NPWS

# Murvey Machair SAC
# (site code: 002129)

## Conservation objectives supporting document- Coastal habitats

Version 1

January 2017

## Contents



*Please note that the opinions expressed in the site report from the Coastal Monitoring Project (CMP) 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 (2017) Conservation Objectives: Murvey Machair SAC 002129. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.**

# 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 (European Commission, 2013). 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.

Murvey Machair SAC is located on the south-west coast of Co. Galway, approximately 6.5km west of Roundstone village. The main habitat in this SAC is a small machair/wetland on a 30m high granite hill, which is covered in windblown sand supplied from the adjacent beach. There is also a series of wetlands occurring in the low-lying area to the north of the hill. The underlying geology of the site consists of granite. Most of the bedrock is masked by a cover of sand and thin organic soils (NPWS, 2013).

Annual strandline vegetation stretches the length of the adjacent beach. The strandline habitat is extensive, which is uncommon for western coastal sites of Ireland, as most beaches here are exposed to the Atlantic Ocean (Ryle *et al*., 2009).

The machair habitat in this SAC has a typically herb-rich sward. Seepage zones and damp hollows also occur and support abundant sedges and mosses. Because of its hilliness, Murvey Machair SAC is geomorphologically somewhat atypical of other Irish machairs. It is thought to represent the relict stages of what was once considered a more extensive system (NPWS, 2013). Crawford *et al*. (1998) hypothesised that the presence of a small eroded reef of intertidal peat suggested a former machair system with a water body between it and the hill.

In addition to the machair, the SAC contains areas of freshwater marsh, freshwater lake, wet grassland and heath. The northern part of the SAC contains two small but productive coastal lakes, Lough Namanawaun and Lough Murvey, which provide an excellent example of wetland succession. The open waters contain abundant pondweeds (*Potamogeton* spp.) and are fringed with swamp, dominated by common reed (*Phragmites australis*), common club-rush (*Scirpus lacustris*) and great fen-sedge (*Cladium mariscus*). The swamp gives way to freshwater marsh and wet grassland. The eastern lake, Lough Namanawaun, is largely in-filled (NPWS, 2013).

Lough Namanawaun and Lough Murvey contain two rare plant species; slender cotton-grass (*Eriophorum gracile*) and slender naiad (*Najas flexilis*). Both are legally protected under the Flora (Protection) Order, 2015 (FPO; Statutory Instrument No. 356 of 2015) and are listed as Near Threatened on the Irish Red List of vascular plants (Wyse Jackson *et al*., 2016). Slender naiad is also listed on Annex II of the EU Habitats Directive (NPWS, 2013).

Petalwort (*Petalophyllum ralfsii*), a small liverwort that is rare in Europe and is listed on Annex II of the EU Habitats Directive and on the FPO, occurs in the machair habitat (Ryle *et al*., 2009; Campbell *et al*., 2015).

Annex I species on the EU Birds Directive are known to occur within Murvey Machair SAC, including chough (*Pyhrrocorax pyrrhocorax*) and golden plover (*Pluvialis apricaria*) which have been recorded on the machair (Ryle *et al*., 2009).

Murvey Machair SAC (site code: 002129) is selected for machair and petalwort. The following is the sole coastal habitat listed as a Qualifying Interest for the SAC (*denotes a priority habitat):

21A0 Machairs (* in Ireland)

The distribution of the sand dune habitats, including machair, found in Murvey Machair SAC is presented in Appendix I.

## 2 Conservation Objectives

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

This supporting document sets out the conservation objective for machair in Murvey Machair 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 machair habitat 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. Bassett (1983), Crawford *et al*. (1998) and Gaynor (2006, 2008) provide additional information on machair in Ireland. The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland. One sub-site associated with Murvey Machair SAC was surveyed, mapped and assessed. This sub-site was Doolan (Murvey) (CMP site ID: 098).

As part of the Coastal Monitoring Project (CMP), detailed individual reports and habitat maps were produced for each sub-site and those compiled for Doolan (Murvey) are included in Appendix II.

The conservation objectives for the machair habitat in Murvey Machair SAC are based on the findings of the individual report from the CMP, combined with the results of Crawford *et al*. (1998) and Gaynor (2008). It is thought that the sub-site as surveyed by the CMP represents the entire area of sand dune habitats within Murvey Machair SAC.

