

# Soil Science

With Dr Emilia Urbanek



Swansea  
University  
Prifysgol  
Abertawe



Watch the video here:  
[youtu.be/FMt8hj3aB7A](https://youtu.be/FMt8hj3aB7A)

Open the file in your  
web browser to click on  
the links.

## What is soil?

Soil is the top layer of the Earth's crust where plants and trees grow, and many small animals live.

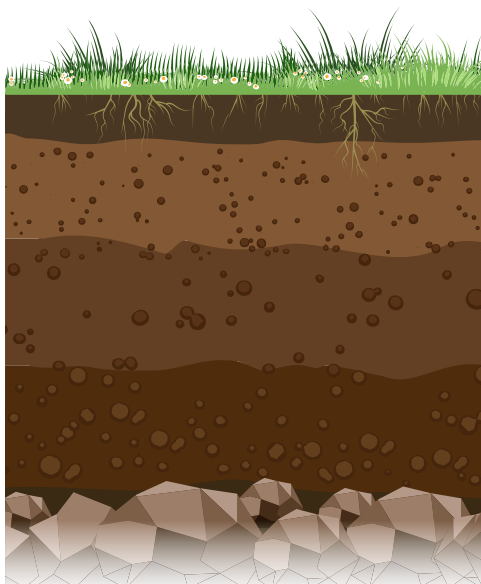
Soil is a dark, crumbly material made from organic and inorganic parts.

Inorganic parts include mineral particles and clay. Organic parts include liquids, gases and organic matter from decomposing plants and animals.

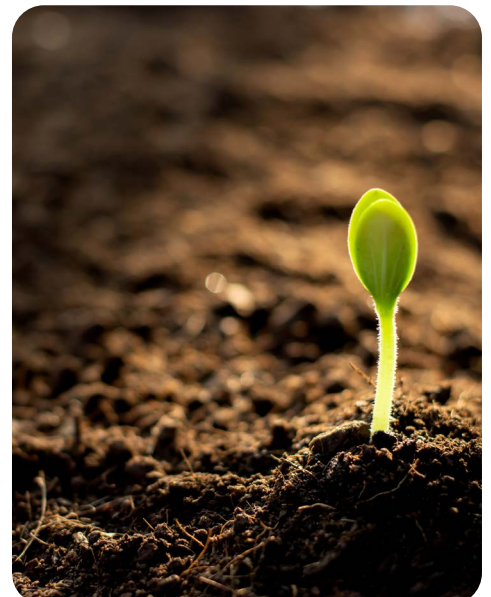
### Most soil is:

- 45% inorganic minerals
- 25% water
- 25% air
- 5% organic material

## Layers of soil



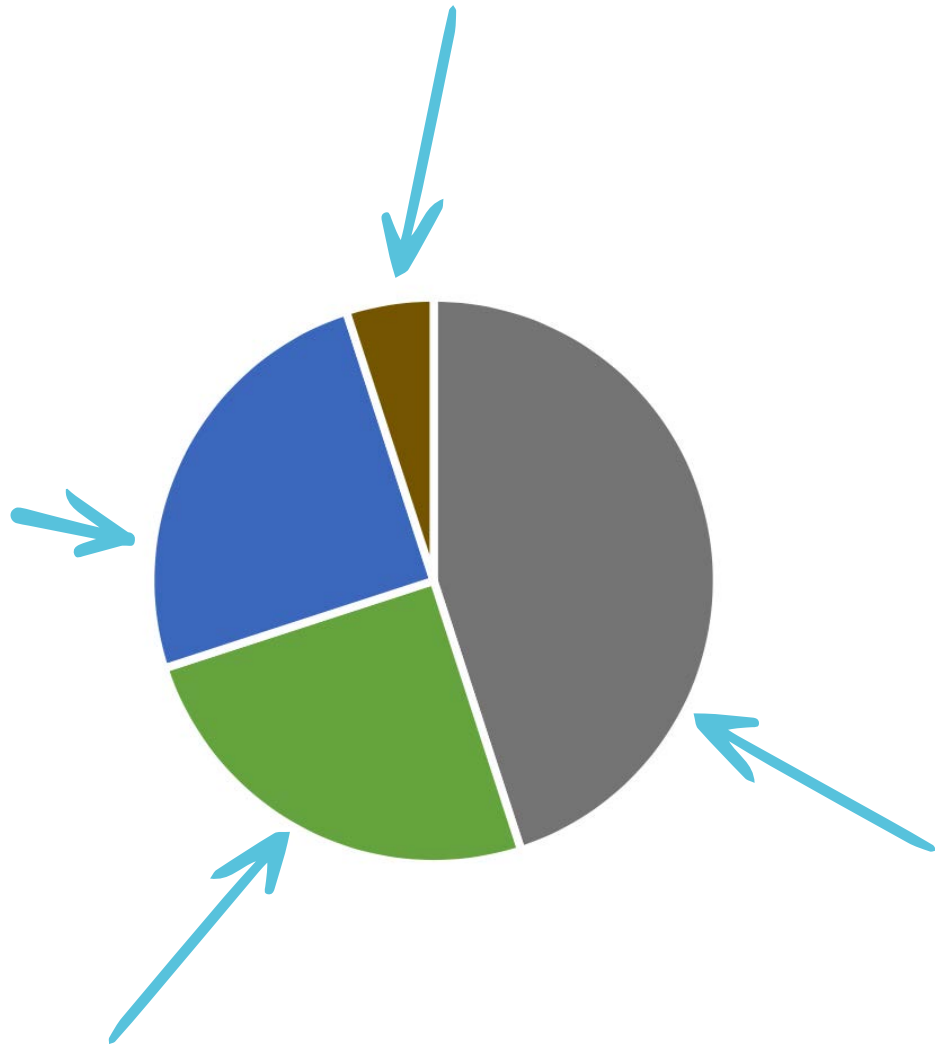
- ← Organic
- ← Top soil
- ← Subsoil
- ← Parent material
- ← Bedrock



