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Survey and assessment of vegetated shingle and associated habitats at 30 coastal sites in Ireland

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Survey and assessment of vegetated shingle and associated habitats at 30 coastal sites in Ireland

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Cover photo: Perennial vegetation of stony banks by Emmi Virkki

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Abbreviations:

VSM = Vegetated Shingle Monitoring (Martin *et al*., 2017)

SDM = Sand Dunes Monitoring Project (Delaney *et al*., 2013)

CMP = Coastal Monitoring Project (Ryle *et al*., 2009)

NSBS = National Shingle Beach Survey (Moore & Wilson, 1999)

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Executive Summary

A survey of 30 sites thought to support the habitat 1220 Vegetated shingle was completed between 23rd May and 28th September 2016. 1220 Vegetated shingle was located at 27 of the 30 sites and 64.57 ha of the Annex I habitat were mapped and assessed. The site with the largest area of 1220 Vegetated shingle was Derrymore Island in Co. Kerry (8.41 ha). Nine of the 30 sites surveyed during the Vegetated Shingle Monitoring (VSM) project included other Annex I sand dune habitats that were also mapped and assessed. The individual site reports for these nine sites present the monitoring data and conservation condition for each of these sand dune habitats, in addition to 1220 Vegetated shingle. The individual site reports also discuss management issues for each site, including coastal defences, agriculture, recreation, litter and non-native invasive species. For 21 of the 30 sites the individual site reports only present the monitoring data and conservation condition for 1220 Vegetated shingle.

The VSM data were used to produce a list of typical and characteristic species for four of the six vegetation communities recorded within the 1220 Vegetated shingle habitat. The pioneer community was characterised by the perennial species *Beta vulgaris* subsp. *maritima, Crambe maritima, Crithmum maritimum, Galium aparine, Glaucium flavum, Lathyrus japonicus, Raphanus raphanistrum* subsp. *maritimus, Rumex crispus, Silene uniflora, Sonchus arvensis,* and *Tripleurospermum maritimum*. The grassland community was characterised by the grass species *Agrostis capillaris, Agrostis stolonifera, Arrhenatherum elatius, Dactylis glomerata, Poa humilis, Elytrigia repens, Festuca rubra, Holcus lanatus* and *Koeleria macrantha*, the rush *Luzula campestris*, and the broadleaf herbs *Achillea millefolium, Armeria maritima, Cerastium fontanum, Daucus carota, Leontodon autumnalis, Lotus corniculatus, Plantago coronopus, Plantago lanceolata, Potentilla anserina, Rumex acetosa, Taraxacum officinale* agg., *Galium verum, Trifolium pratense* and *Trifolium repens*. The scrub community was characterised by the woody species *Lonicera periclymenum, Prunus spinosa, Rubus fruticosus* agg., *Ulex europaeus* and the climber *Calystegia sepium*. As only one monitoring plot was recorded within the lichen-rich and heath communities, a typical species list is not presented for either, but the species lists recorded within each of these communities are presented in the individual site reports.

The pioneer community was recorded within 27 sites, the grassland community was recorded at 22 sites, the scrub community was recorded at eight sites, and lichen-rich, heath and woodland communities were each found at one site. In addition to being recorded within all sites containing 1220 Vegetated shingle, the pioneer community also covered the largest area at 33.87 ha, with the grassland community the second largest, covering 26.89 ha. The scrub community covered 2.88 ha and the other three communities of 1220 Vegetated shingle together only covered 0.96 ha of the survey area. In total 167 monitoring stops were recorded within 1220 Vegetated shingle, with 111 stops within the pioneer community, 48 within the grassland community, 6 within the scrub community and 2 within other communities.

Of the 27 sites where the 1220 Vegetated shingle habitat was recorded, 26 are within an SAC, The Cunnigar (Co. Waterford) being the only site not within an SAC. The total area of 1220 Vegetated shingle surveyed within 20 SACs was 57.32 ha, representing 89% of the total area of 1220 Vegetated shingle surveyed.

Five of the 1220 Vegetated shingle sites had an overall conservation assessment of Favourable: Rossguill Peninsula (Co. Donegal), Bartraw Strand (Co. Mayo), Clonconeen Lough and Rinavella Bay (Co. Clare), South of Spanish Point (Co. Cork) and Derrymore Island (Co. Kerry).

Twenty of the 27 VSM sites where 1220 Vegetated shingle was recorded had a Favourable assessment for Area and seven had an Unfavourable assessment. Of these seven sites, five were assessed as Unfavourable-Inadequate, due to small areas of gravel extraction and newly built infrastructure, and one was assessed as Unfavourable-Bad due to recreational pressure having resulted in the loss of 26% of the habitat area at the site.

The Structure and Functions of 1220 Vegetated shingle was assessed as Favourable for 12 sites and Unfavourable-Inadequate at 15 sites. As none of the 27 VSM sites failed more than two of the Structure and Functions criteria none were assessed as Unfavourable-Bad. The main reason for an unfavourable assessment of Structure and Functions and Future Prospects was new coastal defences installed since 1992, which impacted on the substrate mobility of the system.

The Future Prospects of 1220 Vegetated shingle was assessed as Favourable at eight sites, Unfavourable-Inadequate at 14 sites and Unfavourable-Bad at five of the 27 VSM sites. The main negative impacts recorded within 1220 Vegetated shingle were agricultural intensification, tracks, walking and horse-riding, litter and new or upgraded coastal defences, with coastal defences impacting on 11 of the 27 sites.

Future priorities for achieving Favourable conservation status for 1220 Vegetated shingle include ensuring all future construction and maintenance works for coastal defences are appropriately assessed. Also, long-term (greater than 12 years) monitoring data should be collected to assess the impact of coastal defences on the Annex I habitat. It is proposed that only when long-term data on Area, Structure and Functions and Future Prospects are available can impacts, such as new coastal defences, be accurately assessed, with the possibility of a larger proportion being judged to be having a neutral impact, based on the evidence of consistently Favourable Area and Structure and Functions.

It is recommended that, where feasible, the future monitoring of 1220 Vegetated shingle be conducted at the SAC level, rather than on a site basis. In addition, the habitat could be monitored and mapped at the same time as other contiguous coastal Annex I habitats such as sand dunes and salt marshes.

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1. Introduction

1.1 The study of shingle systems in Ireland

Vegetated shingle is listed on Annex I of the EU Habitats Directive as habitat 1220 Perennial vegetation of stony banks (referred to in the remainder of this report as 1220 Vegetated shingle). Ireland is required, under Article 17 of the Habitats Directive, to report on the conservation status of this and all other Annex I habitats every six years. This reporting requires information on four parameters: Range, Area, Structure and Functions, and Future Prospects (Evans & Arvela, 2011).

A number of surveys of Ireland's coastal habitats have been conducted over the last number of years. In 1999 the National Shingle Beach Survey (NSBS) took place to conduct an inventory of shingle areas of conservation value on the Irish coast and to record data relating to their rare species and vegetation (Moore & Wilson, 1999). Moore & Wilson (1999) listed 153 potential sites for the 1220 Vegetated shingle habitat. At each site a list of vascular plant species was compiled and associated habitats were noted, in addition to which a profile sketch and photographic record was made of each site. Habitat assessments, including mapping the extent of the shingle habitat and recording monitoring stops, were not within the remit of the NSBS project. However, the NSBS did rank each site as either High, Medium or Low conservation importance, based on site representativity, species diversity, habitat diversity and the presence of rare or scarce species.

The Coastal Monitoring Project 2004-2006 (CMP) updated an earlier inventory of Irish sand dune systems, developed a monitoring programme for sand dune habitats, and mapped and assessed these habitats at 181 sites (Ryle *et al*., 2009). This provided the basis for the first assessment of Annex I sand dune habitats in Ireland. 1220 Vegetated shingle was included within the remit of the CMP, but only where it occurred in association with sand dune systems. The vegetated shingle areas surveyed during the CMP were acknowledged to represent only a subset of the total national resource of the EU Annex I habitat. Ryle *et al*. (2009) highlighted the fact that the monitoring protocol for vegetated shingle had yet to be finalised.

The Sand Dunes Monitoring Project (SDM) (Delaney *et al*., 2013) built on the baseline survey of the CMP. 1220 Vegetated shingle was also included within the remit of this survey, but again only where the habitat occurred in association with sand dune systems. Following a review during the SDM of the CMP methodology used to collect and analyse the assessment data for vegetated shingle and sand dune habitats, some modifications were made. It was found that during the CMP some vegetation communities consisting of short-lived species on shingle were included within 1220 Vegetated shingle, and these were reclassified as 1210 Annual vegetation of drift lines during the SDM. Structure and Functions criteria were expanded to include positive indicator species, rare species, non-native species, alterations to sediment dynamics, and damage due to disturbance. These criteria were assessed either at a monitoring stop level, or at a site level, or both. The SDM carried out the second set of national assessments of 1220 Vegetated shingle and sand dune habitats, thereby helping to fulfil the Article 17 reporting requirements for 2013. As the SDM surveyed a subset of CMP sites, the vegetated shingle sites were again only a subset of the total national resource of 1220 Vegetated shingle. This subset has been regarded as unrepresentative of the national resource, comprising largely marginal sites which do not include large shingle banks (NPWS, 2013).

The aim of this project was to survey 30 sites thought to support the 1220 Vegetated shingle habitat based on the NSBS inventory of shingle sites. The Vegetated Shingle Monitoring (VSM) project would include a baseline survey of 19 sites that had been previously visited by the NSBS in 1999 and a resurvey of 11 sites that had been surveyed either by the CMP between 2004 and 2006, or by the SDM in 2011-2012, or both. When selecting the 30 sites to be surveyed priority had been given to sites that were ranked of High conservation importance during the NSBS and also sites were chosen to represent the range of variation in shingle systems in terms of geographical location, geomorphology, and topography. Of the 30 sites selected for survey all but one, Derrymore (Co. Kerry), had been visited by the NSBS.

The data collected during this project were used to characterise the 1220 Vegetated shingle habitat and assess its conservation condition at each of the sites where it was found to occur. At nine of the coastal sites that had been previously surveyed by the CMP or SDM the conservation condition of all Annex I sand dune habitats was also assessed.

1.2 Vegetated shingle sites in Ireland

As noted by Delaney *et al.* (2013), the areas of 1220 Vegetated shingle that were surveyed by the SDM and CMP were mostly restricted to fringing beach communities. However, there are five main categories of shingle system present in Ireland: fringing beach, spit, bar, apposition beach/cuspate foreland, and barrier island (Chapman, 1976).

The known distribution of 1220 Vegetated Shingle in Ireland is shown in Figure 1 and the distribution is based on the data collected for NSBS (1999) and NPWS (2013). As Figure 1 shows, 1220 Vegetated shingle is found around much of the Irish coastline.

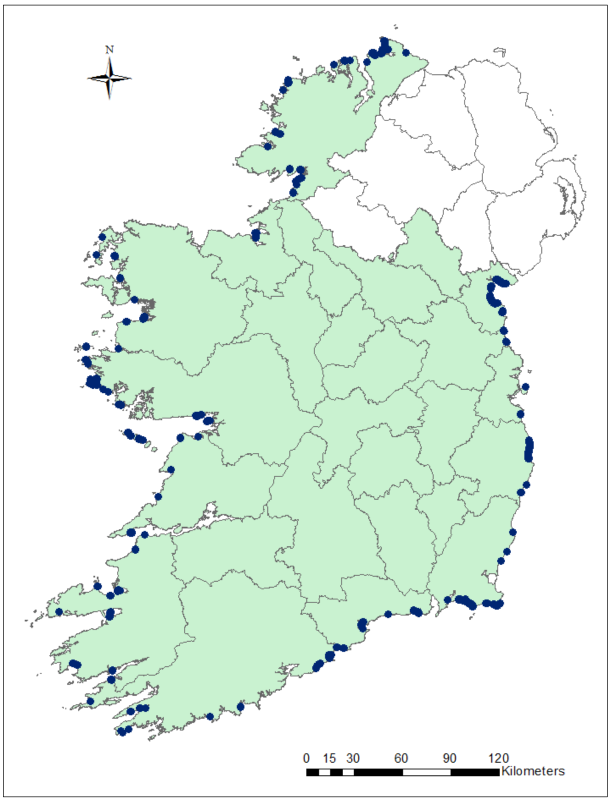

Figure 1: Distribution of 1220 Vegetated shingle within Ireland based on the data presented in NSBS (1999) and NPWS (2013).

1.3 The definition of the 1220 Vegetated shingle habitat

The following description of the 1220 Vegetated shingle is from NPWS (2013):

"This habitat occurs along the coast where shingle (cobbles and pebbles) and gravel have accumulated to form elevated ridges or banks above the high tide mark. Most of the rocky material should be less than 250 mm in diameter to be considered in this habitat category. The vegetation tends to be dominated by perennial species, typically including sea sandwort *(Honckenya peploides)*, curled dock *(Rumex crispus)*, sea beet *(Beta vulgaris* ssp. *maritima)*, rock samphire *(Crithmum maritimum)* and sea mayweed *(Tripleurospermum maritimum)*. Species diversity is determined by the degree of exposure and by substrate stability, coarseness and size. The presence of lichens indicates long term stability."

The definition of shingle varies slightly, depending on the literature source consulted. For example, shingle was defined for the purposes of the NSBS as "areas of coastal beaches, above the mean high water mark, rich in stones of approximately 2 mm to 250 mm in diameter which have been worked by the sea, giving them a rounded or smoothed shape" (Moore & Wilson, 1999). The JNCC applied the term "shingle" to pebbles larger in diameter than sand (>2 mm) but smaller than boulders (<200 mm) (JNCC, 2004).

The Interpretation Manual of EU Habitats (CEC, 2013) in particular associates the habitat with "the upper beaches of great shingle banks", vegetated with a range of perennial species; it notes the wide range of vegetation types that may be found on large shingle structures inland of the upper beach, with coastal forms of grassland, heath and scrub vegetation, as well as unusual lichen- and bryophyte-dominated communities, developing on more mature, stable, shingle.

1.4 Difficulties and challenges surveying 1220 Vegetated shingle

Ryle *et al*. (2009) observed that the distinction between unvegetated shingle or cobble and the perennial vegetation of 1220 Vegetated shingle is not always well defined and that a target minimum vegetation cover should be set. Similarly, they noted that "other vegetation types, such as grassland, heath and scrub can also develop on more mature, stable shingle banks and it would be helpful to establish guidelines on the point at which vegetation can no longer be considered as belonging to perennial vegetation of stony banks, but to one of the more stable communities."

