Dawlish Warren NNR

2019 botanical survey

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March 2020

Contents

1 INTRODUCTION

1.1 BACKGROUND

Dawlish Warren NNR comprises c155ha centred on a 2.4km long sand spit extending out into the mouth of the Exe Estuary. The land is owned partly by Teignbridge District Council and partly by the Devon Wildlife Trust. This survey is for the land owned and managed by Teignbridge District Council only.

Dawlish Warren NNR is designated as an SSSI, SAC and is part of the Exe Estuary SPA and Ramsar site. It is a site of renowned botanical importance. Formal botanical survey of the Warren has included mapping exercises in 1990, 2003 and 2012, and annual surveys of the population and distribution of the Warren Crocus, *Romulea columnae,* The collation of records deriving from the field observations of local and visiting naturalists also contributes greatly to knowledge of the flora and vegetation of the site.

The last decade has seen substantial changes to the habitats and management of Dawlish Warren. Most significantly with the Dawlish Warren Beach Management Scheme (DWBMS), which during 2017 saw the removal of much of the hard engineering from the dunes along most of the frontage of the site and a beach recharge which allows a greater percentage of the site to become more dynamic. There has also been the continued use of winter Pony grazing, a scrub reduction programme and increased use of tractor mounted mechanised cutting devices.

There is a need to collect data allowing the changes in distribution of important species and habitats across the site to be understood and for this to be related to the ecological influence of visitor and recreational use of the site.

This project is funded by Teignbridge District Council with additional support from South East Devon Habitat Regulations Partnership. The survey will be used by the managers of the site to chart the changes that have occurred since the 2012 survey, act as a baseline following the DWBMS and identify human impacts on habitats and key botanical species. The work will also contribute to long term monitoring of the site to ensure that it is in favourable conservation status and that national and international conservation obligations are being met.

1.2 OBJECTIVES OF THE PROJECT

- Determine changes in communities since 2012 survey
- Provide detailed mapping of plant communities in order to determine effectiveness of present management
- Produce colour coded habitat maps suitable for comparison with 1994, 2003 and 2012 surveys
- Produce distribution maps of certain rare/scarce species.
- Produce distribution maps of current extent of selected invasive species.
- Produce colour coded heat maps of areas of the site subject to significant trampling pressure and identify areas at risk of erosion from trampling

- Identify and produce map of areas of fixed dune and/or dune slack subject to nutrient enrichment from dog fouling or other eutrophication effects

2 METHODOLOGY

The study area was defined as the vegetated area of the NNR under TDC management and is similar to the boundary taken for the 2012 survey, except where erosion or dune building has altered the vegetated area at Warren Point.

2.1 BROAD HABITAT ASSESSMENT

An assessment of the distribution of predefined broad habitats was undertaken in order to facilitate comparison with surveys undertaken in 2002 and 2012. The categories used (following Stewart 2003 and Wheeler & Wilson 2013) are summarised below (Table 1).

Trees and tall scrub	Includes mature and regenerating *Salix*, *Betula* and *Alnus* over 1.5 m.
Low scrub and bramble	Includes *Sambucus nigra, Crataegus monogyna, Malus, Ulex europaeus* and *Rubus fruticosus*, even when large bushes. This category also includes more substantial stands of *Lupinus arboreus*.
Marram	Areas where *Ammophila arenaria* is a substantial component including *Ammophila Arenaria/*Carex arenaria mixtures. Areas where *Ammophila arenaria* is a minor component are not included.
Sand couch foredune	Species-poor pioneer vegetation of embryo dunes dominated by *Elytrigia juncea* with a substantial component of bare sand.
Dune grassland	Includes short, dry turf communities dominated by *Carex arenaria* and/or by fine leaved grasses (*Festuca* spp., *Agrostis* spp. etc.).
Neutral grassland	Includes areas where coarser grasses predominate (*Holcus lanatus, Dactylis glomerata and Arrhenatherum elatius*) and the community lacks dune community preferentials.
Damp dune grassland	Damp dune slack communities in which short turf species *Agrostis stolonifera*, *Plantago coronopus*, *Leontodon saxatilis*, smaller *Carex* spp. are frequent, with species typical of dune slack. *Juncus maritimus*, *Hydrocotyle vulgaris* and *Carex arenaria*.
Damp neutral grassland	Grasslands which support damp loving species but lack sufficient damp dune slack preferential species to be included in that category.
Reeds	Areas where *Phragmites australis, Bolboschoenus maritimus* or tall aquatic *Carex* spp. dominate.
Open water	Open water without swamp.
Shingle	Shingle banks between pioneer and foredunes which are largely bare of vegetation.
Bare sand	Sandy areas with very low vegetation cover (<25%).

Table 1. Definitions of mapping categories used for the 2019 assessment of Broad Habitat coverage.

Mapping was carried out through walkover surveys assisted by a desk-based exercise interpreting aerial photographs (dated 2016). Refinements to the map were subsequently made drawing on more detailed observations of vegetation carried out as part of the determination of NVC communities.

Both earlier surveys utilised some additional categories, based on intermediacy or complex mixtures between the defined mapping conventions. The most important of these are the mosaics of 'Marram and Low scrub and bramble' and 'Dune grassland and Low scrub and bramble'. These are useful and meaningful mapping categories because both types of vegetation are a key feature of the site. However, the limits of mosaics were not closely defined in the survey reports. We employ these categories again here with caveat that there may be some difference in surveyor interpretation between 2012 and 2019. To minimise this effect, earlier (2010) aerial photographs were examined in conjunction with the 2012 quadrat data and the 2012 Broad Habitat Map in order calibrate our 2019 assessments. On this basis, areas that would be likely to contain bramble (*Rubus fruticosus*) at frequencies of 20% or more and at cover values of 4% or above but which are not compositionally referable to strict W24, indicate 'low-scrub' mosaicking (published NVC constancy tables allow for bramble at frequency values of 1 and cover up to a DOMIN value 4 in both SD6 and SD7 communities and sub-communities). Higher constancies and cover values clearly represent stands in succession towards woodland or scrub proper.

The previous survey report does not refer to the extents of each broad habitat recorded in 2012 but a detailed map was produced. Therefore, for the purposes of change assessment, the broad habitat map accompanying the 2012 survey was digitised in a GIS and approximate areas for each broad habitat category then calculated.

2.2 NVC & BOTANICAL FIELDWORK

2.2.1 NVC SAMPLING

Vegetation sampling for identification of the plant communities to National Vegetation Classification was undertaken using standard methods (Rodwell 2000). Fieldwork took place between March 1st and September 2019. 137 formal vegetation samples were recorded (quadrats) equivalent to approximately 2200 individual species records. An additional 1100 species field observations in support of the habitat and species mapping work were made.

The aim of the sampling was to record at least 5 quadrats for every community of appreciable extent. Vegetation communities distributed in patches <~10m^2 were captured using target notes or mapped as mosaics. However, some distinctions become apparent only after analysis of data. Therefore some communities were assigned on the basis of fewer samples and other supporting evidence contained in field notes and records. In common with previous surveys some of the smaller

habitat patches could not accommodate an array of quadrats and were described qualitatively through annotated species lists and target notes.

The standard quadrat size used was 2m x 2m with a 10m x 10m plot (with 15m 'halo' for canopy recording) being used for woodland and tall scrub habitat. This was seen as a necessary economy in order to produce the required mapping on a workable timescale. In intimately variable and mosaicked vegetation such as found in mobile dune, semi-fixed and fixed dune grassland this inevitably has the effect of 'smoothing out' some of the small-scale heterogeneity, with, for example, short-lived annual communities associated with microtopographic relief amongst tracts of Marram dominated vegetation tending to go unmapped. Where possible we have attempted to indicate this further layer of vegetation diversity through target notes and records of localised notable species and their specific associates.

Nomenclature follows Stace (2019) for vascular plants, and the current published checklists of the British Bryological Society and British Lichen Society for bryophytes and lichens respectively.

Economies
For sand dune vegetation, cover and abundance information can be essential for discriminating between NVC types so the identification of communities using quadrat species lists (constancy alone) was generally not feasible and the decision was made to collect full abundance data for every sample. However, acceptable economies with respect to lower plant determinations in predominantly vascular plant vegetation etc (Rodwell 2006) were employed.

2.2.2 DATA PROCESSING & ANALYSIS

Field data were collected using the DOMIN scale for comparison with published constancy tables (Rodwell 1995, 2000) and converted to percentage cover using the DOMIN 2.6 transformation (Curral 1987) for computer analysis. Plots were grouped into sets *a priori* (based on field observations of reasonably homogeneous vegetation stands and supported by air photo interpretation). Sets were then analysed using the software, Modular Analysis of Vegetation Information System (MAVIS 2016). This computes a 'matching coefficient' (i.e. an index of the goodness-of-fit) comparing the new field data with the synoptic tables of the NVC.

To aid in interpretation of point to point variation in the vegetation communities, individual vegetation samples (quadrats) were also converted from DOMIN to an estimate of frequency by applying the arbitrary relationship between plot cover and constancy as defined in Dring (2000). This allowed an estimate of the nearest NVC community to any single sample to be computed in MAVIS.

Final diagnosis of NVC communities was undertaken using a combination of the published keys and descriptions and constancy tables and the 'goodness-of-fit' function calculated using MAVIS (MAVIS 2016).

2.2.3 DIGITAL HABITAT & VEGETATION MAPPING

Map features were digitised in QGIS 3 on the OS British National Grid projection. Where feature boundaries closely conformed (i.e. edge of a path or linear feature within ~1m of current OS large scale mapping) to current OS MasterMap line data these lines were replicated to facilitate compatibility with other spatial datasets that may be employed in the management of the site.

Unvegetated areas falling at the exterior coastal edge of the site were not included in the habitat mapping.

2.3 RARE & SCARCE VASCULAR PLANT SPECIES

Ten rare or scarce vascular plant species were defined in the project brief as requiring ongoing observation or monitoring input:

Romulea columnae	Sand Crocus
Vulpia fasciculata	Dune fescue
Vulpia ciliata	Bearded fescue
Poa infirma	Early meadow-grass
Poa bulbosa	Bulbous Meadow-grass
Trifolium suffocatum	Suffocated Clover
Trifolium glomeratum	Clustered Clover
Euphorbia portlandica	Portland Spurge
Ophioglossum azoricum	Small adder's tongue
Galium parisiense	Wall Bedstraw

Data on Sand Crocus were collected by the TDC ranger team as part of annual monitoring work undertaken for this species and this species was not actively quantified.

An effort to revisit the majority of recorded sites for this selection of species from the 2012 survey was made. As far as possible species-specific searches were timed for the optimum chance of accurate population assessments (e.g. mid March for *Poa infima*, mid June for *Hypochaeris glabra*). However, this was not practical for every locus for every species and therefore some colonies may have been missed due to timing of fieldwork sessions. All populations (or individuals for low density species) found in the course of vegetation survey and refound from targeted searches were recorded to high spatial precision in the field by GPS and the distribution of records later analysed within a GIS. Data on associated species were collected in most cases, either by use of appropriately placed NVC samples or field notes.

2.3.1 DIGITAL MAPPING

Populations of the targeted species were mapped in a GIS as polygons based on their observed distributions on the ground. For individuals or colonies covering very small areas a circular ring has been used to represent the point location; it is not to scale (c10m on the map) but provides a clearer visualisation of distribution than a simple point or cross point. Where colonies were larger or more dispersed over a wide area an attempt to map the actual extent, or an 'envelope' encompassing clusters of colonies, has been made. Any non-circular polygons indicated on the map represent, to scale, the extent of ground within which a recognisable colony of a species was observed. These spatial envelopes are not intended to imply continuous cover nor that a species was necessarily absent from land outside the polygon.

Due to the frequent overlapping of distributions of the target species it was decided, for clarity, to map each species separately. The source data files are supplied so that they can in future be overlaid in a GIS if required for management planning purposes.

2.3.2 INVASIVE PLANT SPECIES

Invasive species were recorded and mapped in a similar way to target rare species (above, 2.3) with emphasis on areas particularly affected by invasion or dominance rather than on censusing individual populations or mapping all instances. The taxa included in the project brief were:

Aster spp.	Michaelmas daisy
Rosa rugosa	Japanese Rose
Yucca gloriosa var *recurvifolia* (*Yucca recurvifolia*)	Spanish Dagger
Lupinus arboreus	Tree Lupin
Erigeron (*Conyza*) *canadensis* agg. *(*including *E. sumatrensis)*	Fleabanes (New World origin spp.)
Hippophae rhamnoides	Sea Buckthorn

A single map (Map 4) dedicated to these species of concern was produced. Additional species included on this map (following, and for comparison with Wheeler and Wilson 2013) are *Buddleja davidii* and *Sisyrinchium montanum*. Records of other non-native species encountered in the survey were highlighted as target notes elsewhere (see Map 5).

2.4 HUMAN IMPACTS

An assessment of recreational impacts on Dawlish Warren SAC in 2011 (Lake 2011) concluded that trampling, eutrophication from dog fouling and wildfire were the main factors affecting vegetation. As an adjunct to the vegetation survey described in this report data were collected, at the instruction of South East Devon Habitat Regulations Partnership, in order to map the apparent distribution and intensity of trampling and eutrophication pressures on the site.

2.4.1 TRAMPLING ASSESSMENT

To collect data on trampling impact and risk the survey area was gridded within a GIS into 25m x 25m cells. This resolution of study was chosen as being sufficiently fine to illustrate major patterns whilst still being feasible within the space of the project. It also aligns with the earlier study undertaken by Footprint Ecology to identify areas at risk of erosion from trampling (Lake 2011).

A qualitative 5-point scale was defined in order to estimate trampling intensity and erosion risk (as a simple artificial composite score) in each square. This was based primarily on observations of the standard indices of trampling effects on vegetation (Cole & Bayfield 1993): loss of plant cover, reduced vigour or stature and damage (e.g. breakage and bruising of stems). Observations on substrate condition (erosion and compaction) were also used to qualify these, particularly in later ground-truthing of desk-based assessments.

Grid cells were assigned to the 5 categories using the following guidelines:

1. Slight risk/impact areas. <5% bare substrate overall and not obvious generally in air photos, areas usually with continuous cover of semi-natural vegetation. Typically areas on level ground or gentle slopes (≤3˚). Where no recent grazing, mowing or strimming management, vegetation usually includes elements of tall sward, underscrub or woody features at least locally. Where shorter vegetation maintained trampling-sensitive plants such as *Sedum* spp., Orchidaceae and fruticose lichens such as *Cladonia* spp. may form vigorous stands. Transition zones between disturbed and undisturbed either not visible or of minimal extent.
2. Lower risk/impact areas. Typically 5%-10% exposed sand or soil area with low density of desire paths of low width (<50cm). Transition zones between disturbed and undisturbed may be evident but not a conspicuous feature, with areas of reduced height vegetation localised around lines of access.
3. Moderate risk/impact areas. Typically <10% exposed sand or soil area due to trampling but diffuse effects more marked. Trampling impacts evident as reduced height sward at least locally. Sward generally not abraded so far as to cause erosion except localised at pinch points, path junctions etc. Areas usually traversed by significant (≥1m wide) formal tracks or paths or well-established desire paths. Transition zones obvious and occupying significant areas, with secondary effects of larger formal paths and trackways evident on adjacent vegetation. Paths in areas of fixed dunes with broad trample zones characterised by very short vegetation but not extensively re-mobilising sand. Tall herbs scrub and underscrub may be present but if so scattered and localised, with average distance between woody vegetation patches ≥10m. Increased abundance of trampling resistant genera in sward (e.g. *Poa* and *Plantago coronopus* and *Carex arenaria*) relative to 1 and 2.
4. High risk/impact areas. Intermediate to 3 and 5. May be some incipient braiding of desire paths in transition zones. Trampling resistant species usually abundant.
5. Very high risk/impact areas. Usually >15% exposed sand or soil. Typically, but not exclusively, areas on steeper slopes (>7˚). Typically high density of desire paths through semi-natural vegetation some of which broad (≥50cm) with obvious secondary erosion including heavily compacted transition zones and braiding effects where path users avoid mobile sand of main line to walk on fixed or semi fixed turf adjacent. Marked erosion hotspots at path junctions. Vegetation height clearly reduced in significant (>10%) proportions of the area. Reduced vegetation cover and vigour effects extend to trample-resistant species (e.g. *Poa* and *Plantago coronopus* and *Carex arenaria*).

The assessment was carried out firstly by interpretation of high resolution recent aerial photography (GetMapping images held by DBRC flown in mid July 2016 and Google Earth imagery dating from late June 2018). 573 cells covering the site were assessed.

A sample of 100 cells were 'ground-truthed' in late August/early September 2019 with an independent re-assessment of the criteria in the field. Squares were selected for ground truthing to include the range of impacts evident in the desk-based interpretation and to support assessments where air photo analysis was ambiguous or gave low certainty. Data were collected using the QFIELD app (QGIS Development Team 2019) in conjunction with VEGAPP installed on an Android smartphone displaying the 25m grid and user's GPS position.

For ¼ of ground-truthed cells a georeferenced photograph was produced. The photo was taken, where possible, to portray the vegetation as seen from the SW region of the 25m cell looking towards the northeast. The intention was to capture the general situation across the range of trampling levels observed, include some context (to aid in any future comparative use of the images) but minimise extraneous scenery, sky etc. The locations of these photos are indicated on an appended map.

In sand dune systems, which are inherently dynamic, there is a complex interaction of natural processes and human induced change. For this reason some areas of naturally mobile sand may have been erroneously assigned to the high trampling category. The ground truthing process aimed to minimise this effect. Where an expanse of unvegetated sand or substrate within a grid cell was evidently caused mainly by coastal processes this was disregarded in the estimation of plant percentage cover. Similarly, for grid cells falling at the transition from the dune system to a beach or to an area of made-ground only the dune portion was considered in the trampling assessment score.

Bare sand (and areas with very early stage Marram stands) overlying the Geotube installed in 'the Neck' in 2017 as part of the DWBMS was not assessed for current trampling as there was too little vegetation present to assess and recreational walkers are effectively excluded from the establishing vegetation by a system of enclosures.

The dataset from this assessment was processed in QGIS (QGIS Development Team 2019) using Inverse Distance Weighting (IDW) Interpolation on the revised (ground-truthed) trampling scores and a distance coefficient of 2. The interpolated dataset was then rendered as a 'Heatmap' covering the survey area and a 30 metre buffer to provide a continuous graphical surface for visualisation of trampling impacts. The source GIS data are retained.

2.4.2 EUTROPHICATION ASSESSMENT

In order to explore current and recent patterns of eutrophication impacts on the site's vegetation two approaches were combined.

1. A composite Fertility indicator score was derived for each vegetation sample collected in 2019 and 2012 (quadrat datasets recorded for NVC surveys of the site in the present survey and in the 2012 survey). 2012 data were included to expand the coverage of samples and it was judged, after comparing datasets, that changes in fertility would be gradual enough to justify treating the two amalgamated datasets as one for the purpose of deriving baseline information on the broad patterns of fertility currently expressed on the site.

The fertility index used was an adapted Ellenberg score for Nitrogen, which is in effect a general indicator of soil fertility (Hill et al. 1999). In this system values have been assigned to each plant species ranging from 1 to 9 with the lowest score corresponding to the lowest fertility.

Computation of a composite N value for each quadrat sample – a complex set of species with varying cover values – was performed within MAVIS Plot Analyser (2016) using a simple cover weighting as follows:

Cover-weighted score = Sum (E. c)/ Sum (c)

where E = Ellenberg score for each species
c = cover value for each species
n = number of species having Ellenberg scores in the quadrat

IDW interpolation of all the cover weighted N scores was employed in the same way to that described above (2.4.1) for trampling impact in order to generate a heatmap visualisation which would indicate areas of nutrient enrichment.

2. Direct observation of species indicative of heightened nutrient levels in the context of Dawlish Warren were made in the field (including in formal vegetation samples - 2.2.1) and all instances of dog fouling (and occasionally human waste) encountered during fieldwork were spatially recorded. This was not a systematic survey but is likely to give additional information on the distribution of external nutrient inputs from recreational usage. These data were superimposed on the heatmap (above) to provide added context.

To maintain clarity on the map only selected indications of enrichment were mapped: records of the nutrient tolerant grass species, *Arrhenatherum elatius*, *Poa annua* and *Anisantha sterilis*. All these have individual N values at 7 (above the maximum cover-weighted score of 6 computed for the reserve). Concentrations of these taxa are therefore likely to indicate localised enrichment effects and aid in the visualisation of the fertility gradients observed over the site and were seen to provide a good proxy for the wider range of species observed indicating nutrient enrichment.

3 RESULTS

3.1 BROAD HABITAT MAPPING

The results of the remapping of broad habitats are captured in Map 1 and summarised below in Table 2. Changes since the mapping was carried out in 2012 are discussed in section 4 of the report.

Broad Habitat	2012 (ha)	2019 (ha)	change (ha) : (% of 2012)
Damp dune grassland	1.77	1.64	-0.13 : -7.5
Damp dune grassland/scrub mosaic	-	0.03	0.03 : +100
Damp neutral grassland	0.39	0.19	-0.21 : -52.0
Dune grassland	4.77	5.27	0.50 : +10.5
Dune grassland/scrub mosaic	0.76	0.50	-0.26 : -34.7
Low scrub and bramble	3.58	1.39	-2.18 : -61.1
Marram	11.37	8.15	-3.22 : -28.3
Marram/scrub mosaic	5.22	3.85	-1.37 : -26.3
Neutral grassland	0.19	-	-0.19 : -100
Reeds	0.66	0.62	-0.04 : -6.5
Sand couch foredune	0.81	0.26	-0.55 : -67.7
Trees and tall scrub	2.22	2.84	0.63 : +28.2
Open water	0.25	0.18	-0.07 : -27.2
Bare ground	0.43	0.58	0.15 : +35.3
Bare sand & shingle	1.02	1.37	0.35 : +34.8
Buildings	0.02	0.02	0 : 0
Total area within broad habitat survey	**31.99**	**26.89**	**-5.10 : -15.9**

Table 2. The areas of broad habitats mapped in 2012 and in 2019 at Dawlish Warren NNR (Teignbridge District Council portion).

3.2 NVC PLANT COMMUNITIES

Twelve NVC plant communities were identified occurring on the site in sufficient extents to be mappable. Map 2 shows these using standard codes and Table 3 summarises the areas of the communities (and also provides a schedule to the accompanying Map 2). The relevant chapters of the NVC provide descriptions of the floristics, habitats and affinities of these communities (Rodwell 1995, 2000). 2019 quadrat data are reproduced for reference in an appendix to this report (see 8.5)

Additional unmapped communities included SD19, which occurred in small patches within the mobile dunes (SD6) and in disturbed semi-fixed dunes (SD7). Four sub-communities of SD6, which

accounts for just over 25% of the mapped area of vegetation were identified and two of SD7 (17.5%).

This survey has taken a conservative approach to the identification of those communities sampled at Dawlish which showed a poor fit with published NVC constancy tables opting to characterise such stands as being variants of the closest fitting *published* community. Precedence has been given to the published key attributes rather than to digital matching of samples with synoptic tables. One exception to this has been in ascribing some areas to the SD11 community (Rodwell 2000) following Wheeler and Wilson (2013) who propose that the Dawlish dry dune grassland lichen-rich sward found in parts of Greenland Lake is likely to be a geographical analogue of the community described from an inadequately small number of samples, all from eastern England; even though the Dawlish stands do not contain the character species for this community the rationale is that floristically speaking, its closest affinities are with this vegetation.

