Colonisation by vascular plants of sand ridges at Hightown sand dunes, Merseyside; 2025 update

Philip H. Smith, January 2026

Summary

A fourteen-year study followed floristic development on artificial sand ridges created in 2011 as part of mitigation for a coast-protection scheme at Hightown sand dunes, Merseyside. Covering about 0.5 ha, the six parallel ridges (National Grid reference SD297028) are orientated east/west and are situated within the Sefton Coast SSSI and *Natura 2000* site. The number of vascular plant taxa recorded each year ranged from 63 to 87, with no significant trend over time. The cumulative total identified during the study period was 153 taxa, about 12% being non-native and 13% regionally or nationally notable, including a sizeable population of the nationally 'endangered' *Centaurium intermedium* (Intermediate Centaury). The proportion of ruderal plants declined over time from about 48% to 20%, reflecting maturation of the vegetation and a reduction of bare sand from about 80% to 2% of the ground surface. A significant positive relationship was found between the percentage of ruderal species and percentage of bare ground. Additional observations included a variety of duneland invertebrates.

Introduction

During the restoration of a works compound used for a 2011 coast-protection scheme at Hightown sand dunes, a series of sandy ridges was created as part of ecological mitigation within the Sefton Coast Site of Special Scientific Interest (SSSI) and *Natura 2000* site. It was hoped that this would produce a more topographically diverse landscape, attracting a wider variety of duneland wildlife than the almost level expanse of heavily vegetated and scrubby fixed dune that existed here previously. The presence of north and south-facing slopes with troughs in between was intended to add further habitat diversity. There are four parallel east/west ridges up to 2.2 m high and 50 m long, together with two smaller ridges 15 m long and 2 m high, covering an area of about 0.5 ha at National Grid Reference SD297028 (Fig. 1a, b).

During the first growing season in 2012, about 20% of the bare sand was colonised by a total of 65 vascular plants, five (8%) being non-native and three (5%) regionally or nationally notable. Nearly half of the species (48%) were classed as 'ruderals', typically associated with disturbed ground, the remainder being more characteristic sand dune plants. Further monitoring

took place each summer, the number of vascular plants increasing to 87 in 2013. Thereafter, numbers fluctuated, falling to 74 in 2024. The proportion of ruderal species fell from 48% in 2012 to about 18% in 2024. In the latter year, six (8%) of the plants were regionally or nationally notable, while the same number was non-native. The amount of bare sand on the ridges declined from about 80% to 2% cover (Smith, 2021a, 2022, 2023, 2024; Smith & Lockwood, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020).

Monitoring in 2025

Further recording visits took place at intervals during the spring and summer of 2025. The number of vascular plants identified on the ridges fell from 74 in 2024 to 66 (Table 1). However, there was no significant trend of numbers over time (Fig. 2). Six (9%) of the plants recorded in 2025 were regionally or nationally notable, Fig. 3 showing there was no significant trend in year counts since the beginning of the study. Only seven (10.6%) of the taxa found in 2025 were non-native, this being a low total compared with the 38% aliens for the dune system as a whole (Smith, 2020). Ten (15%) of the year total were classed as ruderals, being lower than 17.6% in 2024. The proportion of ruderal plants continued to show a slow decline over time (Fig. 4), as did the estimated percentage of bare sand (Fig. 5). There was also a highly significant positive relationship between the proportion of ruderals and percentage bare sand (Fig. 6), reflecting the fact that ruderal plants are often associated with disturbed, open substrates.

Only one new vascular taxon was added during the year: *Cotoneaster hjelmqvistii* (Hjelmqvist's Cotoneaster). This brought the cumulative total of vascular plants recorded on the ridges during the 14 study seasons to 153, 20 (13%) being notable, 19 (12%) non-native and 49 ruderal, ten of the latter also being non-native (Table 1).

Unfortunately, the 'nationally scarce' *Coincya monensis* subsp. *monensis* (Isle of Man Cabbage), a British endemic, was not re-found, having been restricted to south-facing slopes with open vegetation up to 2023. However, the 'nationally scarce' *Centaurium littorale* (Seaside Centaury) and 'endangered' *Centaurium intermedium* (Intermediate Centaury) were recorded again, the latter in substantial numbers in the troughs between the ridges.