Delaney *et al.* (2013) also noted constraints associated with assessment of the habitat during the SDM. UK guidelines (JNCC, 2004) were used as a basis for developing assessment criteria. However, the target for frequency of positive indicator species indicated in these guidelines was developed for large shingle bank systems, whereas the examples of vegetated shingle found during the SDM were smaller, less stable and less diverse features associated with beaches and sand dune systems. To avoid unnecessarily harsh assessments, a less stringent target was introduced for beach-fringing communities while the original target was retained for later use on large shingle banks (Delaney *et al*., 2013). Furthermore, the processes and impacts affecting larger, more stable shingle banks are different from the beach-fringing communities assessed by the SDM (Delaney *et al*., 2013). The SDM report recommended that these differences be taken into account in the Article 17 reporting to the European Commission.

Assessing the current impact of coastal defences on 1220 Vegetated shingle can be problematic due to issues such as the period of time that the defences have been in place, sometimes for hundreds of years, and the distance between the coastal defences and the shingle habitat. Both the CMP (Ryle *et al*., 2009) and SDM (Delaney *et al*., 2013) judged the majority of coastal defences that were built pre-designation (i.e. 1992, with confirmation of their presence *circa* 1992 on the 1995 aerial photographs) as having a neutral impact on coastal habitats. However, both the CMP and the SDM did judge coastal defences which were built pre-designation but which currently affect a coastal habitat due to recent modification of these structures as having a negative impact. Both the CMP and SDM assessed all coastal defences that were built post-designation and were impacting on the substrate mobility of the system as having a negative impact on 1220 Vegetated shingle.

1.5 Vegetated shingle plant communities

As stated above, the UK Common Standards Monitoring Guidance (JNCC, 2004) was utilised by Delaney *et al.* (2013) when developing assessment criteria for the EU Annex I habitat 1220 Vegetated shingle. The UK Common Standards Monitoring Guidance (JNCC, 2004) lists six communities within vegetated shingle but Delaney *et al*. (2013) only examined pioneer communities, as these were the only shingle communities surveyed within the SDM.

During this survey it was anticipated that the majority of the six vegetated shingle communities of Scrub communities, Heath communities, Grassland communities, Mature grassland communities, Secondary pioneer communities, and Pioneer communities listed in Table 1 would be recorded.

Table 1: Major divisions of the shingle vegetation classification presented in JNCC (2004) and based on Sneddon and Randall (1993).

1. Scrub communities	la. *Prunus spinosa* communities lb. *Rubus fruticosus* communities lc. *Ulex europaeus* communities	
2. Heath communities	2a. Wet heaths 2b. Dry heaths	 2b.i. *Pteridium aquilinum* 2b.ii. *Calluna vulgaris* communities 2b.iii Moss-rich communities
3. Grassland communities	3a. Saltmarsh-influenced grasslands 3b. *Agrostis stolonifera* grasslands 3c. *Arrhenatherum elatius* grasslands 3d. *Festuca rubra* grasslands 3e. Mixed grasslands 3f. Sandy grasslands	
4. Mature grassland communities	4a. Mature grasslands 4b. Less mature grasslands	4a.i. Mature grasslands - *Festuca rubra* 4a.ii. Mature grasslands - *Dicranum scoparium* 4a.iii. Mature grasslands - *Arrhenatherum elatius* 4b.i. Less mature grasslands pure shingle 4b.ii. Less mature grassland saltmarsh influence
5. Secondary pioneer communities		
6. Pioneer communities	6a. *Honckenya peploides* dominated communities 6b. *Senecio viscosus* dominated communities 6c. *Beta vulgaris maritima* dominated communities 6d. *Raphanus maritimus* dominated communities 6e. Herb-dominated pioneer communities 6f. *Silene maritima* dominated pioneer communities	

1.6 Conservation status of 1220 Vegetated shingle in Ireland

The current national conservation assessment for 1220 Vegetated shingle habitat in Ireland is Unfavourable-Inadequate (NPWS, 2013), with this overall assessment based on the individual parameters of Range, Area, Structure and Functions, and Future Prospects.

JNCC (2004) lists five broad criteria that should be used to assess the status of the 1220 Vegetated shingle habitat. These are:

- habitat extent: current extent recorded in the field that is then compared with previous survey data or aerial photographs
- physical structure: functionality and sediment supply, identifying anthropogenic processes (e.g. coastal defences) that may be having a negative impact
- vegetation structure: natural zonation of vegetation important in a dynamic habitat such as 1220 Vegetated shingle
- vegetation composition: characteristic/typical species (for each vegetation zone) and presence of notable species such as *Crambe maritima*
- negative indicators: negative indicator species, such as non-native species and agricultural species, and signs of disturbance

In addition to these broad criteria JNCC (2004) also recommends that factors such as transitions to other habitats (e.g. saltmarsh) are recorded.

The JNCC (2004) guidelines were utilised in the Scottish Natural Heritage vegetated shingle survey (Murdock *et al*., 2014) and these two documents together with the information in Sneddon & Randall (1993) and the data and methodologies presented in Irish studies (Moore & Wilson, 1999; Ryle *et al*., 2009; Delaney *et al.*, 2013) formed the basis for the monitoring and assessment of the 1220 Vegetated shingle in Ireland conducted during this survey.

1.7 Aims and objectives of the project

1. Develop a revised standard definition for the habitat 1220 Vegetated shingle in Ireland (see Section 5: Conclusions)
2. Refine the survey and assessment methodologies for the 1220 Vegetated shingle habitat (see Section 2: Methodologies).
3. For the 30 selected sites conduct a baseline habitat mapping survey and assessment for the vegetated shingle habitat (see individual site reports in Martin *et al.* 2017)
4. For nine of the sand dune sites conduct monitoring surveys and assessments for the associated sand dune habitats and compare the data to those collected during the previous CMP or SDM surveys (see individual site reports in Martin *et al.* 2017)
5. Populate the updated Irish coastal habitats database (MS Access database held by NPWS) with the data collected during the project.

2. Methodologies

The primary aim of this project was to assess the conservation status of the Annex I habitat 1220 Vegetated shingle at a representative sample of 30 sites across Ireland. At nine of these 30 sites the vegetated shingle habitat had previously been recorded associated with a dune site and for these nine sites the sand dune habitats 1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2120 Marram dunes (white dunes), *2130 Fixed dunes (grey dunes), 2170 Dunes with creeping willow, 2190 Humid dune slacks and *21A0 Machairs were also assessed. The methodologies utilised during the VSM for monitoring these sand dune habitats followed those published in Delaney *et al*. (2013).

2.1 Site selection

A sample of 30 1220 Vegetated shingle sites were selected by the National Parks and Wildlife Service (NPWS) from sites identified during the NSBS, CMP and SDM. The sites were chosen to be representative of the range of habitat types and geographic locations of 1220 Vegetated shingle sites within Ireland.

Table 2: Sites surveyed during the VSM, their counties and SAC(s) with which they coincide and the most recent previous survey of the site. The prefix '*' indicates the nine sites where sand dune habitats were also surveyed.

No.	Site Name	County	NSBS Classification	SAC code	Previous survey
1	Whitestrand Bay-Culoort	Donegal	Multi-ridged raised beach	2012	CMP 2006
2	Tullagh Bay and Tullagh Point	Donegal	Vegetated shingle ridge; Multi-ridged raised beach	2012	NSBS 1999
*3	Rossguill Peninsula	Donegal	Vegetated fringing beach	194	SDM 2012
4	Coastline from Port ui Chuirean to Bunaninver	Donegal	Vegetated shingle ridge; Unvegetated fringing beach; Multi-ridged raised beach	1141	NSBS 1999
*5	Streedagh	Sligo	Shingle based dune system	1680	CMP 2006
*6	Trawmore, Keel	Mayo	Vegetated shingle ridge; Vegetated fringing beach	1513	CMP 2006
*7	Bartraw Strand	Mayo	Shingle based dune system	1482	CMP 2006
8	Tawin Point	Galway	Vegetated shingle ridge; Vegetated fringing beach	268	NSBS 1999
9	An Gleannachan	Galway	Vegetated shingle ridge; Vegetated lagoonal system	213	NSBS 1999
10	Cloonconeen Lough and Rinvella Bay	Clare	Vegetated lagoonal system	2165	NSBS 1999
*11	Magherabeg	Kerry	Vegetated shingle ridge	2070	SDM 2011
12	Cromane Point	Kerry	Vegetated shingle ridge; Vegetated shingle spit	343	NSBS 1999
13	Rossdohan Island	Cork	Vegetated shingle spit	2158	NSBS 1999
14	Pallas Harbour	Cork	Vegetated shingle spit	2158	NSBS 1999
15	Farranamagh Lough	Cork	Vegetated lagoonal system	2189	NSBS 1999
16	Reen Point	Cork	Vegetated shingle spit	2281	NSBS 1999
17	Rossmore (Dunbeacon)	Cork	Vegetated shingle ridge	2280	NSBS 1999

Table 2: (continued)

No.	Site Name	County	NSBS Classification	SAC code	Previous survey
18	South of Spanish Point, Crookhaven	Cork	Vegetated fringing beach	1040	NSBS 1999
19	Broadstrand Bay	Cork	Vegetated shingle ridge	1230	NSBS 1999
20	Ferrypoint	Waterford	Vegetated shingle spit	2170	NSBS 1999
21	The Cunnigar	Waterford	Vegetated shingle spit	N/A	CMP 2005
*22	Ballyteige Burrow	Wexford	Shingle based dune system	696	SDM 2012
*23	Tacumshin	Wexford	Vegetated lagoonal system	709	CMP 2004
*24	Lady's Island Lake	Wexford	Vegetated lagoonal system	704	CMP 2004
25	The Murrough	Wicklow	Vegetated shingle ridge	2249	NSBS 1999
26	Annagassan Pier to Ardsallagh	Louth	Vegetated fringing beach; Multi-ridged raised beach	455	NSBS 1999
27	Castlebellingham to Annagassan Pier	Louth	Multi-ridged raised beach	455	NSBS 1999
28	Eggleston Point to Dundalk	Louth	Vegetated fringing beach; Multi-ridged raised beach	455	NSBS 1999
29	River Foot	Louth	Vegetated shingle ridge	455	NSBS 1999
*30	Derrymore Island	Kerry	Vegetated shingle spit	2070	CMP 2005

The locations of the sites selected for survey are shown in Figure 2.

(a) (b)

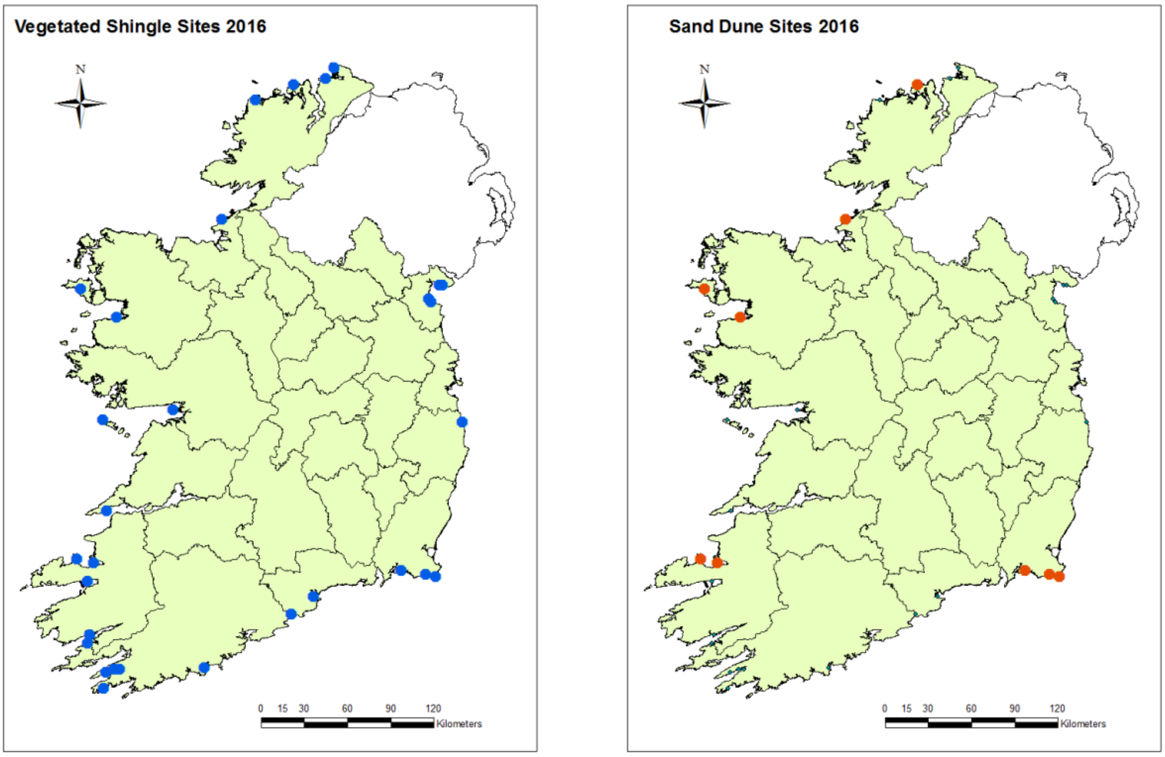

Figure 2: The locations of (a) vegetated shingle and (b) sand dune monitoring sites.

For 11 of the 30 sites ecologists had digital and printed baseline maps derived from the maps generated during the SDM and CMP; for the other 21 sites there was no baseline mapping and the site survey was guided by the field notes and positioning of vegetation transects recorded by the NSBS.

2.2 Field surveys

The field survey methodologies presented below are based on the SDM project (Delaney *et al*., 2013). The complete methodologies have been reproduced below with some sections taken directly from our previous project report (Delaney *et al*., 2013).

