



## Stage 5 – Soil in the Environment

# Learning Objectives



- Understand the importance of soil and soil health.
- Understand soil composition.
- Assess human impact on soils, ways we can improve the quality of soils, and how farmers protect and maintain soil health.



## Recap

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- We learned plants need the right amount of water and light to make food in their leaves in a process called photosynthesis.
- Plants also need nutrients from the soil.



## Types of Soil

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In your groups, you are going to look at a selection of soil samples.

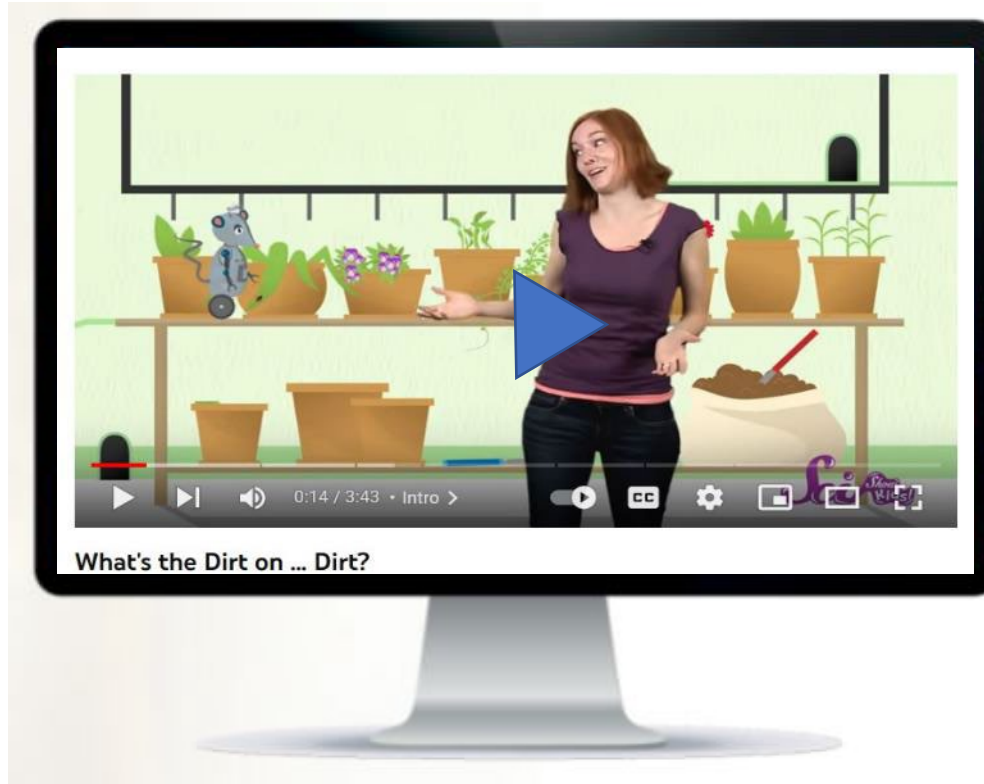
- What are their similarities?
- What are their differences?
- What do you think soil is?



# What is Soil?



Watch the video to learn what soil is made up of:



<https://www.youtube.com/watch?v=if29mjcd5bc>



## What is Soil?

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- Soil is made up of minerals from broken-down rocks, air containing gases such as carbon dioxide, oxygen, water, and organic matter from decaying plants and animals.
- The well-being of all plants and land-based animals depends on the complex processes that take place in soil. To grow healthy crops, you need healthy soil.



# Healthy Soil

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- **Healthy soil has biodiversity, a variety of living things or organisms such as earthworms, insects, microbes, and plant roots.**
- **Soil is one of nature's most complex ecosystems and one of the most diverse habitats on earth.**
- **Did you know just one teaspoon of healthy soil can contain more living organisms than there are people living on earth?**



## Soil and Farming

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- Farmers work hard to ensure their soils stay healthy and full of nutrients for their plants.
- However, they face some challenges when looking after their soil.





# What is Compacted Soil?



- Soil is compacted when something presses down on it, pushing the tiny soil particles together.
- When soil is compacted, it is more difficult for water to drain through the soil. Roots have trouble growing through the soil. Seedlings (new plants) cannot get through soil to reach for the sun.
- It can increase the risk of flooding, water erosion, and soil movement.



