cornwall environmental consultants LTD





Making Space for Sand
Site No 22 - Penhale
Ecological Assessment

CEC3683
17th December 2024

Document Control

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Rev A			
Rev B			

Disclosure

The information, opinion and advice which we have prepared and provided is true and has been prepared and provided in accordance with the CIEEM's Code of Professional Conduct and the British Standard for Biodiversity – Code of Practice for Planning and Development (2013). We confirm that the opinions expressed are our true and professional bona fide opinions.

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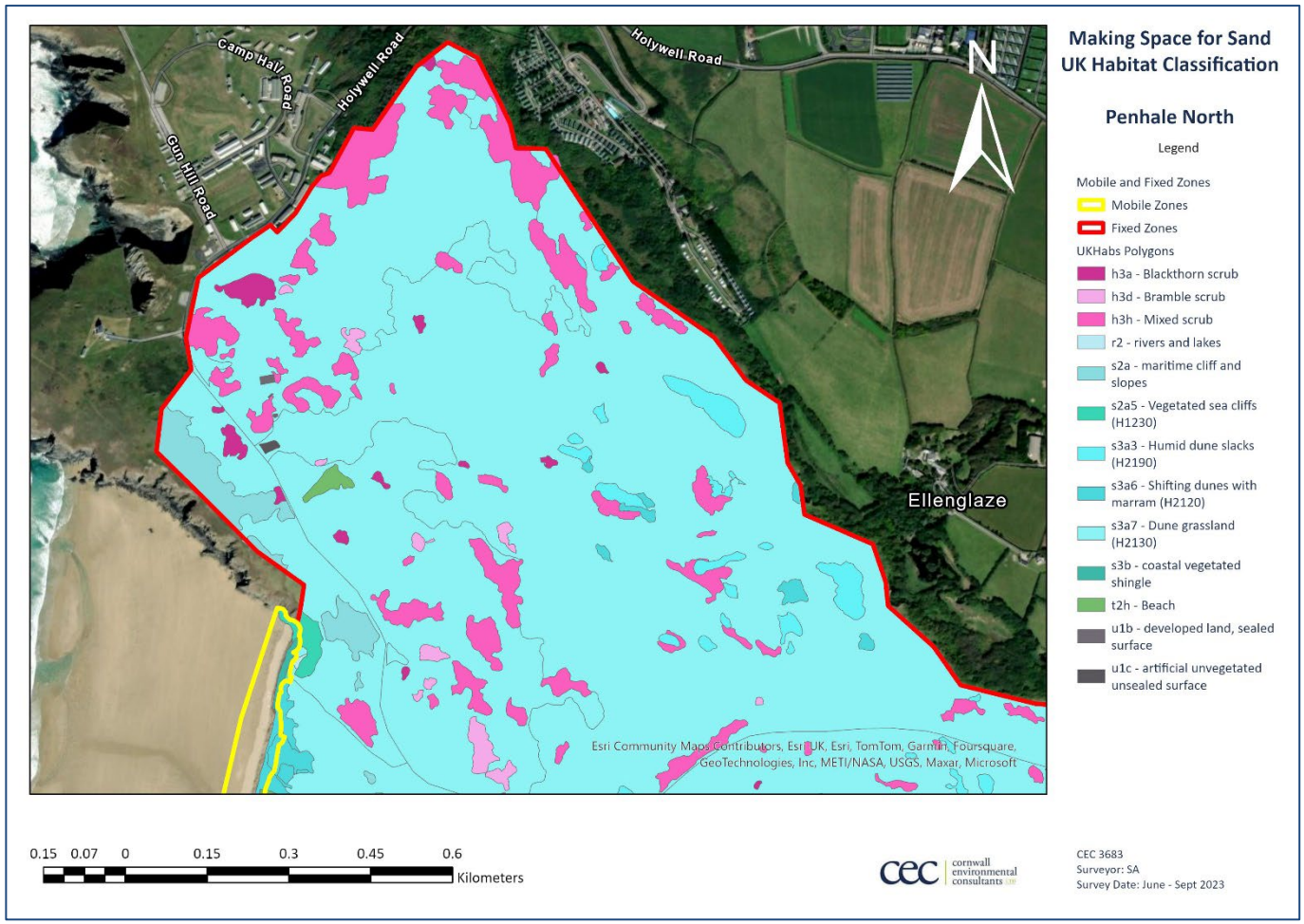
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Summary

Site and methods	
Purpose of report	To identify the ecological constraints and opportunities associated with the management of the dune system at Penhale.
Site assessed	Penhale
Area (ha)	407.22
Location:	Grid reference: SW 76953 56923 What3words: evoked.tricycle.paints
Planning Authority involved	Cornwall Council
Survey methods	Extended Phase 1 Habitat Survey UK Habitat Classification Biodiversity Net Gain Condition Assessment
Surveyor's name	Steve Adams BA(Hons), MSc, MCIEEM, CEnv
Date of assessment	July & September 2023 May & June 2024
Weather on date of assessment	Dry and sunny

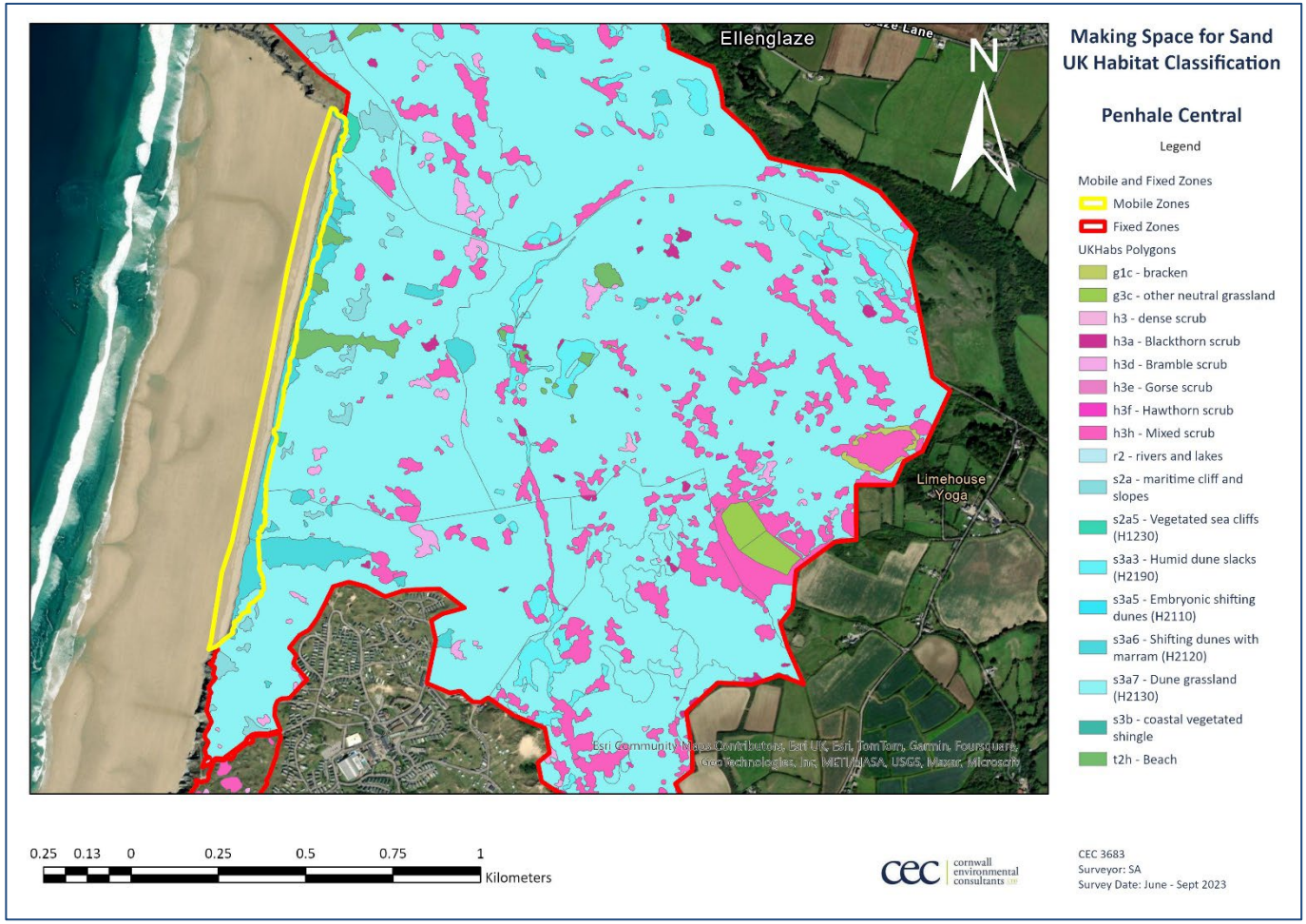
Results	
Designated sites	Penhale Dunes SAC Penhale Dunes SSSI Perranporth Dunes CWS (CK2.4)
Important habitats present	Coastal Sand Dunes Maritime cliff and slope Humid Dune Slack

Non-native invasive species present	Cotoneaster, Montbretia
Protected species present	Nesting Birds Chough Reptiles Badgers Bats
Potential for protected species	
Enhancement recommendations	Reduction in the area of scrub Increase the areas of bare sand Removal of invasive species



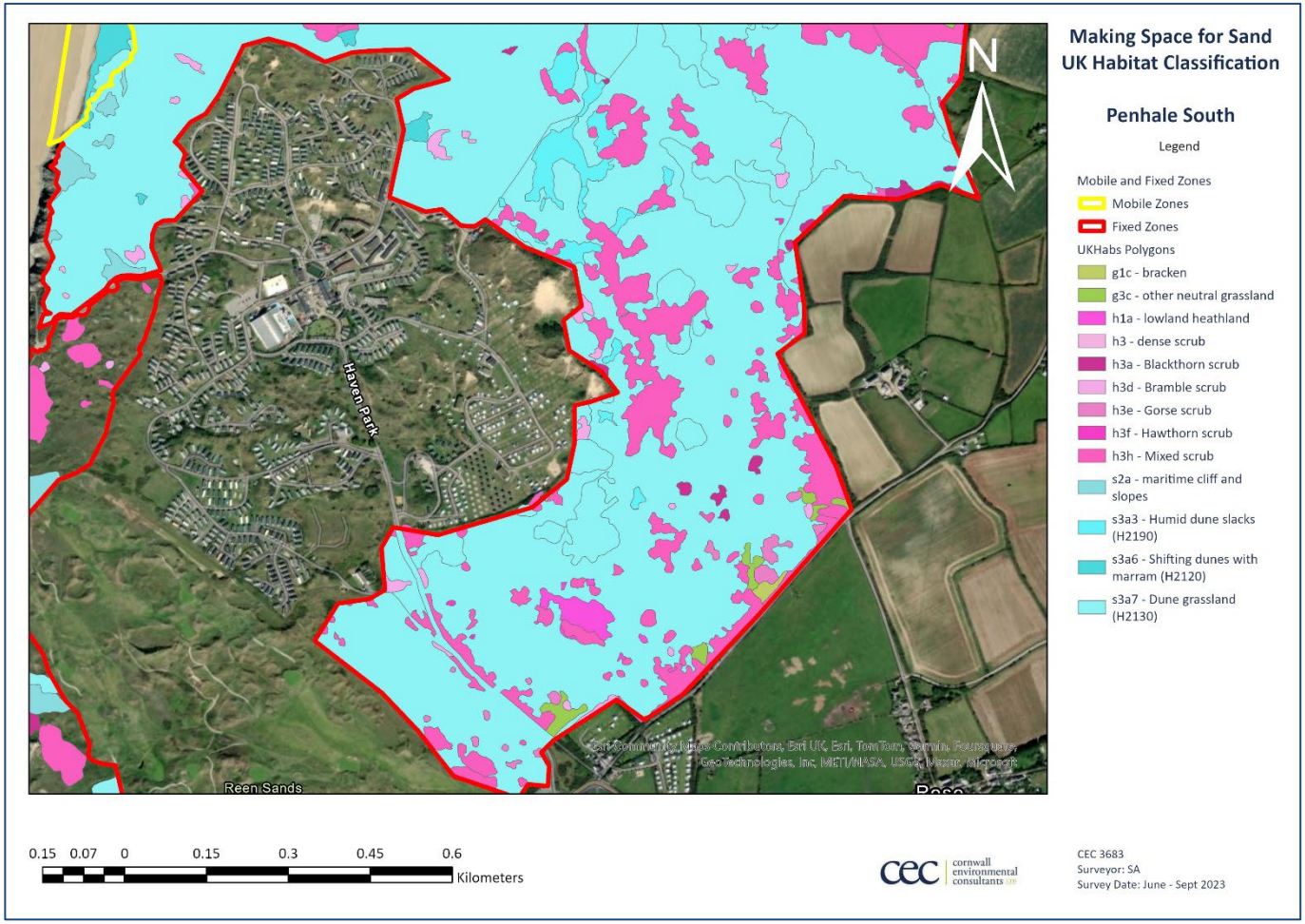
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1. Introduction

1.1. Background

1.1.1. The United Nations General Assembly (UNGA) declared 2021-2030 a 'Decade on Ecosystem Restoration'. The process of ecological restoration involves restoring the biodiversity and integrity of a native reference system (Gann *et al* 2019), to achieve successful restoration, the 'end point' should be defined within the planning stage of a project (Rieger *et al* 2014).

