** had been mapped as **2120 Marram dunes (white dunes)** during the baseline survey. The area of ***2130 Fixed dunes (grey dunes)** is also lower in the revised baseline map than originally mapped to better reflect the boundary between ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs**. This also accounts for the increase in the Area of ***21A0 Machairs.**

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

Habitat	Baseline survey (ha)	Revised baseline (ha)	Sand Dunes Monitoring Project (ha)
2110 Embryonic shifting dunes	0.00	0.04	0.40
2120 Marram dunes (white dunes)	2.67	2.52	1.65
*2130 Fixed dunes (grey dunes)	15.96	11.66	13.45
*21A0 Machairs	74.23	79.81	81.57
Total	**92.86**	**94.03**	**97.07**

The total area of sand dune habitats has increased from 94.03 ha to 97.07 ha since the baseline survey due to the expansion of **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** on the sheltered eastern side of the site. ***21A0 Machairs** have increased by over a hectare due to the inclusion of an area that previously contained several caravans. Although there are still some caravans present, most of them have been removed and the ***21A0 Machairs** habitat has recovered. ***2130 Fixed dunes (grey dunes)** have expanded since the baseline survey into areas that were previously unvegetated or contained **2120 Marram dunes (white dunes)**. A large area of unidentified habitat (labelled "Other") was mapped adjacent to the ***21A0 Machairs** during the CMP. In 2012, this was found to be composed of a wet part of the machair plain with a machair fen type community. There is

no clear change in the vegetation community or habitat morphology at the boundary to indicate why the ***21A0 Machairs** was considered to end here. This area was mapped and labelled as being both ***21A0 Machairs** and fen during the SDM. However, the area was not surveyed and it is not included in the total area of ***21A0 Machairs** shown in Table 2.

2.1.2 Structure and Functions

The Structure and Functions of **2110 Embryonic shifting dunes**, **2120 Marram dunes (white dunes)** and ***2130 Fixed dunes (grey dunes)** were assessed as Favourable. Table 3 shows the number of monitoring stops carried out in each habitat and the number of criteria assessed. The number of criteria that failed is also shown. The ***21A0 Machairs** habitat was assessed as Unfavourable-Inadequate due to the failure of a single criterion.

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

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
2110 Embryonic shifting dunes	4	7	0
2120 Marram dunes (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	8	11	0
*21A0 Machairs	12	10	1

2.1.3 Future Prospects

Impacts and activities recorded at Tranarossan are presented in Table 4. Impact codes are assigned according to Ssymank (2010).

With the exception of encroachment of *Pteridium aquilinum* and saltwater intrusion, all of the impacts recorded relate to agriculture or recreation. Non-intensive sheep, cattle and horse grazing are positive impacts on the ***2130 Fixed dunes (grey dunes)** and ***21A0 Machairs**, but intensive cattle grazing, and intensive sheep grazing on ***2130 Fixed dunes (grey dunes)**, has a negative effect. All of the effects associated with amenity use are negative at this site except for walking and camping.

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

Habitat Code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
2110	X	No impacts	-	-	100	-
2120	G01.02	Walking	Low	Neutral	1	Inside
*2130	A04.01.02	Intensive sheep grazing	High	Negative	1	Inside
*2130	A04.02.02	Non-intensive sheep grazing	Low	Positive	1	Inside
*2130	A05.02	Supplementary feeding	High	Negative	1	Inside
*2130	G02.08	Camping	Low	Neutral	1	Inside
*2130	G05	Campfires	High	Negative	1	Inside
*2130	G05.01	Trampling	High	Negative	1	Inside
*2130	H05.01	Rubbish	High	Negative	1	Inside
*2130	I02	Bracken encroachment	High	Neutral	1	Inside
*21A0	A04.01.01	Intensive cattle grazing	High	Negative	1	Inside
*21A0	A04.01.02	Intensive sheep grazing	High	Neutral	5	Inside
*21A0	A04.02.01	Non-intensive cattle grazing	Medium	Positive	15	Inside
*21A0	A04.02.02	Non-intensive sheep grazing	Low	Positive	40	Inside
*21A0	A04.02.03	Non-intensive horse grazing	Medium	Positive	1	Inside
*21A0	A04.03	Undergrazing	Medium	Negative	10	Inside
*21A0	E04.01	Sheep pen & cattle crush	High	Negative	1	Inside
*21A0	G01.03.02	Off-road driving	High	Negative	1	Inside
*21A0	G02.08	Caravan park	High	Negative	1	Inside
*21A0	G05	Campfires	High	Negative	1	Inside
*21A0	I02	Bracken encroachment	Medium	Negative	1	Inside
*21A0	J02.09.01	Salt water intrusion	Medium	Neutral	10	Outside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Tranarossan is discussed below. The present conservation status in 2012 is compared with the baseline status and if a habitat is not in Favourable status, the main reasons for the Unfavourable assessment are given. Areas recorded in 2012 are compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