# What Causes it?



- Heavy rainfall can be harmful to soil. Each drop is like a tiny hammer, making a hole in the soil.
- Driving on soil, especially with heavy vehicles, can leave deep marks. Even walking on soil a lot can compact it. You may have seen a path worn in a field or yard; that is compacted soil.
- Growing the same crop year after year can hurt the soil. Plant roots help hold the soil together while they absorb water and nutrients.



# How are Farmers Helping?



- Farmers are changing how they farm to reduce soil compaction.
- Planting cover crops helps to protect soil in winter.
- Farmers are finding ways to drive less on their fields. All together in Ontario, farmers save more than 170 million litres of fuel per year. That is like taking 122,000 cars off the road!
- Farming today uses a lot of technology, equipment that flies (really!) and inventing equipment that does not have big tires.





# Innovative Technology

Technology and good ideas are helping farmers protect soil!

Using equipment differently can help. Tractors that have tracks instead of tires or that have less air in their tires do not press as hard on the soil.

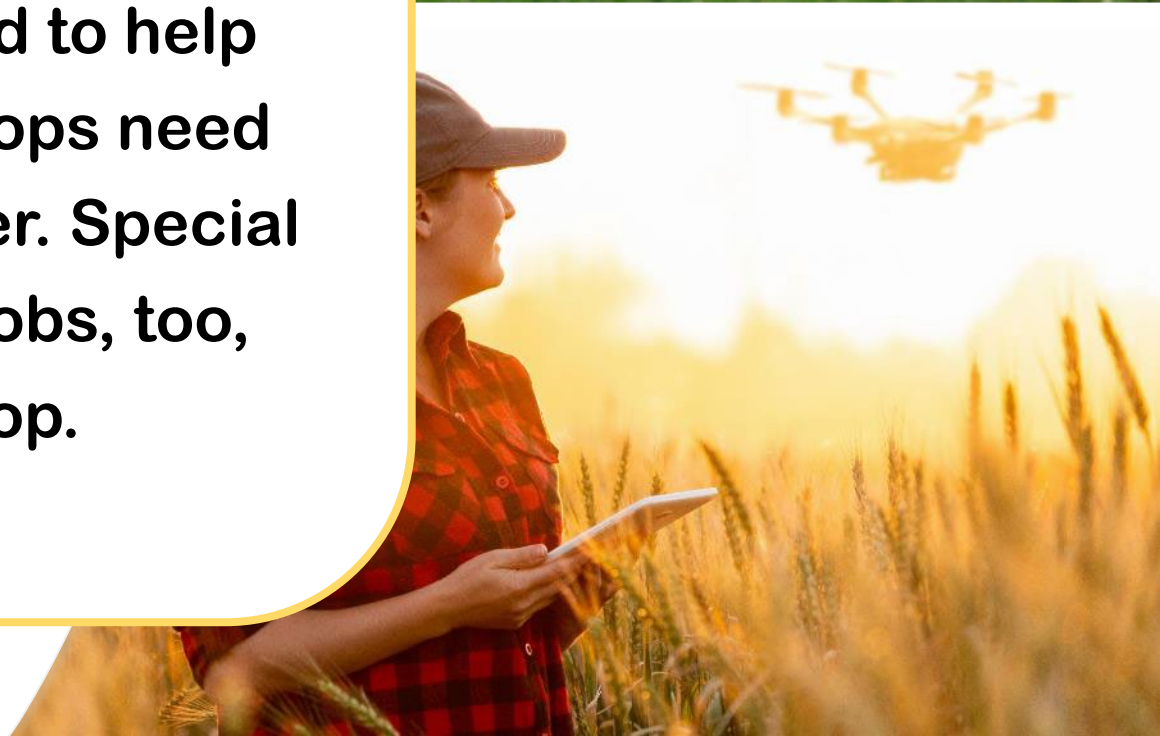


## Innovative Technology

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Technology and good ideas are helping farmers protect soil!

Drones flying over fields can make maps of the field to help farmers see where crops need more water or fertilizer. Special drones can do other jobs, too, such as spraying a crop.



