Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (site code 625) Conservation objectives supporting document -coastal habitats

NPWS

Version 1

February 2015

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

Please note that this document should be read in conjunction with the following report: NPWS (2015). Conservation Objectives: Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625. 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.

Bunduff Lough and Machair/Trawalua/Mullaghmore SAC is situated on the south side of Donegal Bay, 5km south-west of Bundoran. The part of the site west of Mullaghmore Head is very exposed to the prevailing wind and swells from the Atlantic, whereas the Head itself affords moderate shelter to the eastern part of the site. The underlying geology is of sedimentary rocks including limestone and shale. Windblown sand is common in places, covering much of the underlying rock and shingle. Both Trawalua and Bunduff strands are long sandy beaches. The site is generally low-lying and includes a fine range of coastal habitats, with open shallow marine areas, intertidal sandy beaches, bedrock shoreline, various sand dune types, including fixed dunes and machair. Bunduff Lough is a shallow coastal lake, probably with brackish influence, and is fringed with swamp, fen and dune grassland. Grazing is the main influence within the site and the area is used for water-based recreational activities.

The site is of importance in terms of both habitat diversity and quality. The machair and alkaline fen are particularly well developed. Much of the machair is wet in character and there are interesting transitional areas within the alkaline fen. The machair is considered one of the best examples in the north-west region. The beaches are notably long and wide and back onto well-developed marram dunes.

The rare liverwort, *Petallophyllum ralfsii* has been recorded in the machair habitat. The site also has a number of locally rare plant species including dodder (*Cuscuta epithymum*), marsh helleborine (*Epipactis palustris*) and bee orchid (*Ophrys apifera*).

Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (site code: 625) is designated for a range of habitats including orchid-rich calcareous grassland, alkaline fen, reefs, large shallow inlets and bays, tidal mudflats and vegetated sand dunes. The following three coastal habitats are included in the list of qualifying interests for the site:

- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130)
- Machairs (21A0)

All three habitats are associated with sand dune systems and are usually found in close association with each other. The Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) also recorded humid dune slacks, embryonic shifting dunes and annual vegetation of drift lines within this SAC but these Annex I habitats are not listed as qualifying interests for this site. The distribution of sand dune habitats within Bunduff Lough and Machair/Trawalua/Mullaghmore SAC is presented in Appendix I.

This backing document sets out the conservation objectives for the three coastal habitats listed above in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by a list of parameters, attributes and targets. The main parameters are (a) Range (b) Area and (c) Structure and Functions, the last of which is broken down into a number of attributes, including physical structure, vegetation structure and vegetation composition.

The targets set for the **sand dune habitats** are based primarily on the results of the Coastal Monitoring Project (CMP) (Ryle *et al.*, 2009) and this document should be read in conjunction with that report. Crawford *et al*. (1996) and Gaynor (2006, 2008) provide additional information on machair in Ireland.

The CMP surveyed, mapped and assessed a total of two sub-sites within Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (Ryle *et al*., 2009):

1. Trawalua (Appendix II)
2. Bunduff (Appendix III)

A third sub-site at Mullaghmore was not surveyed by the CMP (due to access problems) and areas of habitats were mapped using aerial photos (2000) and NPWS internal files. These areas are included on the Trawalua habitat map in Appendix II.

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

Trawalua sand dunes are situated south of the village of Mullaghmore in County Sligo and 18km north of Sligo town. The site is adjacent to Bunduff machair. The area of Mullaghmore is located between the Trawalua and Bunduff sub-sites. Trawalua, Mullaghmore and Bunduff are generally low-lying and include a good diversity of coastal, wetland and marine habitats (Ryle *et al*., 2009).

Both Trawalua and Bunduff have extensive areas of machair that occur mostly in the flat areas between the fixed dune ridges and areas of alkaline fen/marsh vegetation. Fixed dune

habitat is also well represented at the sites, with a large area of fixed dunes backing Trawalua strand and a smaller area at Bunduff (Ryle *et al*., 2009).

The conservation objectives for the sand dune habitats in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC are based on the findings of the individual reports for each of these sites, combined with the results of Gaynor (2008). It is thought that the two sub-sites as surveyed by the CMP, as well as the sub-site at Mullaghmore, represent the total area of sand dunes within Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. However, there are likely to be additional machair fen areas that have not been included in the area mapped.

2 Conservation Objectives

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

3 Sand dune habitats

Sand dunes are hills of windblown 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)

- **Machairs (21A0) ***

Six dune habitats were recorded by Ryle *et al*. (2009) but only the three habitats indicated in bold above are listed as Qualifying Interests for Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems. Annual vegetation of drift lines and embryonic dunes were also recorded at the two sub-sites: Trawalua and Bunduff. Humid dune slacks were recorded at Trawalua (Ryle et al., 2009).

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

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

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

Fixed dunes refers to the more stabilised area of dune systems, generally located in the shelter of the mobile dune ridges, where the wind speed is reduced and the vegetation is removed from the influence of tidal inundation and salt spray. This leads to the development of a more or less closed or ‘fixed’ carpet of vegetation dominated by a range of sand-binding species (Gaynor, 2008).

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

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.

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 Bunduff Lough and Machair/ Trawalua/ Mullaghmore SAC:

1. Trawalua
2. Bunduff

Mullaghmore is also a CMP sub-site within this SAC, but it was not surveyed by the CMP. Instead, an estimation of the coastal habitats present at the site was made using aerial photos (2000 series) and NPWS internal files. It is estimated that the area still retains fixed dune and small patches of machair (Ryle *et al.,* 2009).

Comparison of the CMP with the Biomar Machair Survey (Crawford *et al*., 1996) revealed considerable degradation of the machair habitat that could be attributed to changes in farming practices. Some of the machair commonages have been fenced (stripped) resulting in greater

concentration of livestock in confined areas, overgrazing, supplementary feeding and poaching of the land (Ryle *et al.,* 2009).

Detailed descriptions from the Coastal Monitoring Project (Ryle *et al.,* 2009) of each sub-site and each sand dune habitat found at Trawalua and Bunduff are presented in Appendices II and III. A total of 284.78ha of sand dune habitat was mapped within the Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, of which 7.94ha represents annual vegetation of driftlines, embryo dunes and humid dune slacks which are not listed as qualifying interests for this particular site.

3.1 Overall objectives

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dune)' in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC is to 'restore the favourable conservation condition'.

The overall objective for 'Fixed coastal dunes with herbaceous vegetation' in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC is to 'restore the favourable conservation condition'.

The overall objective for 'Machair' in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC is to 'maintain 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.

3.2 Area

3.2.1 Habitat extent

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. Baseline habitat maps were produced for the sand dune habitats in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). These maps are included with the individual site reports in the set of Appendices at the end of this document. The total areas of each sand dune habitat within the SAC as estimated by Ryle *et al*. (2009) are presented in the second column of the following table. These figures were subsequently checked and adjusted to take into account some

overlapping polygons and mapping errors. The adjusted figures are presented in the final column.

Habitat	Total area (ha) of habitat from CMP	Total area (ha) of habitat within SAC boundary
Shifting dunes along the shoreline with *Ammophila arenaria*	10.13	10.13
Fixed coastal dunes with herbaceous vegetation *	186.62	180.32
Machairs *	86.48	86.38
Total	**283.23**	**276.83**

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

3.3 Range

3.3.1 Habitat distribution

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

All three qualifying interest habitats occur at both the Trawalua and Bunduff sub-sites.

Fixed coastal dune habitat is also well represented at the sites, with large area of fixed dunes backing Trawalua strand, at Mullaghmore and a smaller area at Bunduff (Ryle *et al.,* 2009).

Both sub-sites have extensive areas of machair that mostly occur in the flat areas between fixed dune ridges and the areas of alkaline fen/marsh vegetation. At Bunduff, machair habitat accounts for approximately 50% of the total sand dune habitat and at Trawalua it accounts for almost 30% of the total sand dune resource (Ryle *et al.,* 2009).

At Trawalua, the mobile dunes accounts for approximately 4.2% of the sand dune habitat and consists of relatively tall dunes almost 3 to 4m in height. They are mainly intact, however, in some areas the habitat is eroded (Ryle *et al*., 2009).

At Bunduff, the mobile dunes account for approximately 5% of the total sand dune habitat. They are affected by natural erosion which has been compounded by high recreational pressure at the site. A dune management project was put in place by Sligo County Council in association with the Department of Communications, Marine and Natural Resources, NPWS and the co-operation of the Mullaghmore community, to restore the dune habitat at Bunduff. Fences in the form of chestnut paling were erected at the western end of the beach for approximately 226m. (Ryle *et al*., 2009).

The target is that there should be no decline or change in the distribution of these sand dune habitats, unless it is the result of natural processes, including erosion, accretion and succession.

3.4 Structure and Functions

The location, character and dynamic behaviour of sand dunes are governed by a combination of geographic, climatic, edaphic and anthropogenic factors. Sand dunes are highly complex, dynamic systems, where the habitats occur in a complex and constantly evolving and changing mosaic. They function as systems in terms of geomorphology and hydrology and maintaining the favourable conservation condition of the habitats present depends on allowing these processes to continue unhindered. Maintaining the favourable conservation condition of all of the sand dune habitats in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

3.4.1 Physical structure: functionality and sediment supply

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

Dunes and machair systems are naturally dynamic and require continuous supply and circulation of sand. Sediment supply is especially important in the seaward side of these systems, where the strandline communities utilise accumulations of organic matter in tidal

litter, trapping sand and initiating dune formation. Many machair systems are fronted by a low ridge of embryonic dunes and/or mobile dunes. In general, the true machair plain represents the area where wind erosion has eroded the original dune system down to a level just above the water table, where the wet consistency of the sand prevents further erosion (Gaynor, 2006).

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, thus 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/machair system, without any physical obstructions.

3.4.2 Physical structure: hydrological and flooding regime

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 machair plains at Bunduff and Trawalua consist of a mosaic of wet and dry vegetation communities and they are strongly influenced by the local hydrology. There are large areas of fen associated with the machair plains, particularly at Bunduff, indicating that the machair at this sub-site is particularly sensitive to interference with the local hydrological regime.

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

3.4.3 Vegetation structure: zonation

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

At both Bunduff and Trawalua sub-sites, a range of terrestrial habitats occur alongside the sand dune habitats (such as reedbeds, wet woodland, scrub, sea cliffs, wet grassland, maritime heath and small areas of juniper scrub), in addition to a range of coastal habitats such as open shallow marine areas, intertidal sandy beaches and bed rock shoreline. There are also two small areas of orchid-rich calcareous grassland in the eastern part of Bunduff, towards the back of the fixed dune grassland (Ryle *et al*., 2009).

