NPWS

Tacumshin Lake SAC
(site code: 000709)

Conservation objectives supporting document- Coastal habitats

Version 1

May 2018

Contents

Please note that the opinions expressed in the site report from the Vegetated Shingle Monitoring Project (VSM) 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 (2018) Conservation Objectives: Tacumshin Lake SAC 000709. Version 1.0. National Parks and Wildlife Service, Department of Culture, 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 (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.

Tacumshin Lake SAC is located approximately 15km south of Wexford town, Co. Wexford. It encompasses Tacumshin Lake, a shallow lagoon, and extends west as far as Ringbaun and east as far as Grogan. Two small populations of the *Critically Endangered* plant cottonweed (*Achillea maritima*, formerly *Otanthus maritimus*) (Wyse Jackson *et al*., 2016) occur in the SAC. Cottonweed is also legally protected through its listing on the Flora (Protection) Order, 2015 (FPO; Statutory Instrument No. 356 of 2015). Another noteworthy species that has been recorded is the FPO listed and *Near Threatened* lesser centaury (*Centaurium pulchellum*) (Wyse Jackson *et al*., 2016). The lagoon and its surrounding land support large numbers of over-wintering birds; for this reason, part of the site has also been designated as a Special Protection Area (Tacumshin Lake SPA 004092) (NPWS, 2014). The invertebrate fauna in the SAC is particularly rich with over 45 taxa recorded in a brief survey in 1996 (see Ryle *et al*., 2009).

Tacumshin Lake SAC (site code: 000709) is selected for coastal lagoons (a priority habitat), perennial vegetation of stony banks and sand dune habitats. The following four coastal habitats are included in the list of Qualifying Interests for the SAC and are dealt with in this supporting document:

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

The mapped distribution of perennial vegetation of stony banks and sand dune habitats in Tacumshin Lake 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 objectives for the four coastal habitats listed above in Tacumshin Lake SAC, which are 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 **perennial vegetation of stony banks** (vegetated shingle) are based in part on the findings of the Vegetated Shingle Monitoring Project (VSM) (Martin *et al*., 2017), which was carried out in 2016 on behalf of the National Parks and Wildlife Service (NPWS). This document should be read in conjunction with that report.

Vegetated shingle within Tacumshin Lake SAC was also recorded during the National Shingle Beach Survey (NSBS), which was carried out in 1999 on behalf of NPWS (Moore and Wilson, 1999), and by the Coastal Monitoring Project (CMP) which ran from 2004 to 2006, also on behalf of NPWS (Ryle *et al*., 2009).

The VSM surveyed, mapped and assessed a single sub-site associated with Tacumshin Lake SAC (Martin *et al*., 2017):

Tacumshin (VSM site code 023)

The conservation objective for perennial vegetation of stony banks in Tacumshin Lake SAC is based on the findings of the VSM (Martin *et al*., 2017).

The targets set for the **sand dune habitats** are also based in part on the results of the VSM (Martin *et al*., 2017) and again, this document should be read in conjunction with that report. It is also recommended that this document be read in conjunction with the final report from the Coastal Monitoring Project (CMP) (Ryle *et al*., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney *et al*., 2013). The CMP was a comprehensive national baseline survey of all known sand dune systems in Ireland, which included the sand dunes habitats within Tacumshin Lake SAC. The SDM subsequently reviewed and modified the methodology used during the CMP to map and assess the conservation status of dune habitats. A subset of 40 sites was selected as a representative sample of the national dune resource for the SDM survey, but did not include Tacumshin Lake SAC.

As part of the VSM, a detailed individual site report and habitat maps were produced for the Tacumshin sub-site and these are included in Appendix II at the end of this document.

The conservation objectives for the sand dune habitats in Tacumshin Lake SAC are based on the findings of the VSM (Martin *et al*., 2017). It is thought that the sub-site as surveyed by the VSM represents the entire area of sand dune habitats within Tacumshin Lake SAC, 13.95ha (34.2%) of which represents habitats that are listed as Qualifying Interests for this particular SAC.

3 Perennial vegetation of stony banks

The following definition of perennial vegetation of stony banks habitat in Ireland is based on the data collected during the VSM (Martin *et al*., 2017) and is an adaptation of the definitions used in European Commission (2013) and NPWS (2013).

Perennial vegetation of stony backs occurs along the coast where shingle (cobbles, pebbles, and gravel ≥2mm) has accumulated to form elevated ridges or banks above the high tide mark. The majority of the rocky material should be between 2mm and 256mm in diameter to be considered in this habitat category. On the upper beach, the pioneer community can be characterised by perennial species such as sea beet (*Beta vulgaris* subsp. *maritima*), sea-kale (*Crambe maritima*), rock samphire (*Crithmum maritimum*), cleavers (*Galium aparine*), yellow-horned poppy (*Glaucium flavum*), sea pea (*Lathyrus japonicus*), wild radish (*Raphanus raphanistrum* subsp. *maritimus*), curled dock (*Rumex crispus*), sea campion (*Silene uniflora*), perennial sow-thistle (*Sonchus arvensis*) and sea mayweed (*Tripleurospermum maritimum*). The majority of the area within this pioneer community is usually bare shingle. At the top of the beach, and moving inland, a wider range of vegetation types can be found at larger shingle sites including a lichen-rich community and coastal forms of grassland, heath and scrub. The grassland community can be characterised by grass species such as common bent-grass (*Agrostis capillaris*), creeping bent-grass (*A. stolonifera*), false oat-grass (*Arrhenatherum elatius*), cock's-foot (*Dactylis glomerata*), spreading meadow-grass (*Poa humilis*), sand couch (*Elytrigia repens*), red fescue (*Festuca rubra*), Yorkshire fog (*Holcus lanatus*) and crested hair-grass (*Koeleria macrantha*), field wood-rush (*Luzula campestris*), and broadleaf herbs such as yarrow (*Achillea millefolium*), thrift (*Armeria maritima*), common mouse-ear (*Cerastium fontanum*), wild carrot (*Daucus carota*), autumn hawkbit (*Leontodon autumnalis*), common bird's-foot trefoil (*Lotus corniculatus*), buck's-horn plantain (*Plantago coronopus*), ribwort plantain (*P. lanceolata*), silverweed (*Potentilla anserina*), common sorrel (*Rumex acetosa*), dandelion (*Taraxacum officinale* agg.), lady's bedstraw (*Galium verum*), red clover (*Trifolium pratense*) and white clover (*T. repens*). The scrub community can be characterised by the woody species honeysuckle (*Lonicera periclymenum*), blackthorn (*Prunus spinosa*), bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*) and the climber hedge bindweed (*Calystegia sepium*). These more inland communities have less bare shingle and vegetative cover usually dominates. The majority of the grassland and scrub communities are rooted within soil, whereas the pioneer community is usually rooted in gravel, sand or organic matter (e.g. decomposing seaweed and other plant material). Once the soil layer on top of the shingle is more than 30cm deep, the community is no longer defined as perennial vegetation of stony banks.

3.1 Overall Objective

The overall objective for 'Perennial vegetation of stony banks' in Tacumshin Lake 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) Range, (b) Area 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. The target for favourable condition is that there is no decrease from the established baseline. Bearing in mind that coastal systems are naturally dynamic and subject to change, even within a season, this target is assessed subject to natural processes, including erosion and succession.

The VSM (Martin *et al*., 2017) mapped the area of vegetated shingle where it occurred. The area of perennial vegetation of stony banks recorded by the VSM within Tacumshin Lake SAC was 3.92ha (Martin *et al*., 2017).

The area of perennial vegetation of stony banks increased from 0.78ha during the CMP (Ryle *et al*., 2009) to 3.92ha during the VSM (Martin *et al*., 2017) due to the development of the habitat after extreme storm events.