Broad Habitat category	NVC code	Plant community or sub-community	2019 mapped area (ha)
Reeds or Damp dune grassland	M27c	*Filipendula ulmaria-Angelica sylvestris* mire: *Juncus effusus-Holcus lanatus* sub-community	0.35
Reeds	S4	*Phragmites australis* swamp and reed-beds	0.46
Sand couch foredune	SD4	*Elytrigia juncea* foredune community	0.59
Marram	SD6	*Ammophila arenaria* mobile dune community (including early stage SD6 *Ammophila* stands/bare sand)	1.60
Marram	SD6a	*Ammophila arenaria* mobile dune community: *Elytrigia juncea* sub-community	1.07
Marram	SD6d	*Ammophila arenaria* mobile dune community: *Ammophila arenaria* sub-community	2.44
Marram	SD6e	*Ammophila arenaria* mobile dune community: *Festuca rubra* sub-community	1.17
Marram	SD6g	*Ammophila arenaria* mobile dune community: *Carex arenaria* sub-community	0.82
Marram	SD7	*Ammophila arenaria-Festuca rubra* semi-fixed dune community	1.99
Marram	SD7b	*Ammophila arenaria-Festuca rubra* semi-fixed dune community: *Hypnum cupressiforme* sub-community	1.55
Marram/scrub mosaic	SD6/W24	*Ammophila arenaria* mobile dune community/*Rubus fruticosus-Holcus lanatus* underscrub mosaic	2.69
Dune grassland	SD7c	*Ammophila arenaria-Festuca rubra* semi-fixed dune community: *Ononis repens* sub-community	1.17

Dune grassland/scrub mosaic	SD7/W24	*Ammophila arenaria-Festuca rubra* semi-fixed dune community	1.36
Dune grassland	SD11	*Carex arenaria-Cornicularia aculeata* dune community	0.27
Dune grassland	SD12	*Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland	2.14
Damp dune grassland	SD15c	*Salix repens-Calliergon cuspidatum* dune-slack community: *Carex flacca-Pulicaria dysenterica* sub-community	1.64
Damp dune grassland/scrub mosaic	SD15/W24	*Salix repens-Calliergon cuspidatum* dune-slack community/*Rubus fruticosus-Holcus lanatus* underscrub mosaic	0.03
Low scrub and bramble	W21	*Crataegus monogyna*-Hedera helix scrub	0.06
Low scrub and bramble	W23	W23 *Ulex europaeus-Rubus fruticosus* scrub	0.06
Low scrub and bramble	W23/W24	W23 *Ulex europaeus-Rubus fruticosus* scrub/*Rubus fruticosus-Holcus lanatus* underscrub mosaic	0.79
Low scrub and bramble	W24	W24 *Rubus fruticosus-Holcus lanatus* underscrub	0.50
Dune grassland/scrub mosaic	unknown NVC/W24	W24 *Rubus fruticosus-Holcus lanatus* underscrub/undiagnosed dune grassland community mosaic	0.16
Trees and tall scrub	W6	W6 *Alnus glutinosa-Urtica dioica* woodland	2.63
Other surfaces combined (not identified in NVC system in present survey: open water, bare ground, bare sand, buildings, Sycamore on dunes)			1.34
Total area within NVC survey			**26.89**

Table 3. National Vegetation Classification plant communities, sub-communities and mosaics thereof recorded in 2019 at Dawlish Warren NNR (Teignbridge District Council portion)

3.3 RARE & SCARCE VASCULAR PLANT SPECIES

Map 3 (a series with target notes appended, see 8.1) represents the results of the rare and scarce vascular plant survey. Diffuse populations of notable species have been mapped using the recorded extent on the ground, where possible with qualifying remarks on population sizes. Very scarce species which were encountered as single individuals or highly localised populations have been mapped as point target notes. It should be emphasised that these mapped instances of scarce or sensitive species do not provide a complete census and it is entirely possible that other populations exist on the site. Remarks made by previous surveyors on the narrow phenological 'window of opportunity' for detecting many of the target species are equally applicable for the 2019 season

when winter and spring germinating annuals appeared early and were rapidly desiccated during a hot and dry summer.

Some interpretation of change in the fortunes of these species is possible but this analysis is qualitative. In making these remarks we also assume equivalence in the spatial precision of past records and their mapping and that achieved in the present survey.

3.3.1 *ROMULEA COLUMNAE* (SAND CROCUS) (NATIONALLY RARE, RED DATA LIST: VULNERABLE)

The appended map reflects incidental records made in course of vegetation work. This species is monitored annually in a separate exercise undertaken by the TDC ranger team.

3.3.2 *VULPIA FASCICULATA* (DUNE FESCUE) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

The distribution of this species in 2019 is apparently somewhat wider than in 2012 when the main colonies were confined to Warren Point. These colonies at the northern end of the reserve are mostly intact but have shifted in size and shape. Some of the smaller colonies (2012 Vf2, Vf6 and Vf5) have been lost to coastal erosion but a number of other stands have either developed or been discovered in the present survey which at least compensate. In particular there is now a significant population in the part of the reserve south of the neck. The spread south along the dune ridge may have been facilitated by scrub clearance work freeing up or creating suitable bare sites in the matrix of marram communities, with some of the strongest colonies appearing in recently opened-up areas.

These factors should be considered in future interpretation of the fortunes of the species on the site:

- Stands of this species can be inconspicuous and it is to be expected that further colonies exist in suitable habitat which may in future grow to become more conspicuous or fade away due to competition with taller vegetation. It is probable that unmapped stands lie along the dune ridge between the main northern and southern aggregations recorded.

- Mapping the extent of this species, which has localised patches of monospecific cover grading continuously into low cover as a minor component of open marram grassland is challenging and subjective; comparison of 2012 and 2019 maps should be interpreted with caution.

- The species is known to undergo large population fluctuations as a result of weather effects on its annual reproductive output (Cope & Gray 2009).

3.3.3 *VULPIA CILIATA* SSP. *AMBIGUA* (BEARDED FESCUE) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

Vulpia ciliata ssp. *ambigua* is the scarce native taxon of *Vulpia ciliata* for which the U.K. has special conservation responsibility; there are few populations outside Britain.

It has been known at Dawlish since at least the 1950s and there are vouchered records from the 1990s (Smith et al. 2016). An annotation on a 1990 survey map suggests it was present alongside paths and tracks at this time but no specific locality was detailed (suggesting the plant was then reasonably frequent) and in 1994 multiple localities were mapped in trampled areas of fixed dune grassland on the southern part of the reserve (Kerry 1994). In the 2012 survey the plant was not found at all (Wheeler & Wilson 2013). The authors suggest this may have been due to the characteristic population fluctuations known to occur in this species (Carey 1994, in Stewart et al.); because the grass has no seed bank a poor year can have drastic impacts on populations but new colonies can develop within a few years from a single seed given suitable conditions (open ground and hot summers).

However, *Vulpia ciliata* ssp. *ambigua* has not been seen recently. It was not found in 2019 and attempts to find it in c.2014 by BSBI recorders and in 2017 by Natural England surveyors were also unfruitful (R. Smith, BSBI; R. Large, NE pers. comm. 2019).

While searching, significant colonies of the Mediterranean subspecies, *Vulpia ciliata* subsp. *ciliata* were found in 2019 on Warren Point, usually in close association with *Vulpia fasciculata* stands in hot, dry sand exposures with rabbit disturbance. Records of *Vulpia ciliata* on Warren Point from 2017 held on the BSBI Database it transpires also refer to this taxon (R. Large pers. comm.). It appears that one subspecies of this grass has replaced the other in recent years but at present there is no information about the mechanism for this and, in particular, whether the new taxon should be regarded as invasive or as alien. It has been found at Kingswear in a similar timeframe (2014, Roger Smith, BSBI, pers. comm.) but was hitherto unknown in Devon.

To avoid confusion the records of *Vulpia ciliata* subsp. *ciliata* have been mapped only as target notes (Map 5, 8.3) rather than as rare or as alien species.

Differences in the ecological preferences of the two subspecies have not been researched in the preparation of this report but it is noted that studies of the species in general suggest it is favoured by warm, wet springs and hot dry summers. Climate change could therefore facilitate its spread (Cope & Gray 2009). There is no known management that could favour one subspecies above the other on the NNR.

3.3.4 *POA INFIRMA* (EARLY MEADOW-GRASS) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

Poa infirma was so abundant that population estimates are impractical. A large colony not mapped in 2012 occupies a broad strip c25m long and 3m wide in an area where people cross from the main trackway obliquely up towards the dune ridge. Here the level of trampling is considerable but dispersed with enough footfall to create openings in the turf but not cause total abrasion. The densest populations were found in slightly elevated situations (such as small mounds left by rabbit

digging which have subsequently been trampled) with sand exposed but well compacted (10-45% bare sand). The surfaces and fringes of footpaths over fixed and semi-fixed grassland provide similar conditions where long linear colonies can be seen.

Comparison of the 2019 records with 2012 indicates that the overall population of this species is stable but there has been considerable turnover in the distribution of individual colonies, with some significant aggregations of plants in areas unmapped in 2012 and vice versa. A number of areas of significant presence mapped in 2012 when revisited in 2019 showed either absence or reduction, with stands or plants occurring at low density, apparently due to competition with other grasses (including other short stature annuals like *P. annua* and *Vulpia bromoides*). Loss of *P. infirma* from these areas often coincides with the loss of bare sand, the closing over of small gaps in the sward and increase in sward height. However, there are ostensibly suitable areas on the back path and near the visitor centre in which *Poa infirma* appears to have become sparser where this cannot be solely attributed to loss of sites. A possible cause is eutrophication in what is a spatially constrained habitat where external nutrient inputs from canine urine are likely to be disproportionately concentrated. Circumstantial evidence for this is provided by the apparent replacement of the species by small prostrate forms of *Poa annua*, a species with a much higher fertility tolerance (Ellenberg N value of 7 versus 5 for *P. infirma*: Hill et al. 1999). Notably, in these situations *Poa annua* is often yellowish, so size and colour alone should not be treated as a reliable diagnostic for *Poa infirma*; flowers and inflorescences should be checked.

3.3.5 *POA BULBOSA* (BULBOUS MEADOW-GRASS) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

In 2012 only one colony of this species was recorded. Search for the plant in the same area – on the back path - in early spring 2019 failed to refind it. The habitat requirements are thought to overlap closely with those of *Poa infirma* and a single colony of *P. bulbosa* was found at a new location in the present survey on a low mound in short, moderately trampled and scuffed turf by a path in close proximity to larger colonies of *P. infirma*.

The 2012 and 2019 records both derive from vegetation seemingly analogous to typical *Poa infirma* habitat. *P. bulbosa* is an inconspicuous species which could easily be overlooked amongst complex mixtures of *Poa infirma* and prostrate forms of *Poa annua* (the 2019 plants also exhibited the yellowish foliage characteristic of *Poa infirma*). Despite the potential for under-recording it is clearly much the scarcer of the two specialist maritime *Poa* species present.

Whether the apparent scarcity is being mediated by current management/trampling levels needs further scrutiny. This is a perennial, persisting by swollen stem bases close to the substrate surface outside of its short flowering period. For the population to remain stable Its bulb-like structures would need to survive through the season of heaviest trampling and associated soil surface abrasion.

P. bulbosa must be regarded as a data-deficient species in the context of Dawlish Warren management as there is little detailed information on its distribution on the reserve prior to the 2012 survey. The BSBI hold records from 1984 onwards, the majority of which are associated with the southernmost part of the site (including the buffer zone outside the present study area). There are recent (2018) records made by Natural England staff on the adjoining golf-course part of the NNR.

Hence, earlier recommendations for 'maintenance of suitable conditions in open short-turf grassland, and along tracksides and footpaths' cannot be refined. However, the statement that '*Poa bulbosa* will favour similar conditions to winter annual species like *Poa infirma* and *Trifolium suffocatum/glomeratum*', whilst evidently broadly correct, may conceal some significant ecological differences since populations of the other three species are apparently faring better. Speculatively, it may be disfavoured above some trampling threshold which its annual counterparts, *P. annua* and *P. infirma*, find tolerable or favourable.

3.3.6 *HYPOCHAERIS GLABRA* (SMOOTH CAT'S-EAR) (RED DATA LIST: VULNERABLE)

This species is likely to be more widespread at present than the appended maps indicate; a number of plants were found incidentally in quadrats placed for vegetation survey. This would be improbable if the plant were as scarce as apparent. The low apparency is due in part to the difficulty in detecting the species – it is easily missed in walkover surveying and requires close scrutiny of the ground ('knee-walking') to locate colonies and undertake population counts.

The main aggregations found in 2019 were in a similar but not identical position to that mapped in 2012 – it was absent from the exact mapped location, suggesting some mobility. The largest counts were associated with human-trampled strips of vegetation flanking the informal red-post-marked path on Warren Point, the plants typically occupying a narrow zone between the line of maximum pressure along the centre of the path and its partially trampled fringes. Here the pathway creates suitable habitat and it seems that away from such conditions the species exists at low cover (sometimes as single plants) in association with chance dispersal and smaller scale rabbit trampling; other plants were found in vegetation actively trampled and scuffed by rabbits, with some particularly well-grown plants established in small rabbit-created divots.

3.3.7 *TRIFOLIUM SUFFOCATUM* (SUFFOCATED CLOVER) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

Tiny plants of this species are found by close examination of short fixed dune turf but to census the site's population would be very labour-intensive owing to the necessary search time to detect sparser populations. It is most gregarious, and therefore most conspicuous, in very compacted and trampled swards. The plants are short-lived and their tendency to quickly disintegrate after flowering in May also makes an accurate assessment of the population challenging.

The distribution as mapped in 2012 appears to have changed, with fewer extensive continuous stands such as those indicated along the edge of the main trackway. These populations are still evident but the position of the colonies seems to be less dependent on the track edges. For example, at the south end of the reserve the strongest representation is in a flat area of SD12 which is mown and trampled by people entering the reserve at the southwest corner and then walking across the sward (in a broad desire line towards the path leading to the foredune and beach) rather than along the trackway. The short sward height and level of openness created by this combination has favoured spread of the poorly competitive *Trifolium suffocatum* (and *Poa infirma*) into the

interior of this grassland unit where it is frequent (and accompanied by *T. micranthum* and *T. ornithopodioides*).

Wet summer conditions may allow seed to germinate in August and thereby complete a second generation before the normal autumn germination. This perhaps would aid spread in conjunction with the right level of footfall.

3.3.8 *TRIFOLIUM GLOMERATUM* (CLUSTERED CLOVER) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

This is a species which is 'erratic in space, time and vigour' (Coombe & Leach in Stewart et al 1994). In the present survey a very large colony was located in a previously unmarked locus on Warren Point but at the same time some of the other colonies were not refound. A population in the Crocus Compound in 2012 appears to be persisting well, with similar numbers of plants observed in 2019.

The 'new' colony towards Warren Point occupies a slightly different habitat to those described on the south part of the reserve (generally from species-rich SD12). Here >300 plants grow on a shallow NE facing bank, in very short rabbit-grazed turf which is also influenced by human trampling along the margin of a post-marked path. This is SD7 semi-fixed dune community which is beginning to transition to a more fixed community type. *Trifolium glomeratum* occupies areas where the soil/sward surface is very compacted but not broken up. Associate species include *Plantago coronopus, Carex arenaria, Galium verum, Syntrichia ruralis* var*. ruraliformis, Hypnum cupressiforme* sens. lat*., Vulpia bromoides, Veronica arvensis, Catapodium rigidum, Rumex acetosella, Ammophila arenaria, Cerastium diffusum, Cerastium semidecandrum, Aira praecox* and *Festuca rubra* agg.

In the Crocus compound the spots with *Trifolium glomeratum* are found as a constituent of more species-rich vegetation with no more than 5% bare sand. Associates here are *Agrostis capillaris*, *Aira praecox, Anthoxanthum odoratum, Arrhenatherum elatius, Bromus hordeaceus, Carex arenaria, Centaurium erythraea, Cerastium fontanum, Crepis capillaris, Dactylis glomerata, Erodium cicutarium* agg., *Euphrasia officinalis* agg., *Festuca rubra, Galium parisiense, Galium verum, Hypochaeris radicata, Luzula campestris, Oenothera stricta, Ornithopus perpusillus Plantago coronopus, Plantago lanceolata, Ranunculus repens, Rubus fruticosus* agg., *Rumex acetosella, Senecio jacobaea, Trifolium arvense, Vicia hirsuta* and *Vicia sativa*.

The distribution of *Trifolium glomeratum* plants in the Crocus compound suggests there are likely to be other unrecorded colonies (which can be as small as 5 or so plants) at low cover within this enclosure.

3.3.9 *EUPHORBIA PORTLANDICA* (PORTLAND SPURGE) (RED DATA LIST: LEAST CONCERN)

This is a species of wide ecological amplitude in the context of Dawlish Warren NNR, being occasional to frequent in a range of habitat types. The distribution described by Wheeler and Wilson

in 2012 effectively describes the current situation with the pattern of absence from the oldest fixed dune grassland, the wettest slack-like communities and the small areas of strandline and embryonic dune communities at Warren Point still evident from our records. We have fewer records from the fixed grassland to the east of Greenland Lake than indicated in 2012 but there remain large populations in the mobile and semi-fixed dunes around the seaward ridge and with no large areas of absence from the vegetation along the seaward boundary of the reserve. In much of the mapped area the species is frequent but low density; it occurs in a high proportion of quadrats at DOMIN cover values of 1 or 2.

Localised concentrations are associated with recent scrub clearance and with expanses of bare sand in the early stages of vegetation development on the neck between Warren Point and visitor centre and it would seem that the existing rotational regime of scrub removal and path fencing suits the species well.

3.3.10 *OPHIOGLOSSUM AZORICUM* (SMALL ADDER'S TONGUE) (NATIONALLY SCARCE, RED DATA LIST: LEAST CONCERN)

This species was encountered in the 2019 survey in only 2 places. The four 2012 recorded sites were searched without success but a colony was found in analogous habitat nearby to a 2012 colony (Oa 3 in the 2012 survey). A second colony was found in drier conditions although occupying a damp microsite in the 'Crocus compound'. The tendency of the species to grow mixed with *O. vulgatum* will always leave some doubt about the true population size but it is though to have been under-recorded in the present survey. The TDC ranger team also reported frequent *O. azoricum* showing in April along the main trackway.

3.4 INVASIVE SPECIES

3.4.1 *ASTER* SPP.

The distribution of species of the Michaelmas Daisy aggregate centres on the damp dune grassland (and in particular where the soil hydrology is moving towards freshwater conditions) and in the smaller areas of damp neutral grassland. The mapped distributions in 2012 and 2019 differ only in slight details with the main colonies in similar locations and occupying similar extents.

3.4.2 ROSA RUGOSA

In 2012 it was reported that this species had been contained and was recorded only as a small population at one location. No evidence of the species spreading or colonising other parts of the site was found in the present survey.

3.4.3 *YUCCA GLORIOSA* VAR. RECURVIFOLIA (*YUCCA RECURVIFOLIA*)

Colonies of this species were found in two spots on Warren Point. Where plants are small or regenerating from rootstocks of old controlled individuals they may be inconspicuous in stands of tall Marram. The extent and location appear to be similar to that mapped and described in the 2012 survey report although the exact coordinates are different, suggesting continued low level presence and regeneration on this part of Warren Point.

3.4.4 LUPINUS ARBOREUS

This species has been the principal perceived invasive non-native threat to native vegetation on the reserve historically but by 1992 was reported as being under control. The extent of the land covered by Tree Lupin is apparently much less extensive than in 2012. Although it is still present in the areas mapped on Warren Point in 2012, with frequent skeleton and moribund plants, large stands are not dominant. Vegetation samples taken in this area in 2019 show it to be both low frequency and low cover (frequency < 20% and cover where present sparse). At the southern tip of the reserve it maintains a significant presence but again not in extensive stands.

Overall it was present in 4/137 NVC quadrats sampled in 2019 and 6/96 in 2012. The area affected by this plant seems genuinely much decreased even since 2012, however there is some difficulty in interpretation since small, dispersed and dead plants were not systematically mapped in the present survey.

3.4.5 *ERIGERON CANADENSIS* AGG. (INCLUDING *ERIGERON SUMATRENSIS*)

Five loci were mapped in 2012 and three in the present survey. The habitats were similar: open SD6/bare sand on Warren Point, sand denuded by recent scrub clearance and bare sand on the Neck created by DWBMS works. Though there does not appear to have been a measurable spread, the plant is almost certainly more frequent than these records suggest as not all suitable areas were worked intensively for records.

Vigilance and the avoidance of seed setting, especially after nearby scrub exposes new sand, is still likely to be required to prevent this species from developing more pervasive colonies on the reserve.

3.4.6 HIPPOPHAE RHAMNOIDES

This species was not recorded in 2019 suggesting its successful eradication; the 2012 survey did not record it either.

3.4.7 OTHER FREQUENTLY OCCURRING NON-NATIVE SPECIES

3.4.7.1 SISYRINCHIUM MONTANUM

Although we have only qualitative information on this, records from 2012 and 2019 indicate that this species has spread in the intervening years.

This is a perennial hemicryptophyte which can form large stands in its native range. It is assumed to be spreading by seed and the distribution of records suggests this could be mediated by movement of people and machines on the central trackway. Although it is diminutive, growing amongst taller grasses, and does not pose an obvious competitive threat to its native associates this could be deceptive and further spread into the interior of SD15 stands should be closely monitored.

Precautionary measures could include avoidance of works which may transfer seed to unaffected areas when ripe capsules are present, or physical removal of unripe fruits post flowering by appropriately timed cutting.

3.4.7.2 *OENOTHERA* SPP.

Evening Primrose plants are a conspicuous and characteristic component of the vegetation of the study area and are at least occasional in all areas except the woodland and the damp dune grassland. The highest cover values were recorded in SD6 samples from sand ridges with disturbance and/or mobility but it is also a frequent component of the semi-fixed and fixed swards. Most plants appear to belong to either *O. stricta* or *O. glazioviana* but there may be other species represented and there are plants which appear intermediate between the two mentioned. In common with the earlier monitoring survey, *Oenothera* has not been categorised as an invasive species and no areas were encountered where it formed stands to the exclusion of native species. The plants are annual to biennial and in areas of high population density its overwintering rosettes may counteract erosion and mobility of sand in some areas but it may also cause a finite loss of available microhabitat for establishment of native winter annuals. Currently this is unlikely to be a limiting factor for any of the conservation concern species over significant areas of the site.

Evening Primrose is targeted for control in the reserve's current management plan.

3.4.7.3 ANISANTHA STERILIS

This is a common archaeophyte with a European Southern-temperate distribution. However, it was not mentioned in descriptions of vegetation on the site in 2012 nor was it sampled in any quadrats. It was recorded at low cover around the back path in 2002 (Stewart 2003) and described as occasional to the Warren as a whole (de Lemos 1992). During the present survey it was recorded in all parts of the site including at high cover in dune Marram and Dune grassland in the southernmost part of the reserve where it may be symptomatic of nutrient enrichment; it ranks alongside *Arrhenatherum elatius*, *Elytrigia repens* and weedy umbellifers like *Heracleum sphondylium* in its nutrient demands (Hill et al. 1999).

3.4.7.4 LAGURUS OVATUS

This attractive grass is very frequent along the foredune strip, usually in spaces between Marram tussocks in SD6. It does not feature on the species list produced for the 1990 NCC survey (Holder & Woolven 1990) nor was it sampled in quadrats recorded for the 2012 survey though it is listed as present by Stewart (2003) 10 years earlier and known to have been present since at least the 1950s (de Lemos 1992). It was reported to be rare in the 1990s (Weaving 1992) but now must be described as common, ascending to the level of a low-cover constant in some areas of the foredune (NVC SD6a

& SD6e). It is assumed to be an introduced non-native species at Dawlish but its place in the vegetation and ecological behaviour is directly analogous to the various other annual European maritime grasses, such as *Vulpia fasciculata* and *Phleum arenarium* present on the dunes in mobile, semi-fixed and disturbed areas of dune grassland. Ongoing climate change may favour Mediterranean taxa such as this and *Vulpia ciliata* subsp. *ciliata* and it is doubtful whether extensive management techniques could counteract such floristic shifts. As an established component of southern English sand dune vegetation in general this species is reported to be increasing (Cope & Gray 2009).

3.4.7.5 ASPARAGUS OFFICINALIS

This species is widespread on the site growing in both dry and damp grassland. It is particularly frequent around the fringes of Greenland Lake and the bases of its enclosing ridges.

3.5 HUMAN IMPACTS

The results of the investigation into trampling rates and potential eutrophication arising from recreational use of the NNR are shown in graphical form as heatmaps. which describe this section of the report are presented for context against a backdrop showing the boundaries of the broad habitat mapping (Map 1).

3.5.1 TRAMPLING ASSESSMENT

The pattern of trampling impact and erosion risk (Figure 1) is complex with known hotspots clearly showing at the major access points to the reserve and passage points between the beach and reserve over the front ridge. Other significant pressure points include the link between the Crocus Compound and Back Path and the north west side of Warren Point. Areas of lower pressure appear to correlate loosely with natural controls such as water or woody vegetation.

