



WELEDA

Since  1921



The Invisible World of Soil

Te Ao Tē Kitea i te Kōpū
o Papatūānuku

taster resources

Ngā mihi nui to [Weleda](#) for supporting Garden to Table in the creation of a new Curriculum Resource on Soil. Here are two taster lessons from the full resource which is available to Garden to Table member schools.

For over a century, Weleda, a certified B-Corp company, has been growing the plants used to make their iconic products using natural, soil-friendly methods. Their global [‘Save Earth’s Skin’](#) campaign, which launched in 2022, aims to raise awareness that soil, just like our skin, is a living, breathing ecosystem. Their environmental stewardship and protection is at the heart of everything they do. Weleda has funded the creation of this full soil resource as an investment into the New Zealand community and education of the importance of healthy soils.



Lesson 2 Soil Sausages and Soil Ribbons

Learning Outcome:

To find and name the different particles of soil

To understand the types of soil in your local area

Teacher Information

The inorganic or geological components of soil are derived from **eroded rock**. These have been worn away by wind and rain over thousands of years, eventually settling together to make soil. This activity will look at the geological makeup of soil. Soil needs air, water and microbiology to be truly soil, something living - this will be covered in the next section.

This is a very basic soil test, getting students familiar with the feel and texture of different soil types in a hands-on way. Be aware that the amount of water used is critical. Too much water and the soil sample will turn to mud very quickly. If one sample has a significant amount more water than another sample it will behave differently when making the sausage smiles and the soil ribbons, which might lead to misleading results.

You will need:

A tarpaulin or Tuff Spot

A spade

A bucket

Soil from several sites in the school grounds

Water (in a spray bottle is best, but not essential)

Student Activities - Soil Sausages

Dig up a small spadeful of soil from different sites in the school. Leave worms behind if you can. Pick out big bits of organic matter, grass, roots, bark and stones and discard. Take your soil samples mindfully and return the soil to the same site when finished.

Put the soil on the tarpaulin or Tuff Spot.

Take a big handful of soil, moisten it with a little water and knead it like playdough until it comes together in a ball. You want it to feel like playdough, not mud, so add water slowly.

Roll it into a sausage.

Bend your soil sausage first into a smile then into a ring shape.



Soil that cracks and won't bend easily has a high sand content. This soil feels gritty.

Soil that bends into a ring with cracks has roughly equal proportions of sand, silt and clay. This soil type is called loam and is the best for vegetable gardening.

Soil that bends into a smooth ring and feels soft and silky has a high clay content.

Many soils are a mixture of sand, silt and clay. Your sausage smile might crack and be smooth and silky at the same time, showing it has some clay content but also some sand or silt. The clay is holding the water making it smooth but the sand is making the soil harder to hold together, so it cracks.

Lesson 2 Soil Sausages and Soil Ribbons (continued)

Learning Outcome:

To find and name the different particles of soil

To understand the type of soil in your local area

Teacher Information

You may not find examples of each soil type within your school grounds. You might like to gather small samples from other locations as a comparison.

Encourage students to use the scientific vocabulary where possible.

The smaller the soil particles the more water that soil can hold.

Some students will struggle with getting dirty but the sensory experience of touching different soils mindfully is great learning.

Student Activities - Soil Ribbons

Squeeze your sausage between your finger and thumb to make a ribbon. Try to get your ribbon to be even in thickness and width.

Let your ribbon hang over the top of your finger until it breaks.

Measure the length of the broken off ribbon.

A short ribbon means soil is loamy - a mixture of clay and sand.

The longer your ribbon the more clay is in your soil.

Soil with lots of sand will struggle to stay in a ribbon.

Make another ribbon with the same soil to confirm the soil type.

Getting Technical - Adding Some Maths

Record each ribbon length and then work out the average length for each soil sample:

Sand will not form a ribbon.

Loamy sand will form a **5mm** ribbon.

Clayey sand will form a **5-15mm** ribbon

Sandy loam will form a **15-20mm** ribbon

Light sandy clay loam will form a **20-25mm** ribbon

Loam will form a **25mm** ribbon

Sandy clay loam will form a **25-40mm** ribbon

Clay loam will form a **40-50mm** ribbon

Sandy clay and **light clay** will form a **50-75mm** ribbon

Medium clay will form a **75-100mm** ribbon

Heavy clay will easily form a ribbon **longer than 100mm**.

NSW Govt Dept of Primary Industries PrimeFact 1363

Getting Dirty - A Sensory Experience

Take some time to explore the different soil samples using your senses. What does clay-based soil sound like when it has water added? Does sand-based soil sound the same? What does each soil type smell like? Are the samples different colours? Why might that be?

Take a pinch of soil. Add a bit more water and rub the soil sample with your fingers into the palm of your hand.

Clay particles will stain your fingers. They will feel smoother and stickier.

Sand particles will feel gritty and you should be able to see each particle.



Why is this useful?

Understanding your soil type helps you to make the right improvements to your soil to help you grow the best vegetables and fruit. Different plants grow better in different types of soil, e.g. Carrots like loose sandy soil. They find it hard to grow straight roots in stony or hard-packed soil and so the carrot crop is sometimes a little wonky!

Soil with a high clay content can dry very hard in summer and get very wet and boggy in the winter, because the water gets stuck between the tiny particles. Adding lots of organic matter like compost can help improve this soil. Adding some sand can help too.