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

3.4.4 Vegetation structure: bare ground

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

Petalwort (*Petallophylum ralfsii*), the Annex II liverwort species listed in the EU Habitats Directive, was recorded at the Bunduff sub-site in 2003 (Hodgetts, 2003).

In the fixed dune habitat at Trawalua, there are a significant number of tracks caused by horse riding throughout the habitat, although bare sand is <10% of the whole habitat (Ryle *et al.,* 2009).

The fixed dunes at Bunduff are naturally eroded in some areas particularly on the seaward side. The CMP also noted that some small blowouts at the southwestern part of the site were re-vegetating (Ryle *et al*., 2009).

The target is to achieve up to 10% bare sand. This target is assessed subject to natural processes.

3.4.5 Vegetation composition: plant health of dune grasses

The health of the dune grasses (particularly *Ammophila arenaria* and *Elytrigia juncea*) are assessed by the plant parts above the ground (they should be green) and the presence of flowering heads. This gives a clear indication of the status of the supply of blown sand, which is required for these species to thrive.

The CMP noted unhealthy marram (*Ammophila arenaria*) patches in mobile habitat which was eroding at Trawalua (Ryle *et al*., 2009).

At Bunduff, the mobile dunes are affected by natural erosion which is compounded by high recreational pressure at the site. Trampling and walking across the habitat has led to a loss in vegetation, and as a consequence *Ammophila arenaria* has lost condition in some places. As part of a dune management project to restore the habitat, fences in the form of chestnut paling were erected at the western end of the beach for approximately 226m. At the time of survey, however, the CMP noted evidence of trampling and cattle grazing behind the fences (Ryle *et al*., 2009).

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

3.4.6 Vegetation structure: vegetation height

This attribute applies to the fixed dunes 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).

Bunduff is a commonage site where the main land use is light to moderate grazing by sheep, cattle and horses. Rabbits also graze the machair. The fixed dune is also grazed but to a lesser extent than the machair (Ryle *et al.,* 2009)

At Trawalua the machair habitat is grazed by cattle and sheep as well as horses. The sward is kept low and species diversity is high. The fixed dune habitat is also grazed but to a lesser extent. Some of the fixed dune is undergrazed and in places there is an abundance of agricultural weeds (Ryle *et al*., 2009)

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

3.4.7 Vegetation composition: typical species & sub-communities

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

The fixed dune at Trawalua is relatively intact and supports a complement of typical species (Ryle *et al*., 2009). At Bunduff, the CMP noted an abundance of orchids (frog orchid (*Coeloglossum viride*) and bee orchid (*Ophrys apifera*)) present in the fixed dunes. The parasitic species dodder (*Cuscuta epithymum*) was also abundant in the fixed dunes at the time of survey (Ryle *et al*., 2009).

Machair is common throughout the SAC site and it occurs mostly in the flat areas between dune ridges and the areas of alkaline fen/marsh vegetation. Although areas with typical dry machair grassland can be found close to dune ridges, much of the habitat is wetter than is usually seen and there are large areas that are considered to be transitional to alkaline fen,

another Annex I habitat. The areas of wet machair/alkaline are very species-rich, often containing 40-50 plant species in an area of $4m^2$.

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*).

The Annex II plant species *Petalophylum ralfsii* was recorded at Bunduff machair (Hodgetts, 2003).

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

3.4.8 Vegetation composition: negative indicator species

Negative indicators include non-native species (e.g. *Hippophae rhamnoides*), species indicative of changes in nutrient status (e.g. *Urtica dioica*) and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) has not been recorded from this site (Preston *et al*., 2002; Ryle *et al*., 2009) and should not be introduced.

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 Bunduff, negative indicators recorded in the machair habitat by the CMP include common ragwort (*Senecio jacobaea*). In the fixed dune at Bunduff, the CMP recorded common ragwort (*Senecio jacobaea*), spear thistle (*Cirsium vulgare*), creeping thistle (*Cirsium arvense*), perennial rye-grass (*Lolium perenne*) and bramble (*Rubus fruticosus*). In the mobile dunes at this sub-site, the CMP recorded creeping thistle (*Cirsium arvense*) abundantly in the western end of the beach close to the fencing as well as scattered throughout the rest of the mobile dune habitat with a declining abundance noted towards the east of the beach (Ryle *et al.,* 2009).

At Trawalua, negative indicator species common ragwort (*Senecio jacobaea*) and perennial rye grass (*Lolium perenne*) were noted infrequently in the machair habitat. These species were also recorded frequently in the fixed dune habitat along with nettle (*Urtica dioica*) (Ryle et al., 2009).

The target is that negative indicators (including non-native species) should make up less than 5% of the vegetation cover and *Hippophae* should not be introduced.

3.4.9 Vegetation composition: scrub/trees

This attribute only applies to the fixed dunes. 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.

Gorse (*Ulex europeus*) was recorded in the machair at Bunduff during the CMP. Heath species such as ling (*Calluna vulagaris*) were also recorded here. Burnet rose (*Rosa pimpinellifolia*) as well as a number of low-growing juniper (*Juniperus communis*) was recorded from the fixed dune habitat at this sub-site (Ryle *et al*., 2009).

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

3.4.10 Vegetation composition: bryophytes

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

At Trawalua, typical bryophytes noted by the CMP include *Rhytidiadelphus squarrosus* as well as other species such as *Aulacomnium* spp. and *Climacium dendroides* (Ryle *et al*., 2009).

At Bunduff, bryophytes recorded in the machair habitat by the CMP include, *Rhytidiadelphus squarrosus, Climacium dendroides, Homalothecium lutescens, Hypnum cupressiforme, Scleropodium purum, Pleurozium schreberi, Brachythecium albicans and Thuidium tamariscinum* (Ryle *et al*., 2009).

The target for this attribute therefore is that the cover of bryophytes should always be at least an occasional component of the vegetation (Ryle *et al*., 2009).

4 References

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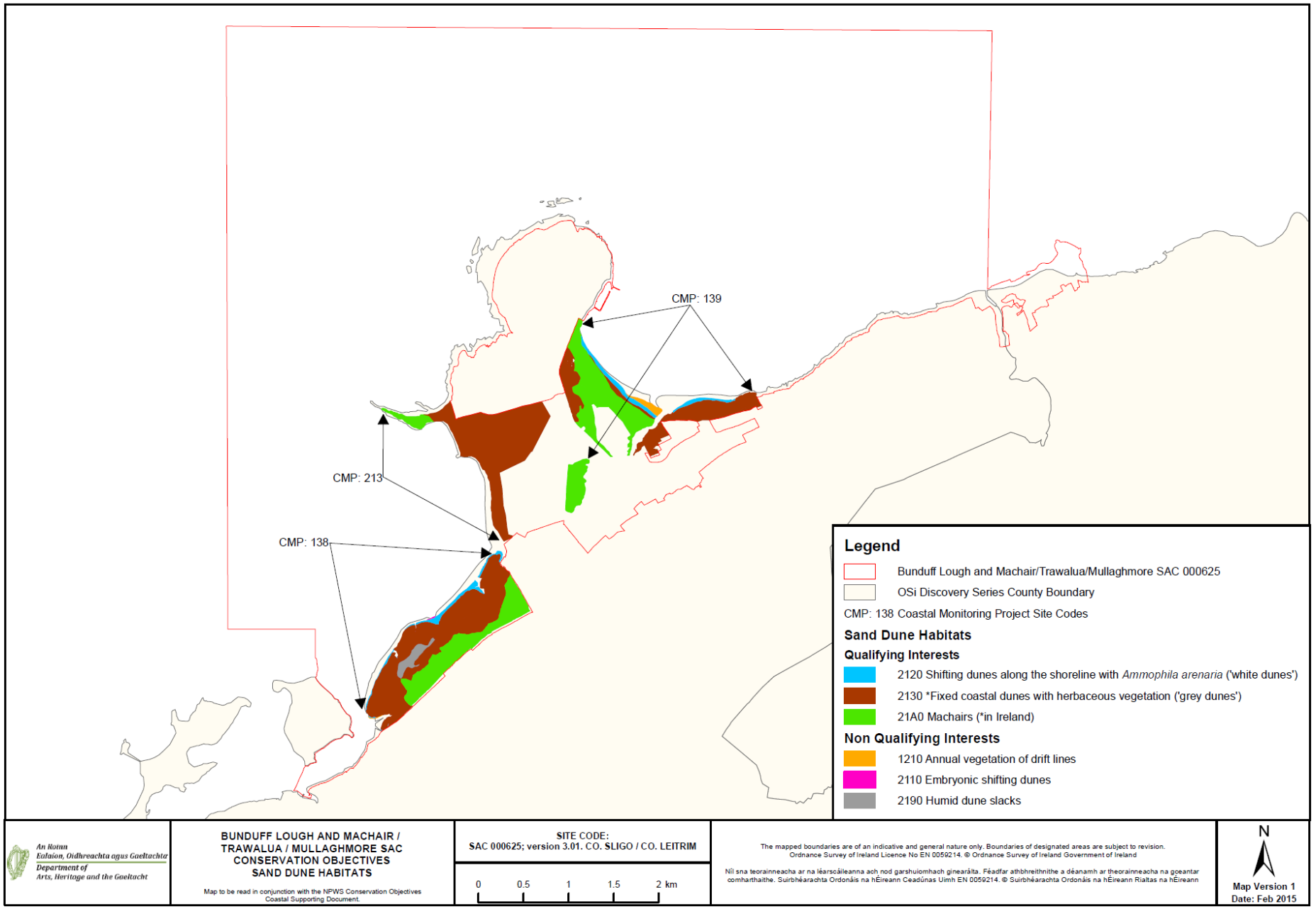
Appendix I – Distribution map of sand dune habitats within Bunduff Lough and Machair/Trawalua/Mullaghmore SAC



Appendix II – Trawalua strand & Mullaghmore site report and habitat map from the Coastal Monitoiring Project (Ryle *et al*., 2009)

SITE DETAILS

CMP06 site name: **Trawalua Strand & Mullaghmore** CMP06 site code: **138**

CMP Map No.: **135**

County: **Sligo** Discovery map: **16** Grid Reference: **G696 546 & G715 565**

6 inch Map No.: **Sl 02, 03 & 05**

Aerial photographs (2000 series): **O 0711-B, C, D; O 0712-A, B, C; O 0736-A, B, C**

NPWS Site Name: **Bunduff Lough and Machair/ Trawalua**

NPWS designation: pNHA: **625** cSAC: **625**

Other Designation Blue Flag - **Mullaghmore**

Ranger Area: **Sligo**

MPSU Plan: **Draft 2 Consultation 2004**

Report Author**: Melinda Swann**

SITE DESCRIPTION

Trawalua sand dunes are situated south of the village of Mullaghmore in County Sligo and 18km north of Sligo town. They are part of the cSAC 625, Bunduff Lough and Machair/Trawalua. The site is adjacent to Bunduff machair, which is, discussed elsewhere in this report (CMP 139). The area of Mullaghmore (code 213) (located between Trawalua and Bunduff) was originally part of the Trawalua site. Some parts however, are now under private ownership (Classiebawn Estate) and therefore this part of the site was not surveyed (see end of the report). Trawalua, Mullaghmore and Bunduff are generally low-lying and include a good diversity of coastal, aquatic and marine habitats. The Annex I habitats for which the overall cSAC has been proposed for designation are 'Machair', 'Fixed coastal dunes with herbaceous vegetation' (Grey dunes), 'Shifting dunes along the shoreline with *Ammophila arenaria*', 'Alkaline fen', 'Large shallow inlets and bays', 'Tidal mudflats' as well as 'Orchid-rich grassland'. In addition, the site is also selected as a cSAC for the liverwort, *Petalophyllum ralfsii* (Petalwort), which is listed on Annex II of the E.U. Habitats Directive. This species does not occur at Trawalua but has been recorded at Bunduff in 2003 (Hodgetts, 2003).