2.2.1 Field equipment

Surveyors used digital and printed baseline maps derived from the maps generated during the CMP (Ryle *et al*., 2009) and SDM (Delaney *et al*., 2013), or in the case of the nineteen 1220 Vegetated shingle sites that had not been mapped before, on indicative baseline maps based on the NSBS data (Moore & Wilson, 1999). For the three sites that had been mapped by both the CMP and SDM, Rossguill Peninsula, Magherabeg and Ballyteigue Burrow, the surveyors utilised the most recent maps produced by the SDM. The digital maps were provided as part of a GIS project (using ArcPad software) which was loaded onto mobile mappers for use in the field. The ArcPad project included specially designed waypoint shapefiles which allowed geographic data to be recorded in the field. Digital MS Excel spreadsheets, also loaded onto the mobile mappers, were provided for recording information relating to the Structure and Functions and Future Prospects of the site. The spreadsheets were also printed onto waterproof paper to allow work to continue in the event of a technical failure. A sheet for recording general site-related information was provided and building on the description provided by the NSBS each shingle site was classified using the categories of fringing beach, spit, bar, apposition beach/cuspate foreland, and barrier island following Chapman (1976).

A health and safety form was provided to be filled in each day. Each ecologist also carried a digital camera, a compass, a 2 m x 2 m string relevé, a tape measure, and a first-aid kit.

2.2.2 Mapping area

Two methodologies were employed to map the area of Annex I sand dune habitats. Foredune habitats, such as 1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, and 2120 Marram dunes, tend to be narrow and linear, and the boundaries of these habitats were mapped using transects. Transects perpendicular to the coastline were recorded at regular intervals along the foreshore and transitions between habitats along the transects were marked with waypoints on the mobile mappers. As well as the transects perpendicular to the shore, the start- and end-points of each of these habitats parallel to the shore were marked with a waypoint to aid digitisation and the habitats were also drawn on the field map. The habitats occurring farther inland tend to be less linear, and a different method was found to be more effective. *2130 Fixed dunes (grey dunes), 2190 Humid dune slacks, 2170 Dunes with creeping willow and *21A0 Machairs indicated on the baseline maps were visited and the boundaries were checked by walking along them. For 1220 Vegetated shingle both mapping methodologies were employed depending on whether the habitat existed as a linear strip or a more extensive stable system. In addition to the baseline maps 2010-series aerial photographs for each site were examined and specific locations likely to contain habitats of interest were visited, even if they were not marked on the baseline maps. For 1220 Vegetated shingle and all dune habitats mapped during this project the minimum mapping unit (MMU) was 0.04 ha.

Occasionally, well-developed habitats were found on sites where they had not previously been mapped. If it was considered extremely unlikely that a habitat had developed since the CMP or SDM, it was assumed that the habitat had been omitted erroneously. There are several reasons why a habitat may not have been represented on the baseline maps despite having been present on the site at the time of the CMP or SDM. This could occur because (a) the interpretation of a particular habitat has changed, (b) changes to the methodology resulted in more detailed mapping, (c) some locations were simply not visited during the CMP or SDM, or (d) errors had been made when digitising the field maps from the CMP or SDM. All mapping was revised to reflect these discrepancies (Section 2.3.1).

Where a habitat mapped in 2016 was believed to represent a genuine change in habitat, this was noted as “change” in the waypoint’s attributes. For newly recorded habitats which were present during the CMP or SDM but not marked on the baseline map, the waypoints were marked “interpretation”. Waypoints confirming unchanged boundaries were recorded occasionally to clarify complex boundaries or to confirm that each part of the site was visited, and these waypoints were recorded with the label “no change”.

Each habitat mapped on the site during the VSM was represented as a closed, labelled polygon on the field map. Complex habitat mosaics occasionally occurred where the minimum mapping area was too large to allow easy representation of all of the habitats present. To cater for this eventuality, a primary, secondary and tertiary habitat could be entered for each waypoint or polygon. The habitat with the most cover within a polygon was called the primary habitat and other habitats were entered as the secondary and tertiary habitats. It should be noted that when saltmarsh was recorded on shingle this combination of habitats was not recorded as a habitat mosaic, instead the habitat was classified as a saltmarsh. This approach followed the methodology utilised by the Saltmarsh Monitoring Project (McCorry & Ryle, 2009) when it previously surveyed sites with saltmarsh on shingle.

The site boundary mapped during the CMP or SDM did not always correspond to the boundary of the sand dune system. In some cases, this was because part of the system was occupied by a golf course and if this was the case no attempt was made to determine whether Annex I habitats were present within a golf course during the VSM. Elsewhere, the site boundary sometimes reflected the point where the land use changed, for example, the point where commonage ended and dunes had been enclosed within field boundaries. Where habitats or boundaries had changed in comparison to the baseline maps, the changes were marked on the field map to facilitate subsequent digital mapping. Polygons which had been altered from the baseline map were labelled "c" (change) or "i" (interpretation) to indicate whether or not there had been a genuine change since the CMP or SDM.

If the boundaries of a habitat could not be accessed due to the presence of livestock or because permission to access the land could not be obtained, the area was retained in the VSM map but marked as “ns” (not surveyed) if the surveyor could not see the habitat, or "e" (viewed externally) if the surveyor was able to view the habitat from the boundaries.

Features which occupied an area smaller than the minimum mapping area were recorded with a single waypoint and these included habitats, rare plants and impacts on the site. The locations of monitoring stops were also recorded with waypoints. Photographs were taken at monitoring stops and at features.

As observed during the CMP, at the landward side of shingle sites it can be difficult to define where the 1220 Vegetated shingle habitat ends and other terrestrial habitats such as semi-natural grassland start. For this survey the methodology of Murdock *et al*. (2014) was followed and all habitats on shingle with a soil layer of 30 cm or less were included within the 1220 Vegetated shingle habitat. To apply this methodology in the field a probe was used to help ascertain soil depth.

2.2.3 Structure and Functions

For nine of the ten sand dune habitats described by Delaney *et al*. (2013) Structure and Functions were assessed in the field following their methodology. For 1220 Vegetated shingle the methodology was updated as indicated below. One general change to the SDM methodology was to record percentage cover scores rather than assign Domin scores. Cover scores were recorded to the nearest 5% except for covers of less than 10%; to provide increased detail and consistency, these were recorded as 0.1%, 0.3%, 0.5%, 0.7%, 1%, 3%, 5% or 7%.
When assessing a criterion on a habitat-wide basis, the data from all of the monitoring stops and the relevant mapping data contributed to a habitat-scale assessment. During the VSM areas of scrub, bracken and disturbed habitat were not mapped as part of the field survey and their impact on Structure and Functions were instead assessed using the monitoring stop data.

The main source of information regarding Structure and Functions was the monitoring stop. The number of monitoring stops recorded within each Annex I sand dune habitat was decided in the field after some preliminary field mapping had taken place. Table 3 shows how the number of stops recorded increased according to the habitat area. In some cases, the area of a habitat was overestimated or underestimated in the field and more or fewer stops were recorded than were indicated in **Error! Reference source not found.** A minimum monitoring area of 0.04 ha was established to ensure that habitats were large enough to function properly and not excessively influenced by the adjacent habitats and edge effects.

Table 3: Number of monitoring stops recorded in each Annex I sand dune habitat (Delaney *et al*., 2013).

No. of monitoring stops recorded	Area of habitat (ha)
0	≤0.04
2	>0.04 – 0.25
4	>0.25 – 1
8	>1 – 25
12	>25 – 100
16	>100

For the 11 sites that had been previously surveyed by the CMP or SDM the location of the VSM monitoring stops followed those of the most recent survey and the same numbers for the stops were utilised. If new monitoring stops were required, either to reflect changes in habitat area or to address under-recording in previous surveys, then the next available number was assigned to the stop and the suffix ‘a’ was used. If a monitoring stop needed to be moved more than 5 m, often to reflect natural shifts in habitat boundaries, the monitoring stop number was retained and the suffix ‘m’ was used. The positions of new and moved stops were recorded as waypoints.

The data recorded at monitoring stops varied depending on the habitat being assessed. The assessment criteria and target values for each habitat assessed are presented in Appendix I in the form of recording sheets for Structure and Functions. The criteria and thresholds were primarily derived from the JNCC assessment guidelines, with alterations to take into account the recommendations regarding positive indicator species made by Ryle *et al.* (2009). Frequency of positive indicator species, continued presence of rare species, frequency and cover of negative indicator species and frequency of non-native species were assessed for each habitat, as were the degree of disturbance and anthropogenic alteration of sediment availability in the system. Additional criteria were also assessed and these depended on the specific ecological characteristics of the Annex I habitat. Positive and negative indicator species were different for each habitat. The threshold values for the frequency of positive and negative indicator species leading to a pass or fail score within a habitat are derived from those stated in the UK Common Standards Monitoring Guidelines (JNCC, 2004).

Fewer criteria were assessed at the simple foredune habitats, where the exposed conditions and unpalatable vegetation limit the damage done by invasive species and herbivore activity. The more stable, landward habitats are more complex both in their internal ecology (e.g. inter-species competition) and in their relationships with outside influences such as water availability. The Structure and Functions of *2140 Decalcified *Empetrum* dunes and *2150 Decalcified dune heath were not assessed within this report.

In addition to the Structure and Functions data at each 2 m x 2 m monitoring stop two digital photographs were taken: one of the 2 m x 2 m monitoring stop area, and a landscape photograph to record the stop in the context of its surroundings.

2.2.2.1 RECORDING STRUCTURE AND FUNCTIONS FOR 1220 VEGETATED SHINGLE.

The field survey methodology for 1220 Vegetated shingle detailed in the SDM final report (Delaney *et al.*, 2013) was updated to ensure all the plant communities within the 1220 Vegetated shingle habitat (Table 4) were recorded and assessed.

Table 4: The four main communities of 1220 Vegetated shingle that were assessed during the VSM 2016.

1220 communities	**Code (Fossitt, 2000)**	**Notes**
1. Scrub communities	WS1	To include both scrub with tree species such as *Prunus spinosa*, and scrub with low woody species such as *Rubus fruticosus* agg.
2. Heath communities	H	Recorded heath communities to Fossitt level 3 (e.g. HH2)
3. Grassland communities	G	Recorded grassland communities to Fossitt level 3 (e.g. GS1)
4. Pioneer communities	CB1	Recorded the one Fossitt level 3 category CB1

The overall number of monitoring stops recorded at each shingle site was calculated following the same methodology as Delaney *et al.* (2013) and shown in Table 3. As the majority of shingle sites were surveyed within one day, the area of the 1220 Vegetated shingle habitat at the site had to be estimated before the required number of monitoring stops could be calculated. To maximise the amount of information recorded at each shingle site monitoring stops were divided among the different 1220 Vegetated shingle communities based on the area each community covered and the diversity within each. For example, if 75% of a 1 ha 1220 Vegetated shingle site area was semi-natural grassland (GS) but the community was very homogenous (e.g. a *Festuca rubra*-dominated grassland community) and the remaining 25% was made up of a diverse pioneer shingle community (CB1), two monitoring stops were placed in the 1220 Vegetated shingle grassland community and two were placed within the 1220 Vegetated shingle pioneer community, to maximise the information recorded during the survey. To ensure that all typical species within each 1220 Vegetated shingle community were recorded all vascular plant species present within each monitoring stop were recorded using presence/absence. Structure and Functions criteria that were recorded at each 1220 Vegetated shingle stop are presented in Appendix I.

At each 2 m x 2 m stop within the 1220 Vegetated shingle habitat three digital photographs were taken: one of the 2 m x 2 m monitoring stop area, a landscape photograph to put the stop in the context of its surroundings, and if exposed shingle was visible a third with a 30 cm ruler placed on the shingle substrate to allow particle size to be recorded through digital images (Plate 1).


a)


b)


c)

Plate 1: Photos of a) gravel, b) pebble and c) cobble substrate. Red line represents 10 cm. Photos by Rory Hodd (b) and Jim Martin (a, c).

This method for recording particle size was used by Murdock *et al*. (2014) and it has the two advantages of being quick to record in the field and a permanent record of what can often be a complex matrix of different-sized particles. Shingle images were analysed by eye and the percentage, to the nearest 5%, of the substrate within each of the categories shown in Table 5 was recorded. For a monitoring stop to qualify as 1220 Vegetated shingle habitat at least 60% of the substrate had to be classified as either gravel, pebble or cobble, or a combination. Small boulders or sand can often be a minor component of the 1220 Vegetated shingle habitat. In addition to the shingle substrate the finer substrate that the vegetation was rooting in was also recorded as either gravel, sand, organic material, or soil (often composed of sand, organic material and rock particles).

Table 5: Shingle substrate types (as defined in Fossitt (2000) with minor modifications) recorded within 1220 Vegetated shingle. A minimum of 60% of the substrate must be cobble/pebble/gravel for the habitat to be classified as the 1220 habitat.

Particle Type	Diameter size range (mm)
Boulder	>256
Cobble	>64-256
Pebble	>16-64
Gravel	2-16

For some sites with a gravel substrate and few pebbles or cobbles, such as Lady's Island Lake and Tacumshin (both in Co. Wexford), it was necessary to utilise a 2 mm sieve to allow the percentage of shingle in the substrate to be calculated at each monitoring stop. If the proportion of the substrate with a particle size ≥ 2 mm within any potential area of 1220 Vegetated shingle habitat was less than 60% the area was not considered to be the 1220 habitat.

It should be noted that the size of the shingle substrate was always recorded in the field to decide if areas qualified as the 1220 Vegetated Shingle habitat or not. However, where more detailed analysis was required, such as estimating the percentage of the different shingle categories, it was found to be more efficient to record these data off-site.

2.2.4 Future Prospects

To assess Future Prospects field surveyors recorded impacts using the standard EU codes (Ssymank, 2011). Once the survey was completed these data were analysed for each of the Annex I coastal habitats being surveyed at the site.

It should be noted that, following the approach undertaken by the SDM (Delaney *et al*., 2013), permanent built infrastructure, such as coastal defences and coastal roads, that were in place pre-designation (i.e. 1992, with confirmation of their presence *circa* 1992 on the 1995 aerial photographs) and had not undergone significant modifications or improvements since 1992 were scored as neutral. Infrastructure built post-designation that was impacting on the substrate mobility of the system was recorded as having a negative impact on 1220 Vegetated shingle. Aerial photographs were utilised to assist in determining when coastal infrastructure such as sea walls and rock armour had been built. It should be noted that expert judgement was often applied and the SDM and VSM did utilise the proviso that if the built infrastructure that was in place pre-designation was considered to be contributing to obvious negative impacts, such as on-going habitat loss, the impact was scored as negative and field surveyors noted where this was the case.

2.3 Post-survey analyses and data management

Area, Structure and Functions, and Future Prospects data for 1220 Vegetated shingle and sand dune habitats, where applicable, were collected and assessed on a site basis. The results of these assessments and the overall conservation condition of each habitat are presented in each of the individual site reports (Martin *et al.* 2017). It was not within the remit of this project to extrapolate the results from the VSM to a National Conservation Assessment for 1220 Vegetated shingle or any of the sand dune habitats.