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

3.3 Range

3.3.1 Habitat distribution

The recorded location of the surveyed vegetated shingle site in Tacumshin Lake SAC, as mapped by Martin *et al*. (2017), is presented in Appendix I.

Perennial vegetation of stony banks is located on the southern edge of Tacumshin Lake, on the landward side of the dune system (Martin *et al*., 2017).

The NSBS classified the perennial vegetation of stony banks in the NSBS sub-site Tacumshin Barrier as a vegetated lagoonal system and it is defined as a spit bar (shingle storm beaches) following Chapman (1976).

The NSBS (Moore and Wilson, 1999) ranked each surveyed site as either High, Medium or Low interest, based on site representativity, species diversity, habitat diversity and the presence of rare or scarce species. Tacumshin Barrier was ranked as a 'High interest' site by the NSBS (Moore and Wilson, 1999) due to the gravel based dune system found there. A 'High interest' ranking denoted a site that is of high conservation value and perhaps of interest botanically or geomorphologically (Moore and Wilson, 1999).

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

3.4 Structure and Functions

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

3.4.1 Physical structure: functionality and sediment supply

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

The shingle in the Tacumshin sub-site comprises pebble and gravel as defined using a modified version of the particle size ranges defined in Fossitt (2000). Gravel is the major component in all stops in the Tacumshin sub-site (Martin *et al*., 2017).

Table 1. Shingle composition (as defined in Fossitt (2000) with minor modifications) of perennial vegetation of stony banks in the Tacumshin sub-site during the VSM 2016. Percentage (%) cover shown, recorded to the nearest 5%. Only stops with exposed shingle could contribute to the data presented.

	Stop 1	**Stop 2**	**Stop 3**	**Stop 4**
Boulder (>256 mm)	0	0	0	0
Cobble (>64-256 mm)	0	0	5	0
Pebble (>16-64 mm)	0	5	10	5
Gravel (2-16 mm)	100	95	85	95

On-going works around the sluice between the lagoon and the sea is impacting on the natural sediment dynamics of the vegetated shingle habitat in the sub-site (Martin *et al*., 2017).

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

3.4.2 Physical structure: disturbance

Damage to the habitat due to disturbance was assessed as a negative indicator by Martin *et al*. (2017). Disturbance can include damage from heavy trampling, vehicle damage and removal of substrate.

The target is that no more than 20% of the habitat is affected by disturbance.

3.4.3 Vegetation structure: zonation

Ecological variation within this habitat type depends on stability, the amount of fine material accumulating between the pebbles, climatic conditions, width of the foreshore and past management of the site. The ridges and lows also influence the vegetation patterns, resulting in characteristic communities and zonations of bare and vegetated shingle. In the frontal, less stable areas of shingle, the vegetation tends to be dominated by short-lived salt-tolerant perennials (pioneer community). Where the shingle is more stable, it becomes more vegetated and may include grassland, heathland and scrub communities, depending on the exact nature of the site. The

presence of lichens indicates long-term stability of the shingle structure. Further information on the communities of perennial vegetation of stony banks is found in Martin *et al*. (2017).

The VSM (Martin *et al*., 2017) recorded one community of perennial vegetation of stony banks in the Tacumshin sub-site - a pioneer community.

Vegetated shingle is part of a naturally dynamic coastal system. In order to ensure the ecological functioning of all of the vegetated shingle communities present, it is vital to maintain the zonations and transitions to other habitats, including lagoon, saltmarsh and sand dune habitats.

Habitats that are associated with the vegetated shingle in Tacumshin Lake SAC include sand dune and saltmarsh habitats and a lagoon.

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 composition: communities and typical species

The degree of exposure, as well as the coarseness and stability of the substrate determines species diversity. Typical species lists for the three main vegetated shingle communities (pioneer, grassland and scrub) are presented in Martin *et al*. (2017).

As mentioned above, the shingle in the Tacumshin sub-site includes one community of perennial vegetation of stony banks that was recorded during the VSM (Martin *et al*., 2017) – a pioneer community. Table 2 presents the typical species recorded within the pioneer community of perennial vegetation of stony banks in the Tacumshin sub-site by Martin *et al*. (2017).

Table 2. Typical species recorded within the pioneer community of perennial vegetation of stony banks in the Tacumshin sub-site by Martin *et al*. (2017). Negative and non-native species are excluded from the list.

Pioneer community	
Ammophila arenaria	*Poa humilis*
Atriplex prostrata	*Polygonum oxyspermum* subsp. *rali*
Festuca rubra	*Rumex crispus*
Hypochaeris radicata	*Sonchus* species
Lotus corniculatus	*Tripleurospermum maritimum*
Plantago lanceolata	

Notable species were also recorded during the VSM (Martin *et al*., 2017). The *Critically Endangered* (Wyse Jackson *et al*., 2016) and FPO listed species cottonweed (*Achillea maritima*) was recorded within the perennial vegetation of stony banks habitat in Tacumshin Lake SAC by Ryle *et al*. (2009), but not during the VSM (Martin *et al*., 2017). It should be noted that the recent presence of cottonweed in the SAC was due to a translocation experiment rather than a naturally occurring population.

The target for this attribute is to ensure that occurrence of the typical species within the range of vegetated shingle communities is maintained.

3.4.5 Vegetation composition: negative indicator species

Negative indicator species can include species indicative of changes in nutrient status, e.g. nettle (*Urtica dioica*), and species not considered to be typical of the habitat, e.g. bracken (*Pteridium aquilinum*). The list of negative indicator species commonly found in the habitat is presented in Appendix I of Martin *et al*. (2017).

No negative indicator species were recorded within the monitoring stops in the habitat in the Tacumshin sub-site by the VSM (Martin *et al*., 2017).

The target for negative indicator species is that no species is present in more than 60% of stops and the combined cover in any individual stop is 25% or less.

3.4.6 Vegetation composition: non-native species

Non-native species can be invasive and have deleterious effects on native vegetation. Low targets are set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances.

No non-native species were recorded within the monitoring stops in the habitat in the Tacumshin sub-site by the VSM. However, the non-native invasive species Japanese rose (*Rosa rugosa*) was recorded within the Tacumshin sub-site, but with less than 1% coverage (Martin *et al*., 2017).

The target for non-native species is that no species is present in more than 20% of stops, the combined cover in any individual stop is 1% or less, and the cover across the whole site 1% or less. At a site level, if a non-native species has been under-recorded, or not recorded, via the stops, the percentage cover for the species across the site should be recorded and assessed.

4 Sand dune habitats

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

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

- **Annual vegetation of drift lines (1210)**
- **Embryonic shifting dunes (2110)**
- **Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (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) *

The three dune habitats indicated in bold above are listed as Qualifying Interests for Tacumshin Lake SAC, two of which, embryonic shifting dunes (2110) and marram (*Ammophila arenaria*) dunes (2120), were recorded by Martin *et al*. (2017) from the SAC. Annual vegetation of drift lines (1210) is listed as a Qualifying Interest for the SAC, but was not recorded as present within the SAC by either the VSM (Martin *et al*., 2017) or the CMP (Ryle *et al*., 2009). Fixed dunes (2130) was also recorded by Martin *et al*. (2017), but this Annex I habitat is not a Qualifying Interest for the SAC. These habitats include mobile areas at the front as well as more stabilised parts of dune systems.

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 than in the embryonic dunes, 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 refer 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).

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

Detailed descriptions from the VSM (Martin *et al*., 2017) of each sand dune habitat found in the Tacumshin sub-site are presented in Appendix II. A total of 40.79ha of sand dune habitats was mapped within Tacumshin Lake SAC, 13.96ha (34%) of which represents habitats that are listed as Qualifying Interests for this particular SAC.