1.1.2. Making Space for Sand is a partnership project from Cornwall Council, with Cornwall Wildlife Trust (CWT), University of Plymouth (UoP), South West Coastal Monitoring (SWCM) and Cornwall Community Flood Forum (CCFF). The project is funded by DEFRA as part of the Flood and Coastal Innovation Programmes, which are managed by the Environmental Agency (EA). The programmes will drive innovation in flood and coastal resilience and adaptation to a changing climate.

1.1.3. The purpose of Stage 1 of the project was to conduct an analysis of dune systems at 40 locations around Cornwall, and by using modelling techniques to predict the future of the dunes in relation to climate change and rising sea levels. A 'State of the Dunes' report will be developed which will include the modelling predictions, ecological, social and heritage findings and considerations.

Table 1: Timeline of events

Date	Assessments Undertaken
MS4S Stage 1 - February 2022	Baseline Assessment and Ground truthing
MS4S – Stage 2 – June 2023	UK Habitat Classification, BNG Baseline

1.1.4. As part of the current stage of works, Stage 2, CEC are working collaboratively with Cornwall Wildlife Trust and the Environmental Records Centres for Cornwall and the Isles of Scilly (ERCCIS) to produce an ecological baseline report for 23 sites which will be used to inform restoration objectives and guide landowners and volunteer groups in these efforts. This will involve the ecological survey of the sites and assessment under Phase 1, UK Habitat Classification and Biodiversity Net Gain survey methodologies, along with the mapping of invasive species recorded on site.

1.1.5. In the recently published DEFRA list of irreplaceable habitats, sand dunes are listed, however an estimated 70% of dune systems have been lost globally during the last century due to anthropogenic pressures such as development and poor habitat management. Sand dunes are an important ecological feature, providing a unique and diverse habitat for flora and fauna, and protection against flooding, storm surges and wave attack (D'Alessandro *et al* 2020). Dunes are a multifunctional landscape and should be managed as such, allowing for interventions. Legally required stabilisation along the Dutch coast has led to a decline in pioneer species and biodiversity, coupled with increased nitrogen deposition and reduction in grazers such as rabbit. This led to a dominant climax community, and it is now recognised that this is creating a fossilised and partly acidified landscape.

1.1.6. The aim of the Making Space for Sand Project is to encourage the more sustainable use and development of the coastal fringe to allow for a more natural, ecosystem approach to coastal management where traditional coastal protection is not possible.

1.2. The Site

1.2.1. Site 22, Penhale (Figure 1) is part of the most extensive dune system in Cornwall, located on the north coast and stretching from Perranporth to Holywell. At its northern end are Ligger Point and Penhale

headlands and the village of Holywell, while at its southern end it joins into the dune system at Perranporth. Its northern part is owned by the MoD and used for training and as such has no public access, while the southern section has open public access. Haven holiday park (Perran Sands) is surrounded on three sides by the dune system and the golf course on the fourth side. The dunes stretch ~1.8km inland from the high tide mark.

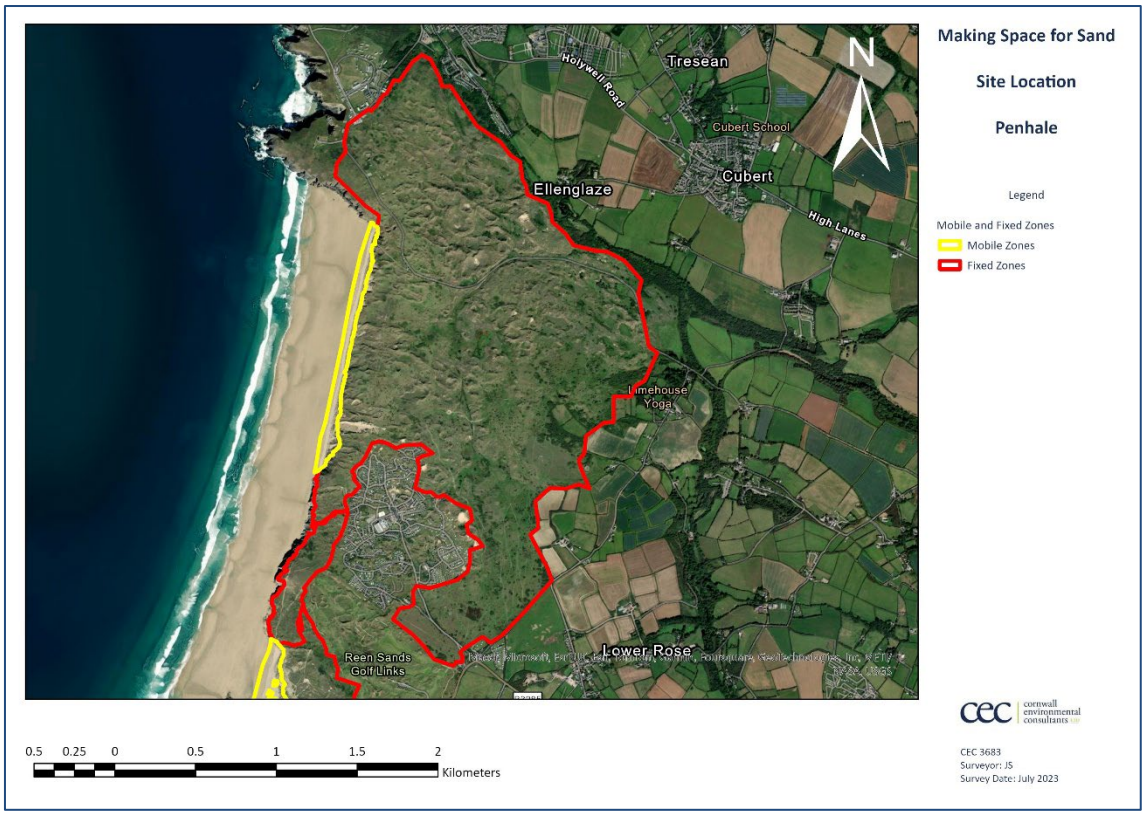


Figure 1: Site location showing Penhale, linking to Perranporth to the south.

1.2.2. This report has been prepared by Steve Adam who has 25 years experience in preparing ecological reports such as this.

1.2.3. This report follows the desk study and ground truthing report 'CEC3683 Making Space for Sand – Penhale – Site 22, February 2022' which details the baseline information from Stage 1 of the project.

2. Proposals

2.1.1. At this stage of the project, Stage 2, there are no plans for the site. However, there is potential for this to change as the project progresses.

3. Conservation Designations

3.1. Conservation Designations

Special Areas of Conservation (SAC)

3.1.1. A SAC is land designated under the Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. This land is designated under the Conservation of Habitats and Species Regulations 2017 (as amended). Land with SACs is considered to be part of a network of high-quality conservation sites, and those considered to be most in need of conservation at a European level. SACs are a European Marine Protected Area.

Sites of Special Scientific Interest (SSSI)

3.1.2. SSSIs are designated under the Wildlife & Countryside Act 1981 where they support habitats and/or species of national importance, this is overseen by Natural England. SSSIs represent the best sites for wildlife and geology. Many SSSIs are internationally important and play an important part in local culture and economy. The natural wildlife and geological features of SSSI's are considered to be irreplaceable parts of the national heritage. These are protected in order to preserve their importance, and to prevent damage and development.

County Wildlife Sites (CWS)

3.1.3. CWS are non-statutory designations for areas of semi-natural habitat in Cornwall, outside of the protection of SSSIs and SACs. CWS were selected based on their high nature conservation value, and on distinctive, important or threatened habitats and species.

4. Legislation

4.1. Legislation

4.1.1. The Wildlife and Countryside Act (HM Government, 1981, as amended) is the main piece of legislation relating to nature conservation in Great Britain. It transposes into British law the Berne, Bonn and RAMSAR Conventions, and the European 'Birds Directive' (CEC, 1979). This legislation covers protection of wildlife (birds, other animals and plants), Sites of Special Scientific Interest (SSSI's) (with some SSSI's also designated as Special Protection Areas, SPA's), National Nature Reserves (NNR's) and RAMSAR sites.

4.1.2. The Conservation of Habitats and Species Regulations (HM Government, 2019) transposes into British law the European 'Habitats Directive' (CEC, 1992), and covers Special Areas of Conservation (SAC's) and European Protected Species (EPS) (see below). It also provides further protection for SPA's and RAMSAR sites.

4.1.3. The Countryside and Rights of Way (CRoW) Act (HM Government, 2000) increases protection for SSSIs and threatened species. It specifies the duty of Local Authorities to further the conservation of listed (UK BAP priority) habitats and species.

4.1.4. The Natural Environment and Rural Communities (NERC) Act (HM Government, 2006) confers a legal duty on every public authority to conserve biodiversity under Section 40(1). Section 41 required the publication of lists of habitats and species of principal importance for the conservation of biodiversity in England. This list contains the habitats and species previously known as UK BAP priorities for conservation, and the terminology of habitats and species of principal importance supercedes the UK BAP terminology. Such features will be referred to as Habitats of Principal Importance (HPIs) and Species of Principal Importance (SPIs), throughout this report.

4.1.5. The Environment Act 2021 (HM Government, 2021) sets clear statutory targets for the recovery of the UK's natural world in four priority areas: air quality, biodiversity, water and waste, and includes an important new target to reverse the decline in UK species abundance by the end of 2030. It will also require new developments to improve and/ or create habitats for nature, and tackle deforestation overseas.

4.1.6. The Hedgerows Regulations 1997 protects historically / ecologically important hedgerows.

4.1.7. The Protection of Badgers Act 1992 provides specific protection for badgers.

5. Policy

5.1.1. Shoreline Management Plan (SMP) is a strategy for managing flood and erosion risk for a particular stretch of coastline over short (0-20 years), medium (20-50 years) and long (50-100 years) term time periods. An SMP is considered to be the most sustainable approach to managing flood and coastal erosions risks. Cornwall adopted SMP2 in 2011, though the epochs date back to a 2005 start. Within SMP there are four policy approaches which have been assigned to stretches of coastlines (known as management units) and will vary between epochs. The four policies as defined by DEFRA are: No Active Intervention (NAI), Hold the Line (HTL), Managed realignment (MR), and Advance the line (ATL). Additional to the main policies, there are five sub policies: Do not Defend (DnD), Repair not Replace (RnR), Local Activity Only (LAO), Natural Features (NF) and Placeholder (P).

5.1.2. Penhale is covered under policy unit MA30: 30.5, Table 2 below shows the policy plans under SMP2.

Table 2: Shoreline Management Plan Policies

Timeframe	SMP Policy	Sub Policy
Epoch 1 (2005 - 2025)	Managed Realignment	Natural Features
Epoch 2 (2025 -2055)	Managed Realignment	Natural Features
Epoch 3 (2055 - 2105)	Managed Realignment	Natural Features

6. Methodology

6.1. Desk Study

6.1.1. As part of Stage 1 of the Making Space for Sand project, a desk study was undertaken recording the key features of the site, including statutory and non-statutory designations, invasive species records, Phase 1 habitat analysis, landscape features and historical features.

6.1.2. Information regarding notable plant species was obtained from the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS), supplementary to the information provided in Stage 1 of the project.

6.1.3. A desk study search for statutory designated sites within 1km of the site was completed using the online Multi-Agency Geographic Information for the Countryside (MAGIC) mapping tool. In addition, the Cornwall Council Interactive mapping website was used to look for County Wildlife Sites (CWS) within the search area.