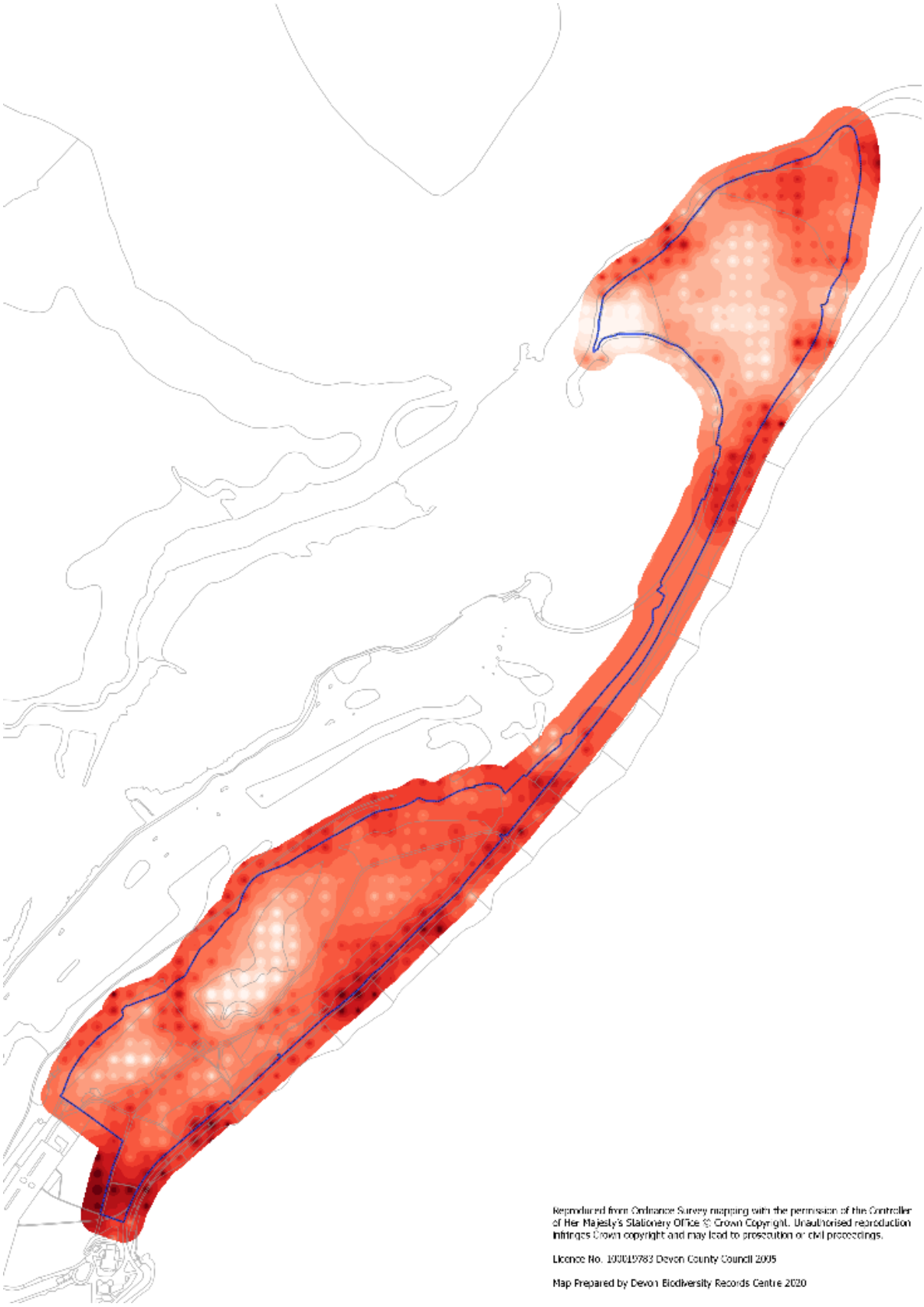

Figure 1. Heatmap indicating trampling pressure and erosion risk from recreational use at Dawlish Warren NNR (Teignbridge DC ownership). Darker reds = higher risk.

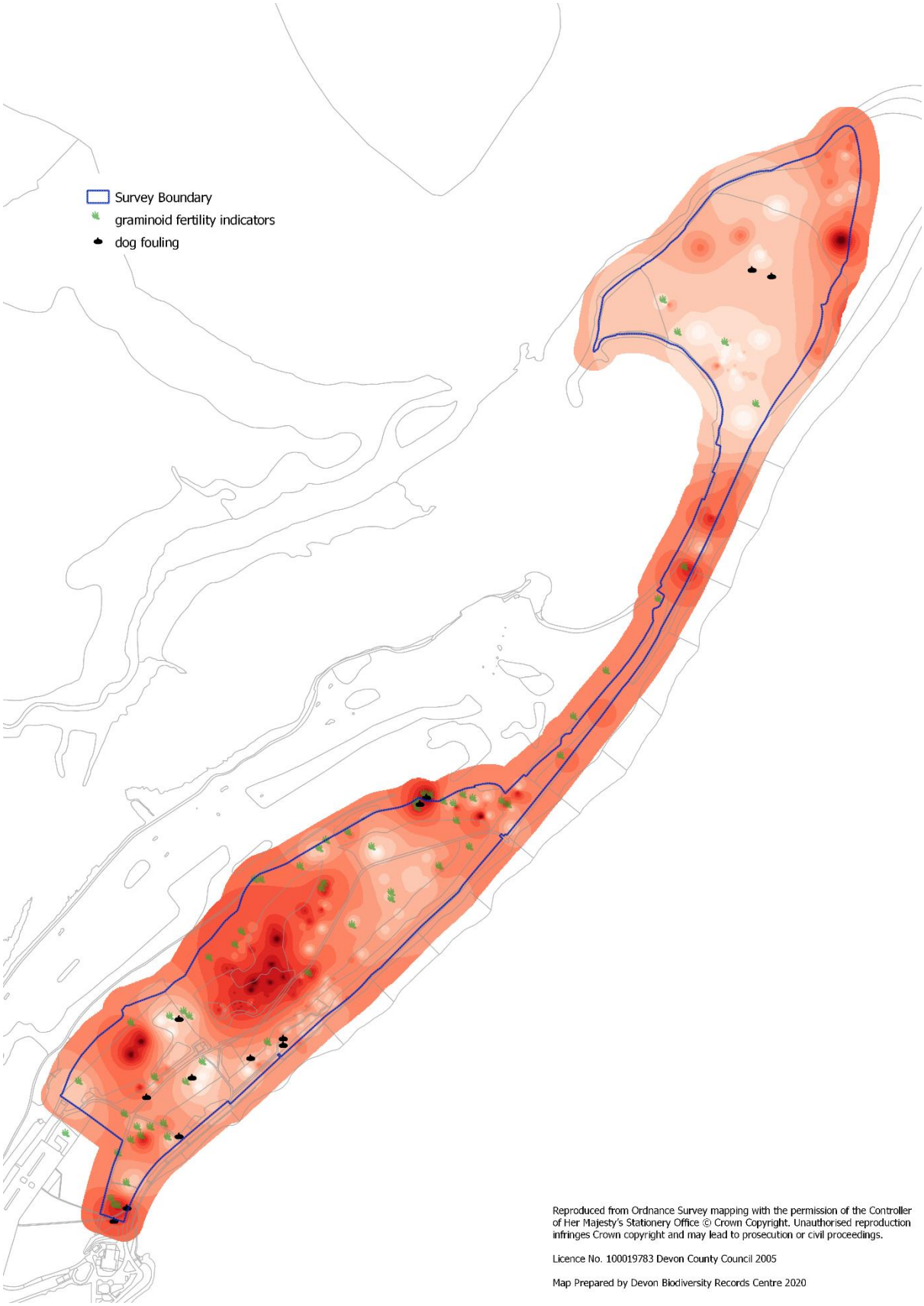

Figure 2. Heatmap showing the estimated fertility levels as expressed in vegetation composition across the site. Darker reds correspond to higher N values. Graphic is based on interpolation of cover-weighted values derived from 234 independent multi-species sample plots. Occurrence of dog fouling and selected disturbance and fertility indicating grasses (*Arrhenatherum elatius*, *Poa annua* and *Anisantha sterilis*) provides context to the pattern of fertility in the

vegetation of the whole site. Note that high N values may have multiple causes and are a proxy (only) for recreation borne eutrophication.

3.5.2 EUTROPHICATION

Figure 2 provides a visualisation of the gradients in fertility across the site based on analysis of vegetation samples.

Cover-weighted N values ranged from 2 to 6. That is, there were no samples which were characteristic of extremely infertile situations nor of extremely rich sites. A value of 6 is typical of moderately enriched sites with characteristic species such as *Agrostis stolonifera*, *Aster* agg., *Cirsium arvense* and *C. vulgare, Dactylis glomerata*, *Stellaria media* etc. whilst a value of 2 represents the low fertility environment required for a number of dune specialists important in the context of the site like *Ophioglossum azoricum*, *Poa bulbosa*, *Romulea columnae*, *Trifolium glomeratum*, *Trifolium subterraneum*, *Vulpia fasciculata* etc.

Note that the areas of highest fertility are not necessarily those with highest nutrient inputs from recreational usage (4.2, below).

4 DISCUSSION AND INTERPRETATION

The repeat mapping of the extent and distribution of broad habitats is an effective way of monitoring ecological change in a dune system. Because of the rapidity of change possible and the complexity of mosaicking in the specific habitats (i.e. NVC communities) long-term (5 to 10 year interval) views of the general extents of the key ecological elements of the system are probably more meaningful than direct comparisons of NVC maps. The undertaking of an NVC survey provides valuable supporting information on the detail of floristic change both at site level and within habitat level but the absolute amounts and distributions of NVC communities within each broad type is challenging to track because of the “intrinsic difficulties of surveying a complex habitat, the natural rate of change and the continual gradation between the dune communities” (Hill et al. 2005, 149).

4.1 HABITAT CHANGE SINCE 2012

The apparent changes (see Table 2 and Maps 1 and 2) need to be considered in the light of some caveats. Differences between earlier assessments and the present survey may result from inconsistent application of the broad habitat definitions among different surveyors or differing opinion on how the same or similar vegetation ought to be classified. We have tried to minimise this by close reference to the definitions drawn up by Stewart (2003) and examination of air photos contemporary with his survey and with the 2012 survey. After comparison of the broad habitat mapping undertaken in 2012 with the results of the present survey the following are the principle broad habitat changes in recent years:

- More than 0.5ha of Sand couch foredune habitat has been lost, which is the highest proportional loss for any of the recorded broad habitats. However, an associated loss of Marram of >3ha is the most significant absolute loss. Most of this change is due to coastal dynamism on Warren Point (not to processes of vegetation succession).

- Areas which were mapped as shingle in 2012 had evidently accreted considerable dunes with well-developed mature Marram communities by 2015. By the time of the present survey these had been replaced by sparse low marram (SD6a) in recently accreted sand, fringed with variably narrow belts of embryo dune (SD4) and with a large expanse of former Marram now falling below MHWM.
- Erosion of both embryonic and older dunes and reinitiation of foredune communities around the edges has resulted in a complex pattern of vegetation at Warren Point. The remaining vegetation is still dominated by Marram SD6 communities but there are narrow linear stands of earlier successional communities (and ephemeral strandline communities, often confined to small unmappable pockets). SD2 and SD4 were mapped as a feature of the site in 2012 and whilst now of small extent are characteristic of the system in this area.
- Significant scrub decline across the whole site; the area ascribed to the category 'Low scrub and bramble' is now c5% of the surveyed area as opposed to 11% in 2012. Areas mapped as Marrram and grassland scrub mosaic have also declined significantly. (The apparent increase listed under damp dune grassland/scrub mosaic is due to this category not being employed in 2012 but a small area, of 0.03ha, being mapped in the present survey.) Clearly this is a change dependent on planned and continual management input. Many of the replacing open-habitats still have a strong presence of 'controlled bramble'.
- A recorded gain in area of woodland (mapped as 'Trees and tall scrub') is less significant and while real is likely to be imprecise owing to difficulties in consistently defining and capturing, between surveys, the woodland edges, which on this site form a dynamic and semi-natural transition to adjacent scrub and grassland rather than presenting a hard line.
- The significant gain in bare sand and shingle results largely from the replacement, following DWBMS works, of Marram and Marram/Low scrub mosaic on the neck with a bank of new sand, which itself is beginning to revert to Marram. There are some vestigial stands of older Marram plants perched on the remnant ridge with cliffs to seaward and bare sand paths landward.
- Land marked as damp neutral grassland in 2012 and as a mosaic of cleared W6 and SD15 dune slack has reverted, where maintained open, to recognisable dune slack community with a good range of the species characteristic of damp slacks elsewhere on the reserve. Several areas marked as scrapes or unvegetated now support semi-natural dune vegetation communities.
- Several areas marked as scrub mosaics or recently cleared scrub similarly now support recognisable dune vegetation communities whilst others have developed otherwise.
- Substantial areas on the southern front of the reserve, backed by the hard-engineered esplanade, were mapped as mobile SD6 communities in 2012. The process of fixation has since advanced considerably in spite of management to control domination by perennial woody vegetation; many of these areas now conform more closely to various types of semi-fixed SD7 dune communities.

4.1.1 NVC

The spatial patterns and extents and botanical composition of specific plant communities recorded in the present survey are broadly in agreement with the previous monitoring event. The following are interpreted to be the most significant differences:

- Areas recorded as neutral grassland, MG1, in 2012 could not be refound. Although a number of areas of the site exhibited a tendency towards greater fertility and mesotrophic grassland affinities, with *Arrhenatherum*, *Holcus* etc becoming locally frequent, these stands invariably now hold a reasonable complement of dune preferentials. This suggests that recent mowing and grazing management may have partially reversed this process, or possibly that some of the ranker areas of *Arrhenatherum* etc in 2012 now support low scrub.
- The succession towards freshwater and mesotrophic conditions in Greenland Lake is clear in the floristics of the Damp dune grassland and Dune grassland habitats here. There are for example some distinct patches of M27 identifiable to the NE and NW of the main pond which were formerly referred to reedbeds and cleared W6/SD15.
- We follow previous surveys in referring the bulk of the damp dune grassland to an awkward fitting SD15c, which lacks in *Salix repens* but still keys to have its closest affinities with this community. In the tract of mapped SD15 to the north of the main pond and west of the trackway however, there is also a tendency for the vegetation to have a somewhat fen-like stamp with SD15 species such as *Calliergonella cuspidata* and *Hydrocotyle vulgaris* locally giving way to *Filipendula* and *Phragmites*.
- In 2012 two reed swamp communities were mapped fringing the open water in Greenland Lake. Sampling in 2019 similarly discovered two distinct variants within the *Phragmites* dominated vegetation. However, in the current survey the composition of these (a species-rich and a species-poor phase, possibly related to *Phragmites* vigour and cutting date) both conform to S4 (Rodwell 1995).
- The 2019 NVC map also differs from the 2012 map in the diagnosis of some of the drier fixed-dune grassland in Greenland Lake, the central trough of the reserve. This grassland lies on a gradient environmentally between the dune-slack communities around and extending out from the reed-swamps and pool and the semi-fixed dune grassland and dune grassland on the flanking ridges and undulations. In 2012 some of the drier parts were referred to SD11. We have retained this classification for the most lichen-heavy sward encountered to the SW of the visitor centre but elsewhere placed these habitats within the broad semi-fixed SD7 envelope (in agreement with the diagnosis of these stands made in the 1990 survey) on the basis of their current appearance.

As Proctor emphasised in his writings on the vegetation of sand-dune systems and in particular of semi-fixed dunes, “great diversity of other species may occur, and semi-fixed dunes can look extraordinarily different from one another; probably no two authors would agree on all the details of a workable classification. Some of this variation may be due to differences in the nutrient status of the sand, some to its water-holding capacity or the proximity of the water-table, some to grazing and some to pure chance…” (Proctor 2013).

Community designations and apparent changes in community from one survey date to another must be interpreted in this light.

4.2 HUMAN IMPACT

This survey has attempted to produce a baseline for judging change in trampling pressure and its effects and the pattern of anthropogenic nutrient enrichment on the site. It was beyond the scope of the project to undertake direct monitoring of trampling and nutrient levels so this was done by proxy and field observation.

Comparison of the trampling and eutrophication map (Figure 1, Figure 2) with those for selected species of conservation concern (Map 3) shows quite clearly that it is areas of intermediate disturbance where these notable species coincide or clump with low disturbance/high fertility areas and high disturbance areas less favoured.

The map of eutrophication influences on the site is based on the calculation of a composite Ellenberg N (fertility score) for each vegetation sample, supplemented by direct observations of dog fouling and vegetation composition characteristic of elevated nutrient levels. The direct observations were made *ad hoc* in the course of other fieldwork so the results should be seen as an indicative supplement to the pattern of trampling impact.

It must be emphasised that the pattern of fertility shown on the map does not discriminate between anthropogenic and other causes of enrichment in the vegetation. *Phragmites,* and other fen species which are relatively high fertility status plants, therefore result in the key fertility feature of the site being the reedbeds. It is not known if the reedbeds on site are acting as a net N source or as a sink but the results of this basic vegetational analysis and the topography of the site does suggest a role in nutrient cycling on the reserve. The open water ponds dug in the 1980s and associated freshwater wetland vegetation may be providing an N sink service for the wider Greenland Lake.

Elsewhere there are key eutrophication hotspots near the SW access points and near the northern boundary of Greenland Lake and the golf course and there is little doubt that these are at least partly consequent on recreational use and dogs in particular. The southern enrichment spots do partly coincide with some of the areas formerly most affected by *Lupinus arboreus* and the implication that N fixation under these legume stands (referred to by Holder and Woolver, 1990) may have had a lasting effect on the soil chemistry and consequently on the type of vegetation community forming may also be a consideration.

5 ACKNOWLEDGEMENTS

We are grateful to Phil Chambers and the TDC ranger team for arranging the project and assisting with access, information and for the loan of some equipment, Paul Seymour for valuable help with data processing, Jamie Witherford (DBRC volunteer) for assisting with the trampling assessment and Roger Smith (BSBI) and Rob Large (NE) for information on historical plant records and Ian Egerton and the rest of the DBRC team for their ongoing support.

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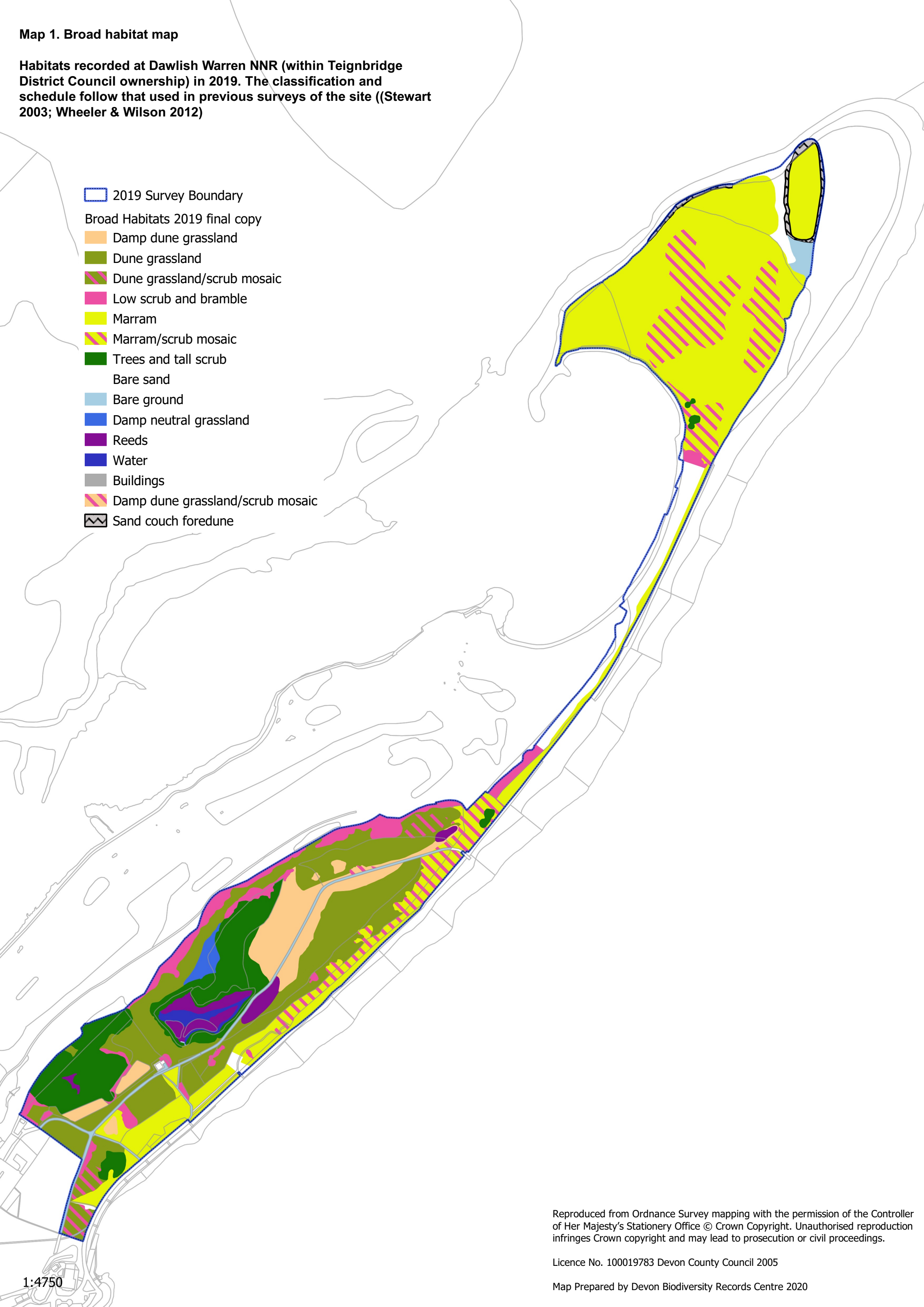
7 MAPS

1. Map of Broad Habitats
2. Map of NVC communities
3. Rare & scarce vascular plant species distribution
4. Invasive plant species distribution
5. Target notes

Map 1. Broad habitat map

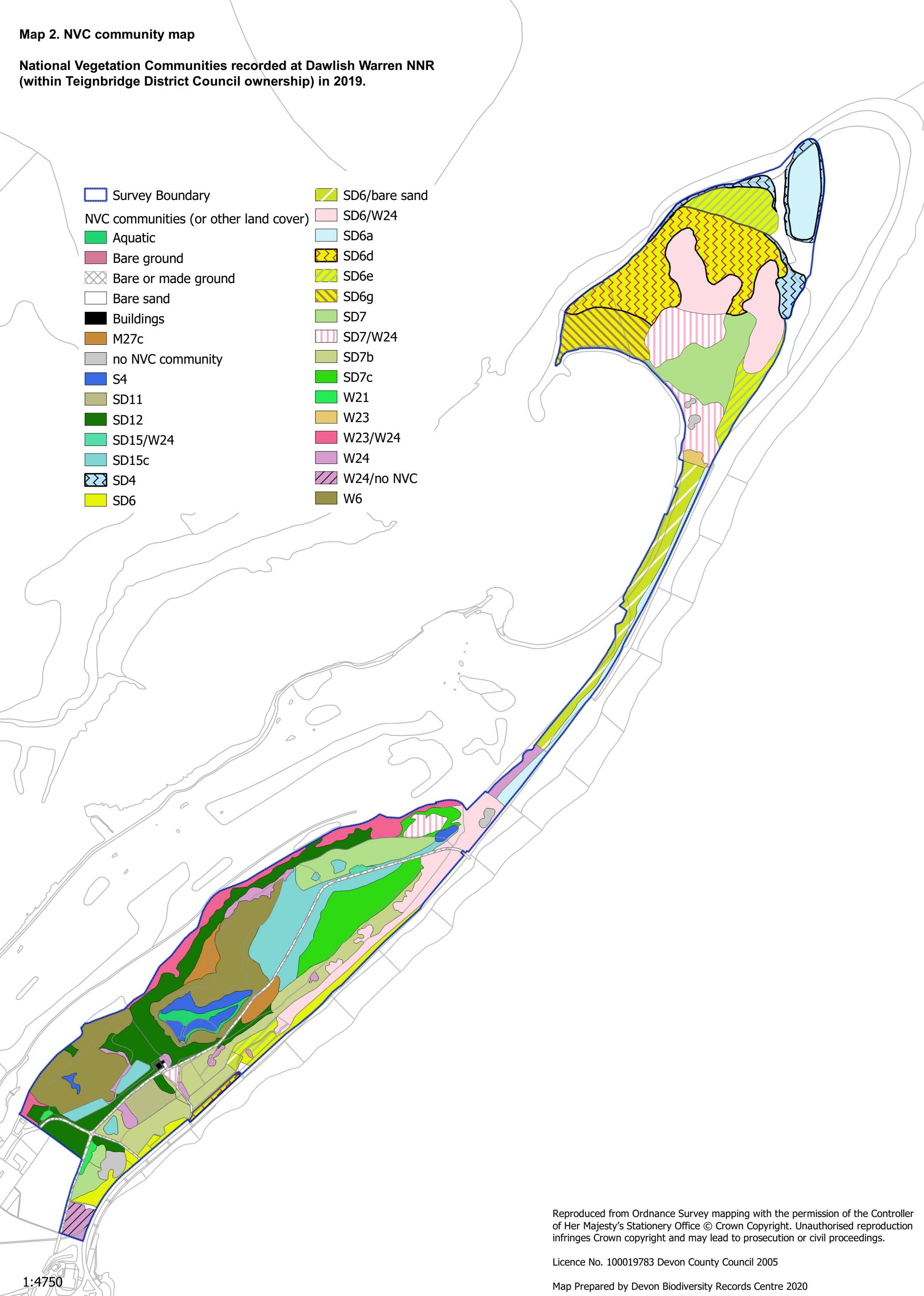
Habitats recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. The classification and schedule follow that used in previous surveys of the site ((Stewart 2003; Wheeler & Wilson 2012)



Map Prepared by Devon Biodiversity Records Centre 2020

Map 2. NVC community map

National Vegetation Communities recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019.