## 3 Sand dune habitats

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

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

- Annual vegetation of drift lines (1210)
- Embryonic shifting dunes (2110)
- Shifting dunes along the shoreline with *Ammophila arenaria* (2120)
- Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130) *
- Decalcified dunes with *Empetrum nigrum* (2140) *
- Atlantic decalcified fixed dune (Calluno-Ulicetea) (2150) *
- Dunes with *Salix repens* subsp. *argentea* (Salicion arenariae) (2170)
- Humid dune slacks (2190)
- **Machairs (21A0) ***

Two dune habitats were recorded during the CMP by Ryle *et al*. (2009) from Murvey Machair SAC, one of which, machairs, indicated in **bold** above, is listed as a Qualifying Interest (QI) for the SAC. Annual vegetation of drift lines was also recorded, but this habitat is not a Qualifying Interest for the SAC.

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

Machair 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 a low frequency of sand-binding species (Gaynor, 2006). Irish machair is a priority habitat under the EU Habitats Directive.

Dune habitats 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.

Detailed descriptions from the Coastal Monitoring Project (Ryle *et al*., 2009) of each sand dune habitat found at Doolan (Murvey) are presented in Appendix II. A total of 43.05ha of sand dune habitats were mapped within Murvey Machair SAC, 42.71ha (99%) of which represents machair, which is listed as a Qualifying Interest for this particular SAC.

## 3.1 Overall objective

The overall objective for 'Machairs' in Murvey Machair SAC is *to 'restore the favourable conservation condition*'.

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

## 3.2 Area

### *3.2.1 Habitat area*

Habitat extent is a basic attribute to be assessed when determining the condition of a particular habitat. A baseline habitat map was produced for the sand dune habitats in the Doolan (Murvey) sub-site during the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009). This map is included with the individual site report in Appendix II at the end of this document. The total area of machair habitat within the Doolan (Murvey) sub-site as estimated by Ryle *et al*. (2009) is 43.1ha, 42.71ha of which is contained within the boundary of Murvey Machair SAC.

It is important to note that the CMP mapped the extent of the true machair plain and did not include the lakes at the back of the system which are ecologically intrinsic to the machair system as a whole.

The target for this attribute is that the area of machair habitat 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, including machair, within Murvey Machair SAC as mapped by Ryle *et al.* (2009) is presented in Appendix I.

Murvey Machair SAC can be divided into two contrasting halves, an exposed coastal half, dominated by wind-blown sand and a more sheltered half, dominated by lakes and wetlands. The sheltered nature of the wetland areas and their close proximity to the coast is partially responsible for the extensive development of freshwater marsh vegetation along the margins (Ryle *et al*., 2009).

Machair is the main sand dune habitat at Murvey and it occurs on the sand covered slopes of a large granite hill that flanks the eastern side of Murvey beach. The seaward machair edge is steeply eroding and slumping in places. Further east as the sand fades out, the machair grades into rocky fields which are fenced and agriculturally improved (Ryle *et al*., 2009).

A small area of machair also occurs on the more gently sloping land directly west of the seepage channel and this is the only remaining area that represents the more 'classic' machair plain. This area is fenced and some of the fences are now hanging from the steeply eroding edges of the machair. The machair was more extensive in the past but has been severely eroded; it is retreating landward with sands blowing upslope and only patches of typical machair surviving (Ryle *et al*., 2009).

The target is that there should be no decline or change in the distribution of the machair habitat, 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 the machair habitat in Murvey Machair SAC in terms of structure and functions depends on a range of attributes for which targets have been set as outlined below.

### *3.4.1 Physical structure: functionality and sediment supply*

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

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

Murvey Machair SAC is important because of the presence of the priority Annex I habitat machair, though the quality of the habitat has been reduced by erosion by the sea. Natural erosion is exacerbated by poaching and overgrazing which is evident in the numerous areas of bare sand that dominate the machair. The local rabbit population did not appear high during the CMP. Their numbers may have been controlled by shooting. Nonetheless, rabbit burrowing has undermined the structure of the machair and contributed to natural erosion. It is likely that impacts from recreational activities mainly during summer months, such as trampling from walkers, are also affecting the machair (Ryle *et al*., 2009).

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

### *3.4.2 Physical structure: hydrological and flooding regime*

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. As demonstrated in Murvey Machair SAC, 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.