4.1 Overall objectives

The overall objective for 'Annual vegetation of drift lines' in Tacumshin Lake SAC is to '*maintain the favourable conservation condition*'.

The overall objective for 'Embryonic shifting dunes' in Tacumshin Lake SAC is to '*maintain the favourable conservation condition*'.

The overall objective for 'Shifting dunes along the shoreline with *Ammophila arenaria'* in Tacumshin Lake 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.

4.2 Area

4.2.1 Habitat area

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 the Tacumshin sub-site during the VSM (Martin *et al*., 2017). These maps are included with the individual site report in Appendix II at the end of this document.

The total areas of each Qualifying Interest sand dune habitat within Tacumshin Lake SAC as estimated by Martin *et al.* (2017) are presented in the second column of the following table.

Habitat	Total area (ha) of habitat from VSM in Tacumshin sub-site	Total area (ha) of habitat within SAC boundary
Annual vegetation of drift lines	0.0	0.0
Embryonic shifting dunes	0.73	0.73
Shifting dunes along the shoreline with *Ammophila arenaria*	13.52	13.23
Total	**14.25**	**13.96**

As mentioned earlier, annual vegetation of drift lines (1210) was not recorded within the SAC by either the VSM (Martin *et al*., 2017) or the CMP (Ryle *et al*., 2009). However, the habitat is dynamic in nature and it can appear and disappear within a site from year to year.

The area of embryonic shifting dunes increased from 0.67ha during the CMP (Ryle *et al*., 2009) to 0.73ha during the VSM (Martin *et al*., 2017) due to natural processes.

The area of mobile dunes increased from 8.21ha during the CMP (Ryle *et al*., 2009) to 13.52ha in the Tacumshin sub-site during the VSM (Martin *et al*., 2017). This is partially due to succession from perennial vegetation of stony banks, and also due to development in areas previously mapped as fixed dunes (grey dunes) during the CMP, either due to sand deposition on the fixed dunes (grey dunes) from storm activity, restarting the successional process of dune formation, or erosion (Martin *et al*., 2017).

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

4.3 Range

4.3.1 Habitat distribution

The distribution of sand dune habitats in Tacumshin Lake SAC, as mapped by Martin *et al.* (2017), is presented in Appendix I.

Embryonic shifting dunes are located in four distinct areas at the front of the dune system in the Tacumshin sub-site, with the longest stretch of habitat approximately 600m in length. Where they occur, they are the most seaward habitat present (Martin *et al*., 2017).

Mobile dunes stretch almost the entire length of the Tacumshin sub-site, and for the most part form the most seaward habitat in the SAC (Martin *et al*., 2017).

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

4.4 Structure and Functions

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

4.4.1 Physical structure: functionality and sediment supply

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

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

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.

4.4.2 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.

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

4.4.3 Vegetation composition: plant health of dune grasses

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

The target for this attribute is that healthy shoots of dune grasses or flowering/fruiting are observed in more than 40% of monitoring stops.

4.4.4 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*) and sand couch (*Elytrigia juncea*) are 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 bird's-foot trefoil (*Lotus corniculatus*), wild thyme (*Thymus polytrichus*), kidney vetch (*Anthyllis vulneraria*), wild pansy (*Viola tricolor*) and biting stonecrop (*Sedum acre*).

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

4.4.5 Vegetation composition: negative indicator species

Negative indicators include species indicative of changes in nutrient status, e.g. nettle (*Urtica dioica*), and species not considered characteristic of the habitat, e.g. bracken (*Pteridium aquilinum*).

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 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 sea buckthorn, which can form dense impenetrable thickets.

No negative indicator species were recorded within the embryonic shifting dunes habitat in the Tacumshin sub-site during the VSM (Martin *et al*., 2017).

The negative indicator species false oat-grass (*Arrhenatherum elatius*), creeping thistle (*Cirsium arvense*), spear thistle (*C. vulgare*) and common ragwort (*Senecio jacobaea*) were recorded within three monitoring stops within the shifting dunes along the shoreline with *Ammophila arenaria* habitat in the Tacumshin sub-site at a cover of less than 1% (Martin *et al*., 2017).

The target for negative indicators is that no species is present in more than 60% of stops and the combined cover of negative indicators throughout any one habitat is 5% or less and the highest cover score within any one stop in 25% or less.

4.4.6 Vegetation composition: non-native species

Non-native species can have a negative impact on sand dune habitats. Sea buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled.

Japanese rose (*Rosa rugosa*) was recorded by the VSM (Martin *et al*., 2017) within the shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) habitat in the Tacumshin sub-site.

The target is that non-native species, such as sea buckthorn (*Hippophae rhamnoides*), should not be present in more than 20% of stops.

5 References

Chapman, V.J. (1976) Coastal Vegetation. Pergamon Press, Oxford.

Delaney, A., Devaney, F.M., Martin, J.R. and Barron, S.J. (2013). Monitoring survey of Annex I sand dune habitats in Ireland. Irish Wildlife Manuals, No. 75. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

European Commission (2013) Interpretation Manual of European Union Habitats – EUR 28. DG Environment-Nature and Biodiversity, Brussels.

Fossitt, J.A. (2000) A guide to habitats in Ireland. The Heritage Council, Kilkenny.

Gaynor, K. (2008) The phytosociology and conservation value of Irish sand dunes. Ph.D. Thesis, National University of Ireland, Dublin.

Martin, J.R., Daly, O.H. and Devaney, F.M. (2017) Survey and assessment of vegetated shingle and associated habitats at 30 coastal sites in Ireland. Irish Wildlife Manuals, No. 98. National Parks and Wildlife Service, Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin.

Moore, D. and Wilson, F. (1999) National Shingle Beach Survey of Ireland 1999. Unpublished report to National Parks and Wildlife Service, Dublin.

