

Dynamic Dunes Worksheet



This worksheet accompanies our 'Dunes on our Doorstep' video.

To watch the video, sign in to the S4 portal at:

www.s4scienceportal.co.uk

and click on the 'Online Science Lessons' button!

What are we learning?

We will be learning about **coastal dunes** and the adaptations of plant and animal species that live in them.



What are dunes?

You might have seen sand dunes, at the beach, but have you ever thought about how they form? Sand dunes are **landforms** built by the **wind** or **water**. They take the form of ridges or mounds where the wind piles the sand up. Dunes tend to occur at coasts, where they are formed by the wind and sea, or in deserts where they are formed by the wind. Groups of dunes together are known as a **dune system**.

Wales has many sand dune systems because it has a long coastline with lots of wind. The sand dunes around Wales are an important source of **natural habitat** supporting lots of rare **animals, plants** and **fungi**.

We will focus on the **coastal dune systems** that we can find all around the British coastline.

Have you ever seen or been to a dune system before? Try drawing one here.



Desert dunes



Beach dunes

Dune Structure

Dune systems are complex, but we can break them down into 2 groups to make it easier – stable and unstable.

Unstable Dunes

Unstable dunes are the youngest, right at the front of the system. Being so close to the open ocean means they are constantly battered by **winds**, which blows the sand around. The **constantly moving** sand makes the unstable dunes inhospitable to most plants who need stable soil to fix their roots. These dunes are colonised by highly **specialised** plants that have **adaptations** for low nutrients and unstable ground.



Stable Dunes

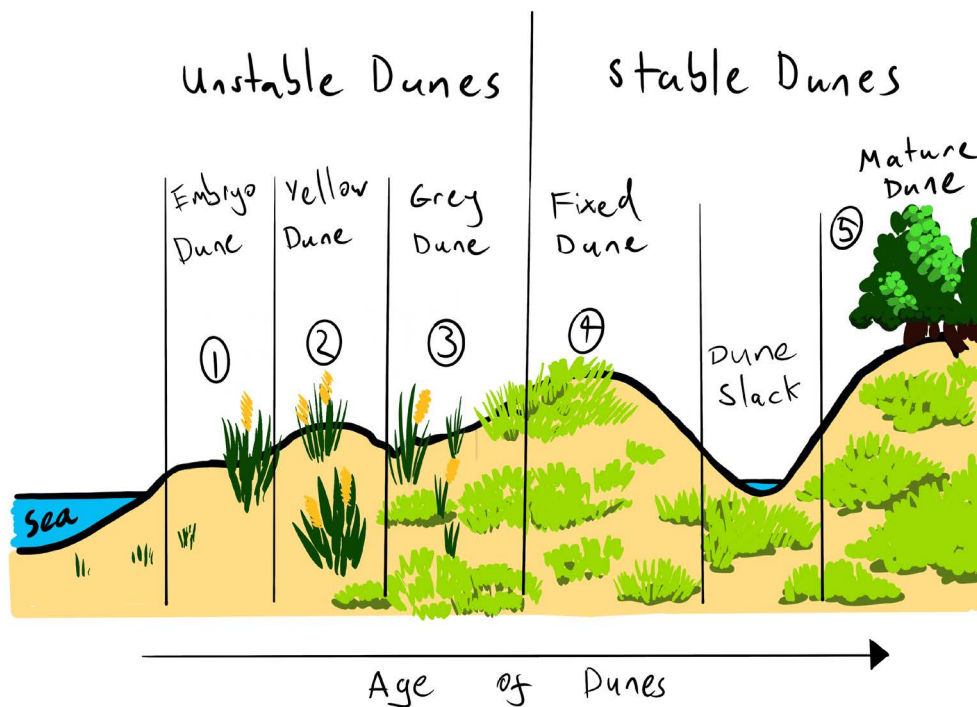


Stable dunes are older and found towards the back of the dune system. Over time, plants have slowly **stabilised** these dunes with their roots. When the plants die, they **decay** (rot) and their **nutrients** break down into the sand. These nutrients help even more plants to grow. The very oldest stable dunes can even support **woodland**! The dip between the dunes here is called the **dune slack** – it is shielded from the wind and the ground is stable enough to form **ponds** and **wetland**.

The lack of water in desert dune systems prevents plants from growing. Without plants the dunes cannot **stabilise** or form the same defined structure as coastal dune systems.

Succession

Woodland grows on the oldest '**mature dunes**' at the back of a coastal dune system. This can happen because the dunes become more stable over time. As sand on unstable dunes is blown by wind from the open ocean the dune slowly moves backward. New dunes spring up in front, shielding those behind and providing time for plants to grow. These plants start to hold the dunes in place with their roots. The sand slowly turns into soil as more and more **nutrients** from dead plants is broken down. The cycle continues until the soil is rich enough to support woodland. By this time the dune will have been slowly blown to the back of the system.