6.2. Field Survey

6.2.1. A walkover site survey was undertaken to identify plant species and map habitats present. Signs of faunal species were also searched for; including tracks, prints, droppings, hairs, feeding remains, nests and burrows.

UK Habitat Classification (UK Habs) Survey

6.2.2. UKHabs is a surveying technique which maps parcels of land within a defined area and classifies them according to their habitat type, covering terrestrial, freshwater and coastal habitat types. The UKHabs system largely superseded the previous system of Phase 1 Habitat Classification. UKHabs works by classifying habitats at different levels, with level 1 being the differentiation between terrestrial, coastal and freshwater, there are nine ecosystem types at level 2, which filters down in 20 broad habitat types in level 3. In some cases, the habitat will be further classified under levels 4 and 5.

6.2.3. Secondary codes can be applied to a habitat parcel to signify the presence of other features within that habitat.

6.2.4. The UKHabs survey was carried out by Steve Adams during Summer-Autumn 2023 and early summer 2024. The study area included mobile and fixed dune areas as shown in Figure 1. The weather conditions at the time of survey were sunny and hot, although during visits in 2024 there was the occasional light shower.

6.2.5. The survey work was carried out in accordance with the following documents:

- UKHab Ltd: UK Habitat Classification Version 2.0 (2023)
- CIEEM Guidelines for Preliminary Ecological Appraisal (2017)
- BS42020:2013 Biodiversity – Code of practice for planning and development (BSI, 2013)

6.2.6. The scale of habitat classification will be based on the size of the site, where it is considered the site is medium/large (>1ha), the scale of surveying will be approximately 25m x 25m, smaller sites will be surveyed at a finer scale of 5m x 5m.

6.3. Limitations

6.3.1. The conclusions and recommendations presented within this report are based on the current ecological

features identified, and the current dune boundary as shown in Figure 1 and in Map 1. Ecological features can change over time, particularly if site management/ use changes, or in the case of a dune system there is a particularly stormy winter; as a guide it is recommended that this report is valid until June 2025.

6.3.2. The survey was spread through the summer and autumn of 2023 and early summer 2024 catching the optimal season to undertake vegetation surveys: as many plant species are in bloom, accurate identification of the habitats has taken place.

6.3.3. This ecological assessment does not include a search for Tree Preservation Orders (TPOs) or Conservation Area status.

6.4. Habitat Designations

Habitats of Principal Importance – Coastal Sand Dunes

6.4.1. Coastal Sand Dunes (Broad habitat supralittoral sediment) classify as a Habitat of Principal Importance (HPI) under Section 41 of the Natural Environment and Rural Communities Act 2006.

6.4.2. Sand dune habitats are classified as Annex 1 habitats under the EU Habitats Directive 1992, this is transposed into UK law under The Conservation of Habitats and Species Regulations 2017. This requires member states to designate, protect and manage these habitats.

6.4.3. Within the requirements of BNG, Coastal Sand Dunes are listed as irreplaceable habitat, this means that any classification as HPI must be retained.

.

7. Baseline Ecological Conditions

7.1. Sand Dune Ecology

7.1.1. Sand dunes are formed through a successional process. Embryo dunes form closest to the sea where an obstruction is in place and windblown sand accumulates. Pioneer halophytic (salt tolerant) species then have the capacity to colonise this area, the typical species here being lyme and sand couch grasses.

7.1.2. Fore dunes establish where the embryo dunes have created stability in the substrate, marram grass begins to establish and further stabilise the substrate by allowing more sand to accumulate. There is now the addition of more organic matter where marram dies back. Water retention is increased and microhabitats within the dune area allow a wider diversity of vegetation to colonise.

7.1.3. Within the fixed dunes, the diversity of species will out compete marram, red fescue being a key competitor. The diversity of herbs and grasses leads to an increase in the humic content of the substrate making it more suitable for the establishment of scrub species, and eventually woodland.

7.1.4. 'Blowouts' are areas of bare sand where plant roots have been damaged leading to exposed bare sand. Erosion within these areas can be accelerated by excess trampling, grazing and burrowing. Sand sedge is a key coloniser of these areas and starts the process of stabilising the area. Despite this, blowouts and other exposed bare sand areas are an important feature of the dune landscape and ecology.

7.1.5. Dune slacks occur where the terrain drops to the level of the water table and can be seasonally or permanently wet. These areas will support different species to the other areas of the dune including reeds, rushes, sedges and horsetails. Nutrients and organic matter will accumulate in these areas supporting these different plant communities.

7.2. Sand Dune Ecological Management

7.2.1. Sand dune management historically has been to stabilise and prevent erosion. This has been achieved through strategic planting of species such as sea buckthorn, or through preventing access into areas of the dunes. This approach facilitates the stabilisation of fixed dune and scrub areas, but limits the establishment of embryo and foredunes, and the key dune features such as blowouts and dune slacks.

7.2.2. Hard management approaches include the placement of rock armour and other sea defences at the toe of the dune, this limits the dunes capacity to establish seaward. Softer management approaches include the placement of old Christmas trees to act as a barrier to allow sand to accumulate.

7.2.3. Where dunes have become over stabilised through management approaches and limits imposed by human development, within some dune systems artificial recreation of the mosaic of habitats occurs. These approaches include scraping back of scrub and cutting of notches to encourage wind-blown erosion to take place.

7.2.4. Low nutrient levels are essential for dune health. Nutrient enrichment is a key management issue facing dune ecology, with species such as bramble, nettle and dock able to thrive in nutrient rich environments and outcompete dune specialist species. Sources of nutrient enrichment include atmospheric deposition, agricultural runoff and dog waste.

7.3. Indicator Species

7.3.1. The National Plant Monitoring Scheme has compiled a list of 30 plant species as indicators of dune health, with 25 being +ve, and 5 being -ve, and 17 being 'wild flower' level. See Table 3 below for full list.

Table 3: Dune Indicator Species

Name	Common Name	Wildflower Indicator	Indicator +/-	Present at Penhale
Alopercurus geniculatus	Marsh Foxtail		+	
Carex flacca	Glaucous Sedge		+	✓
Carlina vulgaris	Carline Thistle		+	✓
Cerastium arvense	Field Mouse-ear		+	
Cirsium arvense	Creeping Thistle	✓	-	✓
Equisetum palustre	Marsh Horsetail		+	✓
Filago minima	Small Cudweed		+	
Geranium sanguineum	Bloody Cranes-bill		+	
Lysimachia vulgaris	Yellow Loosestrife	✓	+	✓
Medicago lupulina	Black Medick		+	✓
Ophiglossum vulgatum	Adder's tongue	✓	+	
Pilosella officinarum	Mouse-ear Hawkweed	✓	+	✓
Plantago coronopus	Buck's-horn Plantain	✓	+	✓
Potentilla reptans	Creeping Cinquefoil	✓	+	✓
Ranunculus acris	Meadow Buttercup	✓	+	✓
Ranunculus repens	Creeping Buttercup	✓	+	✓
Rosa ruogsa	Japanese Rose	✓	-	
Rubus fruiticosus	Bramble	✓	-	✓
Rumex acetosella	Sheep's Sorrel	✓	+	✓
Sagina nodosa	Knotted Pearlwort		+	✓
Salix repens	Creeping Willow	✓	+	✓
Senecio erucifolius	Hoary Ragwort		+	
Senecio jacobaea	Common Ragwort	✓	-	✓
Thalictrum minus	Lesser Meadow-rue		+	
Trifolium fragiferum	Strawberry Clover		+	✓
Trifolium pretense	Red Clover	✓	+	✓

Name	Common Name	Wildflower Indicator	Indicator +/-	Present at Penhale
Trifolium repens	White Clover	✓	+	✓
Urtica dioica	Common Nettle	✓	-	✓
Valerianella locusta	Common Cornsalad		+	✓
Vica cracca	Tufted Vetch	✓	+	✓

7.3.2. In addition to these species, Red Valarian (*Centranthus ruber*), Alexanders (*Smyrnium olusatrum*), Tamerisk (*Tamerix*) and Sea buckthorn (*Happophae rhamnoides*) have been classified as negative indicators for the purposes of this study, this is based on them being non-native species to Cornwall and having capacity to become invasive in the dune environment. This is in addition the commonly listed and Schedule 9 invasive non-native species.

7.4. Site Description

7.4.1. The dunes at Penhale, rise quickly from the beach to 60-70m above sea level within the first 200m but then drop again, in places as low as 20m above sea level where there are dune slacks. Embryo dunes only occur as a very narrow strip at the base of the dunes before marram covers the dunes. Short dune grassland is the main habitat overall but only occurs as small patches on the seaward facing initial slopes. Once over the ridge, it becomes the dominate habitat. Marram remains frequent to abundant in much of the fixed dune grassland. There are also a few small patches of species rich very short grassland maritime cliff vegetation mainly along the top of the ridge.

7.4.2. Management in the last three years has included large scale creation of dune blow-outs on the seaward face of the dunes and also removal of vegetation from patches on inland areas of dunes. This is to create bare sand, as the dunes had become too stable and had lost their dynamic element of mobile sand, guidance from the sand dune managers handbook suggests 15% of a dune system should be bare sand to allow it to maintain its dynamism.

7.4.3. UK Habitat Classification distribution is shown in Map 1.

7.5. Statutory and Non-Statutory Designated Sites

7.5.1. Designated sites which are on or in proximity to the site are show in Table 3 and Figure 3 below.

Table 4: Designated Sites

Designation	Qualifying Features	Condition
SAC – Penhale lies within the Penhale Dunes SAC.	Fixed coastal dunes with herbaceous vegetation (“grey dunes”) Humid dune slacks Shifting dunes along the shoreline with *Ammophila arenaria* (“white dunes”)	No condition assessment available

Designation	Qualifying Features	Condition
	Dunes with *Salix repens* ssp. *Argentea* (Salicion arenariae) Petalwort (*Petalophyllum falfsii*) Shore dock (*Rumex rupestris*) Early gentian (*Gentianella anglica*)	
Penhale lies within the Penhale Dunes SSSI	Sand dunes Maritime grassland/coastal heathland mosaic Invertebrate assemblages Vascular plant assemblage	Unfavourable - Recovering
CWS - Perranporth Dunes CWS (CK2.4) lies immediately south of Penhale	Coastal sand dunes HPI and SPIs; Petalwort (*Petalophyllum falfsii*) Shore dock (*Rumex rupestris*) Early gentian (*Gentianella anglica*) Grayling (*Hipparchia semele*) Wall (*Lasiommata megera*) silver-studded blue (*Plebejus argus*) small heath (*Coenonympha pamphilus*) adder (*Vipera berus*) skylark (*Alauda arvensis*)	