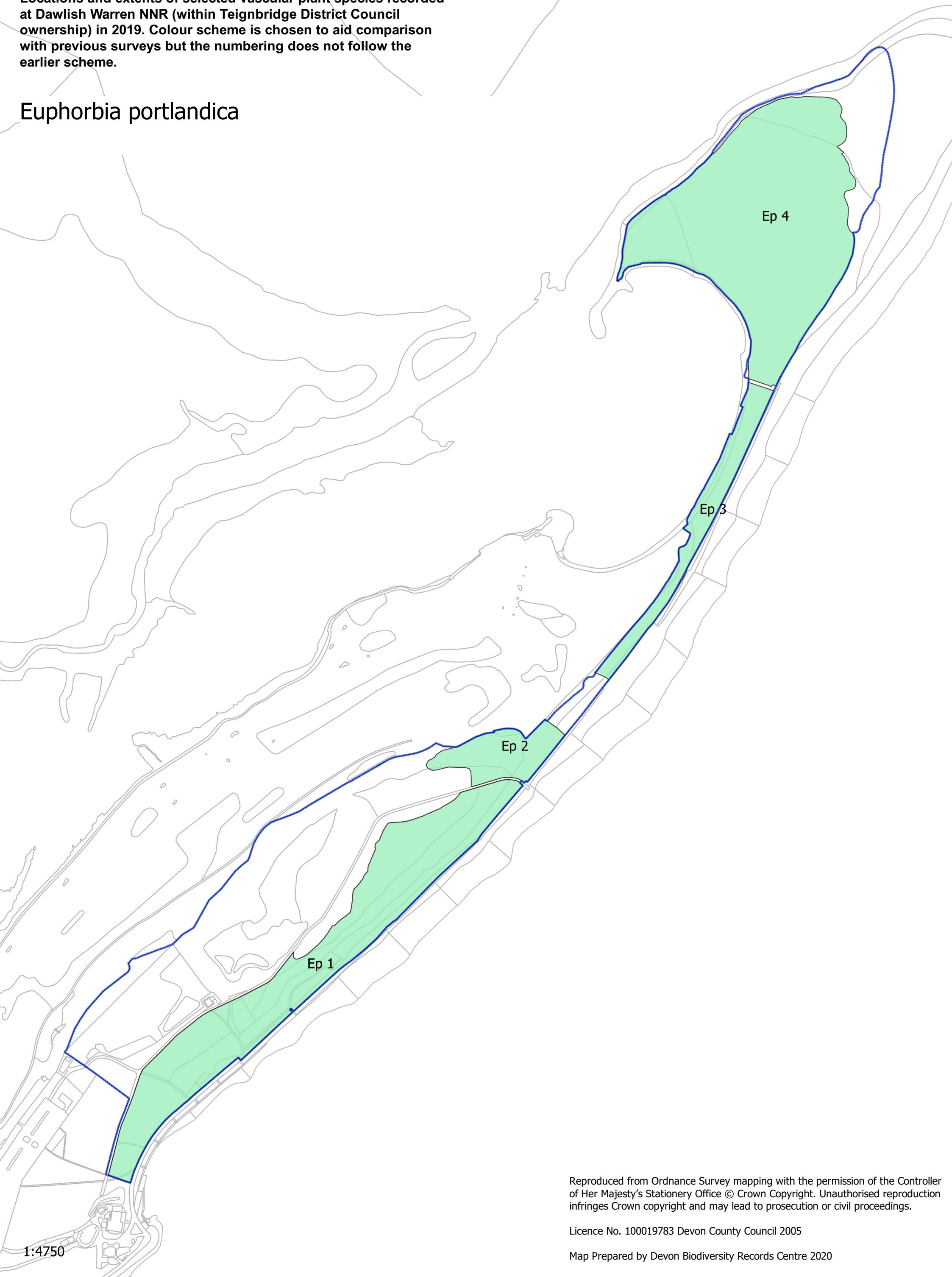


Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Euphorbia portlandica



Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Galium parisiense

Gp 1

Gp 3

Gp 2

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Hypochaeris glabra

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Ophioglossum azoricum

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Poa bulbosa

Pb 1

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Poa infirma

Pi 1
Pi 2
Pi 6
Pi 3
Pi 5
Pi 4
Pi 10
Pi 17
Pi 16
Pi 7
Pi 8
Pi 9
Pi 11
Pi 12
Pi 14
Pi 13
Pi 15

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Romulea columnae

Rc 3

Rc 1

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Trifolium glomeratum

Tg 1

Tg 2

Tg 3

Tg 4

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Trifolium suffocatum

Ts 1
Ts 5
Ts 3
Ts 4
Ts 2

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 3 (a series). Rare & scarce species

Locations and extents of selected vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Vulpia fasciculata

Vf 3
Vf 4
Vf 9
Vf 8
Vf 7
Vf 11
Vf 10
Vf 1
Vf 5
Vf 6
Vf 2

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 4. Invasive plant species

Locations and extents of selected invasive or alien vascular plant species recorded at Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019. Colour scheme is chosen to aid comparison with previous surveys but the numbering does not follow the earlier scheme.

Survey Boundary

Invasive plant species

- Aster agg.
- Buddleja davidii
- Conyza canadensis agg.
- Erigeron karvinskianus
- Lupinus arboreus
- Sisyrinchium montanum
- Yucca gloriosa var. recurvifolia

Cc 3
Bd 2
La 8
La 9
La 7
Bd 1
Yg 1
La 11
Cc 2
La 10
Cc 1
Sm 3
La 6
Sm 5
Sm 1
A 2
Sm 2
A 3
Sm 6
A 5
A 4
La 12
La 5
Sm 4
A 1
Ek 1
La 4
La 3
La 2
La 1

1:4750

Map Prepared by Devon Biodiversity Records Centre 2020

Map 5. Target notes

Locations of target notes accompanying NVC and Broad habitat maps of Dawlish Warren NNR (within Teignbridge District Council ownership) in 2019.

Map Prepared by Devon Biodiversity Records Centre 2020

8 APPENDICES

1. Rare & scarce vascular plant species – target notes
2. Invasive plant species – target notes
3. Target notes (schedule to Map 5)
4. Georeferenced photographs from Trampling study
5. NVC quadrat data
6. List of plant species recorded in the study area in the present survey

8.1 RARE & SCARCE VASCULAR PLANT SPECIES – TARGET NOTES

Map 3 Code	Species	Notes
Ep 1	Euphorbia portlandica	large population of Euphorbia portlandica distributed as a low cover component of the SD6/SD7 vegetation complex along the ridge and landward slopes, occasionally present in sizeable stands where scrub control has been undertaken. Present in a high proportion of quadrats sampled in this area at DOMIN 1 or 2.
Ep 2	Euphorbia portlandica	frequent in gaps in scrub and underscrub in this area and with luxuriant patches colonising where recent scrub control generates turnover of bare sand patches.
Ep 3	Euphorbia portlandica	Euphorbia portlandica is an important component of the early stage SD6 vegetation colonising bare sand associated with the DWBMS. Scattered clumps remain in a vestigial strip of established SD6 above the cliffed erosion face to the beach.
Ep 4	Euphorbia portlandica	Occurs in 60% of vegetation samples within this area at low cover (up to 4 on DOMIN scale). It is dispersed throughout SD6 and SD7 communities on Warren Point as single plants and in small groups. It is also found in association with small scrub patches where rabbits have created bare sand habitat.
Gp 1	Galium parisiense	vigorous patch c. 50cm wide in open SD7
Gp 2	Galium parisiense	a few totally desiccated plants found in August in this area where bare ground/sand 25% or more. Search earlier in season needed to reveal extent of species at this site which lies between two recorded colonies in 2012, c100m apart.
Gp 3	Galium parisiense	25+ plants in bare area within SD12 sward near informal path along bank top, absent from wider search radius of 15m and apparently localised
Hg 1	Hypochaeris glabra	118 plants associated with partially trampled vegetation around the fork in a pathway

Hg 2	Hypochaeris glabra	163 plants, in 3 or 4 loose aggregations, mostly associated with partially trampled path edges and sub paths
Hg 3	Hypochaeris glabra	34 rosettes, many browsed or not flowering, in fairly dense cluster, 1m wide, inconspicuous, in an area dominated by Sedum album, with Crepis capillaris and occasional Marram. Under a Sambucus bush with some encroaching Rubus fruticosus and some Cerastium glomeratum.
Hg 4	Hypochaeris glabra	1 single plant, with Vulpia fasciculata
Hg 5	Hypochaeris glabra	6 rosettes in sandy hollow
Hg 6	Hypochaeris glabra	at least 3 plants in an area of Vulpia fasciculata and 45% unvegetated sand
Hg 7	Hypochaeris glabra	4 rosettes on bank, 2m outside T. glomeratum vegetation sample (Quadrat # 36). Close proximity to H. radicata plants
Oa 1	Ophioglossum azoricum	36 plants in species rich SD12 grassland, in close proximity to 2012 Trifolium glomeratum record. (associates in 2019 quadrat #2)
Oa 2	Ophioglossum azoricum	8 plants growing in intimate mixture with much higher numbers of O. vulgatum. Seasonally wet shallow depressions with Carex flacca etc. Potentially more frequent than recorded in this part of the site
Pb 1	Poa bulbosa	a low mound within site of 2012 Poa infirma colony, lacks Pi but has colony of yellowish Poa bulbosa
Pi 1	Poa infirma	Long strip Poa infirma mapped in 2012 (Pi1). The species is present but not as a continuous stand and observations suggest much less extensive than previously
Pi 2	Poa infirma	Mapped linear colony of Poa infirma in 2012. Today most of small Poa here is annua though there are appreciable numbers of Pi plants they are apparently less extensive and generally rather scattered. c20 plants in aggregation and a few more scattered c10m to the south
Pi 3	Poa infirma	patchy presence of Poa infirma, apparently much less extensive than in 2012 (location of Pi3), occasional plants along ridge and a

		good but small patch, on S side edge of desire path where sandy eroded strip grades into adjacent rabbit turf
Pi 4	Poa infirma	small patch Pi, in intimate association with Poa annua, dry, slightly elevated area, not mapped 2012 but between Pi8 and Pi10 locations
Pi 5	Poa infirma	Poa infirma present but the subordinate plant to prostrate, yellowish Poa annua. Pi only where sand visible, other grasses dominant in intervening areas. Hybrids possible. This is close to or the same as Pi3 mapped in 2012 and the population appears reduced.
Pi 6	Poa infirma	Pi, good patch in area of active rabbit disturbance and digging, <1m wide and 6 to 7 m long and scattered small patches extend away from edges of main aggregation, where there is some level of sand exposure and becoming sparse wherever the sward grows denser with P. annua, Festuca rubra, Vulpia bromoides etc
Pi 7	Poa infirma	Poa infirma present at low density in damper area between stronger colonies to N and S
Pi 8	Poa infirma	very large population in a broad strip c25m long and c3m wide, not marked on 2012 map, in an area where people diverge obliquely from main pathway up towards the dune ridge causing a diffuse band of trampling. Plant density becoming diffuse in places.
Pi 9	Poa infirma	Pi9 on 2012 rare spp. map. Pi still present here but also in significant amounts in a short turf area between new wooden barrier and the lake
Pi 10	Poa infirma	Poa infirma patches up to 1.5m wide in area of rabbit diggings associated with low mounds, with Poa annua, Plantago coronopus, Cerastium spp. Extending at lower cover along well trodden path and side of main trackway.
Pi 11	Poa infirma	Poa infirma diffusely along fence path towards visitor centre from car park, becomes sparse to absent to N (very small flat forms of Poa annua plants, some of which are etiolated, persist).

Pi 12	Poa infirma	Poa infirma frequent on narrow path (seaward side of trackway), between chestnut fence and trackway.
Pi 13	Poa infirma	abundant at junction of footpaths and main trackway
Pi 14	Poa infirma	Several well developed patches of Poa infirma, tending to centre on very slight mounds with rabbit grazing and bare soil/packed sand, many plants less than 15mm tall and typically <10mm. In intimate association with Poa annua (which occupies the crests of these micro-knolls, is lusher, darker green with much longer leaves, Blinks another associate in this conrext). Two ± concentric rings of P. infirma around larger patches of Poa annua 30 to 50cm across with ring of infirma encircling and grading out into surrounding sward in which it is present as scattered plants. Becoming scarce further away from path edge and distribution clearly influenced by trampling disturbance.
Pi 15	Poa infirma	Poa infirma, sizeable patch, the main aggregation of plants c 2m diameter, on slight rise with rabbit disturbance and sand patches, with Poa annua.
Pi 16	Poa infirma	partly but not totally coincident with Pi8 on 2012 map. This population although spread over several metres is apparently less dense and less extensive than in 2012. In a slight hollow. Growing in intimate association with small and yellowish Poa annua.
Pi 17	Poa infirma	small patch Pi, in intimate association with Poa annua, dry, slightly elevated area, not mapped 2012 but between Pi8 and Pi10 locations
Rc 1	Romulea columnae	Fruiting plants were found in vegetation samples taken in this area in late May at cover values of DOMIN 1 to 3. During flowering apparency is much greater.
Rc 3	Romulea columnae	in late May small numbers of plants with ripe capsules were found here (the same area as 2012 Rc 3) but no count was made of plants during the flowering period
Tg 1	Trifolium glomeratum	>300 plants on shallow NE facing bank, in very short rabbit-grazed turf also influenced by human trampling at flank of post-marked path.

Tg 2	Trifolium glomeratum	22 plants in short turf around informal path running along W side of wooden barrier
Tg 3	Trifolium glomeratum	2 plants, with fruiting Romulea (apparently same locus as Tg3 2012)
Tg 4	Trifolium glomeratum	4 plants in a rabbit-stamped area within a wider expanse of taller grassland currently partially enclosed by a fence but clearly subjected to high levels of human trampling historically.
Ts 1	Trifolium suffocatum	present sparsely in eroded sward around and on path along low dune ridge. Relative to 2012 significantly weaker population at this locus.
Ts 2	Trifolium suffocatum	locally very abundant at junction of footpaths and main trackway
Ts 3	Trifolium suffocatum	present at low cover on and around abraded surface of footpath between trackway and fenceline (not at edges of trackway). Short yellow forms of Poa annua are intermingled, abundant and increasingly outcompete P. infirma in the section towards the visitor centre
Ts 4	Trifolium suffocatum	100s of plants in trampled and mown short SD12 grassland, often with Poa infirma and Trifolium subterraneum
Ts 5	Trifolium suffocatum	a few plants at the meeting of informal cross paths where trampling of turf intensified, species potentially quite frequent in the surrounding sward
Vf 1	Vulpia fasciculata	Vulpia fasciculata consistently present in samples and observations in Marram grassland along this section of ridge. Usually at low cover but locally very frequent.
Vf 2	Vulpia fasciculata	Vulpia fasciculata has a general presence in this area at low cover and inconspicuous, small aggregations of up to 10 plants in hollows between and at bases of sand mounds and around rabbit diggings.
Vf 3	Vulpia fasciculata	1000s of plants, scattered presence throughout this area in continuously variable density. Dense stands wherever significant openings in Marram cover with low cover in intervening areas.

		Foci for larger aggregations are in sandy hollows, especially where rabbit disturbed, and on more compacted sand along informal footpaths. Plants away from paths tending to be more vigorous.
Vf 4	Vulpia fasciculata	1000s of plants in sandy hollows with particular concentrations in rabbit dug and scuffed areas, broadly corresponding to Vf4 of 2012 survey but apparently more extensive. sandy open basin/hollow mixed with Marram and Oenothera
Vf 5	Vulpia fasciculata	Vulpia fasciculata - very strong colony containing high 100s or1000+ plants on open area with recently established Marram and 40-70% bare sand
Vf 6	Vulpia fasciculata	Vulpia fasciculata consistently present at low cover (DOMIN 1 to 4) amongst Marram with 20-50% bare ground in vegetation samples here (probably present in analogous unsampled habitat to SW)
Vf 7	Vulpia fasciculata	Vulpia fasciculata present in this area but not abundant suggesting decline since 2012, a few plants found in bare sand patches around path branches
Vf 8	Vulpia fasciculata	small group of plants in narrow trough at end of sandy hollow, rabbit scraping and digging adjacent to plants, low cover vegetation otherwise dominated by bryophytes and small annual herbs.
Vf 9	Vulpia fasciculata	Vulpia fasciculata, >300 plants mostly in habitat ~50% bare sand with some stabilising vegetation nearby, but plants not usually forming a sward with any close associates. Stand extends sometimes up to about 5m either side of path line into a more complex vegetation containing Hypochaeris, Oenothera and Sedum on the more stabilised surface where it persists at much lower cover
Vf 10	Vulpia fasciculata	Vulpia fasciculata - small group of c.10 plants directly associated with bare sand of post-marked path
Vf 11	Vulpia fasciculata	Vulpia fasciculata - c200 plants, associated with the open conditions created by nexus of informal foot paths close to the ridge. Rapidly fades out from the vegetation with the transition to taller Marram and more vigorous grasses a short distance away

		from the directly trampled zone (often replaced by Vulpia bromoides and/or Festuca rubra)

8.2 INVASIVE PLANT SPECIES – TARGET NOTES

Map 4 code	Species	Notes
A 1	Aster agg.	in SD15, locally attaining cover values up to c.30%. Early season surveys may underestimate dominance levels in this area of damp dune grassland.
A 2	Aster agg.	Aster, including the hybrid A. x versicolor, is present and constant in a large area of damp dune grassland. Typically frequent but locally abundant with DOMIN scores ranging from 1 to 5.
A 3	Aster agg.	Locally abundant in damp neutral grassland, attaining values up to 30% cover in sampled vegetation.
A 4	Aster agg.	Frequent (III) in tall Phragmites dominated vegetation
A 5	Aster agg.	occasional in reedswamp and adjacent wet woodland
Bd 1	Buddleja davidii	single large bush in SD6/Rubus underscrub mosaic
Bd 2	Buddleja davidii	single large bush in SD6d
Bd 3	Buddleja davidii	One small plant in SD6a
Cc 1	Erigeron canadensis agg.	occasional plants on bare recolonising areas of sand cut from former W24 on landward slope of dune ridge
Cc 2	Erigeron canadensis agg.	present sparsely as colonist of bare sand

Cc 3	Erigeron canadensis agg.	Scattered plants usually as singles in SD6e Marram
Ek 1	Erigeron karvinskianus	Sizeable stand up to 3m long x 2m. Currently very localised on low bank by newly laid path
La 1	Lupinus arboreus	Occasional bushes in bramble underscrub with gorse/dune grassland mosaic
La 10	Lupinus arboreus	present sparsely as colonist of bare sand
La 11	Lupinus arboreus	present at low cover in fragmentary SD6a on neck between Greenland Lake and Warren Point
La 12	Lupinus arboreus	occasional at low cover in SD7 dune grassland, e.g. at scrubby marginal areas
La 2	Lupinus arboreus	c30 plants on old dune ridge by defunct wire fence, some dying back
La 3	Lupinus arboreus	present at low cover in dune grassland
La 4	Lupinus arboreus	present at low cover in Marram
La 5	Lupinus arboreus	infrequent and low cover presence in ridge-top SD6 vegetation
La 6	Lupinus arboreus	occasional to locally frequent in brambly Marram on landward slope of foredune ridge
La 7	Lupinus arboreus	occasional to locally frequent component of the SD6/low scrub mosaic occupying old dune ridge with Rubus fruticosus and Rubia peregrina
La 8	Lupinus arboreus	scattered old plants fairly constant in this area of Marram and Marram/bramble mosaic
La 9	Lupinus arboreus	large dead stand in SD6d

Sm 1	Sisyrinchium montanum	frequent all along sides of main trackway through SD15 where sward slightly taller. Flowering and fruiting
Sm 2	Sisyrinchium montanum	Moderately frequent (present in c50% of samples in this vegetation stand) throughout, at low cover, <4%. Potential for spread into interior of SD15 stands from trackside and woodside stands
Sm 3	Sisyrinchium montanum	locally frequent to abundant at base of bank (>30 plants)
Sm 4	Sisyrinchium montanum	present at low cover in area of damp dune grassland which had been released from tree and shrub cover around time of last survey (2012)
Sm 5	Sisyrinchium montanum	present at low cover in transition between SD15 and SD7
Sm 6	Sisyrinchium montanum	locally frequent along damp edge of woodland/damp grassland transition
Yg 1	Yucca gloriosa var. recurvifolia	17 young plants establishing or regenerating on old fire site
Yg 2	Yucca gloriosa var. recurvifolia	A few old stems, including both tall healthy individuals and skeletons. Small regenerating plants are locally frequent in the near vicinity amongst dense Marram.

8.3 GENERAL TARGET NOTES ACCOMPANYING HABITAT MAPS (SCHEDULE TO MAP 5)

Map 5 Code	**Notes**
1	Species rich dune grassland in short turf around back path, includes: Plantago coronopus, Hypochaeris radicata, Vulpia ciliata subsp. ciliata, Vulpia bromoides, Trifolium suffocatum, Poa annua, Galium verum, Bromus hordeaceus, Cerastium semidecandrum, Carex arenaria, Aphanes arvensis agg., Veronica arvensis, Sagina apetala, Hypnum cupressiforme sens.lat., Geranium molle, Dactylis glomerata, Trifolium dubium, Rumex acetosella, Oenothera glazioviana, Bellis perennis, Aira caryophyllea, Aira praecox, Cerastium glomeratum, Luzula campestris, Ornithopus perpusillus, Poa humilis, Poa infirma, Sedum acre & Sedum anglicum.

