

Sand Dunes in Wales

Sands of LIFE



naturalresources.wales/SandsofLIFE



Co-funded by
the European Union



Noddir gan
Lywodraeth Cymru
Sponsored by
Welsh Government

Dynamic dunes

The coastal sand dunes of Wales are captivating, iconic landscapes and one of the country's most natural and species-rich habitats. They are biodiversity hotspots where vibrant carpets of flowers survive alongside song birds, butterflies and a wide array of endangered insects.

The unique character of the dunes is valued by local people and visitors alike, as they provide a dramatic backdrop to a day on the beach, a place for play and exercise or leisurely walks and relaxation.

There are approximately 8,100 hectares (31 square miles) of sand dune in Wales - which amounts to just 0.3% of the country's land surface.

There are more than 80 significant sand dunes sites along the Welsh coastline. They range from the extensive dune systems at Newborough and Kenfig which cover more than 500 hectares, to smaller sites like Poppit Sands (Pembrokeshire) and Lligwy (Anglesey) which are less than 10 hectares in size. Many of the individual sites are part of larger, interconnected sedimentary systems which are linked by coastal currents.



Newborough Warren



Morfa Dyffryn



Pembrey Burrows



Significant sand dunes in Wales	County	Area (hectares)
Gronant and Talacre	Denbighshire & Flintshire	519
Conwy (Deganwy, Morfa Conwy, Kinmel Bay)	Conwy	22
Valley (Twyni Trewan, Fferam, Llyn and Cymyran)	Anglesey	301
Newborough Warren and Forest	Anglesey	1200
Tywyn Aberffraw	Anglesey	300
Morfa Harlech	Meirionydd	420
Morfa Dyffryn	Meirionydd	320
Ynys Las	Ceredigion	68
Stackpole	Pembrokeshire	180
Laugharne-Pendine Burrows	Carmarthenshire	660
Pembrey Coast	Carmarthenshire	590
Oxwich	Swansea	76
Whiteford Burrows	Swansea	130
Kenfig Burrows	Bridgend	540
Merthyr Mawr Warren	Bridgend	350



Whiteford Burrows

Sand dune facts

11%
of the dunes in the
UK are in Wales

Sand dunes only cover
0.3%
of the land surface
of Wales

Total area of sand
dune in Wales is
8,100
hectares

Number of sand
dune systems
87

Approximately **30%**
of sand dunes in Wales have
been lost to development and
erosion since 1900

Of those remaining,
90%
of open sand has
been overgrown since
the 1940s

Sand dunes in Wales have
**important links to
military history** having
been used as training and
weapons testing sites before
and during World War II

Highest sand dune in the
UK and the second largest
of its kind in Europe is
**Big Dipper at Merthyr
Mawr at over
60 metres**

Some Welsh dunes developed
during great storms in the
14th Century but the dunes at
**Pembrey Burrows are
less than 80 years old**

Sand dunes support around
**90 plant and fungi
species** which are **rare,
scarce or endangered**

Sand dunes are listed
as one of the habitats
most at risk
in Europe

Ideal conditions for wildlife is
**10-15% of bare sand,
but many dunes have
only 3%**

The first coastal National
Nature Reserve was
Newborough Warren,
designated in 1955

More than **5000 species
of invertebrate** are
found on Welsh dunes,
with **over 280 being
nationally rare or
scarce**

**Over 500 species
of plants have been
recorded at Kenfig
Burrows**

Havens for wildlife

Sand dunes support an exceptional variety of rare and highly specialised plant and animal species, many of which are classified as threatened or vulnerable. Dunes are particularly important for rare flowering plants, mosses and liverworts, fungi and invertebrates.

They encompass a range of distinctive but interdependent habitats, including bare shifting sand, majestic dune ridges, flower-rich dune grassland and marshy slacks with expanses of orchids.

Each part of the dune landscape offers uniquely different environmental conditions and intricate, ever-changing mosaics of micro-habitats. The sand is typically calcium-rich due to a high proportion of shells, which favours a wide variety of lime-loving plants.

Life in the dunes is very challenging as conditions are harsh. There is shifting sand, salt spray and limited nutrient availability as well as extreme fluctuations between drought and flood. As a result, specialist species that are well-adapted to these demanding conditions have an advantage over more common species.

Sand dunes have limited value as farmland, so many have escaped agricultural intensification over the years, avoiding the impacts of ploughing, fertilisers and pesticides.

Together, these factors mean that sand dunes are one of the most natural and biodiverse ecosystems remaining in Wales, and one of the few places in the lowlands where visitors can still experience a sense of wilderness and an abundance of wildlife.