At Murvey Machair SAC, seepage zones and damp hollows also occur and support abundant sedges, mosses, fool's water-cress (*Apium nodiflorum*), brookweed (*Samolus valerandi*) and creeping bent (*Agrostis stolonifera*). On the north-western edge of the hill, a small channel edged by freshwater marsh runs out from Lough Namanawaun down to Murvey beach (Ryle *et al*., 2009).

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 saltmarsh communities.

In addition to the machair interest, Murvey Machair SAC contains areas of freshwater marsh, freshwater lake, wet grassland and heath. The northern part of the SAC contains two small but productive coastal lakes. Upslope, the machair grades into fields dominated by rock with dry grassland, heath, flushes and damp areas giving rise to stands of wet vegetation (Ryle *et al*., 2009). On the south of the beach where the channel empties and flushes run down onto the beach from the eroding machair edge, there are patches of brackish marsh species amongst the annual strandline vegetation. These species include sand sedge (*Carex arenaria*), yellow iris (*Iris pseudacorus*) and club sea-rush (*Bolboschoenus maritimus*) (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 attribute applies to machair habitat and does not apply to other Annex I sand dune habitats present where high levels of bare sand are a natural component of the habitat. In the less exposed 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.

Bare sand can be exposed from the actions of grazing animals, however, it must be borne in mind that even with a moderate grazing regime, some localised damage is to be expected, because the impact of grazing animals is not applied at the same intensity throughout the site.

At Murvey Machair SAC, the total machair area is 42.71ha with approximately 15ha of this comprising bare sand (representing approximately 35% of the total area). Overgrazing and erosion has caused a decline in the extent of the machair with an increase in the cover of bare sand (Ryle *et al*., 2009). The machair is overgrazed mainly by sheep and rabbits and this is threatening the long-term viability of this habitat. The impacts of rabbit burrowing and overgrazing have exacerbated the natural erosion resulting in large areas of bare sand in the machair habitat (Ryle *et al*., 2009).

The target is not to exceed 10% bare sand. This target is assessed subject to natural processes.

### *3.4.5 Vegetation structure: sward height*

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).

Machairs are extensively used in both Ireland and Scotland as commonage areas for grazing. All machair sites are grazed by cattle, or sheep, or both. Sheep are commonly the grazing animal, but the grazing density and sheep:cattle ratio is vital in determining the quality and diversity of the machair (Angus, 1994).

Most of Murvey Machair SAC is heavily grazed by sheep, cattle and rabbits. The sward height is low indicating that the area is overgrazed. This is exacerbating the natural erosion along the back of the beach. Overgrazing, mainly by sheep and rabbits, is preventing flowering and fruiting of characteristic vegetation resulting in low species diversity (Ryle *et al*., 2009).

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

### *3.4.6 Vegetation composition: typical species and 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* spp.) are also present. The fixed, more stable dune vegetation includes lady's bedstraw (*Galium verum*), common bird's-foot-trefoil (*Lotus corniculatus*), wild thyme (*Thymus polytrichus*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).

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

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

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

Other species typically recorded on Irish machair include common yarrow (*Achillea millefolium*), early hair-grass (*Aira praecox*), common mouse-ear (*Cerastium fontanum*), smooth hawksbeard (*Crepis capillaris*), common stork's-bill (*Erodium cicutarium*), eyebright (*Euphrasia officinalis*), common flax (*Linum catharticum*), red bartsia (*Odontites verna*), yellow rattle (*Rhinanthus minor*), biting stonecrop (*Sedum acre*), wild thyme (*Thymus polytrichus*) 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*).

At Murvey Machair SAC, the machair habitat has a typically herb-rich sward characterised by species such as red fescue (*Festuca rubra*), daisy (*Bellis perennis*), ribwort plantain (*Plantago lanceolata*), buck's-horn plantain (*Plantago coronopus*), white clover (*Trifolium repens*), yarrow (*Achillea millefolium*), sand sedge (*Carex arenaria*), glaucous sedge (*C. flacca*), common mouse-ear (*Cerastium fontanum*), eyebright (*Euphrasia officinalis* agg.), lady's bedstraw (*Galium verum*), fairy flax (*Linum catharticum*), common bird's-foot trefoil (*Lotus corniculatus*), selfheal (*Prunella vulgaris*) and biting stonecrop (*Sedum acre*) (Ryle *et al*., 2009).