## Label the soil pie chart

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## ACTIVITY SHEET



Made from broken down minerals



We can drink it



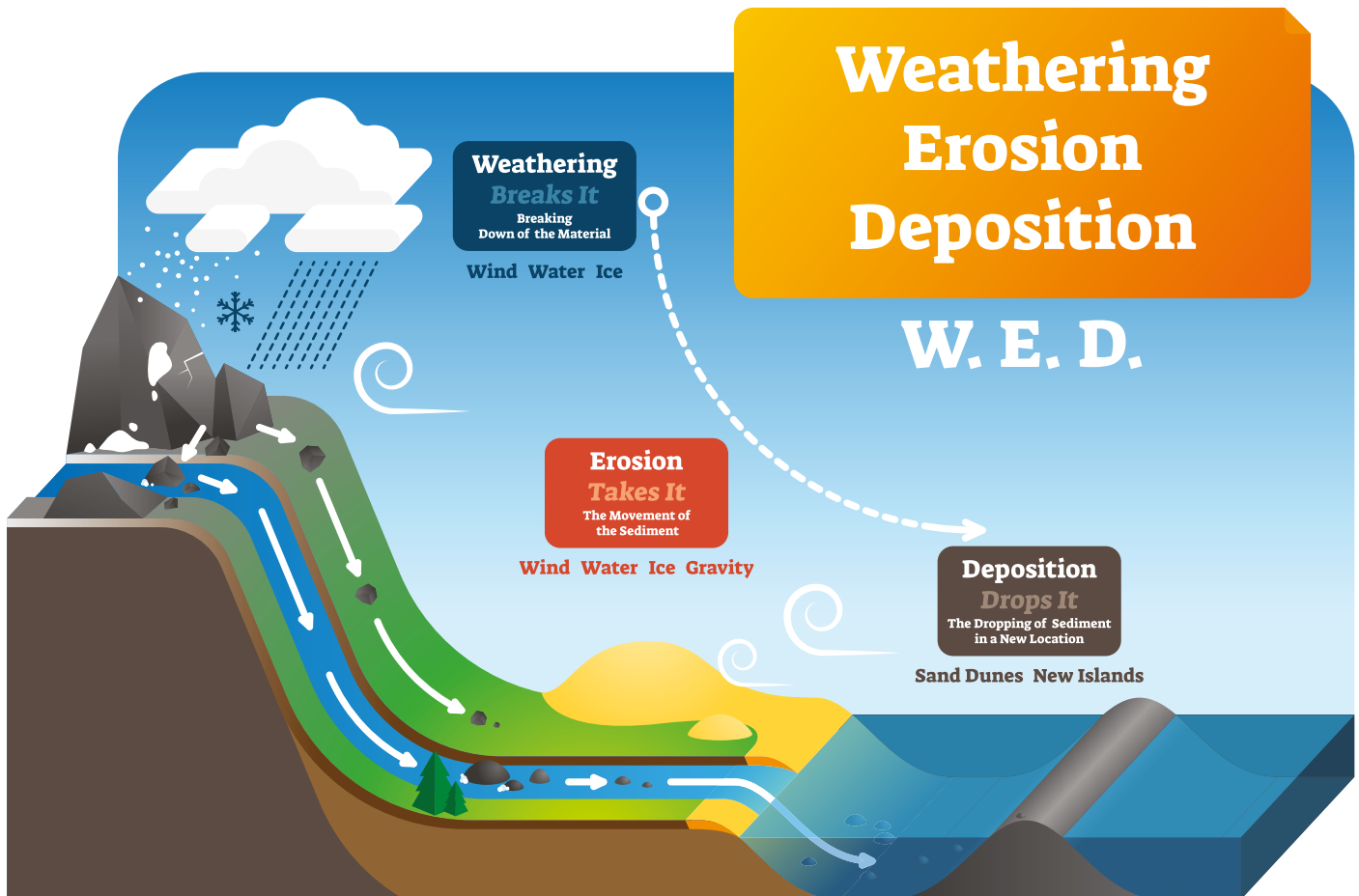
Made from decomposing plants and animals



We can breathe it

# How does soil form?

Soil forms through the erosion and weathering of rocks, and the decomposition of animal and plant parts.



**Erosion** and **Weathering** are natural processes which shape the Earth. They are the gradual wearing away of soil and rocks by rain, wind and other natural actions.

This weathered material is then deposited on different parts of the Earth; in rivers and the oceans, and on the land's surface. Over time decaying plant and animal parts are added to it and, together with the weathered minerals, this makes soil.

Soil is a valuable resource to us and lots of other living things. Lots of plants and animals live in soil and take food and nutrients from it. We use soil to grow a lot of the food we eat. Soil is also important because it absorbs (soaks up) rainwater, preventing flooding.

This means that soil erosion can be bad for us and the environment.

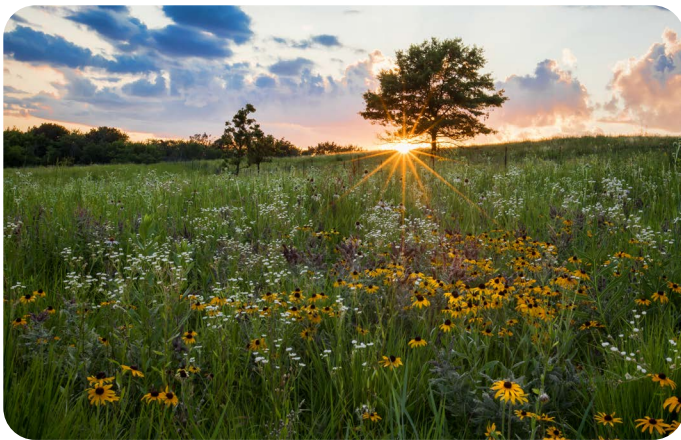
# Soil Erosion Disaster – the Great Dust Bowl

In the 1930s, in the Great Plains region of the United States of America (Oklahoma, Texas, Colorado, New Mexico and Kansas), a bad drought struck. This part of the USA experiences droughts quite often but this one was different. It lasted for years and was accompanied by huge dust storms. Some were so bad that the dust choked cattle and sometimes even people. The dust storms were known as 'black blizzards' because the sky would darken so much. Dust covered everything, crops died and people were forced to leave because they could not farm any longer.



