

## Photo Description



This image shows a cross-section of soil with different layers visible. At the top, we can see green grass and plant roots growing down into the dark soil. Below that are layers of darker soil and reddish-brown material, showing how soil is made of many different things mixed together.

## Scientific Phenomena

**Anchoring Phenomenon:** Soil has visible layers and contains living things (plants, roots, organisms) and non-living materials (rocks, minerals, decomposed matter).

**Why This Happens:** Soil forms over long periods of time as rocks break down into tiny pieces and mix with dead plants and animals. Gravity pulls heavier materials down, creating natural layers. Plants grow roots down into the soil to find water and nutrients they need to survive. Living organisms in the soil help break down dead material and create a rich environment where new plants can grow.

## Core Science Concepts

- \* **Soil Composition:** Soil is made up of many things—rocks, minerals, dead plants, dead animals, water, and air all mixed together.
- \* **Soil Layers:** Different materials settle in different places, creating layers in soil. Darker soil near the top usually has more organic material (dead plants and animals), while deeper layers may have more rocks and minerals.
- \* **Living Things in Soil:** Plants, worms, bugs, and microorganisms live in soil. Plant roots grow down into soil to absorb water and nutrients.
- \* **Weathering and Decomposition:** Over time, large rocks break into smaller pieces, and dead organisms break down, becoming part of the soil.

### Pedagogical Tip:

For Kindergarteners, focus on observable, hands-on exploration rather than abstract concepts. Use sensory language: "Feel the bumpy rocks," "Smell the earthy soil," "See the roots." Avoid overwhelming them with terminology; instead, repeat simple phrases like "Soil is made of tiny pieces" throughout the lesson.

### UDL Suggestions:

**Multiple Means of Representation:** Provide real soil samples students can examine with magnifying glasses, plus large photographs and videos showing soil close-up. Some students may understand soil better through tactile exploration than visual observation alone.

**Multiple Means of Engagement:** Connect soil to their lives: "Plants in our classroom need soil to grow!" or "Worms live in soil and help gardens." Allow choice in how they explore—some students may prefer digging, others drawing or discussing.

**Multiple Means of Expression:** Accept varied responses: drawing soil layers, building a soil model, acting out plant roots growing, or verbally describing what they observe. Don't require only one type of answer.

### Zoom In / Zoom Out

#### Zoom In: Tiny Soil Particles and Decomposition

If we could shrink down really, really small—smaller than an ant!—we'd see that soil isn't just one thing. We'd see teensy-tiny pieces of rock and minerals, and we'd watch dead leaves and bugs very slowly breaking apart into smaller and smaller pieces. We'd also see teeny living things (too small to see with just our eyes!) like bacteria working hard to break down dead stuff. This decomposition process happens slowly over months and years, turning big pieces into dust-sized bits that mix together to make rich soil.

#### Zoom Out: Soil in the Whole Ecosystem and Planet

When we zoom way out, we see that soil is the foundation for life on Earth! Soil covers land all around our planet. All the plants we eat—carrots, lettuce, apples, wheat—grow in soil. Animals eat those plants, and when they die, they go back into the soil. Worms, bugs, and other creatures live in soil and help break things down. Rain soaks into soil and travels down to underground water that people, plants, and animals need to drink. In this way, soil connects the sky (rain), the plants and animals, and the water underground—it's all one big, connected system that keeps Earth healthy and alive.

### Discussion Questions

1. What do you see in different parts of the soil? (Bloom's: Remember | DOK: 1)
2. Why do you think plant roots grow down into the soil instead of up into the air? (Bloom's: Infer | DOK: 2)
3. What do you think happens to a leaf after it falls to the ground and stays in the soil for a long time? (Bloom's: Analyze | DOK: 2)
4. How do you think soil helps plants grow? (Bloom's: Explain | DOK: 3)

### Potential Student Misconceptions

Misconception 1: "Soil is just dirt and has nothing living in it."

Clarification: Soil is full of living things! Worms, bugs, ants, and teeny-tiny creatures we can't see with our eyes all live in soil. Even plant roots are alive and growing in soil. Soil is like a busy home for many creatures.

Misconception 2: "All soil is the same color and made of the same stuff everywhere."

Clarification: Soil is different in different places! Some soil is dark brown, some is reddish, and some has more rocks or sand in it. Different places have different kinds of soil because of the rocks and plants that are there. Even in our own yard, soil can look different in different spots.

Misconception 3: "Plants only need water from rain; they don't really need soil."

Clarification: Soil does much more than just hold water! Soil gives plants food (nutrients) they need to grow strong and healthy. Roots drink water from soil AND eat special food in the soil. Without soil, plants can't grow.