Other species present at Murvey Machair SAC are Yorkshire fog (*Holcus lanatus*), cat's ear (*Hypochaeris radicata*), autumn hawkbit (*Leontodon autumnalis*), field wood-rush (*Luzula campestris*), dandelion (*Taraxacum* spp.) and the mosses, *Aulocomium* spp*., Brachythecium* spp*., Calliergonella cuspidata* and *Homalothecium lutescens* (Ryle *et al*., 2009).

The Annex II liverwort petalwort (*Petalophyllum ralfsii*) has been recorded at Murvey Machair SAC (Ryle *et al*., 2009; Campbell *et al*., 2015).

The target for this attribute is to maintain a typical flora for the machair habitat.

### *3.4.7 Vegetation composition: negative indicator species*

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

At Murvey Machair SAC, no negative indicator species were recorded in the machair. However, most of the machair is overgrazed and this is restricting the flowering and fruiting of most of the plant species (Ryle *et al*., 2009).

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

### *3.4.8 Vegetation composition: scrub/trees*

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

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

### *3.4.9 Vegetation composition: bryophytes*

Bryophytes are an important element of the machair flora. Frequently occurring species include *Campylium stellatum, Scorpidium revolvens, Ctenidium molluscum* and *Philontis fontana*, most of which are indicative of wet, base-rich conditions.

At Murvey Machair SAC, the mosses *Aulocomium* spp.*, Brachythecium* spp.*, Calliergonella cuspidata, Homalothecium lutescens*, *Syntrichia ruralis* subsp. *ruraliformis* and *Brachythecium albicans* were present on the machair (Ryle *et al*., 2009). As mentioned earlier, petalwort (*Petalophyllum ralfsii*) also occurs on the machair. Thalli were found on flushed ground between rock outcrops on high ground and in partly bare patches of very short moss-rich grassland on unshaded calcareous sand of machair slope (Ryle *et al*., 2009; Campbell *et al*., 2015).

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

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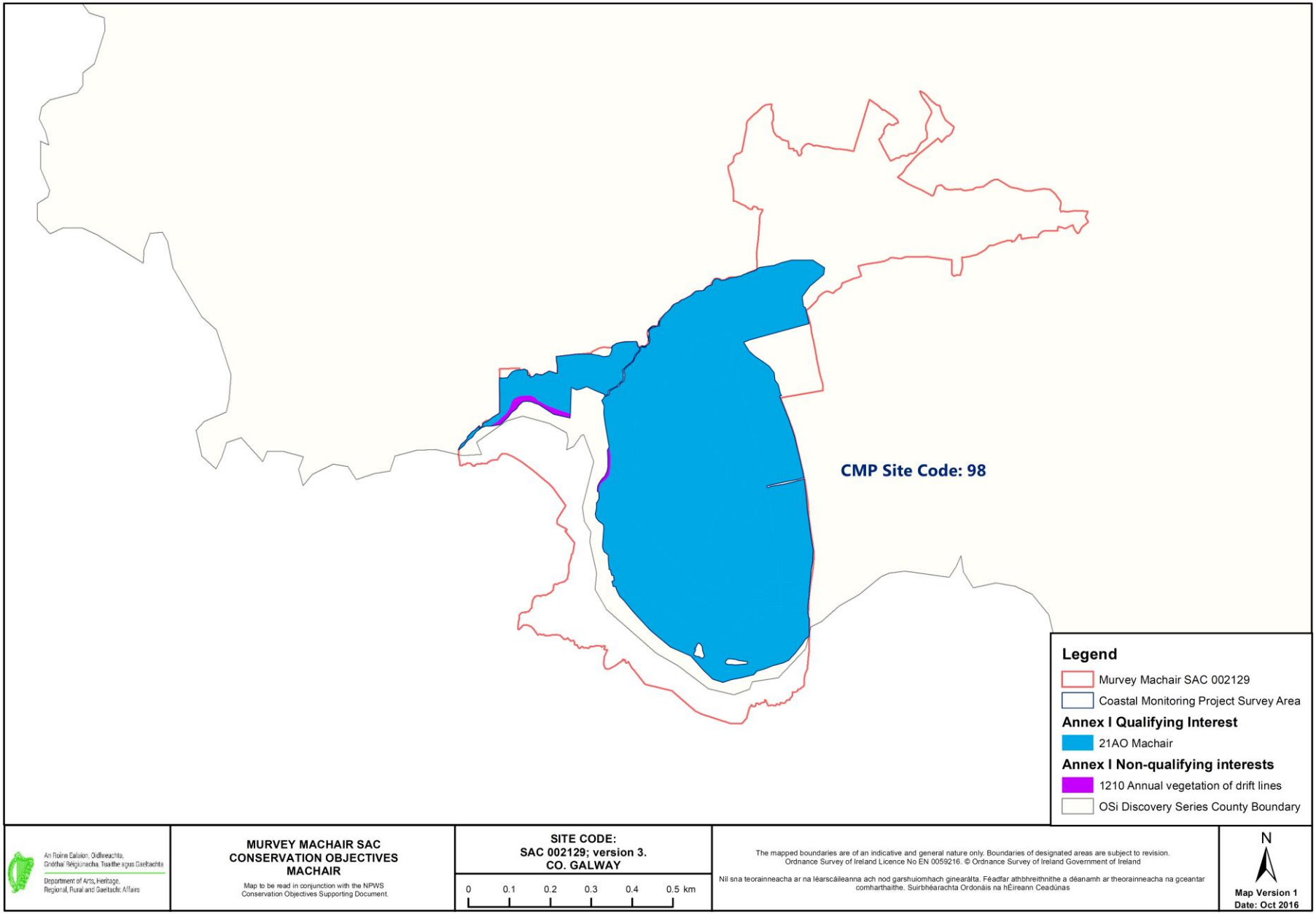
## Appendix I – Distribution map of sand dune habitats within Murvey Machair SAC