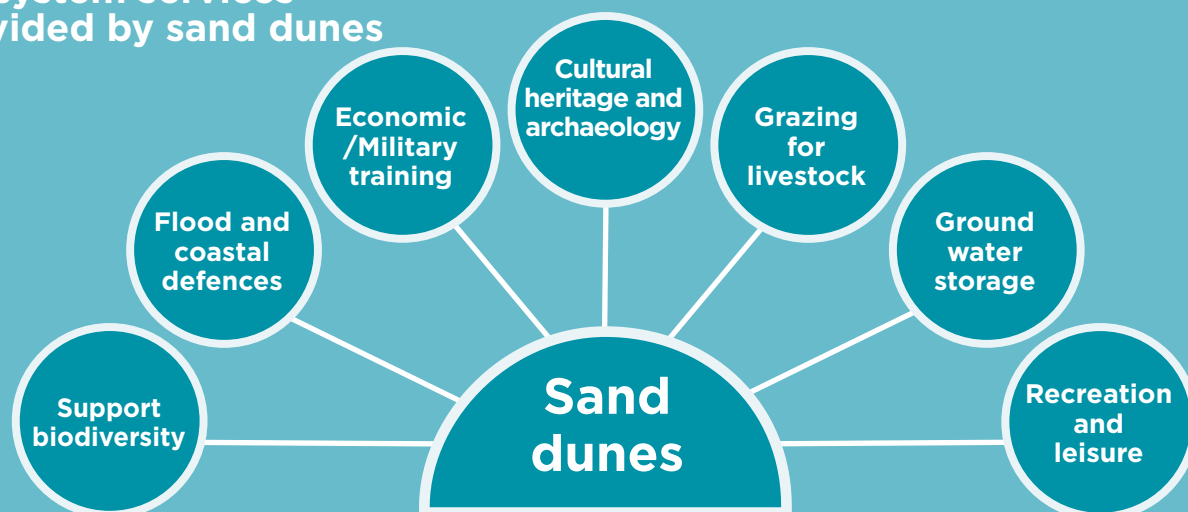
Their significance for wildlife conservation has been acknowledged in Wales, with the majority of sand dunes being designated as Sites of Special Scientific Interest, and some recognised as National Nature Reserves. The larger dune systems are classed as Special Areas of Conservation, highlighting their international importance for biodiversity and their integral role within Europe's network of protected areas.

Well-being for the people of Wales

As well as being rich in biodiversity, sand dunes help safeguard our wider environment. They act as natural sea defences against flooding and erosion, maintain the quality and flow of fresh water, and boost populations of bees and other vital pollinators for our food crops.

Beaches and dunes are also important to the Welsh tourist economy and are great locations for outdoor exercise and recreation - whether fun at the beach, an early morning walk, a horse ride or a fitness session.

Ecosystem services provided by sand dunes



How dunes begin

Sand dunes develop in areas where an ample supply of sand exists near the shore, often originating from submerged sand banks left by the glaciation of the last Ice Age. Favourable currents and waves carry this sand onto the beach. For dunes to take shape, the coastline needs to be exposed to winds that consistently blow toward or along the coast, with sufficient strength to lift and transport sand grains inland. Dunes tend to form behind wide, flat beaches where the sand can dry out and blow freely between high tides.

Sand grains move inland until either the wind loses energy or they encounter beach debris or strandline plants. Sand begins to accumulate above the high tide mark, starting the formation of the dunes.

Dune formations

By standing on an exposed dune on a blustery day, you can truly appreciate the driving force of the wind in shaping this natural phenomenon. However, sand supply, water, and plant life also contribute to the distinctive form of the dunes, which are characterised by a sequence of dry ridges interspersed with damp hollows known as dune slacks.

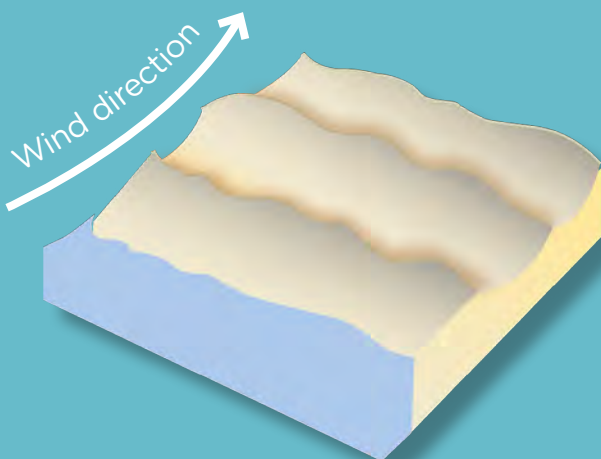
Many dunes in Wales exhibit sinuous horseshoe-shaped ridges (parabolas) as at Newborough Warren. However, other dunes, take the form of linear ridges and troughs, known as transverse dunes, as seen at Pembrey Burrows.

In their natural state, sand dunes are dynamic; constantly evolving and generating ever-changing patterns of bare sand and new areas of low-lying wetland. Over time, dune ridges have the tendency to advance inland as sand gradually drifts over the crest and cascades down the sheltered side, typically at an average rate of 1-2 metres per year. Additionally, 'blow-outs' can form as sand is scoured away in a circular motion, creating unique bowl-shaped features in the dunes.