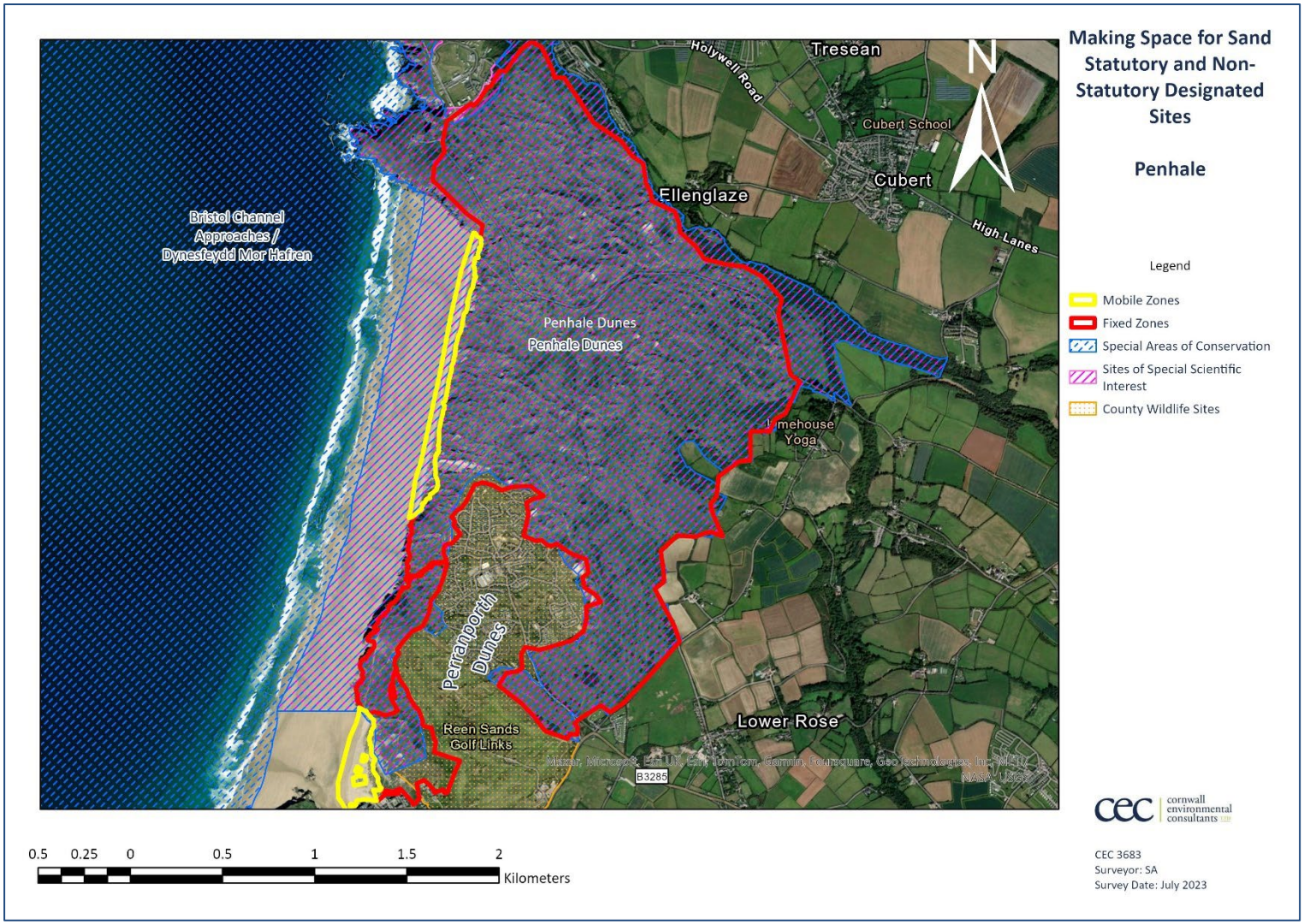


Figure 2: Designated Sites

7.6. Habitats

7.7. Site survey recorded habitats.

7.7.1. Across the site 407.222ha of vegetated habitat was mapped. Areas of beach extending into the sea were not mapped. See Appendix A for full details of recorded habitats on site and their appropriate classifications.

Humid dune slack (H2190) (s3a3)

7.7.2. There is a network of dune slacks to the east of the Haven holiday park,dominated by a mix of grasses, sedges and mat forming herbs. During the summer months, these slacks all dry out but during the winter can be flooded for several months. Some of these slacks tend to be taller with a more grassy sward, with common sedge (*Carex nigra*) and Yorkshire fog (*Holcus lanatus*). Shore dock (*Rumex rupestris*) has been recorded in the past in these slacks. In other slacks marsh pennywort (*Hydrocotyle vulgaris*) is the dominant species with smaller amounts of water mint (*Mentha aquatic*), lesser spearwort (*Ranunculus flammula*) and marsh bedstraw (*Galium palustre*).



Figure 3 Dune slack with creping willow - May 2024

7.7.3. Within the MoD land there is a large dune slack at Bulrush Lake which can hold standing water all year round. While slacks to the north of the road in the MoD area have a strong population of creeping willow (*Salix repens*).

7.7.4. Dune slacks cover approximately 10.26ha which is about 2.5% of the site. Many of these slacks are very small being 500m^2 (0.05ha) or less.

Shifting Dunes with Marram (H2120) (s3a6)

7.7.5. Open dune supports a generally species-poor and open vegetation cover dominated by the dune building grass, marram. This community is found along the seaward edge of the dunes and along the edges of blow-outs. The shifting dunes habitat forms a narrow strip along the base of the dunes (up to 75m wide) on the seaward edge immediately above the beach However, it is also found within the blowouts which includes the natural blowouts and those mechanically created in 2023. The largest of these blowouts stretches about 350m inland to the top of the ridgeThere are also some smaller blowouts inland (up to 1km inland), which have this open marram grassland round their edges..



Figure 4 Shifting dunes with marram at the northern end of Penhale

7.7.6. The main herbs associated with this community were cat's-ear (*Hypochaeris radicata*) and sea bindweed (*Calystegia soldanella*). Ruderal species were also scattered through this community including common ragwort (Senecio jacobaea) and prickly sow-thistle (*Sonchus asper*). Unusually there were several areas which supported southern marsh orchid (*Dactylorhiza praetermissa*).

Dune grassland (s3a7)

7.7.7. This is the main habitat within the site and covers almost 80% of Penhale. Dune grassland occurs further inland where sand accretion has virtually ceased and vegetation has stabilized the dunes. Areas of bare sand are infrequent and often have been formed due to trampling by visitors. These communities can be very species diverse, with coastal species still present, but now non-salt tolerant species also occur. Marram, while still present, is greatly reduced, often occurring in scattered tufts, although there are areas where the sward is still dominated by marram. Instead, red fescue is now the dominant species in a sward that is often only a few centimetres tall but can also be rather rank. These dunes are often referred to as

"grey dunes" or "fixed dunes" are a feature for which the SAC has been designated.

7.7.8. Dune grassland can be very varied in structure and diversity. There are extensive stands at the rear of the dunes with a sward normally between 2-15cm tall. These have a species-rich sward of small herbs and grasses. The dominant grass here is red fescue with frequent buck's-horn plantain (*Plantago coronopus*) and wild thyme (*Thymus polytrichus*). In places salad burnet (Sanguisorba minor) can be abundant. Other distinctive plants in this community are yellow-wort (*Blackstonia perfoliate*) and carline thistle (Carlina vulgaris), and it is also here where the main Cornish population of mountain everlasting (*Antennaria dioica*) can be found as well as scattered clumps of Cornish heath (*Erica vagans*). It is also in these areas that one of the features for designation as a SAC, early gentian (*Gentianella amarella* ssp. *angelic*) is found.



Figure 5 Species-rich short dune grassland

7.7.9. There are also areas where there is a taller, ranker sward. Marram is still present throughout although in lower quantities, but downy oat-grass (*Avenula pubescens*) is also present. While herbs are present, they tend to only by occasional such as ribwort plantain (*Plantago lancelata*), creeping thistle (*Cirsium arvense*) and lady's-bedstraw (*Galium verum*).

7.7.10. This is the most abundant habitat on the site covering 323.3ha or 80.45%. However, within this there are also frequent scattered areas of scrub which were too small to map or difficult to map as they were low growing and hidden within the marram.

Maritime Cliff and Slope (s2a)

7.7.11. This community is normally found in a narrow band along cliff tops, but at this site it can be found almost 200m inland from the cliff tops, although still in exposed positions. Soils are thin with significant amounts

of bare ground and vegetation is usually only a few centimetres high.

7.7.12. Red fescue and buck's-horn plantain, along with wild thyme are the dominant species. Two other species are meant to be constants, thrift and sea mouse-ear (Cerastium diffusum diffusum), however, although present neither are constant. Other species present include thrift (*Armeria maritima*) and sea mouse-ear (*Cerastium diffusum diffusum*), bird's-foot-trefoil (*Lotus corniculatus*), lady's-bedstraw, cat's ear, mouse-ear hawkweed (*Pilosella officinarum*) and sheep's-bit (*Jasione montana*). In early summer spring squill (*Scilla verna*) can also be seen in this community.



Figure 6 Maritime cliff and slope showing the short sward and frequent bare ground

Vegetated Sea Cliffs (H1230) (s2a5)

7.7.13. This vegetation is restricted to the steeper slopes with frequent bare stone, mosses and lichens. Vegetation is restricted to only 1-2cm with wild thyme, buckhorn plantain, mouse-eared hawkweed, bird's-foot-trefoil and sheep's-bit. On the steepest areas there is frequent sea samphire (*Crithmum maritimum*).

Coastal vegetated shingle (s3b)

7.7.14. At the northern end of the beach is a narrow strip of stones and small boulders at the back of the beach. There are scattered plants of sea samphire, sea rocket (*Cakile maritima*), sea bindweed and sea-purslane (*Atriplex portulacoides*).

Beach (t2h)

7.7.15. There are 14 areas of freshly cleared dunes creating bare sand, which has been mapped as beach. The

largest of these is 1.39ha, and is on the dune front and stretches from the back of the beach 310m inland, over the top of the main ridge of frontal dunes. The other areas are all less than 0.4ha. The areas along the dune front were cleared in September 2023 as part of the Dynamic Dunescapes project. The smaller areas inland have been cleared partly by the Dynamic Dunescapes project and partly by the MoD when training exercises are undertaken with excavators.

Lowland heathland (h1a)

7.7.16. There are scattered areas of heathland on Gear Sands which are associated with old spoil areas. The heath is heavily dominated by heather (Calluna vulgaris), while the other usual constants bell heather (*Erica cinerea*) and spring squill are absent. After heather the most frequent plant is the moss *Hypnum cupressiforme*. There is the very occasional ribwort plantain, and bird's-foot-trefoil and round the edges bramble (*Rubus fruticosus* agg.) and blackthorn (*Prunus spinosa*) starting to encroach into this habitat.



Figure 7 Lowland heath on Gear Sands

Dense scrub (h3)

7.7.17. Scattered throughout the dunes are small patches of low growing scrub dominated by wild privet (*Ligustrum vulgare*). This does not have a Level 4 UK Habs habitat so has been mapped as Dense scrub.

Blackthorn scrub (h3a)

7.7.18. This habitat is dominated by blackthorn often with small amounts of bramble especially round the edges, although there can be scattered single bushes of elder (*Sambucus nigra*) or hawthorn (*Crataegus monogyna*). The underlying field layer is often absent, or there is only a sparse cover of ivy where there is one. This scrub can be found in exposed areas where it is wind pruned through to very landward edge

of the site. One problem with mapping this scrub, or encroachment by this scrub is that in many places it only grows to the same height as the marram, or just below, so is difficult to map unless walking through it.

Bramble scrub (h3d)

7.7.19. This habitat is scattered throughout the dunes, with the exception of the exposed frontal sand dunes. It is dominated by bramble, although low growing stands will have marram and other grasses such as false oat-grass or Yorkshire fog growing through them. The taller stands tend to have other species more restricted to the edges.

Gorse scrub (h3e)

7.7.20. This habitat is dominated by European gorse with occasional bramble. It tends to be restricted to the hind dunes. There is often a rank grass round its edges with red campion and foxglove (*Digitalis purpurea*).



Figure 8 Scattered scrub, most of which will have been too small to map.

Hawthorn scrub (h3f)

7.7.21. This scrub community tends to be one of the more species rich scrub communities. While hawthorn is the dominant species, there tends to be some elder, blackthorn, wild privet and bramble. The field layer is usually species-poor, often only ivy (*Hedera hibernica*), although the edges have a rich field flora.

Mixed scrub (h3h)

7.7.22. This is the most diverse scrub with no one scrub species dominating, although often two will be abundant, with others occurring occasionally. Blackthorn and bramble tend to be the two most abundant species

with hawthorn, elder and European gorse being occasional. Wild privet if present will be on the edge of the habitat.

Bracken (g1c)

7.7.23. This is a rare habitat on the dunes, found in only four places and totalling only 0.69ha. They all occur on the eastern edge of the site and are dominated by a mix of bracken and bramble with very little under the bracken canopy and other species such as red campion restricted to the edges.

Other neutral grassland (g3c)

7.7.24. The largest area of this habitat is two fields in the south-eastern corner of the MoD land. Otherwise this habitat tends to be close to the access points along the eastern edge of the dunes where fouling by dogs has enriched the soil. These areas are dominated by coarse leaved tussock grasses, especially false-oat grass and cock's-foot with smaller amounts of Yorkshire fog. Tall herbs such as hogweed, black knapweed (*Centaurea nigra*), nettles (*Urtica dioica*), hogweed (*Heracleum sphondylium*) and sea carrot (*Daucus carota* ssp. *Gummifer*), with smaller herbs like ribwort plantain and bird's-foot-trefoil hidden within the sward.