Both sites have extensive areas of machair that occur mostly in the flat areas between the fixed dune ridges and the areas of alkaline fen/marsh vegetation. Although areas with typical dry machair grassland can be found close to dune ridges, much of the habitat is wetter than is usually seen and there are large areas that are considered to be transitional to the Annex I habitat, alkaline fen. Alkaline fen vegetation is best developed to the south-west of Bunduff Lough. Machair at this site is the best example in Co. Sligo, and one of the best in northwest Ireland (MPSU 2004).

Fixed coastal dune habitat is also well represented at the sites, with a large area of fixed dunes backing Trawalua strand and a smaller area at Bunduff. Both Trawalua and Bunduff strands are long, sandy beaches. Other terrestrial habitats encountered within the site include reedbeds, wet woodland, scrub, sea cliffs, grassland, maritime heath and small areas of juniper scrub.

As mentioned Mullaghmore Point as well as Classiebawn Woods separates Trawalua from Bunduff. Classiebawn Wood is plantation woodland of Maritime Pine (*Pinus pinaster*). Trawalua (area surveyed) is a commonage, and the main land use is light to moderate grazing by sheep, cattle and horses. Outwintering of stock with supplementary feeding of baled silage occurs in several areas. Recreational activities are moderate at Trawalua. The most popular recreational activity is horse riding and takes place frequently along the beach and across the machair. Some camping also occurs on the sand dunes. Hunting and shooting occurs extensively throughout both sites.

This overall cSAC contains a good range of habitats and in particular the machair is important as it is intact and has not been sub-divided by fences.

The current survey concentrates on the Annex I sand dune habitats and includes annual strandline, embryonic dunes, mobile dunes, fixed dunes and machair. The areas of Annex I sand dune habitats recorded at Trawalua are shown in Table 138A.

Table 138A Areas of EU Annex I habitats mapped at Trawalua

EU Code	EU Habitat	Area (ha)
H21A0	Machair	33.389
H2130	Fixed coastal dunes with herbaceous vegetation	75.732
H2190	Humid dune slacks	5.469
H2120	Shifting dunes along the shoreline with *Ammophila arenaria*	5.033
H2110	Embryonic shifting dunes	0.044
H1210	Annual vegetation of driftlines	0.150
	Total Sand dune	119.817

Note: See Mullaghmore areas at the end of this report

Machair (H21A0)

The machair habitat comprises 33.4ha (approximately 27.9 %) of the total sand dune habitat at Trawalua (Table 138A). The machair is species-rich and has small hummocks throughout with wet species dominating the tops such as *Hydrocotyle vulgaris* (Marsh pennywort), *Equisetum* spp. (Horsetail spp.) as well as *Anagallis tenella* (Bog pimpernel). The machair is very grassy with an abundance of *Cirsium dissectum* (Marsh thistle) giving the appearance of a meadow/wet machair habitat. At the southern end of the habitat, the machair forms a mosaic with hollows and flushes containing species such *as Mentha aquatica* (Water mint), *Potentilla anserina* (Silverweed), *Ranunculus flammula* (Lesser spearwort) and *Juncus* spp. (Rush spp.). Furthermore, in some areas of the machair there are patches containing *Salix repens* (Creeping willow). There is a small river in the northeast of the site, which is the boundary of the site (i.e. boundary to Mullaghmore – not surveyed). The river was quite murky in appearance, probably due to the surrounding peaty hinterland. This is also the main access point onto the site for the horse riders. The machair is separated from the surrounding agricultural land by a wall. This is the southeastern boundary of the site and beyond this the land gently rises to form hills. Overall the machair is in very good condition and is one of the best machair sites in Ireland.

The typical species of machair found at Trawalua include *Lotus corniculatus* (Common bird's-foot-trefoil), *Bellis perennis* (Daisy), *Carex arenaria* (Sand sedge), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Carex flacca* (Glaucous sedge), *Carex nigra* (Common sedge), *Prunella vulgaris* (Selfheal), *Trifolium repens* (White clover), *Thymus polytrichus* (Wild thyme), *Cerastium fontanum* (Common mouse-ear), *Achillea millefolium* (Yarrow), *Viola* spp. (Violet spp.), *Potentilla anserina* (Silverweed), *Hydrocotyle vulgaris* (Marsh pennywort) and *Euphrasia officinalis* agg. (Eyebright).

Other species include *Ranunculus repens* (Creeping buttercup), *Pilosella officinarum* (Mouse-ear-hawkweed), *Luzula campestris* (Field wood-rush), *Poa pratensis* (Smooth meadow grass), *Poa* spp. (Meadow grass), *Leontodon saxatilis* (Lesser hawkbit), *Equisetum* spp. (Horsestail), *Hypochaeris radicata* (Cat's-ear), *Anagallis tenella* (Bog pimpernel), *Polygala vulgaris* (Common milkwort), *Phleum arenarium* (Sand cat's-tail), *Ammophila arenaria* (Marram grass), *Veronica* spp. (Speedwell), *Poa* spp. (Meadow grass), *Danthonia decumbens* (Heath-grass), *Eleocharis* spp. (Spike-rush), *Juncus articulatus* (Jointed rush), *Plantago maritima* (Sea plantain), *Poa annua* (Annual meadow-grass), *Taraxacum* agg. (Dandelion), *Sagina procumbens* (Procumbent pearlwort), *Carex pulicaris* (Flea sedge), *Festuca rubra* (Red fescue), *Briza media* (Quaking-grass), *Nardus stricta* (Mat-grass), *Agrostis stolonifera* (Creeping bent), *Cynosurus cristatus* (Crested dog's-tail) and *Lathyrus pratensis* (Meadow vetchling).

The typical bryophyte noted is *Rhytidiadelphus squarrosus,* as well as other species such as *Aulacomnium* spp., and *Climacium dendroides.*

Negative indicators noted include *Holcus lanatus* (Yorkshire fog), *Senecio jacobaea* (Common ragwort) and *Lolium perenne* (Perennial rye-grass), but these species are not widespread and occur at low cover-rates.

Fixed Dunes (H2130)

The priority habitat, fixed dune comprises 75.7ha (approximately 63.2%) of the total sand dune habitat at Trawalua (Table138A). The fixed dune habitat is relatively intact at this site. However, there is some erosion to the front of the habitat and there are many examples of slumped vegetation and some blowouts and sandy tracks are present. The dunes are quite high and are undulating in appearance. Towards the seaward side of the habitat there are areas consisting of semi-fixed dunes. There are high amounts of *Ammophila arenaria* (Marram grass) hummocks interspersed with short sward, however in some places there is quite a tall sward with *Festuca rubra* (Red fescue) dominating. There is also an abundance of agricultural weeds towards the front of the habitat, in the northern part of the site. Throughout the habitat there is an extensive cover of bryophytes. The *A. arenaria* decreases towards the landward side of the dunes in the northeastern part of the site. Here there is a more tightly

grazed sward with some eroded areas. Some areas of bare sand are now re-vegetating and there is a patch of exposed tree stumps, indicating the site was previously wooded. This fixed dune grassland then grades into a flat machair plain. The fixed dunes have signs of disturbance from animals in some places, with an abundance of agricultural weeds present. This is especially apparent in the far south of the site where cattle use some of the hollows for shelter. There is an abundance of weed species here, such as *Cirsium* spp. (Thistle spp.) and *Urtica dioica* (Common nettle). Another area towards the river, in the northeast of the site also contains a high cover of agricultural weeds and old tracks. This area seems to have been used regularly in the past by the pony trekkers, but is now recovering. The cattle and sheep roam freely over the fixed dune and the machair habitat. There are also rabbit burrows present, but no rabbits were seen on the day of survey, except for dead carcasses. Some burning was evident in the south of the habitat in the form of a small patch of burnt *A. arenaria* (Marram grass). However, this may have been accidental, as there was a cigarette butt in the vicinity.

Typical species recorded in the fixed dunes are *Anthyllis vulneraria* (Kidney vetch), *Lotus corniculatus* (Common bird's-foot trefoil), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Carex arenaria* (Sand sedge), *Carex flacca* (Glaucous sedge), *Thymus polytrichus* (Wild thyme), *Centaurium erythraea* (Common centaury), *Euphrasia officinalis* agg. (Eyebright), *Trifolium repens* (White clover), *Festuca rubra* (Red fescue), *Luzula* campestris (Field wood-rush), *Hypochaeris radicata* (Cat's-ear), *Pilosella officinarum* (Mouse-ear-hawkweed), *Crepis capillaris* (Smooth hawk's-beard), *Prunella vulgaris* (Selfheal), *Rhinanthus minor* (Yellow-rattle), *Geranium molle* (Dove's-foot crane's-bill), *Arrhenatherum elatius* (False oat-grass), *Veronica chamaedrys* (Germander speedwell), *Viola tricolor* subsp. *Curtisii* (Wild pansy), *Viola* spp. (Violet spp.) *Peltigera* spp. (Peltigera spp.), *Sedum acre* (Biting stonecrop) and *Cerastium fontanum* (Common mouse-ear).