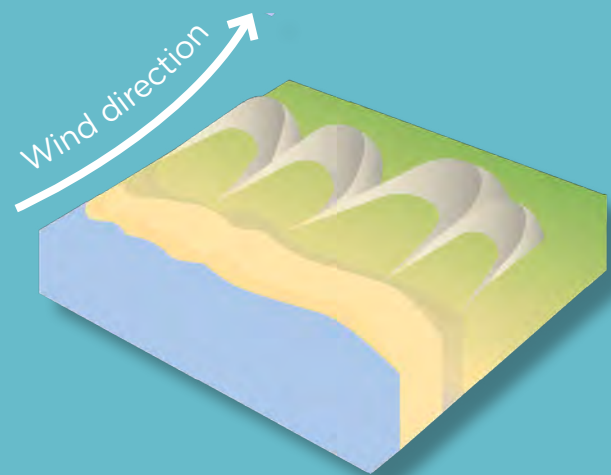
The role of plants is also crucial in shaping the dunes. Highly-adapted species such as Marram grass, colonise and bind the bare sand, allowing the dunes to increase in height and stability.

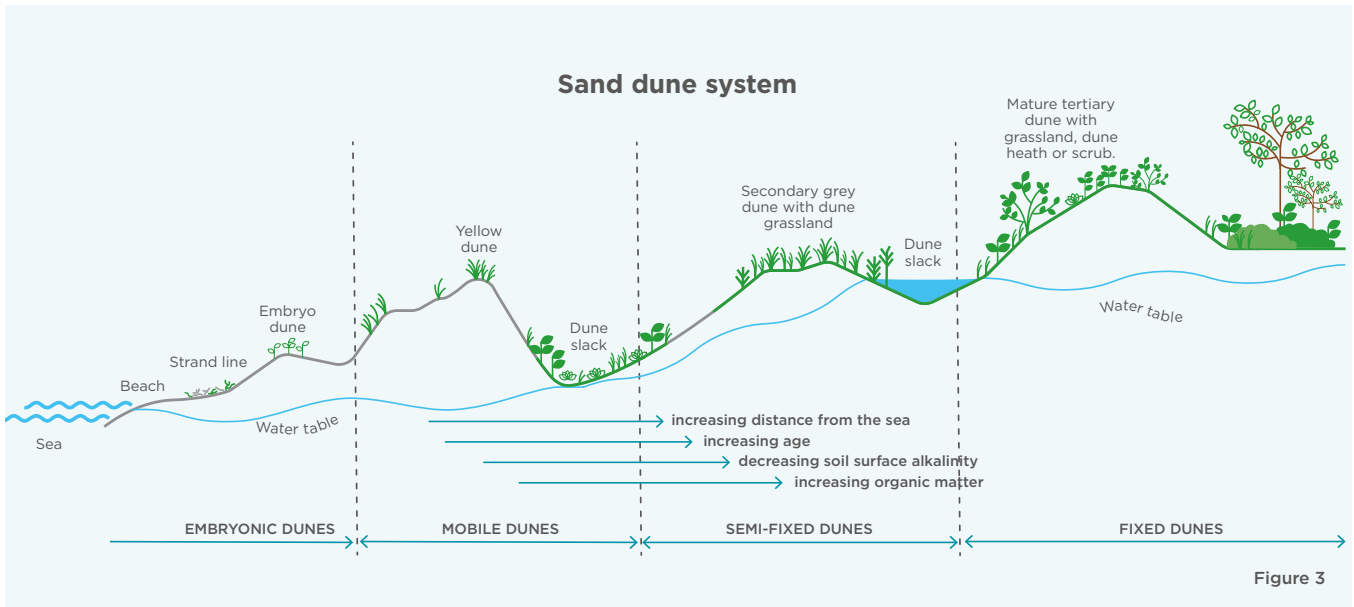
The natural process of building a dune system is known as succession. A series of distinct successional zones can be observed, each with a different character and suit of species. These zones range from young, low embryo dunes at the top of the beach, followed by mobile yellow dunes, through to mature, vegetated dunes which can be as much as 3km inland.

Transverse dunes



Parabolic dunes





Embryo dunes

Embryo dunes take shape on the strandline, at the high tide mark, where driftwood, seaweed and other debris start capturing sand. When enough sand has accumulated, pioneer dune plants like Sea rocket and Sand couch take hold. Their roots trap and bind the sand further to form the first low mounds.

Surviving in this environment is extremely challenging and vegetation remains sparse. Plants of the embryo dunes are supremely adapted, displaying high tolerance to salt and drought. They may have waxy, fleshy leaves which conserve moisture, or seeds that can be dispersed by the sea.



Typical species of the embryo dunes

- | | |
|------------------|------------------|
| Lyme grass | Sea sandwort |
| Sand couch grass | Prickly saltwort |
| Sea rocket | |

Yellow dunes (Fore dunes or shifting dunes)

Where there are plentiful supplies of sand, the embryo dunes will steadily grow in height, and Marram grass will take root, creating tall dunes known as 'yellow dunes'. These impressive formations reach heights of 20 metres or so in Wales.

Referred to as mobile or shifting dunes, both the embryo and yellow dunes are characterised by loose sand that can be easily blown by the wind. Consequently, their shape and position can change significantly over time.

The tall yellow dunes provide some shelter to the land behind them, but their steep slopes and ridges are a punishing environment for plant life. The water table can be metres below the surface and rainwater swiftly drains through the loose sand. Plants must endure extreme drought, as well as ever-shifting sand which can either bury the leaves or expose the roots.