2.2.1 2110 Embryonic shifting dunes

2110 Embryonic shifting dunes is the most exposed sand dune habitat present at Tranarossan and it was found only on the more sheltered eastern side of the site. **2110 Embryonic shifting dunes** were not recorded during the baseline survey. However, a small area of **2110 Embryonic shifting dunes** appeared to have persisted since the baseline survey and the baseline map was revised accordingly. No assessments were carried out on this habitat during the CMP and therefore trend cannot be ascribed for this habitat.

Area

The area of **2110 Embryonic shifting dunes** has increased from 0.04 ha to 0.4 ha since the baseline survey and Area was assessed as Favourable.

Structure and Functions

Four monitoring stops were recorded in **2110 Embryonic shifting dunes** and the habitat passed the Structure and Functions assessment. The site was surveyed in May, before the flowering season for *Elytrigia juncea* and *Leymus arenarius*, and although no flowering or fruiting of the target species was observed, the vegetation within the stops was green and healthy, so the habitat was allowed to pass this criterion. **2110 Embryonic shifting dunes** were assessed as Favourable.

Future Prospects

No impacts or activities were recorded in this habitat and the Future Prospects were assessed as Favourable.

Conservation assessment

The conservation status of **2110 Embryonic shifting dunes** was assessed as Favourable. This habitat was not assessed during the Coastal Monitoring Project, so no comparison with its previous conservation status can be made.

2.2.2 2120 Marram dunes (white dunes)

This habitat is found on both the eastern and western sides of the site. On the more exposed, western side of the site, it is the most seaward habitat.

Area

The area of **2120 Marram dunes (white dunes)** decreased from 2.52 ha to 1.65 ha since the baseline survey. This reduction was due to succession to ***2130 Fixed dunes (grey dunes); 2120 Marram dunes (white dunes)** actually extended to beyond their previous boundaries in the east of the site. Area was assessed as Unfavourable-Inadequate during the baseline survey due to trampling exacerbating erosion leading to a loss of habitat. Growth of **2120 Marram dunes (white dunes)** in some areas indicates that loss of area attributed to succession and trampling was no longer an impact in 2012. Area was assessed as Favourable (improving).

Structure and Functions

Eight monitoring stops were recorded in **2120 Marram dunes (white dunes)**. Although no flowering or fruiting was recorded, the site was surveyed before the main flowering season of the target species and there was healthy vegetation in each stop. The Structure and Functions were assessed as Unfavourable-Bad in the baseline survey. This was due to the unhealthy nature of *Ammophila arenaria*, especially in areas where heavy trampling occurred. As this impact is no longer an issue for this habitat, and with the vegetation healthy in each stop recorded in 2012, the Structure and Functions of **2120 Marram dunes (white dunes)** were assessed as Favourable (improving).

Future Prospects

Walking was the only recorded impact on the habitat in 2012. This is a low intensity neutral impact. Future Prospects were assessed as Unfavourable-Bad in the baseline survey due to recreational pressures and trampling, neither of which were recorded as impacts in 2012. The Future Prospects were therefore assessed as Favourable (improving).

Conservation assessment

2120 Marram dunes (white dunes) were assessed as Favourable (improving) at Tranarossan. This is an improvement on the baseline survey when the habitat was assessed as Unfavourable-Bad due to loss of area, poor structure and functions and pressures related to recreation.

*2.2.3 *2130 Fixed dunes (grey dunes)*

Area

Area was assessed as Favourable during the baseline survey. The area of ***2130 Fixed dunes (grey dunes)** increased from 11.66 ha to 13.45 ha between the baseline survey and 2012. Area was assessed as Favourable (stable) in 2012.

Structure and Functions

All eight of the monitoring stops were in good condition and the ***2130 Fixed dunes (grey dunes)** passed the Structure and Functions assessment. The only negative features noted were the presence of negative species (*Senecio jacobea* in three stops and *Pteridium aquilinum* in one stop) and disturbance due to trampling. These were not having a significant negative impact on the structure of the fixed dunes however, and the habitat passed the Structure and Functions assessment. As the Structure and Functions were assessed as Favourable during the baseline survey too, ***2130 Fixed dunes (grey dunes)** were assessed as Favourable (stable).