## Appendix II – Doolan (Murvey) site report and habitat map from the Coastal Monitoring Project (Ryle *et al.*, 2009)

## DOOLAN

**SITE DETAILS**

**CMP06 site name:** Doolan **CMP06 site code:** 098 **CMP Map No.:** 96

**County:** Galway **Discovery map:** 44 **Grid Reference:** L 645 416

**6 inch Map No.:** Ga 62 (& 49)

**Aerial photographs (2000 series):** O 3069A,B,C&D

**NPWS Site Name:** Murvey Machair

**NPWS designation:** **pNHA:** 002129 **cSAC:** 002129

**Ranger Area:** Galway

**MPSU Plan:** None

**Report Author:** Anne Murray

**SITE DESCRIPTION**

Doolan is better known locally as Murvey and will be referred to as Murvey in this report. Murvey machair cSAC is located approximately 6.5km west of Roundstone in County Galway. The cSAC is designated for the EU Annex I priority sand dune habitat – Machair and this comprises the main part of the site. The northern part of the cSAC contains two loughs, Lough Namanawaun and Murvey Lough, these are included as they provide a good example of hydroseral succession. The loughs also contain two rare and legally protected species - *Najas flexilis* (slender naiad) and *Eriophorum gracile* (slender cotton-grass). The former is listed in Annex II of the EU Habitats Directive

The cSAC holds two populations of *Petalophyllum ralfsii* (petalwort), a rare liverwort listed in Annex II of the EU Habitats Directive. This liverwort has been recorded on the machair at Murvey.

Annex I species of the EU Birds Directive are known to occur within the cSAC, including *Pyhrrocorax pyrrhocorax* (chough) and *Pluvialis apricaria* (golden plover) which have been recorded on the machair.

**Table 98A** Areas of EU Annex I habitats mapped at Doolan

| EU Code | EU Habitat | Area (ha) |
|---|---|---|
| H1210 | Annual vegetation of drift lines | 0.341 |
| H21A0 | Machair | 43.104 |
| | **Total Sand dune** | **43.445** |

**Machair (H21A0)**

Machair is the main sand habitat at Murvey, it occurs on the sand covered slopes of a large granite hill that flanks the eastern side of Murvey beach. The seaward machair edge is steeply eroding and slumping in places. The machair is unenclosed except towards the top of the hill where it is

partitioned into small fields. Some of the fields have been reseeded and fertilised, and others are unimproved and lightly grazed by cattle and horses. Further east, as the sand peters out the machair grades into rocky fields which are fenced and agriculturally improved. On the north-western edge of the hill, a small channel edged by freshwater marsh runs out from Lough Namanawaun down to Murvey beach continuing south along the beach to the sea, here it is edged by patches of brackish marsh.

A small area of machair also occurs on the more gently sloping land directly west of this channel and this is the only remaining area that represents the more 'classic' machair plain. This area is fenced and some of the fences are now hanging from the steeply eroding edges of the machair. Upslope, the machair grades into fields dominated by rock with dry grassland, heath with some flushes and damp areas giving rise to stands of wet vegetation.

