

Changing flora of Devil's Hole, Ravenmeols – 2024 update

Philip H. Smith, November 2024

Summary

The 'Devil's Hole' consists of two large active dune blowouts that originated in the early 1940s at Ravenmeols Local Nature Reserve on the Sefton Coast, north Merseyside. Wind erosion produced two calcareous, seasonally-flooded, dune-slacks (north and south) that are still growing. Their floristic development was studied between 2004 and 2024, annual changes being monitored from 2012. By 2024, 186 vascular plants had been recorded, annual totals showing a tendency to level off after about 2015 and then start to decline, following a 'hump-back' model that describes a typical trend of species-richness during ecological succession. Thirty-eight regionally or nationally notable taxa were listed (20% of the total), while only about 8.6% of the plants were non-native, this low figure being attributed to the distance of the site from gardens. Particular features of the slacks include large populations of the Red-listed *Parnassia palustris* (Grass-of-Parnassus), *Dactylorhiza incarnata* subsp. *coccinea* (Early Marsh-orchid) and *Epipactis palustris* (Marsh Helleborine). Older parts of the two slacks were colonised by 15 taxa of *Salix* (willow), including up to 142 bushes of the nationally rare hybrid *Salix* × *friesiana*. Analysis of fixed-point quadrats recorded in the northern slack in 2014 and 2019 were referable to rare UK National Vegetation Classification (NVC) communities of young calcareous dune-slacks. Between the two surveys, *Salix repens* (Creeping Willow) increased, while species associated with wetter slack habitat declined.

The site also supported breeding *Epidaeia calamita* (Natterjack Toad) in wet years and a rich diversity of insects, including the Red-listed *Cicindela hybrida* (Northern Dune Tiger Beetle) and the solitary bee *Colletes cunicularius* (Early Colletes).

Introduction

Devil's Hole (National Grid Reference SD278054) consists of two large active blowouts in the Ravenmeols Sandhills Local Nature Reserve on the Sefton Coast, north Merseyside. Formerly owned by Sefton Metropolitan Borough Council, the land was transferred to the ownership of the National Trust on 15th September 2017. Initiated in the early 1940s by World War II military activity, the Devil's Hole is considered to be the largest feature of this type in Britain (Fig. 1) and

has attracted international interest as a site for the study of the effects of wind-flow on sand movement. It consists of two steep-sided troughs, the northern being by far the larger, together with a depositional lobe to the east which is inundating a block of conifers planted between 1905 and 1910 (Gresswell, 1953). Previously a bare sand basin (Figs. 2, 3), by the early-1990s the northern blowout reached the water-table, producing a secondary dune-slack which floods in wet winters (Smith, 2017) (Figs. 4, 5).



Figure 1. Devil's Hole in 2010 (Bing 3D maps), showing an early stage in slack formation.



Figure 2. Monochrome photograph of the Devil's Hole in about 1970.



Figure 3. Aerial photograph of the Devil's Hole in 1984 before slack formation began.



Figure 4. Devil's Hole north flooded for the first time in 1995, after a wet winter.

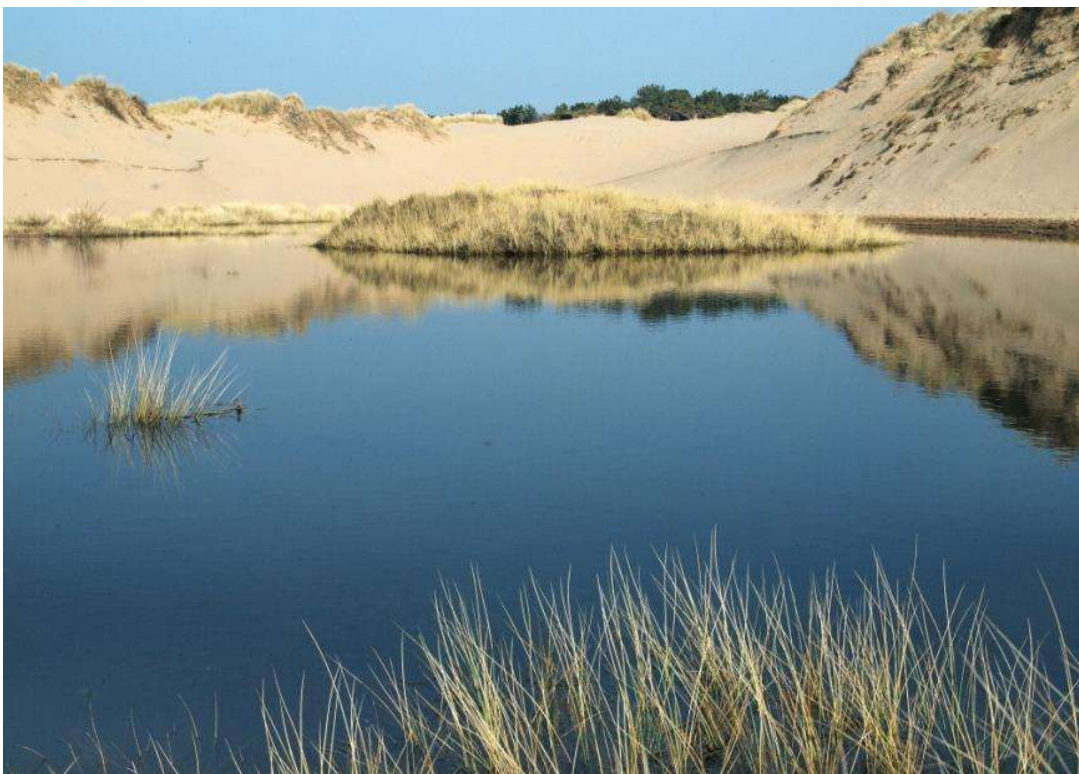


Figure 5. Extensive flooding of Devil's Hole north in March 2013.