As before, sporadic observations were made on invertebrates. A few nesting burrows of the Early Colletes solitary bee (*Colletes cunicularius*) were noted in March/April, these being much reduced in number, as in 2024, due to a lack of bare sand. A few common butterflies were

observed. No evidence of Rabbit- (*Oryctolagus cuniculus*) grazing was seen. Dogwalkers maintained short vegetation along some of the troughs, creating suitable conditions for smaller, less competitive plants, such as *Centaurium* spp.

Conclusions & assessment

Development of coarse vegetation on the ridge crests continued during 2025; these being dominated by *Ammophila arenaria* (Marram) and *Arrhenatherum elatius* (False Oat-grass) with occasional tall herbs, such as *Pastinaca sativa* (Wild Parsnip) and young *Crataegus monogyna* (Hawthorn) bushes (Figs. 7, 8). Overall species-richness has begun to show signs of a decline (Fig. 2), though the trend is not statistically significant. Such a change would be expected, reflecting rapid ecological succession towards a closed vegetation type with fewer opportunities for colonisation, especially by ruderal species. The proportion of the latter has shown a significant decline during the study (Fig. 4). Plant species-richness seems to be higher on the ridges than the overgrown, scrub-infested fixed dunes that still prevail in the surrounding area. Several notable vascular taxa, including the nationally 'endangered' *Centaurium intermedium* (Fig. 9), were present, especially in the troughs, though the proportion is lower than might be expected, probably due to the absence of wet slack habitat which supports many of the dune system's rarer taxa (Smith, 2021b). A high proportion of the plants recorded were native species. The expected benefits from varied topography and open conditions on the ridges are gradually being lost, due to vegetation overgrowth and, unless Rabbit activity or disturbance increase, this trend is likely to continue.

Acknowledgements

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References

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Figure 1a. Aerial photograph of Hightown sand ridges in 2015 (Google Earth)

Figure 1b. Same view as above in 2024

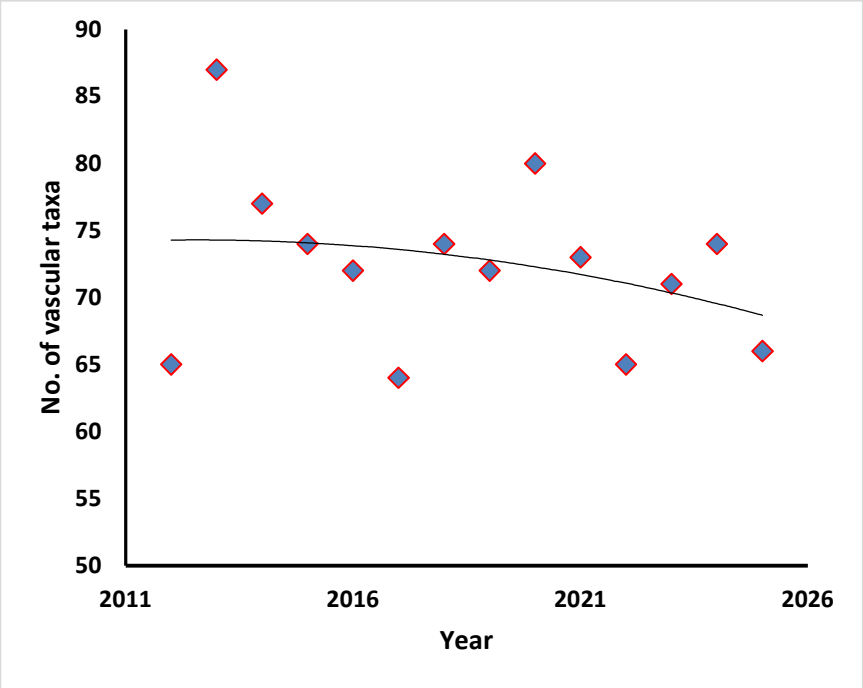

Figure 2. Number of vascular plants recorded each year from 2012 to 2025). Fitted line polynomial (r = -0.297; p = 0.302)