Other species found in the fixed dunes are *Taraxacum* agg. (Dandelion), *Poa* spp. (Meadow grass), *Anacamptis pyramidalis* (Pyramidal orchid), *Ammophila arenaria* (Marram grass), *Bellis perennis* (Daisy), *Ranunculus bulbosus* (Bulbous buttercup), *Ranunculus repens* (Creeping buttercup), *Ranunculus acris* (Meadow buttercup), *Leucanthemum vulgare* (Oxeye daisy), *Holcus lanatus* (Yorkshire-fog), *Arenaria*

serpyllifolia (Thyme-leaved sandwort), *Leontodon saxitilis* (Lesser hawkbit), *Leontodon autumnalis* (Autumn hawkbit), *Campanula rotundifolia* (Harebell), *Dactylis glomerata* (Cock's-foot), *Anthoxanthum odoratum* (Sweet vernal-grass), *Potentilla erecta* (Tormentil), *Trifolium pratense* (Red clover), *Heracleum sphondylium* (Hogweed) and *Schoenus nigricans* (Black bog-rush).

The typical mosses found are *Rhytidiadelphus squarrosus, Rhytidiadelphus triquetrus* and *Tortula ruraliformis*. Other mosses present include *Scleropodium purum, Hylocomium splendens, Homalothecium lutescens* and *Calliergonella cuspidata.*

The negative indicator species *Senecio jacobaea* (Common ragwort), *Cirsium vulgare* (Spear thistle), *Lolium perenne* (Perennial rye-grass), *Urtica dioica* (Common Nettle) are found throughout the habitat.

Dune slack (H2190)

There is a relatively large dune slack located behind the fixed dunes in the south of the site. It is composed of low-growing *Salix repens* (Creeping willow) and is grazed by sheep and cattle. There are low, fixed dune ridges towards the back of the slack and in some places the slack grades into the machair. It is a wet slack with cover of *S. repens* accounting for approximately 60% of the slack.

The dune slack vegetation is characteristic of the EU Annex I habitat type, Humid dune slack (H2190). The area of the dune slack comprises approximately 5.5ha (approximately 4.6%) of the total sand dune habitat (Table 138A). The typical species found in the dune slack include *Carex flacca* (Glaucous sedge), *Carex arenaria* (Sand sedge), *Carex nigra* (Common sedge), *Hydrocotyle vulgaris* (Marsh Pennywort), *Mentha aquatica* (Water mint), *Ranunculus flammula* (Lesser spearwort), *Salix repens* (Creeping willow), *Juncus* spp. (Rush spp.), *Galium palustre* (Common marsh-bedstraw), *Potentilla anserina* (Silverweed), *Leontodon autumnalis* (Autumn hawkbit), *Prunella vulgaris* (Selfheal) and *Holcus lanatus* (Yorkshire-fog).

Other species include *Festuca rubra* (Red fescue), *Cardamine pratensis* (Cuckooflower), *Trifolium repens* (White clover), *Cerastium fontanum* (Common Mouse-ear), *Lotus corniculatus* (Common bird's-foot-trefoil), *Plantago lanceolata* (Ribwort plantain), *Euphrasia officinalis* agg. (Eyebright), *Hypochaeris radicata*

(Cat's-ear), *Crepis capillaris* (Smooth hawk's-beard), *Rhinanthus minor* (Yellow-rattle), *Cynosurus cristatus* (Crested dog's-tail), *Poa* spp. (Meadow grass), *Bellis perennis* (Daisy), *Anagallis tenella* (Bog pimpernel), *Arenaria serpyllifolia* (Thyme-leaved sandwort), *Vicia cracca* (Tufted vetch), *Cirsium dissectum* (Meadow thistle), *Rumex acetosella* (Sheep's sorrel), *Filipendula ulmaria* (Meadowsweet), *Galium saxitilis* (Heath bedstraw), *Ranunculus repens* (Creeping buttercup) and *Agrostis stolonifera* (Creeping bent).

The typical moss *Calliergonella cuspidata* is abundant and the moss *Rhytidiadelphus squarrosus* is also found in the habitat.

The negative indicators *Senecio jacobaea* (Common ragwort), *Lolium perenne* (Perennial rye-grass) and *Cirsium arvense* (Creeping thistle) are abundant throughout the habitat.

Mobile Dunes (H2120)

The mobile dune habitat comprises 5.033ha (approximately 4.2%) of the total sand dune habitat at Trawalua (Table 138A). The mobile dunes are relatively tall, approximately 3-4 meters above the level of the beach. They are mainly intact, however in some areas the habitat is eroded with, in places a discontinuous appearance. In the south of the site especially, there are places where the mobile dunes are absent and instead there is slumped fixed dune vegetation. Unhealthy *Ammophila arenaria* (Marram grass) can be found in these areas. This is most probably due to horse riding activities through the habitat as well as natural erosion. In other areas of the site, where sand accretion has occurred, the mobile dunes are re-vegetating in front of slumped fixed dunes. Furthermore towards the middle of the beach there is a distinct wide band of vegetation that has re-colonised a previously eroded area. There are a number of blowouts through the habitat and the horse riding activities affects the regeneration of vegetation.

The typical species *Ammophila arenaria* (Marram grass) dominates the habitat. There is also a constant component of *Elytrigia juncea* (Sand Couch) throughout the mobile dunes. Also abundant through the habitat is *Tussilago farfara* (Colt's foot).

Embryonic Dunes (H2110)

Embryonic dunes account for 0.044ha (approximately 0.037%) of the total sand dune habitat at Trawalua (Table138A). The embryonic dune habitat is not well developed at this site. There is only one small area located in a re-vegetating track. Here the vegetation is sparse in appearance and therefore was deemed not worthy of monitoring on this occasion. The habitat may be unable to develop as a result of the horse riding activities. The dominant species found in the embryonic dunes is *Elytrigia juncea* (Sand couch).

Strandline (H1210)

The strandline habitat constitutes 0.150ha (approximately 0.125%) of the total sand dune habitat at Trawalua. Strandline habitat is minimal at the site with only one short band located in the far southwest of the beach. It is sparsely vegetated by *Cakile maritima* (Sea rocket) and *Salsola Kali* (Saltwort).

IMPACTS

The main impacts on the sand dune habitat at Trawalua are given in Table 138B. The machair habitat is grazed (Code 140) by cattle and sheep as well as horses, which is a positive influence at the site, as it keeps the sward height low and therefore species diversity high. Pony-trekking and walking (Code 622) occurs across the habitat.

The fixed dune is also grazed (Code 140) but to a lesser extent. This is a positive impact as it keeps the species diversity high. Some of the fixed dune is under-grazed (Code 149) and in places there is an abundance of agricultural weeds. There are rabbit burrows amongst the fixed dune but the population seems to have been diminished as a result of shooting (Code 290). There was a high number of rabbit carcasses scattered at the back of the fixed dune. Some littering (Code 700) and burning (Code 180) was evident on the day of survey, but at a low level. The fixed dunes are naturally eroded (Code 900) in some places along the frontline. There are also some blowouts apparent at the site. High levels of pony-trekking (Code 622) affect the habitat as well as some walking and camping in the dunes (Code 608).

The mobile dune is affected by natural erosion (Code 900), as well as walking and pony-trekking (Code 622). Some litter has also washed up on the beach (Code 700).

The embryonic dunes and strandline are prone to natural erosion (Code 900) and to disturbance by walking and pony trekking (Code 622). It is difficult to assess the area affected by natural erosion, as there is no previous data available and therefore the area affected appears as 'Unknown' in table 138B.

Table 138B Intensity and impact of various activities on sand dune habitats at Trawalua

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H21A0	140	B	0	33.4	Inside
H21A0	622	B	-1	3.34	Inside
H2130	140	B	+2	37.8	Inside
H2130	149	B	-1	37.8	Inside
H2130	180	C	-1	Unknown	Inside
H2130	290	A	-1	Unknown	Inside
H2130	608	C	-1	Unknown	Inside
H2130	622	A	-1	30.28	Inside
H2130	700	C	-1	0.1	Inside
H2130	900	A	0	0.7	Inside
H2120	622	A	-1	1	Inside
H2120	700	C	-1	0.5	Inside
H2120	900	B	0	Unknown	Inside
H2110	622	A	-1	Unknown	Inside
H2110	900	A	0	Unknown	Inside
H1210	622	A	-1	0.150	Inside
H1210	900	A	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

CONSERVATION STATUS

The conservation status of a site is assessed on the condition of the site with regards to the extent, structure and functions and the future prospects of the habitat. The main source of baseline information for this site was from the NATURA 2000 report, the Biomar Survey (1996) and the MPSU management plan. It must be noted that the above-mentioned surveys may be superceded by information collected during the current survey.

Table 138C Conservation status of Annex I sand dune habitats at Trawalua

Habitat[1]	EU CONSERVATION STATUS ASSESSMENT			Overall EU conservation status assessment	Proposed Irish conservation status system[2]
	Favourable	**Unfavourable - Inadequate**	**Unfavourable - Bad**		
Machair (H21AO)	Extent Structure & functions Future Prospects			**Favourable**	Favourable-Maintained
Fixed Dunes (H2130)		Extent Structure & functions Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining
Dune slack (H2190)	Extent Structure & functions Future Prospects			**Favourable**	Favourable-Maintained
Mobile dunes (H2120)	Structure & functions	Extent Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining

[1]EU Codes as per Interpretation Manual
[2]Ratings are Favourable (Enhanced, Maintained, Recovered, Declining), Unfavourable (Recovering, Unchanged, Declining) and Destroyed (Partially destroyed, Completely destroyed and Unknown)

Details of the numbers and pass/failure rates of monitoring stops used to assess habitat structure & functions at Trawalua are shown in Table 138D.

Machair (H21A0)

The machair habitat is well represented at this site. The extent of the machair is therefore considered *favourable*. The NATURA 2000 assessment is *excellent representativity*, meaning the machair is well developed at the site and is one of the best examples of the habitat in the country.

The structure and functions parameter is rated as *favourable*. All eight monitoring stops passed their targets (Table 138D), although in some cases the sward was quite tall. Overall species diversity is high throughout the machair. The NATURA 2000 assessment is *excellent structure*. This means that the machair is in very good condition at the site.

Quadrats taken from the Biomar machair survey have also been used to compare past and present condition of the site. The closest quadrats to the 2006 monitoring stops are used for comparison and this provides a good indicator of any change in species composition as well as sward height. The criteria used during the current survey

(2006) are applied to quadrats in the machair survey (1996). Five monitoring stops were compared to five quadrats taken in 1996. All the 1996 quadrats passed the current criteria. All the monitoring stops in the current survey also passed. Therefore, the condition of the site does not seem to have changed between surveys.

Table 138D Monitoring stop totals and pass/failure rates of Annex I sand dune habitats at Trawalua

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	8	0	**Favourable**
Fixed dunes (H2130)	7	1	**Unfavourable- inadequate**
Dune Slack (H2190)	2	0	**Favourable**
Mobile dunes (H2120)	3	0	**Favourable**

The future prospects of the machair at Trawalua are rated as *favourable*. There is currently no development and current recreational activities are relatively low, and do not appear to be impacting the habitat. This assessment corresponds to the assessment made in the NATURA 2000 form of *excellent future prospects.* The MPSU Management Plan (2000) also states that the Commonage Framework Plan for the site, specifies a stocking level of less than 10% at Trawalua and that therefore no de-stocking is required (this also includes the fixed dune habitat). The machair itself is a feature of local distinctiveness for the area and therefore, should be maintained in its current condition.