### Extension Activities

1. Soil Jar Exploration: Fill a clear jar with soil from outside. Let students observe and describe what they see using magnifying glasses. Ask them to draw the different colors and materials they observe. (Supports observation and descriptive language skills)

2. Plant a Seed in Soil: Give each student a small cup with soil and a bean or grass seed. Have them water it, observe daily, and draw pictures of the root growing down into the soil over 2-3 weeks. Connect to: "The roots need soil to help the plant grow!" (Supports understanding of plant-soil relationships)

3. Soil Sensory Bin: Create a sensory exploration station with clean soil, rocks, sticks, leaves, and worms (if available). Let students dig, feel, and observe. Discuss: "What do you feel? What do you see living in the soil?" (Supports tactile and observational learning)

### Cross-Curricular Ideas

**Math Connection: Sorting and Patterns**

Collect different soil samples from around your school or neighborhood (if available, use pre-packaged clean soil for safety). Have students sort soil by color, texture, or what they find in it (rocks, sticks, leaves). Create a simple bar graph: "How many rocks did we find?" or "Which color of soil did we find the most?" This builds sorting, counting, and data skills while exploring soil variation.

**ELA Connection: Descriptive Language and Storytelling**

Read *The Tiny Seed* by Eric Carle, then have students dictate or draw a story about "A Day in the Life of a Seed in Soil." Ask them to use describing words: "The soil was dark and cool and wet. The seed felt..." Create a class big book with student illustrations and simple sentences. This builds vocabulary (dark, wet, crumbly, cold) and narrative skills while reinforcing soil science concepts.

**Art Connection: Soil Layer Collage**

Give students paper cups or clear containers and layers of different materials: colored sand, pebbles, dried leaves, small sticks, and crumbled brown paper to represent soil layers. Have them create a "soil profile" collage by layering these materials. They can paint or color over it, then draw plant roots growing down through the layers. This supports fine motor skills, creativity, and visual understanding of soil structure.

**Social Studies Connection: Where Our Food Comes From**

Connect soil to community gardens or farmers markets. Discuss: "Where do carrots, tomatoes, and apples grow? They grow in soil! Farmers take care of soil to help food grow." If possible, visit a small garden or bring in a farmer or gardener to talk about how they care for soil. This builds understanding of community resources and where food comes from, while reinforcing soil's importance to human life.

### STEM Career Connection

**Farmer / Gardener**

Farmers and gardeners work with soil every day! They dig in soil, plant seeds, water plants, and help food grow in soil. They learn what soil is made of and how to keep it healthy so plants grow big and strong. If you love digging in dirt and watching plants grow, you might become a farmer! Average Annual Salary: \$45,000–\$60,000 USD

**Soil Scientist**

Soil scientists are like detectives who study soil! They dig up soil from different places, look at it very carefully, test it, and learn what's in it and how to help plants grow better. They might work for farms, gardens, parks, or universities. They ask questions like: "Why is this soil different from that soil? How can we make soil better?" Average Annual Salary: \$48,000–\$68,000 USD

**Geologist**

Geologists study rocks, minerals, and the Earth! Soil comes from rocks that break down over millions of years, so geologists help us understand where soil comes from and what it's made of. They might dig in the ground to look for rocks and fossils, or work at museums teaching people about Earth. Average Annual Salary: \$52,000–\$75,000 USD

### NGSS Connections

Relevant Performance Expectation:

- K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.
- K-LS1-1: Use observations to describe patterns of what plants and animals (including humans) need to survive.

Disciplinary Core Ideas:

- K-ESS2.A (Earth Materials and Systems)
- K-LS1.A (Structure and Function)

Crosscutting Concepts:

- Patterns (Layers in soil follow patterns)
- Systems and System Models (Soil is a system with living and non-living parts)

### Science Vocabulary

- \* Soil: The dark material on the ground made of tiny pieces of rock, dead plants, and animals all mixed together.
- \* Roots: The parts of a plant that grow down into the soil to drink water and get food for the plant.
- \* Layer: A flat sheet or level of something, like the different levels you see when you look at soil from the side.
- \* Decompose: When dead plants and animals slowly break down and become part of the soil.
- \* Organism: Any living thing, like plants, animals, bugs, or worms.

### External Resources

Children's Books:

- The Tiny Seed by Eric Carle (demonstrates seed growth and plant life cycles)
- Dirt by Maya Gottfried, illustrated by Robert Andrew Parker (celebrates soil and exploration)
- Plants Can't Sit Still by Rebecca Hirsch (explains how plants use soil and roots)