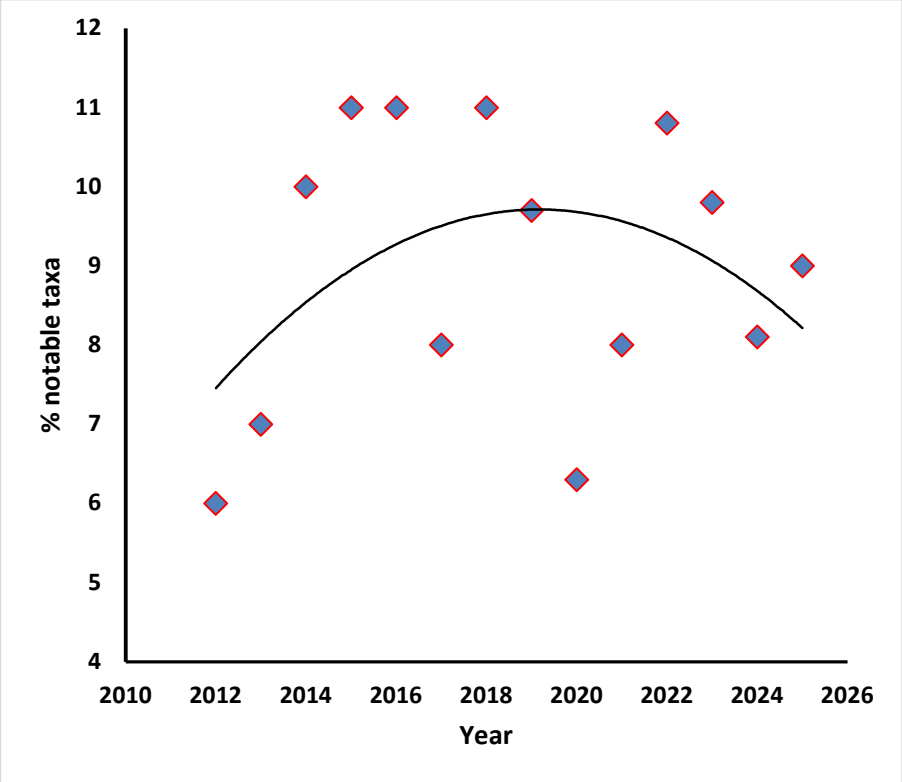

Figure 3. Proportion of regionally or nationally notable plants, 2012-2025. Fitted line polynomial (r = 0.398; p = 0.159)

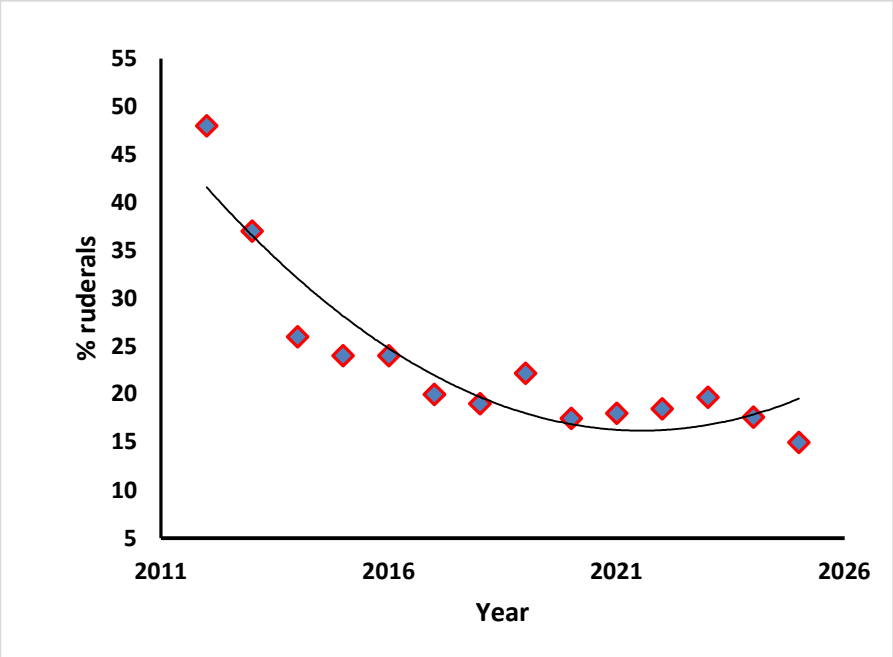

Figure 4. Percentage of ruderal plants recorded each year, 2012 to 2025. Fitted line polynomial ($r = -0.922$; $p \leq 0.00001$)