An overall EU conservation status of *favourable* is assigned to the machair (Table 138C).

The overall Irish conservation status is *favourable-maintained.*

Fixed dunes (H2130)

The extent of the fixed dune is rated as *unfavourable-inadequate* as there are a significant number of tracks caused by horse riding throughout the habitat (although bare sand is <10% of the whole habitat). Any re-vegetation of the tracks is mostly prevented by this activity.

The structure and functions of the fixed dune are rated as *unfavourable-inadequate.* This is as a result of one of the eight monitoring stops failing. The monitoring stop failed as a result of sward height and cover of agricultural weeds.

The future prospects for the fixed dune are rated as *unfavourable-inadequate.* The lack of large grazers in some areas of the fixed dunes means that there is undergrazing occurring. In some areas of the site there is a high cover of agricultural weeds. There is also a large threat to the structure of the habitat as a result of the pony trekking. The NATURA 2000 assessment is *good future prospects.* A feature of local distinctiveness for this habitat is the abundance of *Anacamptis pyramidalis* (Pyramidal orchid). In order to maintain species diversity, it is important that the fixed dune habitat be monitored and managed with this species in mind.

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

Dune Slacks (H2190)

There is only one example of a dune slack occurring at Trawalua. It is located in the southwestern end of the site. The extent is rated as *favourable* as there is no apparent decline in the area of dune slack.

Two monitoring stops were placed in the slack as it was a relatively large area (5.5ha) and there was only one example at the site. Both monitoring stops passed (Table 138D). The structure and functions parameter is therefore rated as *favourable*. The slack is wet with high species diversity.

The future prospects for the dune slack at this site are considered *favourable* on the basis that there is no overgrazing and the natural functioning of the habitat is flourishing.

Based on the above parameters the current overall EU conservation status of dune slack at Trawalua is rated as *favourable* (Table 138C).

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

Mobile Dunes (H2120)

The extent of the mobile dunes at Trawalua is considered to be *unfavourable-inadequate*. There is mostly good development of the habitat at the site, however there are areas that have been damaged as a result of the pony trekking and in places is preventing re-vegetation occurring.

The structure and functions of the habitat are rated as *favourable*. Three monitoring stops were carried out in the mobile dunes, as fourth stop was not possible as the habitat decreases in area towards the east of the beach. All three monitoring stops passed. The cover of unhealthy *Ammophila arenaria* (Marram grass) is patchy and the overall habitat is intact. The steep mobile dune ridge indicates that there has been natural erosion in the past with a removal of the front of the mobile dunes. Recent accretion however, has allowed re-development of mobile dunes.

The future prospects of the habitat are rated as *unfavourable-inadequate*. This is due to the high levels of pony trekking that occurs across the habitat. This activity will decrease the extent of the habitat further in the future, if it is allowed to continue at the current level. The NATURA 2000 assessment is rated as *good conservation value* (for the cSAC as a whole). The MPSU Management Plan states that NPWS will monitor the effects of recreation and amenity use within the mobile dune habitat and liase with users to establish controls on usage where necessary. This management plan should therefore be carried out where possible.

The overall EU assessment is rated as *unfavourable-inadequate.*

The overall Irish assessment is *unfavourable -declining.*

There is very little presence of embryonic dunes and strandline at Trawalua and no distinct zonation pattern. This may simply be a case of the system recovering from a phase of natural erosion. However, high levels of disturbance by the pony trekking

may be preventing development of new vegetation. Therefore there is no conservation assessment for the two habitats at this site.

MULLAGHMORE

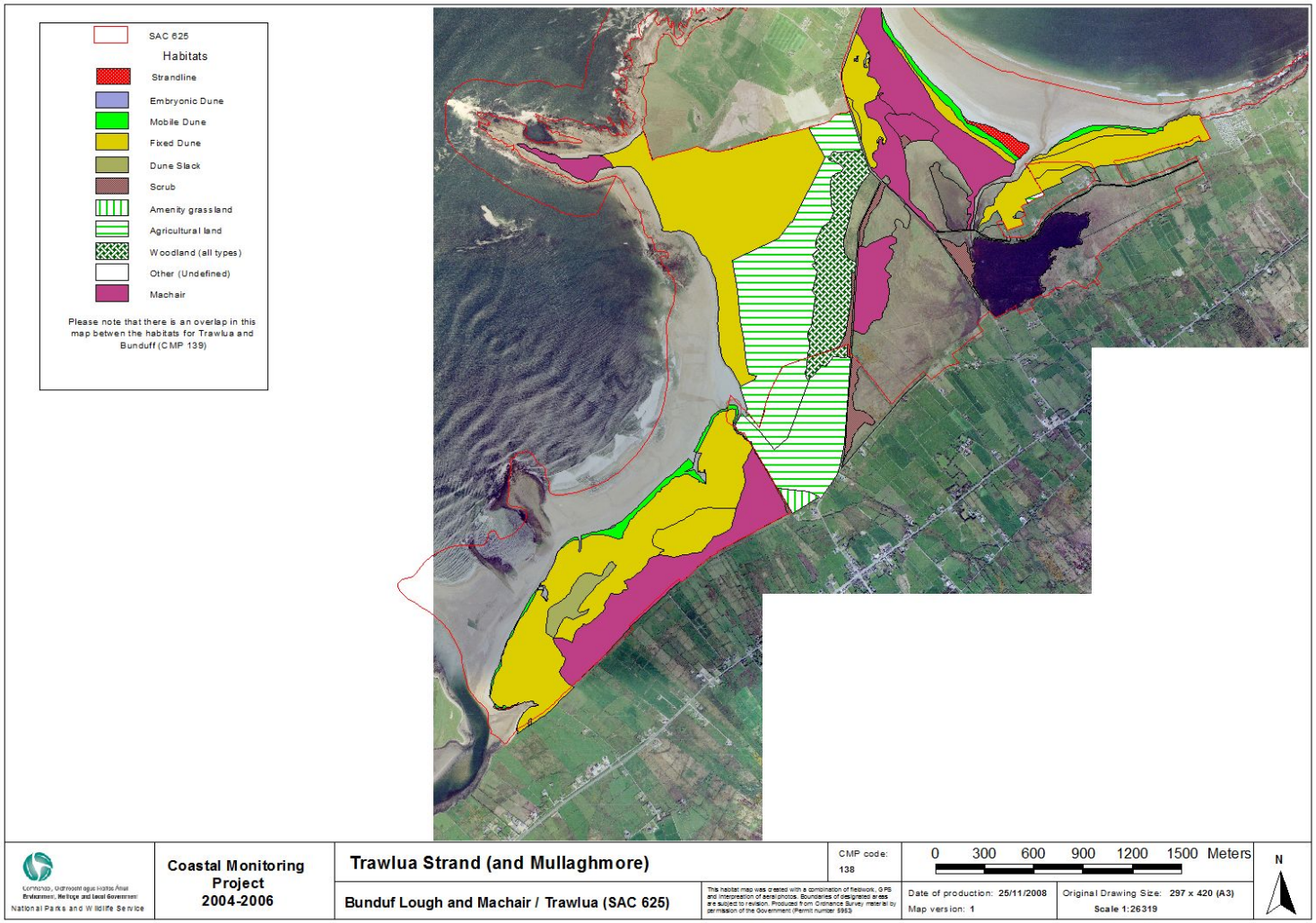
SITE DESCRIPTION

Mullaghmore is located between the sites of Trawalua (CMP site code 138) and Bunduff (CMP site code 139). The area is partly owned by the Classiebawn Estate. The site was not surveyed during 2006. However, an estimation of the sand dune habitats present at the site has been made using aerial photographs (2000 series) and past habitat maps (MPSU 2000). It is estimated that the area still retains fixed dune and small patches of machair. However there seems to be large tracks of land, which have been converted into agricultural holdings. The estimated areas of the above mentioned habitats are listed below in Table 1.

Table 1 Estimated Areas of EU Annex I habitats at Mullaghmore

EU Code	EU Habitat	Area (ha)
H21A0	Machair	4.181
H2130	Fixed coastal dunes with herbaceous vegetation	70.865
	Total Sand dune	75.046
Other Habitats		
	*Agricultural Grassland/Amenity Grassland	90.500
	*Forestry/Scrub	29.05
	Total Other Habitats	120.55

* Accounts for former sand dune habitat.


SAC 625
Habitats
Strandline
Embryonic Dune
Mobile Dune
Fixed Dune
Dune Slack
Scrub
Amenity grassland
Agricultural land
Woodland (all types)
Other (Undefined)
Machair
Please note that there is an overlap in this map betwen the habitats for Trawlua and Bunduff (CMP 139)
Coimisiún, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government
National Parks and Wildlife Service
Coastal Monitoring Project 2004-2006
Trawlua Strand (and Mullaghmore)
CMP code: 138
0 300 600 900 1200 1500 Meters
N
Bunduf Lough and Machair / Trawlua (SAC 625)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5963)
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:26319

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

SITE DETAILS

CMP06 site name: **Bunduff** CMP06 site code: **139** CMP Map No.: **136**

County: **Sligo** Discovery map: **16** Grid Reference: **G715 565**

6 inch Map No.: **Sl 02, 03**

Aerial photographs (2000 series): **O 0711-B, C, D; O 0712-A, B, C; O 0736-A, B, C**

NPWS Site Name: **Bunduff Lough and Machair/Trawalua**

NPWS designation: pNHA: **625** cSAC: **625**

Other Designations - Blue Flag - **Mullaghmore**

Ranger Area: **Sligo**

MPSU Plan: **Draft 2 Consultation 2004**

Report Author: **Melinda Swann**

SITE DESCRIPTION

Bunduff machair is situated south of the village of Mullaghmore in County Sligo and 18km north of Sligo town. It is part of the overall cSAC 625, Bunduff Lough and Machair/Trawalua. The site is adjacent to Trawalua (CMP site code 138) sand dunes, which are discussed elsewhere in this report. The two sites are generally low-lying and include a good diversity of coastal, aquatic and marine habitats. The Annex I habitats for which the overall cSAC has been proposed for designation are 'Machair', 'Fixed coastal dunes with herbaceous vegetation' (Grey dunes), 'Shifting dunes along the shoreline with *Ammophila arenaria*', 'Alkaline fen', 'Large shallow inlets and bays', 'Tidal mudflats' as well as 'Orchid-rich grassland'. In addition, the site is also selected as a cSAC for the liverwort, *Petalophyllum ralfsii* (Petalwort), a species listed on Annex II of the E.U. Habitats Directive. The species was last recorded at the site in 2003 (Hodgetts, 2003). Bunduff is commonage, and the main land use is light to moderate grazing by sheep, cattle and horses. Out-wintering of stock with supplementary feeding of baled silage occurs in several areas.