The structure and early evolution of the blowouts, before colonisation by slack vegetation, were described by Neal & Roberts (2001). Later studies based on aerial photographs and field survey show that, by 2012, the northern basin was about 320 m long, having grown in length at a linear rate since 1945 and had a maximum width of 90 m, while the southern blowout measured about 125×50 m. The entire site covered an area of over 3.13 ha, though its annual rate of growth had declined linearly since 1960, due in part to landward expansion being slowed by the conifer plantation (O’Keeffe, 2014).

During the 1970s, two small ‘proto-dunes’ began to form around *Ammophila arenaria* (Marram) in what was then a sandy northern basin. These developed into sizeable features, a third one forming to the east in 2008. The two older ones have stabilised to form rounded fixed-dunes. The vegetated area in the floor of the blowouts has been increasing by about 10% per annum since the early 2000s and, by 2012, had an area of 1.05 ha (O’Keeffe, 2014). Further sand-blow and slack enlargement has continued. Studies of wind-flow dynamics measured about 4 tonnes of sand moving in the north blowout during a few days of moderate winds in October 2015 (Delgado-Fernandez *et al.*, 2018) (Fig. 6).



Figure 6. Wind sculpturing, Devil’s Hole north.

Floristics to 2023

Following the breaching of the winter water-table, vegetation began to colonise the larger northern basin in 2003, while plants first appeared in the southern slack in 2008. Smith & Lockwood (2012) recorded only 16 vascular plants in 2004. Nineteen years later, in 2023, 117 taxa were present in the northern slack, while 61 were identified in the southern basin, the grand total since recording began being 179 vascular plants (Smith, 2023). The proportion of non-native taxa was particularly low at 8.5%, this being attributed to the site's distance from gardens (about 600 m). By 2023, as many as 38 regionally or nationally notable species had been recorded in the two slacks (21% of the total). The species count increased annually up to about 2015, when numbers levelled off and then began to fall.

Deep flooding in years such as 2013 and 2021 seemed to kill off some plants, including the England Red-list 'Vulnerable' *Parnassia palustris*, which declined to only 1125 individuals in 2013, compared with an estimated 10,000+ the previous summer (Smith & Lockwood, 2012).

Using UK NVC methodology, nineteen 2 m × 2 m quadrats were recorded in the northern slack in the summer of 2014. Keys and descriptions in Rodwell (2000) showed that the plant communities were referable to SD13: *Sagina nodosa*-*Bryum pseudotriquetrum* dune-slack and SD14: *Salix repens*-*Campylium stellatum* dune-slack. Both are relatively rare vegetation types associated with young calcareous dune-slacks. This survey was repeated in 2019, when it was evident that *Salix repens* had increased in frequency, while species associated with wetter slack habitat, such as *Eleocharis palustris* (Common Spike-rush), had declined.

The 2024 survey

As before, visits were made at not less than two-week intervals from spring to autumn to record vascular plants in the two slacks. The year total for the larger northern basin was 114, three fewer than the previous year, while the southern slack held 57 taxa, a reduction of four on 2023. The combined year total for both sites was 121 taxa (Appendix 1). Since 2015, the data show a decline in species-richness for both slacks, especially the southern one, following a 'hump-back' model that describes a trend of species-richness during ecological succession (Isermann, 2011) (Fig. 7). In 2024, thirty regionally or nationally notable plants were recorded in the northern slack (23.9% of the year total), while 15 (24.6%) were found in the southern basin. Two new

taxa were added to the site species list: *Festuca ovina* (Sheep's-fescue) and *Veronica arvensis* (Wall Speedwell), both being in the northern basin. This brings the total of higher plants identified in the Devil's Hole slacks since recording began in 2004 to 186. Thirty-eight (20.4%) of the grand total are notable, of which 15 are Red-listed (Appendix 1). The proportion of non-native taxa remained low at 8.6%. As usual, *Parnassia palustris* was a feature of the vegetation during the late summer with several thousand plants in flower, concentrated on the drier fringes of the slacks. There was also a fine display of the 'near threatened' *Epipactis palustris* in June/July. The 'nationally scarce' *Pyrola rotundifolia* subsp. *maritima* (Round-leaved Wintergreen) was, again, mostly associated with patches of *Salix repens*. Worryingly, *Phragmites australis* (Common Reed), found for the first time at the eastern end of the northern slack in 2021, continued to spread rapidly. This species is known to become invasive over time (Smith, 2020). The National Trust mowed the stand in the autumn in the hope of reducing its vigour.

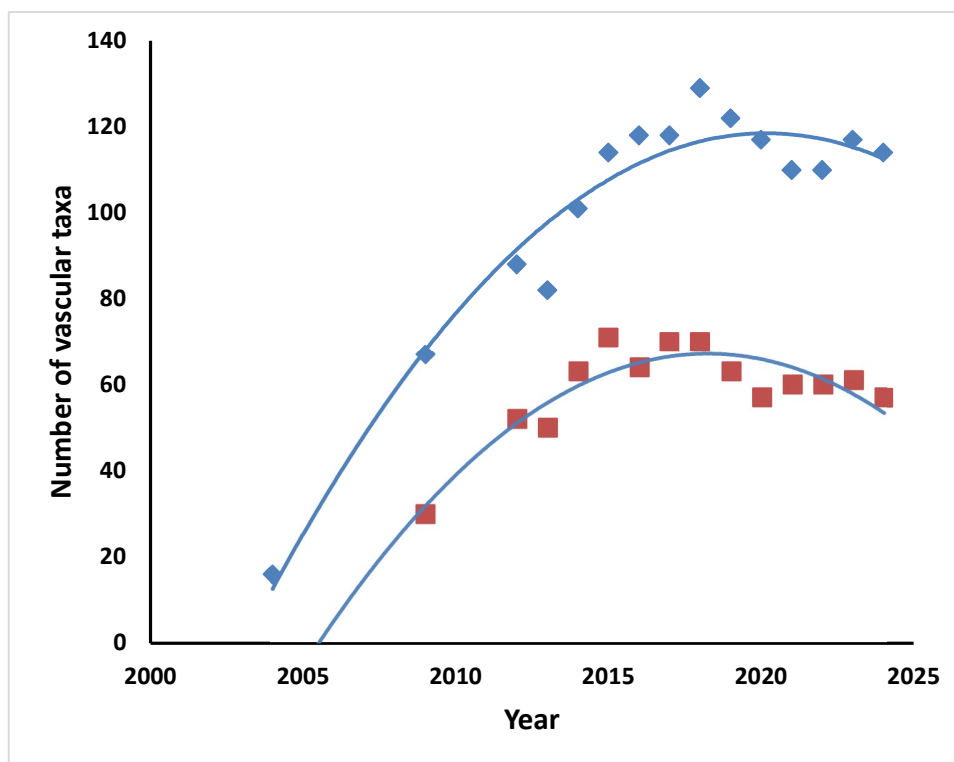


Figure 7. Number of vascular taxa in northern (blue) and southern (red) slacks, 2004-2024; fitted lines polynomial (northern $r = 0.971$, $p \leq 0.00001$; southern $r = 0.9$, $p = 0.000012$).