Future Prospects

Negative impacts and activities on this habitat include campfires, dumping, trampling, supplementary feeding and intensive sheep grazing, but none of these affected more than 1% of the habitat. All of the negative impacts were of high intensity. *Pteridium aquilinum* and camping were recorded as neutral impacts, as they are not problematic at current levels, but could develop into threats in the future. Non-intensive sheep grazing is a low-intensity positive impact affecting 1% of the habitat. Because there are five high intensity, negative impacts each affecting up to 1% of the habitat; the habitat failed the assessment with a score of Unfavourable-Inadequate. Future Prospects were assessed as Unfavourable-Inadequate during the baseline survey due to supplementary feeding and recreational pressures. As these impacts are still very much in evidence today, the Structure and Functions were assessed as Unfavourable-Inadequate (stable).

Conservation assessment

***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Inadequate (stable) due to the presence of negative impacts and activities on the habitat. The conservation assessment has not changed since the baseline survey when it was assessed as Unfavourable-Inadequate due to the impacts and activities affecting the site.

*2.2.4 *21A0 Machairs*

Area

Area was assessed as Favourable during the baseline survey. The area of ***21A0 Machairs** has increased since the baseline survey from 79.81 ha to 81.57 ha. This increase is due to the inclusion of an

area of ***21A0 Machairs** that has recovered after the removal of caravans. Although there has been a small loss of area (0.39 ha) elsewhere on the site due to trampling at an access point for the beach, the overall trend is positive and Area was assessed as Favourable (improving).

Structure and Functions

***21A0 Machairs** passed all but one of the of the Structure and Functions criteria. Bryophyte cover was low in an area which is lacking in management and close to a stream. Although most of the habitat is in good condition, parts of the ***21A0 Machairs** habitat are not in optimal condition and the habitat was assessed as Unfavourable-Inadequate. At one stop, bryophytes were totally absent and there were only two positive indicator species. Here, the ***21A0 Machairs** habitat is prone to flooding as it is close to a small stream and a naturally occurring breach in the dunes. Because this is a natural variation in the composition of the ***21A0 Machairs**, the criterion assessing positive indicator species was allowed to pass on Expert Judgement. The ***21A0 Machairs** habitat was assessed as Unfavourable-Inadequate during the baseline survey, again to represent an area that was not in optimal condition (overgrazed and disturbed). The Structure and Functions were therefore assessed as Unfavourable-Inadequate (stable) in 2012.

Future Prospects

Positive impacts include non-intensive grazing by cattle, sheep and horses, which together affect up to 56% of the habitat. Intensive sheep grazing is a neutral impact, as it has a positive effect on the species diversity, but has also caused some disturbance to the habitat. Undergrazing has a medium-intensity negative effect on 10% of the habitat. Bracken encroachment, caravans, campfires, off-road driving, agricultural structures and intensive cattle grazing each have a negative impact on the ***21A0 Machairs** habitat, but none affects more than 1% of the habitat. The Future Prospects are assessed as Unfavourable-Inadequate. During the baseline survey, Future Prospects were assessed as Unfavourable-Inadequate, due to the caravan parks and associated recreational activities, and also due to intensive agricultural management. These same impacts were recorded in 2012 and Future Prospects for ***21A0 Machairs** were therefore assessed as Unfavourable-Inadequate (stable).

Conservation assessment

The area of ***21A0 Machairs** has increased since the baseline survey due to the removal of caravans, but the Structure and Functions and Future Prospects were both assessed as Unfavourable-Inadequate because of low bryophyte cover and undergrazing. The conservation assessment has not changed since the baseline survey when it was assessed as Unfavourable-Inadequate due to the impacts and activities affecting the site. The conservation status of this habitat was assessed as Unfavourable-Inadequate (stable) during the SDM.

3 Discussion

3.1 Agriculture

Some agricultural practices are causing small areas of the Annex I habitats to be degraded at Tranarossan. In particular, supplementary feeding and the erection of animal shelters have a high-intensity, but very localised effect. The site is divided into separate units and the management differs

across the units. For the most part, management is positive and the negative impacts are limited to a small number of individual management units.