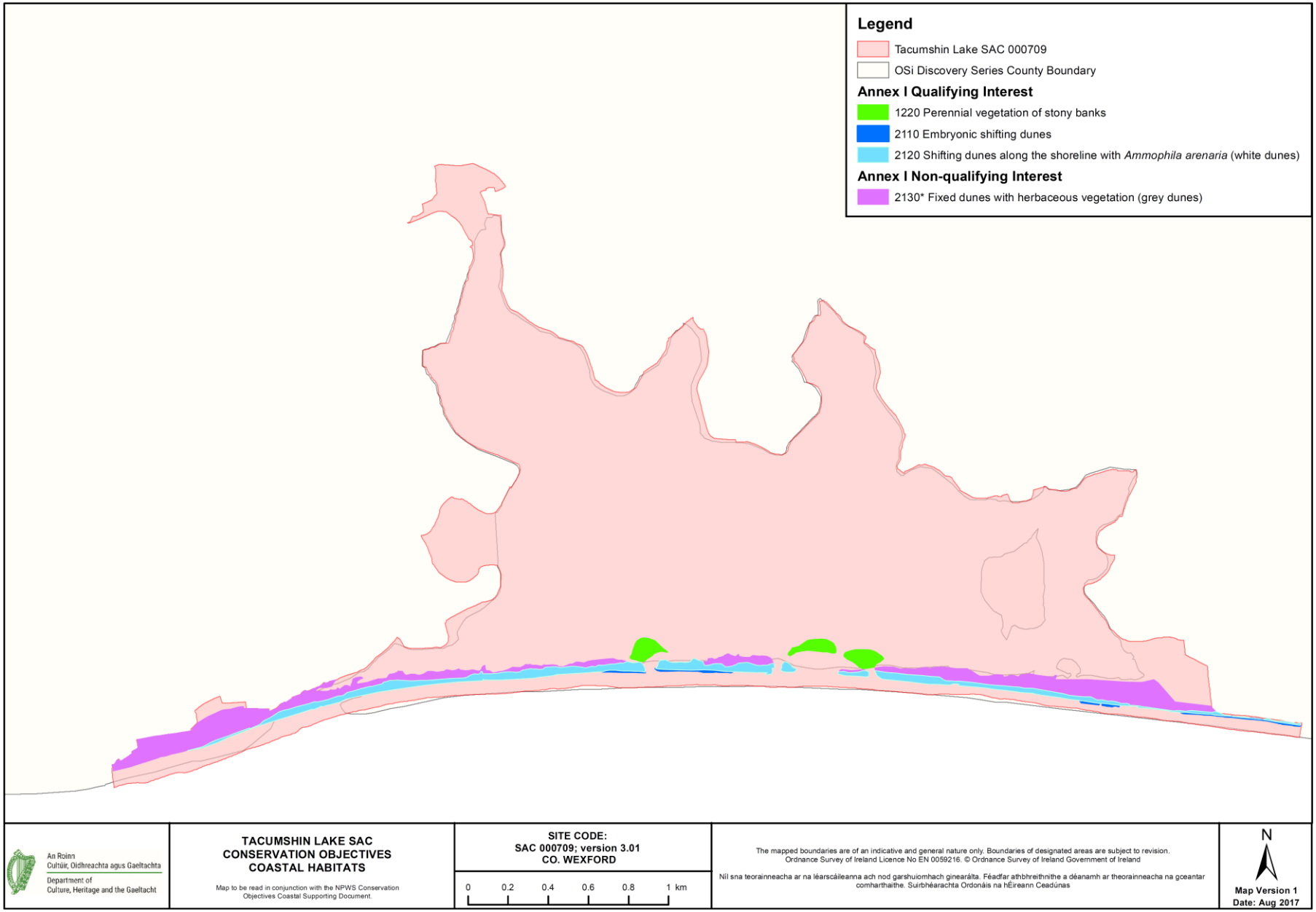
NPWS (2013) The status of EU protected habitats and species in Ireland. Volume 2. Habitat Assessments. Version 1.1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2014) Site synopsis for Tacumshin Lake SPA 004092. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004092.pdf

Ryle, T., Murray, A., Connolly, K. and Swann, M. (2009) Coastal Monitoring Project 2004-2006. Unpublished report to the National Parks and Wildlife Service, Dublin.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. and Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

Appendix I – Distribution map of perennial vegetation of stony banks and sand dune habitats within Tacumshin Lake SAC



Appendix II – Tacumshin site report and habitat maps from the Vegetated Shingle Monitoring Project (VSM)

SITE 023 TACUMSHIN

The following individual site report should be read in conjunction with the main report (Martin *et al.*, 2017). Please note that NSBS refers to the National Shingle Beach Survey (NSBS) (Moore & Wilson, 1999), CMP refers to the baseline Coastal Monitoring Project (Ryle *et al*., 2009), SDM refers to the Sand Dunes Monitoring Project (Delaney *et al*., 2013) and VSM to the Vegetated Shingle Monitoring Project (Martin *et al*., 2017).

The shingle at this location is referred to as Site 130 Tacumshin Barrier by the NSBS, and the dune system and shingle at this location is referred to as Site 40 Tacumshin by the CMP.

1 SITE DESCRIPTION

Tacumshin is a small site located approximately 15 km south of Wexford town, Co. Wexford. It forms the southern edge of Tacumshin Lake, a land-locked shallow lagoon, and extends west as far as Ringbaun and east as far as Grogan. Tacumshin Lake is considered one of the prime examples of lagoon habitat within Ireland, and apart from an outfall pipe, the lagoon is now land-locked by a gravel/sand bar. The site is a Special Area of Conservation (SAC 000709) (NPWS, 2013) and was ranked as a 'High interest' site by the NSBS due to the gravel based dune system found there. Four Annex I sand dune habitats (*indicates a priority habitat) were recorded during the CMP: **1220 Perennial vegetation of stony banks, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes)** and ***2130 Fixed dunes (grey dunes).** Other Annex I habitats associated with the sand dunes at Tacumshin include ***1150 Coastal lagoons** and **1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)**. **1210 Annual vegetation of drift lines** is listed as a Qualifying Interest for this SAC, however this habitat was not recorded during the CMP or the VSM. The site was not surveyed during the SDM.

Two small populations of the rare Flora Protection Order (FPO) species *Otanthus maritimus* (cottonweed) were recorded by the CMP, but neither population was re-found during the VSM. Other noteworthy species recorded at the site include FPO species, *Centaurium pulchellum* (lesser centaury), though this was not located during the CMP or the VSM, and the Annex V species *Rana temporaria* (common frog), Annex IV species *Lacerta vivipara* (viviparous lizard) and Annex V species *Lepus timidus* (*hibernicus*) (mountain hare). Mountain hares were observed during the VSM. The lagoon and its surrounding land support large numbers of over-wintering birds and for this reason part of the site has been designated as a Special Protection Area (SPA 004092) (NPWS, 2014a). The invertebrate fauna at the site is particularly rich with the CMP stating that over 45 taxa were recorded in a brief survey in 1996.

The beach is not favoured for swimming owing to the course nature of the sediment and its exposed nature. The majority of recreational users come to walk, horse-ride or fish. There are no recreational facilities at the site other than a number of small informal car parking areas. The surrounding area is rural with farmland adjacent to the sand dunes. Most of the site is in private ownership, with compensated management regimes established between local farmers and the National Parks and Wildlife Service (NPWS).

2 CONSERVATION ASSESSMENTS

2.1 Overview

Tacumshin was surveyed on the 30th and 31st of May 2016. Of the four Annex I habitats recorded on the site during the baseline survey, all four were recorded in 2016. The habitats found at Tacumshin in 2016 and the results of the conservation assessments are presented in Table 1. The conservation status of **1220 Perennial vegetation of stony banks** and **2120 Marram dunes (white dunes)** were assessed as Unfavourable-Inadequate. **2110 Embryonic shifting dunes** were assessed as Favourable. ***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Bad. **1220 Perennial vegetation of stony banks** and **2110 Embryonic shifting dunes** were not assessed during the CMP and therefore no comment on whether the condition of these habitats is improving, deteriorating or remaining stable could be made.

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

Habitat	Area	Structure & Functions	Future Prospects	Overall result
1220 Perennial vegetation of stony banks	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
2110 Embryonic shifting dunes	Favourable	Favourable	Favourable	Favourable
2120 Marram dunes (white dunes)	Favourable (stable)	Favourable (stable)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)
*2130 Fixed dunes (grey dunes)	Favourable (stable)	Unfavourable-Bad (deteriorating)	Unfavourable-Bad (deteriorating)	Unfavourable-Bad (deteriorating)

The Area and Structure and Functions of **2120 Marram dunes (white dunes)** have now remained Favourable across two reporting periods, as determined by the CMP and VSM. It is proposed that if Area and Structure and Functions remain Favourable after the next reporting period all recorded activities within this habitat should be judged to be having a neutral impact as demonstrated by the consistently favourable Area and Structure and Functions.

2.1.1 Area

The areas of Annex I sand dune habitats at Tacumshin are presented in Table 2. The baseline habitat areas presented here are taken from the baseline CMP maps for this site (Ryle *et al.*, 2009), with some minor changes made as a result of re-interpretation of some sand dune habitats during the VSM. Comparisons are made between the baseline CMP areas and the VSM areas, as presented in Table 2, for changes in habitat area at this site.

Table 2. Areas of Annex I dune habitats mapped at Tacumshin during the baseline CMP survey and the VSM.

Habitat	†Baseline CMP (ha)	VSM (ha)
1220 Perennial vegetation of stony banks	0.78	3.92
2110 Embryonic shifting dunes	0.67	0.73
2120 Marram dunes (white dunes)	8.21	13.52
*2130 Fixed dunes (grey dunes)	37.65	29.16
Total	47.31	47.33

†Note: Baseline CMP areas were revised based on re-interpretation of some habitats during the VSM survey.