2.3.1 Area

The first step in the digitisation process was to assess and revise the GIS shapefiles produced during the CMP or SDM depending on which was the base map for a site. As discussed in Delaney *et al.* (2013), the changes to habitat boundaries which were labelled "interpretation" were considered to improve the accuracy of the base map rather than indicating genuine changes since the CMP or SDM. The base maps were edited to reflect these changes before any calculation of change in area was made and the resulting areas are the revised CMP areas and revised SDM areas.

Following the SDM methodology, mosaic polygons were sometimes digitised, with the most common habitat type recorded in the attributes table as the primary Annex I habitat or primary Fossitt habitat. During the VSM, features such as scrub, woodland and dense bracken within sand dune Annex I habitats were not recorded in the attributes table, but were recorded within the impacts used to assess Future Prospects. All polygons surveyed during the baseline surveys were revisited during the VSM.

The Area assessment was carried out by subtracting the revised habitat areas recorded on the CMP or SDM maps (i.e. those areas remapped due to interpretation rather than actual change) from the corresponding areas on the final VSM maps. When there was no baseline mapping available, the 1995 aerial photographs were viewed, and any changes in area between 1995 and 2016 were mapped. In addition, the 2000, 2005 and 2010 aerial photographs were also utilised when assessing changes in habitat area. As the quality of imagery varies between series, in particular for earlier years, any area changes determined by this method were regarded as the minimum that could have occurred, as smaller changes are unlikely to be detected.

2.3.2 Structure and Functions

Structure and Functions were assessed using the criteria listed in Appendix I. When a habitat failed to meet the target values for a criterion at a site, the data, photographs and habitat maps were consulted. If the target values were not achieved for reasons relating to the natural, dynamic processes at work on coastal systems, then the result was overturned on expert judgement and the criterion was allowed to pass. When expert judgement was used in this way, a note was made on the conservation assessment sheet and in the individual site report. After each criterion had been applied and expert judgement was used where appropriate, the number of criteria which failed was noted. If no criteria failed, then the Structure and Functions for the site were assessed as Favourable. If one or two criteria failed, the Structure and Functions were assessed as Unfavourable-Inadequate. If three or more criteria failed, they were assessed as Unfavourable-Bad. Although the number of criteria varies depending on the habitat, the number of failed criteria leading to an Unfavourable assessment is the same for all habitats. Failure to pass three or more criteria indicates that several aspects of the Structure and Functions are impaired, irrespective of how many criteria are assessed.

2.3.3 Future Prospects

The Future Prospects assessment relates to the likely development and maintenance of 1220 Vegetated shingle or Annex I sand dune habitats in Favourable condition for the foreseeable future (Ellmauer, 2010). The "foreseeable future" is suggested by Ellmauer to be two reporting phases, i.e. 12 years. For dynamic coastal habitats, this also refers to the potential for the habitat to continue to develop according to coastal processes into the future.

After the field survey of each site had been completed and the entire site had been viewed, all of the ecologists who had been present at the site discussed the impacts and activities. Each impact was recorded using the standard EU code (Ssymank, 2011), and a brief description was given. The following details were recorded for each impact: the intensity of the impact (high, medium or low), effect (positive, negative or neutral), the percentage of each habitat affected, and the source of the impact (from inside or outside the Annex I habitat).

The impacts and activities recorded during the survey allowed the ecologist to predict the future trend of the habitat, that is, whether the site would improve or deteriorate over the 12 years following the survey. If the impacts and activities affecting a site were expected to maintain or improve the Area and Structure and Functions of a habitat so that they would be in Favourable status in 12 years, the Future Prospects were Favourable. However, if the impacts and activities were predicted to cause the habitat to be in Unfavourable-Inadequate condition in 12 years' time, then Future Prospects were assessed as Unfavourable-Inadequate. If the Area and Structure and Functions of a habitat were expected to be Unfavourable-Bad in 12 years' time on the basis of the impacts and activities recorded during the survey, Future Prospects were assessed as Unfavourable-Bad.

The scoring system (Table 6) utilised by Delaney *et al*. (2013) was followed to evaluate the impacts and activities affecting habitats. Source, as a factor, was not included in the calculation, as it was felt that this should have no bearing on the impact score. Low-intensity negative impacts affecting ≤1% of the habitat were presented within the individual site reports but were not considered to be significant and were assigned a score of zero. The Future Prospects score for an Annex I habitat within a site is the sum of its individual impact scores (Table 6), for example the total impact score for the 1220 Vegetated shingle at site 9 is 0.75 (0.75 for impact A04.02: donkey grazing + 0 for impact J02.12.01: coastal protection that was in place pre-designation + zero is applied for the two impacts that are low intensity and impact ≤1% of the area = total score of 0.75). It should be noted that within the individual sites reports presented in Martin *et al.* 2017 the total impact score is not presented and instead areas of Annex I habitat that scored ≥0 are assessed to have Favourable Future Prospects, while those scoring between <0 and -3 were Unfavourable-Inadequate and <-3 Unfavourable-Bad, and these final assessments are presented in the individual site reports. For the example of site 9 the overall score of 0.75 is ≥0 and therefore the Future Prospects for this site were assessed to be Favourable.

Although the impact score is a useful tool, the individual impacts affecting each site must be examined before the Future Prospects for a site are assessed. Future Prospects scores were reviewed with some changed due to expert judgement.

Table 6: Scoring system used to quantify individual impacts in Annex I habitats (Delaney *et al*., 2013). Impact score is the mathematical product of all three attribute scores.

Attribute of impact	Value	Attribute score
1. Intensity of impact	High	1.5
	Medium	1
	Low	0.5
2. Effect of impact	Positive	1
	Neutral	0
	Negative	-1
3. % Area of Annex I polygon impacted	≥1%	0.5
	2-25%	1
	26-50%	1.5
	51-75%	2
	>75%	2.5
	100%	3

2.3.4 Conservation condition

Once Area, Structure and Functions and Future Prospects had been assessed for each habitat at a site, the overall conservation condition of the habitat at the site was determined. Following the EU guidelines for the assessment of Annex I habitats (Evans and Arvela, 2011), the conservation status of a habitat is determined by the least positive score of the three parameters. The assessment of each parameter and of the conservation status of each habitat is qualified by the addition of a trend. The trend can be improving (i.e. becoming more positive) or deteriorating (i.e. becoming less positive), or stable, depending on whether the VSM assessment is more positive than, more negative than, or the same as the baseline assessment.

The VSM condition assessment results (Area, Structure and Functions, Future Prospects and Overall Conservation condition) for each habitat at a site were compared against the revised baseline (CMP or SDM) results, where possible, to determine whether the condition of 1220 Vegetated shingle or any of the sand dune habitats was deteriorating, improving or remaining stable over time at a particular site. For sites that were surveyed by both the CMP and SDM, the revised CMP was chosen as the baseline survey over the SDM as all sites were surveyed by the CMP between 2004 and 2006, whereas only three were surveyed by the SDM from 2011 to 2012. Also this approach allowed for an assessment to be made in change of habitat condition over approximately two reporting periods (i.e. 10-12 years). It was felt that assessing change in habitat condition over a longer period of time would be more meaningful and robust, particularly because Annex I sand dune habitats are so dynamic.

The results of the condition assessments for each Annex I habitat at each of the 30 sites are presented in the individual site reports in Martin *et al.* 2017.

2.3.5 Characterisation of 1220 Vegetated Shingle habitat

1220 VEGETATED SHINGLE PLANT COMMUNITES

For each site where the 1220 Vegetated shingle habitat was recorded, a list of vascular plant species for the shingle communities (Table 4) that were mapped at the site are presented in the individual site reports (see Martin *et al.* 2017). To assist in defining the 1220 Vegetated Shingle plant communities at a national scale, the vascular plant species data collected from all shingle sites were analysed to produce a list of typical species for each shingle community. To do this the non-native and negative indicator species for the 1220 vegetated shingle habitat, as defined in Appendix I, were removed from the dataset and all monitoring stops recorded during the VSM were grouped into the plant communities listed in Table 4. The resulting vascular plant species list for each community was then organised in order of frequency to ascertain which vascular plant species were recorded most frequently within each of the shingle communities. To then assist in defining each of the 1220 Vegetated shingle communities from each other, the typical species lists were designed to be mutually exclusive, with species that were frequent in more than one vegetated shingle community assigned to the community they were most common in. The resulting species lists, together with the information presented in CEC (2013) were then used to produce a typical species list for each community (see Section 3.2.3).

1220 VEGETATED SHINGLE SUBSTRATE

As stated above for a habitat to qualify as 1220 Vegetated shingle habitat at least 60% of the substrate had to be classified as gravel, pebble or cobble (as defined in Table 5) or a combination of these. As was also stated above, in addition to the shingle substrate the finer substrate that the vegetation was rooting in was also recorded using the categories of gravel, sand, organic material, or soil. For each site where the 1220 Vegetated shingle community was recorded, a table categorising the shingle substrate and a list of the finer substrates that the vegetation was rooting in are presented in the individual site reports (see Martin *et al.* 2017). Summary data on these substrates are presented in the Results section below.

3. Results

3.1 Summary data

The total area of 1220 Vegetated shingle surveyed during the VSM was 64.57 ha (Table 7) and 167 monitoring stops were recorded. The surveyed site with the largest area of 1220 Vegetated shingle was Derrymore Island in Co. Kerry (8.41 ha). The only other three sites with an area of 1220 Vegetated shingle greater than 5 ha were Tawin Point in Co. Galway (7.17 ha), The Murrough in Co. Wicklow (6.88 ha) and Eggleston Point to Dundalk in Co. Louth (6.39 ha).

Table 7: Area of 1220 Vegetated shingle recorded at each of the 30 VSM sites, 1220 is a Qualifying Interest for all 23 listed SACs.

No.	Site Name	County	Shingle classification	1220 area (ha)	SAC code
1	Whitestrand Bay-Culoort	Donegal	Fringing beach	2.78	2012
2	Tullagh Bay and Tullagh Point	Donegal	Fringing beach	2.04	2012
3	Rossguill Peninsula	Donegal	Fringing beach	0.04	194
4	Coastline from Port ui Chuirean to Bunaninver	Donegal	Fringing beach	2.30	1141
5	Streedagh	Sligo	Spit	0.00	1680
6	Trawmore, Keel	Mayo	Fringing beach	0.00	1513
7	Bartraw Strand	Mayo	Spit (tombolo)	0.87	1482
8	Tawin Point	Galway	Fringing beach	7.17	268
9	An Gleannachan	Galway	Fringing beach	1.72	213
10	Cloonconeen Lough and Rinvella Bay	Clare	Fringing beach	2.34	2165
11	Magherabeg	Kerry	Fringing beach	0.33	2070
12	Cromane Point	Kerry	Fringing beach and spit	1.52	343
13	Rossdohan Island	Cork	Spit	0.75	2158
14	Pallas Harbour	Cork	Spit (tombolo)	1.22	2158
15	Farranamagh Lough	Cork	Spit	0.89	2189
16	Reen Point	Cork	Spit	0.43	2281
17	Rossmore (Dunbeacon)	Cork	Spit	0.17	2280
18	South of Spanish Point, Crookhaven	Cork	Fringing beach	0.07	1040
19	Broadstrand Bay	Cork	Fringing beach	1.78	1230
20	Ferrypoint	Waterford	Spit	3.98	2170
21	The Cunnigar	Waterford	Spit	0.65	N/A
22	Ballyteige Burrow	Wexford	Spit	0.00	696
23	Tacumshin	Wexford	Bar (shingle storm beaches)	3.92	709
24	Lady's Island Lake	Wexford	Bar and fringing beach	1.25	704

Table 7 (continued)

No.	Site Name	County	Shingle classification	1220 area (ha)	SAC code
25	The Murrough	Wicklow	Fringing beach	6.88	2249
26	Annagassan Pier to Ardsallagh	Louth	Fringing beach and apposition beach/cuspate foreland	2.82	455
27	Castlebellingham to Annagassan Pier	Louth	Fringing beach and apposition beach/cuspate foreland	3.41	455
28	Eggleston Point to Dundalk	Louth	Fringing beach and apposition beach/cuspate foreland	6.39	455
29	River Foot	Louth	Fringing beach	0.44	455
30	Derrymore Island	Kerry	Spit	8.41	2070
	Total area			64.57	

Three of the 30 sites, Ballyteige Burrow (Co. Wexford), Streedagh (Co. Sligo), and Trawmore, Keel (Co. Mayo), included within the VSM had no 1220 Vegetated shingle habitat recorded within them.

The results presented in this report should be read in conjunction with the site reports (see Martin *et al*. 2017) that have been prepared for each of the 30 sites listed in Table 7. These individual site reports present the Area, Structure and Functions, Future Prospects, and overall conservation status for the 1220 Vegetated shingle and each of the Annex I sand dune habitats recorded within each site. For the nine sites where other sand dune habitats were recorded, 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) and *2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) were recorded at all nine sites, with 1210 Annual vegetation of drift lines, 2110 Embryonic shifting dunes, 2170 Dunes with *Salix repens* ssp. a*rgentea* (*Salicion arenariae*), 2190 Humid dune slacks and *21A0 Machairs each recorded in at least two of the sites. The individual sites reports also discuss management issues at each site, including coastal defences, agriculture, recreation, litter and non-native invasive species. The results and discussion presented in this Irish Wildlife Manual will focus solely on the 27 sites where the 1220 Vegetated shingle habitat was recorded.

3.2 The 1220 Vegetated shingle habitat

3.2.1 Shingle substrate

The most important characteristic of 1220 Vegetated shingle is that the habitat is comprised of perennial vegetation of the upper beaches of shingle banks (CEC, 2013). Therefore, when monitoring this EU Annex I habitat, data were gathered on both the vegetation and the shingle substrate.

The shingle substrate recorded at the 27 monitoring sites where 1220 Vegetated shingle was recorded included cobble, pebble and gravel, as defined using a modified version of the particle size ranges defined in Fossitt (2000). Figure 3 shows that pebble was the most abundant component of the shingle substrate, recorded as the major shingle component in 36 stops (42% of analysed stops), cobble was the next most abundant, recorded as the major component in 31 stops (36% of analysed stops), with gravel recorded as the major shingle component in 19 stops (22% of analysed stops). It should be noted that only stops with exposed shingle could contribute to the data presented.