## What happened to cause the Dust Bowl?

When farmers arrived in the American prairies in the 1860s they saw rich grasslands and thought the soil must be deep and fertile and capable of supporting crops and cattle. Farming spread, the prairie grassland was cleared, for cows and wheat fields.



**Proper prairie**



**Wheat field**

What the farmers did not know was that the prairie soil was fragile and thin and only held in place by the grass. The prairie grass was adapted to cope with droughts, but when the severe droughts happened in the 1930s the wheat died, there was nothing to hold the soil in place and it blew away in dust storms.

Over 300 million tons of topsoil blew away in one year (1935). It blew all the way to the Atlantic Ocean, thousands of miles away.

The Dust Bowl storms lasted for 8 years but they taught us a lot about soil, farming and climate. So, when drought arrived again in the 1950s, many farmers were practicing conservation to protect the soil and over four million acres of land had been permanently restored as Prairie grassland, so the soil did not blow away again.

Write, or draw, your summary of what caused the Dust Bowl.

Words to think about: soil, drought, adaptation, conservation, farming.

## Hands-on activity

# Measuring soil erosion

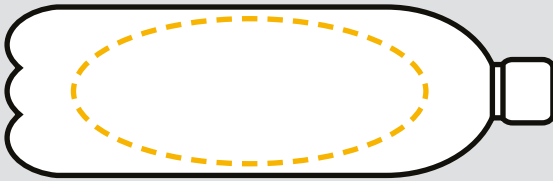
### You will need:

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- Some string or wire.
- Some soil.
- Leaf debris (some dead leaves, twigs and stones, like you might find on the ground in a wood or park)
- Small plants growing in soil or some seeds
- Duct tape
- 6x Empty 2L plastic bottles
- Scissors or a box cutter
- A wooden board or a large piece of thick cardboard
- A large waterproof container to catch spills (a bucket or a big plastic tub would work)
- Measuring jugs

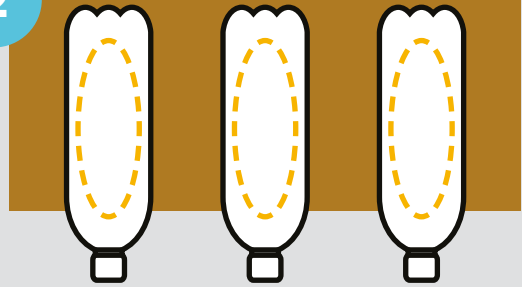
# Method

1



Take 3 empty plastic bottles and cut a large hole in one side. Like this.

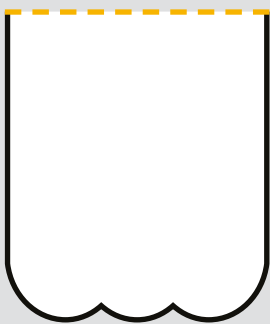
2



Stick the bottles to a board, or some strong cardboard, open side upwards. The necks (tops) of the bottles should hang over the side of the board.

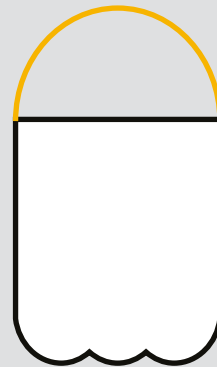
Place the board flat on a table so that the bottle necks hang over the side of the table.

3



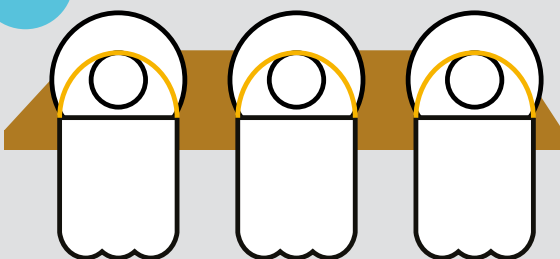
Take 3 more empty plastic bottles. Cut off the bottom third of each bottle to create 3 'cups'.

