

SOILS SCIENCE ACTIVITY PACK

LET'S INVESTIGATE SOIL! WHAT IS SOIL? WHAT DOES IT DO?
HOW WE CAN WE SUSTAINABLY GROW FOOD IN IT? HOW CAN WE CAN CARE FOR SOIL?

MODULE 1. SOILS - THE BASICS

Why is soil important?

Soil forms at the surface of the landscape like the "skin of the earth." It is the foundation of food production here in the Limestone Coast region of South Australia.

It is the foundation of our environment. Farmers and gardeners use it to grow food crops and pasture.

As well as being at the core of producing the food you eat, soil is essential in supporting native habitat areas and is the foundation for plants and animals to live.

Scientists have estimated that the Earth's soil stores more carbon than all of the world's forests combined and helps to regulate climate.

Soils and plants

You might have grown plants before in soil or you might want to have a go at growing some for the first time.

Have you ever wondered how soil helps the plants to grow?

Soil creates specific conditions that allow the plant to have access to many of the building blocks they require to grow.

The relationship between plants and soil is complex, however in simple terms - soil gives plants access to the following:

- a physical support for the plants roots to anchor and grow in
- water to survive
- nutrients plants need to grow
- insulation for temperature regulation
- air the plants need to take up through the roots

What is soil?

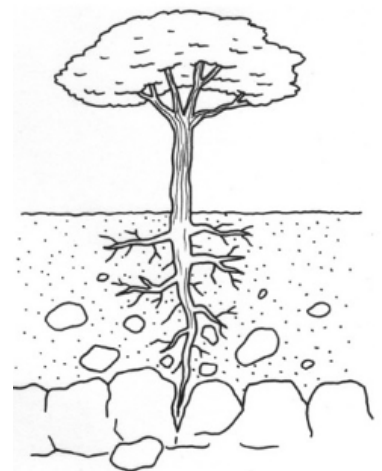
Soil is made when rocks break down into small mineral particles and mixes with plant and animal matter. The plant and animal matter is referred to as organic matter. The mineral particles and organic matter are held together in a structure that also contains water and air.

The soil structure and properties of soil are largely determined by the type of parent rock it comes from and the amount of organic matter it contains.

Soil may appear to be simple and lifeless, however it is highly complex and contains millions of living things.

ACTIVITY

To help understand why we need to care for our soils, try **ACTIVITY 1: COMPARING APPLES & EARTH.**



Mineral particles

The mineral particles are tiny pieces of rock that have broken down from the parent rock. Parent rock is formed through past geological events that occurred millions of years ago. Soils are formed through processes such as physical, chemical and biological weathering and a process called deposition.

Different soils are named after their deposition processes, such as:

- colluvial soil– particles are transported by gravity
- alluvial soil – particles are moved via running water
- glacial soil - heavy ice masses push glacial soils around
- aeolian soil- formed through wind moving soil particles

These processes have all worked together over time to form the soils in our landscape today. The parent material and weathering processes during its formation largely determine the properties the soil has today.

LOCAL FOCUS

The soils in the South East of South Australia were formed millions of years ago. The region is often referred to as the Limestone Coast due to its prominent geological formation.

The geological formations started with the separation and movement of Gondwanaland into the Australian and Antarctic continents. This started about 158 million years ago, and saw the development of the southern seaway (the Southern Ocean), and the resultant formation of the south east coastline of Australia. As Antarctica began to pull away from southern Australia, sequences of sand and silt were deposited in an elongate depression, known as the Otway Basin, which formed as the two new land masses began to fracture and drift apart.



The basement rocks that underlie the western portion of the basin were deposited during the lower and upper Cretaceous (145 – 100 and 100 – 66 million years ago respectively) which was laid down both during and after separation. They typically comprise sandstone, siltstone, mudstone and shale and were likely formed in a depositional environment of rivers and lakes (fluvial).

Want to know how the soils were formed in our region?

Check out the Geology of the South East section on page 5 of [Landscapes of the South East- An educational guide for the landscapes of the South East of South Australia](#)



Organic Matter

Organic matter is any living or dead plant and animal material. It is a source and store of nutrients, and binds soil together to form [aggregates](#). When organic matter binds soil together it makes the particles more stable with pockets for air and water.

The living component of the soil is called the soil biota. Soil is home to many soil animals such as earthworms, spiders, insects, [protozoa](#) and [nematodes](#). It also contains millions of micro-organism (soil microbes) which you need to use a microscope to see.

These micro-organisms are made of different types of bacteria, fungi, and algae. Many soil biota organisms play an important role in breaking down organic matter on the surface such as leaves. This process converts the leaves from organic matter into organic carbon.

Soil organic carbon makes up approximately 60% of the overall organic matter and includes all living and dead organic material in the soil such as plants, soil organisms and animal materials. It does not include fresh, undecomposed plant material on the surface.