Both sites have extensive areas of machair that occur mostly in the flat areas between the fixed dune ridges and the areas of alkaline fen/marsh vegetation. Although areas with typical dry machair grassland can be found close to dune ridges, much of the habitat is wetter than is usually seen and there are large areas that are considered to be transitional to the Annex I habitat, alkaline fen. Alkaline fen vegetation is best developed to the southwest of Bunduff Lough. Machair at this site is the best example in Co. Sligo, and one of the best in northwest Ireland (MPSU 2004).

Fixed coastal dune habitat is also well represented at the site, with a small area at Bunduff and a larger area of fixed dunes backing Trawalua strand. Both Trawalua and Bunduff strands are long, sandy beaches. Other terrestrial habitats encountered within the site include reedbeds, wet woodland, scrub, sea cliffs, wet grassland, maritime heath and small areas of juniper scrub. There are two small areas of orchid-rich calcareous grassland in the eastern part of Bunduff, towards the back of the fixed dune grassland.

Many nesting birds use the sea cliffs, including *Pyrrhocorax pyrrhocorax* (Chough) (an Annex I Birds Directive species). Bunduff Lough and the surrounding areas is also an important area for wildfowl, including *Cygnus cygnus* (Whooper Swan) (Annex I), *Anas platyrhynchos* (Mallard), *Anas penelope* (Wigeon), *Anas clypeata* (Shoveler), *Aythya ferina* (Pochard*), Aythya fuligula* (Tufted Duck), *Cygnus olor* (Mute Swan), *Anas crecca* (Teal) and *Anser albifrons flavirostris* (Greenland White-fronted Goose) (Annex I).

Recreational activities are quite high at Bunduff, as Mullaghmore village is a popular holiday destination. Bunduff strand is a Blue Flag beach and there is a lifeguard hut located at the western end of the beach. The strand is very busy during the summer months and the bay is a popular site for boating and water sports. Some camping also occurs on the sand dunes and shooting and fishing occurs around Bunduff Lough. The River Duff on the northeastern edge of the site is a popular freshwater fishing area, as well as an occasional venue for canoeing during flood conditions. As there are a number of Annex I bird species, which use the Lough and surrounds, shooting in this area should be prevented.

This overall cSAC contains a good range of habitats and in particular the machair is important as it is intact and has not been sub-divided by fences.

The current survey concentrates on the Annex I sand dune habitats and includes annual strandline, mobile dunes, fixed dunes (priority E.U. habitat) and machair (priority habitat in Ireland). The areas of Annex I sand dune habitats recorded at Bunduff are shown in Table 139A.

Table 139A Areas of EU Annex I habitats mapped at Bunduff

EU Code	EU Habitat	Area (ha)
H21A0	Machair	48.905
H2130	Fixed coastal dunes with herbaceous vegetation	40.021
H2120	Shifting dunes along the shoreline with *Ammophila arenaria*	5.1
H1210	Annual vegetation of driftlines	2.282
	Total Sand dune	96.308

Machair (H21A0)

The machair habitat comprises 48.9ha (approximately 50.8%) of the total sand dune habitat at Bunduff (Table 139A). The machair is species-rich and grades into fixed dune in the northeast and west, as well as into the Annex I habitat alkaline fen, to the southeast. The machair is dry in the north of the site but grades into wetter areas and forms a mosaic with fen species towards the lake. Throughout the habitat there is an extensive cover of bryophytes. There is no sign of re-seeding however, in the most westerly part of the machair, near to the car park, there are patches of agricultural weeds indicating disturbance. This may be where supplementary feed is provided. There is also some erosion of the front of the machair here, at the beach edge, as a result of recreational pressure. There is some *Ulex europaeus* (Gorse) scrub in the middle of the machair, which may spread further, in time. There were two pairs of *Carduelis cannabina* (Common linnet) nesting in the gorse here.

There is a small track that runs through the machair and has heath species present such as *Calluna vulgaris* (Ling heather). There are flushes present on either side of this track, which form mosaics with the wet machair. Cattle were grazing the habitat on the day of survey and there was some supplementary feed present near the gorse. No sheep or horses were present on the survey day but may graze the site also.

There are small ridges consisting of *Ammophila arenaria* (Marram grass) in the south of the site, near to the road. Here species diversity is also high with an abundance of *Equisetum* spp. (Horsetail) and *Listera ovata* (Twayblade), as well as *Carlina vulgaris* (Carline thistle) present on the ridges. The ridges are surrounded by wet machair and to the north, the habitat grades into fen and then a lake. The fen is also present on the southwest side of the road and this then again, grades into machair. This machair would have been originally connected with the Trawalua machair to the south and west. The Classiebawn estate and the roads however have altered the system. At one stage the whole area of Bunduff, Mullaghmore and Trawalua would have been one large system. Overall the machair habitat at Bunduff is interesting with high species diversity and is one of the best intact machair sites in Ireland. The Annex II species *Petalophyllum ralfsii* (Petalwort) was searched for at the edge of the machair, but was not found on this occasion.

The typical species of machair found at Bunduff include *Lotus corniculatus* (Common bird's-foot-trefoil), *Bellis perennis* (Daisy), *Carex arenaria* (Sand sedge), *Carex nigra* (Common sedge), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Carex flacca* (Glaucous sedge), *Prunella vulgaris* (Selfheal), *Trifolium repens* (White clover), *Thymus polytrichus* (Wild thyme), *Cerastium fontanum* (Common mouse-ear), *Achillea millefolium* (Yarrow), *Viola tricolor* subsp. *curtisii* (Wild pansy), *Hydrocotyle vulgaris* (Marsh pennywort), *Linum catharticum* (Fairy flax), *Mentha aquatica* (Wild mint), *Coeloglossum viride* (Frog orchid), *Anacamptis pyramidalis* (Pyramidal orchid) and *Euphrasia officinalis* agg. (Eyebright).

Other species include *Ranunculus bulbosus* (Bulbous buttercup), *Ranunculus* spp. (Buttercup spp.), *Pilosella officinarum* (Mouse-ear-hawkweed), *Luzula campestris* (Field wood-rush), *Poa pratensis* (Smooth meadow grass), *Leontodon saxatilis* (Lesser hawkbit), *Leontodon autumnalis* (Autumn hawkbit), *Equisetum* spp. (Horsestail), *Hypochaeris radicata* (Cat's-ear), *Anagallis tenella* (Bog pimpernel), *Anagallis arvensis* (Scarlet pimpernel), *Polygala vulgaris* (Common milkwort), *Veronica chamaedrys* (Germander speedwell), *Briza media* (Quaking-grass), *Anthoxanthum odoratum* (Sweet vernal-grass), *Festuca rubra* (Red fescue), *Taraxacum* agg. (Dandelion), *Succisa pratense* (Devil's-bit scabious), *Rumex acetosella* (Sheep's sorrel), *Trifolium pratensis* (Red clover), *Blackstonia perfoliata*

(Yellow-wort), *Centaurium erythraea* (Common centaury), *Leucanthemum vulgare* (Oxeye daisy), *Danthonia decumbens* (Heath-grass), *Carex pulicaris* (Flea sedge), *Cynosurus cristatus* (Crested dog's-tail) and *Vicia cracca* (Tufted vetch). The wet machair forms a mosaic with the fen as it approaches the lough, here marsh/fen species such as *Pinguicula vulgaris* (Common butterwort), *Epipactus palustris* (Marsh helleborine) and *Lychnis flos-coculi* (Ragged-robin) are found.

Bryophytes noted in the machair are *Rhytidiadelphus squarrosus, Climacium dendroides, Homalothecium lutescens, Hypnum cupressiforme, Scleropodium purum, Pleurozium schreberi, Brachythecium albicans* and *Thuidium tamariscinum.*

Negative indicators noted include *Holcus lanatus* (Yorkshire fog) and *Senecio jacobaea* (Common ragwort).

Fixed Dunes (H2130)

The priority habitat, fixed dune comprises 40.021ha (approximately 41.6%) of the total sand dune habitat at Bunduff (Table139A). The fixed dune habitat is quite varied at Bunduff. As well as areas of fixed dune located at the seaward side of the site, there are low dune ridges located behind the machair. This is most probably remnants of the once larger fixed dune system, but has now been fragmented as a result of the Classiebawn estate. It is evident from past aerial photographs and previous studies that this is, the case and the fixed dune previously continued to the southwest, to connect with Trawalua. The remaining habitat is relatively intact at this site and is species-rich. However there has been some erosion of the fixed dune as the seaward side, as a result of recreational pressure at the site. Sand trap fences (chestnut paling) have been constructed at the front of the mobile dunes in one area, which in turn helps the fixed dune habitat. *Ammophila arenaria* (Marram grass) has also been planted here. Sligo County Council in association with the Department of Communications, Marine and Natural Resources, NPWS and the co-operation of the Mullaghmore community has implemented this project in order to encourage dune restoration. At the most easterly part of the beach the fixed dunes overlie sea cliffs and a pair of *Fulmarus glacialis* (Fulmar) were seen here on the day of survey.

The fixed dune habitat consists of *Ammophila arenaria* (Marram grass) hummocks interspersed with short sward. The *A. arenaria* decreases towards the landward side of the dunes in the northeastern part of the site. Here there is a typical short sward fixed dune grassland. This fixed dune grassland grades into wet areas, as well as orchid-rich calcareous grassland, (Annex I). Also here, the fixed dune grades into intensive agricultural holdings to the southeast. There is also an abundance of orchids present in the fixed dunes and species such as *Coeloglossum viride* (Frog orchid) and *Ophrys apifera* (Bee orchid) (Red Data Book species) can be found in the northeast of the site. Also in this area there are a number of low-growing *Juniperus communis* (Juniper) bushes scattered throughout the fixed dune as well as clumps of *Rosa pimpinellifolia* (Burnet rose). There are some supplementary feeding areas also located in the northeastern part of the fixed dunes and consist of bale wrapped hay and silage. Burnet rose (R. *pimpinellifolia)* is also associated with agricultural weeds, indicating supplementary feed may have been previously located here as well.