The machair was more extensive in the past but has been severely eroded, retreating landward with sands blowing upslope and only patches of typical machair surviving. The total machair area is 43ha with approximately 15ha of this comprising bare sand (representing over 30% of the total area).

The typical machair species present at Murvey include *Achillea millefolium* (yarrow), *Agrostis stolonifera* (creeping bent), *Bellis perennis* (daisy), *Carex arenaria* (sand sedge), *Carex flacca* (glaucous sedge), *Cerastium fontanum* (common mouse-ear), *Euphrasia officinalis* agg. (eyebright), *Galium verum* (lady's bedstraw), *Linum catharticum* (fairy flax), *Lotus corniculatus* (common bird's-foot trefoil), *Plantago lanceolata* (ribwort plantain), *Prunella vulgaris* (selfheal), *Sedum acre* (biting stonecrop) and *Trifolium repens* (white clover).

Other species present are *Festuca rubra* (red fescue), *Holcus lanatus* (Yorkshire fog), *Hypochaeris radicata* (cat's ear), *Leontodon autumnalis* (autumn hawkbit), *Luzula campestris* (field wood-rush), *Plantago coronopus* (buck's-horn plantain), *Taraxacum* agg. (dandelion) and mosses, *Aulocomium* spp., *Brachythecium* spp., *Calliergonella cuspidata* and *Homalothecium lutescens*.

No negative indicator species were recorded in the machair. However, most of the machair is overgrazed and this is restricting the flowering and fruiting of most of the plant species.

Two populations of the rare liverwort *Petalophyllum ralfsii* (petalwort) were recorded by Neil Lockhart (1997). They occurred on flushed ground between rock outcrops on high ground, located at the southern end of the unenclosed machair. The location of the liverwort populations is indicated as a theme on the CMP digital map for this site. The liverwort was searched for during this survey but without success. A monitoring stop was placed in this area and it passed, although it did fail one attribute - sward height indicating that the area is overgrazed.

**Annual vegetation of drift lines (H1210)**

A wide band of annual strandline vegetation stretches the length of the beach and covers a total area of 0.3ha. This habitat is dominated by one typical species *Salsola kali* (prickly saltwort). No negative indicator species were recorded in the strandline habitat.

On the south of the beach where the channel empties and where flushes run down onto the beach from the eroding machair edge, there are patches of brackish marsh species amongst the annual strandline.

The species include *Carex arenaria* (sand sedge), *Iris pseudacorus* (yellow iris) and *Scirpus maritimus* (club sea-rush).

## IMPACTS

**Table 98B** Intensity and impact of various activities on sand dune habitats at Doolan

| EU Habitat Code[1] | Activity Code[2] | Intensity[3] | Impact[4] | Area affected/ha | Location of Activity[5] |
|---|---|---|---|---|---|
| H21A0 | 103 | C | -1 | 0.5 | Inside |
| H21A0 | 142 | A | -1 | 40 | Inside |
| H1210 | 142 | A | -1 | 0.3 | Inside |
| H21A0 | 146 | A | -1 | 40 | Inside |
| H1210 | 146 | A | -1 | 0.3 | Inside |
| H21A0 | 150 | B | -1 | 5 | Inside |
| H21A0 | 622 | B | -1 | 40 | Inside |
| H1210 | 622 | C | -1 | 0.3 | Inside |
| H21A0 | 720 | A | -1 | 20 | Inside |
| H21A0 | 900 | A | 0 | Unknown | Inside |
| H21A0 | 954 | C | -1 | 0.5 | 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 cSAC. Outside = activities recorded outside but adjacent to sand dune habitat that are impacting the cSAC

The activities impacting the machair and sand dunes at Murvey are given in Table 98B. This site is mainly impacted by natural erosion and grazing. The greatest negative impact on the machair is overgrazing (code 142 and 146) mainly by sheep and rabbits, preventing flowering and fruiting of characteristic vegetation resulting in low species diversity. Natural erosion (code 900) is exacerbated by poaching (code 720) and overgrazing, this is evident in the numerous areas of bare sand which dominate the machair. Bare ground accounts for approximately 15ha of the machair habitat.

The eastern and northwestern parts of the machair are fenced into individual fields (code 150). Invasion by agricultural weeds (code 954) was observed in the northwestern part of the site, perhaps due to intensive use of the fields, which are now heavily eroded. Some of the machair fields on the eastern edge of the site have been seeded and fertilized (code 103).