Willows continued their general dominance of the slack vegetation with 12 taxa identified, one fewer than in 2023. The largest bushes, mainly of *Salix caprea* (Goat Willow) and *S. cinerea* (Grey Willow), are now about 3 m tall (Fig. 8). An ongoing survey of the nationally rare hybrid *Salix* $\times$ *friesiana* (*Salix repens* $\times$ *S. viminalis* Osier) recorded, measured and labelled 114 bushes, 28 fewer than the previous year. Overall, the number of bushes of this hybrid recorded annually since 2012 has begun to fall (Fig. 9), probably due to competition from other willow taxa and less bare ground in which to seed. The growth trends for mean area and mean height of bushes since 2012 are shown in Figs. 10 and 11. *Salix* $\times$ *friesiana* is known from only thirteen post-2000 hectads (10 x 10 km grid squares) in Britain & Ireland (BSBI Maps project) but is relatively frequent on the Sefton Coast with over 400 bushes recorded up to 2014 (Smith, 2015) and more since. The Devil's Hole also supports five specimens of the even rarer *Salix* $\times$ *doniana* (Don's Willow). Only about 43 bushes are known in Britain, 38 being in the Sefton dunes (Smith, 2024.).

Although there was evidence of some Rabbit *Oryctolagus cuniculus* grazing and browsing, it was insufficient to prevent the growth of dense willow scrub in the older slack areas, this being dominated by *Salix repens* (Fig. 12). Rapid successional changes since 2007 are illustrated by the contrast between Fig. 13 and Fig. 14. As in previous years, any seedlings or young bushes of the invasive *Hippophae rhamnoides* (Sea Buckthorn) and *Betula* (birch spp.) were removed when seen.



Figure 8. *Salix* scrub in Devil's Hole north, October 2023.

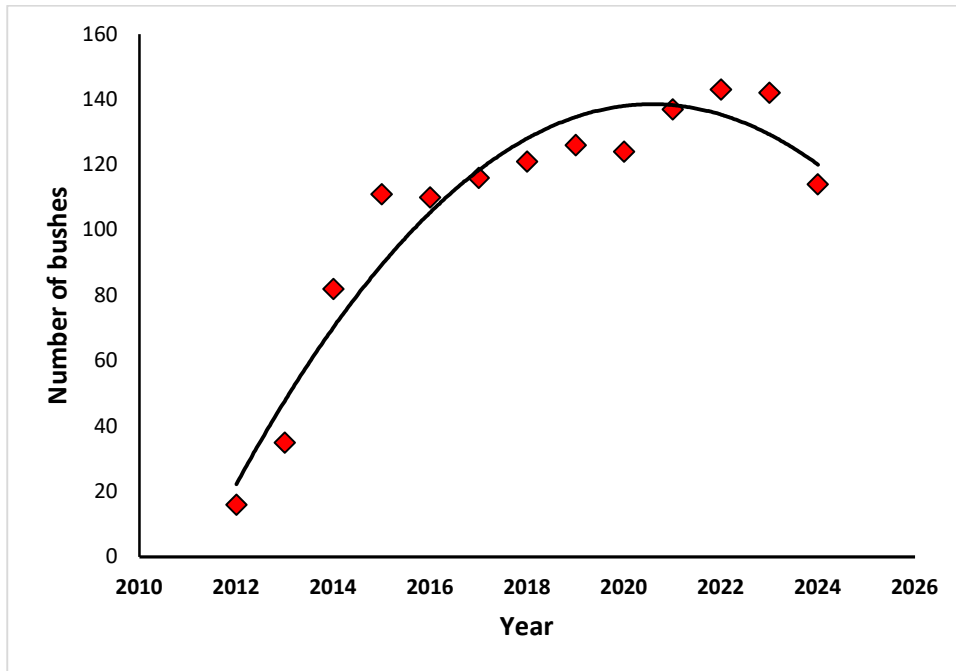


Figure 9. Annual number of *Salix × friesiana* bushes found in the Devil's Hole, 2012-24; fitted line polynomial.