All foredune habitats present at Tacumshin, **1220 Perennial vegetation of stony banks**, **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)**, increased in area since the CMP. ***2130 Fixed dunes (grey dunes)** decreased in area since the CMP. The sand dunes at Tacumshin have undergone a substantial amount of re-working since the CMP, with natural erosion occurring along the seaward edge of the site and pushing back the sand dune habitats in a landward direction by up to 23 m in parts. There are also three new breaches in the dunes since the CMP. It also appears that a large amount of sand and gravel has also been deposited on the existing dunes by storm activity since the CMP, reducing the area of ***2130 Fixed dunes (grey dunes)** further and creating new habitat formation opportunities for the foredune habitats.

With regards to interpretation, only **2120 Marram dunes (white dunes)** and ***2130 Fixed dunes (grey dunes)** had their CMP areas adjusted. Both habitats had additional areas outside of the original CMP site boundary for Tacumshin and were added to the site, with the CMP areas adjusted accordingly. In addition to this the boundary between ***2130 Fixed dunes (grey dunes)** and two saltmarsh habitats was adjusted due to interpretation by the VSM surveyors. Again, the CMP area of ***2130 Fixed dunes (grey dunes)** was adjusted accordingly to reflect this change in the habitat boundaries.

The total area of sand dune habitats has increased from 47.31 ha to 47.33 ha since the baseline CMP survey due to natural processes of deposition. As all changes in area are due to either interpretation or natural processes, Area was as assessed as Favourable for all habitats.

2.1.2 Structure and Functions

Table 3 shows the number of monitoring stops carried out in each habitat and the number of criteria assessed. The number of criteria that failed is also shown. The Structure and Functions of **2110 Embryonic shifting dunes** and **2120 Marram dunes (white dunes)** were assessed as Favourable. **1220 Perennial vegetation of stony banks** was assessed as Unfavourable-Inadequate with one criterion, interference with sediment dynamics, failing. ***2130 Fixed dunes (grey dunes)** was assessed as Unfavourable-Bad due to the failure of three criteria, positive indicator species, height of vegetation, and interference with sediment dynamics.

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

Habitat	No. monitoring stops	Total no. assessment criteria	No. failed criteria
1220 Perennial vegetation of stony banks	4	7	1
2110 Embryonic shifting dunes	4	7	0
2120 Marram dunes (white dunes)	8	7	0
*2130 Fixed dunes (grey dunes)	10	11	3

2.1.3 Future Prospects

Impacts and activities recorded at Tacumshin are presented in Table 4. Impact codes are assigned according to Ssymank (2011). Hare grazing was identified as a positive impact on **2120 Marram dunes (white dunes)** and ***2130 Fixed dunes (grey dunes).** Storm activity impacting upon **1220 Perennial vegetation of stony banks** and **2120 Marram dunes (white dunes)** was the only other positive impact recorded on the site. A lack of grazing, paths and tracks, walking and horse-riding,

tractors, trampling, invasive non-native species and the presence of engineering works to build and maintain the sluice between lagoon and sea were all recorded as negative impacts on ***2130 Fixed dunes (grey dunes)** also, with the majority being high-intensity impacts. The engineering works also impacted negatively on **1220 Perennial vegetation of stony banks.** Horse riding and walking, tractors, trampling and invasive non-native species were recorded as negative impacts for **2120 Marram dunes (white dunes)**. Storm activity was recorded as a neutral impact for ***2130 Fixed dunes (grey dunes)**. No impacts were recorded for **2110 Embryonic shifting dunes**.

Table 4. Impacts recorded in Annex I sand dune habitats at Tacumshin in 2016. Source refers to whether the impact being scored originates inside or outside the Annex I habitat being assessed.

Habitat code	Impact code	Impact description	Intensity	Effect	Percent of habitat	Source
1220	J02.12.01	Sluice engineering works	High	Negative	10	Inside
1220	L07	Storm (storm beach creation)	High	Positive	100	Outside
2120	G01.02	Walking and horse-riding	Medium	Negative	5	Inside
2120	G01.03.02	Off-road motorised vehicles (Tractors)	Medium	Negative	<1	Inside
2120	G05.01	Trampling	High	Negative	<1	Inside
2120	I01	Invasive non-native species (*Rosa rugosa*)	High	Negative	<1	Inside
2120	K04.05	Hare grazing	Low	Positive	1	Inside
2120	L07	Storm (large amounts of sand deposition)	High	Positive	100	Outside
*2130	A04.03	Abandonment of pastoral systems	Medium	Negative	100	Inside
*2130	D01.01	Paths and tracks	High	Negative	<1	Inside
*2130	G10.02	Walking and horse-riding	Medium	Negative	5	Inside
*2130	G01.03.02	Off-road motorised vehicles (Tractors)	High	Negative	1	Inside
*2130	G05.01	Trampling	High	Negative	<1	Inside
*2130	I01	Invasive non-native species (*Rosa rugosa*)	High	Negative	<1	Inside
*2130	J02.12.01	Sluice engineering works	High	Negative	10	Inside
*2130	K04.05	Hare grazing	Low	Positive	1	Inside
*2130	L07	Storm (large amounts of sand deposition)	High	Negative	25	Outside

2.2 Annex I habitat assessments

The conservation status of the Annex I habitats at Tacumshin is discussed below. The present conservation status in 2016 is compared with the baseline status and if a habitat is not in Favourable status, the main reasons for the Unfavourable assessment are given. Areas recorded in 2016 are compared with the revised baseline areas. It should be borne in mind that natural processes such as erosion, deposition and succession are primary drivers of change on coastal habitats.

2.2.1 1220 Perennial vegetation of stony banks

1220 Perennial vegetation of stony banks was located at the back of the dune system where several breaches in the dunes are present. It appears that during extreme storm activity, large amounts of shingle from the sea were deposited on the existing dunes and these storm beaches were

subsequently colonised by perennial species to form **1220 Perennial vegetation of stony banks.** The NSBS classified the **1220 Perennial vegetation of stony banks** at this site as a vegetated lagoonal system and it is defined as a spit bar (shingle storm beaches) following Chapman (1976). During the CMP, **1220 Perennial vegetation of stony banks** was not assessed because it was present in a relatively small area located on the landward side of the dunes where the lagoon outfall is located. For this reason no comment can be made on whether the condition of the habitat at Tacumshin is improving, deteriorating or remaining stable.

Area

The area of **1220 Perennial vegetation of stony banks** increased from 0.78 ha during the CMP to 3.92 ha during the VSM due to the development of this habitat after extreme storm events. Area was assessed as Favourable during the VSM.

Structure and Functions

Four monitoring stops were recorded in **1220 Perennial vegetation of stony banks**, with Structure and Functions failing one criterion. This criterion assessed interference with sediment dynamics. The on-going engineering works to build and maintain the sluice between the lagoon and the sea is impacting on the natural sediment dynamics of the site. Structure and Functions were assessed as Unfavourable-Inadequate during the VSM.

Future Prospects

The only two impacts recorded for **1220 Perennial vegetation of stony banks** were the negative impact of the engineering works to maintain the sluice between the lagoon and the sea, and the positive storm activity at this site which is creating new opportunities for habitat development. Although the positive impact of the storm activity currently outweighs the negative impact of the engineering works, there is no way of predicting the frequency of the storm activity. It is also a natural process. The negative impact of the engineering associated with the sluice will continue for the foreseeable future and is anthropogenic in nature. Future Prospects for **1220 Perennial vegetation of stony banks** were therefore assessed using expert judgement as Unfavourable-Inadequate during the VSM.