We call the process of one **ecosystem** slowly developing into another '**succession**'. If left alone, all coastal dune systems would eventually **succeed** into woodland. So why do we still have dunes at all? Why haven't they all become woodland? There are 3 main factors preventing this:

1. **New Dunes** – a healthy dune system always has a supply of **fresh sand** blown by the wind or washed up by the sea. The fresh sand is deposited at the front of the system, in areas naturally sheltered from the wind and sea. This creates a new 'embryo dune'. Sheltered areas change based on the shape of the coast and direction of the wind so **embryo dunes** are constantly being formed in new places.
2. **Grazing** – grazing animals eat the plants they find on dune systems. This stops the plants from **stabilising** the dunes with their roots.
3. **Humans** – human actions have led to the destruction of many dune systems in the UK. We now try to **protect** and **maintain** the systems that are left. We often do this by cutting back woodland and digging up plants. It sounds bad to get rid of plants, but it helps keep our dunes healthy in the long run!

Quick Quiz

Q1. Tick true or false on these statements:

	TRUE	FALSE
Dunes are naturally formed hills made of sand.	<input type="checkbox"/>	<input type="checkbox"/>
A single dune is called a dune system.	<input type="checkbox"/>	<input type="checkbox"/>
Unstable dunes have very few plants to stop sand blowing away.	<input type="checkbox"/>	<input type="checkbox"/>
Stable dunes are the youngest dunes.	<input type="checkbox"/>	<input type="checkbox"/>
Ponds can form in the dune slack.	<input type="checkbox"/>	<input type="checkbox"/>

Q2. What is succession?

Q3. What 3 factors stop dune systems from entirely succeeding into woodland?

Dune Wildlife

Natterjack Toads



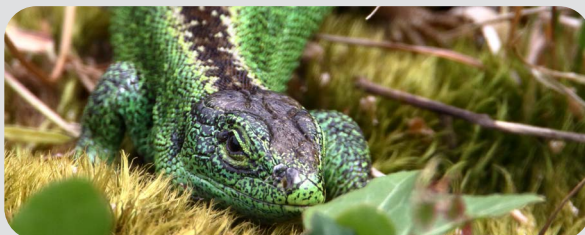
Natterjack toads can only be found in a handful of dune systems across the UK, including a few in north Wales. They live in **ponds** and **wetland** that form in the **dune slack**. Between April and July, they produce a very loud mating call – earning them the name ‘natterjack’. Their very short legs **are adapted** for crawling rather than hopping. Crawling is a much easier way to get around on loose sand and they can even break into a run.

Rabbits



Rabbits are common on dune systems because they can easily build their **burrows** in the sand. There are also plenty of grasses for rabbits to eat without much **competition** from other grazers. By grazing the rabbits help to maintain healthy dunes by slowing **succession** into woodland. Their presence attracts **birds of prey**, such as buzzards, who can easily spot them on bare dunes.

Sand lizards



Sand lizards are the rarest lizard in the UK and can only be found in dunes! They use the sand to dig small burrows to live and hibernate in over winter. They love sunning themselves on bare sandy dunes. Males turn bright green in breeding season, making them an easy spot. The females stay a sandy-brown all year round. Sand lizards were locally **extinct** in Wales due to **habitat destruction** by humans but have successfully been **reintroduced**.

Marram Grass



Marram grass (also known as dune grass) is one of the most important species in dune systems. It is the first plant to **colonise** new dunes because it is so well **adapted** to living in them. Their roots are very long, growing many metres underground. This **adaptation** anchors the plant and surrounding sand in place, beginning to **stabilise** the dune. Marram grass is **outcompeted** by other plant species when the dune becomes stable enough.

Activity

Sand vs Soil

This experiment can get messy – make sure you ask an adult first!



The sand in sand dunes makes for an inhospitable environment for all but very specialised plants. Over time, decaying plant matter mixes with the sand to make soil which can support many more species. One reason for this is that soil is more stable than sand. We will investigate the stability of soil and sand in the following experiment.

Materials

- Sand
- Soil
- Plastic cups
- Water
- Watering can or jug

Instructions

1. Mix some of the sand with a little water until it is similar to the wet sand you would make sandcastles from at the beach. Do the same with some of the soil to turn it into mud.
2. Fill one of the plastic cups with wet sand, then turn the cup upside down on a level surface to make a free-standing structure (like a sandcastle!). Repeat for the dry sand, wet mud and dry soil.

3. Purse your lips and blow hard on each of the four structures to simulate wind. What happens to each of them? How long did you blow for?

4. Use the watering can or jug to steadily pour water on each of the structures. This is to simulate rain. What happens to the structures? How does the water look? Write or draw your findings here.

Questions



Q1. Which of the materials made the strongest structure? Was there a difference for wind and

Q2. What does this tell you about the importance of marram grass to unstable dunes?

Curriculum Links

KS3 Science (Interdependence on organisms):

4. The interdependence of organisms and their representation as food webs, pyramids of numbers and simple energy-flow diagrams
5. how and why food webs are affected by environmental factors, e.g. light intensity, water availability, temperature, and their fluctuations
6. how human activity affects the global environment, e.g. acid rain, greenhouse effect, and the measures taken to minimise any negative effects and monitor them, e.g. by Earth observation satellites

Area of Learning and Experience: Science and Technology:

The world around us is full of living things that depend on each other for survival

1. The fragility and resilience of ecosystems
2. The limiting factors of population growth
3. The resources that living things compete for
4. The importance of ecosystem engineers to the modification and maintenance of ecosystems
5. The far reaching and long-standing consequences of human impact on the environment
6. The importance of conserving native species



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