## Innovative Technology

Technology and good ideas are helping farmers protect soil!

With a map made by a drone, a farmer can use GPS to send an auto-steer (self-driving) tractor into a field to only the places where needed.

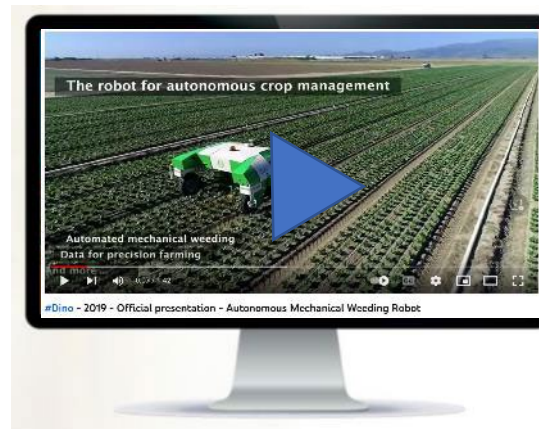




# Innovative Technology

Technology and good ideas are helping farmers protect soil!

Check out the Dino Robot, a weeding machine tested in Canada.





# Investigating Soil Compaction

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**Minds on!**

- Let's talk about how soil is affected by different things pressing on it. **What do you notice?**







# Investigating Soil Compaction

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## Ask

- How much pressure does it take to compact the soil?
- How long does pressure have to be applied to make a mark?
- How can farmers change things?  
That's a good question. Farmers are thinking of these things too.



# Erosion



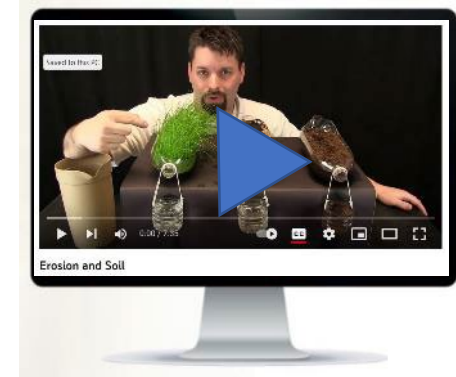
- Erosion is another way soil is affected; it happens when the top layer of soil is worn down and moved by wind or water.
- When topsoil is dry, the wind can pick it up and carry it away. It takes away the nutrients that plants need to grow.



# Erosion



- In addition to washing the nutrients and topsoil away from fields, water erosion can also cause flooding. The soil is washed into nearby rivers.
- This video shows the impact of plants on preventing soil erosion.
- Many farmers help prevent erosion by planting cover crops, such as winter wheat. They help keep wind off the soil and their roots help hold the soil together.



# Nutrients



- Farmers make sure nutrients the plants use are put back into the soil for the next crops.
- Different crops need different nutrients.
- Farmers apply fertilizers to their soil. Fertilizer puts back the nutrients that plants have used.
- Fertilizer can be animal waste like manure or nutrients like nitrogen, phosphorus, or potassium, which exist naturally in soil.



# Investigating Soil Nutrition

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- We are going to investigate the effect of fertilizer on plant growth by growing three plants from seeds.
- We will give each one a different amount of fertilizer and observe any differences in how the plants grow.



# Making a Fair Test



- Think about how we set up a fair test with our other seeds.
- The variable we are changing is the amount of fertilizer. This means we have to keep everything else the same.
- We need to keep the amount of water and location in our classroom the same for each plant.



## Measuring the Plants' Growth

As a group you will need to decide what you are going to measure while your plant is growing.

Will you investigate:

- How fast the plants are growing?
- How high the plants are growing?
- The number and colour of leaves.
- Remember to make your prediction.



## Investigating Soil Biodiversity

- Worms are an excellent indicator of soil health.
- The more worms there are in the soil, the healthier it is.
- We are going to find two different areas of soil and cut out two equal sized pieces.
- Count the number of worms in each location.
- Which area had the healthiest soil?





# Composting



- We can help make healthy soil for our gardens by composting our food waste.
- We will make a mini composter in class so we can see how the food breaks down into healthy soil.
- Add some organic waste (potato peel, apple core, etc) to a large bottle with a little soil in. Put the bottle in direct sunlight and watch the changes inside the bottle over time.