4



Attach some string or wire to the top of each cup to create handles. Make sure these are really secure and won't fall off!

5



Use the handles to hang the cups from the necks of the bottles so that any liquid coming out of the bottles will collect in the cups.

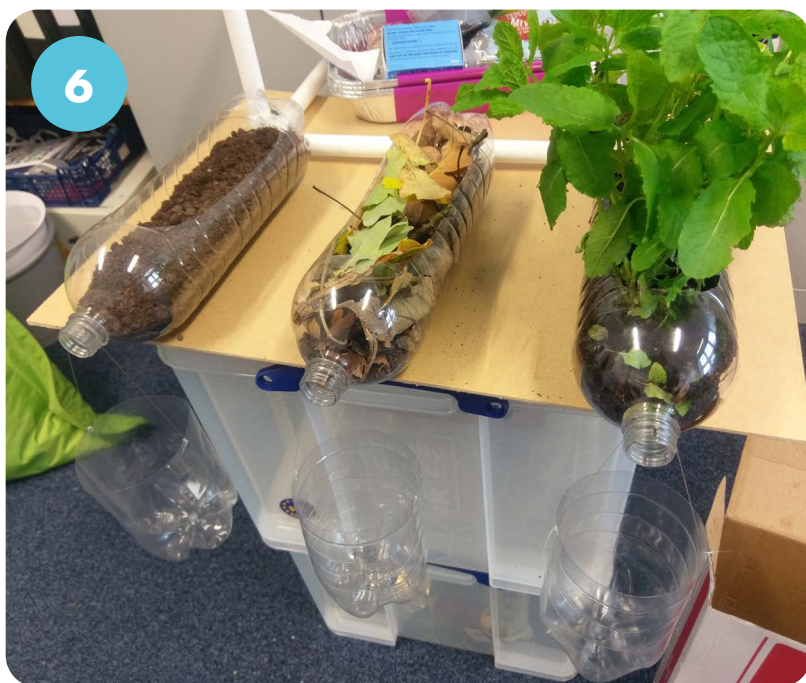
- Place a large waterproof container on the floor under the cups to catch any spills.
- Add soil to one bottle in an even layer about 3cm (centimeters) deep.
- Add soil to a second bottle in an even layer about 2cm deep. Put a 1cm thick layer of dead leaves on top of the soil in the second bottle.
- In the third bottle, add soil with plants growing in it.



## Method continued

If you have time, you can plant some seeds in the soil (grass seeds would work well) and wait for them to grow enough that the soil is full of roots. If you don't want to wait for plants to grow, you take some small plants, or grass, with their roots and use these to fill the bottom of the bottle, so the layer of soil is about 3cm deep and the plants are growing out of the top of it. A chunk of grass turf works well (do not destroy anyone's lawn! Find plant material that is waste, or is being thrown away in garden rubbish).

Your experiment should now look like this.



7

Fill your measuring jug with water.

8

Pour the water slowly into each bottle (one at a time) until the water starts to pour out of the neck of the bottle and into the cups. You should stop when the cups are about  $\frac{1}{2}$  full and keep track of how much water you have poured into each bottle.

## What did you see?

How much water did you pour into each of the three bottles?

Bottle	Amount of water
Bottle 1: Plain soil (mL, Millilitres)	
Bottle 2: Plain soil with leaf litter (mL, Millilitres)	
Bottle 3: Soil with living plants (mL, Millilitres)	

How fast did the water run out of the bottles? Which bottle soaked up the most water?  
Which bottle did the water run out of fastest?

Bottle	Did the water run out fast or slow?	What did the water look like when it ran out into the cup?
Bottle 1: Plain soil		
Bottle 2: Plain soil with leaf litter		
Bottle 3: Soil with living plants		

What conclusions would you make about soil, plants and erosion from this experiment?



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(S4) Funded by the European Social Fund and the Welsh Government.