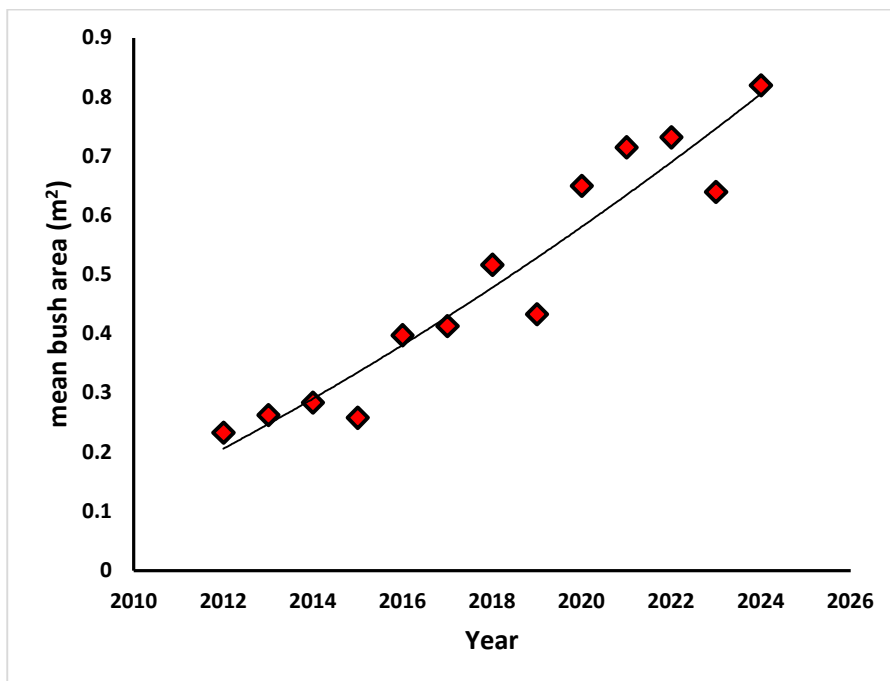


Figure 10. Mean area (m²) of *Salix × friesiana* bushes in the Devil's Hole, 2012-24; fitted line polynomial.

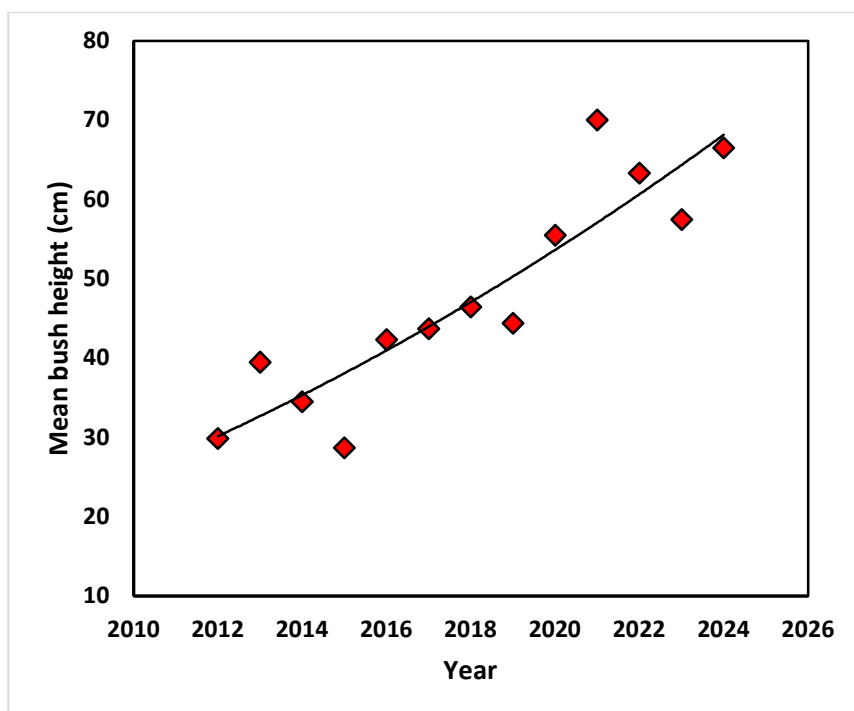


Figure 11. Mean height (cm) of *Salix* $\times$ *friesiana* bushes in the Devil's Hole, 2012-24; fitted line polynomial.



Figure 12. Devil's Hole north in October 2020, showing abundance of *Salix repens*.



Figure 13. Devil's Hole north in September 2007 showing an early stage in vegetation development.



Figure 14. Devil's Hole north in May 2024, 17 years on from Figure 13, showing extensive flooding and successional change.

Other observations in 2024

As usual, fortnightly measurements of the water-table continued throughout the year. The autumn and winter were extremely wet, so that the maximum water-level reached in March 2023 was a record high. Over the ten years of observations, there was an upward trend in water-table height, caused largely by three particularly wet years in 2019/20, 2020/21 and 2023/24 (Fig. 15).

Conditions for Natterjack Toad breeding were favourable, with sufficient water for spawning in the eastern part of the northern slack and retention of surface water most of the summer. Over 1000 Natterjack tadpoles were noted in May, resulting in a small number of toadlets. *Lissotriton vulgaris* (Smooth Newt), *Bufo bufo* (Common Toad) and *Rana temporaria* (Common Frog) also bred successfully.

Several dragonflies probably bred, including *Libellula quadrimaculata* (Four-spot Chaser), *Anax imperator* (Emperor) and *Sympetrum striolatum* (Common Darter). A vagrant *Sympetrum danae* (Black Darter) was seen twice in September (Fig. 16). As in 2023, the nationally rare Northern Dune Tiger Beetle had a poor year with only single figures seen. The Red-listed solitary bee *Colletes cunicularius* (Early Colletes) was abundant again in spring on the two older proto-dunes and in the northwest corner of the northern blowout. The nationally scarce *Lasiopogon cinctus* (Spring Heath Robberfly) was recorded in May. As usual, *Zygaena filipendulae* (Six-spot Burnet) was numerous in August. Amongst the butterflies, *Polyommatus icarus* (Common Blue) was frequent, together with the occasional *Pyronia tithonus* (Gatekeeper), *Lasiommata megera* (Wall) and *Hipparchia semele* (Grayling). Orthoptera were represented by numerous *Chorthippus brunneus* (Field Grasshopper) and a few *Tetrix undulata* (Common Groundhopper) (Fig 17). Several hoverflies included *Chalcosyrphus nemorum* (Small Leafwalker) and *Paragus haemorrhous* (Common Grass Skimmer), the latter being scarce in the north of England. Sandy tracks attracted *Philonicus albiceps* (Dune Robberfly), *Dysmachus trigonus* (Fan-bristled Robberfly) and *Acrosathe annulata* (Coastal Silver Stiletto) (Fig. 18). Patches of bare sand also revealed the tracks of *Capreolus capreolus* (Roe Deer) (Fig. 19).

Recreational use of the site was often considerable, including children sliding down the slopes of the blowout. Although potentially damaging to wildlife, this probably helped to maintain the dynamism of the feature. As usual, dogs were allowed or encouraged by owners to enter the water in the slacks, despite signs erected by the National Trust in 2021 explaining the presence of breeding Natterjack Toads and requesting cooperation.