Conservation assessment

1220 Perennial vegetation of stony banks was assessed as Unfavourable-Inadequate during the VSM due to the presence of the sluice between the lagoon and the sea and on-going engineering works to maintain it.

2.2.2 2110 Embryonic shifting dunes

2110 Embryonic shifting dunes were located in four distinct areas at the front of the dune system, with the longest stretch of habitat approximately 600 m in length. Where they occurred, they were the most seaward habitat present. During the CMP, **2110 Embryonic shifting dunes** were not assessed and no comment can therefore be made on whether the condition of the habitat at Tacumshin is improving, deteriorating or remaining stable.

Area

The area of **2110 Embryonic shifting dunes** increased from 0.67 ha during the CMP to 0.73 ha during the VSM due to natural processes. Area was assessed as Favourable during the VSM.

Structure and Functions

Four monitoring stops were recorded in **2110 Embryonic shifting dunes**, with Structure and Functions passing all criteria. Structure and Functions were assessed as Favourable during the VSM.

Future Prospects

No impacts were recorded for **2110 Embryonic shifting dunes** during the VSM. Future Prospects were assessed as Favourable during the VSM.

Conservation assessment

2110 Embryonic shifting dunes at Tacumshin were assessed as Favourable during the VSM.

2.2.3 2120 Marram dunes (white dunes)

2120 Marram dunes (white dunes) stretch almost the entire length of the Tacumshin site, and for the most part form the most seaward habitat of the site.

Area

2120 Marram dunes (white dunes) have increased in area from 8.21 ha during the CMP to 13.52 ha during the VSM. This is partially due to succession from **1220 Perennial vegetation of stony banks**, and also due to development in areas previously mapped as ***2130 Fixed dunes (grey dunes)** during the CMP, either due to sand deposition on the ***2130 Fixed dunes (grey dunes)** from storm activity, restarting the successional process of dune formation, or erosion. Area was assessed as Favourable during the CMP and as Favourable (stable) during the VSM.

Structure and Functions

All criteria passed in the Structure and Functions assessment. During the CMP, Structure and Functions were assessed as Favourable. Structure and Functions of **2120 Marram dunes (white dunes)** were assessed as Favourable (stable) during the VSM.

Future Prospects

Recreational activities such as trampling, and walking and horse-riding, as well as the use of tractors on site and the presence of invasive non-native species, have all had a negative impact on the **2120 Marram dunes (white dunes)**. Storm activity and hare grazing were recorded as impacting positively on the habitat. Storms have deposited large amounts of sand on the dunes, burying ***2130 Fixed dunes (grey dunes)** and allowing **2120 Marram dunes (white dunes)** to establish in their place. During the CMP, Future Prospects were assessed as Favourable because it was apparent that considerable amounts of windblown sand are driven along the beach ensuring continuation of the habitat. Similar to **1220 Perennial vegetation of stony banks**, although the positive impacts outweigh the negative due to the percentage area they impact on (storm activity – 100%), there is no way of knowing if the storm activity is a frequent enough occurrence at this site. It is also a natural process. It is expected that the anthropogenic negative impacts will continue for the foreseeable future. Future Prospects were therefore assessed using expert judgement as Unfavourable-Inadequate (deteriorating) during the VSM.

Conservation assessment

2120 Marram dunes (white dunes) were assessed as Favourable during the CMP and as Unfavourable-Inadequate (deteriorating) during the VSM due to the presence of a number of negative impacts recorded within this habitat at the time of survey.

*2.2.4 *2130 Fixed dunes (grey dunes)*

***2130 Fixed dunes (grey dunes)** are mainly fronted by **2120 Marram dunes (white dunes)**, except for at the most westerly point of the site at Ringbaun, where they are the most seaward habitat present. They form the most extensive sand dune habitat at Tacumshin.

Area

The area of ***2130 Fixed dunes (grey dunes)** decreased from 37.65 ha to 29.16 ha between the baseline CMP survey and 2016, with much of the loss attributed to natural erosion and/or due to storm activity depositing sand on top of this habitat, resulting in successional processes starting anew. Area of ***2130 Fixed dunes (grey dunes)** was assessed as Favourable during the CMP and as Favourable (stable) during the VSM.

Structure and Functions

Three of the criteria failed in the Structure and Functions assessment. The criteria which failed assessed the number of positive indicator species, height of vegetation and the presence of engineering works to maintain the sluice. Positive indicator species were frequent in only about 50% of stops, with two stops containing only two positive indicator species. This is a result of a lack of grazing, which is also evident from the tall height of vegetation, with 80% of stops failing this criterion. A permanent sluice pipe was constructed with one way gates to assist in a reduction of flooding of adjacent farmland and there are on-going engineering works on site to maintain this sluice which are impacting negatively on ***2130 Fixed dunes (grey dunes)**. During the CMP, Structure and Functions were assessed as Unfavourable-Inadequate because of undergrazing and other criteria not specified at two stops. Structure and Functions were assessed as Unfavourable-Bad (deteriorating) during the VSM.

Future Prospects

Hare grazing has a positive effect on 1% of the ***2130 Fixed dunes (grey dunes)** at Tacumshin. The presence of *Rosa rugosa* (Japanese rose) as an invasive non-native species, trampling, paths and tracks, tractors and walking and horse-riding on the habitat are scored as negative impacts affecting up to approximately 8% of ***2130 Fixed dunes (grey dunes)** combined. A lack of grazing negatively affects 100% of the habitat resulting in low diversity and tall vegetation. The engineering works associated with the sluice impact negatively on 10% of ***2130 Fixed dunes (grey dunes)**. Storm activity was recorded as a neutral impact, as it is natural rather than anthropogenic, on 25% of the habitat. During the CMP, negative impacts recorded for the habitat included agricultural improvement, walking/horse riding and paths and tracks. Horse riding and training on the ***2130 Fixed dunes (grey dunes)** was noted during the CMP as a particular impact which needed to be addressed. The Future Prospects of the habitat were assessed as Unfavourable-Inadequate during the CMP owing to the relative homogeneity and floristic diversity. Future Prospects were assessed as Unfavourable-Bad (deteriorating) during the VSM.

Conservation assessment

***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Inadequate during the CMP. ***2130 Fixed dunes (grey dunes)** were assessed as Unfavourable-Bad (deteriorating) during the VSM. The Unfavourable-Bad assessment is largely due to the lack of grazing resulting in a species-poor, rank sward.

3 DISCUSSION

3.1 Species lists for 1220 Perennial vegetation of stony banks communities

One community of **1220 Perennial vegetation of stony banks** was recorded during the VSM – a pioneer community. Table 5 presents the positive indicator species recorded within the pioneer community of **1220 Perennial vegetation of stony banks** at Tacumshin.

Table 5. Positive indicator species recorded within the pioneer community of **1220 Perennial vegetation of stony banks** at Tacumshin. Negative and non-native species are excluded from the list.

Pioneer community	
Ammophila arenaria	*Poa humilis*
Atriplex prostrata	*Polygonum oxyspermum* s. *rali*
Festuca rubra	*Rumex crispus*
Hypochaeris radicata	*Sonchus* species
Lotus corniculatus	*Tripleurospermum maritimum*
Plantago lanceolata	

3.2 Shingle vegetation substrate and composition

The vegetation of the pioneer community of **1220 Perennial vegetation of stony banks** is rooted within a gravel sand matrix for stops 1, 3 and 4, and a gravel, sand, and organic matrix for stop 2. The shingle comprises cobble, pebble and gravel as defined using a modified version of the particle size ranges defined in Fossitt (2000). Gravel is the major component in all stops (Table 6).

Table 6. Shingle composition (as defined in Fossitt (2000) with minor modifications) of **1220 Perennial vegetation of stony banks** at Tacumshin during the VSM 2016. % cover shown, recorded to the nearest 5%. Only stops with exposed shingle could contribute to the data presented.