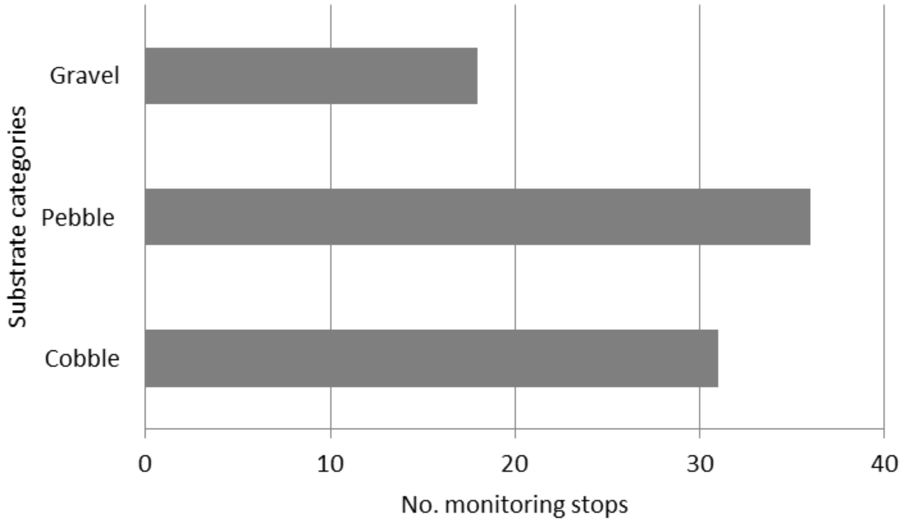

Figure 3: The major shingle substrate categories recorded at 86 of 167 stops. Data were only utilised where the majority of the stop was exposed shingle and where one substrate category represented >50% the shingle present.

The fine matrix within which the vegetation on 1220 Vegetated shingle was rooted was defined using four categories; soil, organic material (e.g., decomposing seaweed and other plant material), gravel and sand. The number of monitoring stops within which each of the fine matrix categories was recorded is presented in Figure 4. For 96% of the monitoring stops within the pioneer community their vegetation was rooted within the three categories of gravel, sand and organic matter, with only 4% rooted within soil. The majority of the grassland and scrub communities were mostly rooted within soil (75% and 67% of monitoring plots respectively).

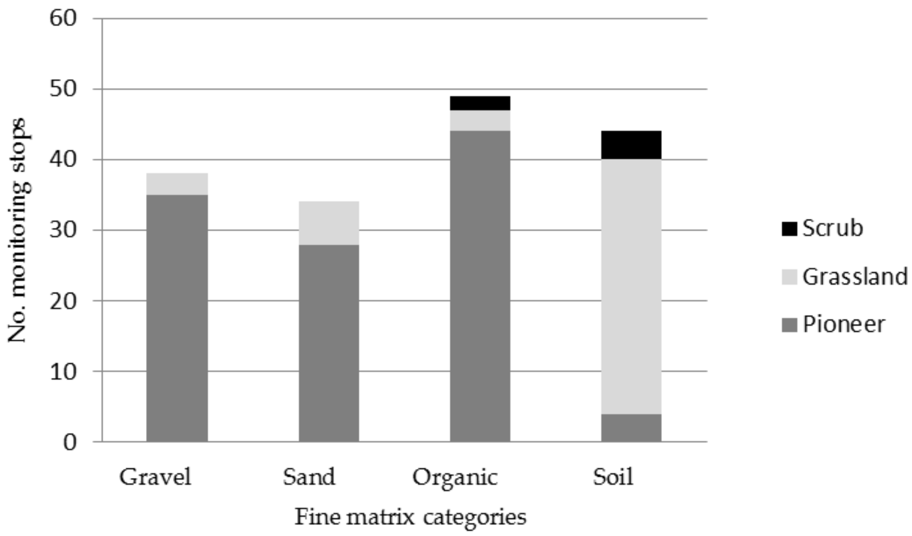

Figure 4: The fine matrix recorded within the 167 monitoring stops for 1220 Vegetated shingle.

3.2.2 Vascular plant species

In total, 163 vascular plant species were recorded within the 167 monitoring plots. The mean diversity within each plot was eight species. The grassland community of 1220 Vegetated shingle represents the most species-diverse community, with a mean of 10 vascular plant species per plot, and the pioneer community the least diverse, with a mean of seven vascular species per plot. The grassland community also had the highest mean percentage vegetation cover at 95%, while the pioneer community had the lowest mean percentage vegetation cover at 42%.

Of the 123 vascular plant species recorded within the 111 pioneer community monitoring stops, 19 species were recorded within more than 10% of stops (Table 8). For the 48 grassland community monitoring stops, 29 vascular plant species were recorded within more than 10% of stops (Table 9). As only six monitoring stops were recorded within the scrub community, all recorded species occurred in greater than 10% of stops, therefore the woody species present within the stops are presented in Table 10.

Table 8: Most frequently recorded vascular plant species within the pioneer community of 1220 Vegetated shingle. Only species recorded in a minimum of 10% of pioneer community monitoring stops are shown.

Scientific name	**No. of stops**	**% of stops**
Tripleurospermum maritimum	65	59
Atriplex prostrata	43	39
Rumex crispus	40	36
Festuca rubra	39	35
Beta vulgaris subsp. *maritima*	32	29
Silene uniflora	30	27
Galium aparine	26	23
Raphanus raphanistrum subsp. *maritimus*	26	23
Lotus corniculatus	21	19
Honckenya peploides	20	18
Sonchus arvensis	19	17
Arrhenatherum elatius	19	17
Agrostis stolonifera	19	17
Plantago lanceolata	18	16
Elytrigia repens	12	11
Potentilla anserina	12	11
Leontodon autumnalis	12	11
Elytrigia juncea	12	11
Calystegia sepium	12	11

Table 9: Most frequently recorded vascular plant species within the grassland community of 1220 Vegetated shingle. Only species recorded in a minimum of 10% of grassland community monitoring stops are shown

Scientific name	No. of stops	% of stops
Festuca rubra	43	90
Plantago lanceolata	32	67
Trifolium repens	28	58
Agrostis stolonifera	20	42
Holcus lanatus	17	35
Lotus corniculatus	17	35
Poa humilis	15	31
Leontodon autumnalis	12	25
Arrhenatherum elatius	11	23
Taraxacum officinale agg.	10	21
Cerastium fontanum	9	19
Raphanus raphanistrum subsp. *maritimus*	9	19
Lolium perenne	9	19
Elytrigia repens	8	17
Rumex crispus	8	17
Armeria maritima	8	17
Daucus carota	8	17
Agrostis capillaris	7	15
Achillea millefolium	7	15
Dactylis glomerata	6	13
Potentilla anserina	6	13
Sonchus arvensis	6	13
Tripleurospermum maritimum	6	13
Silene uniflora	6	13
Senecio jacobaea	6	13
Luzula campestris	6	13
Trifolium pratense	6	13
Galium verum	6	13
Rubus fruticosus agg.	6	13
Rumex acetosa	5	10
Koeleria macrantha	5	10
Plantago coronopus	5	10
Calystegia sepium	5	10

Table 10: Most frequently recorded woody plant species recorded within the scrub community of 1220 Vegetated shingle.

Scientific name	No. of stops	% of stops
Rubus fruticosus agg.	5	83
Ulex europaeus	2	33
Lonicera periclymenum	1	17
Prunus spinosa	1	17

3.2.3 Typical species for 1220 Vegetated shingle

Tables 8 to 10 above list the most frequently recorded vascular plant species within the three main communities of 1220 Vegetated shingle. These species lists, together with the information presented in CEC (2013), have been used to produce typical species lists for each community (Tables 11 to 13; see also Plates 2 to 4). As stated in Section 2.3.5 to assist in defining each of the 1220 Vegetated shingle communities from each other, the typical species lists were designed to be mutually exclusive, with species that were frequent in more than one vegetated shingle community assigned to the community they were most common in. For example, *Lotus corniculatus* is more common in the grassland community than the pioneer community and was therefore assigned to the grassland community.

For the scrub community, as the presence of woody species is the major defining characteristic, only woody species are listed, with the climber *Calystegia sepium* added based on expert judgment. Also based on expert judgement, *Glaucium flavum* has been added to the typical species list for the pioneer community. To help distinguish the proposed typical species for 1220 Vegetated shingle from those of other coastal EU Annex I habitats found in the vicinity of this habitat, any species listed by CEC (2013) for 1210 Annual vegetation of drift lines and 2110 Embryonic shifting dunes have been excluded from the typical species lists. These comprise *Atriplex prostrata*, which is included within *Atriplex* spp. for 1210 Annual vegetation of drift lines, and *Elytrigia juncea*, *Leymus arenarius* and *Honkenya peploides* for 2110 Embryonic shifting dunes.

Table 11: Typical and characteristic plant species list for the pioneer community of 1220 Vegetated shingle. Data sources are VSM and CEC (2013).

Scientific name	Data source
Beta vulgaris subsp. *maritima*	VSM
Crambe maritima	CEC
Crithmum maritimum	CEC
Galium aparine	VSM
Glaucium flavum	VSM
Lathyrus japonicus	CEC
Raphanus raphanistrum subsp. *maritimus*	VSM
Rumex crispus	VSM
Silene uniflora	VSM
Sonchus arvensis	VSM
Tripleurospermum maritimum	VSM

Plate 2: 1220 Vegetated shingle pioneer community at Broadstrand Bay. Photo by Emmi Virkki.

Table 12: Typical plant species list for the grassland community of 1220 Vegetated shingle. The VSM data were used as the source for all 24 species.

Scientific name	
Achillea millefolium	*Koeleria macrantha*
Agrostis capillaris	*Leontodon autumnalis*
Agrostis stolonifera	*Lotus corniculatus*
Armeria maritima	*Luzula campestris*
Arrhenatherum elatius	*Plantago coronopus*
Cerastium fontanum	*Plantago lanceolata*
Dactylis glomerata	*Poa humilis*
Daucus carota	*Potentilla anserina*
Elytrigia repens	*Rumex acetosa*
Festuca rubra	*Taraxacum officinale* agg.
Galium verum	*Trifolium pratense*
Holcus lanatus	*Trifolium repens*

Plate 3: 1220 Vegetated shingle grassland community at Derrymore Island. Photo by Jim Martin.

Table 13: Typical plant species list for the scrub community of 1220 Vegetated shingle.

Scientific name	Data source
Calystegia sepium	VSM
Lonicera periclymenum	VSM
Prunus spinosa	VSM
Rubus fruticosus agg.	VSM
Ulex europaeus	VSM

Plate 4: 1220 Vegetated shingle scrub community at Broadstrand Bay. Photo by Emmi Virkki.

3.2.4 Summary data for the 1220 Vegetated shingle communities

The pioneer community of 1220 Vegetated shingle was recorded within all 27 VSM sites, with the grassland community recorded at 22 sites (81%), the scrub community recorded at 8 sites (30%), and lichen-rich, heath and woodland communities each found at one site. The lichen-rich community was found at the site Coastline from Port ui Chuirean to Bunaninver (Co. Donegal), the heath community was recorded at Tullagh Bay and Tullagh Point (Co. Donegal) and the woodland community was located within Eggleston Point to Dundalk (Co. Louth).

In addition to being recorded within all shingle sites surveyed during the VSM, the pioneer community also covered the largest area at 33.87 ha (52%) of the survey area, with the grassland community the second largest covering 26.89 ha (42%) of the survey area. The scrub community covered 2.88 ha (4%) and all other communities of 1220 Vegetated shingle only covered 0.96 ha (2%) of the survey area.

In total, 167 monitoring stops were recorded within the 1220 Vegetated shingle, with 111 stops (67%) within the pioneer community, 48 (29%) within the grassland community, 6 (4%) within the scrub community and 2 (1%) within other communities.

3.3 Distribution within Natura 2000 sites

Table 14 presents the total area of 1220 Vegetated shingle recorded within Special Areas of Conservation (SACs). Twenty-six of the twenty-seven sites where 1220 Vegetated shingle habitat was recorded are within an SAC. The Cunnigar (VSM site no. 21) was the only site not within an SAC.

The SACs with the largest amount of 1220 Vegetated shingle are Dundalk Bay SAC (000455) with 11.28 ha, Tralee Bay and Magherees Peninsula, West to Cloghane SAC (002070) with 8.68 ha and Galway Bay Complex SAC (000268) with 7.02 ha. Of the total area of 1220 Vegetated shingle surveyed during the VSM (64.57 ha), 89% (57.32 ha) was recorded within SACs.

Table 14: The 20 SACs surveyed during the VSM where 1220 Vegetated shingle was recorded, 1220 is a Qualifying Interest for all 20 listed SACs.

SAC code	VSM site no.	County	Area of 1220 habitat within the SAC (ha)
194	3	Donegal	0.04
213	9	Galway	1.32
268	8	Galway	7.02
343	12	Kerry	0.84
455	26, 27, 28, 29	Louth	11.28
704	24	Wexford	0.97
709	23	Wexford	3.92
1040	18	Cork	0.07
1141	4	Donegal	1.13
1230	19	Cork	0.46
1482	7	Mayo	0.87
2012	1, 2	Donegal	4.40
2070	11, 30	Kerry	8.68
2158	13, 14	Cork	1.92
2165	10	Clare	2.13
2170	20	Waterford	3.92
2189	15	Cork	0.89
2249	25	Wicklow	6.88
2280	17	Cork	0.17
2281	16	Cork	0.43
Total area			57.32 ha

3.4 Conservation condition of 1220 Vegetated shingle

The results of the conservation condition of 1220 Vegetated shingle at each site are shown below (Table 15).

Table 15: Condition results for the 27 VSM sites where 1220 Vegetated shingle was recorded.