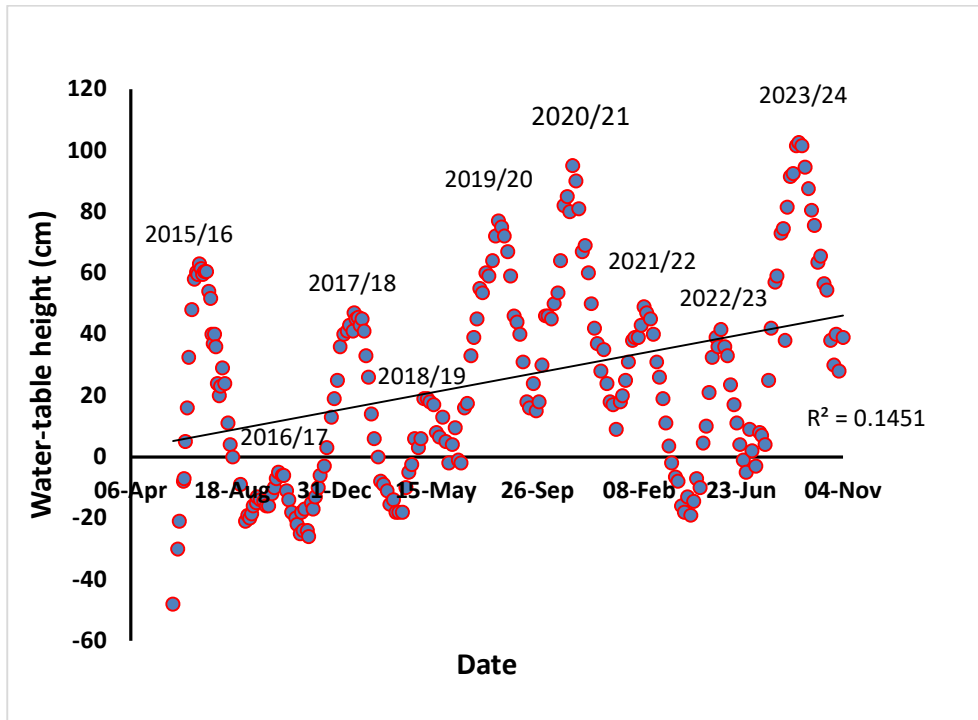


Figure 15. Fortnightly measurements of the Devil's Hole north water-table from October 2015 to November 2024 ($r = 0.381$; $p \leq 0.00001$). Zero on the y-axis indicates ground level.



Figure 16. Black Darter, Devil's Hole north, September 2024.



Figure 17. Common Groundhopper, Devil's Hole north, May 2024.



Figure 18. Coastal Silver Stiletto male, Devil's Hole north, June 2024.



Figure 19. Roe Deer footprints, Devil's Hole north, July 2024.

Acknowledgements

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References

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Nomenclature follows C.A. Stace's *New Flora* fourth edition (2019) and later amendments.

KEY: * = non-native or introduced native taxon; d = dominant; a = abundant; f = frequent; o = occasional; r = rare; l = locally; v = very. Stat. = conservation status; NR = Nationally Rare; NS = Nationally Scarce; VU = GB Vulnerable; NT = Near Threatened (*italics* = threat status in England Red List); S41 = listed as a species of principal importance under Section 41 of NERC Act 2006; SCI = Species of Conservation Importance in North West England; JS = record by Joshua Styles.

Year

[illegible]

<i>Aira praecox</i>	Early Hair-grass	lo			vla		lo		lo	r	
<i>Ammophila arenaria</i>	Marram	la	la	la	la	la	la	la	la	la	
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid	o	r	o	lo	lo	lo	lo	lo	lf	SCI
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass						lo				
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort	lf	r	lo	lo	lo	lo		lo	lo	
<i>Asparagus officinalis</i> *	Garden Asparagus	r	r	r	r	r	r	r	r	r	
<i>Bellis perennis</i>	Daisy							r			
<i>Betula pendula</i>	Silver Birch	r	r	r	o	o		r	r	vlo	
<i>Betula pubescens</i>	Downy Birch	r	r	r	r	r			r	r	
<i>Blackstonia perfoliata</i>	Yellow-wort	o	o	o	o	o	o	o	o	o	
<i>Blysmus compressus</i>	Flat-sedge	vlo	vlo	vlo	r	r	r	r	r		VU VU SCI S41
<i>Bromus hordeaceus</i>	Soft Brome										
<i>Campanula rotundifolia</i>	Hare-bell	o	vlf	vlf	vlf	vlf	lf	lf	lo	lo	NT
<i>Cardamine hirsuta</i>	Hairy Bitter-cress	o	o	o	o	o		vlf	r	lo	
<i>Cardamine pratensis</i>	Cuckooflower	lo	lf	o	lo	r	r	lo	lo	lo	
<i>Carex arenaria</i>	Sand Sedge	la	la	la	la	la	la	la	la	la	
<i>Carex flacca</i>	Glaucous Sedge	la	la	la	la	la	la	la	la	la	
<i>Carex hirta</i>	Hairy Sedge	r	o	r	lo		r	lo	lo	lo	
<i>Carex nigra</i>	Common Sedge							vlf		vlf	
<i>Carex viridula</i>	Small-fruited Yellow-sedge	lf	lf	o	lf	lf	lf	lf	lf	lf	SCI
<i>Carlina vulgaris</i>	Carline Thistle	r	lo	lo	lo	lo	lo	lo	lo	lf	SCI
<i>Centaurea nigra</i>	Common Knapweed										
<i>Centaureum intermedium</i>	Intermediate Centaury	r	r	r	r	lo	lo	r	r	r	EN
<i>Centaureum erythraea</i>	Common Centaury	lo	lf	lf	lf	o	lf	o	lf	lf	
<i>Centaureum littorale</i>	Seaside Centaury	r	vlo	r	r	r	lo	lo	r	r	NS SCI
<i>Centaureum pulchellum</i>	Lesser Centaury	r									SCI
<i>Cerastium diffusum</i>	Sea Mouse-ear	lf	lo	lf	vlf	o	lo	lo	vlf	lf	
<i>Cerastium semidecandrum</i>	Little Mouse-ear		lo	lo				lo	r	lo	
<i>Cerastium fontanum</i>	Common Mouse-ear	o	o	o	o	o	o	r	r	o	