	Stop 1	**Stop 2**	**Stop 3**	**Stop 4**
Boulder (>256 mm)	0	0	0	0
Cobble (>64-256 mm)	0	0	5	0
Pebble (16-64 mm)	0*	5	10	5
Gravel (2-16 mm)	100	95	85	95

* There is a tiny component of pebble present in Stop 1, however it is <1%.

3.3 *Otanthus maritimus* translocation

Otanthus maritimus was planted as part of a translocation experiment to increase the number of sites the species was found at. It was rediscovered during the CMP, but was not found during the VSM. Despite initial survival being high, only a few plants in the site nearest the sluice had survived and it is believed that the translocation sites were damaged by a horse (Steven Waldren, pers. comm.). As the initial presence of *Otanthus maritimus* on site was due to a translocation experiment, it was felt that the absence of the species during the VSM should not impact on the Structure and Functions assessment.

3.4 Lack of grazing

The ***2130 Fixed dunes (grey dunes)** are suffering from a lack of grazing, with this habitat showing signs of becoming rank. ***2130 Fixed dunes (grey dunes)** at Tacumshin face a number of negative pressures which are threatening the long-term viability of the habitat. A lack of grazing, assessed as a medium intensity negative impact, is of particular concern, with the habitat failing the Structure and Functions assessment, in part, due to low species diversity and too high a sward height. The only evidence of grazing was the presence of hares. A lack of grazing can result in bracken encroachment and succession to scrub communities, and also a lack of structural diversity, which can be detrimental to species diversity. Grazing animals help create micro-habitats within the ***2130 Fixed dunes (grey dunes)** habitat via grazing reducing or inhibiting successional phases, dung creating localised nutrient-enriched patches, and trampling causing small-scale blowouts. These grazing processes, when at an appropriate level, help to create and maintain an open and diverse ***2130 Fixed dunes (grey dunes)** habitat.

3.5 Flood alleviation

According to Healy *et al.* (1997) at least four artificial outlets have been cut in the sand/gravel bar to aid in the drainage of Tacumshin Lake and alleviate flooded adjacent farmland. However, these outlets were short-lived due to rapid siltation. At the end of the 19th century, the lagoon was drained by means of a large bore pipe. An additional drainage pipeline was installed through the sand/gravel bar in 1975 and a series of drainage channels were excavated in the lake bed. The capacity of these two pipes was insufficient to prevent the lagoon filling up in winter however so two main drains were excavated to aid with drainage (NPWS, 2013). A permanent sluice pipe was constructed with one way gates and there are ongoing engineering works on site to maintain this sluice. While modifications to the hydrology of the site only impact on the sand dune habitats by the physical footprint of the sluice, and associated drainage ditches and engineering works, modifications to the hydrological regime of the lagoon could lead to changes in salinity altering the present feeding and breeding habitat for birds. For this reason, modification of hydrographic functioning (J02.05) is recorded as a medium negative impact for the Tacumshin Lake SPA (NPWS, 2014b).

3.6 Non-native invasive species

The non-native invasive species *Rosa rugosa* (Japanese rose) appears to have invaded this site since the CMP in 2004, *Rosa rugosa* is an Amber listed species (ISI, 2016) and should be eradicated as soon as possible.

3.7 Storm activity

During the winter of 2014/2015 a large (approximately 1 ha) shingle storm beach was formed where a storm deposited tonnes of shingle gravel onto the dune and parts of the lagoon and saltmarsh. This is important for the site as these storm events provide habitat for **1220 Perennial vegetation of stony banks** species. In addition to the formation of this shingle storm beach, the front of the dune system has been eroded back and large amounts of sand were deposited on top of the ***2130 Fixed dunes (grey dunes)** so that it is now classified as **2120 Marram dunes (white dunes)**. Approximately one

third of the ***2130 Fixed dunes (grey dunes)** was lost and **2120 Marram dunes (white dunes)** have developed in their place.

3.8 Climate change

Due to the extensive erosion of coastal systems within Ireland during the winter storms of 2013/14 and evidence that an increase in Atlantic storms over the last few decades could be due to climate change (Masselink *et al.*, 2016), the impact of climate change on all sand dune habitats, particularly the foredune habitats, should be assessed. Based on comparisons between the VSM mapping recorded in 2016 and the CMP mapping recorded in 2004, there has been a loss of sand dune habitats along the seaward side of the site, with some parts of the site moved landwards by approximately 23 m. The sand dune habitats have been reworked extensively at Tacumshin by storm events, with not only erosion of habitats occurring, but deposition of large amounts of sand and gravel onto the habitats too. Although there have been losses, the impact of climate change has not been assessed for this site however as it would be more appropriate if an assessment of this impact was made at the national level.

A site-specific management plan addressing the issues discussed in sections 3.4 to 3.7 would help improve the Future Prospects of **1210 Annual vegetation of drift lines, 1220 Perennial vegetation of stony banks, 2120 Marram dunes (white dunes),** and ***2130 Fixed dunes (grey dunes)**, and this would ultimately improve their overall conservation assessments.

4 REFERENCES

Chapman, V.J. (1976) Coastal Vegetation. Pergamon Press, Oxford.

Delaney, A., Devaney, F.M, Martin, J.R. and Barron, S.J. (2013) Monitoring survey of Annex I sand dune habitats in Ireland. *Irish Wildlife Manuals*, No. 75. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin.

Healy, B., Oliver, G., Hatch, P. and Good, J. (1997) *Coastal lagoons in the Republic of Ireland (Volume III) 2. Tacumshin Lake.* Report prepared for the National Parks and Wildlife Service (BioMar/Life), Department of Arts, Heritage and the Gaeltacht, Dublin.

ISI (Invasive Species Ireland) (2016) Amber list. http://invasivespeciesireland.com. Accessed 06/01/2016.

Martin, J.R., Daly, O.H. and Devaney, F.M. (2017) Survey and assessment of vegetated shingle and associated habitats at 30 coastal sites in Ireland. *Irish Wildlife Manuals*, No. 98. National Parks and Wildlife Service, Department of the Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin.

Masselink, G., Castelle, B., Scott, T., Dodet, G., Suanez, S., Jackson, D. and Floc'h, F. (2016) Extreme wave activity during 2013/2014 winter and morphological impacts along the Atlantic coast of Europe. *Geophysical Research Letters*, 43: 2135-2143.

Moore, D. and Wilson, F. (1999) *National Shingle Beach Survey of Ireland*. Unpublished report to the National Parks and Wildlife Service, Dublin.

NPWS (2014a) SPA site synopsis for SPA 004092 Tacumshin Lake. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004092.pdf. Accessed November 2016.

NPWS (2014b) Natura 2000 Standard Data Form, Site 004092. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. http://www.npws.ie/sites/default/files/protected-sites/natura2000/NF004092.pdf. Accessed 11th July 2016.

NPWS (2013) SAC site synopsis for SAC 000709 Tacumshin Lake. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000709.pdf. Accessed November 2016.