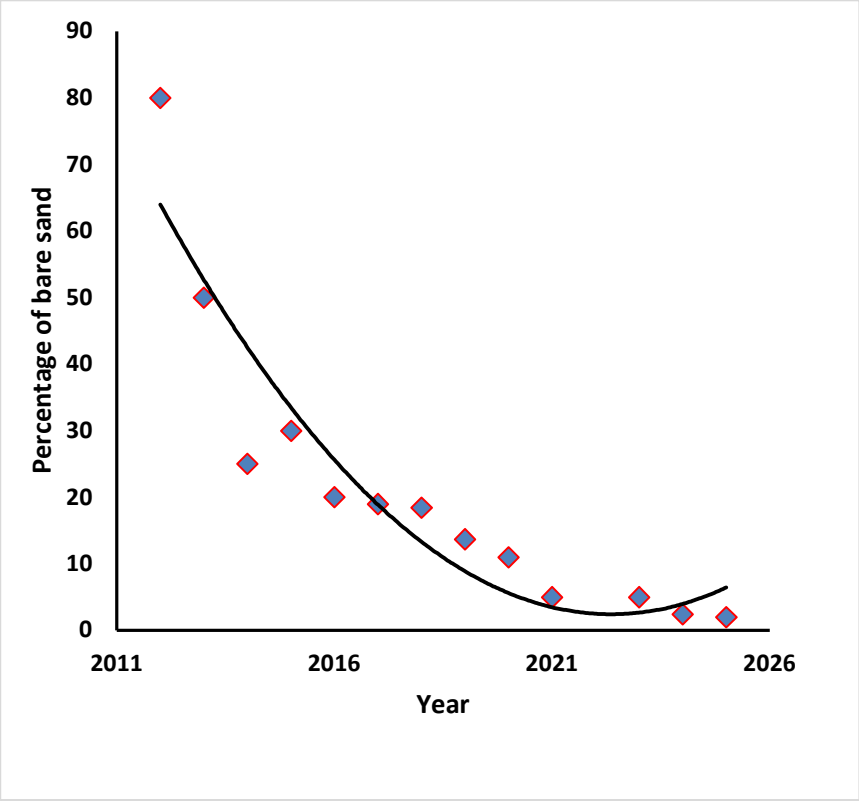

Figure 5. Percentage of bare sand estimated each year, 2012-2025 (not recorded in 2022). Fitted line polynomial ($r = -0.936$; $p \leq 0.00001$)

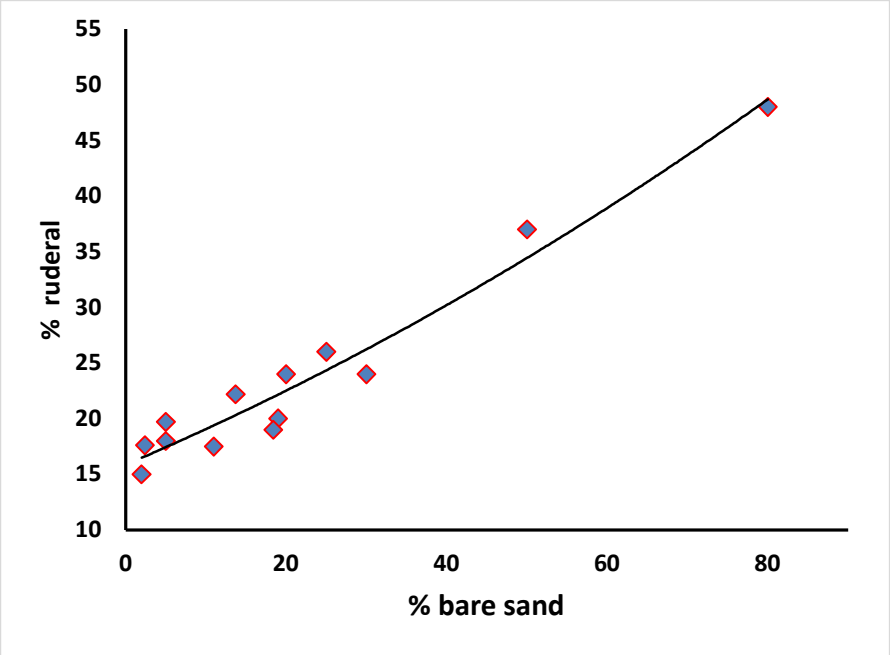

Figure 6. The relationship between the percentage of ruderal plants each year and percentage bare sand (not recorded in 2022). Fitted line polynomial ($r = 0.976$ $p \leq 0.00001$)

Figure 7. Hightown ridges in September 2012, after one growing season (similar view to Fig. 8)