7.7.25. The grassland fields are dominated by common bent and Yorkshire fog, ribwort plantain and white clover. In places the sward is more species rich with red fescue, bird's-foot-trefoil, germander speedwell and lady's bedstraw. Bramble and blackthorn are starting to encroach along the south and west boundaries; while creeping thistle and spear thistle are frequent alongside these boundaries.

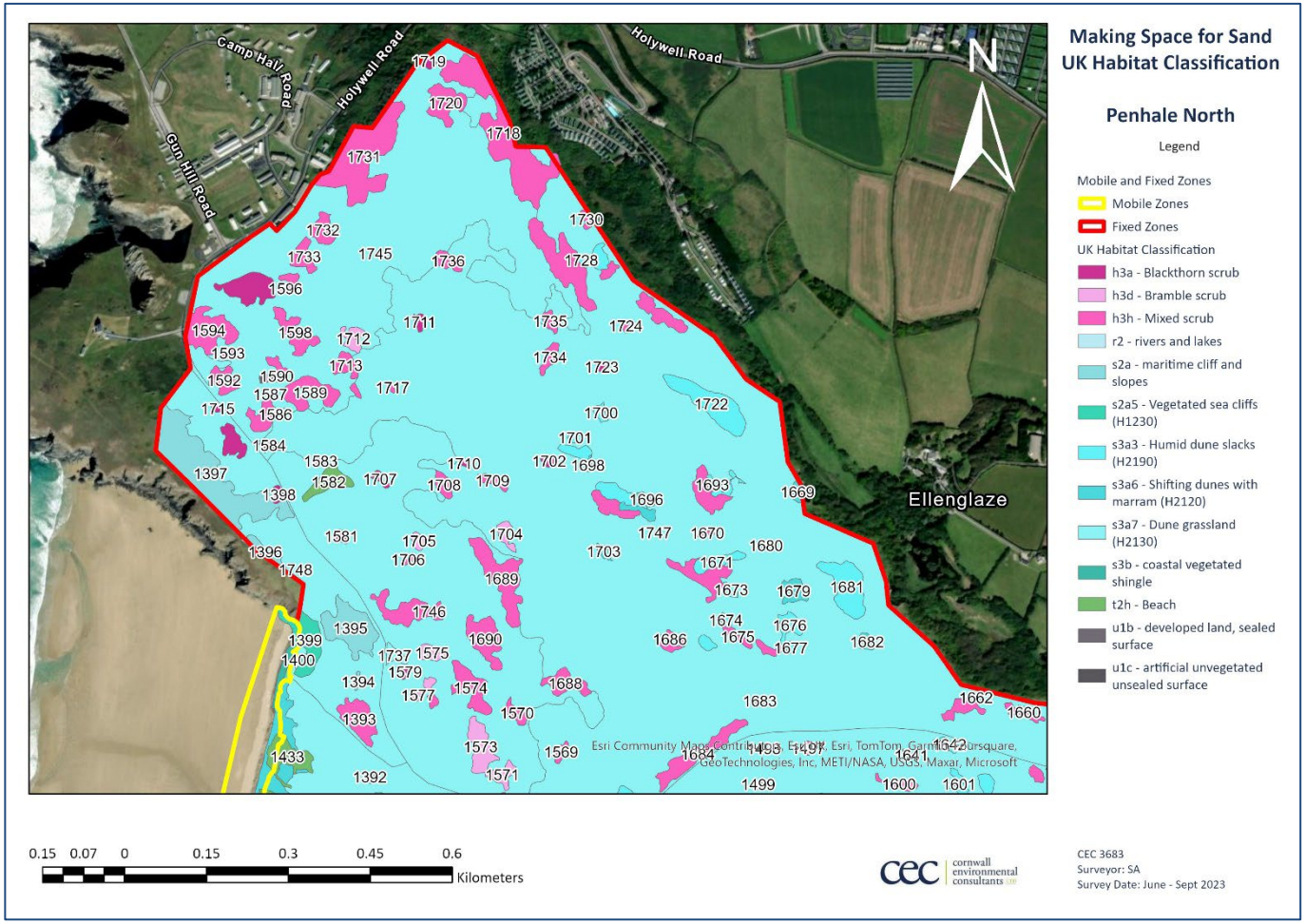
Developed land (u1b)

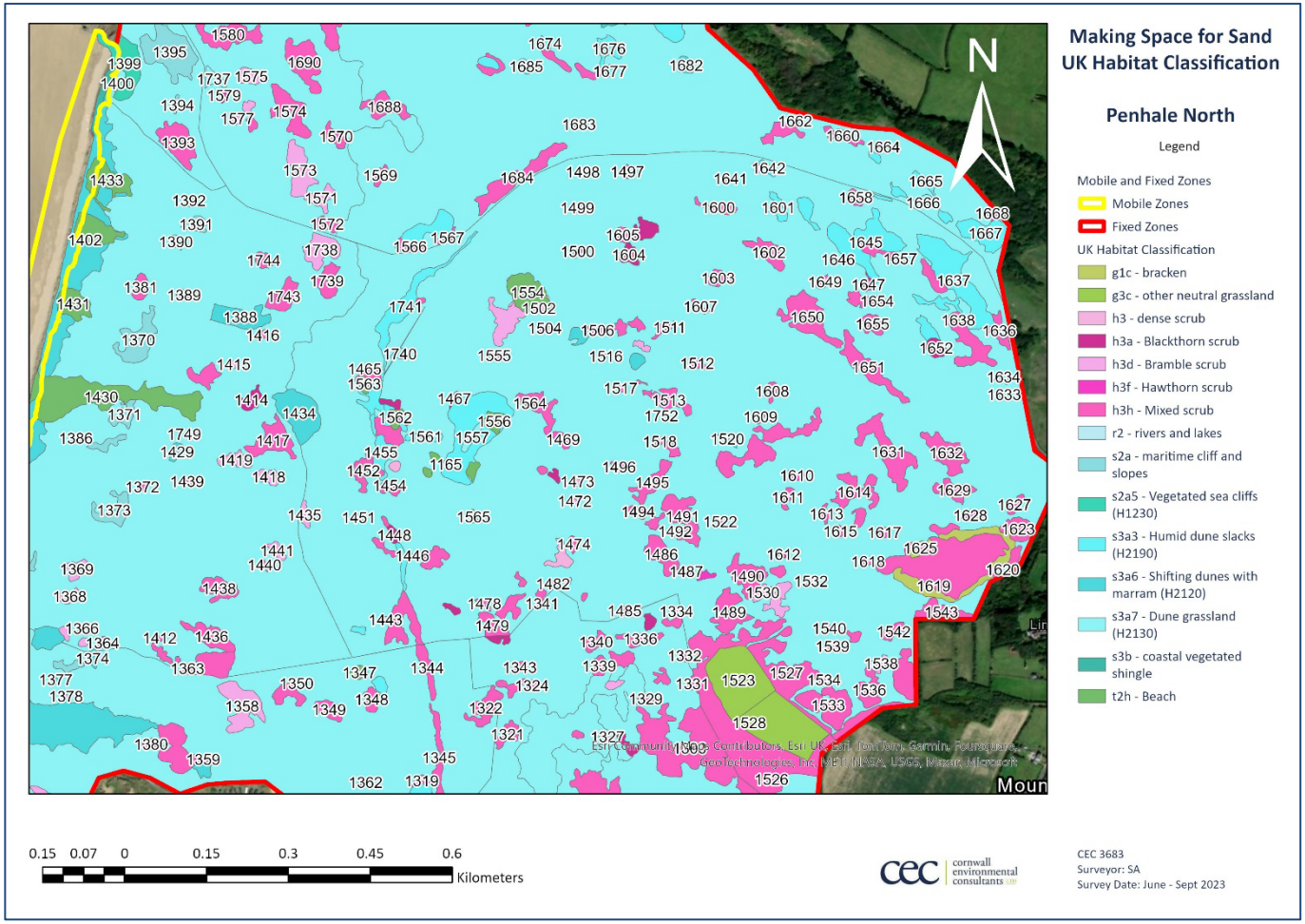
7.7.26. There are three old MoD buildings and a hard-cored car parking area in the north of the site.

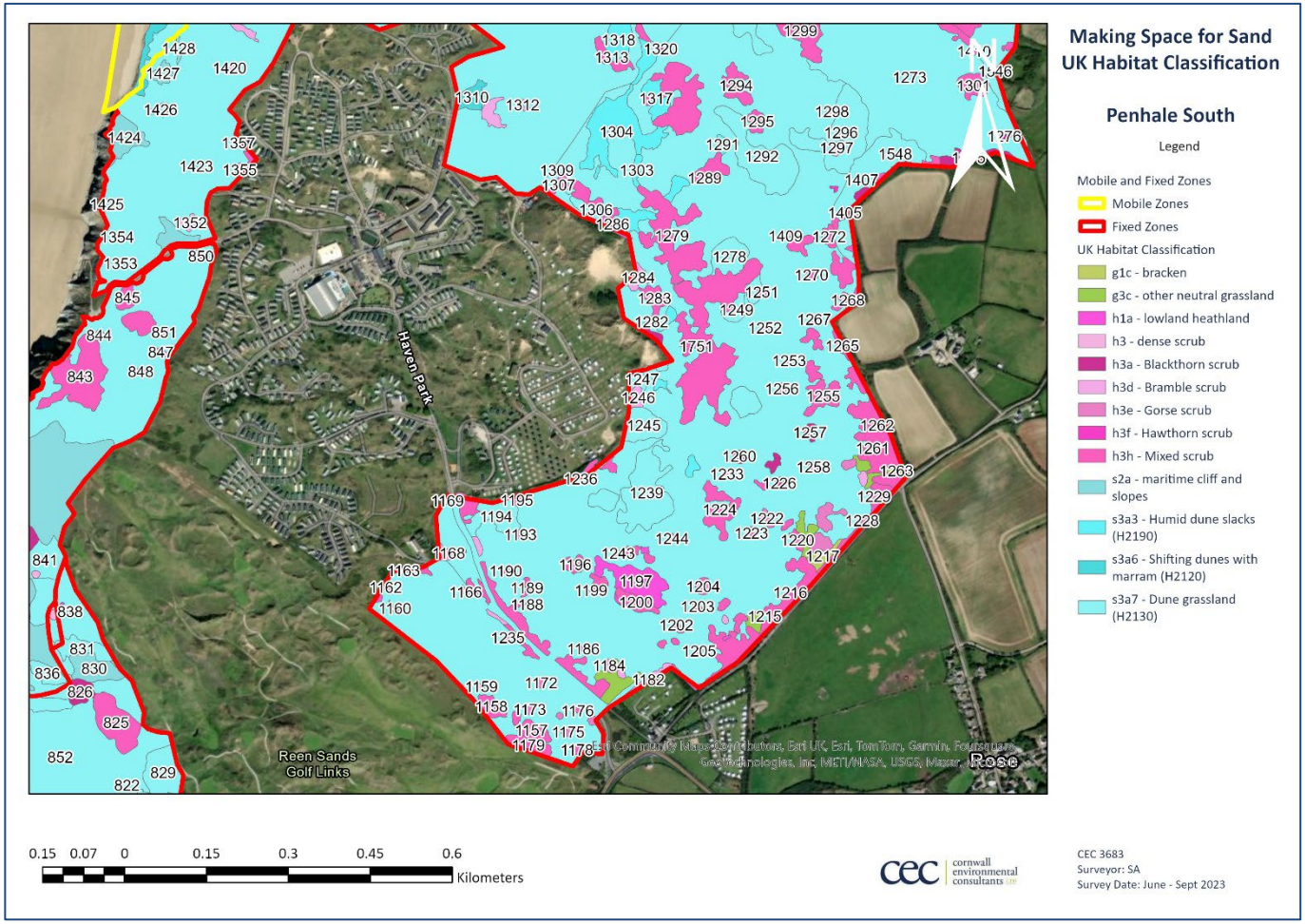
Table 5 Habitats Present with Area and Percentage Cover

Habitat Type	Area Cover	Percentage Cover
Humid dune slack (H2190) (s3a3)	10.2ha	2.5%
Shifting Dunes with Marram (H2120) (s3a6)	9.42ha	2.31%
Dune grassland (s3a7)	323.29ha	79%
Maritime Cliff and Slope (s2a)	4.55ha	1.12&
Vegetated Sea Cliffs (H1230) (s2a5)	0.56ha	0.14%
Coastal vegetated shingle (s3b)	0.15ha	0.04%
Beach (t2h)	3.23ha	0.75%
Lowland heathland (h1a)	0.65ha	0.16%
Dense scrub (h3)	0.5ha	0.12%
Blackthorn scrub (h3a)	2.59ha	0.64%
Bramble scrub (h3d)	4.11ha	1.01%
Gorse scrub (h3e)	0.59ha	0.14%
Hawthorn scrub (h3f)	0.17ha	0.04%
Mixed scrub (h3h)	43.77ha	10.75%