Soil with a high sand content means that the water drains very quickly around the big particles, making this type of soil very dry. Adding compost can help sandy soils hold water better.

Lesson 7 Call the FBI

Learning Outcome: To introduce the living part of soil (the microbiology)

Teacher Information

Soil is teeming with life, but most of that life is so small we cannot see it. This makes it hard to appreciate the vastness of life under the soil. In this lesson we introduce the FBI of soil - **Fungi, Bacteria** and **Insects**. They make up the living things of soil, alongside the air, water, decomposing organic matter (anything that was alive that is now rotting, plus the poo of all of these soil animals) and the rock particles and minerals.

In this lesson, students will make a top trumps-style game called Battle of the Bugs. Students will need to research their soil 'bug' to find out the information required for each card.

This website has fantastic information for many types of soil insect in New Zealand: <http://soilbugs.massey.ac.nz>

You could provide students with a template to fill in or decide on the Battle categories together.

Student Activities

Watch this video on the importance of life in the soil:

Why soil is one of the most amazing things on Earth - BBC Ideas
<https://youtu.be/OiLITHMvRw>

Discuss with students the three main types of living organisms in soil: Fungi, Bacteria and Insects. Explain how these organisms are microscopic (hence microorganisms) and the world of soil is so vast that so much of it remains undiscovered.

Decide on the categories to be displayed on each card. Don't make it too complicated - soil scientists are still describing, understanding and discovering new things about soil microorganisms every day.

Make some rules so that each card is consistent, e.g. Each species is named by its common name, with the scientific name written in smaller font below - see template for examples.

Some of the numbers might be hard for students to find and in this case being very accurate is not necessary. Keeping to more general numbers will show students more about size and abundance than accurate numbers:

Approximate abundance in 20 grams of soil for comparison:

Bacteria = 2,000,000,000

Fungi = 20,000,000

Protozoa = 200,000

Nematodes = 20,000

Mites = 40

Springtails = 10

Millipedes = 1

Earthworms = 1

Lesson 7 Call the FBI (continued)

Learning Outcome: To introduce the living part of soil (the microbiology)

Teacher Information

For deeper learning, you could change the colour for each of the FBI. For the purpose of this learning it would be enough to split fungi into saprobic and mycorrhizal fungi: <https://teara.govt.nz/en/fungi/page-1>

Student Activities

Use a publishing program like Canva to make each card (see example below), design or illustrate by hand, or use the template found on the following page.

SOIL INSECT



Length: 0.3-0.5mm
Speed: 2
Cuteness: 8/10
Abundance: 100

Tardigrade are also know as water bears. Tardigrade means slow one. They float in the film of water covering lichen and moss.

Tardigrade

SOIL FUNGI

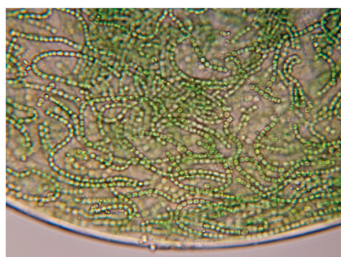


Length: 20m
Speed: 1
Cuteness: 1/10
Abundance: 20,000,000

Saprophytic fungi break down dead wood, leaf matter and dead insects. They break it down into smaller parts, storing carbon and nutrients in the soil.

Saprophytic fungi

SOIL BACTERIA



Length: 0.5-1 μm to 40 μm
in diameter
Speed: 3
Cuteness: 4/10
Abundance: 2,000,000,000

Cyanobacteria (the world's oldest fossil at 350 million years old) makes its own food from photosynthesis. They combine with fungi to make lichens.

Cyanobacteria

SOIL INSECT



Length: 2-3mm
Speed: 7
Cuteness: 10/10
Abundance: 10

Springtails, also known as Collembola, have a forked tail that is tucked in by a catch. When the catch lets go, the spring throws the springtail 10-15cm away.

Springtail

Lesson 7 Call the FBI (continued)

Learning Outcome: To introduce the living part of soil (the microbiology)

Battle of the Bugs

Rules for playing:

Play in small groups or as a class.

Shuffle the cards and deal all of the cards evenly amongst the players. Each player looks at their top card only.

Player 1 chooses a category they think they can win. They call out the statistic/number from that category. The other players try to beat this statistic by having a higher number. The player with the highest number wins all of the cards from that round and adds them to the bottom of their card pile. That player chooses the category for the next round. The first player to get all of the cards wins.

SOIL INSECT



Length:
Speed:
Cuteness:
Abundance:

SOIL FUNGI



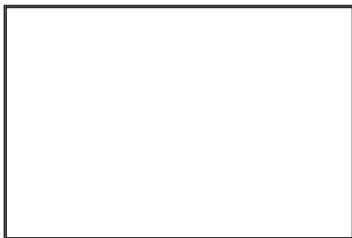
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SOIL INSECT



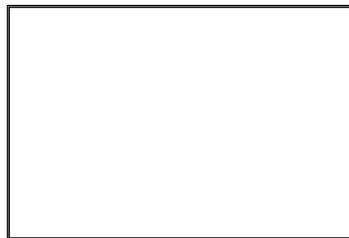
Length:
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SOIL INSECT



Length:
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SOIL BACTERIA



Length:
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SOIL INSECT



Length:
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