Figure 8. Hightown ridges in July 2025, showing dense ridge crest vegetation

Figure 9. *Centaurium intermedium*, Hightown ridges July 2025

Table 1. Vascular plants recorded annually on the Hightown sand ridges, 2016-2025 (2012-15 excluded)

*non-native (neophyte or introduced native); R = ruderal; r = rare; o = occasional; f = frequent; a = abundant; d = dominant; l = locally; v = very; No frequency = taxa recorded before 2016; Stat. = conservation status; NR = Nationally Rare; NS = Nationally Scarce; NT = Near Threatened; VU = Vulnerable; EN = Endangered (italics = England Red List); SCI = Species of Conservation Importance in North West England. Nomenclature follows C.A. Stace's *New Flora 4th edition* (2019) and subsequent amendments.

Taxon	**English name**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**Stat**
Achillea millefolium	Yarrow		r		o	o	o				r	
Agrimonia eupatoria	Agrimony		r	o	o	r	o	o	lo	o	o	
Agrostis capillaris	Common Bent		lf	lf	lf	lo	lo			o		
Agrostis stolonifera	Creeping Bent								r	r		
Ammophila arenaria	Marram	la	a	ld	ld	ld	ld	ld	ld	ld	ld	
Anacamptis pyramidalis	Pyramidal Orchid				r			r		lo	lo	SCI
*Angelica archangelica**	Garden Angelica						r					
Angelica sylvestris	Wild Angelica									r	r	
Anthoxanthum odoratum	Sweet Vernal-grass	o		o	lo	lf	lf	lf	lf	lf	lf	
Anthyllis vulneraria	Kidney-vetch	f	a	a	a	o	f	f	lf	f	la	
Arabidopsis thaliana R	Thale-cress				r			o	vlo			
Arenaria serpyllifolia	Thyme-leaved Sandwort	o	o	o	o		o	o	o			
Arrhenatherum elatius	False Oat-grass		la	la	la	a	a		lf	la	la	
*Asparagus officinalis**	Garden Asparagus	r		o	o	o	r	o	o	r	r	
Atriplex patula R	Common Orache											
Atriplex prostrata R	Spear-leaved Orache											
Avenula pubescens	Downy Oat-grass					o	o	lo	lo	lf	lf	
Bellis perennis	Daisy	r	r	r								
Beta vulgaris subsp. *maritima*	Sea Beet											
Betula pendula	Silver Birch								r	r	r	
Blackstonia perfoliata	Yellow-wort	r	o	r	lo		lo	lo				
Bromus hordeaceus R	Soft Brome				vlo							

Cakile maritima	Sea Rocket											
Campanula rotundifolia	Harebell		r	r	lo	lo	vlo					*NT*
Capsella bursa-pastoris R	Shepherd's-purse											
Cardamine hirsuta	Hairy Bitter-cress	o	o			o		o	o	r		
Carex arenaria	Sand Sedge	la	lf	lf	lf	lf	lf	lf	lf	lf	lf	
Carex flacca	Glaucous Sedge	o		r	r	r	la	la	lf	lf	lf	
Carlina vulgaris	Carline Thistle				r	r			r			SCI
Catapodium marinum	Sea Hard-grass	r										
Centaurea nigra	Common Knapweed											
Centaurium erythraea	Common Centaury		o	o	o	r	o		r	o	lo	
Centaurium intermedium	Hybrid Centaury		o	lf	lf	r	o		r	lo	lf	EN
Centaurium littorale	Seaside Centaury	r	r	o	lo	o	lf		r		lo	NS SCI
Cerastium diffusum	Sea Mouse-ear	o	o	o	o	lf	o	o	o	r		
Cerastium fontanum	Common Mouse-ear	o	o	f	o	o	o	o	o	o	o	
Cerastium glomeratum R	Sticky Mouse-ear											
Cerastium semidecandrum	Little Mouse-ear					r						
Chamaenerion angustifolium R	Rosebay Willowherb	o	o	o	lo	vlo	vlo	vlo	r	vlf	vlo	
Chenopodium album R	Fat-hen											
Cirsium arvense R	Creeping Thistle				r							
Cirsium vulgare R	Spear Thistle		r	r				r				
Coincya monensis subsp. *monensis*	Isle of Man Cabbage	o	o	r	o	r	o	r	r			NS SCI
*Consolida ajacis**	Larkspur											
*Cotoneaster hjelmqvistii**	Hjelmqvist's Cotoneaster										r	
Crataegus monogyna	Hawthorn	o	o	o	o	o	o	lo	o	o	o	
Crepis capillaris	Smooth Hawk's-beard		r	o	o	o	r		r	o	o	
Dactylis glomerata	Cock's-foot	lf	lf	la	lf	lf	lf	lf	lf	lf	lf	
Dactylorhiza incarnata subsp. *coccinea*	Early Marsh-orchid							r				NS *NT* SCI
Elymus junceiformis	Sand Couch			r								