No.	Site Name	Area	Structure & Functions	Future Prospects	Overall result
1	Whitestrand Bay-Culoort	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad
2	Tullagh Bay and Tullagh Point	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
3	Rossguill Peninsula	Favourable	Favourable	Favourable	Favourable
4	Coastline from Port ui Chuirean to Bunaninver	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad
7	Bartraw Strand	Favourable	Favourable	Favourable	Favourable
8	Tawin Point	Unfavourable-Inadequate	Favourable	Favourable	Unfavourable-Inadequate
9	An Gleannachan	Unfavourable-Inadequate	Favourable	Favourable	Unfavourable-Inadequate
10	Cloonconeen Lough	Favourable	Favourable	Favourable	Favourable
11	Magherabeg	Favourable	Favourable	Favourable	Favourable
12	Cromane Point	Favourable	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad
13	Rossdohan Island	Favourable	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
14	Pallas Harbour	Favourable	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
15	Farranamagh Lough	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
16	Reen Point	Favourable	Favourable-	Unfavourable-Inadequate	Unfavourable-Inadequate
17	Rossmore (Dunbeacon)	Favourable	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate
18	South of Spanish Point	Favourable	Favourable	Favourable	Favourable
19	Broadstrand Bay	Favourable	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad
20	Ferrypoint	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
21	The Cunnigar	Unfavourable-Bad	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Bad
23	Tacumshin	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
24	Lady's Island Lake	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
25	The Murrough	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
26	Annagassan Pier to Ardsallagh	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
27	Castlebellingham to Annagassan Pier	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
28	Eggleston Point to Dundalk	Favourable	Unfavourable-Inadequate	Unfavourable-Bad	Unfavourable-Bad
29	River Foot	Favourable	Unfavourable-Inadequate	Unfavourable-Inadequate	Unfavourable-Inadequate
30	Derrymore Island	Favourable	Favourable	Favourable	Favourable

As Table 15 shows, only five of the 1220 Vegetated shingle sites had an overall conservation condition of Favourable: Rossguill Peninsula (Co. Donegal), Bartraw Strand (Co. Mayo), Cloonconeen Lough and Rinavella Bay (Co. Clare), South of Spanish Point (Co. Cork) and Derrymore Island (Co. Kerry).

3.4.1 Area and distribution

There has been a slight decrease in the number of sites where the 1220 Vegetated shingle habitat was found since the NSBS, with the habitat no longer recorded at Trawmore, Keel (Co. Mayo). As stated by Delaney *et al*. (2013), natural processes such as erosion, deposition and succession are primary drivers of change in coastal habitats, and only losses or gains in area due to anthropogenic factors are taken into account in the Area assessment.

As the VSM was the first survey in Ireland to comprehensively map 1220 Vegetated shingle, the total area surveyed at 64.57 ha was much larger than the 32.44 ha and 2.60 ha mapped during the CMP and SDM respectively.

Seven (26%) of the 27 VSM sites where 1220 Vegetated shingle was recorded had an unfavourable assessment for Area (Table 15). Six of these sites were assessed as Unfavourable-Inadequate: five due to small areas of gravel extraction, and Whitestrand Bay-Culoort (VSM site no. 1) due to a combination of gravel extraction and the building of a small car park on the 1220 Vegetated shingle. The Cunnigar (VSM site no. 21) was assessed as Unfavourable-Bad due to recreational pressure having resulted in the loss of 26% of the 1220 Vegetated shingle habitat at this site since the CMP.

3.4.2 Structure and Functions

The Structure and Functions of 1220 Vegetated shingle was assessed as Unfavourable-Inadequate at 15 (56%) of the 27 VSM sites, the remaining 12 sites being assessed as Favourable. As none of the 27 VSM sites failed more than two of the Structure and Functions criteria, none were assessed as Unfavourable-Bad.

As Table 16 shows, the overwhelming reason for sites failing the Structure and Functions assessment was the presence of coastal defences that impacted on the substrate mobility of the system. The second most common criterion for sites failing their Structure and Functions assessment was negative indicator species, with the frequency or cover of species such as *Cirsium arvense, Lolium perenne,* and *Urtica dioica* too high to pass the criterion. The only other criterion which sites failed was notable species. There were two sites, Broadstrand Bay (site 19) and Castlebellingham to Annagassan Pier (site 27), where the notable species *Glaucium flavum* was not relocated and the reason for its absence from the site was thought to be anthropogenic.

Table 16: Structure and Functions assessment criteria for the 27 VSM sites where 1220 Vegetated shingle was recorded.

Assessment criteria	**Number (%) passing criteria**
1. Shingle habitat	27 (100%)
2. Native plant species	27 (100%)
3. Notable species	25 (93%)
4. Negative indicator species	22 (81%)
5. Non-native species	27 (100%)
6. Coastal defences	15 (56%)
7. Disturbance	27 (100%)

The total area of 1220 Vegetated shingle within the VSM sites which was assessed as Favourable and Unfavourable-Inadequate is presented in Table 17. The Structure and Functions of 36% of the total area were assessed as Favourable, with 64% of the area assessed as Unfavourable-Inadequate.

Table 17: The total assessed area and percentage of area of 1220 Vegetated shingle with Favourable and Unfavourable-Inadequate Structure and Functions in 2016. No sites were assessed as Unfavourable-Bad.

	Area (ha)	**Area (%)**
Favourable	23.52	36%
Unfavourable-Inadequate	41.05	64%

3.4.3 Future prospects

The Future Prospects of 1220 Vegetated shingle was assessed as Favourable at 8 sites (30%), Unfavourable-Inadequate at 14 sites (52%), and Unfavourable-Bad at 5 of the 27 VSM sites (18%).

The Future Prospects data collected during the VSM focused on human impacts, but it should be recognised that natural processes such as erosion, deposition and succession are the primary drivers of change on coastal habitats. Although the impact of climate change was not recorded during the VSM, this impact does need to be assessed at a national level.

The only positive impacts recorded were grazing and storms producing shingle storm beaches (Table 18). Extensive cattle grazing was recorded at two sites, with sheep and donkey grazing each recorded at one site. Rabbit grazing was also recorded at one site, but it affected less than 1% of the VSM survey area. Following the SDM methodology natural processes such as erosion and deposition were generally not recorded within the Future Prospects data. However, the formation of shingle storm beaches to provide suitable substrate for the 1220 Vegetated shingle habitat was such an important positive impact at some sites, such as Tacumshin (VSM site no. 23), it was recorded. The SDM is the only other survey that applied the Ssymank (2011) criteria when assessing Future Prospects of 1220 Vegetated shingle and no positive impacts were recorded for the habitat during the SDM.

Table 18: The positive impacts affecting 1220 Vegetated shingle. Only impacts that affected ≥1% of the VSM survey area for the habitat are shown.

Impact code	**Impact description**	**No. of sites affected:**				**Area affected (ha)**	**Area affected (% of total survey area)**
		Low intensity	**Medium intensity**	**High intensity**	**Total**		
A04.02	Donkey grazing	1	0	0	1	0.86	1.3
A04.02.01	Extensive cattle grazing	1	1	0	2	2.18	3.3
A04.02.02	Extensive sheep grazing	0	1	0	1	5.74	8.8
L07	Storms creating shingle storm beaches	0		1	2	4.05	6.3

The neutral impacts recorded within at least 1% of the total VSM survey area are shown in Table 19. Extensive cattle grazing was recorded at three sites and extensive sheep grazing was recorded at two. Walking and horse riding was recorded as a neutral impact in seven sites and coastal protection was recorded as a neutral impact in eight sites. Rabbit/hare grazing, electricity/phone lines, fencing, and succession were recorded as a neutral impact at one site each and affecting less than 1% of the VSM survey area. The SDM survey recorded walking and horse riding as the most common neutral impact, with coastal defences the second most common.

Table 19: The neutral impacts affecting 1220 Vegetated shingle. Only impacts that affected ≥1% of the VSM survey area for the habitat are shown.

Impact code	Impact description	No. of sites affected: Low intensity	Medium intensity	High intensity	Total	Area affected (ha)	Area affected (% of total survey area)
A04.02.01	Extensive cattle grazing	2	2	0	4	2.55	3.9
A04.02.02	Extensive sheep grazing	2	0	0	2	4.24	6.6
G01.02	Walking and horse riding	7	0	0	7	2.22	3.4
J02.12.01	Coastal protection	1	3	4	8	1.03	1.6

The negative impacts recorded within at least 1% of the VSM survey area are shown in Table 20. The most common negative impacts were coastal defences, recorded at 11 sites and 11.2% of the area of 1220 Vegetated shingle surveyed, and litter, recorded at 21 sites and 5.7% of the area surveyed. Other common negative impacts were invasive non-native species recorded at ten sites, gravel extraction recorded at six sites, and storage of boats or fishing equipment recorded at five sites. However, each of these impacts affected less than 1% of the VSM survey area. The SDM recorded litter, coastal defences, and walking and horse riding as the most common negative impacts, with the impact of trampling also recorded as a common negative impact.

Table 20: The negative impacts affecting 1220 Vegetated shingle. Only impacts that affected ≥1% of the VSM survey area for the habitat are shown.

Impact code	Impact description	No. of sites affected: Low intensity	Medium intensity	High intensity	Total	Area affected (ha)	Area affected (% of total survey area)
A02.01	Agricultural intensification	0	1	1	2	0.79	1.2
D01.01	Tracks	0	1	3	4	1.22	1.9
G01.02	Walking and horse riding	3	0	0	3	2.42	3.7
H05.01	Litter	16	4	1	21	3.70	5.7
J02.12.01	Coastal defences	0	2	9	11	7.20	11.2

4. Discussion

The VSM visited 30 coastal sites during 2016 and surveyed 64.57 ha of 1220 Vegetated shingle across 27 of these sites. The VSM was the first comprehensive survey of this habitat in Ireland that mapped current extent and conducted conservation assessments. The 64.57 ha of 1220 Vegetated shingle represents 33% of the estimated 197 ha listed for this Annex I habitat in NPWS (2013). However, as the figure of 197 ha presented in NPWS (2013) was extrapolated from a limited dataset it is possible that the actual area of 1220 Vegetated shingle is much larger

Three of the 30 sites included within the VSM survey had no 1220 Vegetated shingle recorded within them. Two of these sites, Ballyteige Burrow (Co. Wexford) and Streedagh (Co. Sligo), are extensive dune systems on shingle spits. Although there is some evidence that temporary areas of 1220 habitat may have formed at Ballyteige Burrow (Ryle *et al*., 2009), there is no evidence from either the NSBS, CMP, or VSM for the presence of 1220 Vegetated shingle at Streedagh. At Trawmore, Keel (Co. Mayo) the NSBS recorded the presence of 1220 Vegetated shingle; however, the CMP did not record the habitat and although the VSM did note extensive areas of shingle beach, no 1220 Vegetated shingle was recorded. It is possible that the 1220 Vegetated shingle on the shingle beach at Trawmore, Keel has been temporarily lost due to natural erosion and will re-establish again in the future.

The conservation assessment of the 1220 Vegetated shingle habitat resulted in 20 sites being assessed as Favourable for Area, 12 assessed as Favourable for Structure and Functions, and 8 Favourable for Future Prospects. Five sites had an overall conservation condition that was Favourable. Due to the fact that there was no baseline mapping available for 19 of the 1220 Vegetated shingle sites it is possible that the area of habitat that has been lost has been underestimated, as it is difficult to estimate previous extent from aerial photography. There is also the possibility that Future Prospects could have been assessed too strictly during the VSM; however, in the absence of long-term data (greater than 12 years) it is prudent to apply a precautionary principle when scoring Future Prospects. Once long-term data on Area, Structure and Functions and Future Prospects are available, the effect of impacts such as new coastal defences can be assessed more accurately, with the possibility of a larger proportion being judged to be having a neutral impact, based on the evidence of consistently Favourable Area and Structure and Functions.

For 22 of the 27 sites where 1220 Vegetated shingle was recorded it was not possible to make any comments on trends in the parameters of Area, Structure and Functions, and Future Prospects, as no baseline conservation assessments were available for comparison. For the five 1220 Vegetated shingle sites where the habitat had been assessed previously, two sites remained in Favourable conservation condition and stable, and three sites had deteriorated, with two Unfavourable-Bad and one Unfavourable-Inadequate (Table 21). Apart from these five sites it is difficult to make general comparisons between the 1220 Vegetated shingle data collected during the CMP and SDM with the data collected during the VSM. The reasons for this are that all the CMP and SDM shingle sites were fringing beach communities that were part of large dune systems, whereas the majority of the VSM sites were not associated with sand dunes, and the CMP and SDM only mapped and assessed the pioneer community of 1220 Vegetated shingle, whereas the VSM also mapped and assessed more stable 1220 Vegetated shingle habitats such as grassland communities.

Table 21: Trend for the five 1220 Vegetated shingle sites that had previously been assessed by the CMP.

No.	Site Name	Area	Structure & Functions	Future Prospects	Overall result
1	Whitestrand Bay-Culoort	Unfavourable-Inadequate (stable)	Unfavourable-Inadequate (stable)	Unfavourable-Bad (deteriorating)	Unfavourable-Bad (deteriorating)
7	Bartraw Strand	Favourable (stable)	Favourable (stable)	Favourable (stable)	Favourable (stable)
21	The Cunnigar	Unfavourable-Bad (deteriorating)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Bad (deteriorating)
24	Lady's Island Lake	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)	Unfavourable-Inadequate (deteriorating)
30	Derrymore Island	Favourable (stable)	Favourable (stable)	Favourable (stable)	Favourable (stable)

5. Conclusions

5.1 A revised definition for 1220 Vegetated shingle in Ireland

A revised standard definition for the 1220 Vegetated shingle habitat in Ireland was one of the aims of the VSM project. Based on the data collected during the VSM the following standard definition is presented:

1220 Vegetated shingle occurs along the coast where shingle (cobbles, pebbles, and gravel ≥ 2 mm) has accumulated to form elevated ridges or banks above the high tide mark. The majority of the rocky material should be between 2 mm and 256 mm in diameter to be considered in this habitat category. On the upper beach the pioneer community can be characterised by perennial species such as *Beta vulgaris* subsp. *maritima, Crambe maritima, Crithmum maritimum, Galium aparine, Glaucium flavum, Lathyrus japonicus, Raphanus raphanistrum* subsp. *maritimus, Rumex crispus, Silene uniflora, Sonchus arvensis,* and *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 *Agrostis capillaris, Agrostis stolonifera, Arrhenatherum elatius, Dactylis glomerata, Poa humilis, Elytrigia repens, Festuca rubra, Holcus lanatus,* and *Koeleria macrantha*, the rush *Luzula campestris*, and broadleaf herbs such as *Achillea millefolium, Armeria maritima, Cerastium fontanum, Daucus carota, Leontodon autumnalis, Lotus corniculatus, Plantago coronopus, Plantago lanceolata, Potentilla anserina, Rumex acetosa, Taraxacum officinale* agg., *Galium verum, Trifolium pratense,* and *Trifolium repens*. The scrub community can be characterised by the woody species *Lonicera periclymenum, Prunus spinosa, Rubus fruticosus* agg., *Ulex europaeus* and the climber *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 30 cm deep the community is no longer defined as 1220 Vegetated shingle.