3.2 Recreation

Tranarossan is located within a region that is dependent on tourism, and in the years between 2000 and 2012, a large number of holiday homes appear to have been built. There are also several campsites located near the site, as well as one within it. There has been a reduction in the damage associated with recreation at Tranarossan since the baseline survey. The main impacts associated with recreation recorded in 2012 include trampling and campfires, and these were limited in extent.

4 References

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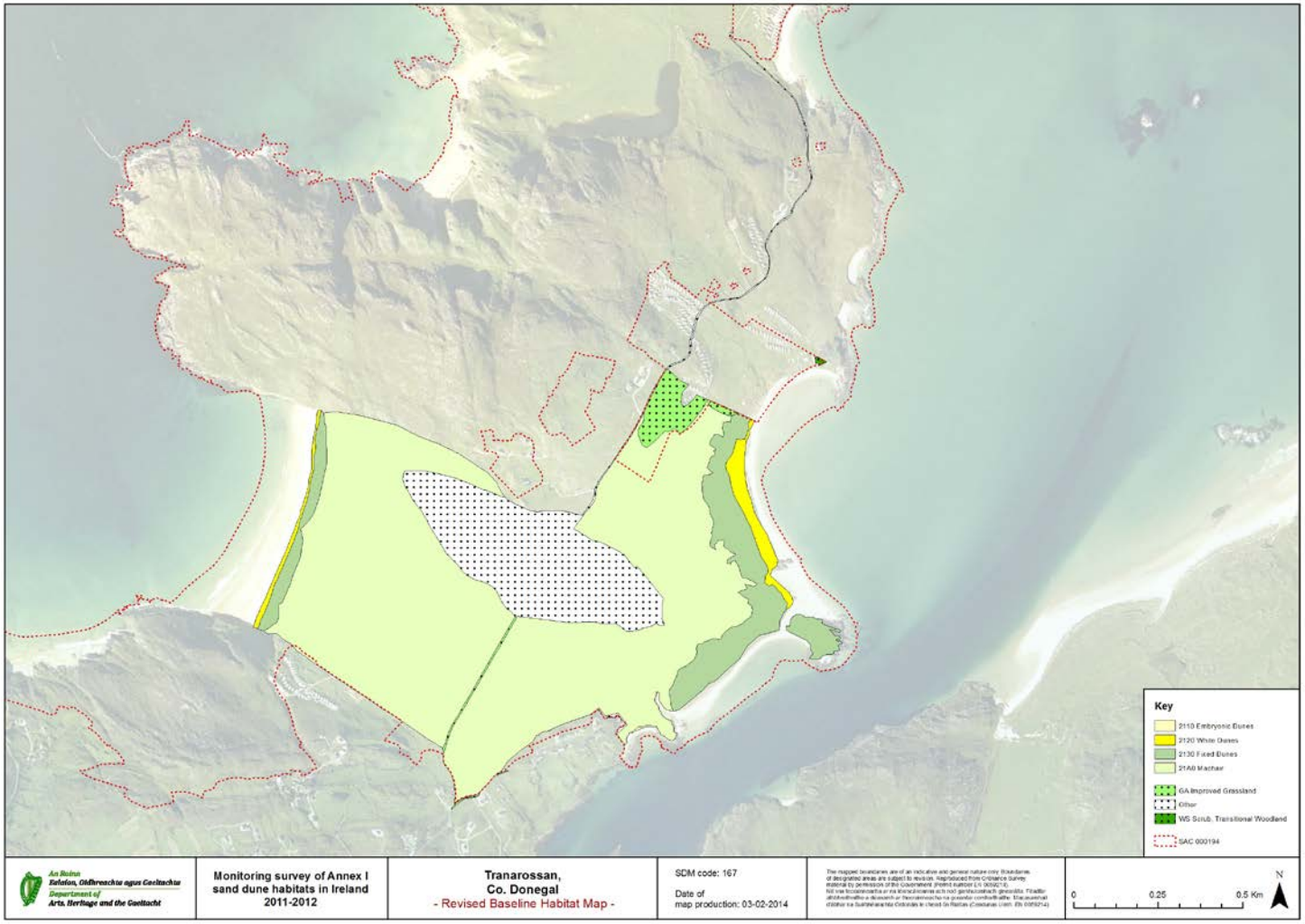
Key
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
21A0 Machair
GA Improved Grassland
Other
WS Scrub, Transitional Woodland