Typical species of the yellow dunes

Common cat's-ear	Sea spurge
Marram grass	Sea stock (South Wales only)
Sea bindweed	Viper's bugloss
Sea holly	



Marram grass

Marram grass takes centre stage in the yellow dunes and is the primary species responsible for dune-building in the UK. This fast-growing, resilient grass has many adaptations for survival. It is salt tolerant and features sturdy, inwardly rolled leaves that minimise moisture loss.

Marram can cope with being buried by drifting sand, as it has a network of tough rhizomes (modified underground stems) which anchor the plant firmly and send out both roots and shoots. The rapidly growing roots can reach several metres in length both downwards and laterally, allowing them to out-pace sand inundation and reach water during dry spells. This growth pattern directly influences the shape of the dune that forms - resulting in long, sinuous lines of dunes.

Accretion and erosion

In some stretches of the Welsh coast, sea currents carry abundant supplies of sand, resulting in the active accretion (building-up) of embryo and yellow dunes. In these cases, the dunes steadily advance seaward and lead to the creation of new land.

However, in other areas (sometimes nearby) dunes are eroding. In these instances the embryo dunes disappear entirely, leaving behind steep sand cliffs, as winter storms carve into the yellow dunes.



Grey dunes (Secondary dunes, fixed dunes)

Further inland are the 'grey dunes', which are older and were originally yellow dunes. They can be the largest within the dune system, reaching heights of over 20 metres, however, undulating landscapes of lower dunes and sand plains are also common. Also known as 'secondary' or 'fixed' dunes, these sand dunes are typically stabilised by a covering of vegetation, preventing them from moving. Nonetheless, localised erosion can result in patches of bare sand or blow-outs.

Away from the shoreline, conditions are less harsh and a thin layer of darker organic soil develops, allowing more plants to thrive. The calcium-rich grey dunes of Wales support extensive dune grasslands, with a diverse array

of abundant colourful flowers. These European priority habitats can boast more than 30 different plant species per square metre on some sites.

In Wales, at least 20 particularly rare or uncommon plants have been recorded on the grey dunes, including Heath dog violet, Sticky storks-bill, Field gentian and Squinancywort.

Less common annual plant species, such as the Sand cat's-tail grass, Early forget-me-not and Shepherd's cress have adapted to dry conditions by completing their life cycle quickly. They flower early in spring, ahead of most plants, and set seed before the onset of summer.

Loose sand carried by the wind is known as 'sand rain'. As it settles on dune grassland it brings an influx of fresh calcium which nourishes the plant communities.



Common centaury and Wild thyme



Dune pansy



Typical species of the grey dunes

- | | |
|-----------------------|------------------|
| Autumn gentian | Kidney vetch |
| Autumn lady's-tresses | Lady's bedstraw |
| Bird's-foot trefoil | Pyramidal orchid |
| Common centaury | Red fescue grass |
| Carline thistle | Rest-harrow |
| Dewberry | Sheep's bit |
| Dune pansy | Wild thyme |

Dune slacks

Dune slacks are low-lying hollows between the dunes, which generally experience flooding in winter and damp conditions in summer. Slacks emerge when wind scours away sand from behind advancing dune ridges or from dish-shaped blow-outs. Once the water table is reached the erosion ceases as the saturated sand is immobile, resulting in a flat bottom to the slack.

The resulting wetland habitat, rich in calcium, can support a remarkable variety of plant life. While conditions are less harsh than in the foredunes, nutrients remain limited and plants must withstand periodic flooding.

Dune slacks are renowned for their stunning floral displays, making them one of the prime orchid habitats outside the tropics. Marsh helleborine, one the most attractive British orchids, thrives in these habitats, forming impressive carpets of flowers. Rare and uncommon plants found in dune slacks include Fen orchid, Petalwort, Dune helleborine, Dune gentian, Grass-of-parnassus and Seaside centaury.

Creeping willow is usually present in dune slacks, and in some cases it traps blown sand to form small hummocks, known as 'hedgehog dunes' because of their characteristic rounded shape.

Typical species of dunes slacks

- | | |
|--------------------|-----------------------|
| Autumn gentian | Southern marsh orchid |
| Creeping willow | Variegated horsetail |
| Early marsh orchid | Water mint |
| Marsh helleborine | |
| Marsh pennywort | |



Marsh helleborine



Marsh Orchid



Dune heath

Dune heath is a rare habitat in Wales which typically occurs further inland within more mature dunes. Over time, rainwater leaches the calcium out of the sand, rendering it more acidic, and paving the way for heather and lichen to develop.

Studies indicate that it may take up to 200 years for soils to attain the levels of acidity which will support dune heath. Unfortunately, inland parts of the dunes are more likely to be developed or used for agriculture or forestry, endangering this valuable habitat.



Dune heath at Cymeran



Dune heath in Newborough Forest with Cladonia lichen

Typical species of dune heath

- Bell heather
- Cladonia lichen
- Common heather (Ling)
- Heath bedstraw
- Sheep's sorrel
- Sheep's fescue grass

Mature dunes

Mature dunes, also known as hind dunes or tertiary dunes, represent the oldest dunes within the system, situated farthest from the beach. As the physical conditions become less extreme and organic matter builds up in the soil, the nutrient and moisture levels increase. Consequently, less specialised, more vigorous, common plants can survive. Over time, the establishment of tall scrub and dune woodland occurs, transforming the landscape. However, if there are sufficient numbers of grazing livestock or rabbits present, the area will remain as open grassland or a mosaic of grassland and scrub, rather than transitioning to mature woodland.