<i>Chamaenerion angustifolium</i>	Rosebay Willowherb	lo	lf	lf	lo	lo	lo	lo	lo	lo	
<i>Cirsium</i> × <i>celakovskianum</i>	Hybrid Thistle										
<i>Cirsium arvense</i>	Creeping Thistle	lf	lf	lf	o	o	o	o	o	o	
<i>Cirsium vulgare</i>	Spear Thistle	r	r								
<i>Crepis capillaris</i>	Smooth Hawk's-beard	o	r	o	r	o	o	o	o	o	
<i>Cynoglossum officinale</i>	Hound's-tongue		r	r							NT SCI
<i>Dactylorhiza</i> × <i>grandis</i>	Hybrid Marsh-orchid	o	r	r	r						
<i>Dactylorhiza fuchsii</i>	Common Spotted-orchid	r	r								
<i>Dactylorhiza incarnata</i> subsp. <i>coccinea</i>	Early Marsh-orchid	lf	lf	lf	lf	lf	lo	lo	lo	lo	NT SCI
<i>Dactylorhiza incarnata</i> subsp. <i>incarnata</i>	Early Marsh-orchid				r			r	r		SCI
<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid	o	o	o	o	o	o	o	o	o	
<i>Dactylorhiza purpurella</i>	Northern Marsh-orchid	r		r	r			r	r		SCI
<i>Daucus carota</i>	Wild Carrot		r	r			r		r	r	
<i>Eleocharis palustris</i>	Common Spike-rush	la	la	la	la	la	la	la	la	la	
<i>Eleocharis quinqueflora</i>	Few-flowered Spike-rush			vlf	vla	la	la	la	la	la	SCI
<i>Elymus juncea</i>	Sand Couch			r							
<i>Elymus repens</i>	Common Couch				JS						
<i>Epilobium ciliatum</i> *	American Willowherb						r	r			
<i>Epilobium hirsutum</i>	Great Willowherb	r	r	r	lo	lo	lf	lf	lf	lf	
<i>Epilobium obscurum</i>	Short-fruited Willowherb			r							
<i>Epilobium palustre</i>	Marsh Willowherb								r		
<i>Epilobium parviflorum</i>	Hoary Willowherb		lo	lo	lo	r		r	o	o	
<i>Epipactis dunensis</i>	Dune Helleborine			r							NR
<i>Epipactis palustris</i>	Marsh Helleborine	la	la	lf	lf	lf	lo	lf	lf	lf	NT SCI
<i>Erigeron acris</i>	Blue Fleabane	o	o	lo	lo	o	o	r	lo	o	
<i>Erigeron canadensis</i> *	Canadian Fleabane	r	r	r				o	r		
<i>Erigeron sumatrensis</i> *	Guernsey Fleabane			vlo	vlo	vlo	r			vlo	

<i>Erodium aethiopicum</i>	Sticky Stork's-bill	r									NS SCI
<i>Erodium cicutarium</i>	Common Stork's-bill	o									
<i>Erophila verna</i>	Common Whitlow-grass	lo	o	o				r		lo	
<i>Euphrasia confusa</i>	Confused Eyebright	lf	lf	lf	lf	lf	lo	lo		vlf	VU VU
<i>Euphrasia nemorosa</i>	Common Eyebright	lf	lf	lo	lf	o	lf	o	o	o	NT
<i>Festuca ovina</i>	Sheep's-fescue									r	
<i>Festuca rubra</i>	Red Fescue	la	la	la	la	la	la	la	la	la	
<i>Galium palustre</i>	Marsh Bedstraw										
<i>Linum catharticum</i>	Fairy Flax									vlo	
<i>Lysimachia maritima</i>	Sea Milkwort										
<i>Helosciadium nodiflorum</i>	Fool's Watercress	r				r		vla		vlf	
<i>Hieracium umbellatum</i>	Umbellate Hawkweed	o	lo	lo	lo	o	o	o	o	o	
<i>Hippophae rhamnoides*</i>	Sea Buckthorn	r	r	r	r	r	r	r	lo	r	
<i>Holcus lanatus</i>	Yorkshire-fog	lf	lf	lf	lf	lf	lf	lf	lf	lf	
<i>Hydrocotyle vulgaris</i>	Marsh Pennywort	la	la	la	la	la	la	la	la	la	NT
<i>Hypericum perforatum</i>	Perforate St John's-wort										
<i>Hypericum tetrapterum</i>	Square-stalked St John's-wort	r	r	lo	lo	lo	r		r		
<i>Hypochaeris radicata</i>	Cat's-ear	o	o	lf	lf	lf	lf	lf	lo	lo	
<i>Isolepis setacea</i>	Bristle Club-rush										
<i>Jacobaea vulgaris</i>	Common Ragwort	o	o	o	o	o	o	o	o	o	
<i>Juncus articulatus</i>	Jointed Rush	lf	lf	lf	lf	lf	la	la	la	la	
<i>Juncus bufonius</i>	Toad Rush	o		la		lf	lf	lo		vlf	
<i>Juncus inflexus</i>	Hard Rush	r	r	r	r	r	vlf	vlf	vlf	vlf	
<i>Juncus subnodulosus</i>	Blunt-flowered Rush	vla	vla	vla	vla	vla	la	la	la	la	SCI
<i>Lathyrus pratensis</i>	Meadow Vetchling	vlo		vlo		lo	lo			r	
<i>Leontodon saxatilis</i>	Lesser Hawkbit	o	o	o	o	o	o	o	o	o	
<i>Linum catharticum</i>	Fairy Flax	vlf	r	r	vlf	vlf	vlf	lf	vlf	vla	
<i>Lolium perenne</i>	Perennial Rye-grass			r							
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	la	la	la	la	lf	lf	lf	la	la	