2	Geranium rotundifolium: occasional to locally frequent in this area of SD7, at edges of scrub and underscrub patches
3	vegetation dominated by Carex arenaria and Sedum album with Rosa canina agg., Ammophila arenaria, Rubus fruticosus agg., Iris foetidissima, Rubia peregrina, Vicia sativa, Geranium rotundifolium, Sonchus oleraceus, Geranium robertianum, Euphorbia portlandica
4	Euphorbia paralias: present at very low cover in this area of sparse Ammophila. Apparently much rarer on the reserve than E. portlandica at present.
5	Damp neutral grassland: few dune or maritime preferentials represented except occasional Carex arenaria and Juncus maritimus, sward dominated by Agrostis spp., Holcus, Mentha, Phragmites etc with Agrostis capillaris, Agrostis stolonifera, Anthoxanthum odoratum, Arrhenatherum elatius, Aster agg., Betula pubescens (seedlings/sprouts), Carex arenaria, Carex flacca, Centaurium erythraea, Crataegus monogyna, Dactylis glomerata, Dactylorhiza majalis praetermissa, Euphrasia officinalis agg., Festuca rubra agg., Galium palustre, Holcus lanatus, Hypericum perforatum, Hypnum cupressiforme sens.lat., Hypochaeris radicata, Juncus bufonius sens.str., Juncus conglomeratus, Juncus maritimus, Leontodon autumnalis, Linum catharticum, Lophocolea bidentata sens.lat., Lotus corniculatus, Lotus pedunculatus, Luzula campestris, Mentha aquatica, Oenanthe crocata, Parentucellia viscosa, Phragmites australis, Plantago lanceolata, Poa pratensis sens.lat., Ranunculus acris, Ranunculus repens, Rhinanthus minor, Rhytidiadelphus squarrosus, Rosa canina agg., Rubus fruticosus agg., Rumex acetosa, Rumex crispus, Salix sp., Sisyrinchium montanum, Sonchus arvensis, Trifolium dubium, Trifolium repens, Vicia cracca, Vicia sativa.
6	Anacamptis pyramidalis: stand containing both pink and white flowered plants with Aira praecox, Ammophila arenaria, Arenaria serpyllifolia, Calystegia soldanella, Chamerion angustifolium, Dicranum scoparium, Euphorbia portlandica, Festuca rubra agg., Hypnum cupressiforme sens.lat., Hypochaeris radicata, Oenothera stricta, Peltigera canina, Pleurocarpous bryophyte, Polypodium vulgare sens. lat, Rubus fruticosus agg., Sedum anglicum
7	Ophioglossum vulgatum: small number of plants near fenceline
8	Moenchia erecta (England Red List, Vulnerable): locally frequent in SD12 grassland between ponds to E and woodland to W
9	Species-rich SD15 on site of cleared W6. Contains Agrostis stolonifera, Alnus glutinosa, Betula pendula, Calliergon cuspidatum, Carex distans, Centaurium erythraea, Dactylorhiza praetermissa, Epilobium obscurum, Epipactis palustris, Euphrasia officinalis agg., Hydrocotyle vulgaris, Iris pseudacorus, Juncus articulatus, Juncus inflexus, Leontodon saxatilis, Linum catharticum, Lotus pedunculatus, Mentha aquatica, Parentucellia viscosa, Potentilla anserina,

	Prunella vulgaris, Pulicaria dysenterica, Ranunculus acris, Rubus fruticosus agg., Rumex acetosa, Salix cinerea, Trifolium dubium, Trifolium fragiferum
10	Vegetation dominated by Hydrocotyle vulgaris and Calliergon cuspidatum with abundant Epipactus palustris and frequent Agrostis stolonifera, Juncus maritima and J. articulatus. Ophioglossum vulgatum is present locally and other associates include Carex arenaria, Leontodon saxatilis, Mentha aquatica, Salix cinerea, Eleocharis palustris, Molinia caerulea, Carex viridula subsp.oedocarpa, Leontodon autumnalis, Lotus pedunculatus, Lycopus europaeus, Poa pratensis sens.lat., Rubus fruticosus agg. and Phragmites australis
11	Sedum album: Sedum lawn; trample sensitive succulents attain very high cover values in this area, producing a vegetation which matches poorly with NVC sand-dune community descriptions
12	Oenanthe lachenalii (England Red List, Near Threatened category): occurs at low frequency and low cover throughout this stand of SD15 to W of main trackway
13	Amblystegium humile: an uncommon moss species (1st record for NNR) locally fairly frequent under Phragmites towards edge of open water.
14	Salsola kali: Eroded seaward face of dune ridge supports scattered Prickly Saltwort plants
15	Vulpia ciliata subsp. ciliata: discrete colonies are scattered along the eroded face of old ridge at boundary between SD6e and SD6d Marram stands, invariably with V. fasciculata
16	Ruscus aculeatus: interior of woodland where generally dominated by Rubus underscrub. Also single well grown clump of Altar Lily (Zantedeschia aethiopica), flowering in dense understorey
17	Spergularia rubra: several plants on a heavily trampled section of the back path
18	Cynoglossum officinale: single plant on fire site
19	chestnut fenced corridor along top of Geobag with fragmentary semi-natural stand of SD6a to E side and to W fenced compounds for establishment of planted Marram accompanied by a few natural colonists including sizeable patches of Beta vulgaris and Oenothera. Vegetation cover is generally <35%.

20	Silene uniflora: small isolated patch
21	diffuse and variable width band of Sand Couch foredune with Eryngium maritimum, Honckenya peploides and occasional Cakile maritima
22	Vulpia ciliata subsp. ciliata: tamped down area with rabbit dung at transition from mobile dune to adjacent SD6d
23	Alnus glutinosa: seedling.
24	Eryngium maritimum: scattered within this area of mobile dune, very low cover but near constant
25	Vulpia ciliata subsp. ciliata: 3 plants, in close association with a large stand of Vulpia fasciculata in an area of intensive rabbit burrowing
26	Taxus baccata: single Yew tree, c2.5m tall in SD6 dunes
27	Vulpia ciliata subsp. ciliata: 6 plants in area dominated by V. fasciculata, seaward side of eroded dune face
28	Lagurus ovatus: frequent in disturbed spots by pathsides near visitor centre.
29	inclosed area of SD7 with tall vegetation, clearly showing effect of fencing on trampling control and vegetation recovery with contrasting area to immediate north of fence crossed for access to beach from visitor centre
30	Tamarix gallica: large patch at edge of bramble underscrub, which is punctuated by young sycamore and willow. Location approximate due to GPS fault.
31	Ammophila arenaria: chestnut fenced compounds for re-establishment of vegeation on blown-out/disturbed section of frontal ridge and path. Dog faeces are frequent in this area. Early dominance over the bare sand surface by Lagurus ovatus and Oenothera spp. but small Ammophila is well established and there are fragmentary mature Marram tussocks and associates towards seaward edge. Associates and colonists include Aira praecox, Anisantha sterilis, Arrhenatherum elatius, Cakile maritima, Erodium cicutarium, Euphorbia portlandica, Festuca rubra agg., Hypnum cupressiforme var. lacunosum, Hypochaeris radicata, Ononis repens, Phleum arenarium, Rosa canina agg., Rubus fruticosus agg., Rumex crispus, Salsola kali, Vulpia fasciculata.

32	grassy area of SD7 which is floristically similar to the yellow Asteraceae rich stands to NE but visually different with taller sward and higher levels of Holcus lanatus and Arrhenatherum elatius.
33	Elytrigia atherica: a few plants of Sea Couch, with Festuca rubra, on crest of subsidiary ridge, within SD7 grassland
34	Vulpia ciliata subsp. ciliata: 12+ inflorescences growing in intimate mixture with locally abundant V. fasciculata
35	Vulpia ciliata subsp. ciliata: 20 plants growing amongst dozens of V. fasciculata on trampled down rabbit disturbed area, V. fasciculata growing in ring around rabbit latrine. Bare ground >50%
36	Vulpia ciliata subsp. ciliata: 15 plants in Vf4 (mapped V. fasciculata zone) and potentially other colonies here
37	point where main path breaches dune ridge has exposed sand at broadest width approx. 7.5m. Here where Ammophila absent vegetation locally on landward side of ridge resembles the foredune community with Cakile maritima, Honckenya peploides and Euphorbia portlandica.
38	Ophrys apifera: 41 flowering spikes, base of landward ridge slope at transition from mobile dune/scrub to damp dune grassland in Greenland Lake, protected from trampling by temporary string fencing (plus non flowering rosettes outside string fence). Associates include Anthoxanthum odoratum, Cynosurus cristatus, Linum catharticum & Rubus fruticosus agg. Rosa sp.
39	stumps of birch from scrub clearance within last few years at this spot which now has various orchids
40	Ophioglossum vulgatum: bank to landward side of pond
41	Oenanthe pimpinelloides: amongst locally abundant Anisantha sterilis
42	Catapodium marinum: 1 clump. Apparently much scarcer on the site than C. rigidum
43	scrubby clump of Pyrus communis s.l. behind visitor centre on old fenceline with Prunus spinosa, suckering out into adjacent grassland, fringe rough unmown grass around.

44	Old fenceline: combination of old fenceline, new fenceline, new wooden barrier and topography promotes structural diversity in sward, with the area between the barrier and the fence mown and area inside Crocus compound moderately trampled.
45	Betula pubescens and Salix cinerea regenerating in damp neutral grassland outside woodland area
46	Dactylis glomerata: abundant in 'help save the dunes marram planting' enclosure
47	Populus alba: scatter of c30 plants bushy regrowth, up to c.1.5m tall along dune ridge
48	Carex arenaria: almost all Sand Sedge infructescences in this area affected by a black smut fungus, probably Anthracoidea arenariae.
49	Clump of Sycamore provides a semi-woodland feature in the mobile dune area. This is a eutrophication and disturbance hotspot used as cover by beachgoers, with used toilet paper, dog waste, litter, discarded barbecues, charcoal and as fire site etc
50	Quercus ilex: 1 young stem or sapling 1.3m high, plus several seedlings or resprouts in vicinity
51	Malus pumila: large but low spreading tree, mantled by Rubus fruticosus underscrub (with many nectaring adult Gatekeepers) with Stachys sylvatica
52	Erodium lebelii (Nationally Scarce)
53	Short species rich grassland with moderately heavy trampling which favours Trifolium species including T. micranthum, T suffocatum, T. ornithopoides, T. dubium and T. subterraneum. Associates include: Aphanes arvensis agg., Carex arenaria, Carex otrubae, Centaurium erythraea, Dactylorhiza praetermissa, Euphrasia agg., Festuca rubra sens. lat., Holcus lanatus, Hypnum cupressiforme agg., Hypochaeris radicata, Leontodon saxatilis, Lolium perenne, Luzula campestris, Montia fontana, Myosotis discolor, Peltigera sp., Plantago coronopus, Poa annua, Poa infirma, Polytrichum juniperinum, Pulicaria dysenterica, Ranunculus parviflorus, Rumex acetosa, Scorzoneroides autumnalis, Spiranthes spiralis, Stellaria media, Vicia cracca, Vicia sativa subsp. segetalis.
54	Rhinanthus minor: dense stand in paddock gateway where sward regularly opened by vehicles/machinery
55	belt of scrub surrounding small paddock 1.5 to 3m tall, bramble and gorse with occasional elder with margins of tall Dactylis and Anthoxanthum, Arrhenatherum, Silene and Festuca rubra. Linnet, Blackcap and Whitethroat singing from.

56	Hyacinthoides hispanica: small clump in scrubby disturbed dune grassland
57	Vulpia ciliata subsp. ciliata: eroded edge of old Marram dune, where transition to mobile sand and shingle
58	Pancratium maritimum: 5 or 6 plants on a low disturbed mound in brambly SD7 grassland. Also a location for small Yucca plants.
59	Anagallis minima (Endangered, England Red List): >80 plants in damp mossy turf near transition from SD15 to SD12 grassland, potentially many more here if analogous areas systematically searched
60	Eroding patch of denuded sand on path through fixed dune turf forms a large pit of mobile sand.
61	Eutrophication hotspot: path is screened on both sides by scrub and evidently bushes here invite use as toilet by both dogs and people. The vegetation locally has a marked nitrophilous stamp with Urtica dioica, Sambucus nigra, Arrhenatherum elatius, Anisantha sterilis, Galium aparine, Solanum dulcamara, Anthriscus sylvestris and Stellaria media.
62	mixture of W23/W24, active scrub control and gorse cut back but reasserting over Rubus underscrub. Vegetation is a mosaic of Rubus underscrub and Ammophila-Arrhenatherum grassland.
63	Formerly mapped as mesotrophic grassland (NVC MG1) in 2012. In 2019 although there is some localised enrichment with Arrhenatherum and Anisantha in this area the sward has c.50% Marram and frequent Festuca rubra and therefore appears to have reverted to a recognisable dune grasland type with frequent Carex arenaria, Hypochaeris radicata, Plantago coronopus etc. and some Spiranthes spiralis.
64	Arrhenatherum elatius, Lupinus arboreus, Rubus fruticosus: species poor cleared scrub, now reverting to Ammophila/Festuca rubra with Phleum arenarium and Euphorbia portlandica etc in newly available sand patches
65	Carlina vulgaris: (only record from this survey of this species) a single plant in cleared scrub now developing into Ammophila dune with Lagurus, Lupinus and good numbers of Euphorbia portlandica.
66	large patch clonal Salix cinerea on ridge with Acer pseudoplatanus and mantle of Rubus fruticosus underscrub (including Solanum dulcamara, Hedera helix and Iris foetidissima) surrounded by former scrub which is now Ammophila and Elytrigia juncea/Festuca rubra with Lagurus ovatus, Rubia peregrina,

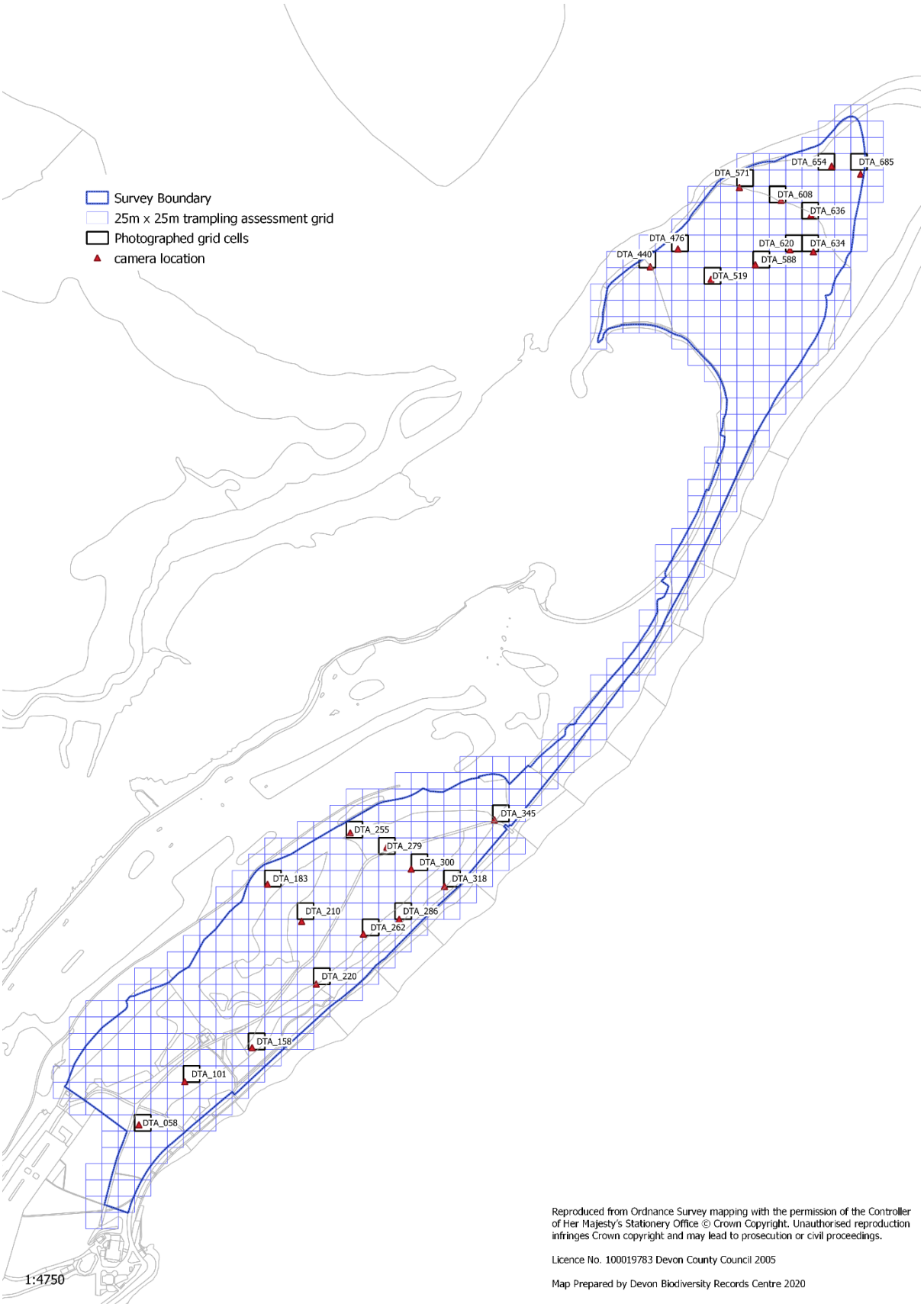
67	Clematis vitalba: O to F along top of dune ridge and a feature of the scrub to mobile dune community transition here
68	Bidens tripartita (apparently 1st NNR record): a few plants in southern part of reed-swamp
69	An area of disturbed brambly dune grassland. Formerly mapped as SD6/W24 mosaic, the heavy Rubus presence remains but the grassland is more fixed and has many indications of enrichment with Anisantha sterilis and Arrhenatherum elatius locally dominant (and little Ammophila) and species such as Galium aparine and Dactylis glomerata also present. Dog faeces are frequent. Carex arenaria and Festuca rubra remain prominent with occasional Phleum arenarium and Euphorbia portlandica where trampling gaps occur.
70	Acer pseudoplatanus canopy with small amounts of Quercus robur and Quercus ilex. There is abundant Hedera helix and a lower tier of Tamarix gallica, Prunus lusitanica, Clematis vitalba, Rosa spp./sp. and patchy Rubus fruticosus underscrub. The area beneath the trees and immediately surrounding has assemblage of herbs which is a mixture of dune plants and nutrient demanding ruderals including non-native casuals such as Echinochloa crus-galli (apparently 1st record for NNR): Parietaria judaica, Arrhenatherum elatius, Cerastium diffusum, Galium aparine, Agrostis stolonifera, Aira praecox, Solanum dulcamara, Urtica dioica, Vulpia bromoides, Carex arenaria, Clematis vitalba, Holcus lanatus, Oenothera glazioviana, Ammophila arenaria, Anagallis arvensis, Anisantha sterilis, Anthriscus caucalis, Sonchus asper, Fumaria muralis, Hypochaeris radicata, Plantago coronopus, Polypodium vulgare sens.lat., Carduus tenuiflorus, Cerastium glomeratum, Erodium lebelii, Festuca rubra agg., Anthoxanthum odoratum, Bromus hordeaceus, Atriplex glabriuscula, Elytrigia juncea, Euphorbia portlandica, Solanum dulcamara, Solanum nigrum, Verbascum thapsus and Hordeum murinum.
71	Ulex europaeus: small fringe of gorse scrub around slack/old Marram nursery
72	mixed gorse and bramble scrub mantling adjacent wet woodland grades into a very small stand of Phragmites over Hydrocotyle vulgaris
73	Salix repens: single large clump, rather erect, present but very rare in this dune slack area. Salix cinerea maintained at low stature by management is very frequent.
74	Armeria maritima: small clump in SD7 grassland

75	Ophioglossum vulgatum: 60 plants in a low scrape, with Agrostis stolonifera, Aira caryophyllea, Anthoxanthum odoratum, Bryum pseudotriquetrum, Carex arenaria, Carex flacca, Cynosurus cristatus, Danthonia decumbens, Euphrasia agg., Euphrasia officinalis agg., Festuca rubra agg., Festuca rubra subsp. juncea, Galium verum, Juncus bufonius, Juncus maritimus, Lotus corniculatus, Luzula campestris, Ononis repens, Ophioglossum azoricum, Ophioglossum vulgatum, Parentucellia viscosa, Plantago coronopus, Plantago lanceolata, Poa annua, Prunella vulgaris, Rhinanthus minor, Sedum anglicum, Spiranthes spiralis and Vulpia bromoides.
76	additional species in SW paddock not in quadrat samples: Hypericum perforatum, Ononis repens, Phragmites australis, Valerianella carinata, Dipsacus fullonum, Geranium dissectum, Galium mollugo, Leucanthemum vulgare, Mentha aquatica, Veronica chamaedrys
77	Anthriscus caucalis: Bur Chervil one of the early colonists of the bare sand on the neck overlying Geobag
78	Acer pseudoplatanus: little grove of low (up to 6m) multi-stemmed trees with spreading canopies and slight understorey or mantle of Rubus fruticosus underscrub. A shade tolerant field layer of Iris foetidissima and Veronica hederifolia beginning to develop from Carex arenaria, Galium aparine, Senecio vulgaris, Sonchus oleraceus, Tripleurospermum maritimum and Galium aparine.
79	broken band of scrub along boundary with DWT/golf course consists of a mixture of Ulex europaeus and Rubus fruticosus agg. punctuated by individuals of several tree and shrub species including Betula pendula, Crataegus monogyna, Ilex aquifolium, Malus pumila, Rosa canina agg. and Sambucus nigra. Typical herbs fringing the stands and between shrubs are: Anisantha sterilis, Arrhenatherum elatius, Cardamine flexuosa, Dactylis glomerata, Geranium robertianum, Hypericum perforatum, Poa annua, Raphanus raphanistrum subsp. maritimus, Rumex acetosella and Silene dioica
80	Hollow in former Marram nursery now supports botanically interesting dune slack-like vegetation with Agrostis stolonifera, Bellis perennis, Carex arenaria, Carex distans, Carex otrubae, Centaurium erythraea, Dryopteris filix-mas, Epilobium parviflorum, Holcus lanatus, Hydrocotyle vulgaris, Juncus maritimus, Lotus corniculatus, Mentha aquatica, Parentucellia viscosa, Phragmites australis, Poa humilis, Potentilla anserina, Prunella vulgaris, Pulicaria dysenterica, Samolus valerandi (an extensive stand), Schedonorus arundinaceus, Trifolium fragiferum & Trifolium micranthum. Drier surrounds have Ulex europaeus, Betula pubescens and Salix cinerea, Verbascum thapsus, Aira caryophyllea, Holcus lanatus.
81	Juncus maritimus: good stands of Sea Rush persist (despite the advance towards freshwater conditions). Plants growing along the margin of the wet woodland and dune slack vegetation, and probably elsewhere on the reserve, support the case bearing moth, Coleophora maritimella, currently its only known site in Devon.