The local rabbit population does not appear high, at present. Their numbers may have been controlled by shooting which has been noted in previous reports. Nonetheless, rabbit burrowing has undermined the structure of the machair and contributed to natural erosion (code 900).

It is likely that impacts from recreational activities mainly during summer months, such as trampling (code 720) from walkers (code 622) are also affecting the machair.

Assessment of impacts on annual vegetation of drift lines is difficult due to the ephemeral nature of this habitat. However, the presence of a wide band of strandline is a good indication of health and potential viability of this habitat. Prickly saltwort (*Salsola kali*) which dominates the strandline, may be more resistant to grazing than other annual species.

## CONSERVATION STATUS

The conservation status of a site is assessed on the condition of the site and on baseline information. The main source of baseline information for this site is the machair survey by Bassett (1983), the NATURA 2000 survey and the Biomar Survey of Irish Machair Sites (Crawford *et al*., 1998).

The method of assessment of conservation status differed in the NATURA 2000 survey and so only broad comparisons are made between the conservation status of the two surveys. In relation to the machair habitat, comparisons can be made with the Biomar machair survey (1996) mainly in relation to the parameters of extent and structure and functions of the machair. The conservation status of the Annex I sand dune habitats at Murvey are given in Table 98C.

### Machair (21A0)

The extent of machair is rated as *unfavourable-inadequate* (Table 98C). The impacts of rabbit burrowing and overgrazing have exacerbated the natural erosion resulting in large areas of bare sand in the machair habitat. This has caused a decline in the extent of the machair.

The structure and functions parameter of the machair is rated as *unfavourable-bad*. Four monitoring stops were placed in the machair during this survey and two of these failed (Table 98D) due to cover of bare sand and overgrazing. Six relevés were placed in the machair at Murvey during the Biomar Survey of Irish Machair Sites (Crawford *et al*., 1998). These three relevés were confined mainly to the south and east of the site.

**Table 98C** Conservation status of Annex I sand dune habitats at Doolan

| **Habitat**[1] | **EU Conservation Status Assessment** | | | **Overall EU conservation status assessment** | **Proposed Irish conservation status system**[2] |
|---|---|---|---|---|---|
| | **Favourable** | **Unfavourable - Inadequate** | **Unfavourable - Bad** | | |
| **Machair (H21A0)** | | Extent | Structure & Functions/ Future Prospects | **Unfavourable-Bad** | **Partially destroyed** |
| **Annual vegetation of drift lines (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)

**Table 98D** Pass/Fail results of monitoring stops for Annex I sand dune habitats at Doolan

| | **Monitoring stops** | | |
|---|---|---|---|
| **Habitat** | **Pass** | **Fail** | **Conservation status** |
| **Machair (H21A0)** | 2 | 2 | **Unfavourable-bad** |
| **Annual vegetation of drift lines (H1210)** | 2 | 0 | **Favourable** |

The assessment criteria used for monitoring stops of the current survey were applied to the data contained in each relevé. One of the six relevés failed as a result of overgrazing and erosion. This would indicate that the condition of the machair has declined since the 1996 survey.
The future prospects for this habitat are considered *unfavourable-bad* on the basis that the machair is overgrazed and this is threatening the long-term viability of this habitat. The Conservation Plan for this site has yet to be completed and so there is currently no conservation management strategies devised for the site. If grazing pressure is not alleviated soon, it is likely that the machair will be destroyed completely from a combination of natural erosion and overgrazing.

The conservation status of the machair within the entire cSAC is described as *average or reduced conservation* in the NATURA 2000 survey. Currently, the overall EU conservation status of the machair is considered *unfavourable-bad* (Table 98C).

The Irish conservation status is rated as *partially destroyed*.