<i>Luzula campestris</i>	Field Wood-rush	lo	o	o	lf	o	o	lo			
<i>Lysimachia tenella</i>	Bog Pimpernel	la	la	a	lf	vlo	lo	vlf	vlf	vla	SCI
<i>Lythrum salicaria</i>	Purple Loosestrife					r			r		
<i>Mentha aquatica</i>	Water Mint	lf	lf	o	o	o	o	o	o	o	
<i>Myosotis laxa</i>	Tufted Forget-me-not	o	o	o	lo	lo	lo	o	o	o	
<i>Myosotis ramosissima</i>	Early Forget-me-not	lf	lo	lo		o	o		vlf		SCI
<i>Nasturtium officinale</i>	Water-cress				r			r			
<i>Oenothera × fallax*</i>	Intermediate Evening-primrose	o	lo	lo	o	o	o	o	o	o	
<i>Oenothera glazioviana*</i>	Large-flowered Evening-primrose	r		lo	lo	lo	lo	lo	o		
<i>Ononis repens</i>	Common Restharrow	lf	la	la	la	la	la	la	lo	la	
<i>Ophrys apifera</i>	Bee Orchid	o		lo	lo	lo	vlo	lo	lo	lo	
<i>Parentucellia viscosa</i>	Yellow Bartsia		r								SCI
<i>Parnassia palustris</i>	Grass-of-Parnassus	lf	lf	lf	lf	o	lf	lf	lf	lf	<i>VU</i> SCI
<i>Pastinaca sativa</i>	Wild Parsnip	o	o	o	r	o	o	o	o	o	
<i>Phalaris arundinacea</i>	Reed Canary-grass							r	r		
<i>Phleum arenarium</i>	Sand Cat's-tail	lf	lo	lo	lo	lf	lf	la	la	la	<i>NT</i> SCI
<i>Phleum pratense</i>	Timothy										
<i>Phragmites australis</i>	Common Reed						lf	lf	lf	la	
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	lf	lf	lf	lf	lf	lf	lo	la	la	
<i>Pinus sp.*</i>	Pine	r		r	(JS)				r	r	
<i>Plantago coronopus</i>	Buck's-horn Plantain										
<i>Plantago lanceolata</i>	Ribwort Plantain										
<i>Plantago major</i>	Greater Plantain		o	r		r	r	r		r	
<i>Poa annua</i>	Annual Meadow-grass	o	o	o							
<i>Poa humilis</i>	Spreading Meadow-grass			lo							
<i>Poa pratensis</i>	Smooth Meadow-grass	lo	r	lo	vlo	lo	lo				

[illegible]

<i>Salix × reichardtii</i>	Hybrid Willow				r	r	r	r	r	r	
<i>Salix × smithiana</i>	Broad-leaved Osier	r?	r?	r?	r?	r				r	
<i>Salix alba</i>	White Willow	r	r	r	r	r	r	r	r	o	
<i>Salix caprea</i>	Goat Willow	o	o	o	o	o	o	o	o	o	
<i>Salix cinerea</i> subsp. <i>cinerea</i>	Grey Willow					r		r			
<i>Salix cinerea</i> subsp. <i>oleifolia</i>	Grey Willow	f	f	f	f	f	f	f	f	f	
<i>Salix pentandra</i>	Bay Willow	r	r	r	r	r					
<i>Salix purpurea</i>	Purple Willow	r	r	r	r	r	r	r	r	r	
<i>Salix repens</i>	Creeping Willow	a	a	a	a	a	a	a	a	a	NT
<i>Salix viminalis</i>	Osier	r	r	r	r	o	r	r	r	r	
<i>Samolus valerandi</i>	Brookweed	lf	lf	lo	lo	r	o	o	o	o	SCI
<i>Saxifraga tridactylites</i>	Rue-leaved Saxifrage	lf	vlf	lf	vlo	lf	la	la	la	la	
<i>Schedonorus arundinaceus</i>	Tall Fescue										
<i>Schoenoplectus tabernaemontani</i>	Grey Club-rush	r		r		r	vlf	vlf	vlf	vlf	SCI
<i>Scorzoneroidea autumnalis</i>	Autumn Hawkbit		r		lo				r		
<i>Sedum acre</i>	Biting Stonecrop	lf	lf	lf	lf	lf	lf	lf	lf	lf	
<i>Senecio squalidus</i> *	Oxford Ragwort			r	(JS)						
<i>Senecio vulgaris</i> subsp. <i>denticulatus</i>	Groundsel	r	o	o						r	NS
<i>Senecio vulgaris</i> subsp. <i>vulgaris</i>	Groundsel		r		r		r		r		
<i>Sisyrinchium californicum</i> *	Yellow-eyed-grass								vlo		
<i>Solanum dulcamara</i>	Bittersweet								r		
<i>Sonchus asper</i>	Prickly Sowthistle		o	r	r	r	r	r	r	r	
<i>Sonchus oleraceus</i>	Smooth Sowthistle	r		r	r	r	r	r	r	r	
<i>Symphyotrichum</i> sp.*	Michaelmas-daisy				r						
<i>Taraxacum</i> agg.	Dandelion	o	o	o	o	o	o	o	o	o	
<i>Tragopogon pratensis</i>	Goat's-beard					r	lo			r	
<i>Trifolium dubium</i>	Lesser Trefoil		r		vlf						
<i>Trifolium pratense</i>	Red Clover	r	o	la	la	lo	r	vla	la	la	
<i>Trifolium repens</i>	White Clover			vla	vlf	lf	la	la	lo	lo	
<i>Triticum aestivum</i> *	Bread Wheat		r								
<i>Tussilago farfara</i>	Colt's-foot		vlo	vlo	vlo	r	r	r	lo	lo	
<i>Typha latifolia</i>	Bulrush	r		r	lo	lo	lo	lo	lo	lo	