Mature dune at Kenfig Burrows

Permanent wetland

As well as periodically flooded dune slacks, many dunes have permanent freshwater habitats, which are also crucial for wildlife.

At nearly 30 hectares in size, Kenfig Pool is the largest natural lake in South Wales and a notable example of a lake within a dune system. At Tywyn Aberffraw, Llyn Coron was created when the expanding dunes partially dammed the Afon Ffraw.

Sand dune habitat can transition to marshlands and mires alongside lakes and rivers, and to saltmarsh and mudflats on the margins of estuaries. For example, on the Gower the dunes of Whiteford Burrows transition to Llanrhidian Marsh, an important overwintering site for wildfowl and waders.

Scattered throughout the open glades of Newborough Forest is a series of man-made pools. They are particularly rich in wildlife, supporting rarities like Great crested newt, Medicinal leech, Shore dock and scarce Stoneworts.

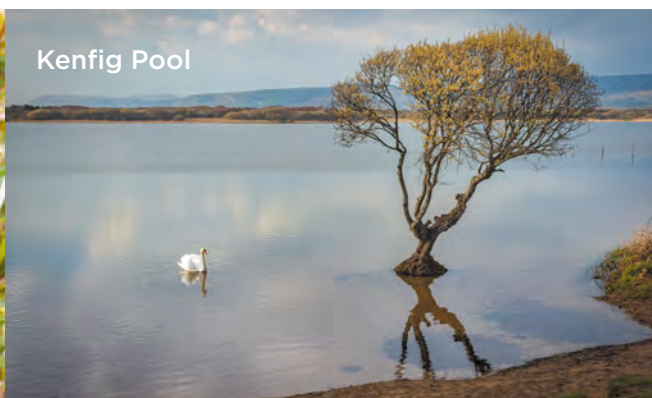
Sand dune fungi

Sand dunes represent one of the most significant habitats for fungi in Britain, and a wide range of species can be seen on Welsh dunes, especially in autumn. The visible toadstools are just the above-ground fruiting bodies - the main part of the fungus (the mycelium) remains hidden below ground.

Fungi interact with the roots of other plants, breaking down dead material and assisting with the uptake of nutrients. These so called mycorrhizal associations provide a vital service by aiding plant colonisation and growth in the nutrient-poor environment of the dunes.

More than 60 species of larger fungi are only found on dunes, with most of these adapted to colonise mobile dunes. However, many more common species can be found in all dune habitats.

Lichens can also be abundant in dunes, growing on the sand surface. These include *Cladonia* 'Reindeer lichens' and smaller crust-forming species where the sand is particularly lime-rich.



Typical fungi of Welsh dunes

Common dune wax cap

Parasol mushroom

Yellow morel

Dune specialists

Coprinus ammophilae

Geastrum schmidellii

Hohenbuehlia culmicola

Melanoleuca cinereifolia

Peziza ammophila (a cup fungus)

Phallus hadriani (a stink horn)

Psathyrella ammophila

Mosses and liverworts

Dunes are also vital for a range of rare mosses and liverworts such as Petalwort (a European Protected Species), as well as the *Bryum* Thread-mosses and *Drepanocladus* Hook-mosses. While these tiny plants may often go unnoticed, they are an integral part of the diverse sand dune flora.

Most of the rare species thrive in the moist and exposed sandy environments of young dune slacks, before other plants have established themselves.

Reptiles and amphibians

Sand dunes are important habitats for amphibians and reptiles. The most likely species to be encountered are Common lizard, Slow worm, Smooth and Palmate newt, Common toad and Common frog, as well as the occasional Adder and Grass snake.

Sand dunes are also havens for three rare European Protected Species. Once extinct in Wales, Sand lizards have been re-introduced on a number of Welsh dunes, between Ynys Las and Talacre, and on the Gower. While their main population stronghold is in the heathlands of southern England, in Wales, the cooler climate means they are restricted to sand dunes. They rely on the warm conditions found in the fore dunes, where they can lay their eggs in bare sand. The mix of open sand and dense Marram grass also provides shelter and opportunities to hunt for invertebrates.

Natterjack toads are found at Gronant and Talacre Dunes, where they have also been re-introduced. These toads lay a string of eggs in shallow pools that normally dry out in late spring or summer, which helps eliminate potential predators. Natterjack toads require a mosaic of habitats, including open sand, dense Marram grass and short dune grassland rich in invertebrates.

Great crested newts breed in deeper pools and dune slacks in wetter dune systems such as at Newborough Forest and Kenfig Burrows. They forage in the surrounding damp habitat and hibernate under stumps or in burrows during the winter.

Invertebrates

The variety of wet and dry habitats on the dunes make them a haven for insects and other invertebrates. In fact, researchers have documented over 5,000 species of invertebrates in dune ecosystems, with 460 of them being largely restricted to these habitats. The open, free-draining sand is used for nesting or hunting, and the abundant flowering plants provide a food source for both larvae and adults.