82	Area of dune grassland with constant Festuca rubra, Carex arenaria, Holcus lanatus and Hypochaeris radicata (much reduced relative to area to immediate south) but with Ammophila sparse and marked enrichment with locally very abundant Arrhenatherum elatius, Dactylis glomerata, Anisantha sterilis etc: Closest NVC reference is SD12/SD7 mosaic but apparently in transition with elements of both less fixed communities and of mesotrophic grassland: Outlying Trifolium glomeratum colony present in trample zone. Other herbs include: Aira praecox, Anthoxanthum odoratum, Arenaria serpyllifolia, Bromus hordeaceus, Calystegia soldanella, Centaurium erythraea, Cerastium glomeratum, Dactylis glomerata, Euphrasia nemorosa, Hypnum cupressiforme sens.lat., Leontodon saxatilis, Lotus corniculatus, Lupinus arboreus, Luzula campestris, Plantago coronopus, Poa humilis, Rubus fruticosus agg., Rumex acetosella, Sedum acre, Trifolium arvense, Veronica arvensis & Vulpia bromoides
83	an area of SD7 with high cover of Hypochaeris radicata and Rhinanthus minor with Anthoxanthum odoratum and Holcus lanatus more frequent than Festuca rubra. A number of less calcifugous species are also fairly frequent locally in the sward including Galium verum, Lotus corniculatus, Linum catharticum and Origanum vulgare suggesting affinities with the SD8 fixed dune grassland. However, on balance the constancy of species like Hypochaeris and Carex arenaria and frequent Ononis repens etc places the vegetation in SD7c. Other associates include: Ammophila arenaria, Arenaria serpyllifolia, Armeria maritima, Arrhenatherum elatius, Bromus hordeaceus, Centaurium erythraea, Cerastium fontanum, Cerastium semidecandrum, Crepis capillaris, Dactylis glomerata, Dactylorhiza praetermissa, Dicranum scoparium, Elytrigia atherica (R), Elytrigia juncea, Euphorbia portlandica, Euphrasia officinalis agg., Festuca rubra agg., Galium mollugo, Hypericum perforatum, Leontodon autumnalis, Leontodon saxatilis, Leucanthemum vulgare, Luzula campestris, Oenothera glazioviana, Plantago coronopus, Plantago lanceolata, Poa humilis, Poa infirma, Prunella vulgaris, Rosa seedling/sp, Rubus fruticosus agg., Rumex acetosella, Senecio jacobaea, Trifolium arvense, Trifolium dubium, Trifolium pratense, Trifolium repens and Vulpia bromoides.
84	Species-rich vegetation most closely corresponding to NVC SD15c but lacking in Salix repens. Notable species are Oenanthe lachenalia and Parentucellia viscosa with the following species all characteristic and frequent: Aster agg., Calliergon cuspidatum, Carex flacca, Cynosurus cristatus, Dactylorhiza praetermissa, Epipactis palustris, Festuca rubra, Holcus lanatus, Hydrocotyle vulgaris, Juncus maritimus, Lotus pedunculatus, Mentha aquatica, Phragmites australis and Pulicaria dysenterica.
85	Phragmites australis: a small patch of reeds separate from the nearby pond occupies a seasonally wet hollow. Lythrum salicaria and Filipendula ulmaria are the main associates. Bolboschoenus maritimus is present sparingly and there are no other coastal or saline species. Floristically a closer match with M27c than any reedswamp or explicitly maritime vegetation. Other species present are Agrostis stolonifera, Alnus glutinosa (g), Angelica sylvestris, Arrhenatherum elatius, Aster agg., Betula pendula (g), Holcus lanatus, Hypochaeris radicata, Iris pseudacorus, Juncus bulbosus, Juncus effusus, Lotus pedunculatus, Mentha aquatica,

	Parentucellia viscosa, Potentilla anserina, Pulicaria dysenterica, Rubus fruticosus agg., Salix cinerea (g), Trifolium fragiferum, Trifolium pratense and Vicia cracca.
86	Grassland on floor of Greenland Lake that is generally higher and drier than the SD15 area to S & W, but forms a mosaic of shallow hollows with moisture tolerant species, dry areas with Sedum or lichen carpets and areas of more typical SD7 Ammophila-Festuca rubra-Carex arenaria swards. The species assemblage as a whole currently places most of this habitat in the community SD7. There are unmapped elements of different types including SD7b and SD7c and possibly others that would require further sampling to accurately map. Much of the area is moderately and diffusely trampled.
87	small pool occupied by Phragmites australis swamp, narrow band of marginal vegetation extends outwards to damp base of ridge on SE side. Fringe has distinct Bolboschoenus maritimus/Juncus maritimus zone over lower tier of Juncus gerardii, Carex distans and Hydrocotyle vulgaris. Other species present in the ecotone: Agrostis stolonifera, Carex arenaria, Carex flacca, Dactylorhiza praetermissa, Danthonia decumbens, Epipactis palustris, Juncus articulatus, Juncus bufonius, Oenanthe lachenalii, Phalaris arundinacea, Pulicaria dysenterica, Salix cinerea and Trifolium fragiferum.
88	beach to dune transition is an abrupt eroded sand cliff 2-3m high

8.4 GEOREFERENCED PHOTOGRAPHS FROM TRAMPLING STUDY



25m x 25m Survey Cell	Date	living plants % cover	Photo grid reference
DTA_058	23/08/2019	99	SX9820678809±3
DTA_071	23/08/2019	65	SX9823878776±4
DTA_101	05/09/2019	70	SX9827778875±3
DTA_158	05/09/2019	95	SX9838078928±4
DTA_183	05/09/2019	75	SX9840479178±3
DTA_210	05/09/2019	98	SX9845679121±3
DTA_220	05/09/2019	85	SX9847879025±3
DTA_255	05/09/2019	85	SX9853179257±3
DTA_262	05/09/2019	85	SX9855179102±3
DTA_279	05/09/2019	89	SX9858779235±3
DTA_286	05/09/2019	70	SX9860679124±3
DTA_300	05/09/2019	98	SX9862479202±4
DTA_318	05/09/2019	96	SX9867579175±3
DTA_345	29/08/2019	95	SX9875279277±3
DTA_440	29/08/2019	90	SX9899180126±3
DTA_476	29/08/2019	60	SX9903480153±3
DTA_519	23/08/2019	75	SX9908580107±3
DTA_571	23/08/2019	45	SX9912880248±3
DTA_588	29/08/2019	95	SX9915380129±3
DTA_608	29/08/2019	30	SX9919280228±3
DTA_620	23/08/2019	85	SX9920680152±3
DTA_634	23/08/2019	96	SX9924280149±3
DTA_636	23/08/2019	35	SX9923880205±4
DTA_654	29/08/2019	40	SX9927080280±3
DTA_685	23/08/2019	40	SX9931580268±4


DTA_058


DTA_101


DTA_158


DTA_183


DTA_210


DTA_220


DTA_255


DTA_262


DTA_279


DTA_286


DTA_300


DTA_318


DTA_345


DTA_440


DTA_476


DTA_519


SAFETY
Danger
Beach erosio
please
and
DTA_571


DTA_588


DTA_608


DTA_620


DTA_634


DTA_636


DTA_654


DTA_685

8.5 NVC QUADRAT DATA

8.5.1 M27C *FILIPENDULA ULMARIA-ANGELICA SYLVESTRIS* MIRE: *JUNCUS EFFUSUS-HOLCUS LANATUS* SUB-COMMUNITY

Quadrat #	37	38	39	40	41	128	129	130	131	132
Grid reference ± estimated GPS precision	SX9835779063 ± 3	SX9834879063 ± 3	SX9835979081 ± 4	SX9837379091 ± 2	SX9838579093 ± 3	SX9845079023 ± 6	SX9844679034 ± 6	SX9846079045 ± 4	SX9847779051 ± 8	SX9846079042 ± 8
date recorded	05/07/2019	05/07/2019	05/07/2019	05/07/2019	05/07/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019
Live vegetation cover (%)	100	100	90	100	100	100	100	100	100	-
Bare ground (%)			10							
Litter (%)										
MAVIS NVC community prediction and goodness of fit score	MG10a 40.20	S4 29.75	MC9e 39.51	MG10a 38.27	M27c 40.60	S26a 46.67	S4b 42.04	S4 39.71	S4 47.41	S4 38.83
NVC community as mapped	M27c	M27c	M27c	M27c	M27c	M27c	M27c	M27c	M27c	M27c
cover-weighted Ellenberg values:										
Light	6.9	6.6	6.8	6.8	7.0	6.8	7.0	6.9	6.6	6.7
Wetness	6.8	6.4	5.9	6.6	6.8	8.3	8.0	8.5	7.4	8.2

Quadrat #	37	38	39	40	41	128	129	130	131	132
pH	6.4	5.9	5.7	5.7	6.6	6.5	6.8	6.7	6.3	6.4
Fertility	5.3	5.2	4.4	4.8	5.5	5.6	5.2	5.2	5.6	5.4
Phragmites australis	5	5	5	5	5	8	7	7	7	7
Holcus lanatus	5	3	3	4	5	4	5	2		3
Rubus fruticosus agg.	4	6	7	4	3	5			8	5
Agrostis stolonifera	6	3		5	7	3	3	3		
Lotus pedunculatus				6	4	3	4	3	5	4
Parentucellia viscosa	3	3			1	4	3			3
Lythrum salicaria						2	7	8	2	6
Filipendula ulmaria						6	4	5	1	3
Mentha aquatica	3	5		3	4		4			
Plantago lanceolata	3	1	3	3	2					
Agrostis capillaris	2	7	4	7						
Juncus bufonius sens.str.	6	3		7	2					
Ranunculus acris	4		2	3	1					
Trifolium repens	2	2	3	3						
Rumex acetosa	1	2		3	3					
Aster agg.		6		3	5					
Vicia cracca				3			5	5		
Alnus glutinosa (g)						3		4		4
Rhytidiadelphus squarrosus			3	5	2					
Aster lanceolatus						3	1		4	
Pulicaria dysenterica						2	3		1	
Salix cinerea (g)								5		4
Rhinanthus minor	2		6							
Anthoxanthum odoratum			6	1						
Pleurocarpous bryophyte	3	3								
Trifolium pratense							4	2		

Quadrat #	37	38	39	40	41	128	129	130	131	132
Hypochaeris radicata			3				2			
Dactylorhiza praetermissa		2		2						
Euphrasia officinalis agg.		1		3						
Trifolium dubium		2	2							
Carex arenaria			2	1						
Rosa canina agg.	1		2							
Betula pendula (g)										4
Iris pseudacorus						4				
Juncus effusus									4	
Lotus corniculatus			4							
Arrhenatherum elatius									3	
Juncus bulbosus								3		
Juncus conglomeratus				3						
Linum catharticum			3							
Potentilla anserina								3		
Sisyrinchium montanum			3							
Angelica sylvestris									2	
Bolboschoenus maritimus							2			
Hypnum cupressiforme sens.lat.			2							
Rumex crispus					2					
Trifolium fragiferum							2			
Betula pubescens (g)					1					
Centaurium erythraea			1							
Festuca rubra agg.			1							
Galium palustre					1					
Hypericum perforatum			1							
Juncus maritimus		1								
Leontodon autumnalis			1							
Lophocolea bidentata sens.lat.			1							

Quadrat #	37	38	39	40	41	128	129	130	131	132
Luzula campestris			1							
Oenanthe crocata				1						
Poa [spp]					1					
Poa pratensis sens.lat.			1							
Salix caprea (g)	1									
Sonchus arvensis					1					
Vicia tetrasperma		1								

8.5.2 S4 *PHRAGMITES AUSTRALIS* SWAMP AND REED-BEDS

Quadrat #	81	82	83	84	85	86	87	88	89	90	91	92
Grid reference ± estimated GPS precision	SX9838879011 ± 4	SX9836579001 ± 6	SX9833779008 ± 6	SX9834578999 ± 4	SX9835979025 ± 4	SX9837079005 ± 3	SX9838979006 ± 3	SX9841079020 ± 4	SX9841779030 ± 4	SX9843679050 ± 3	SX9841579042 ± 3	SX9838579030 ± 3
date recorded	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019	29/08/2019
Live vegetation cover (%)	100	100	100	100	85	100	100	100	100	100	100	100
Bare ground (%)					15							
Litter (%)								75	45	70	25	15
MAVIS NVC community prediction and goodness of fit score	S4 46.26	S4 51.79	S4 52.63	S4 52.98	S4 42.25	S4 45.03	S4 58.82	S4 67.80	S4 57.97	S4a 72.73	S4 62.66	S4b 51.17

Quadrat #	81	82	83	84	85	86	87	88	89	90	91	92
NVC community as mapped	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4	S4
cover-weighted Ellenberg values												
Light	7.2	7.0	7.3	7.4	7.1	7.0	7.1	7.0	7.0	7.0	7.1	7.1
Wetness	9.0	9.1	9.5	9.3	10.	8.8	8.7	9.9	9.7	10.	9.9	9.8
pH	7.0	6.8	6.9	6.5	7.	6.7	6.9	7.0	7.0	7.	7.1	7.0
Fertility	5.6	5.4	5.4	4.7	5.	5.1	5.3	5.9	5.9	6.	6.0	6.0
Phragmites australis	9	9	10	10	9	9	8	10	10	10	10	10
Mentha aquatica	7	5	6	5	4	6	8	2	2		3	4
Bolboschoenus maritimus	6	2	5		5	2	2			1	4	5
Hydrocotyle vulgaris	3		5	8		1	4	1	3		1	
Lotus pedunculatus	5	4	3			7	3	2	1			
Hippuris vulgaris	3	2	2	2	4		3		1		1	2
Agrostis stolonifera	4					3	4		3			
Eleocharis palustris			5	7								
Pulicaria dysenterica	2	5				5						
Eurhynchium praelongum											3	6
Iris pseudacorus		4		2							1	1
Lemna trisulca					3				1	2		2
Galium palustre				3				1				3
Epilobium obscurum		3				2	1					
Lycopus europaeus	2	1				1	2	1			-1	
Lythrum salicaria	1		4				-1			1		
Pleurocarpous bryophyte					5							
Cardamine pratensis		1	1				1					1
Epilobium parviflorum	1					3						
Samolus valerandi	2	1				1						
Epilobium [spp]			3									
Lemna minuta					3							

Quadrat #	81	82	83	84	85	86	87	88	89	90	91	92
Aster sp.	2											
Carex otrubae			1				1					
Carex pseudocyperus			1	1			-1				1	
Juncus articulatus						2						
Parentucellia viscosa	1						1					
Potamogeton natans					2							
Potentilla anserina							2					
Rumex conglomeratus							2					
Scutellaria galericulata		2										
Ceratophyllum demersum									1			
Gnaphalium uliginosum						1						
Juncus bufonius sens.str.						1						
Persicaria maculosa						1						
Rosa canina agg.	1											
Rubus fruticosus agg.		1										
Alnus glutinosa							-1					
Epilobium ciliatum									-1			
Salix cinerea							-1					

8.5.3 *SD6 AMMOPHILA ARENARIA* MOBILE DUNE COMMUNITY & SD6A *ELYTRIGIA JUNCEA* SUB-COMMUNITY

Quadrat #	46	57	58	123	124	125	126	127	5	12	13	14	15	16	17	18	70	71	106	107	108	109	110	103
Grid reference ± estimated GPS precision	SX9826178799 ± 4	SX9842678938 ± 3	SX9843578946 ± 3	SX9846078948 ± 4	SX9846578964 ± 8	SX9848378972 ± 6	SX9851379010 ± 6	SX9853279017 ± 6	SX9819878729 ± 2	SX9928780246 ± 4	SX9930380322 ± 4	SX9931080338 ± 3	SX9929880311 ±	SX9930380323 ±	SX9927180311 ± 3	SX9927480270 ± 3	SX9930280220 ± 2	SX9930880260 ± 3	SX9912679810 ± 6	SX9911779789 ± 6	SX9909279755 ± 4	SX9907579695 ± 16	SX9905879676 ± 6	SX9886979381 ± 3
date recorded	24/07/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	24/05/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	23/08/2019	23/08/2019	11/07/2019	11/07/2019	11/07/2019	11/07/2019	11/07/2019	05/09/2019
Live vegetation cover (%)	80	35	40	40	60	60	-	40	45	15	40	20	40	10	45	25	45	45	60	70	70	60	-	50
Bare ground (%)	20	65	60	60	40	40		60	40	85	60	80	60	90	55	75	55	55	40	30	30	40		50
Litter (%)				0	0	0	0	0	5															
MAVIS NVC community prediction and goodness of fit score	SD7c 47.52	SD6d 74.47	SD6d 79.65	SD6e 55.00	SD6e 62.64	SD6g 58.82	SD6e 54.55	SD6a 63.69	SD7e 44.24	SD6d 35.29	SD6a 57.69	SD6a 51.12	SD6a 68.26	SD6a 42.74	SD6a 65.69	SD6a 54.42	SD6a 61.86	SD6d 76.27	SD6e 45.56	SD6a 66.30	SD6a 68.18	SD6e 53.79	SD6a 63.60	SD6a 62.99
NVC community as mapped	SD6	SD6	SD6	SD6	SD6	SD6	SD6	SD6	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a	SD6a
cover-weighted Ellenberg values:																								
Light	7.9	8.9	9.0	8.5	8.6	8.6	8.8	8.8	8.5	9.0	9.0	8.9	9.0	9.0	9.0	8.9	9.0	9.0	8.1	8.8	9.0	8.5	8.9	8.9
Wetness	4.2	4.2	4.0	4.5	4.4	4.1	4.2	4.5	4.3	4.0	4.4	4.5	4.3	4.3	4.5	4.8	4.6	4.1	4.8	4.6	4.9	4.6	4.7	4.4
pH	5.9	6.1	6.1	6.0	6.0	5.9	6.0	6.3	5.9	6.0	6.3	6.5	6.3	6.3	6.5	6.7	6.6	6.1	6.1	6.4	6.8	6.1	6.7	6.3
Fertility	3.8	3.4	3.1	4.1	3.8	3.4	3.8	4.3	3.6	3.0	4.1	4.7	3.8	4.0	4.5	4.9	4.7	3.3	4.6	4.5	5.4	4.4	5.1	4.1
Ammophila arenaria	3	6	7	7	7	7	9	6	5	4	5	4	6	4	5	4	5	7	4	6	4	5	4	7
Bare ground/litter/water/rock/mud	5			8	7	7	4	8		9	8	9	8	9	8	8			7	6	6	7		7
Festuca rubra agg.	4	2	1	7	6	5	6	4	4									1	6	4		6	2	3
Elytrigia juncea				2				5	3		4	4	4	3	5	5				5	6	3	6	5

Quadrat #	46	57	58	123	124	125	126	127	5	12	13	14	15	16	17	18	70	71	106	107	108	109	110	103
Carex arenaria	5				2	4											1						1	1
Oenothera glazioviana				2		2	6		1		1								1		1		1	
Hypochaeris radicata	4						1		1		1										1			
Rubus fruticosus agg.	1																							
Calystegia soldanella	4		2			1											3	2	3	2		2		2
Oenothera stricta																								
Phleum arenarium									3			1												
Cakile maritima		1	1		1							1	1				3	2	1	3	3			2
Aira praecox	2								3															
Euphorbia portlandica					1																		1	
Honckenya peploides					1		1	1				1	1		1	1	5	2		1	3			
Hypnum cupressiforme sens.lat.									2															
Arenaria serpyllifolia	2																							
Vulpia fasciculata																								
Polypodium vulgare sens.lat.																								
Trifolium arvense	2								2															
Leontodon saxatilis	3								4															
Cochlearia officinalis sens.lat.									3		1	-1				3								
Polypodium vulgare sens.str.																								
Rubia peregrina																								
Vulpia [spp]																								
Ulex europaeus																								
Cerastium diffusum									2															
Dicranum scoparium																								
Syntrichia ruralis var. ruraliformis									3															
Arrhenatherum elatius	4																							
Vulpia bromoides																								
Lagurus ovatus		2																						
Peltigera canina																								
Pleurocarpous bryophyte									3															
Salsola kali		2	1																					1
Sedum album																								
Bryum [spp]																								
Bryum bicolor sens.lat.																								

Quadrat #	46	57	58	123	124	125	126	127	5	12	13	14	15	16	17	18	70	71	106	107	108	109	110	103
Holcus lanatus	3																							
Lupinus arboreus	1																						2	
Tripleurospermum maritimum sens.lat.												2												
Campylopus [spp]																								
Centaurium erythraea																								
Cladonia [spp]																								
Cladonia rangiformis																								
Hypnum [spp]																								
Sedum acre	1								1			-1												
Atriplex [spp]																		1						
Brachythecium [spp]									3															
Bromus hordeaceus	1								2															
Cerastium glomeratum	3																							
Cerastium semidecandrum									2															
Crepis capillaris																								
Dactylis glomerata																								
Hypnum cupressiforme var. lacunosum																								
Myosotis discolor									1															
Ononis repens																			1		1			1
Rubus fruticosus agg (g)																			3					
Rumex acetosella																								
Anacamptis pyramidalis																								
Anisantha sterilis	1								1															
Beta vulgaris subsp.maritima																							2	
Catapodium [spp]																								
Chamerion angustifolium																								
Clematis vitalba																								
Eurhynchium praelongum																								
Hypochaeris glabra																								
Luzula campestris	2																							
Plantago coronopus	2																							
Sambucus nigra																								
Sedum anglicum																								
Sonchus asper																								

Quadrat #	46	57	58	123	124	125	126	127	5	12	13	14	15	16	17	18	70	71	106	107	108	109	110	103
Sonchus oleraceus							1																	
Atriplex laciniata																								1
Conyza canadensis																								
Crithmum maritimum																		1						
Erodium cicutarium agg.																								
Euphorbia paralias																-1								
Galium aparine																								
Geranium lucidum																								
Homalothecium [spp]																								
Iris foetidissima																								
Lathyrus pratensis																								
Leontodon autumnalis																								
Raphanus raphanistrum subsp.maritimus																								
Rumex crispus			1																					
Senecio jacobaea											-1													
Vulpia ciliata subsp. ciliata																								

8.5.4 SD6 cont. SD6D *AMMOPHILA ARENARIA* SUB-COMMUNITY, SD6E *FESTUCA RUBRA* SUB-COMMUNITY, SD6G *CAREX ARENARIA* SUB-COMMUNITY & SCRUB MOSAICS

Quadrat #	42	43	44	24	25	26	27	28	120	121	122	111	68	69	100	101	102	104	118	119
Grid reference ± estimated GPS precision	SX9918280161 ± 3	SX9920780200 ± 3	SX9917480169 ±	SX9922980251 ± 4	SX9919280270 ± 6	SX9918280264 ± 4	SX9915180270 ± 4	SX9914280258 ±	SX9847978985 ± 6	SX9846278976 ± 6	SX9843978968 ± 6	SX9919380231 ± 6	SX9902280084 ± 3	SX9916380105 ± 3	SX9879679341 ± 3	SX9877779315 ± 3	SX9878479309 ± 4	SX9878479281 ±	SX9850579021 ± 4	SX9849079007 ± 6
date recorded	05/07/2019	05/07/2019	05/07/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	10/05/2019	02/08/2019	02/08/2019	02/08/2019	11/07/2019	23/08/2019	23/08/2019	05/09/2019	05/09/2019	05/09/2019	05/09/2019	02/08/2019	02/08/2019
Live vegetation cover (%)	50	60	55	50	92	50	75	70	60	70	70	60	100	80	60	90	40	40	70	-
Bare ground (%)	45	35	45	50	8	50	25	30	40	30	30	40		15	40	10	60	60	30	
Litter (%)	5	5							0	0	0			5				1	0	0
MAVIS NVC community prediction and goodness of fit score	SD7 30.93	SD6d 39.60	SD6e 40.27	SD6d 43.37	SD6d 48.93	SD6d 42.68	SD6d 48.93	SD6d 53.87	SD6e 55.19	SD6g 58.56	SD6g 54.32	SD6d 34.38	SD6g 55.70	SD6d 44.33	SD6g 51.89	W21c 26.94	SD6a 45.20	SD6d 70.31	SD6e 48.53	SD6g 43.32

Quadrat #	42	43	44	24	25	26	27	28	120	121	122	111	68	69	100	101	102	104	118	119
NVC community as mapped	SD6d	SD6d	SD6d	SD6e	SD6e	SD6e	SD6e	SD6e	SD6e	SD6e	SD6e	SD6e	SD6g	SD6/W24	SD6/W24	SD6/W24	SD6/W24	SD6/W24	SD6/W24	SD6/W24
cover-weighted Ellenberg values:																				
Light	8.2	8.0	8.3	8.6	8.9	8.8	9.0	8.9	8.5	8.4	8.5	8.8	8.4	8.6	8.1	6.0	8.3	8.8	8.7	8.1
Wetness	3.9	4.4	4.0	4.1	4.0	4.1	4.0	4.0	4.1	3.8	3.9	3.8	3.7	4.0	4.4	5.5	4.5	4.3	3.9	4.2
pH	6.3	6.0	6.1	5.9	6.0	5.9	6.0	6.0	5.9	5.6	5.7	6.1	5.8	5.9	5.9	6.5	6.0	6.1	5.7	5.6
Fertility	3.4	3.8	3.4	3.8	3.3	3.5	3.4	3.2	3.7	3.1	3.3	2.9	2.8	3.3	3.6	5.7	3.9	3.7	3.4	3.2
Ammophila arenaria	4	7	7	5	8	7	8	8	6	6	6	6	8	8	8		7	6	6	6
Bare ground/litter/water/rock/mud		6	7	7	4	7	5	6	7	6	6	7			7		8		6	5
Festuca rubra agg.		3		4	3	4		2	5	4	5			3	-1			4	5	4
Elytrigia juncea															3		4			
Carex arenaria									4	6	5		5		4				4	5
Oenothera glazioviana				3	3	3	5	3	4		3								5	
Hypochaeris radicata		2	3	2	1	2	2	2	4	2	3	3	2	2				1	2	2
Rubus fruticosus agg.	4	5	4							2			3	2	5	9	4			1
Calystegia soldanella		4							4									2	2	4
Oenothera stricta	3	2								5		3	1	4				1		4
Phleum arenarium				3	2	3	2		3	2	3									
Cakile maritima									1									1		
Aira praecox	2	2	2	2										3					2	
Euphorbia portlandica	1	3	1				2			2	1			2			1		2	1
Honckenya peploides																				
Hypnum cupressiforme sens.lat.	3	3	3									2								4
Arenaria serpyllifolia	2	1	3	2	1	2								3						
Vulpia fasciculata	5		4							1	2	4								
Polypodium vulgare sens.lat.	1									2		1		3	3					3

Quadrat #	42	43	44	24	25	26	27	28	120	121	122	111	68	69	100	101	102	104	118	119
Trifolium arvense										2	2								5	
Leontodon saxatilis										2		2					1			
Cochlearia officinalis sens.lat.				2	1	1														
Polypodium vulgare sens.str.		3	2													2	3			
Rubia peregrina	2		2													6				
Vulpia [spp]				2	2	3	3													
Ulex europaeus									1											8
Cerastium diffusum			3	1								1				1				
Dicranum scoparium	1	3												4						
Syntrichia ruralis var. ruraliformis				3			2													
Arrhenatherum elatius													2				1			
Vulpia bromoides	1																		2	4
Lagurus ovatus									2		2				-1				1	
Peltigera canina	2	1												3						
Pleurocarpous bryophyte		3																		
Salsola kali																		2		
Sedum album													6							
Bryum [spp]					2			2				1								
Bryum bicolor sens.lat.					3			2												
Holcus lanatus									2											
Lupinus arboreus			2																	
Tripleurospermum maritimum sens.lat.				1					1										1	
Campylopus [spp]	4																			
Centaurium erythraea							1					1		2						
Cladonia [spp]																				4
Cladonia rangiformis	2													2						
Hypnum [spp]													4							
Sedum acre	1		2																	
Atriplex [spp]							1		1											