Elymus repens R	Common Couch		o									
Epilobium montanum R	Broad-leaved Willowherb											
Equisetum arvense R	Field Horsetail	la	o	o	o	o	o	o	o	o	o	
Erigeron acris	Blue Fleabane				r							
Erodium aethiopicum	Sticky Stork's-bill			r	r							NS SCI
Erodium cicutarium R	Common Stork's-bill	o	o	r	r		o					
Erophila verna R	Common Whitlow-grass					o				r		
Ervilia hirta R	Hairy Tare								vlo			
Eryngium maritimum	Sea-holly	r		r								*NT* SCI
Euphorbia paralias	Sea Spurge	r	r	r								SCI
Euphrasia nemorosa	Common Eyebright						r	r		vlo	lf	NT *NT*
Fallopia convolvulus R	Black Bindweed											
Festuca ovina	Sheep's-fescue					r						
Festuca rubra	Red Fescue	o	o	lf	la	la	la	la	a	a	a	
Filipendula ulmaria	Meadowsweet	r										
Galium aparine R	Cleavers							la				
Galium verum	Lady's Bedstraw		vlf		lf	r				vlo	vlf	
Geranium molle	Dove's-foot Crane's-bill	r										
Hieracium umbellatum	Umbellate Hawkweed		o	o	lo	o	o	o	o	r	r	
*Hippophae rhamnoides**	Sea Buckthorn	r	r	r	r	r	r		lo	r	lo	
Holcus lanatus	Yorkshire-fog	la	la	la	la	lf	o	o	o	f	o	
Hordeum murinum R	Wall Barley				vlo							
Hyacinthoides × *massartiana**	Hybrid Bluebell		r				r	r			r	
Hypochaeris radicata	Cat's-ear	o	lf	lf	f	lf	f	f	f	o	o	
Jacobaea vulgaris R	Common Ragwort	f	o	o	o	o	o	o	o	o	r	
Juncus articulatus	Jointed Rush					r	r			r		
Juncus bufonius R	Toad Rush						vlf			lo		
Lathyrus pratensis	Meadow Vetchling	lf	lf	lf	lf	lf	lf	lf	lf	lf	lf	
Leontodon saxatilis	Lesser Hawkbit		o	o	o	o	o	o	o	o	o	

*Lepidium didymum** R	Lesser Swine-cress											
Leymus arenarius	Lyme-grass			r		r		r				
Lolium perenne	Perennial Rye-grass	r		r	vlo	vlo	o	o		lo	lo	
Lotus corniculatus	Common Bird's-foot-trefoil	f	lf	lf	lf	lf	lf	lf	lf	lf	lf	
*Lupinus arboreus** R	Tree Lupin											
Luzula campestris	Field Wood-rush		o	r		o	o	lf	o	o	o	
*Malus domestica**	Apple					r	r		r	r	r	
Medicago lupulina R	Black Medick			vla	vla	vla			r	vla	r	
*Melilotus officinalis** R	Ribbed Melilot											
Myosotis ramosissima	Early Forget-me-not	r										SCI
*Oenothera × britannica** R	Hybrid Evening-primrose						r					NS
*Oenothera biennis** R	Common Evening-primrose						r					
*Oenothera glazioviana × biennis × cambrica** R	Triple Hybrid Evening-primrose			lo		r			vlo	r		NS
*Oenothera glazioviana** R	Large-flowered Evening-primrose		o	o	o	o	o	r	o	lf	o	
*Oenothera × fallax** R	Intermediate Evening-primrose		lf	o	o	r	o		lf	o	o	
Ononis repens	Common Restharrow	o	lf	lf	lf	o	o	o	lf	lf	lf	
Papaver dubium	Long-headed Poppy			r								
Pastinaca sativa	Wild Parsnip	o	lf	la	o	o	o	o	o	o	o	
Phleum arenarium	Sand Cat's-tail			vlf		r						*NT* SCI
Pilosella officinarum	Mouse-ear Hawkweed							r				
Plantago coronopus	Buck's-horn Plantain		o		o			r				
Plantago lanceolata	Ribwort Plantain	lf	lf	lf		o	o	o	o	o	o	
Plantago major R	Greater Plantain					r	r	r		r	r	