**Annual Strandline (H1210)**

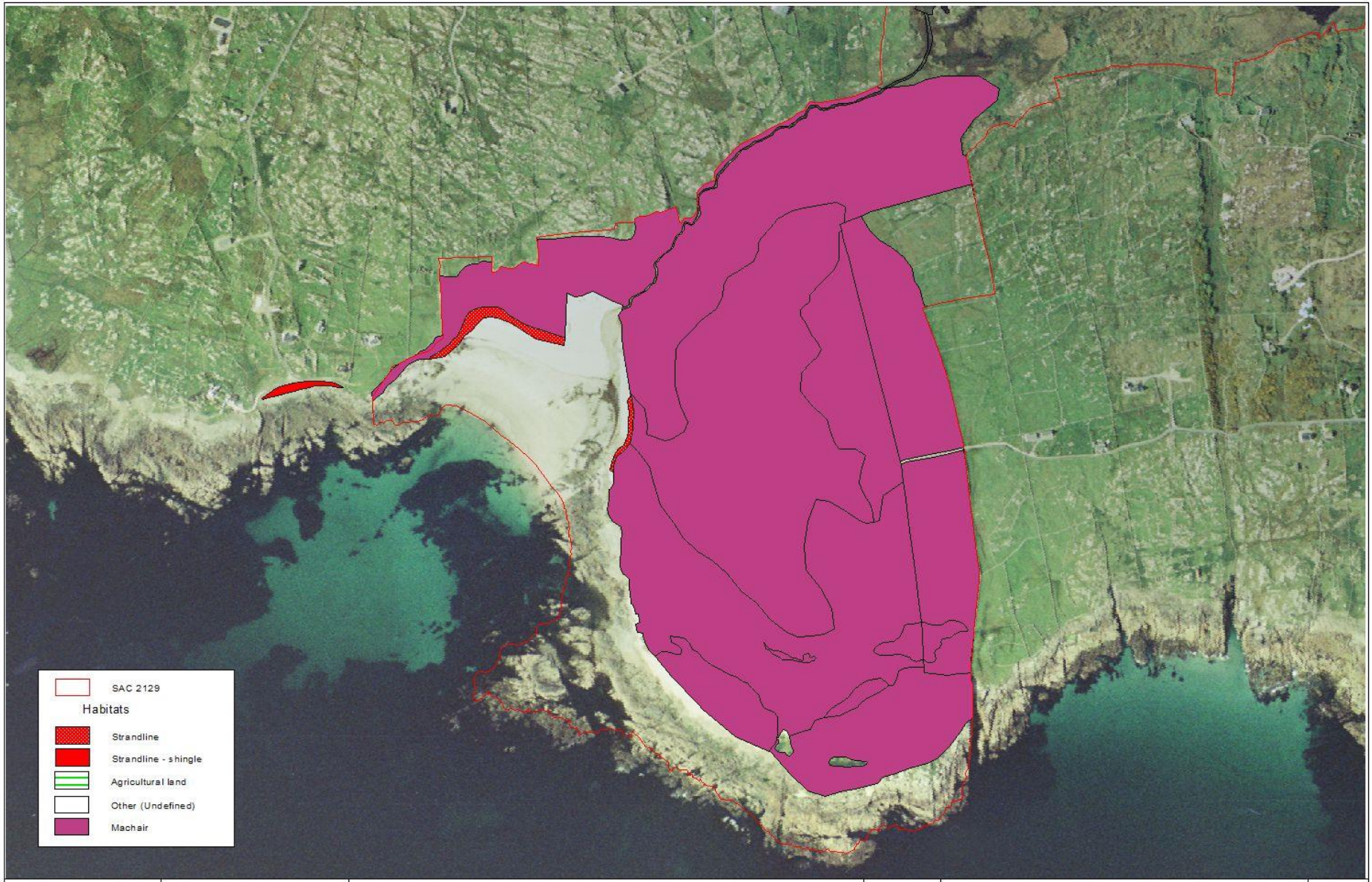
The extent is rated as *favourable* as the strandline was present along most of the length of the beach during this survey. There appears to be no mechanical cleaning of the beach. Therefore, most of the nutrients, organic matter and seed sources, necessary for the maintenance of the strandline vegetation, are retained within the system.

The structure and functions parameter is rated as *favourable*. Two monitoring stops were placed in the strandline vegetation and these passed. The habitat appears to be functioning well, however the diversity of annual species is poor with just one typical species present.

The future prospects for this site are considered *favourable.* The strandline habitat is extensive, which is uncommon for western coastal sites of Ireland, as most beaches here, are exposed to the Atlantic Ocean. The diversity of species may improve if grazing stock is reduced at the site.

The overall EU conservation status of the strandline habitat is considered *favourable.* The assessment of the conservation status of a habitat that is ephemeral in nature is not exact. The total area of the strandline will vary from year to year and its location may also shift in response to coastal processes.

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




Coastal Monitoring Project 2004-2006

Doolan

CMP code: 098

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Murvey Machair (SAC 2129)

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)

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