Quadrat #	42	43	44	24	25	26	27	28	120	121	122	111	68	69	100	101	102	104	118	119
Brachythecium [spp]																				
Bromus hordeaceus																				
Cerastium glomeratum																				
Cerastium semidecandrum	1																			
Crepis capillaris												1	2							
Dactylis glomerata									2						1					
Hypnum cupressiforme var. lacunosum														3						
Myosotis discolor			1	1																
Ononis repens											1				-1					
Rubus fruticosus agg (g)																				
Rumex acetosella													3							
Anacamptis pyramidalis		2																		
Anisantha sterilis																				
Beta vulgaris subsp.maritima																				
Catapodium [spp]																			2	
Chamerion angustifolium		1	1																	
Clematis vitalba															2					
Eurhynchium praelongum													2							
Hypochaeris glabra	2																			
Luzula campestris																				
Plantago coronopus																				
Sambucus nigra																2				
Sedum anglicum	1	1																		
Sonchus asper				1				1												
Sonchus oleraceus															1					
Atriplex laciniata																				
Conyza canadensis								1												
Crithmum maritimum																				
Erodium cicutarium agg.			1																	

Quadrat #	42	43	44	24	25	26	27	28	120	121	122	111	68	69	100	101	102	104	118	119
Euphorbia paralias				1	1															
Galium aparine																1				
Geranium lucidum															1					
Homalothecium [spp]															1					
Iris foetidissima																1				
Lathyrus pratensis																	1			
Leontodon autumnalis										1										
Raphanus raphanistrum subsp.maritimus															1					
Rumex crispus																				
Senecio jacobaea									1				1							
Vulpia ciliata subsp. ciliata												1								

8.5.5 SD7 *AMMOPHILA ARENARIA-FESTUCA RUBRA* SEMI-FIXED DUNE COMMUNITY

Quadrat #	19	20	21	22	23	47	48	53	54	55	56	113	114	115	116	117	29	30	31	32	96	99	105	112	66	67	97	98
Grid reference ± estimated GPS precision	SX9913780005 ± 2	SX9912579979 ± 2	SX9913479967 ± 3	SX9910979994 ± 3	SX9911780019 ± 3	SX9825578820 ± 4	SX9832078916 ± 4	SX9838178907 ± 4	SX9839478922 ± 6	SX9841178934 ± 4	SX9838578914 ± 3	SX9851279047 ± 6	SX9849679030 ± 4	SX9848379012 ± 4	SX9847179005 ± 6	SX9845278991 ± 6	SX9858979200 ± 3	SX9859779173 ± 3	SX9862779204 ± 3	SX9867879215 ± 4	SX9869579315 ± 2	SX9874879326 ± 3	SX9875079298 ± 2	SX9865579233 ± 8	SX9914179907 ± 6	SX9907380039 ± 3	SX9870079311 ± 4	SX9873079319 ± 3
date recorded	12/06/2019	14/06/2019	14/06/2019	14/06/2019	14/06/2019	24/07/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	02/08/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	05/09/2019	05/09/2019	05/09/2019	27/06/2019	23/08/2019	23/08/2019	05/09/2019	05/09/2019
Live vegetation cover (%)	80	80	95	95	100	90	97	70	50	60	80	-	-	70	-	-	95	97	92	85	95	90	80	-	100	90	90	90
Bare ground (%)		10	5	3	0	5	3	30	50	40	20			30			5	3	6	12	5	5	20			10	10	10
Litter (%)	20	10	10	2	0	5						0	0	0	0	0			2	3	3	5						5
MAVIS NVC community prediction and goodness of fit score	H1d 55.68	SD6g 37.11	SD7 38.39	SD10 37.82	SD6g 44.33	SD6g 43.29	SD6g 36.04	SD7c 41.48	SD7c 45.75	SD7e 39.96	SD7c 43.03	SD7 30.68	SD7 46.60	SD7c 43.39	SD7c 51.02	SD6g 41.98	SD7c 38.79	SD7a 35.51	SD7c 42.51	SD7c 40.96	SD7c 48.40	SD7c 46.91	SD7c 52.58	SD7c 44.30	SD7d 34.87	SD6d 23.67	OV27 28.69	SD6g 54.18
NVC community as mapped	SD7	SD7	SD7	SD7	SD7	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7b	SD7c	SD7c	SD7c	SD7c	SD7c	SD7c	SD7c	SD7c	SD7/W24	SD7/W24	SD7/W24	SD7/W24
cover-weighted Ellenberg values																												
Light	7.9	8.0	7.9	8.0	7.7	7.7	7.8	8.8	8.6	8.2	8.5	7.2	8.1	7.6	7.4	7.4	7.2	7.4	7.4	7.2	8.0	8.2	7.9	7.2	7.6	7.8	6.2	7.7
Wetness	3.1	3.1	3.2	2.9	3.4	4.3	4.6	3.6	3.7	3.6	3.8	4.6	3.8	4.4	4.8	4.7	5.0	4.6	4.7	5.0	4.0	4.2	4.3	4.9	3.8	3.4	5.5	4.1
pH	5.2	5.2	5.2	5.1	5.7	5.6	5.7	5.9	5.8	6.1	5.8	5.8	5.4	5.7	5.9	5.7	5.5	5.6	5.4	5.8	5.7	5.6	5.9	5.6	6.0	5.9	6.3	5.8
Fertility	2.2	2.9	2.7	2.2	2.8	4.0	2.9	2.9	3.1	3.3	3.1	4.2	3.2	3.7	4.3	4.2	3.5	3.5	3.4	4.0	3.0	3.3	3.4	3.7	2.7	2.6	5.8	3.4
Carex arenaria	9	4	4	8	9	5	6	3	4	4	4	6	6	5	4	6	2	5	5		4	3	4	3	4	2	3	5
Ammophila arenaria	2	5	4	2	4	2		7	7	5	8		4	4	4	4			1	1	6	7	6		2	3	1	5
Hypochaeris radicata		1	1	1		1		2	2	1	2	2	4	3	4	4	5	6	4	5	3	3	3	4	1			3
Rubus fruticosus agg.		4			3	2	1				1	6	3	5	7	7	2	2	1	4	2		2	2	1	4	8	2
Aira praecox	1	7	6	5		3		3	3	3	3		3	2							3	3	-1		3	3		

Quadrat #	19	20	21	22	23	47	48	53	54	55	56	113	114	115	116	117	29	30	31	32	96	99	105	112	66	67	97	98
Leontodon saxatilis						3	4		2	1	2	2	1	2	1	2	2			2	2	3	2	3				
Bare ground/litter/water/rock/mud		1				5	3	6	7	7	5	5	5	6	4			4	4	4				3				
Festuca rubra agg.						5	4	2	4	4	2		4	4	5	5					3		-1	3	2			2
Rumex acetosella	2		3	2					2		1			2			2	3	4		3	3		2	3	2		3
Euphorbia portlandica		3	3	3	1			1			2	1	1			1					1		2	1	4	3	1	
Hypnum cupressiforme sens.lat.	5		5			4		2			3	3	3	3	3	4					1	3						
Rhinanthus minor												4	3	6	6	5	6	7	5	5			6	8				
Trifolium arvense								3	3	2	1	3	4	2	2	1		1				1						
Plantago lanceolata												3			3		4	5	5	2		2	3	3				3
Senecio jacobaea	2	1		1					1				1				2		1		1	1			1			
Oenothera stricta						2		4	3	3	3			3	4							3				1		
Arenaria serpyllifolia		1	2					2	3	3	3								1		3				3			
Euphrasia officinalis agg.															2		2	2	3	2	2	1	1	2				
Dactylis glomerata												4		3	3			1	2			2		2				4
Holcus lanatus						2	2										2	3	3	5				3				1
Galium verum			4																3	2	5		1		8			4
Anthoxanthum odoratum												2					5	2	4	3				4				1
Syntrichia ruralis var. ruraliformis							3	3	3	4		2	3	2														
Oenothera glazioviana			2									4	4			4				1	1			1				
Poa humilis																	3	4	3		2	2	1		2			
Vulpia bromoides			3										4		3			3	2			1		1				
Cerastium semidecandrum		5	3						2	2	1						1											1
Cerastium diffusum			1	2				2					2	1										1	3			
Hypnum cupressiforme var. lacunosum		7		7						3	4														4	6		
Lotus corniculatus							5										4	4	1	4				3				
Ononis repens													2	3	5				1	3			5					
Plantago coronopus							4								1				1	2	2	3						
Rubia peregrina	3				3					4													1				3	
Cladonia [spp]												4			1	5					1		1					
Elytrigia juncea						2					2									2		2			1			
Phleum arenarium								3	3	3											1		-1					
Luzula campestris										1	1						1		1				1					
Sedum album				4	6									3												8		
Arrhenatherum elatius						4														3							4	2
Vulpia fasciculata								4	3	4	2																	

Quadrat #	19	20	21	22	23	47	48	53	54	55	56	113	114	115	116	117	29	30	31	32	96	99	105	112	66	67	97	98
Rosa canina agg.					4																		1				4	2
Bromus hordeaceus																			2		2	3						2
Erodium cicutarium agg.		3	2	3																		1						
Dicranum scoparium	3											2			2			1										
Polypodium vulgare sens.str.										1	3										1		2					
Ulex europaeus										1		2												1			2	
Centaurium erythraea																1		1	1						1			
Acrocarpous moss							3		4	3																		
Brachythecium mildeanum								4			3											2						
Rosa seedling/sp																	3	3	2									
Catapodium rigidum										3	1														2			
Pilosella officinarum													2										1	3				
Geranium rotundifolium		1	1		2																							
Vicia hirsuta		1						1			1																	
Agrostis capillaris																						4		4				
Honckenya peploides																							3		4			
Galium mollugo												3	2															
Polypodium vulgare sens.lat.						3										2												
Sedum acre			2																						3			
Spiranthes spiralis																						2	3					
Valerianella locusta		2	3																									
Iris foetidissima					3																				1			
Calystegia soldanella								1	2																			
Cerastium glomeratum		1	2																									
Vicia sativa					2						1																	
Crepis capillaris																						1	1					
Linum catharticum																	1			1								
Myosotis discolor			1	1																								
Poa pratensis sens.lat.			1								1																	
Raphanus raphanistrum subsp.maritimus																											1	1
Sonchus oleraceus			1		1																							
Taraxacum agg.																						1	1					
Umbilicus rupestris	1																										1	
Veronica arvensis	1			1																								
Agrostis [spp]																					5							

Quadrat #	19	20	21	22	23	47	48	53	54	55	56	113	114	115	116	117	29	30	31	32	96	99	105	112	66	67	97	98
Bryum [spp]																									3			
Juncus articulatus							3																					
Ophioglossum vulgatum							3																					
Peltigera canina																									3			
Trifolium seedling/sp																							3					
Agrostis stolonifera							2																					
Erodium moschatum																										2		
Homalothecium lutescens												2																
Hypericum perforatum																	2											
Sisyrinchium montanum																	2											
Anisantha sterilis					1																							
Asparagus officinalis																											1	
Cerastium fontanum																		1										
Erigeron karvinskianus																							1					
Galium aparine					1																							
Geranium molle																						1						
Geranium robertianum					1																							
Hedera helix																											1	
Lagurus ovatus										1																		
Leontodon autumnalis																	1											
Lupinus arboreus						1																						
Odontites vernus																											1	
Phragmites australis																								1				
Pleurocarpous bryophyte																							1					
Prunella vulgaris																	1											
Ranunculus repens																						1						
Rosa canina (g)																								1				
Sambucus nigra																											1	
Sedum [spp]											1																	
Sedum anglicum																												1
Sedum anglicum/acre																							1					
Senecio vulgaris																								1				
Trifolium dubium																	1											
Trifolium pratense																	1											
Trifolium repens																		1										

8.5.6 SD11 *CAREX ARENARIA-CORNICULARIA ACULEATA* DUNE COMMUNITY

Quadrat #	49	50	51	52
Grid reference ± estimated GPS precision	SX9831078898 ± 4	SX9830478882 ± 3	SX9828978877 ± 4	SX9828978884 ± 6
date recorded	02/08/2019	02/08/2019	02/08/2019	02/08/2019
Live vegetation cover (%)	99	85	75	70
Bare ground (%)	1	15	25	30
Litter (%)		2		
MAVIS NVC community prediction and goodness of fit score	SD6g 46.63	SD7e 27.55	SD7 36.89	SD7c 38.68
NVC community as mapped	SD11	SD11	SD11	SD11
cover-weighted Ellenberg values				
Light	8.5	8.3	8.5	8.6
Wetness	4.1	3.1	3.7	3.7
pH	5.7	5.7	5.6	5.7
Fertility	2.9	2.6	3.0	3.0
Ammophila arenaria	7	2	5	6

Quadrat #	49	50	51	52
Cladonia rangiformis	6	6	4	4
Hypnum cupressiforme var. lacunosum	2	6	6	5
Carex arenaria	4	4	4	4
Bare ground/litter/water/rock/mud		4	5	6
Leontodon saxatilis	2	3	2	3
Oenothera stricta		2	4	4
Aira praecox		3	3	3
Vulpia fasciculata		4	2	2
Arenaria serpyllifolia		3	2	2
Phleum arenarium		2		3
Syntrichia ruralis var. ruraliformis		3	2	
Hypochaeris radicata	1		2	1
Luzula campestris	1	1	2	
Rumex acetosella			2	2
Aira caryophyllea		3		
Anthoxanthum odoratum	3			
Centaurium erythraea	2		1	
Cerastium semidecandrum		2		1
Euphorbia portlandica			2	1
Pseudoscleropodium purum	3			
Acrocarpous moss		2		
Agrostis stolonifera	2			
Bryum [spp]	2			
Dicranum scoparium	2			
lichen (indet)		2		
Plantago coronopus			2	
Polypodium vulgare sens.str.	2			
Arrhenatherum elatius				1
Cerastium glomeratum		1		

Quadrat #	49	50	51	52
Galium parisiense			1	
Myosotis discolor		1		
Oenothera glazioviana	1			
Veronica arvensis			1	

8.5.7 SD12 *CAREX ARENARIA-FESTUCA OVINA-AGROSTIS CAPILLARIS* DUNE GRASSLAND

Quadrat #	1	2	3	7	8	9	10	11	33	34	35	36	45	60	93
Grid reference ± estimated GPS precision	SX9824178891 ± 2	SX9827278990 ± 2	SX9849479242 ± 2	SX9823478884 ±	SX9810978874 ± 2	SX9812478881 ± 2	SX9810978880 ± 3	SX9812478858 ± 3	SX9824778983 ± 4	SX9826378966 ± 4	SX9829678989 ± 4	SX9828678992 ± 3	SX9821578822 ± 4	SX9827878979 ±	SX9853879267 ± 4
date recorded	23/05/2019	23/05/2019	23/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019	16/05/2019	03/07/2019	03/07/2019	03/07/2019	03/07/2019	24/07/2019	10/05/2019	05/09/2019
Live vegetation cover (%)	89	96	90	65	100	100	100	100	80	90	95	95	90	99	95
Bare ground (%)	11	4	10	30	0		0	0	10	5	2	2	5	1	5
Litter (%)	0	1		5					10	5	3	3	5		
MAVIS NVC community prediction and goodness of fit score	SD7e 28.90	SD12a 35.69	U1b 27.11	U1b 18.52	OV27 40.37	SD12a 46.00	SD7c 40.08	SD7c 44.13	SD12 46.86	SD12a 38.30	U1f 43.76	U1 42.02	SD7e 42.69	SD12 35.25	SD7a 31.54
NVC community as mapped	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12	SD12
cover-weighted Ellenberg values:															

Quadrat #	1	2	3	7	8	9	10	11	33	34	35	36	45	60	93
Light	7.7	7.3	7.9	7.9	7.0	7.1	7.2	7.3	7.1	7.1	6.9	7.1	7.3	7.4	7.3
Wetness	4.5	5.4	4.2	4.1	5.7	5.0	5.2	5.5	4.4	5.1	4.6	4.7	4.8	5.1	4.6
pH	5.4	5.1	5.7	5.3	5.0	5.1	5.2	5.3	4.5	4.4	4.7	5.3	5.5	5.1	5.9
Fertility	4.1	3.5	3.4	3.7	3.7	3.8	3.8	3.9	2.9	2.9	3.5	3.6	3.8	3.6	4.6
Anthoxanthum odoratum	3	6			8	5	7	7	5	7		5	2	4	
Carex arenaria	6	5	3	1		4	1		7	5	6	4	3	4	5
Agrostis capillaris		2		1		5	1	1	7	5	8	5	4		3
Luzula campestris	1	3			3	4	4	4	3	3	3	2	3	4	3
Festuca rubra agg.		4			3	4	5	5				3	5	4	3
Rhytidiadelphus squarrosus		3			7	6			4	3				7	
Rumex acetosella	2	1	1		2	1	2	2	2	2	1	2	2	1	4
Rubus fruticosus agg.					4		1	1		1	4	5	2	4	3
Hypnum cupressiforme sens.lat.		3	2				1	1	3		4		5	6	
Hypochaeris radicata	3		5						3	3	3	1	3		3
Plantago coronopus	5	2	5							1	3	3			3
Holcus lanatus	1	5			3	1				1	1		5	4	
Veronica arvensis	2	1	2	3		1	1	1	1		1		2	2	
Dactylis glomerata	1		2		1		2					2	1	2	5
Plantago lanceolata				4		4	3	1	2			2			
Vulpia bromoides	4	2	4								3		3		
Myosotis discolor		3			1		3	3	1					3	
Galium verum			4					1	1			5			3
Poa pratensis sens.lat.					2	4	4	4							
Bromus hordeaceus	-1		4				1	2				2	1		3
Aphanes arvensis agg.	3		3	3			1							2	
Peltigera canina									4		2			4	2
Ornithopus perpusillus		3							2		1	1		4	
Juncus maritimus					3	3		4		1					

Quadrat #	1	2	3	7	8	9	10	11	33	34	35	36	45	60	93
Centaurium erythraea		1					1			1	3	2	2		
Leontodon saxatilis		1						2	2	2	1		2		
Danthonia decumbens		3							3	4					
Arrhenatherum elatius												3			7
Poa annua	6		4												
Vicia sativa	1				-1	2	4	2				1			
Ranunculus bulbosus					4	1	2	2							
Juncus bufonius sens.str.	2	5		2											
Trifolium suffocatum	2		4	3											
Aira praecox											1	3	2		2
Euphrasia officinalis agg.										1	3	1			3
Lotus corniculatus	1							1		2			4		
Trifolium micranthum	3			3				2							
Trifolium subterraneum	2	2		4											
Bare ground/litter/water/rock/mud		4										2		1	
Moenchia erecta		2									1			4	
Montia fontana		3												4	
Cerastium fontanum					2	2						2			
Vulpia [spp]				6											
Achillea millefolium	1				2		1	1							
Bellis perennis	2		1				1	1							
Cerastium glomeratum	1						1	1					2		
Poa humilis	2												1		2
Sagina procumbens		2								2	1				
Polytrichum juniperinum		2												3	
Senecio jacobaea							1	1			1	1			
Cerastium diffusum	1													2	1
Cerastium semidecandrum	1		3												
Erodium cicutarium agg.				3								1			

Quadrat #	1	2	3	7	8	9	10	11	33	34	35	36	45	60	93
Geranium molle			2				2								
Oenothera glazioviana			1	3											
Romulea columnae		1							3						
Trifolium glomeratum												3	1		
Vulpia ciliata subsp. ciliata			4												
Veronica hederifolia					1		1	1							
Parentucellia viscosa								2			1				
Rhinanthus minor	1							2							
Sagina apetala	1		2												
Trifolium arvense												2	1		
Allium [spp]									3						
Cladonia squamules/sp															3
Galium parisiense												3			
Homalothecium lutescens							1	1							
Poa trivialis					1			1							
Rumex acetosa						1	1								
Spiranthes spiralis		1													1
Trifolium dubium			1				1								
Vicia hirsuta						1						1			
Crepis capillaris												2			
Erophila verna				2											
Euphrasia nemorosa													2		
Oenothera stricta												2			
Ophioglossum azoricum		2													
Pleurocarpous bryophyte										2					
Pseudoscleropodium purum		2													
Sedum anglicum															2
Ammophila arenaria									1						
Calliergon cuspidatum						1									

Quadrat #	1	2	3	7	8	9	10	11	33	34	35	36	45	60	93
Euphrasia tetraquetra		1													
Galium aparine								1							
Leontodon autumnalis														1	
Mentha aquatica								1							
Plantago major					1										
Ranunculus acris					1										
Ranunculus repens												1			
Rosa canina agg.											1				
Rumex crispus					1										
Taraxacum agg.								1							
Trifolium repens								1							
Poa infirma	-1														

8.5.8 SD15 *SALIX REPENS-CALLIERGON CUSPIDATUM* DUNE-SLACK COMMUNITY

Quadrat #	4	59	61	62	63	64	65	72	73	74	75	76	77	78	79	80
Grid reference ± estimated GPS precision	SX9857879243 ± 3	SX9850179189 ± 4	SX9819778880 ± 3	SX9821578881 ± 3	SX9825678909 ± 3	SX9825978919 ± 3	SX9827278933 ± 3	SX9849779181 ± 6	SX9849379153 ± 3	SX9846779152 ± 3	SX9847479135 ± 4	SX9847579093 ± 5	SX9849379125 ± 4	SX9849879158 ± 3	SX9851579170 ± 3	SX9851379188 ± 4
date recorded	23/05/2019	27/06/2019	21/08/2019	21/08/2019	21/08/2019	21/08/2019	21/08/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019	27/06/2019
Live vegetation cover (%)	96	-	100	100	95	98	99	100	100	100	100	100	100	100	95	100
Bare ground (%)	1		0	0	5	2	1	0						0	5	
Litter (%)	3		0													
MAVIS NVC community prediction and goodness of fit score	SD16 38.77	MG1c 35.71	SD17d 38.22	SD15 38.68	SD14b 47.44	SD14a 49.54	SD14a 49.43	M27b 40.58	M27b 43.75	M27b 40.00	M27b 43.54	SD16b 43.81	SD16b 43.48	SD16b 39.12	SD16 32.92	SD15c 42.30
NVC community as mapped	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c	SD15c
cover-weighted Ellenberg values:																
Light	7.3	7.1	7.2	7.1	7.6	7.8	7.6	7.0	7.0	7.0	7.0	7.2	7.3	7.3	7.6	7.4

Quadrat #	4	59	61	62	63	64	65	72	73	74	75	76	77	78	79	80
Wetness	5.1	6.5	7.0	6.9	6.9	7.6	7.4	7.4	7.6	7.4	7.6	6.4	6.2	6.6	7.3	7.2
pH	5.6	6.1	6.3	6.6	6.3	6.3	6.2	6.2	6.4	6.4	6.4	5.8	5.9	6.1	7.0	6.3
Fertility	2.8	5.2	4.9	5.4	4.0	3.5	3.9	5.0	5.3	5.1	5.2	3.9	3.8	3.8	4.3	4.3
Holcus lanatus		4		1				5	5	5	3	6	6	5	3	3
Hydrocotyle vulgaris			4		5	8	7					4	4	5	3	5
Calliergon cuspidatum			3	6	6	7	6					4	3	2	1	3
Filipendula ulmaria		6						8	7	6	7	3				2
Juncus maritimus	2	2		2		4					2	4	4	5	6	5
Aster agg. (including x versicolor)		3		5				3	4	5	4	3		1		4
Epipactis palustris		1	1		5	5	3					3	2	3	2	4
Salix cinerea		3	3	1	4	3	7	4		3						
Agrostis stolonifera			5	6	6	4	5						2			
Mentha aquatica			4	4	2	3	5					2		3	1	3
Phragmites australis				3				3	5	5	5	2	1			
Cynosurus cristatus	1	3						2	1	2		3	3	5	2	1
Danthonia decumbens	4											6	5	5	1	1
Lotus pedunculatus			1	3	1	1	1	2	1	5	1	2	1			2
Rubus fruticosus agg.		3	3	2		1					2	3		3		4
Juncus articulatus			3		4	4	6					1	1	2		
Vicia cracca		2						4	4	4	4	1		1		
Festuca rubra agg.	4	3								3		3	4	2		
Lotus corniculatus	4											4	4	3	2	2
Pulicaria dysenterica			3	2								3		5	2	3
Potentilla anserina		3	4	2								4				5
Ranunculus acris		2	1					2	1	2	2	3	1	3		
Carex flacca	5											2	3	3	2	2
Dactylorhiza praetermissa		2	1					2			1	3	3	3		1
Leontodon saxatilis			3	3	3	3	3								1	