<i>Valerianella locusta</i>	Common Corn-salad	r	lo	r		r					
<i>Veronica arvensis</i>	Wall Speedwell									vlo	
<i>Veronica scutellata</i>	Marsh Speedwell	lo	r	lo	lo	r	lo	r			NT
<i>Vicia lathyroides</i>	Spring Vetch	lo	lo	r	r				lo		SCI
<i>Vicia sativa</i>	Common Vetch	o	o	o	o	o	o		lo	vlf	
<i>Vicia sepium</i>	Bush Vetch										
<i>Viola canina</i>	Heath Dog-violet	lf	lf	lf	lo	lo	lo	lo	lo	lo	SCI NT VU
<i>Vulpia fasciculata</i>	Dune Fescue	lf	lf	lf	lf	lf	la	la	la	la	NS
183 (2024) (17 alien)	Total	118	118	129	122	117	110	105	116	114	37

Southern basin (# = not in northern basin)

Taxon	English name	15	16	17	18	19	20	21	22	23	24	Stat.
<i>Agrostis stolonifera</i>	Creeping Bent	o	o	o	o	o	la	la	f	f	f	
<i>Ammophila arenaria</i>	Marram	o	o	o	o	o	o	o	lo	r	r	
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid		r		r			lo	lo		lo	SCI
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort	r	lo	lf		r						
<i>Asparagus officinalis</i> *	Garden Asparagus		r			r		r	r	r	r	
<i>Bellis perennis</i>	Daisy			r								
<i>Bromus hordeaceus</i>	Soft Brome	r				r						
<i>Carex arenaria</i>	Sand Sedge	la	la	la	la	la	la	la	la	la	lf	
<i>Carex flacca</i>	Glaucous Sedge	lf	la	la	lf	lf	lf	la	o	la	la	
<i>Carex nigra</i>	Common Sedge						vlo		la	vlf		
<i>Carex viridula</i>	Small-fruited Yellow-sedge	f	o	o	o	lf	o	o	lf	lf		SCI
<i>Campanula rotundifolia</i>	Hare-bell							vlo			lo	NT
<i>Centaurea nigra</i>	Common Knapweed		o									
<i>Centaureum erythraea</i>	Common Centaury	f	r	o	o	o	o	o	o	o	o	
<i>Centaureum intermedium</i>	Intermediate Centaury			r	r		r	r	r			
<i>Centaureum littorale</i>	Seaside Centaury	o		o	o	o		o	o	o	r	NS SCI
<i>Cerastium diffusum</i>	Sea Mouse-ear	lf	lf	o	lf	r				lo		
<i>Cerastium fontanum</i>	Common Mouse-ear	r	o	r	o	r	lo				o	

<i>Cerastium semidecandrum</i>	Little Mouse-ear				o							
<i>Chamaenerion angustifolium</i>	Rosebay Willowherb	r	r									
<i>Cirsium arvense</i>	Creeping Thistle	lo	lf	lf	o	lf	o	o		o		
<i>Erigeron canadensis*</i>	Canadian Fleabane	o		r								
<i>Crepis capillaris</i>	Smooth Hawk's-beard	o	o	lf		r		lo	lo		o	
<i>Dactylorhiza incarnata</i> subsp. <i>coccinea</i>	Early Marsh-orchid	r	r	o	r	o	r	o	o	o	o	NS NT SCI
<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid			r	o	o		r	lo	lo	o	
<i>Daucus carota</i>	Wild Carrot	o		o	r		r	r	lo	r	r	
<i>Eleocharis palustris</i>	Common Spike-rush	la	la	la	la	la	la	la	la	la	la	
<i>Eleocharis quinqueflora</i>	Few-flowered Spike-rush	la	la	la	la	la	la	la	la	la	la	SCI
<i>Eleocharis uniglumis</i> #	Slender Spike-rush					la	lf		la			SCI
<i>Epilobium hirsutum</i>	Great Willowherb		o	o	lo	o						
<i>Epilobium obscurum</i>	Short-fruited Willowherb	r										
<i>Epilobium parviflorum</i>	Hoary Willowherb	r	r	r		lo			r			
<i>Epipactis dunensis</i>	Dune Helleborine					r						NR SCI
<i>Epipactis palustris</i>	Marsh Helleborine	lf	o	o	lf	lf	lf	lf	lf	o	lo	NT SCI
<i>Erigeron acris</i>	Blue Fleabane	o		r			o	lo		lo	o	
<i>Erophila verna</i>	Common Whitlow-grass				lo							
<i>Euphrasia confusa</i>	Confused Eyebright			o	lf	o		r		o	lf	VU
<i>Euphrasia nemorosa</i>	Common Eyebright	vlf	lf	lf	o		lf	lf	lf	lf	lf	
<i>Euphrasia tetraquetra</i>	Western Eyebright									r	r	
<i>Festuca rubra</i>	Red Fescue	lf	lf	lf	lf	lf	lf	lf	lf	lf	lf	
<i>Hieracium umbellatum</i>	Umbellate Hawkweed	vlo	r	r	r	r	r	o	r	o	r	
<i>Hippophae rhamnoides*</i>	Sea Buckthorn	r	r	o	r	r	r	r		r		
<i>Holcus lanatus</i>	Yorkshire-fog	o	lf	lf	lf	lf	lf	lf	lf	o	o	
<i>Hydrocotyle vulgaris</i>	Marsh Pennywort	lf	lf	lf	lf	lf	lf	lf	la	la	la	NT

[illegible]

[illegible]

<i>Veronica chamaedrys</i> #	Germander Speedwell		vlo	vlf	vlf	vlf	vlo		lo	r		
<i>Vicia lathyroides</i>	Spring Vetch		r		r				vlf	vlo		SCI
<i>Vicia sativa</i> subsp. <i>nigra</i>	Common Vetch	o		o	o	r	r					
<i>Viola canina</i>	Heath Dog-violet								o			SCI NT <i>VU</i>
<i>Vulpia fasciculata</i>	Dune Fescue	o	o		o	r	lo	lo				NS SCI
108 (2024) (7 alien) (3 additional to N slack)	Total	71	64	70	70	63	57	60	60	60	57	24 not.