Habitat Type	Area Cover	Percentage Cover
Bracken (g1c)	0.69ha	0.17%
Other neutral grassland (g3c)	2.82ha	0.69%
Developed land (u1b)	0.05ha	0.01%
Total	**407.22ha**	
Total scrub	51.73ha	12.7%


Making Space for Sand
UK Habitat Classification
Penhale North
Legend
Mobile and Fixed Zones
Mobile Zones
Fixed Zones
UK Habitat Classification
h3a - Blackthorn scrub
h3d - Bramble scrub
h3h - Mixed scrub
r2 - rivers and lakes
s2a - maritime cliff and slopes
s2a5 - Vegetated sea cliffs (H1230)
s3a3 - Humid dune slacks (H2190)
s3a6 - Shifting dunes with marram (H2120)
s3a7 - Dune grassland (H2130)
s3b - coastal vegetated shingle
t2h - Beach
u1b - developed land, sealed surface
u1c - artificial unvegetated unsealed surface
N
Camp Hall Road
Holywell Road
Gun Hill Road
Ellenglaze
Esri Community Maps Contributors, Esri, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Maxar, Microsoft
0.15 0.07 0 0.15 0.3 0.45 0.6
Kilometers
CEC 3683
Surveyor: SA
Survey Date: June - Sept 2023


Making Space for Sand
UK Habitat Classification
Penhale North
Legend
Mobile and Fixed Zones
Mobile Zones
Fixed Zones
UK Habitat Classification
g1c - bracken
g3c - other neutral grassland
h3 - dense scrub
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h3d - Bramble scrub
h3f - Hawthorn scrub
h3h - Mixed scrub
r2 - rivers and lakes
s2a - maritime cliff and slopes
s2a5 - Vegetated sea cliffs (H1230)
s3a3 - Humid dune slacks (H2190)
s3a6 - Shifting dunes with marram (H2120)
s3a7 - Dune grassland (H2130)
s3b - coastal vegetated shingle
t2h - Beach
N
0.15 0.07 0 0.15 0.3 0.45 0.6
Kilometers
CEC 3683
Surveyor: SA
Survey Date: June - Sept 2023



Cornwall Environmental Consultants Ltd, Five Acres, Allet, Truro, Cornwall, TR4 9DJ

7.8. Species

Flora

Vascular Plants

7.8.1. The desk study found numerous records for plant species of conservation concern within the 1km search area of the site. Examples of notable records include wild leek (nationally scarce, designated under Cornwall Red Data Book), lesser water-plantain (Cornwall RDB; Great Britain Red List: Near-Threatened), flat-sedge (NERC Section 41; Biodiversity Action Plan; Cornwall RDB; GB RL: Vulnerable), sand soft-brome (nationally scarce), true fox-sedge (nationally rare; NERC S. 41; BAP; GB RL: Vulnerable), hound's-tongue (Cornwall RDB; GB RL: Near-Threatened), variegated horsetail (nationally scarce; Cornwall RDB), musk stork's-bill (Cornwall RDB), Portland spurge (Cornwall RDB), early gentian (NERC S. 41; BAP; Habitat Regulatory Schedule 5; Wildlife and Countryside Act Schedule 8; Cornwall RDB), henbane (Cornwall RDB; GB RL: Vulnerable), sea pea subspecies *maritimus* (Cornwall RDB), fragrant evening-primrose (Cornwall RDB), ivy broomrape (Cornwall RDB), shore dock (nationally scarce; NERC S. 41; BAP; HabReg Sch. 5; WACA Sch. 8; Cornwall RDB; GB RL: Endangered), prickly saltwort (NERC S. 41; BAP; Cornwall RDB; GB RL: Vulnerable), balm-leaved figwort (nationally scarce; Cornwall RDB), autumn lady's tresses (Cornwall RDB; GB RL: Near-Threatened), strawberry clover (GB RL: vulnerable), heath dog-violet (Cornwall RDB; GB RL: Vulnerable), pale dog-violet (nationally scarce; NERC S. 41; BAP; Cornwall RDB; GB RL: Vulnerable), and dune fescue (nationally scarce; Cornwall RDB).

7.8.2. Penhale has a diverse assemblage of vascular plants, within the surveyed area the nationally scarce autumn lady's-tresses, Portland spurge, Babington's leek (*Allium ampeloprasum* var. *babingtonii*) and dune fescue are occasional, but where found are often frequent to abundant. Ivy broomrape is rare but often appears to be close to the top edge of a dune with marram grass. The dunes also support other species that while not designated are of interest such as the white form of wild thyme that was recorded in several locations. Gears Sands is the location of the largest population of mountain everlasting (*Antennaria dioica*) (Figure 11) in Cornwall and is also one of the locations not on The Lizard, that Cornish heath (*Erica vagans*) (Figure 12) can be found. A single plant of a colour variant of scarlet pimpernel (*Lysimachia arvensis* var. *pallida*) (Figure 10) was recorded close to Carn Haut. The author has recorded this species in this location over several summers.



Figure 10 The colour variant of scarlet pimpernel



Figure 11 Mountain everlasting on Gear Sands



Figure 12 One of the larger patches of Cornish heath at Gear Sands

Lower Plants

7.8.3. A specialised survey for non-vascular plants, bryophytes and lichens, was outside the scope of this study. The desk study revealed records for the lower plant species sea-loch egg wrack (BAP), Don's thread-moss, dune thread-moss, and twisting thread-moss (all Cornwall RDB), slender beard-moss (nationally rare; Cornwall RDB), chalk hook-moss, Luisier's tufa-moss, and Starke's pottia (all Cornwall RDB), petalwort (NERC S. 41; BAP; WACA Sch. 8; Cornwall RDB), side-fruited crisp-moss (Cornwall RDB), clustered stonewort (nationally scarce; Cornwall RDB), and *Weissia controversa* var. *densifolia* (Cornwall RDB) within 1km of the site.

7.8.4. The nationally rare scrambled egg lichen (*Gyalolechia fulgens*) can be found scattered along the whole of the seaward edge of Penhale in the short maritime grassland and dune grassland. Penhale is probably the best location in the UK to see this species as it supports between 50-60% of the UK population.

Non-native Invasive Plants

7.8.5. There were several non-native invasive plants recorded during the site survey, these were montbretia, two species of cotoneaster and buddleia. Cotoneaster is particularly prolific in the northern corner of the site (Figure 7). See Figure 3 showing mapped invasive and recorded invasive species for the site.



Figure 13 Cotoneaster in the northern corner of Penhale

7.8.6. The desk study returned results for Himalayan cotoneaster, montbretia, curly waterweed, and winter heliotrope, within 1km of the site.