The foredunes and other areas of bare sand support many rare sand dune specialists which are not found elsewhere. For example, the Strandline beetle *Eurynebria complanata* is characteristic of undisturbed shorelines on the south Wales coast.



Bare sand in the yellow dunes is the hunting ground for the Dune tiger beetle *Cincindela maritima*; while the Vernal mining bee *Colletes cunicularius* uses open sand areas to create nesting burrows, but forages almost exclusively on Creeping willow. The majority of the UK population of these two species are found on Welsh dunes. Likewise, most of the Welsh population of the Brown-banded carder bee are confined to dune systems, while Kenfig is one of the few remaining Welsh locations where the Shrill carder bee occurs. Other invertebrates such as the Robberfly *Pamponerus germanicus* and the Stiletto fly *Dialineura anilis*, are more frequently encountered on Welsh dunes than anywhere else in the UK.

These sand dune specialists have been hit hardest by the loss of bare sand on Welsh dunes with populations declining markedly over recent decades. However, they are expert colonisers and rapidly populate new areas of bare sand, whether formed naturally or by conservation actions.

Snails, which use calcium to build their shells, are often extremely numerous on the lime-rich dunes. Snails reach their greatest diversity on dune grassland and include species such as the Heath snail *Helicella itala* and Pointed snail *Cochlicella acuta*.

More obvious species that may be spotted are the butterflies and moths which are abundant throughout the dunes with both adults and caterpillars feeding on coastal plants. The Sand dart and Sandhill rustic are specialist moths of the embryo dunes, feeding on Sea rocket and Sand couch. While species such as the Small blue, Common blue and Marbled white butterflies, the day-flying Cinnabar and Six-spot burnet moths thrive on the diverse range of dune habitats.

Birds

Skylarks, Linnets and Stonechats can be seen on the dunes throughout Wales in the summer. Waders, such as Lapwing, overwinter on nearby estuaries, but come to the dunes to breed. The red-legged Chough can also occasionally be spotted feeding amongst the shorter turf. On the shoreline, Ringed plover can often be found where there is a mix of finer shingle and sand for camouflage, and at Gronant and Talacre there is the largest nesting colony of Little terns in Wales.



Common blue



Shrilc carder bee



Skylark



Cwningar Farm at Newborough prior to the establishment of the conifer plantation in 1947



History of the dunes

Although sand dunes may appear to be areas of natural wilderness, they have in fact been managed by people for centuries. Traditionally, livestock were grazed and rabbits were reared in their thousands for meat and fur. This history is evident in local place names which often end in 'burrows' or 'warren'.

Newborough Warren stands out as one of the few dunes in Britain where Marram grass was used commercially to make haystack covers, mats, ropes and baskets. The practice dates back to the 16th Century and over time developed into a thriving domestic industry.

During World War II many dunes served as military training or weapons testing areas. Remains of firing ranges, pillboxes, railways and decoy airfield strips can still be discovered today.

During the 20th Century, many sand dunes were lost to intensive farming, industry, housing and tourist developments, such as caravan parks and golf courses. Conifer plantations were also established to help stabilise shifting sands and provide a source of timber. Hard sea defences were built which can disrupt the natural movement of sand along the coastline and affect sand supply to the dunes.

As people began to recognise the importance of sand dunes as part of Wales' natural heritage, efforts were made to provide legal protection. Newborough Warren was declared a National Nature Reserve in 1955, followed by seven other dune sites. Today, all the significant dunes systems are designated as Sites of Special Scientific Interest and with the major ones also classed as Special Areas of Conservation. However, many small dunes still lack special protection.

Pressures and threats to Welsh sand dunes

Despite the fact that dunes in Wales are now largely protected from development, populations of many rare and specialist species are decreasing and the condition of the habitat is deteriorating. The 'unfavourable condition' of the dunes is due to a combination of pressures and threats.

On-site factors

- **Loss of grazing livestock:** The level of grazing, especially by cattle, has decreased over time due to economic and practical challenges faced by farmers managing low-productivity grassland. Today, many dunes are only partially grazed or not grazed at all, leading to the overgrowth of tall vegetation and scrub.
- **Decline in rabbit populations:** Rabbits are keystone species on dunes as their grazing and burrowing creates ideal conditions for other wildlife. However, the high rabbit populations of the past have been decimated by diseases such as Myxomatosis. Fewer livestock on the dunes also has a negative effect on rabbits, as they need short, grazed turf for feeding.
- **Invasive non-native species:** In the past, plants which are not native to Welsh dunes, such as Sea buckthorn, were planted in a bid to stabilise the shifting sand. Other alien species, like Japanese rose and Montbretia/Crococsmia arrived through the dumping of garden

waste or on high tides. Once established, such species can spread to smother large areas of dune, destroying natural habitats and impeding access for people and livestock.

- **Afforestation:** Conifer plantations fundamentally change the ecology of the dune. The trees shade out existing vegetation, increase soil acidity and nutrient levels, and create layers of needle litter and brash. Additionally, conifers have high water demands throughout the year, lowering groundwater levels and causing dune slacks to dry out, even some distance away.
- **Stabilisation measures:** In previous decades, shifting sand was considered a threat and the dune ecosystem was perceived as fragile. Management effort focused on stabilising the dunes in the belief that this would help protect them. Examples for such measures included planting Marram grass and erecting fences to trap sand.

