

Ecosystem Services - Soil

Primary

Key Inquiry Questions

1. What ecosystem services does soil provide?
2. Why are healthy soils important?
3. How can the health of soils be improved?

Learning Outcomes

1. Students will learn what soils are made of and why healthy soils are important to their everyday lives and the environment by the end of the lesson.
2. Students will learn how they can improve the health of soils by the end of the lesson.

Sustainability Curriculum Goals

Systems Thinking:

1. Our planet - the biosphere - is a complex system that supplies resources and creates conditions that sustain life on Earth.
2. All forms of life, including humans, are connected to each other through man-made and natural ecosystems on which their well-being depends on.

Sustainable Futures:

1. Actions associated with a sustainable future reflect values of care, respect, responsibility, empathy, and compassion for all living and nonliving things.
2. Sustainable futures involve actions that work to preserve, protect, and/or restore the natural environment.

Activities/Goals:

1. Students should be able to explain what sustainability is, the importance of ecosystem services and biodiversity.

Overview:

The lesson will begin with students exploring the soil in their community, near their school. Students will smell it, feel it, and look for any bugs or insects. Students will collect one handful of dirt each for the activity later on in the lesson. Next, students will learn about soil, what ecosystem services it provides, and why it is so important to their lives by watching a video and answering questions. Lastly, students will create a “Soil Shake” that uses the soil from the beginning activity to determine the number of different types of minerals in their soil. Students will then draw their own jars in their journals and fill out a worksheet with what each layer is.

Materials

SolarSPELL Resource:

1. “Why Soil Matters” (Environment > Natural Habitat > Why Soil Matters)

Other:

1. Notebooks
2. Clear containers with lids (If this is not possible, clear cups can be used, with sticks for stirring)
3. Pencils
4. 1 cup of soil per pair of students (students will collect this when they go outside).

Suggested Procedure

It is recommended that you complete the “Ecosystem Services - What does the Earth Provide” lesson before this one.

Before Lesson:

- Divide students into pairs and give each pair a clear container with a lid.
 - If you do not have any clear containers with a lid, have students use a clear cup and a stick to stir it.
 - Note: This will be used for the after activity lesson.
- Take students outside to an area with soil.
 - This could be a garden, the forest, or a farm for example.
- Tell students to explore the soil and write down the following things in their journals:
 - How does the soil feel?
 - What does the soil smell like?
 - What types of animals or insects can you see, if any?
 - What color is the soil?
- While students are playing in the soil, ask each pair to collect one handful per student of soil (2 handfuls total) and put it into their cups or jars.
- Bring the students back inside and call on a few students to share their answers.

During Lesson:

- Have students watch the video titled “Why Soil Matters”.
- Print out the following questions or have students write down the following questions and take notes on answers during the video.
 - Is soil alive or dead?
 - What are the three main minerals soil contains?

- True or False: It is the organic matter in soil that determines its fertility, which is the ability of soil to sustain plant growth. If false, why is it not true?
- Why are microorganisms, which are super tiny organisms that can't be seen with our eyes, important for soil?
- Name one job earthworms do?
- Name one reason pesticides, which are chemical poured on crops to destroy pests, are bad for soil?
- True or False: Pesticides can not harm humans. If false, why is it not true?
- True or False: Crop rotation, which is planting many different types of crops over time, not plowing the top layer of soil, and not using pesticides can all help the soil replenish its nutrients over time and protect it. If false, why is it not true?
- Answers to questions:
 - Is soil alive or dead?
 - Answer: alive
 - What are the three main minerals soil contains?
 - Answer: silt, sand, clay
 - True or False: It is the organic matter in soil that determines its fertility, which is the ability of soil to sustain plant growth. If false, why is it not true?
 - Answer: True
 - After answering this question in class, tell students that the combination of minerals and organic matter is called humus.
 - Ensure students write this statement down.
 - Why are microorganisms, which are super tiny organisms that can't be seen with our eyes, important for soil?
 - Answer: they can filter out pollutants that help reduce gases in the atmosphere that contribute to climate change
 - Answer: they protect the plants from disease
 - Name one job earthworms do?
 - Possible answers: create tunnels to give plants more access to nutrients, eat earth to make it more nutrient-rich for plants, improve water filtration.
 - Name one reason pesticides, which are chemical poured on crops to destroy pests, are bad for soil?
 - Possible answers: pesticides kill living organisms in soil, and plants depend on chemicals since they don't get nutrients from the soil anymore.
 - True or False: Pesticides can not harm humans. If false, why is it not true?
 - False: Pesticides can harm humans by reducing the nutrients in food and can cause diseases from chemicals left on the fruit.



- True or False: Crop rotation, which is planting many different types of crops over time, not plowing the top layer of soil, and not using pesticides can all help the soil replenish its nutrients over time and protect it. If false, why is it not true?
 - After answering this question in class, tell students that this form of planting crops is called agroecology (spell it out for them to write down) and is good for the soil, the earthworms, plant life, farmers, and humans!
- After the video, give students 5 minutes to discuss their answers with their neighbors.
- Next, go over the answers to each question as a class, calling on students to share their answers.
 - Ask students “After watching the video and answering the questions, what ecosystem services does soil provide?”
 - Possible answers: allows us to grow food, cleans water and air, prevents soil from washing away in a storm, allows us to have fun playing in it.