SAC 000194
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht
Monitoring survey of Annex I sand dune habitats in Ireland 2011-2012
Tranarossan, Co. Donegal
- Revised Baseline Habitat Map -
SDM code: 167
Date of map production: 03-02-2014
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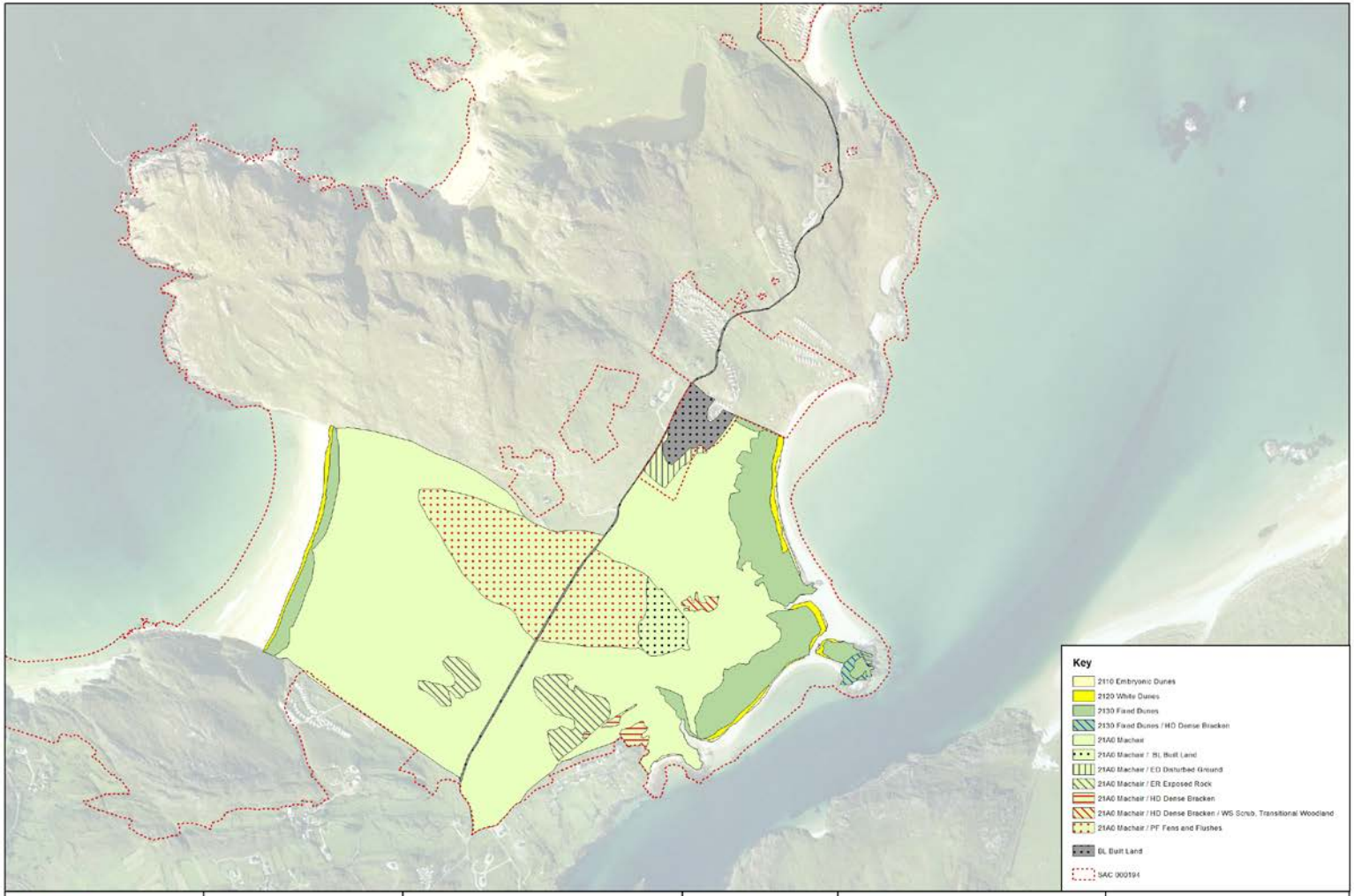
Key
2110 Embryonic Dunes
2120 White Dunes
2130 Fixed Dunes
2130 Fixed Dunes / HD Dense Bracken
21A0 Machair
21A0 Machair / BL Built Land
21A0 Machair / ED Disturbed Ground
21A0 Machair / ER Exposed Rock
21A0 Machair / HD Dense Bracken
21A0 Machair / HD Dense Bracken / WS Scrub, Transitional Woodland
21A0 Machair / PF Fens and Flushes
BL Built Land
SAC 000194
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