Quadrat #	4	59	61	62	63	64	65	72	73	74	75	76	77	78	79	80
Prunella vulgaris	1		2	2	1							2		3	2	2
Betula pubescens (g)					3							3	1	3	1	3
Betula seedling/sp		3						3		3	4					
Carex arenaria				1	4	3	5									
Parentucellia viscosa			3	2	1		1	1		2			2			
Anthoxanthum odoratum	3	4		1										3		
Iris pseudacorus			5	5												
Euphrasia officinalis agg.	1		5	2	1											
Ophioglossum vulgatum	1				2	2	3									
Salix seedling/sp												3		1	2	2
Sisyrinchium montanum			1									1		3		3
Molinia caerulea						2									2	4
Arrhenatherum elatius		5						2								
Carex distans			2	1								2	1			
Oenanthe lachenalii												2	2	1		1
Agrostis canina sens.lat.													2	2		2
Rhinanthus minor				2							3			1		
Lycopus europaeus				1	2	1	1									
Rumex acetosa		1	1											1		1
Rosa canina agg.												1		2	1	
Rumex seedling/sp								1	1	2						
Eleocharis palustris						2	2									
Juncus bufonius sens.str.				3								1				
Lythrum salicaria				1			3									
Trifolium dubium			2									2				
Alnus glutinosa			4													
Bare ground/litter/water/rock/mud															4	
Hypnum cupressiforme sens.lat.															4	
Leontodon autumnalis				1	1	1										

Quadrat #	4	59	61	62	63	64	65	72	73	74	75	76	77	78	79	80
Centaurium erythraea			2	1												
Euphrasia nemorosa													2	1		
Ranunculus repens			2		1											
Agrostis capillaris												3				
Trifolium fragiferum			3													
Betula pendula			1	1												
Linum catharticum			1									1				
Syntrichia ruralis var. ruraliformis													1		1	
Bryum pseudotriquetrum	2															
Carex otrubae				2												
Juncus acutiflorus												2				
Ononis repens	2															
Pleurocarpous bryophyte				2												
Potentilla erecta												2				
Spiranthes spiralis	2															
Anagallis minima							1									
Asparagus officinalis				1												
Cardamine flexuosa							1									
Carex ovalis							1									
Carex viridula subsp.oedocarpa						1										
Elytrigia juncea		1														
Epilobium obscurum			1													
Eurhynchium praelongum				1												
Hypericum tetrapterum		1														
Juncus inflexus			1													
Ophioglossum azoricum	1															
Plantago lanceolata	1															
Poa humilis				1												
Poa pratensis sens.lat.						1										

Quadrat #	4	59	61	62	63	64	65	72	73	74	75	76	77	78	79	80
Quercus cerris				1												
Rumex crispus				1												
Trifolium repens				1												

8.5.9 W6 *ALNUS GLUTINOSA-URTICA DIOICA* WOODLAND, W23 *ULEX EUROPAEUS-RUBUS FRUTICOSUS* SCRUB, W24 *RUBUS FRUTICOSUS-HOLCUS LANATUS* UNDERSCRUB MOSAIC

Quadrat #	133	134	135	136	94	95	6	137
Grid reference ± estimated GPS precision	SX9820178931 ± 6	SX9821678951 ± 6	SX9841779070 ± 3	SX9842579108 ± 3	SX9864279311 ± 2	SX9865579326 ± 2	SX9817978695 ± 3	SX9822078801 ± 6
date recorded	03/07/2019	03/07/2019	03/07/2019	03/07/2019	05/09/2019	05/09/2019	24/05/2019	24/07/2019
Live vegetation cover (%)	60	80	90	100	100	100	95	75
Bare ground (%)			10		0		2	25
Litter (%)	40	20		50			3	5
MAVIS NVC community prediction and goodness of fit score	W6 44.05	W6 41.11	W6 46.51	W1 37.84	W23c 38.54	OV27 54.62	OV27 34.78	SD18 30.25
NVC community as mapped	W6	W6	W6	W6	W23/W24	W23/W24	W24/unknown	---
cover-weighted Ellenberg values:								
Light	6.6	6.2	6.2	6.5	6.1	6.1	7.2	5.1
Wetness	7.5	6.9	6.8	6.9	5.8	5.8	4.7	5.0
pH	6.4	6.1	6.4	6.4	6.2	6.2	6.5	6.5

Quadrat #	133	134	135	136	94	95	6	137
Fertility	6.2	6.1	6.1	6.1	5.9	6.1	5.0	5.7
Alnus glutinosa (c)	4	9	6	4				
Salix caprea (c)	8	7	6	8				
Betula pubescens (c)	4	6	3	4				
Bare ground/litter/water/rock/mud	7	5	4	7				5
Rubus fruticosus agg.	3	8	7	6	9	8	4	4
Rumex sanguineus	3	3	4	4				
Galium palustre	4	2	3	4				
Rosa canina agg.	1		2	3	1	4		2
Acer pseudoplatanus (c)	4							8
Mentha aquatica	2	2	4	4				
Solanum dulcamara	5	3				2		2
Urtica dioica		3	3			3		2
Agrostis stolonifera			5	3				2
Anisantha sterilis						2	6	2
Hedera helix		3						7
Iris pseudacorus	5	4						
Arrhenatherum elatius					3		2	3
Galium aparine	1	1				2	1	3
Poa trivialis		2	3	3				
Scutellaria galericulata	2		3	3				
Carex otrubae	2		3	2				
Holcus lanatus			2			3		2
Lycopus europaeus	1	2	1	3				
Ranunculus repens	1	1	3	2				
Salix cinerea	4		2	1				
Aster novi-belgii			4	2				
Carex arenaria							4	2

Quadrat #	133	134	135	136	94	95	6	137
Dactylis glomerata					3	2	1	
Eurhynchium praelongum		3	1				2	
Oenanthe crocata	2	2	2					
Vulpia bromoides							4	2
Agrostis capillaris					2	3		
Alnus glutinosa			3	2				
Crataegus monogyna			4	1				
Iris foetidissima	2	1	1	1				
Phragmites australis			3	2				
Parietaria judaica								4
Rubia peregrina	1				3			
Salix caprea		4						
Tamarix gallica								4
Cerastium diffusum								3
Geranium robertianum	1		2					
Hypnum cupressiforme sens.lat.					1		2	
Luzula campestris							3	
Oenothera glazioviana					1			2
Aira praecox								2
Ammophila arenaria								2
Anagallis arvensis								2
Anthriscus caucalis								2
Anthriscus sylvestris						2		
Arum maculatum		2						
Carex remota		2						
Carex sp.				2				
Cerastium fontanum							2	
Cerastium glomeratum							1	1
Clematis vitalba								2

Quadrat #	133	134	135	136	94	95	6	137
Cochlearia officinalis sens.lat.							2	
Geum urbanum	1		1					
Polypodium vulgare sens.lat.	1							1
Prunella vulgaris			2					
Prunus lusitanica			1					1
Quercus robur (c)	1							1
Rumex acetosella							2	
Sambucus nigra						2		
Silene dioica	1		1					
Angelica sylvestris			1					
Anthoxanthum odoratum								1
Brachythecium [spp]							1	
Brachythecium rutabulum			1					
Bromus hordeaceus								1
Cardamine pratensis			1					
Carduus tenuiflorus								1
Cornus sanguinea	1							
Dryopteris dilatata	1							
Erodium lebelii								1
Euphorbia portlandica							1	
Festuca rubra agg.								1
Fumaria muralis								1
Geranium molle							1	
Hypochaeris radicata								1
Lonicera periclymenum		1						
Lychnis flos-cuculi			1					
Phyllitis scolopendrium	1							
Plantago coronopus								1
Plantago lanceolata					1			

Quadrat #	133	134	135	136	94	95	6	137
Polypodium vulgare sens.str.					1			
Quercus ilex (c)								1
Raphanus raphanistrum subsp.maritimus						1		
Rosa arvensis				1				
Ruscus aculeatus		1						
Sonchus asper								1
Vicia cracca				1				
Vicia sativa							1	
Zantedeschia aethiopica		1						
Cardamine [spp]							-1	

8.6 LIST OF PLANT SPECIES RECORDED IN THE STUDY AREA IN THE PRESENT SURVEY

	Species	English name
1	*Acer pseudoplatanus*	Sycamore
2	*Achillea millefolium*	Yarrow
3	*Agrimonia eupatoria*	Agrimony
4	*Agrostis capillaris*	Common Bent
5	*Agrostis stolonifera*	Creeping Bent
6	*Aira caryophyllea*	Silver Hair-grass
7	*Aira praecox*	Early Hair-grass
8	*Alnus glutinosa*	Alder
9	*Amblystegium humile*	
10	*Ammophila arenaria*	Marram
11	*Anacamptis pyramidalis*	Pyramidal Orchid
12	*Anagallis arvensis*	Scarlet Pimpernel
13	*Anagallis minima*	Chaffweed
14	*Angelica sylvestris*	Wild Angelica
15	*Anisantha sterilis*	Barren Brome
16	*Anthoxanthum odoratum*	Sweet Vernal-grass
17	*Anthriscus caucalis*	Bur Chervil
18	*Anthriscus sylvestris*	Cow Parsley
19	*Aphanes arvensis agg.*	
20	*Arenaria serpyllifolia*	Thyme-leaved Sandwort
21	*Armeria maritima*	Thrift
22	*Arrhenatherum elatius*	False Oat-grass
23	*Arum maculatum*	Lords-and-Ladies
24	*Asparagus officinalis*	Garden Asparagus
25	*Asplenium adiantum-nigrum*	Black Spleenwort
26	*Asplenium scolopendrium*	Hart's-tongue
27	*Aster agg.*	
28	*Aster x versicolor*	
29	*Atriplex glabriuscula*	Babington's Orache
30	*Atriplex laciniata*	Frosted Orache
31	*Bellis perennis*	Daisy
32	*Beta vulgaris subsp. maritima*	Sea Beet
33	*Betula pendula*	Silver Birch
34	*Betula pubescens*	Downy Birch
35	*Bidens tripartita*	Trifid Bur-marigold
36	*Bolboschoenus maritimus*	Sea Club-rush
37	*Brachypodium sylvaticum*	False-brome
38	*Brachythecium mildeanum*	Sand Feather-moss
39	*Brachythecium rutabulum*	Rough-stalked Feather-moss
40	*Bromus hordeaceus*	
41	*Bryum bicolor sens.lat.*	
42	*Bryum pseudotriquetrum*	Marsh Bryum
43	*Buddleja davidii*	Butterfly-bush
44	*Cakile maritima*	Sea Rocket
45	*Calliergonella cuspidata*	Pointed Spear-moss
46	*Calystegia soldanella*	Sea Bindweed
47	*Cardamine flexuosa*	Wavy Bitter-cress
48	*Cardamine pratensis*	Cuckooflower
49	*Carduus tenuiflorus*	Slender Thistle

50	*Carex arenaria*	Sand Sedge
51	*Carex demissa*	Common Yellow-sedge
52	*Carex distans*	Distant Sedge
53	*Carex flacca*	Glaucous Sedge
54	*Carex leporina*	Oval Sedge
55	*Carex leporina*	Oval Sedge
56	*Carex otrubae*	False Fox-sedge
57	*Carex pendula*	Pendulous Sedge
58	*Carex pseudocyperus*	Cyperus Sedge
59	*Carex remota*	Remote Sedge
60	*Carlina vulgaris*	Carline Thistle
61	*Catapodium marinum*	Sea Fern-grass
62	*Catapodium rigidum*	Fern-grass
63	*Centaurium erythraea*	Common Centaury
64	*Cerastium diffusum*	Sea Mouse-ear
65	*Cerastium fontanum*	Common Mouse-ear
66	*Cerastium glomeratum*	Sticky Mouse-ear
67	*Cerastium semidecandrum*	Little Mouse-ear
68	*Ceratophyllum demersum*	Rigid Hornwort
69	*Chamerion angustifolium*	Rosebay Willowherb
70	*Cirsium arvense*	Creeping Thistle
71	*Cirsium palustre*	Marsh Thistle
72	*Cladonia rangiformis*	
73	*Clematis vitalba*	Traveller's-joy
74	*Clinopodium vulgare*	Wild Basil
75	*Cochlearia officinalis sens.lat.*	
76	*Conyza canadensis agg.*	Canadian Fleabane
77	*Cornus sanguinea*	Dogwood
78	*Crataegus monogyna*	Hawthorn
79	*Crepis capillaris*	Smooth Hawk's-beard
80	*Crepis vesicaria*	Beaked Hawk's-beard
81	*Crithmum maritimum*	Rock Samphire
82	*Crocosmia x crocosmiiflora*	Montbretia
83	*Cynoglossum officinale*	Hound's-tongue
84	*Cynosurus cristatus*	Crested Dog's-tail
85	*Dactylis glomerata*	Cock's-foot
86	*Dactylorhiza praetermissa*	Southern Marsh-orchid
87	*Danthonia decumbens*	Heath-grass
88	*Dicranum scoparium*	
89	*Dipsacus fullonum*	Wild Teasel
90	*Dryopteris dilatata*	Broad Buckler-fern
91	*Dryopteris filix-mas*	Male-fern
92	*Echinochloa crus-galli*	Cockspur
93	*Eleocharis palustris*	Common Spike-rush
94	*Elytrigia atherica*	Sea Couch
95	*Elytrigia juncea*	Sand Couch
96	*Elytrigia repens*	Common Couch
97	*Epilobium ciliatum*	American Willowherb
98	*Epilobium obscurum*	Short-fruited Willowherb
99	*Epilobium parviflorum*	Hoary Willowherb
100	*Epilobium tetragonum*	Square-stalked Willowherb
101	*Epipactis palustris*	Marsh Helleborine
102	*Erigeron karvinskianus*	Mexican Fleabane
103	*Erodium cicutarium*	Common Stork's-bill

104	*Erodium lebelii*	Sticky Stork's-bill
105	*Erophila verna*	
106	*Eryngium maritimum*	Sea-holly
107	*Euphorbia paralias*	Sea Spurge
108	*Euphorbia portlandica*	Portland Spurge
109	*Euphrasia agg.*	
110	*Euphrasia nemorosa*	
111	*Euphrasia tetraquetra*	
112	*Eurhynchium praelongum*	
113	*Festuca arenaria*	Rush-leaved Fescue
114	*Festuca rubra agg.*	Red Fescue
115	*Filipendula ulmaria*	Meadowsweet
116	*Fumaria muralis*	
117	*Galium aparine*	Cleavers
118	*Galium mollugo*	Hedge Bedstraw
119	*Galium palustre*	Marsh-bedstraw
120	*Galium parisiense*	Wall Bedstraw
121	*Galium verum*	Lady's Bedstraw
122	*Geranium dissectum*	Cut-leaved Crane's-bill
123	*Geranium lucidum*	Shining Crane's-bill
124	*Geranium molle*	Dove's-foot Crane's-bill
125	*Geranium robertianum*	Herb-Robert
126	*Geranium rotundifolium*	Round-leaved Crane's-bill
127	*Geum urbanum*	Wood Avens
128	*Gnaphalium uliginosum*	Marsh Cudweed
129	*Hedera helix*	Common Ivy
130	*Hippuris vulgaris*	Mare's-tail
131	*Holcus lanatus*	Yorkshire-fog
132	*Homalothecium lutescens*	Yellow Feather-moss
133	*Honckenya peploides*	Sea Sandwort
134	*Hordeum murinum*	Wall Barley
135	*Hyacinthoides hispanica*	Spanish Bluebell
136	*Hydrocotyle vulgaris*	Marsh Pennywort
137	*Hypericum perforatum*	Perforate St John's-wort
138	*Hypericum tetrapterum*	Square-stalked St John's-wort
139	*Hypnum cupressiforme sens. lat.*	
140	*Hypnum cupressiforme var. lacunosum*	Roof Plait-moss/ Great Plait moss
141	*Hypochaeris glabra*	Smooth Cat's-ear
142	*Hypochaeris radicata*	Cat's-ear
143	*Ilex aquifolium*	Holly
144	*Iris foetidissima*	Stinking Iris
145	*Iris pseudacorus*	Yellow Iris
146	*Isolepis setacea*	Bristle Club-rush
147	*Juncus acutiflorus*	Sharp-flowered Rush
148	*Juncus articulatus*	Jointed Rush
149	*Juncus bufonius*	Toad Rush
150	*Juncus bulbosus*	Bulbous Rush
151	*Juncus conglomeratus*	Compact Rush
152	*Juncus effusus*	Soft-rush
153	*Juncus gerardii*	Saltmarsh Rush
154	*Juncus inflexus*	Hard Rush
155	*Juncus maritimus*	Sea Rush
156	*Lagurus ovatus*	Hare's-tail
157	*Lathyrus pratensis*	Meadow Vetchling

158	*Lemna minuta*	Least Duckweed
159	*Lemna trisulca*	Ivy-leaved Duckweed
160	*Leontodon saxatilis*	Lesser Hawkbit
161	*Leucanthemum vulgare*	Oxeye Daisy
162	*Linum catharticum*	Fairy Flax
163	*Lolium perenne*	Perennial Rye-grass
164	*Lonicera periclymenum*	Honeysuckle
165	*Lophocolea bidentata sens.lat.*	
166	*Lotus corniculatus*	Common Bird's-foot-trefoil
167	*Lotus pedunculatus*	Greater Bird's-foot-trefoil
168	*Lupinus arboreus*	Tree Lupin
169	*Luzula campestris*	Field Wood-rush
170	*Lycopus europaeus*	Gypsywort
171	*Lythrum salicaria*	Purple-loosestrife
172	*Malus pumila*	Apple
173	*Mentha aquatica*	Water Mint
174	*Moenchia erecta*	Upright Chickweed
175	*Molinia caerulea*	Purple Moor-grass
176	*Montia fontana*	Blinks
177	*Myosotis discolor*	Changing Forget-me-not
178	*Odontites vernus*	Red Bartsia
179	*Oenanthe crocata*	Hemlock Water-dropwort
180	*Oenanthe lachenalii*	Parsley Water-dropwort
181	*Oenanthe pimpinelloides*	Corky-fruited Water-dropwort
182	*Oenothera glazioviana*	Large-flowered Evening-primrose
183	*Oenothera stricta*	Fragrant Evening-primrose
184	*Ononis repens*	Common Restharrow
185	*Ophioglossum azoricum*	Small Adder's-tongue
186	*Ophioglossum vulgatum*	Adder's-tongue
187	*Ophrys apifera*	Bee Orchid
188	*Origanum vulgare*	Wild Marjoram
189	*Ornithopus perpusillus*	Bird's-foot
190	*Pancratium maritimum*	Sea Daffodil
191	*Parentucellia viscosa*	Yellow Bartsia
192	*Parietaria judaica*	Pellitory-of-the-wall
193	*Peltigera canina*	
194	*Persicaria maculosa*	Redshank
195	*Phalaris arundinacea*	Reed Canary-grass
196	*Phleum arenarium*	Sand Cat's-tail
197	*Phragmites australis*	Common Reed
198	*Pilosella officinarum*	Mouse-ear-hawkweed
199	*Plantago coronopus*	Buck's-horn Plantain
200	*Plantago lanceolata*	Ribwort Plantain
201	*Plantago major*	Greater Plantain
202	*Poa annua*	Annual Meadow-grass
203	*Poa bulbosa*	Bulbous Meadow-grass
204	*Poa humilis*	Spreading Meadow-grass
205	*Poa infirma*	Early Meadow-grass
206	*Poa pratensis sens.lat.*	
207	*Poa trivialis*	Rough Meadow-grass
208	*Polypodium vulgare sens.lat.*	
209	*Polytrichum juniperinum*	
210	*Populus alba*	White Poplar
211	*Potamogeton natans*	Broad-leaved Pondweed

212	*Potentilla anserina*	Silverweed
213	*Potentilla erecta*	Tormentil
214	*Prunella vulgaris*	Selfheal
215	*Prunus lusitanica*	Portugal Laurel
216	*Prunus spinosa*	Blackthorn
217	*Pseudoscleropodium purum*	Neat Feather-moss
218	*Pulicaria dysenterica*	Common Fleabane
219	*Pyrus communis agg.*	Pear
220	*Quercus cerris*	Turkey Oak
221	*Quercus ilex*	Evergreen Oak
222	*Quercus robur*	Pedunculate Oak
223	*Ranunculus acris*	Meadow Buttercup
224	*Ranunculus bulbosus*	Bulbous Buttercup
225	*Ranunculus parviflorus*	Small-flowered Buttercup
226	*Ranunculus repens*	Creeping Buttercup
227	*Raphanus raphanistrum subsp. maritimus*	Sea Radish
228	*Reseda luteola*	Weld
229	*Rhinanthus minor*	Yellow-rattle
230	*Rhytidiadelphus squarrosus*	Springy Turf-moss
231	*Romulea columnae*	Sand Crocus
232	*Rosa arvensis*	Field-rose
233	*Rosa canina agg.*	Dog Rose
234	*Rubia peregrina*	Wild Madder
235	*Rubus fruticosus agg.*	Bramble
236	*Rumex acetosa*	Common Sorrel
237	*Rumex acetosa*	Common Sorrel
238	*Rumex acetosella*	Sheep's Sorrel
239	*Rumex conglomeratus*	Clustered Dock
240	*Rumex crispus*	Curled Dock
241	*Rumex sanguineus*	Wood Dock
242	*Sagina apetala*	Annual Pearlwort
243	*Sagina procumbens*	Procumbent Pearlwort
244	*Salix caprea*	Goat Willow
245	*Salix cinerea*	Grey Willow
246	*Salsola kali*	Prickly Saltwort
247	*Sambucus nigra*	Elder
248	*Samolus valerandi*	Brookweed
249	*Schedonorus arundinaceus*	Tall Fescue
250	*Scorzoneroides autumnalis*	Autumn Hawkbit
251	*Scutellaria galericulata*	Skullcap
252	*Sedum acre*	Biting Stonecrop
253	*Sedum album*	White Stonecrop
254	*Sedum anglicum*	English Stonecrop
255	*Senecio jacobaea*	Common Ragwort
256	*Senecio sylvaticus*	Heath Groundsel
257	*Senecio viscosus*	Sticky Groundsel
258	*Senecio vulgaris*	Groundsel
259	*Silene dioica*	Red Campion
260	*Silene flos-cuculi*	Ragged-Robin
261	*Silene latifolia x dioica = S. x hampeana*	
262	*Silene uniflora*	Sea Campion
263	*Sisyrinchium montanum*	Blue-eyed-grass
264	*Solanum dulcamara*	Bittersweet

265	*Solanum nigrum*	Black Nightshade
266	*Sonchus arvensis*	Perennial Sow-thistle
267	*Sonchus asper*	Prickly Sow-thistle
268	*Sonchus oleraceus*	Smooth Sow-thistle
269	*Spergularia rubra*	Sand Spurrey
270	*Spiranthes spiralis*	Autumn Lady's-tresses
271	*Stellaria media*	Common Chickweed
272	*Syntrichia ruralis var. ruraliformis*	Sand-hill Screw-moss
273	*Tamarix gallica*	Tamarisk
274	*Taraxacum agg.*	Dandelion
275	*Taxus baccata*	Yew
276	*Trifolium arvense*	Hare's-foot Clover
277	*Trifolium dubium*	Lesser Trefoil
278	*Trifolium fragiferum*	Strawberry Clover
279	*Trifolium glomeratum*	Clustered Clover
280	*Trifolium micranthum*	Slender Trefoil
281	*Trifolium ornithopodioides*	Bird's-foot Clover
282	*Trifolium pratense*	Red Clover
283	*Trifolium repens*	White Clover
284	*Trifolium subterraneum*	Subterranean Clover
285	*Trifolium suffocatum*	Suffocated Clover
286	*Tripleurospermum maritimum*	Sea Mayweed
287	*Ulex europaeus*	Gorse
288	*Umbilicus rupestris*	Navelwort
289	*Urtica dioica*	Common Nettle
290	*Valerianella carinata*	Keeled-fruited Cornsalad
291	*Valerianella locusta*	Common Cornsalad
292	*Verbascum thapsus*	Great Mullein
293	*Veronica arvensis*	Wall Speedwell
294	*Veronica chamaedrys*	Germander Speedwell
295	*Veronica hederifolia*	Ivy-leaved Speedwell
296	*Vicia cracca*	Tufted Vetch
297	*Vicia hirsuta*	Hairy Tare
298	*Vicia sativa*	
299	*Vicia sativa subsp. segetalis*	Common Vetch
300	*Vicia tetrasperma*	Smooth Tare
301	*Vulpia bromoides*	Squirreltail Fescue
302	*Vulpia ciliata subsp. ciliata*	Bearded Fescue
303	*Vulpia fasciculata*	Dune Fescue
304	*Yucca gloriosa* var. *recurvifolia*	Curved-leaved Spanish-dagger
305	*Zantedeschia aethiopica*	Altar Lily