After Lesson:

- Students will now have a chance to learn what kind of soil is present in their community.
- Instruct students to make a “Soil Shake” by pouring water into their container until it is full.
 - Ask students to write down what they predict will happen if they stir or shake the container and let it sit to settle for a few hours.
- Now, students should close their containers (if possible) and shake it!
 - Students who do not have containers with lids should use a stick to stir it rapidly.
- Over time the soil layers will become visible, with rocks (if there) falling to the bottom first, followed by sand, silt, and clay, then organic matter (leaves, sticks) will be floating on top of the water at the very top.
- Have students draw a picture of their containers and/or complete the exercise again with soils from different places, such as the forest, a field, a farm, or a garden for comparison.

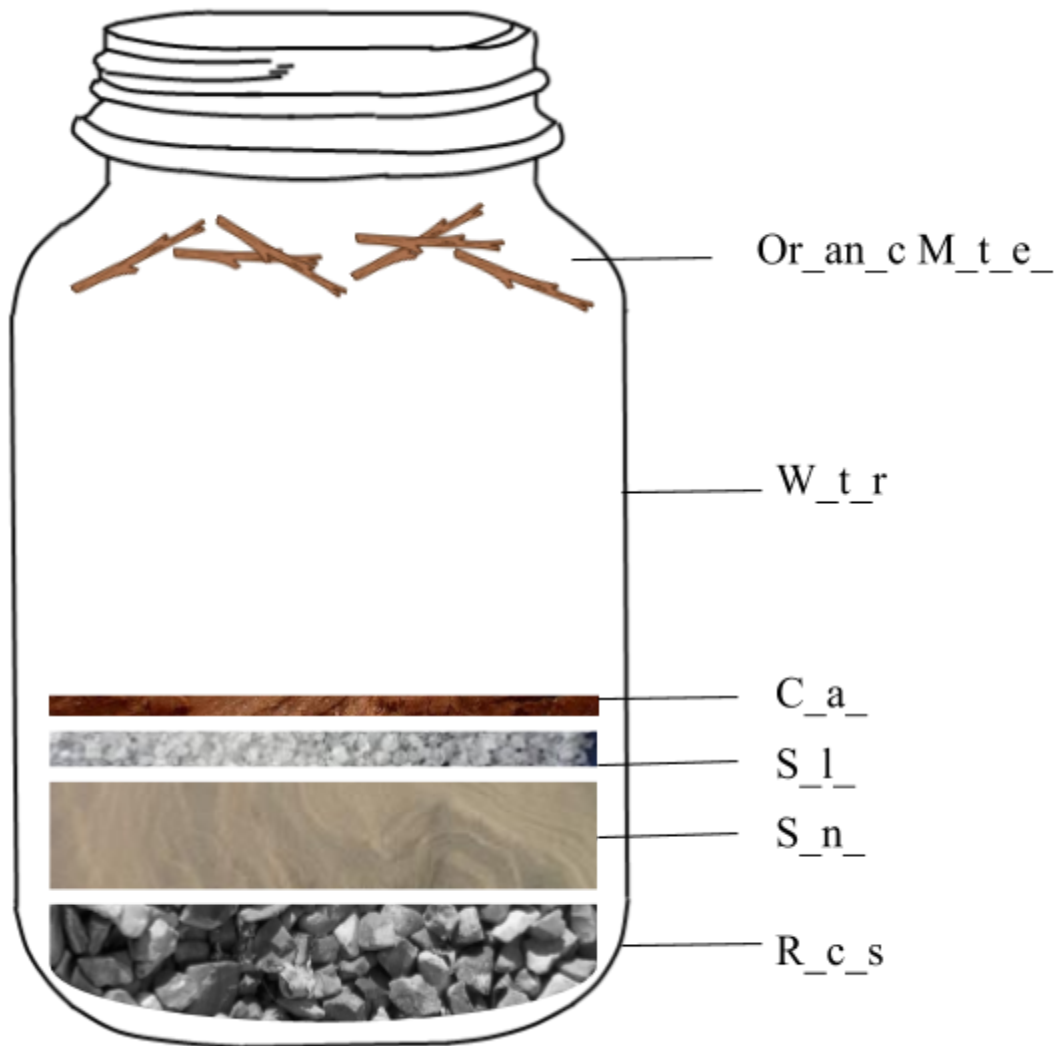
Assessment:

- Challenge the students to complete the diagram titled “Soil Layers”.
 - Remind students to think about their containers when filling it out.
 - If printing is not an option, students can draw the diagram and answers in their notebooks.



Soil Layers Worksheet

Instructions: Fill in the missing letters in the diagram below.



Attributions:

<https://www.deviantart.com/sweetlyscrapped/art/Mason-Jar-217258098>

"<https://www.flickr.com/photos/66603096@N05/17201255332>">"gravely texture" by https://www.flickr.com/photos/66603096@N05>elliott.teters is licensed under CC BY-SA

"<https://www.flickr.com/photos/14212747@N00/1399946532>">"Ripples in the sand" by https://www.flickr.com/photos/14212747@N00>Erik++ is licensed under CC BY-NC-SA

"<https://www.flickr.com/photos/10228735@N07/2427700525>">"Through the Clay" by https://www.flickr.com/photos/10228735@N07>Peachy Weasel is licensed under CC BY

<https://clipartix.com/log-clipart-image-44347/>

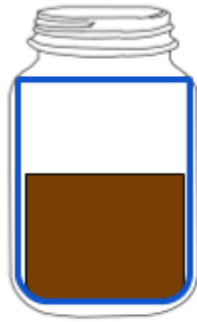


Soil Shake Instructions:

Prediction: I predict the soil will be mostly sandy.



Step 1: Add soil to container until it is about half full.



Step 2: Add water until the jar is mostly full.



Step 3: Put the lid on tight and shake it!!!



Step 4: Wait a few hours for the soil to settle.



Step 5: Observe the layers.