This definition is an adaptation of the definitions used in CEC (2013) and NPWS (2013) and should form the basis for the definition used for future Article 17 reporting.

5.2 Priorities for achieving Favourable conservation status for 1220 Vegetated shingle in Ireland

The data collected during the VSM have shown that the major reasons for an unfavourable assessment of Area were shingle extraction and recreational pressure. In addition, the main reason for an unfavourable assessment of Structure and Functions and Future Prospects were new coastal defences installed since 1992, with agricultural intensification, tracks, walking and horse riding, and litter also recorded as important negative impacts when assessing Future Prospects. All of the issues listed, except the installation of new coastal defences, can be adequately dealt with within comprehensive management plans for the individual sites where these impacts occur. For new or upgraded coastal defences and other stabilising structures that impact on 1220 Vegetated shingle sites, the solution is more complex.

Firstly, it is important that a concerted effort is made by local authorities, supported by State bodies such as the Office of Public Works and National Parks and Wildlife Service, to appropriately assess all future construction and maintenance works for coastal defences, especially those within SACs. It is clear from the data presented within this report that a large proportion of the area of 1220 Vegetated shingle is within SACs, with 89% of the area of the habitat surveyed by the VSM within SACs.

Secondly, for sites where coastal defences are present, long-term (greater than 12 years) monitoring data should be collected to assess the impact of these structures. Once long-term data on Area, Structure and Functions and Future Prospects are available the impact of coastal defences on 1220 Vegetated shingle can be assessed more accurately.

5.3 Recommendations for future monitoring of 1220 Vegetated shingle

It is proposed that future monitoring of 1220 Vegetated shingle should utilise the monitoring methodology applied during this project. Ideally sites should be revisited regularly (i.e., during each Article 17 reporting period) to provide long-term data for the accurate assessment of the conservation condition for the habitat at a site.

The option of including faunal data within the conservation assessment for 1220 Vegetated shingle should be explored. Incidental records for Ringed Plover were gathered at many of the shingle sites surveyed during the VSM. Consultation with organisations such as Birdwatch Ireland could investigate the possibility of this species being included within the Structure and Functions assessment criteria for 1220 Vegetated shingle with its presence noted as a local feature of interest.

It is recommended that, where feasible, future monitoring for the 1220 Vegetated shingle habitat should be conducted on an SAC basis. For example, the four Louth sites, Annagassan Pier to Ardsallagh (VSM site no. 26), Castlebellingham to Annagassan Pier (VSM site no. 27), Eggleston Point to Dundalk (VSM site no. 28), and River Foot (VSM site no. 29) could be monitored in the future as one area of 1220 Vegetated shingle within the Dundalk Bay SAC (000455). This would improve the efficiency of the survey and align the monitoring with other reporting structures such as the Site-Specific Conservation Objectives (SSCOs). However, to ensure that the areas monitored within a national survey are representative of Area, Structure and Functions, and Future Prospects both inside and outside designated sites, it is important that not all monitoring is restricted to within SAC boundaries. Therefore it is important that sites, such as The Cunnigar (VSM site no. 21), that are outside the SAC network, are retained within the monitoring programme to ensure that habitat condition outside designated sites continues to be assessed.

During the VSM it was noted that 1220 Vegetated shingle was almost always recorded in association with other coastal Annex I habitats, such as sand dunes and salt marsh. It would also improve the efficiency of future monitoring if multiple coastal Annex I habitats within a contiguous area were monitored and mapped together, following a similar approach to the one utilised for upland Annex I habitats (Perrin *et al.*, 2014).

It is important that future monitoring of this habitat aims to survey a comparable number of sites and a comparable area of 1220 Vegetated shingle.

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Appendix I. Structure and Functions assessment criteria for 1220 Vegetated shingle and seven EU Annex I sand dune habitats

1210 Annual vegetation of drift lines

Monitoring stop data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Positive indicator species (√ if present)																
Atriplex spp.																
Beta vulgaris ssp. maritima																
Cakile maritima																
Galium aparine																
Honckenya peploides																
Polygonum oxyspermum																
Salsola kali																
Tripleurospermum maritimum																
2a. Negative indicator species (% cover)																
Arrhenatherum elatius																
Cirsium arvense																
Cirsium vulgare																
Lolium perenne																
Senecio jacobea																
Urtica dioica																
Other:																
2b. Highest % cover score at each stop																
3. Non-native species (% cover)																
Other:																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

General site observations

Habitat assessment at site level

Habitat assessment criteria	Habitat assessment scores		Required to pass	Result (pass/fail)
1. Positive indicator species	% frequency		*At least one species present in more than 40% of stops* and *another species present in more than 20% of stops*	
Atriplex spp.				
Beta vulgaris				
Cakile maritima				
Galium aparine				
Honckenya peploides				
Polygonum oxyspermum				
Salsola kali				
Tripleurospermum maritimum				
2a. Negative indicator species	% frequency	% of habitat[1]	*No species present in more than 60% of stopsand combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
Arrhenatherum elatius				
Cirsium arvense				
Cirsium vulgare				
Lolium perenne				
Senecio jacobea				
Urtica dioica				
Other:				
2b. Highest % cover score across all s				
3. Non-native species	% frequency		*No species present in more than 20% of stops*	
Other:				
4. Rare species	% frequency		*No declines since last assessment*	
5a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)			*Both absent*	
5b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)				
6. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)			*No more than 20% of habitat*	
			No. of criteria failed	
			Habitat assessment[2]	

1220 Perennial vegetation of stony banks

Monitoring stop data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Shingle habitat																
List Fossitt code for 1220 community																
2. Native species (list species present)	Record presence/absence of vascular plant species															
3. Notable species	Record % cover															
Crambe maritima																
Glaucium flavum																
Lathrus japonicus																
Mertensia maritima																
Other:																
4. Negative indicator species	Record % cover															
Cirsium arvense																
Cirsium vulgare																
Lolium perenne																
Pteridium aquilinum																
Senecio jacobaea																
Urtica dioica																
Other:																
5. Non-native species (Domin)	Record % cover															
Centranthus ruber																
Other:																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

Habitat assessment at the site level

Habitat assessment criteria	Required to pass	Result (pass/fail)
1. Shingle habitat	*No evidence of decline in 1220 community diversity over time. Ideally both pioneer and more stable 1220 communities (e.g. grassland on shingle) are*	
2. Native plant species	*No evidence of a decline over time in the diversity of typical species within 1220 communties present. Consider additional typical species observed outside*	
3. Notable species	*No evidence of decline in number of individuals over time. Individuals both within and outside stops should be counted*	
4. Negative indicator species		
a)	*No species present in more than 60% of stops*	
b)	*Combined cover in any individual stop 25% or less*	
5. Non-native species		
a)	*No species present in more than 20% of stops*	
b)	*Combined cover in any individual stop 1% or less*	
c)	*Cover across whole site[1] 1% or less. At a site level if a non-native species has been under recorded, or not recorded, via the stops the % cover for the species across the site should be recorded and assessed*	
General observations		
6. Coastal defences		
a)	*None built pre-designation which currently affect the habitat due to modification of the shingle habitat or changes to the sediment cycle at the site. Stabilising features such as coast roads could be included (presence/absence)*	
b)	*Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)*	
7. Disturbance	*No more than 20% of 1220 habitat affected by disturbance (e.g. heavy trampling, vehicle damage, removal of substrate)*	
	No. of criteria failed	
	Habitat assessment[2]	

2110 Embryonic shifting dunes

Monitoring stop data	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
present)																
Elytrigia juncea																
Leymus arenarius																
2a. Negative indicator species (% cover)																
Arrhenatherum elatius																
Cirsium arvense																
Cirsium vulgare																
Lolium perenne																
Senecio jacobea																
Urtica dioica																
Other:																
Other:																
2b. Highest % cover score at each stop																
3. Non-native species (% cover)																
Centranthus ruber																
Name of species:																
4. Green shoots or flowering present (√ if present)																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

General site observations

Habitat assessment criteria	Habitat assessment scores		Required to pass	Result (pass/fail)
1. Positive indicator species	% frequency		*At least one species present in more than 40% of stops*	
→ *Elytrigia juncea*				
→ *Leymus arenarius*				
2a. Negative indicator species	% frequency	% of habitat[1]	*No species present in more than 60% of stops and combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
→ *Arrhenatherum elatius*				
→ *Cirsium arvense*				
→ *Cirsium vulgare*				
→ *Lolium perenne*				
→ *Senecio jacobea*				
→ *Urtica dioica*				
→ Other:				
→ Other:				
→ **stops**				
3. Non-native species	% frequency		*No species present in more than 20% of stops*	
→ *Centranthus ruber*				
→ Name of species:				
→ **4. Healthy shoots and/or flowering/fruiting of *E. juncea* or *L. arenarius* according to season (% frequency)**			*Observed in more than 40% of stops*	
→ **5. Rare species**	% frequency		*No declines since the last assessment*	
→ **6a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)**			*Both absent*	
→ **6b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)**				
7. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)			*No more than 20% of habitat*	
			failed	
			Habitat assessment[2]	

2120 Shifting dunes along the shore with *Ammophila arenaria* (white dunes)

Monitoring stop data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Positive indicator species (√ if present)																
Ammophila arenaria																
Elytrigia juncea																
Leymus arenarius																
2a. Negative indicator species (% cover)																
Arrhenatherum elatius																
Cirsium arvense																
Cirsium vulgare																
Lolium perenne																
Senecio jacobea																
Urtica dioica																
Other:																
Other:																
2b. Highest % cover score at each stop																
3. Non-native species (% cover)																
Name of species:																
Name of species:																
4. Green shoots or flowering present (√ if present)																

Habitat assessment for the site

Habitat assessment criteria	Habitat assessment scores		Required to pass	Result (pass/fail)
1. Positive indicator species	% frequency		*At least one species present in more than 40% of stops*	
→ *Ammophila arenaria*				
→ *Elytrigia juncea*				
→ *Leymus arenarius*				
2a. Negative indicator species	% frequency	habitat[1]	*No species present in more than 60% of stops and combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
→ *Arrhenatherum elatius*				
→ *Cirsium arvense*				
→ *Cirsium vulgare*				
→ *Lolium perenne*				
→ *Senecio jacobea*				
→ *Urtica dioica*				
→ Other:				
→ Other:				
→ **2b. Highest % cover score across all**				
3. Non-native species	% frequency		*No species present in more than 20% of stops*	
→ Name of species:				
→ Name of species:				
→ **4. Healthy shoots and/or flowering/fruiting of *A. arenaria, E. juncea* or *L. arenarius* according to season (% frequency)**			*Observed in more than 40% of stops*	
→ **5. Rare species**	% frequency		*No declines since the last assessment.*	
→ **6a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)**			*Both absent*	
→ **6b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)**				
7. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)			*No more than 20% of habitat*	
			failed	
			Habitat assessment[2]	

General site observations

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

*2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

Monitoring stop data																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1a. Positive indicator species (√ if present)																
Aira praecox																
Anthyllis vulneraria																
Carex arenaria																
Carex flacca																
Cladonia spp.																
Crepis capillaris																
Daucus carota																
Erodium cicutarium																
Euphrasia officinalis agg.																
Festuca rubra																
Galium verum																
Hypochaeris radicata																
Linum catharticum																
Lotus corniculatus																
Luzula campestris																
Ononis repens																
Peltigera spp.																
Phleum arenarium																
Pilosella officinarum																
Plantago lanceolata																
Poa pratensis sens. lat.																
Rhinanthus minor																
Sedum acre																
Thymus polytrichus																
Trifolium repens																
Veronica chamaedrys																
Viola canina																
Viola riviniana																
Viola tricolor																
Agrostis capillaris																
Carex pilulifera																
Festuca ovina																
Galium saxatile																
Polygala serpyllifolia																
Potentilla erecta																
Deschampsia flexuosa																
Dicranum scoparium																
Homalothecium lutescens																
Hylocomium splendens																
Hypnum cupressiforme sens. lat.																
Pleurozium schreberi																
Syntrichia ruralis																
Rhytidiadelphus squarrosus																
Rhytidiadelphus triquetrus																
Scleropodium purum																

	Habitat assessment for the site			
	Habitat assessment criteria	**Habitat assessment scores**	**Required to pass**	**Result (pass/fail)**
	1a. Positive indicator species	**% frequency**	*At least eight species present in more than 20% of stops*	
→	*Aira praecox*			
→	*Anthyllis vulneraria*			
→	*Carex arenaria*			
→	*Carex flacca*			
→	*Cladonia spp.*			
→	*Crepis capillaris*			
→	*Daucus carota*			
→	*Erodium cicutarium*			
→	*Euphrasia officinalis* agg.			
→	*Festuca rubra*			
→	*Galium verum*			
→	*Hypochaeris radicata*			
→	*Linum catharticum*			
→	*Lotus corniculatus*			
→	*Luzula campestris*			
→	*Ononis repens*			
→	*Peltigera spp.*			
→	*Phleum arenarium*			
→	*Pilosella officinarum*			
→	*Plantago lanceolata*			
→	*Poa pratensis sens. lat.*			
→	*Rhinanthus minor*			
→	*Sedum acre*			
→	*Thymus polytrichus*			
→	*Trifolium repens*			
→	*Veronica chamaedrys*			
→	*Viola canina*			
→	*Viola riviniana*			
→	*Viola tricolor*			
→	*Agrostis capillaris*			
→	*Carex pilulifera*			
→	*Festuca ovina*			
→	*Galium saxatile*			
→	*Polygala serpyllifolia*			
→	*Potentilla erecta*			
→	*Deschampsia flexuosa*			
→	*Dicranum scoparium*			
→	*Homalothecium lutescens*			
→	*Hylocomium splendens*			
→	*Hypnum cupressiforme sens. lat.*			
→	*Pleurozium schreberi*			
→	*Syntrichia ruralis*			
→	*Rhytidiadelphus squarrosus*			
→	*Rhytidiadelphus triquetrus*			
→	*Scleropodium purum*			