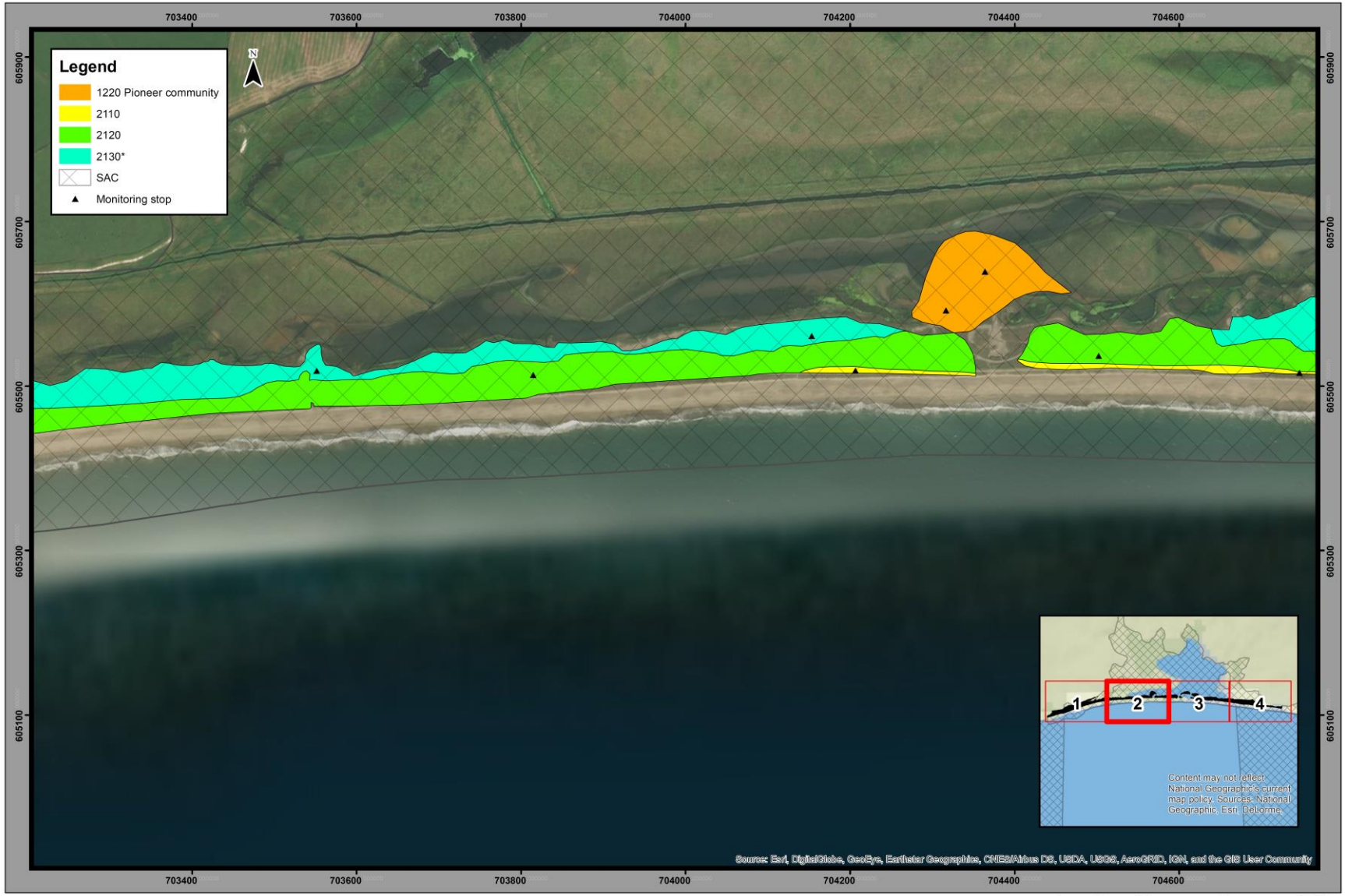
Ryle, T., Murray, A., Connolly, K. and Swann, M. (2009) Coastal Monitoring Project 2004-2006. A report submitted to the National Parks and Wildlife Service, Dublin.

Ssymank, A. (2011) Reference list threats, pressures and activities (final version). http://bd.eionet.europa.eu/activities/Natura_2000/Folder_Reference_Portal/Ref_threats_pressures_FINAL_20110330.xls. Accessed July 2016.

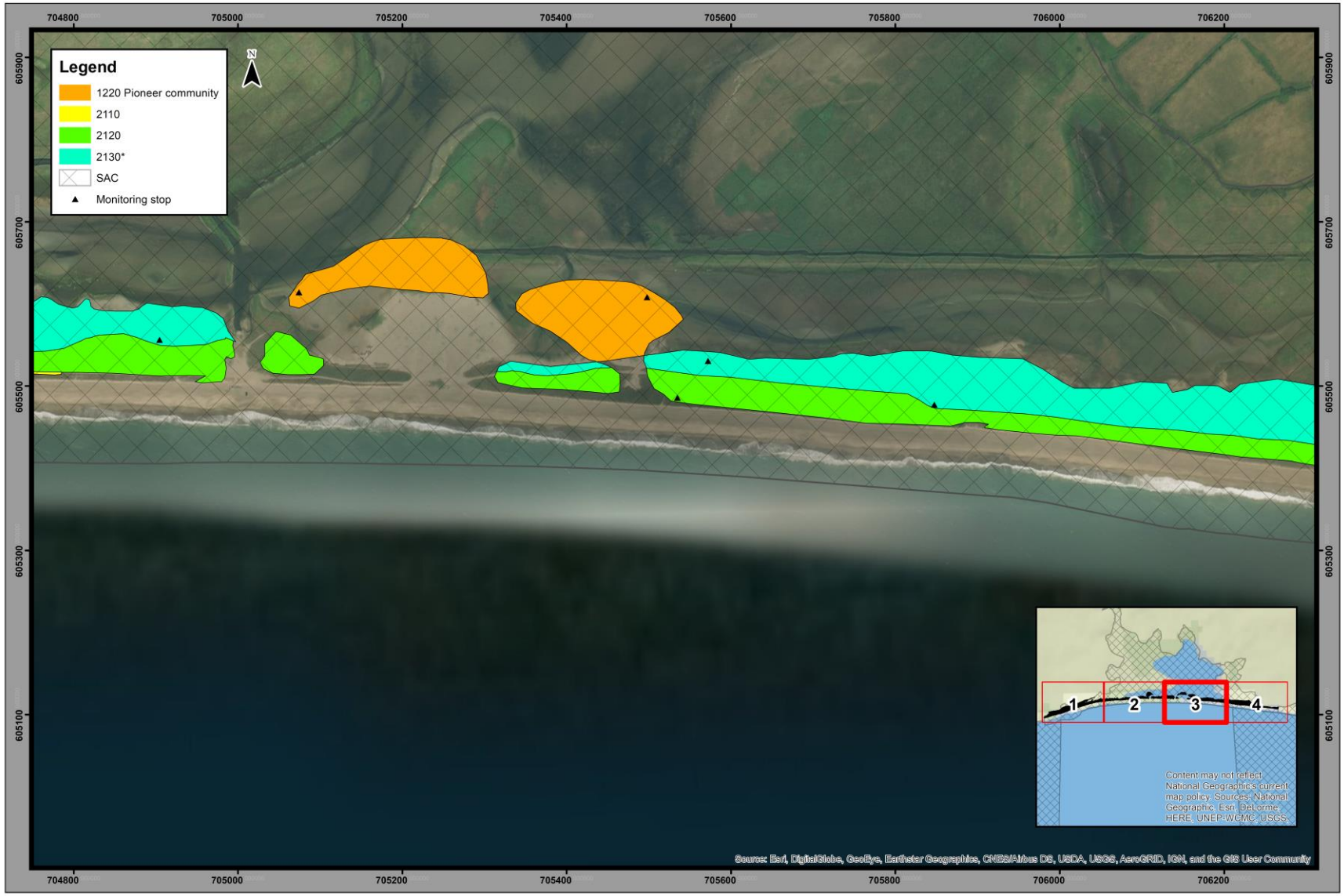
MAP 1 Site 023 Tacumshin, Co. Wexford

Map size A3

MAP 2 Site 023 Tacumshin, Co. Wexford



MAP 3 Site 023 Tacumshin, Co. Wexford



MAP 4 Site 023 Tacumshin, Co. Wexford