Poa annua R	Annual Meadow-grass	r		vlf		r	vla	vla	o	lo	vlf	
Poa humilis	Spreading Meadow-grass					o	o	o	r			
Poa pratensis	Smooth Meadow-grass					o	o	o	o	o	o	
Polygala vulgaris	Common Milkwort	lf	lf	lf	o	o	o	o	o	o	r	
Polygonum aviculare R	Knotgrass											
Polygonum depressum R	Equal-leaved Knotgrass											
Potentilla reptans	Creeping Cinquefoil	r		r		r	lo		r			
Prunella vulgaris	Selfheal									r		
Prunus sp.	Cherry				r	r	r	r	r	r	r	
Pyrola rotundifolia subsp. *maritima*	Round-leaved Wintergreen							r				NS SCI
Ranunculus acris	Meadow Buttercup	r		r	r	r	vlf	o	r	lo	lo	
Ranunculus bulbosus	Bulbous Buttercup	o	r	o	o	o	o		o	o	o	
Ranunculus repens	Creeping Buttercup											
Raphanus raphanistrum subsp. *maritimus*	Sea Radish	r	r	o	o	o	r	r	r	r	r	SCI
Reseda lutea	Wild Mignonette	r	r	r	r							
Reseda luteola R	Weld	r	r		r							
Rhinanthus minor	Yellow-rattle				vlf	o	o	o	o	lf	o	
Rosa canina agg.	Dog-rose			r	r	r	r	r	r	r	r	
*Rosa rugosa**	Japanese Rose			r	r	r						
Rubus caesius	Dewberry	f	la	la	f	f	f	f	f	f	f	
Rubus fruticosus agg. R	Bramble	lf	lf	lf	lf	vlf	vlf	vlf	o	o	o	
Rumex acetosa	Common Sorrel											
Rumex crispus	Curled Dock	lf	o	o	o	o	o	o	r	r		
Rumex obtusifolius R	Broad-leaved Dock											
Salix caprea	Goat Willow							r	r	r	r	
Salix cinerea subsp. *oleifolia*	Grey Willow					r		r	lo	lo	r	
Salix repens	Creeping Willow	lf	lf	lf	lf	la	la	la	la	ld	ld	*NT*
Sambucus nigra	Elder	r	r	r	r	r	r	r	r	r	r	

Senecio viscosus R	Sticky Groundsel											
Senecio vulgaris R	Groundsel											
*Sisyrinchium montanum** R	American Blue-eyed-grass			r								
Solanum dulcamara R	Bittersweet	r	r	r								
Sonchus arvensis R	Perennial Sowthistle	o	o	o	o	o		vlo	o	r		
Sonchus asper R	Prickly Sowthistle	r										
Sonchus oleraceus R	Smooth Sowthistle								o			
Stellaria media R	Common Chickweed											
Taraxacum agg. R	Dandelion	o	o	o	o	o	o	o	o	o	o	
Tragopogon pratensis	Goat's-beard			r		r						
Trifolium arvense	Hare's-foot Clover	r			vlf							
Trifolium dubium	Lesser Trefoil					vla				r		
Trifolium pratense	Red Clover		lf	o	lf	vlf	lf	lf	r	lf	vla	
Trifolium repens	White Clover		r		o	vla	la	la	la	la	o	
Tripleurospermum maritimum R	Sea Mayweed											
*Triticum aestivum** R	Bread Wheat											
Urtica dioica	Common Nettle	la	lf	la	lf	lf	vlf	lf		lf	lf	
Vicia cracca	Tufted Vetch		o		o	vlf	vlf		r	o	r	
Vicia lathyroides	Spring Vetch	r										SCI
Vicia sativa subsp. *nigra*	Common Vetch	o	o	o	o	o	o		r	r	o	
Vicia sativa subsp. *sativa**	Common Vetch	o				r			r			
Viola arvensis R	Field Pansy											
Viola canina	Heath Dog-violet	r	o	o								NT *VU* SCI
Total:153 (19 non-native) (49 ruderal)		72	64	74	72	80	73	65	71	74	66	20