1b. Number of positive indicator species at each stop																
2a. Negative indicator species (% cover)																
Cirsium arvense																
Cirsium vulgare																
Lolium perenne																
Pteridium aquilinum																
Senecio jacobea																
Pteridium aquilinum																
Rosa spp.																
Rubus fruticosus agg.																
Urtica dioica																
Other:																
2b. Highest % cover score at each stop																
3. Non-native species (% cover within 20m																
Name of species:																
Name of species:																
4. Cover of trees and scrub other than Juniperus (% cover within 20m radius)																
5. Trees/saplings from adjacent plantations (% cover within 20m radius)																
6. Height of vegetation (cm)																
7. Flowering and fruiting of any positive indicator species (√ if present)																
8. Bare sand (% cover)																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

3. Calculate the area of bare ground within the habitat at a site level by totalling the areas mapped/observed as bare ground

General site observations

→ **1b. Lowest number of positive indicator species in a monitoring stop**			*At least four species present in every stop*	
2a. Negative indicator species	**% frequency**	**% of habitat[1]**	*No species present in more than 60% of stops and combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
→ *Cirsium arvense*				
→ *Cirsium vulgare*				
→ *Lolium perenne*				
→ *Pteridium aquilinum*				
→ *Senecio jacobea*				
→ *Pteridium aquilinum*				
→ *Rosa* spp.				
→ *Rubus fruticosus* agg.				
→ *Urtica dioica*				
→ Other:				
→ **stops**				
3. Non-native species	**% frequency**		*No species present in more than 20% of stops*	
→ Name of species:				
→ Name of species:				
than *Juniperus* (% frequency)			*Trees and scrub not recorded at more than 60% of stops and combined cover of 5% or less*	
→ **4b. Cover of trees and scrub other than *Juniperus* (% of habitat[1])**				
→ **5. Trees/saplings from adjacent plantations (% frequency)**			*Present at not more than 20% of stops*	
→ **6. Height of vegetation: stops with height 2-10 cm (%)**			*30-70% of stops with appropriate vegetation height*	
→ **7. Flowering and fruiting of any positive indicator species (%**			*Present in 40% or more of stops*	
→ **8a. Bare sand (% of habitat from stops[1])**			*Present but total area not more than 10%*	
→ **8b. Bare sand (% of habitat from map/observations[3])**				
9. Rare species	**% frequency in habitat**		*No declines since last assessment*	
→ **10a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)**			*Both absent*	
→ **10b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)**				
→ **11. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)**			*No more than 20% of habitat*	
			No. of criteria failed	
			Habitat assessment[2]	

2170 Dunes with *Salix repens* ssp. *argentea (Salicion arenaria)*

Monitoring stop data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1a. Positive indicator species (√ if present)																
Carex arenaria																
Carex flacca																
Euphrasia officinalis agg.																
Festuca rubra																
Holcus lanatus																
Lotus corniculatus																
Ononis repens																
Pilosella officinarum																
Rhytidiadelphus squarrosus																
Scleropodium purum																
Salix repens ssp. *argentea*																
1b. Number of positive indicator species at each stop																
2a. Negative indicator species (% cover)																
Cirsium arvense																
Cirsium palustre																
Cirsium vulgare																
Lolium perenne																
Pteridium aquilinum																
Senecio jacobea																
Urtica dioica																
Other:																
2b. Highest % cover score at each stop																

Habitat assessment for the site

Habitat assessment criteria	Habitat assessment score		Required to pass	Result (pass/fail)
1a. Positive indicator species	% frequency		*At least two species present in more than 40% of stops and another two species present in more than 20% of stops*	
→ *Carex arenaria*				
→ *Carex flacca*				
→ *Euphrasia officinalis* agg.				
→ *Festuca rubra*				
→ *Holcus lanatus*				
→ *Lotus corniculatus*				
→ *Ononis repens*				
→ *Pilosella officinarum*				
→ *Rhytidiadelphus squarrosus*				
→ *Scleropodium purum*				
→ *Salix repens* ssp. *argentea*				
→ **1b. Lowest number of positive indicator species in a monitoring stop**			*At least two species present in every stop*	
2a. Negative indicator species	% frequency	% of habitat[1]	*No species present in more than 60% of stops and combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
→ *Cirsium arvense*				
→ *Cirsium palustre*				
→ *Cirsium vulgare*				
→ *Lolium perenne*				
→ *Pteridium aquilinum*				
→ *Senecio jacobea*				
→ *Urtica dioica*				
→ Other:				
→ **2b. Highest % cover score across all**				

3. Non-native species (% cover)																
Name of species:																
Name of species:																
4. Rank grasses (% cover)																
Arrhenatherum elatius																
Dactylis glomerata																
5. Cover of trees and scrub other than Salix repens (% cover withn 20m radius)																
6. Height of *Salix repens* (cm)																
7. Bare sand (% cover)																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

3. Calculate the area of bare ground within the habitat at a site level by totalling the areas mapped/observed as bare ground

General site observations

3. Non-native species	**% frequency**	*No species present in more than 20% of stops*	
Name of species:			
Name of species:			
4. Rank grasses	**% of habitat[1]**	*Total area is less than 10%*	
Arrhenatherum elatius			
Dactylis glomerata			
5a. Cover of trees and scrub other than *Salix repens* (% frequency)		*Trees and scrub present at no more than 40% of stops and combined cover of 5% or less*	
5a. Cover of trees and scrub other than *Salix repens* (% of habitat[1])			
6. Height of *Salix repens* (range)		*All stops with height of 5 to 30 cm*	
7a. Bare sand (% of habitat from		*Present but total area not more than 10%*	
7b. Bare sand (% of habitat from			
8. Rare species	**% frequency**	*No declines since last assessment*	
9a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment		*Both absent*	
9b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)			
10. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of		*No more than 20% of habitat*	
		No. of criteria failed	
		Habitat assessment[2]	

2190 Humid dune slacks

Monitoring stop data

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1a. Positive indicator species (√ if present)																
Anagallis tenella																
Aneura pinguis																
Bryum pseudotriquetrum																
Calliergon cuspidatum																
Campylium stellatum																
Carex arenaria																
Carex flacca																
Carex nigra																
Dactylorhiza spp.																
Epipactis palustris																
Equisetum spp.																
Galium palustre																
Hydrocotyle vulgaris																
Juncus articulatus																
Lotus corniculatus																
Mentha aquatica																
Ophioglossum vulgatum																
Potentilla anserina																
Prunella vulgaris																
Ranunculus flammula																
Sagina nodosa																
Salix repens ssp. *argentea*																
Agrostis stolonifera																
Festuca rubra																
1b. Number of positive indicator species at each stop																
2. Cover of bryophytes (% cover)																

Habitat assessment for the site

Habitat assessment criteria	**Habitat assessment scores**	**Required to pass**	**Result (pass/fail)**
→ **1a. Positive indicator species**	**% frequency**	*At least four species present in more than 40% of stops and another two species present in more than 20% of stops*	
→ *Anagallis tenella*			
→ *Aneura pinguis*			
→ *Bryum pseudotriquetrum*			
→ *Calliergon cuspidatum*			
→ *Campylium stellatum*			
→ *Carex arenaria*			
→ *Carex flacca*			
→ *Carex nigra*			
→ *Dactylorhiza* spp.			
→ *Epipactis palustris*			
→ *Equisetum spp.*			
→ *Galium palustre*			
→ *Hydrocotyle vulgaris*			
→ *Juncus articulatus*			
→ *Lotus corniculatus*			
→ *Mentha aquatica*			
→ *Ophioglossum vulgatum*			
→ *Potentilla anserina*			
→ *Prunella vulgaris*			
→ *Ranunculus flammula*			
→ *Sagina nodosa*			
→ *Salix repens* ssp. *argentea*			
→ *Agrostis stolonifera*			
→ *Festuca rubra*			
→ **1b. Lowest number of positive indicator species in a monitoring stop**		*At least three species present in every stop*	
→ **2. Bryophytes**	**% frequency**	*Present in more than 20% of stops*	

3. Cover of *Salix repens* (%)																
4a. Negative indicator species (% cover)																
Arrhenatherum elatius																
Cirsium arvense																
Cirsium palustre																
Cirsium vulgare																
Lolium perenne																
Pteridium aquilinum																
Senecio jacobea																
Urtica dioica																
Other:																
4b. Highest % cover score at each stop																
5. Non-native species (% cover)																
Name of species:																
Name of species:																
6. Cover of scrub (% cover within 20 m)																
7. Forb cover to grass cover ratio (%:%)[4]																
8. Bare ground (% cover)																

General site observations

3. Cover of *Salix repens* (% of habitat[1])			*Less than 40%*	
4a. Negative indicator species	**% frequency**	**% of habitat[1]**	*No species present in more than 60% of stops* and *combined cover of negative indicators 5% or less* and *highest % cover score of 25% or less*	
Arrhenatherum elatius				
Cirsium arvense				
Cirsium palustre				
Cirsium vulgare				
Lolium perenne				
Pteridium aquilinum				
Senecio jacobea				
Urtica dioica				
Other (specify)				
4b. Highest Domin score across all stops				
5. Non-native species	**% frequency**		*No species present in more than 20% of stops*	
Name of species:				
Name of species:				
6a. Cover of scrub (% frequency)			*Scrub present in no more than 40% of stops* and *combined cover of 5% or less*	
6b. Cover of scrub (% of habitat[1])				
7. Forb: grass ratio (mean)			*Forb cover over 30%, grass cover below 70%*	
8a. Bare ground (% of habitat from stops[1])			*Present but* total *area not more than 5%*	
8b. Bare ground (% of habitat from map[3])				
9. Rare species (e.g. *Petalophyllum ralfsii*)	**% frequency**		*No declines since last assessment*	
10a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)			*Both absent*	
10b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)				
11. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)			*No more than 20% of habitat*	
			No. of criteria failed	
Recorded but not assessed:			**Habitat assessment[2]**	
Embryonic slacks present? (Y/N)				
Algal mats present? (Y/N)				

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad.

3. Calculate the area of bare ground within the habitat at a site level by totalling the areas mapped/ observed as bare ground.

4. For the total area at each stop covered by forbs and grasses, estimate the % of that area covered by each component. Values should total 100%. For example, 40:60.

*21A0 Machairs

Monitoring stop data																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1a. Positive indicator species (√ if																
Agrostis stolonifera																
Aira praecox																
Bellis perennis																
Carex arenaria																
Carex flacca																
Carex nigra																
Cerastium fontanum																
Crepis capillaris																
Euphrasia officinalis agg.																
Festuca rubra																
Galium verum																
Hydrocotyle vulgaris																
Linum catharticum																
Lotus corniculatus																
Orchid spp.																
Plantago lanceolata																
Potentilla anserina																
Prunella vulgaris																
Rhinanthus minor																
Sedum acre																
Thymus polytrichus																
Trifolium repens																
Viola canina																
Viola riviniana																
Viola tricolor																
1b. Number of positive indicator species at each stop																
2. Cover of bryophytes (% cover)																

	Habitat assessment for the site			
	Habitat assessment criteria	**Habitat assessment scores**	**Required to pass**	**Result (pass/fail)**
	1a. Positive indicator species	**% frequency**	*At least six species present in more than 20% of stops*	
→	*Agrostis stolonifera*			
→	*Aira praecox*			
→	*Bellis perennis*			
→	*Carex arenaria*			
→	*Carex flacca*			
→	*Carex nigra*			
→	*Cerastium fontanum*			
→	*Crepis capillaris*			
→	*Euphrasia officinalis* agg.			
→	*Festuca rubra*			
→	*Galium verum*			
→	*Hydrocotyle vulgaris*			
→	*Linum catharticum*			
→	*Lotus corniculatus*			
→	Orchid spp.			
→	*Plantago lanceolata*			
→	*Potentilla anserina*			
→	*Prunella vulgaris*			
→	*Rhinanthus minor*			
→	*Sedum acre*			
→	*Thymus polytrichus*			
→	*Trifolium repens*			
→	*Viola canina*			
→	*Viola riviniana*			
→	*Viola tricolor*			
→	**1b. Lowest number of positive indicator species in a monitoring stop**		*At least three species present in every stop*	
→	**2. Cover of bryophytes (minimum % cov**		*Always over 1%*	

3a. Negative indicator species (%																
Arrhenatherum elatius																
Cirsium arvense																
Cirsium vulgare																
Senecio jacobea																
Urtica dioica																
Lolium perenne																
Phleum pratense																
Pteridium aquilinum																
Other (include native invasive species):																
3b. Highest % cover score at each stop																
4. Non-native species (% cover)																
Name of species:																
Name of species:																
5. Flowering and fruiting of any positive indicator species (√ if present)																
6. Height of vegetation (cm)																
7. Bare ground (% cover)																

Notes :

1. Calculate % of habitat by averaging % cover scores for stops

2. No failures = Favourable, 1-2 failures = Unfavourable - Inadequate, 3+ failures = Unfavourable - Bad

3. Calculate the area of bare ground within the habitat at a site level by totalling the areas mapped/observed as bare ground

3a. Negative indicator species	**% frequency**	**% of habitat[1]**	*No species present in more than 40% of stops and L. perenne and P. pratense not present in more than 20% of stops and combined cover of negative indicators 5% or less and highest % cover score of 25% or less*	
→ *Arrhenatherum elatius*				
→ *Cirsium arvense*				
→ *Cirsium vulgare*				
→ *Senecio jacobea*				
→ *Urtica dioica*				
→ *Lolium perenne*				
→ *Phleum pratense*				
→ *Pteridium aquilinum*				
→ Other:				
→ **stops**				
4. Non-native species	**% frequency**		*No species present in more than 20% of stops*	
→ Name of species:				
→ Name of species:				
→ **5. Flowering and fruiting of any positive indicator species (% frequency)**			*Present in more than 40% of stops*	
→ **6. Sward height (mean)**			*Mean height estimated to be over 8cm in July/August*	
→ **7a. Bare ground (% of habitat from stops**			*Present but* <u>total</u> *area not more than 5%*	
→ **7b. Bare ground (% of habitat from map[3]**				
→ **8. Rare species**	**% frequency**			
→ **9a. Coastal defences built pre-designation which currently affect the habitat due to modification of these structures or changes to the sediment cycle at the site (presence/absence)**			*Both absent*	
→ **9b. Post-designation anthropogenic impacts on the substrate/mobility of the system (e.g. new stabilisation works, sediment extraction) (presence/absence)**				
→ **10. Disturbance (e.g. trampling, vehicle damage, removal of substrate) affecting the habitat (% of habitat)**			*No more than 20% of habitat*	
			No. of criteria failed	
			Habitat assessment[2]	

General site observations