Wider factors

- **Habitat fragmentation:** In contrast to their original extent, sand dunes in Wales are now relatively small and isolated from one another. This habitat fragmentation hinders the migration of species between sites.
- **Coastal squeeze:** Rising sea levels reduce the space available for sand dunes between the high water mark and human infrastructure, such as sea defences, roads or towns. In many cases, sand dunes can no longer respond to



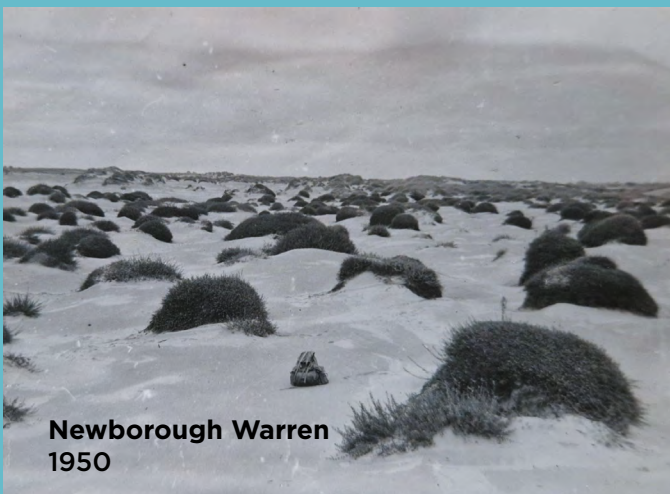
environmental changes by moving along the coastline or rolling inland.

- **Decreased sand supply:** Artificial sea defences or dredging at sea can severely disrupt the supply of sand to the dunes. Climate change can alter currents at sea, which also limits the the delivery of new sand.
- **Altered water conditions:** Groundwater extraction and artificial drainage can dry out dune wetlands. While water pollution can bring excess nutrients which cause negative changes to wetland vegetation.
- **Air pollution:** Shipping, road traffic, industry and farming all create air pollution which impacts sand dunes. Dunes naturally have low nutrient levels which specialist species are adapted to. Air pollution increases nitrogen, ammonia and sulphur dioxide deposits, which enrich the soil like fertiliser. This favours the growth of a less diverse range of coarse and competitive species such as tall grasses, willowherb, thistles, bramble and clematis.
- **Climate change:** Warmer winters and wetter summers promote the over-growth of vegetation on the dunes, while periods of drought negatively affect the wetland habitats. Severe winter storms may improve the mobility of the dunes, but they also pose the risk of erosion of the frontal dunes and coastal flooding.

A changing landscape

The combined effect of these factors has transformed the sand dune landscape over the past 80 years. In the mid-20th century, over 70% of the Welsh dunes consisted of open, mobile sand alongside a diverse mosaic of dune habitats. However, since then the dunes have become almost entirely covered in vegetation and in places have become overgrown with coarse grasses, bramble or bracken, scrub and even trees. While dunes naturally undergo ecological succession, human impacts have accelerated this process

As a consequence the dunes have become overly stabilised (or fixed), and nearly 90% of open, bare sand has been lost. As a result naturally dynamic dunes systems with blowing sand have virtually disappeared in Wales. To maximise biodiversity, an ideal sand dune system should have 30-40% of the area as pioneer habitat, including 10-15% bare sand. Many uncommon species prosper during the early stages of ecological succession, so the loss of these pioneer conditions has resulted in populations of rare, highly specialised wildlife declining and in some cases, becoming locally extinct. Species such as Fen orchid, Petalwort, Crucifix ground beetle, Sand-mining bee and Sand lizard are now threatened, and often rely on targeted conservation efforts for their survival.



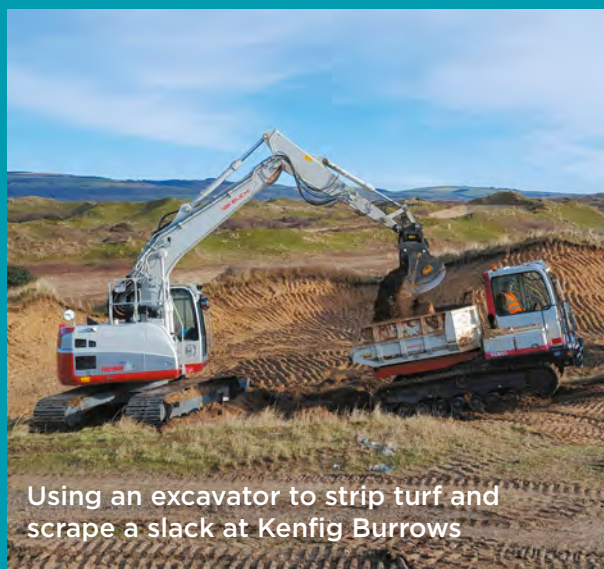
Dune management

As stewards of the environment, it is our responsibility to address these challenges if we are to safeguard dune habitats and species for future generations. Active management is necessary to ensure our dunes remain as havens for both wildlife and people.

Since the 1990s, there has been a radical shift in attitudes to sand dune conservation, as the significance of natural dynamic processes has been recognised. Today, management efforts are focused on restoring a diverse array of early successional stage habitats, re-establishing areas of bare sand and facilitating dune remobilisation.