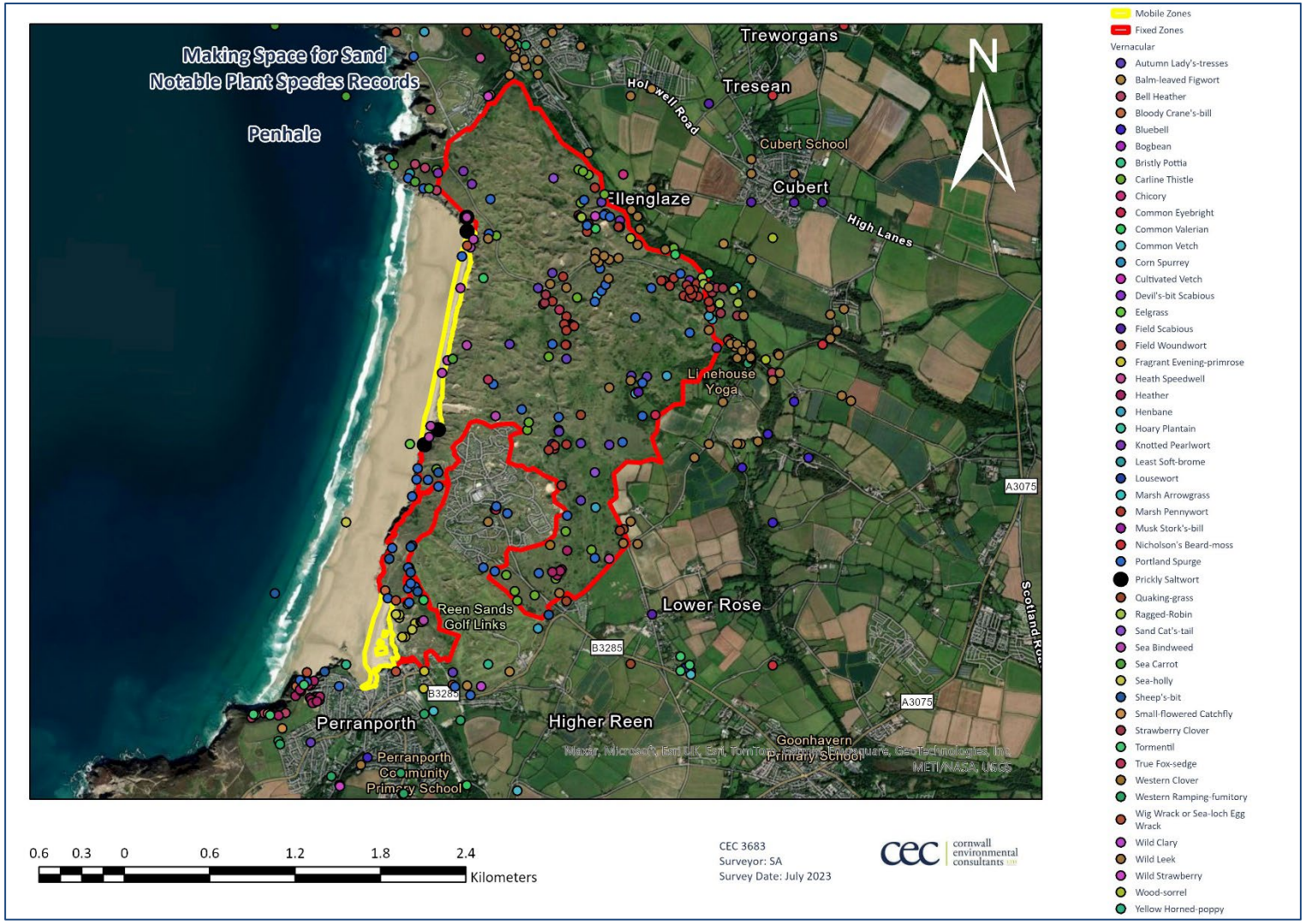


Figure 14: Notable Plant Species Records

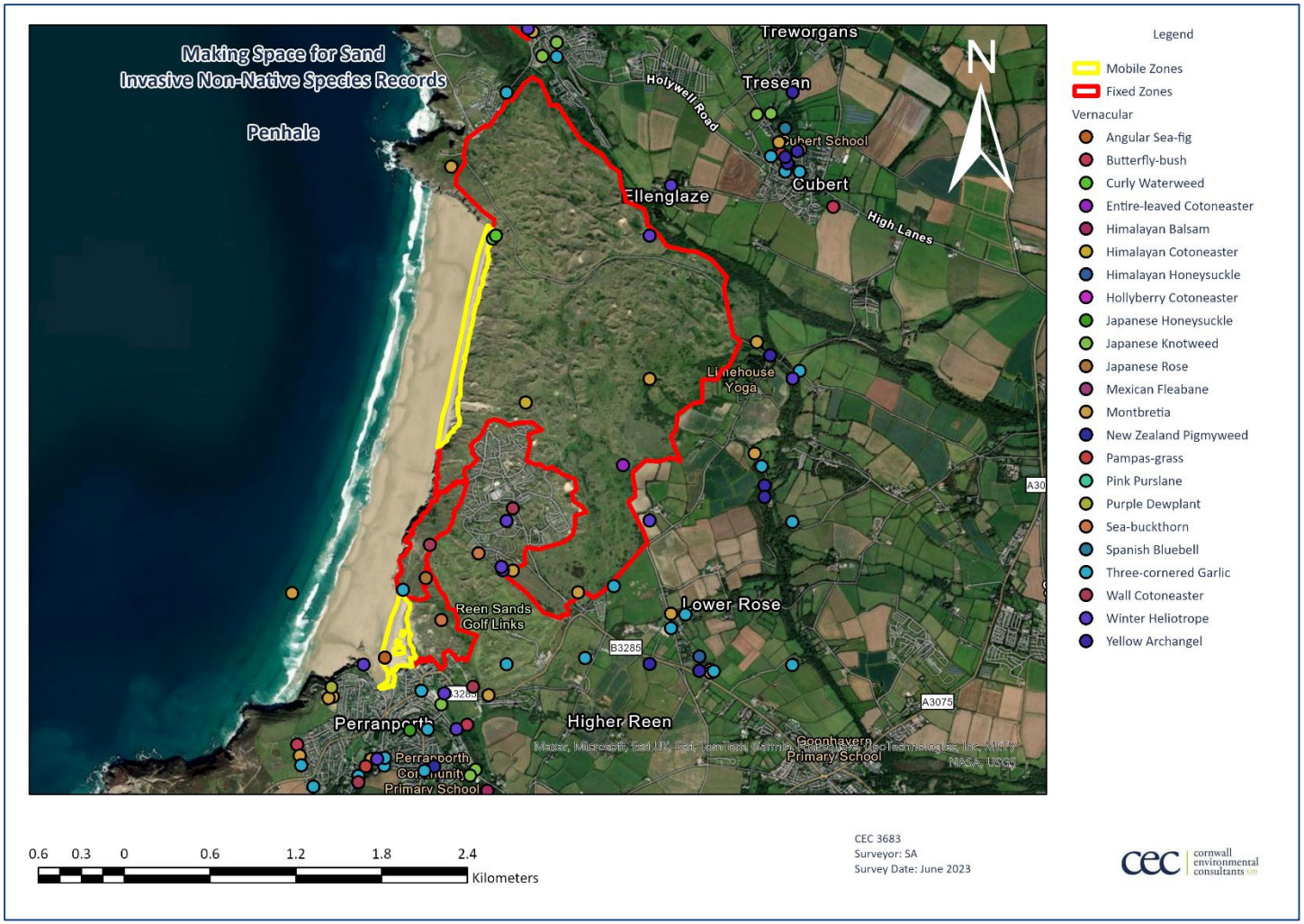


Figure 15: Invasive Non-Native Species Records

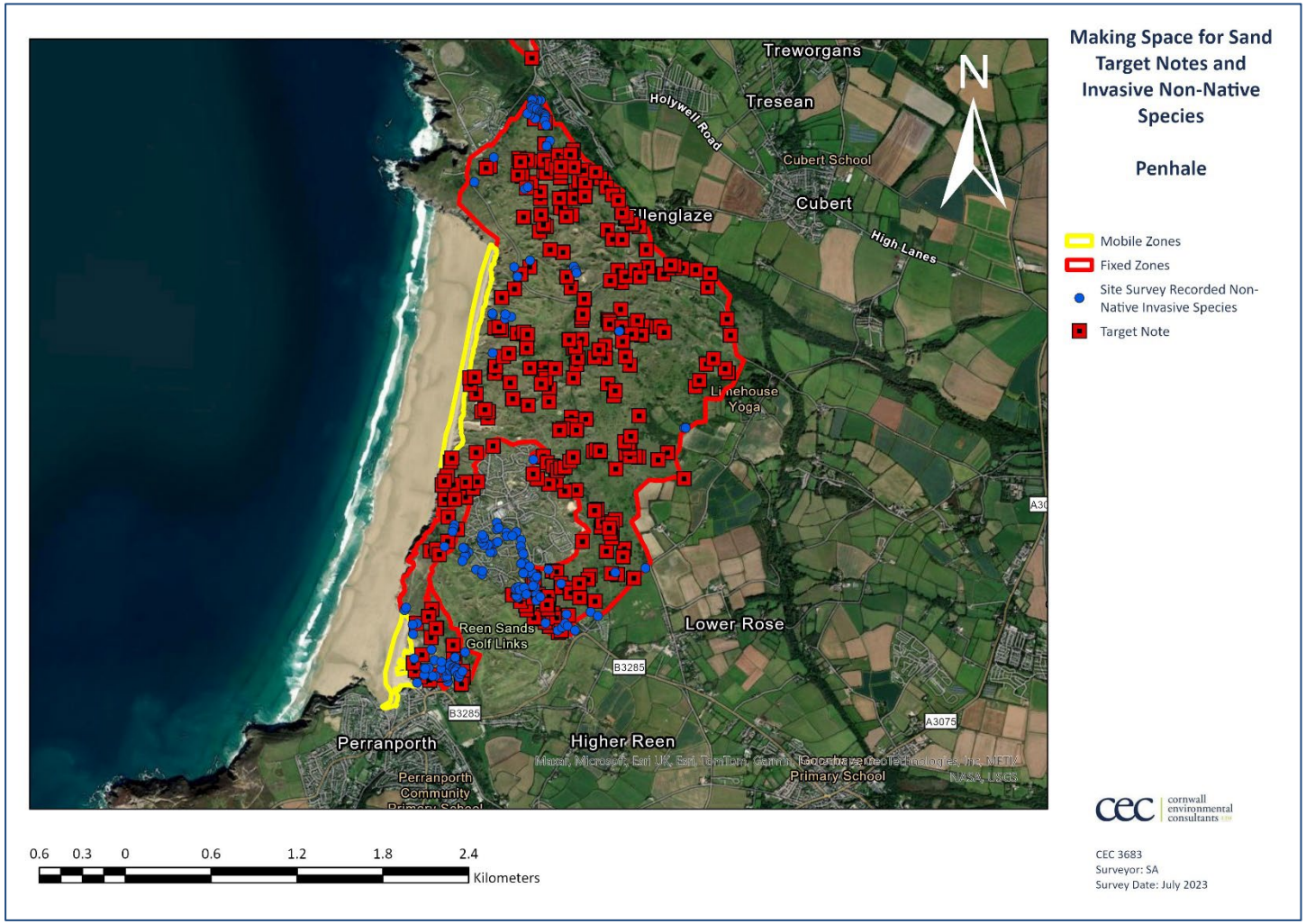
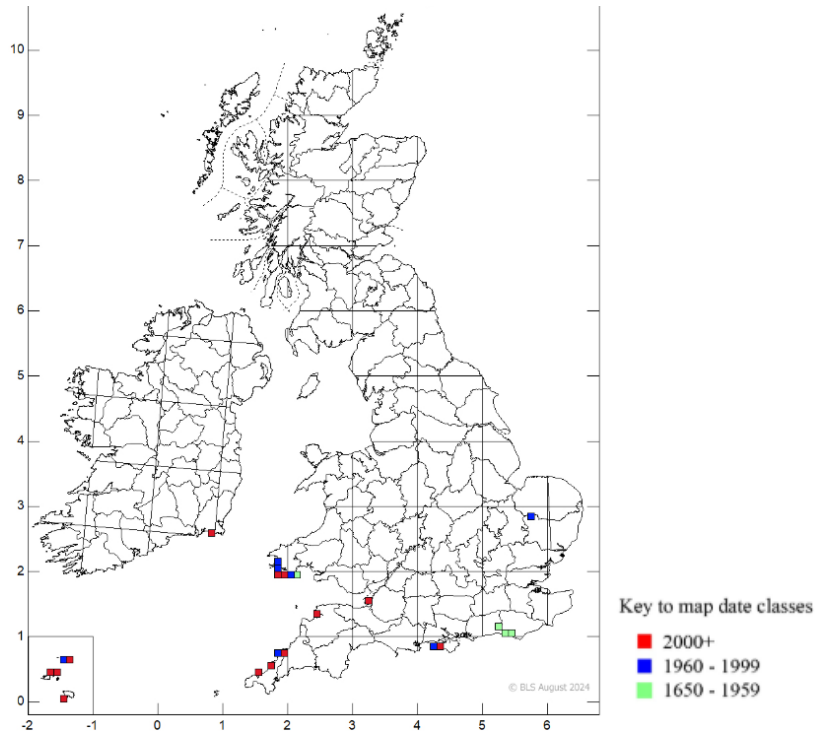


Figure 16: Site Survey Target Notes and Invasive Non-Native Species

8. Species Highlights

8.1. Scrambled egg lichen *Gyalolechia fulgens (syn. Fulgensia fulgens)*

Distribution: This species is currently known from only six sites in England and two in south-west Wales. Penhale Sands is a hotspot as it is believed between 50-60% of the UK's scrambled egg lichen population is set amongst the dunes.





Habitat: Scrambled egg lichen requires an open, well-lit, free draining substrate such as limestone or sand formed from shells and most often develops on other mosses or rocks at or near sea level in the south and west of the UK.

Identification: Scrambled egg lichen is rough made up of overlapping lemon-yellow scales, with a lobed margin. There can be scattered orange fruits of 1.5mm and/or narrow propagules which break off to form new plants, revealing white underneath where the propagule formerly existed

8.2. Shore dock *Rumex rupestris*

One of Europe's most threatened endemic vascular plants, shore dock is a perennial herb belonging to the Polygonaceae or buckwheat family.

Distribution: Tiny and threatened populations along the coastal margins of Normandy and Brittany in France, and Galicia in Spain; Britain is its stronghold. Shore dock has become extinct from Dorset, and the UK is estimated to contain only 700 plants (Stroh *et al*, 2014). Sea defence works, visitor pressure, and more frequent and violent winter storms have all contributed to the decline of this hardy specialist species.

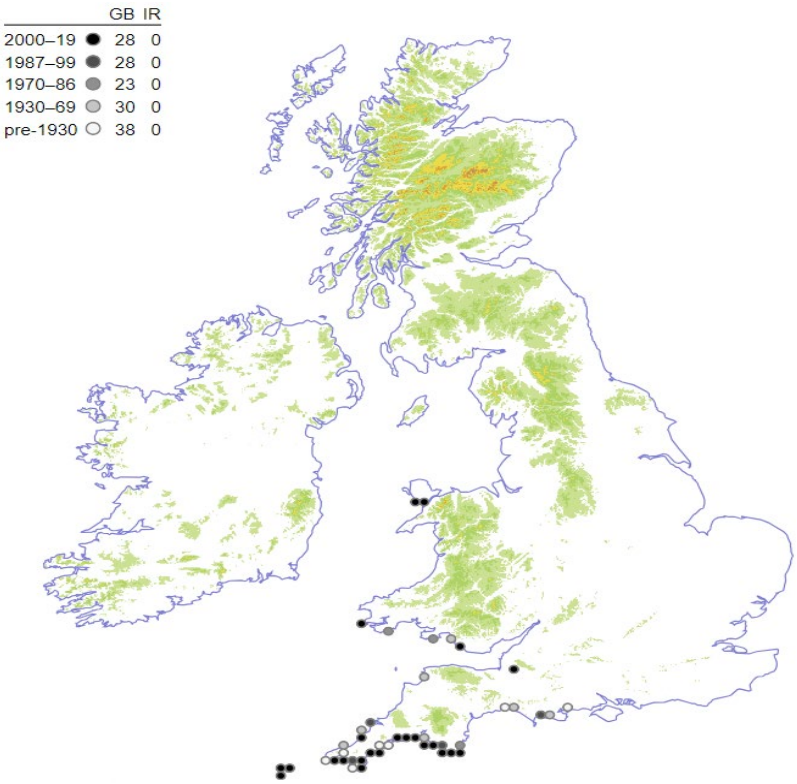
Habitat: Shore Dock can be found on rocky, sandy, and raised beaches, as well as shore platforms and lower slopes of cliffs. However, it only occurs where there's a constant source of freshwater, either running or static.





Identification: Leaves are oblong, taper and have a smooth texture. The tepals have large, swollen tubercles.

Value to wider habitat: An important nectar source for coastal bee species. Shore dock also plays a role in dune stabilisation, which in turn helps to defend seaside communities from flooding.