At the back of the fixed dune in the southwest of the site (behind the machair), there is a small football pitch. This is located on a flat area of fixed dune grassland, next to the road. Cattle, sheep and rabbits graze the overall fixed dune, although sheep were not present on the survey day. There were approximately 30 cattle on the site as well as another 15-20 cattle and a bull on the beach. There seems to be a large population of rabbits, (although none were seen on the day of survey) as there are many rabbit burrows present, which may be undermining the structure of the habitat. There are some blowouts present in the fixed dune at the back of the site, but these are beginning to re-vegetate. Throughout the habitat there is an extensive cover of bryophytes and the parasitic species *Cuscuta epithymum* (Dodder) is abundant across the dunes. A Common frog (*Rana temporaria*) was seen in the northeastern part of the fixed dune.

Typical species recorded in the fixed dunes are *Anthyllis vulneraria* (Kidney vetch), *Lotus corniculatus* (Bird's-foot trefoil), *Galium verum* (Lady's bedstraw), *Plantago lanceolata* (Ribwort plantain), *Carex arenaria* (Sand sedge), *Carex flacca* (Glaucous sedge), *Thymus polytrichus* (Wild thyme), *Centaurium erythraea* (Common centaury), *Euphrasia officinalis* agg. (Eyebright), *Trifolium repens* (White clover), *Festuca rubra* (Red fescue), *Luzula* campestris (Field wood-rush), *Hypochaeris*

radicata (Cat's-ear), *Pilosella officinarum* (Mouse-ear-hawkweed*), Crepis capillaris* (Smooth hawk's-beard), *Prunella vulgaris* (Selfheal), *Viola tricolor* subsp. *curtisii* (Wild pansy), *Viola* spp. (Violet spp.), *Linum catharticum* (Fairy flax), *Polygala vulgaris* (Common milkwort), *Poa pratensis* (Smooth meadow grass), *Campanula rotundifolia* (Harebell), *Veronica chamaedrys* (Germander speedwell), *Peltigera* spp. (Peltigera lichen), *Sedum acre* (Biting stonecrop) and *Cerastium fontanum* (Common mouse-ear).

Other species found in the fixed dunes are *Primula vulgaris* (Primrose), *Taraxacum* agg. (Dandelion), *Anacamptis pyramidalis* (Pyramidal orchid), *Ammophila arenaria* (Marram grass), *Bellis perennis* (Daisy), *Ranunculus bulbosus* (Bulbous buttercup), *Ranunculus* spp. (Buttercup spp.), *Leucanthemum vulgare* (Oxeye daisy), *Holcus lanatus* (Yorkshire-fog), *Arenaria serpyllifolia* (Thyme-leaved sandwort), *Leontodon saxitilis* (Lesser hawkbit), *Potentilla anserina* (Silverweed), *Potentilla erecta* (Tormentil), *Trifolium pratense* (Red clover), *Poa* spp. (Meadow grass), *Rumex acetosella* (Sheep's sorrel), *Parnassia palustris* (Grass-of-parnassus), *Centaurea nigra* (Common knapweed), *Coeloglossum viride* (Frog orchid), *Ophrys apifera* (Bee orchid), *Dactylorhiza* spp. (Marsh-orchid spp.), *Anthoxanthum odoratum* (Sweet vernal-grass), *Bellis perennis* (Daisy), *Equisetum* spp. (Horsestail), *Briza media* (Quaking-grass), *Cynosurus cristatus* (Crested dog's-tail), *Centaurea nigra* (Common knapweed), *Cuscuta epithymum* (Dodder), *Lathyrus pratensis* (Meadow vetchling), *Calluna vulgaris* (Ling heather), *Antennaria dioica* (Mountain everlasting), *Anagallis* spp. (Pimpernel spp.), *Carlina vulgaris* (Carline thistle), *Salix repens* (Creeping willow), *Blackstonia perfoliata* (Yellow-wort), *Danthonia decumbens* (Heath-grass) and *Selaginella selaginoides* (Lesser clubmoss).

Mosses found are *Rhytidiadelphus squarrosus, Rhytidiadelphus triquetrus, Scleropodium purum, Hylocomium splendens, Tortula ruraliformis, Homalothecium lutescens, Hypnum cupressiforme, Climacium dendroides, Thudium tamariscinum, Pleurozium schreberi* and *Calliergonella cuspidata.*

The negative indicator species *Senecio jacobaea* (Common ragwort), *Cirsium vulgare* (Spear thistle), *Cirsium arvense* (Creeping thistle), *Lolium perenne* (Perennial rye-grass) and *Rubus fruticosus* (Bramble) are found in the habitat.

Mobile Dunes (H2120)

The mobile dune habitat comprises 5.1ha (approximately 5.3%) of the total sand dune habitat at Bunduff (Table 139A). The mobile dunes are affected by natural erosion compounded by high recreational pressure at the site. Trampling and walking across the habitat has led to a loss of vegetation. A dune management project is now in place at the site in an attempt to restore the habitat. Fences in the form of chestnut paling have been erected at the western end of the beach for approximately 226 meters. However, there is evidence that people are still trampling behind the fences. Some fences have been broken and cattle have eaten the newly planted *A. arenaria* (Marram grass). This fencing needs to be maintained if the project is to be successful. More robust fencing may need to be considered. As a result of the recreational pressure the *A. arenaria* (Marram grass) has lost condition in some areas. The habitat improves further along the beach as sand accretion has occurred and there is less recreational pressure at this end of the site.

The typical species *Ammophila arenaria* (Marram grass) dominates the habitat. Other species present include *Tussilago farfara* (Colt's foot), *Anacamptis pyramidalis* (Pyramidal orchid), *Dactylorhiza* spp. (Marsh-orchid spp.), *Crepis capillaris* (Smooth hawk's-beard) and *Leucanthemum vulgare* (Oxeye daisy).

The negative indicator *Cirsium arvense* (Creeping thistle) is abundant at the western end of the beach, close to the fencing. It is also found scattered throughout the rest of the mobile dune habitat but declines in abundance towards the east of the beach.

Strandline (H1210)

The strandline habitat constitutes 2.3ha (approximately 2.4%) of the total sand dune habitat at Bunduff. Strandline habitat extends from the middle of the beach to the small river. A thin line of *Salsola Kali* (Saltwort) stretches along the beach to the western end and then grades into a wide band composed of a single sward of *Honkenya peploides* (Sea sandwort), which ends at the river.

No negative indicators were recorded in the strandline habitat.

IMPACTS

The main impacts on the sand dune habitat at Bunduff are given in Table 139B. Cattle and possibly sheep and horses graze the machair as well as rabbits (Code 140). There is a high abundance of agricultural weeds at the most western end of the habitat indicating past disturbance of some kind, or provision of supplementary feed (Code 171) here. Walking (Code 622) occurs across the machair and fishing is popular at Bunduff Lough and river (Code 220). Hunting and shooting also occurs at the site (Code 290).

The fixed dune is also grazed (Code 140) but to a lesser extent than the machair. This is a positive impact as it keeps the species diversity high. Some of the fixed dune may be under-grazed (Code 149) in the northeastern part and in places there is an abundance of agricultural weeds. There are rabbit burrows amongst the fixed dune, although no rabbits were seen on the day of survey. The fixed dunes are naturally eroded (Code 900) in some areas, especially on the seaward side. There are also some relatively small blowouts at the southwestern part of the site, but are re-vegetating. Walking (Code 622) occurs across the habitat and a football pitch is also present (Code 607).

The mobile dune is affected by natural erosion (Code 900), as well as walking (Code 622) and by some trampling (Code 720) and grazing (Code 140) by the cattle. A dune restoration project is in place to restore the front of the fixed dune and mobile dune habitats however this is not maintained.

Strandline is prone to natural erosion (Code 900) and to disturbance by walking (Code 622) and cattle trampling (Code 720).

Table 139B Intensity and impact of various activities on sand dune habitats at Bunduff

EU Habitat Code[1]	Activity Code[2]	Intensity[3]	Impact[4]	Area affected/ha	Location of Activity[5]
H21A0	140	B	0	48.9	Inside
H21A0	171	B	-1	0.040	Inside
H21A0	220	B	-1	Unknown	Inside
H21A0	290	B	-1	Unknown	Inside
H21A0	622	C	0	5	Inside
H2130	140	C	+2	20	Inside
H2130	149	C	-1	1	Inside
H2130	607	C	-1	Unknown	Inside
H2130	622	A	-1	Unknown	Inside
H2130	900	A	-1	Unknown	Inside
H2120	140	B	-1	Unknown	Inside
H2120	622	A	-1	0.2	Inside
H2120	720	A	-1	0.2	Inside
H2120	900	A	0	Unknown	Inside
H1210	622	B	-1	2.3	Inside
H1210	720	B	-1	2.3	Inside
H1210	900	C	0	Unknown	Inside

[1]EU Codes as per Interpretation Manual. Code 21BB is an additional code used to signify the entire dune habitat.
[2] Description of activity codes are found in Appendix 3
[3] Intensity of the influence of an activity is rated as: A= high, B = medium, C = low influence and D = unknown.
[4] Impact is rated as: -2 = irreparable negative influence, -1 = repairable negative influence, 0 = neutral, +1 = natural positive influence and +2 = strongly managed positive influence
[5] Location of activity: Inside = activities recorded within and directly impacting the sand dune habitat. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the sand dune habitat

CONSERVATION STATUS

The conservation status of a site is assessed on the condition of the site, based on extent, structure and functions and future prospects. The main source of baseline information for this site was from the NATURA 2000 report, the Biomar Survey (1996) and the MPSU management plan (2004).

Table 139C Conservation status of Annex I sand dune habitats at Bunduff

Habitat[1]	EU CONSERVATION STATUS ASSESSMENT			Overall EU conservation status assessment	Proposed Irish conservation status system[2]
	Favourable	**Unfavourable – Inadequate**	**Unfavourable – Bad**		
Machair (H21AO)	Extent Structure & functions Future Prospects			**Favourable**	Favourable-Maintained
Fixed Dunes (H2130)	Structure & functions Future Prospects	Extent		**Unfavourable - Inadequate**	Unfavourable - Recovering
Mobile dunes (H2120)		Extent Structure & functions Future Prospects		**Unfavourable - Inadequate**	Unfavourable - Declining
***Annual Strandline (H1210)**	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)
*Based on best scientific judgement

Details of the numbers and pass/failure rates of monitoring stops used to assess habitat structure & functions at Bunduff are shown in Table 139D.

Machair (H21A0)

The machair habitat is well represented at this site and there has been no decline in extent. The extent of the machair is therefore considered *favourable*. The NATURA 2000 assessment is *excellent representativity.*

The structure and functions parameter is rated as *favourable.* A total of seven monitoring stops were carried out in the machair at Bunduff. All passed their targets (Table 139D). Overall species diversity is very high throughout the machair. However, there is some presence of agricultural weeds at the far western end of the habitat due to supplementary feed. The NATURA 2000 assessment is *excellent structure*.