Typical conservation management practice for dunes includes the following measures:

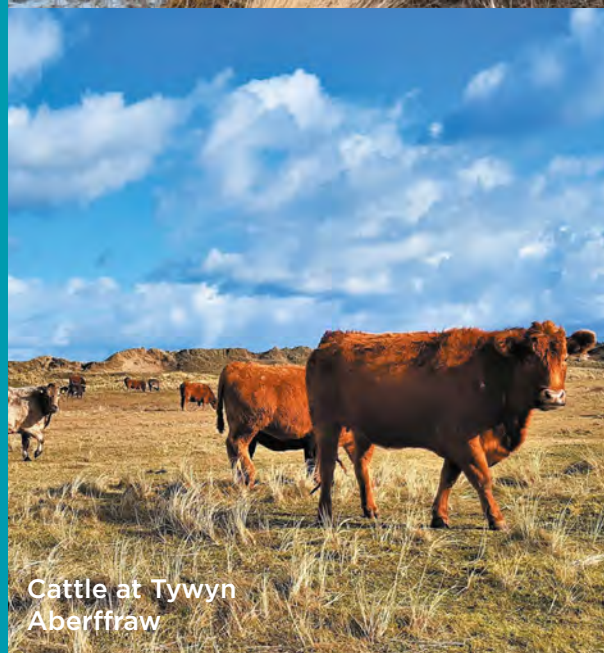
- Creating notches in the foredunes to encourage the wind to blow sand into the dunes.
- Stripping turf from dunes to expose bare sand, allowing early successional stage habitats to develop, and increasing sand mobility.
- Lowering the surface of dried-out dune slacks to re-create pools and wet habitats, and pioneer conditions.
- Maintaining or re-establishing sustainable grazing by livestock, which may involve new or replacement fencing in some areas.
- Mowing to favour low-growing, dune-specialist plants.
- Supporting rabbit populations, by mowing to create new grazing areas and creating artificial warrens.
- Removing invasive non-native species which can smother large sections of dune.
- Managing native scrub to prevent it dominating the dunes and to create a balanced mosaic of scrub and open areas.
- Felling or thinning areas of conifers.
- Blocking ditches and restoring streams to their natural profile.



Using an excavator to strip turf and scrape a slack at Kenfig Burrows



Large scale scrub clearance at Kenfig using tree shears



Cattle at Tywyn Aberffraw

Visiting the dunes

Many dunes are managed by voluntary sector organisations, local authorities, or government agencies such as Natural Resources Wales; all of whom welcome responsible public access and encourage people to enjoy these beautiful landscapes. However, some dunes are privately owned with restricted or no access, except on designated Rights of Way. Other sites are military test bases or training zones, which are closed to the public.

Great places to visit are Tywyn Aberffraw, Newborough Warren and Forest, Morfa Dyffryn, Ynyslas, Stackpole, Pembrey Coast, Kenfig Burrows and Merthyr Mawr. Peak flowering season is mid-May to mid-July, but a visit at any time of the year is rewarding.

Getting involved

At some dune sites there are regular guided walks and events, as well as volunteer groups to help with practical work or monitoring. You can also report any interesting wildlife sightings to the Local Environmental Records Centres Wales. Check relevant social media or websites for information.

Above all, you can make a difference by being a sand dune ambassador for the dunes. Spread the word among your friends and family about the crucial role dunes play in conserving the natural heritage of Wales.



Stay safe on the dunes

- **Visitors should wear suitable clothing** as weather conditions can be extreme on the windswept dunes, where there is no shade or shelter.
- **Don't** underestimate the size of the larger dune sites and how remote they can be – there is not always a phone signal.
- **Take care** when walking as the ground is often loose and unstable, especially on the high ridges, and there are many trip hazards like rabbit holes.
- **Never touch** unidentified objects as they could be unexploded ordnance.
- **Avoid digging** into the dunes as sand can collapse.
- **Do not** approach any livestock.
- **Check for ticks** on your return.

Play your part

- **Light trampling** of dune habitats by visitors can have a positive effect, as it helps maintain areas of open sand and increases sand movement. However, excessive visitor pressure can be an issue in sensitive locations such as strandlines with developing embryo dunes, acidic dunes with fragile lichen communities, or areas where lots of people gather to access the beach or facilities.
- **Disturbance** of wildlife by visitors and their dogs is an issue. It is a particular problem during the breeding season from the beginning of March to the end of August, when dogs can destroy the nests of ground-nesting birds or damage pools with breeding amphibians. Dog waste also contributes nutrient pollution on the dunes. Therefore, visitors are kindly requested to keep dogs under close control and clean up after them.
- **Litter, barbecues and illegal camping** are additional concerns. Visitors are urged to follow the Countryside Code and any specific local guidelines to ensure a positive and sustainable experience for all.

A vibrant field of purple and yellow flowers in the foreground, with a blue sea and sky in the background. The purple flowers are tall and spiky, while the yellow flowers are smaller and more numerous. The background shows a sandy area and a blue sea under a blue sky with some clouds.

naturalresources.wales/SandsofLIFE

Whiteford Burrows