

# SMCOE Green Career Awareness

## *AGRISCIENCE*

Solutionary Phase	Fundamentals
Lesson # and title	Lesson 4: Biodiversity in Soils
Duration	45 minutes

### Lesson Overview

This is an introduction lesson for soil. Students will observe soil and make scientific illustrations of the different organisms interacting with soils (bacteria, nematodes, etc.) They will use dissection scopes to observe closely, then finish with a quick video and exit ticket to connect soil health to the farms in their area

### Learning Objectives

- Students will observe and make observations and inferences about the biodiversity in soil

### Content Standard(s)

CA NGSS, EP&Cs, CCSS-ELA, CCSS-Math, EP&Cs, History/Social Studies, Visual and Performing Arts, Computer Science, Health, CTE, PE  
Insert the standards' codes and language verbatim

### CA NGSS

**ESS3.A:** Natural Resources - Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

### College and Career Connection(s)

In later lessons, students will encounter soil scientists and how they work within the agriculture industry.

#### Equipment, Instructional Resources, and Materials

- Soil from different locations
- Dissection scopes
- [Soil Life Handout](#) or science notebook to make observations and scientific illustrations
- [Healthy Soil Data Table](#)
- [Slide Deck](#)

#### Suggested Student Grouping

Groups of 2 or individual (depending on how many microscopes are available)

#### Vocabulary

- Agriculture - The practice of growing plants for food, clothing, animal feed, and other resources humans need or desire. It also includes raising domesticated animals (livestock).
- Atmosphere - A thick layer of air that surrounds the Earth, supports life on Earth, and protects living things from the sun's harmful radiation.
- Biodiversity - Biological diversity is the variety of life in an area. Examples include the variety of individuals in a species, the variety of species in an ecosystem, and the variety of biomes or species on earth.
- Carbon - An element that is in all living things (e.g., humans, animals, and plants) and many nonliving things (i.e., rocks, soil, water, and our air/atmosphere). Atmospheric carbon is often attached to oxygen in the form of carbon dioxide.
- Carbon footprint - The amount of carbon dioxide and other greenhouse gasses that a person or group of people puts into the atmosphere from their use of fossil fuels.
- Carbon sequestration - The process of capturing and storing carbon dioxide and other forms of carbon from the atmosphere. The natural process of sequestration stores carbon in soil and bodies of water. The human-designed processes using technology to capture and store carbon.
- Carbon release - The process of carbon being released from the soil. This happens naturally as soil organisms breathe (respire), and can be sped up through human activities such as tilling or plowing.
- Climate change - The global long-term change in temperature and weather patterns due to increases in atmospheric carbon dioxide, mostly due to use of fossil fuels.
- Conventional/degenerative agriculture - Industrial practices of farming which include large single-crop farms, intensive tilling and irrigation, and the use of synthetic fertilizers, pesticides, and herbicides. This way of farming is very productive, but requires high amounts of energy,

adds toxins to the soil, and increases carbon release from the soil rather than carbon sequestration (capture).

- Compaction - Describes how close soil particles are to each other; describes how much space is between soil particles.
- Decomposer - Any organism that breaks down dead or decaying organic matter such as dead animals, fallen trees, or leaf litter.
- Ecosystem - A place where all the living things (plants, animals, microorganisms) interact with each other and with nonliving parts of their environment (water, sun, temperature, rocks and soil).
- Erosion - When rocks, soil, or other landforms are gradually worn down by ice, water, or wind.
- Fertilizers - Any substance, natural or man-made, added to soil to increase the level of nutrients it contains and speed up plant growth.
- Greenhouse effect - The natural process of the Earth's atmosphere trapping heat from the sun. Human use of fossil fuels has increased the amount of carbon in the atmosphere, leading to more of the sun's heat being trapped (global warming).
- Herbicides - Chemicals used to kill unwanted plants. Also known as weedkillers
- Microorganism - A living thing such as bacteria or fungi that is too small to be seen without the use of a microscope or other magnification.
- Macro-organism - A living thing that can be seen by the naked eye.
- Monoculture - The practice of growing or producing only one crop, species, or animal in the same place at the same time.
- Pesticides - Chemicals used to kill unwanted organisms such as insects, rodents, plants, or fungi.
- Photosynthesis - The process by which plants use the sun's energy to create carbon-based sugars from carbon dioxide and water.
- Polyculture - The practice of growing or producing multiple crops, species, or animals in the same place at the same time.
- Regenerative agriculture - Farming and grazing practices that focus on restoring soil health and biodiversity, and sequestering (capturing) carbon in the soil.
- Soil - The material on the surface of the Earth in which plants grow. It is a mixture of eroded rocks, minerals, and organic matter. It holds water and air, provides nutrients and structural support to plants, and supports a diverse ecosystem of living micro- and macro-organisms.
- Texture- a description of the size of the particles that make up the soil

## The Lesson

### Preparation

Obtain a variety of soil samples. Create a slide with soil/water mixture to view soil life. **For best results, multiple soil samples should be collected, varying in soil health and therefore biodiversity.** Set out microscopes with set up slides for students to view.

### Lesson Procedure

Link to Lesson Slide Deck: <https://docs.google.com/presentation/d/1E0cEm5zMP06jq0cmVjyzLKr6Nut4WQvD/edit#slide=id.p1>

Activity/Task	Description	Time (min)
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Introduction	<p>Soil has both biotic (living) and abiotic (non living) parts to it. We often do not think about soil as a thriving ecosystem, but healthy soil is! In the lesson, students will explore soil from different samples to find and discover different living things among it!</p> <p>Students will come up with a list of living things that they may find in soil. They will do a pair/share, and as a class, the teacher will then make a list. After coming up with a list, the teacher will present slides showing examples of different living organisms that they may find today, including fungi, invertebrates, and bacteria. Use this slidedeck to introduce it.</p>	10
Guided Practice	<p>The teacher will show students the procedure for putting a small sample of soil onto their dish so that they will be able to observe them under the dissecting scopes. <b>For best results, multiple soil samples should be collected, varying in soil health and therefore biodiversity.</b> If you use soil from a worm bin (recommended), make sure to go over that students are not to sit there and specifically try and get a worm as it will end up in worms cut in half/distressed.</p> <p>Option: If access to a scope that can be projected, show students what they are looking for using it.</p>	5
Independent Practice	<p>Students will then work in pairs (or by themselves depending on the amount of dissection scopes the teacher has access to), to look closely at soil samples. They will make scientific illustrations of their samples. They must use a <b>minimum of 7 minutes per sample before getting a new sample.</b></p> <p>Students can use the <a href="#">Soil Life Handout</a> or science notebook to make observations and scientific illustrations.</p> <p>Options: Add color pencils or art supplies for students to use so that their illustrations are more detailed.</p>	20
Reflection	<p>Teacher should run a class discussion using the slide deck to go over what the students noticed in some of their soil samples. Direct the discussion to what they think are characteristics of healthy soil.</p> <p>Show <a href="#">this quick video</a> about biodiversity in soil</p>	10

	Ask students to make a connection from soil health to farming techniques. Students write and share what type of farming techniques they mostly see in their communities.	
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Assessment
Have students submit their slide drawings handout for credit.