8.3. Autumn lady's-tresses

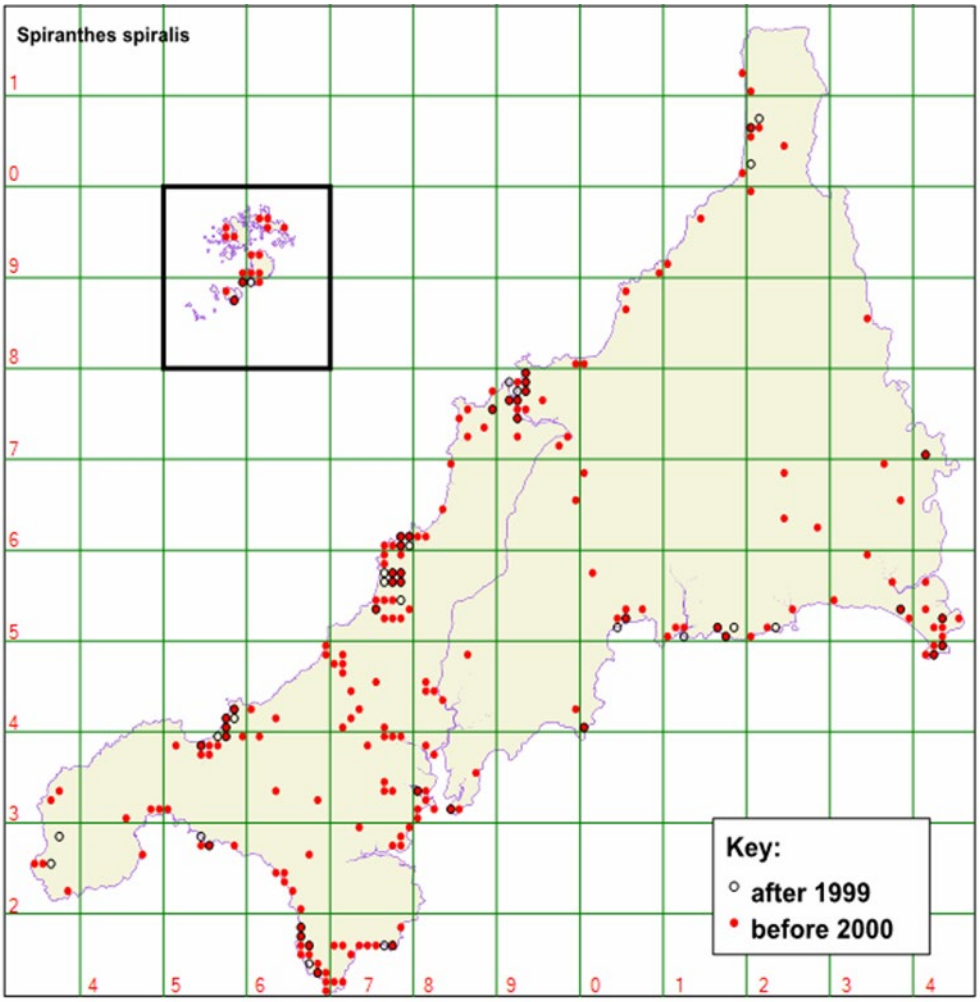
A beautiful plant, and the latest-flowering of all native British orchids, Autumn lady's-tresses derives its name from the tightly spiralled spike of 5-15 very small flowers.





Distribution: Nationally, the species has declined severely; this is due to habitat loss through changing agricultural practices, and possibly with climate change preventing recolonisation of former locations that remain suitable habitats. Like many orchid species, S. spiralis depends on specific mycorrhiza to form a symbiosis and allow seeds to germinate.

Habitat: Autumn lady's-tresses grows on unimproved soils; in Cornwall, these consist of short coastal grasslands, heathland, and some more inland sites where grassland has avoided spraying and is mown or grazed in late summer.



Identification: The leaves are glossy green ovate-elliptic and form a basal rosette over winter – this withers away before the flower spike emerges.

Value to wider habitat: Autumn lady's-tresses is an important nectar source for the common carder bee and red-tailed bumble bee, and silver-Y moth.

8.4. Dune fescue *Vulpia fasciculata*



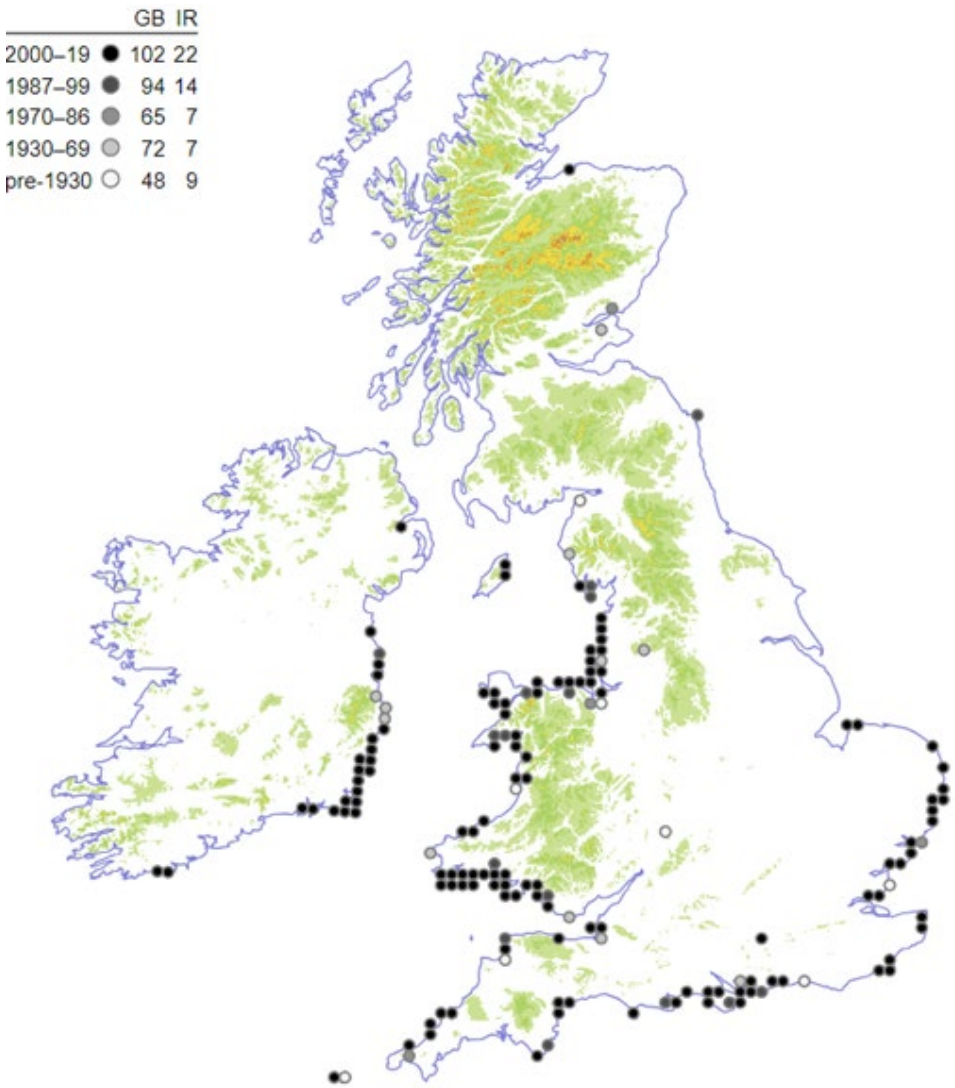
Dune Fescue is an annual herb in the family Poaceae (true grasses) that is native to northern Africa, Europe, the middle east, and western Asia.

Distribution: In the UK it is widespread across the coast of Wales, England and south-east Ireland.

Habitat: Dune Fescue is found across different sand dune systems (wet and dry) and beaches. However, it is particularly common on open, regularly disturbed areas of fixed dune and sandy shingle.

Identification: Smooth, hairless, linear green/bluish-green leaves with ribbed stems; dense spikelets with two to four flowers attached.





Value to wider habitat: Dune fescue is known for its adaptability to different soil types, moisture levels, and climatic conditions, making it a hardy and resilient plant. It also provides habitat and essential food for various wildlife species, such as birds and small mammals. Dune Fescue also plays an important role in soil conservation and erosion control. It has deep root systems that help stabilize soil and prevent erosion and topsoil loss. This grass species is important, as it plays a crucial role in maintaining the health and resilience of natural ecosystems.

9. Ecological Constraints and Opportunities

9.1. Current Management

9.1.1. This site is currently managed by the Cornwall Wildlife Trust. The MoD section is grazed with Red Devon cattle and Exmoor ponies. Occasional grazing with ponies has taken place in the open access areas at Gear Sands using electric fencing, however people and dogs have caused issues.

9.1.2. Penhale is part of the Dynamic Dunescapes projects which included carrying out notching work to the dune front and some inland areas. The MoD still use the site for training, including the training in the use of excavators, this has allowed some additional inland areas to be scraped clean of vegetation, increasing areas of bare sand. This has allowed several areas away from the public access areas along the dune front to have the vegetation scraped away.

9.2. Ecological Constraints

Designated Sites

9.2.1. As this site is a SAC there are a number of management targets set by Natural England. These include; in relation to the shifting dune with marram habitat type, "Restore the extent of bare sand to 10-50% of the feature extent, of varying sizes, in a mosaic with the vegetation." Within the dune grassland areas, the target is "Restore an appropriate cover of bare ground or sand to the H2120 feature, which is typically between 5-20% and in patches in a mosaic with vegetated surfaces."

9.2.2. This survey mapped 3.03ha (0.75%) as beach (t2h), where new bare sand areas had been created. Some of the areas mapped as Shifting Dunes with Marram (H2120) (s3a6) (9.42ha/2.31%) also had significant areas of bare sand. However, even combining these two areas only achieves 12.45ha (3.06%), which is still significantly less than the minimum of 10%

9.2.3. There is also a target to "Restore the total extent of the H2170 feature to approximately 2.54 ha." H2170 is Dunes with creeping willow which under UK Habs would be dune slacks.

9.2.4. During the survey 10.2ha (2.5%) of Humid dune slack (H2190) (s3a3) was recorded however most of these dune slacks do not support creeping willow. There were only two slacks totalling 1.13ha where creeping willow was recorded.

MoD

9.2.5. The northern part of the site is still used by the MoD for training, therefore management does need to be agreed with them, so that it is compatible with their training requirements.

Scrub Control

9.2.6. Although Natural England has not set a target for the amount of scrub that should be present, in the BNG condition assessment for Coastal habitats, scrub should account for less than 10%. This survey has mapped 51.73ha (12.7%) of scrub, however this was only areas that were large enough to be mapped, so areas less than 100m^2 have not been mapped and there will also be areas of low growing scrub within marram grass that may have been missed.

Invasive Non-Native Species

9.2.7. Cotoneaster is probably the most widespread invasive species on site, although there are also several small patches of montbretia and some buddleia. Cotoneaster and montbretia are both listed under Schedule 9 of the Wildlife and Countryside Act 1981, as amended.

9.2.8. For the control of cotoneaster, deciduous specific herbicide treatments should be used. This will target the cotoneaster without being detrimental to the grass species. Once the species has died back, allow six weeks before removal. Beyond this the material will be suitable for commercial composting. Alternatively, small stands of cotoneaster can be removed by hand.

9.2.9. Montbretia can be removed by hand, ensuring that all underground corms are removed.

9.2.10. A full management plan for these species should be put in place to facilitate the eradication of them and allow natural successional processes to take place and expand the presence of Annex 1 habitats. Alongside treatment, establishment of desirable vegetation within cleared areas is recommended to prevent other non-desirable species from establishing.

10. Conclusions

10.1.1. This report details the ecological baseline for the Coastal Sand Dunes at Penhale Dunes.

10.1.2. Penhale Dunes is the largest dune system in Cornwall and hosts a diverse range of habitats and species and includes numerous dunes slacks. The dune system is however restricted by overstabilisation which has been partly addressed by the notching work carried out in 2023.

10.1.3. Ideally the dunes would be grazed by a mix of cattle and horses, however the high levels of visitors and dogs has made this difficult in the open access areas.

10.1.4. The amount of scrub within the dunes is too high, being greater than 10%. Management will need to be undertaken to cut this back. In the open access areas this will probably need to be through scrub bashing, while in the MoD areas stock a combination of scrub bashing and grazing will be used.

10.1.5. The Dynamic Dunescapes project has undertaken significant dune notching work which has created large areas of bare sand. However, the area of bare sand present is still less than half of the target set by Natural England for the SAC.

10.1.6. The invasive cotoneaster is scattered throughout the site and is abundant in the northern corner of the site. There are also scattered small areas of montbretia and buddleia.

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