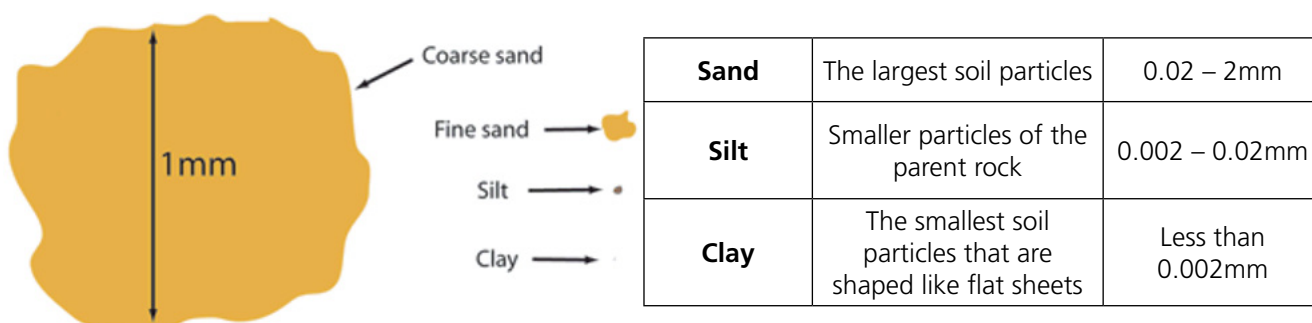
Organic carbon is important as it is involved with providing [nutrients](#) to the soils structure helping to optimize water infiltration, drainage and retention in the soil for growing plants. Organic carbon also provides energy for soil organisms, increasing their population, activity and their ability to cycle nutrients.

The beneficial soil organisms also compete with plant pests and [pathogens](#) that inhibit plant growth.

Soil Properties

Soil properties are attributes that impact the way the soil looks, feels and how it interacts with plants. Soils contain mineral particles, organic matter, water and air. The combinations of these components (composition) in the soil determine the soil's properties. The main soil properties are its' texture, structure, porosity, chemistry and colour.

Texture: A soil's texture describes the different sized particles in the soil. The different size particles are split into groups referred to as sand, silt and clay. Texture indicates composition of various sizes particles.



The texture impacts the soils ability to hold onto nutrients and water. Texture influences the ease with which soil can be worked, the amount of water and air it holds, and the rate at which water can enter and move through soil. Most importantly the texture effects how and when the water is available to plants after rain events or irrigation.

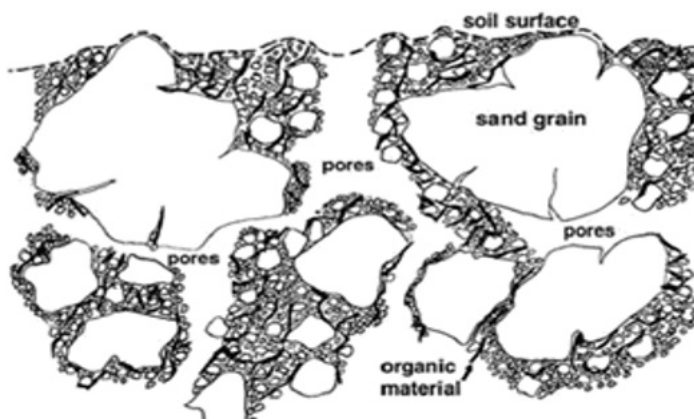
ACTIVITY

Test some soil you have at home to see what kind of texture it has in
ACTIVITY 2: SOIL TEXTURE - THE MANIPULATIVE TEST.



Structure: Soil structure is how the components that make up the soil are arranged. The structure effects how easy or hard it is for roots to grow through it, how much air is present, and how the soil holds water.

Porosity: Refers to the amount of space between particles in the structure allowing air and water to move through the soil.



http://vro.agriculture.vic.gov.au/dpi/vro/vrosite.nsf/pages/soilhealth_soil_structure

Chemical properties: The chemical properties refers to chemical reactions that occur in the soil. These often play an important role holding nutrients and if plants have access to these nutrients.

Colour: Soil colour indicates the minerals present from the parent rock and by the amount and from of organic matter present.

In general terms; black or brown soil indicates high levels of organic matter, red soil shows the presence of iron and aluminium oxide, and white coloured soil comes from silicates and salt.

Soil Types

Earlier we mentioned that part of the name of a soil comes from the deposition processes that broke down the parent rock. However, most commonly, soils are referred to by their texture type.

Sandy soils are the coarsest or lightest of soils. Sand is sometimes described as light, fine or coarse. Sandy soils feel gritty.

Loams have a fairly even mix of sand, silt and clay. Their feel can be described as smooth or silky or perhaps greasy if there is plenty of organic matter present.

Clay soils comprise more than 35% clay particles and are referred to as fine textured or heavy soils. Clays can be described as light, medium or heavy. Clay soils have a plastic feel when moulded.

When soils are named, the dominant texture class comes last in the name. For example "sandy loam" is a loam with a high sand content.

LOCAL FOCUS

Within the South East region there are 62 different types of soil in total!

Want to know more about local soil types?

Check out page 34 of [Landscapes of the South East- An educational guide for the landscapes of the South East of South Australia](#)



Natural Resources
South East

Glossary

Aggregates - are groups of soil particles that are bound together more strongly than to other particles.

Protozoa - is an informal term for an organism which are single-celled eukaryotes. They often feed on organic matter such as other microorganisms or organic matter such as leaves that have been incorporated into the soil.

Nematodes – are a large group of organisms called Nematoda that have slender, cylindrical and unsegmented bodies, such as a roundworm or threadworm. Many are microscopic.

Nutrients - a substance that provides nourishment essential to maintain life and growth for organisms such as plants and animals.

Pathogens- a bacterium, virus, or other microorganism which can cause disease and negatively affects plant or animal health.