Quadrats taken from the Biomar machair survey have also been used to compare past and present condition of the site. The closest quadrats to the 2006 monitoring stops are used for comparison and this provides a good indicator of any change in species composition, occurrence of negative indicators as well as sward height. The criteria used during the current survey (2006) are applied to quadrats in the machair survey

(1996). Three monitoring stops were compared to three quadrats taken in 1996. All the 1996 quadrats passed the current criteria, although a quadrat taken in the most westerly part of the site had a high cover of negative indicator species present. The current condition in this area has also a high abundance of negative indicators present. Therefore this particular area of the site has not changed. Overall there has been no change in condition of the machair between surveys.

Table 139D Monitoring stop totals and pass/failure rates of Annex I sand dune habitats at Bunduff

	Monitoring stops		
Habitat	**Pass**	**Fail**	**Conservation status**
Machair (H21A0)	8	0	**Favourable**
Fixed dunes (H2130)	10	0	**Favourable**
Mobile dunes (H2120)	3	1	**Unfavourable- inadequate**

The future prospects of the machair at Bunduff are rated as *favourable*. There is currently no development and current recreational activities are relatively low, and do not appear to be impacting the habitat. This assessment corresponds to the assessment made in the NATURA 2000 form of *excellent future prospects.* However, as there is a high abundance of agricultural weeds in one area at the site, this should be addressed. The MPSU Management Plan strategy for the machair habitat states that compliance with de-stocking suggestions set out in the Commonage Framework Plan for the site should be carried out (i.e. de-stocking by 15.8% in areas damaged by overgrazing) (this also applies to the fixed dune habitat).
The machair itself is a feature of local distinctiveness at this site and should be managed accordingly. The presence of the Annex II species *P. ralfsii* is also significant.

An overall EU conservation status of *favourable* is assigned to the machair (Table 139C).

The overall Irish conservation status is *favourable-maintained.*

Fixed dunes (H2130)

The extent of the fixed dune is rated as *unfavourable-inadequate* as there has been some loss of extent due to high recreational pressure at the site. The NATURA 2000 assessment is *good representativity* for the cSAC as a whole.

The structure and functions of the fixed dune are rated as *favourable.* All ten monitoring stops passed. There are some areas that may be undergrazed and therefore should be monitored. The NATURA 2000 assessment is *structure well conserved.*

The future prospects for the fixed dune are rated as *favourable.* Although there has been erosion in the past, compounded by high recreational pressure, the introduction of a dune restoration project for the mobile dunes should also help to maintain the fixed dune habitat into the future. However the dune restoration project needs to be maintained properly, which is not the case at present and this needs to be addressed urgently. The lack of large grazers in the some areas of the fixed dunes means that there is undergrazing occurring and agricultural weeds are also apparent in some other places. This problem should be managed and levels of grazing be monitored closely. The MPSU Management Plan strategy for the fixed dune habitat states that compliance with de-stocking suggestions, set out in the Commonage Framework Plan for the site should be carried out (i.e. de-stocking by 15.8% in areas damaged by overgrazing). This may help to decrease the problem of agricultural weeds as a result of supplementary feed but needs to be monitored closely as some areas are already undergrazed.

There is also a large threat to the structure of the habitat as a result of high recreational pressure and from rabbit burrows and this should also be addressed. The NATURA 2000 assessment is *good future prospects*. The fact that there are high numbers of orchids (including a Red Data Book species *Ophrys apifera* (Bee orchid)) present in the fixed dunes is an important feature of local distinctiveness. The habitat should therefore be managed for these species.

The overall EU conservation assessment is rated as *unfavourable-inadequate* as a result of the *unfavourable-inadequate* extent of the habitat at the site. The overall Irish rating is *unfavourable-recovering*.

Mobile Dunes (H2120)

The extent of the mobile dunes at Bunduff is considered to be *unfavourable-inadequate*. Although there is good development of the habitat overall at the site, there has been severe erosion, in the past as a result of anthropogenic activities adding to natural erosion. Trampling and overuse by people as well as cattle has had an adverse affect on the extent of the habitat. A dune restoration project has helped the re-development but in places the habitat is still being damaged and is not recovering well.

The structure and functions of the habitat are rated as *unfavourable-inadequate*. A total of four monitoring stops were placed in the habitat. Three monitoring stops passed and one failed. The cover of unhealthy *Ammophila arenaria* (Marram grass) was high in the monitoring stop that failed. This was located in the western part of the site where the damaged mobile dunes are present.

The future prospects of the habitat are rated as *unfavourable-inadequate*. This is as a result of the continuing damage caused by people and animal pressure at the site of the dune restoration project. This area needs to be monitored closely for breaks in the fences if the project is to be successful. The NATURA 2000 assessment rates the mobile dunes as of *good conservation value* for the cSAC as a whole. The MPSU Management Plan states that NPWS will monitor the effects of recreation and amenity use within the mobile dune habitat and liase with users to establish controls on usage where necessary. This should be carried out.

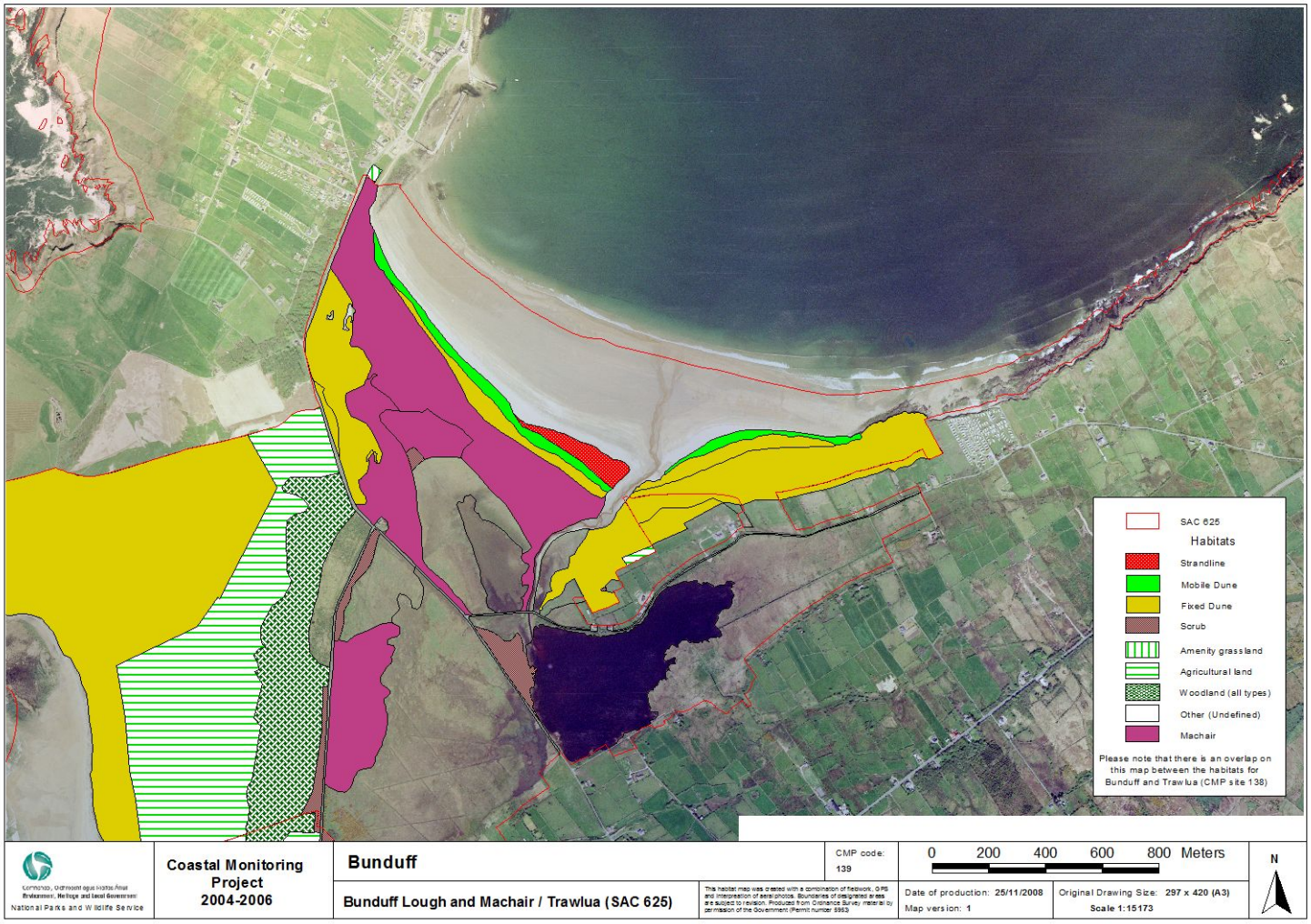
The overall EU assessment is rated as *unfavourable-inadequate.*

The overall Irish assessment is *unfavourable-declining.*

Annual Strandline (H1210)

Annual strandline habitat is only present in one area of the beach at Bunduff. Given the limited area of the habitat no monitoring stops were taken, therefore the conservation assessment for the habitat is based on best scientific judgement. As the habitat is present at all, at such a heavily used site, is a positive sign. The beach is probably cleaned regularly. However, it seems to be carried out manually and without

the use of heavy machinery. This along with natural accretion has allowed the development of the habitat. Some nutrient enrichment from the nearby river (possibly from fishing activities) may also have helped the development of the sward of *Honkenya peploides* (Sea sandwort). Therefore the extent and the structure and functions of the habitat are rated as *favourable.* The future prospects for the habitat is more difficult to assess at such a busy beach. Some trampling by cattle was also noted in the habitat but if the management plan is implemented and mechanical beach cleaning is prevented then the future prospects for the habitat are *favourable*. An overall EU conservation assessment of *favourable* is assigned to the habitat while the Irish assessment is *favourable-maintained*.


SAC 625
Habitats
Strandline
Mobile Dune
Fixed Dune
Scrub
Amenity grassland
Agricultural land
Woodland (all types)
Other (Undefined)
Machair
Please note that there is an overlap on this map between the habitats for Bunduff and Trawlua (CMP site 138)
Coastal Monitoring Project 2004-2006
Bunduff
CMP code: 139
0 200 400 600 800 Meters
N
Bunduff Lough and Machair / Trawlua (SAC 625)
This habitat map was created with a combination of fieldwork, GPS and interpretation of aerial photos. Boundaries of designated areas are subject to revision. Produced from Ordnance Survey material by permission of the Government (Permit number 5953)
Date of production: 25/11/2008
Map version: 1
Original Drawing Size: 297 x 420 (A3)
Scale 1:15173
National Parks and Wildlife Service