

Photo Description



This image shows a cross-section of soil with different layers visible. At the top, you can see dark soil with green plants and their roots growing into it. Below that, there's a reddish-brown layer, and at the bottom is darker soil. The plants' roots are reaching down into the soil to find water and nutrients they need to grow.

Scientific Phenomena

Anchoring Phenomenon: Why do plants need soil, and what is soil made of?

This image demonstrates that soil is a living material composed of multiple layers, each serving different purposes for plant growth. The reddish-brown layer visible in the cross-section contains minerals (like iron) that weathered from rock over long periods of time. The darker layers contain decomposed plant and animal matter called organic material or humus. Plants grow roots into soil because it provides three essential things: water, minerals/nutrients, and physical support. The layering shown happens naturally as soil develops over years and years—rocks break down into smaller pieces, dead plants and animals decay and mix in, and living organisms (worms, insects, microbes) create spaces for air and water.

Core Science Concepts

1. Soil is made of many things: Soil contains broken-down rocks (minerals), dead plants and animals, water, air, and tiny living creatures we cannot see.
2. Soil has layers: Different layers of soil have different colors and textures because they contain different amounts of rock pieces and decomposed material.
3. Plants need soil to survive: Soil provides plants with water, nutrients (food), and a place for roots to anchor and grow.
4. Soil changes over time: Rocks slowly break into smaller pieces, and dead things break down and become part of the soil —this takes a very long time.

Pedagogical Tip:

For First Grade, emphasize the observable, tangible aspects of soil rather than abstract processes. Have students touch real soil, observe its color and texture, and see actual plant roots. Avoid using the term "decomposition" and instead say "plants and animals break down and become part of the soil." Use sensory language: "crumbly," "dark," "wet," "bumpy." This concrete experience builds the foundation for understanding ecosystems in later grades.

UDL Suggestions:

Multiple Means of Representation: Provide soil samples in clear containers at multiple stations so students can examine layers up close. Use real plant specimens with roots visible alongside the photo. Create a simple labeled diagram showing "rocks," "dead plants," and "roots."

Multiple Means of Action & Expression: Allow students to communicate their observations through drawing, sorting activities, or describing soil textures verbally rather than only through writing.

Multiple Means of Engagement: Connect to students' personal experience: "Have you played in dirt? What did it feel like?" This builds relevance and motivation.

Zoom In / Zoom Out

Zoom In: Microscopic View

If we could shrink down very, very small and look at a tiny piece of soil under a microscope, we would see amazing things! We'd see teeny-tiny living creatures called microbes (so small we can't see them without a microscope) that eat dead plants and animals and turn them into nutrients that plants can use. We'd also see water stuck to little bits of soil like a thin blanket. These invisible creatures and water are working hard all the time, even though we can't see them!

Zoom Out: The Big Picture

This soil is part of a much bigger system called an ecosystem. The soil in this picture is connected to the plants growing on top of it, the insects and worms living in it, the water that falls from the sky and soaks through it, and even the rocks deep underground that are slowly breaking apart. All of these things work together to keep the soil alive and healthy. When we take care of soil in our gardens and neighborhoods, we're taking care of the entire living world around us!

Discussion Questions

1. What do you see in the different layers of this soil? (Bloom's: Remember | DOK: 1)
2. Why do you think the plant's roots are growing down into the soil instead of staying above ground? (Bloom's: Infer | DOK: 2)
3. If we left a pile of dead leaves on the ground for a whole year, what do you think would happen to them? (Bloom's: Predict | DOK: 2)
4. What would happen to a plant if we tried to grow it in sand with no soil? Why? (Bloom's: Analyze | DOK: 3)

Potential Student Misconceptions

Misconception 1: "Soil is just dirt—it's not alive."

- Clarification: Soil IS alive! It contains billions of tiny creatures we can't see (microbes), worms, insects, and roots. It's one of the most alive places on Earth. When we say soil is "alive," we mean that living things live in it and help keep it working.

Misconception 2: "All soil looks the same and is made of the same thing."

- Clarification: Soil comes in many different colors and textures depending on where it is. Some soil is red (like we see in the photo), some is brown, some is black. Some soil feels sandy and loose, while other soil feels sticky and clumpy like clay.

Different soils have different amounts of rocks, water, and dead plants mixed in.

Misconception 3: "Plants eat soil like we eat food."

- Clarification: Plants don't eat soil. Instead, their roots drink water from the soil and take in nutrients (food) that are mixed into the soil. The soil is like a restaurant where plants get water and nutrients, but plants don't actually swallow pieces of soil.

Extension Activities

1. Soil Sensory Exploration: Provide students with small containers of different soil types (potting soil, sandy soil, clay-rich soil). Have them observe colors, touch textures, and describe what they feel using words like "smooth," "rough," "crumbly," and "sticky." Ask: "Which soil feels best for planting? Why?"

2. Plant Root Observation: Plant fast-growing seeds (beans, radishes) in clear plastic cups or bags filled with soil so students can observe roots growing downward over 1-2 weeks. Document with drawings or photos. Discuss what the roots are "looking for" in the soil.

3. Soil Layer Model: Have students create a simple soil layer model in a clear jar using actual materials: small pebbles (bottom), sand, dark potting soil, and humus (crushed dead leaves). Add water to show how it soaks through layers. Label each layer and discuss what each one does for plants.

Cross-Curricular Ideas

ELA Connection: Descriptive Writing & Sensory Language

Have students write or dictate sentences describing what they observe in the soil photo using sensory words: "The soil is dark and crumbly. The reddish-brown layer looks bumpy. The roots are thin and wiggly." Create a class "Soil Word Wall" with descriptive words and have students illustrate them. Read aloud Dig, Dig, Digging and have students act out the digging motions while saying rhyming words.

Math Connection: Measuring & Comparing

Give students rulers or string to measure the depths of different soil layers in the photo or in actual soil samples they collect. Create a simple bar graph comparing the thickness of each layer. Have students count the number of visible plant roots and record the data. Practice ordering layers from "shallowest" to "deepest."

Social Studies Connection: Community & Caring for Our World

Discuss how farmers and gardeners use soil to grow food that feeds our community. Take a class "soil walk" around the school grounds and observe different types of soil in different places (playground, flower beds, shaded areas). Talk about why keeping soil healthy is important for everyone in our community. Connect to local farmers markets or school gardens if available.

Art Connection: Soil Layer Collage

Have students create a colorful soil layer collage using torn paper, fabric scraps, sand, and dried leaves glued onto a background to represent each layer of soil. They can use real soil samples (in plastic bags) to represent actual colors. Display the collages with labels identifying each layer. Students can also paint or draw their own version of the soil cross-section and add details like roots, rocks, and worms.

STEM Career Connection

Geologist (or Soil Scientist)

A geologist studies rocks, minerals, and soil to understand how the Earth works. Some geologists are called soil scientists and they spend time digging in the dirt, looking at different soil layers, and figuring out what makes soil healthy for growing plants and buildings. They might work on farms, in gardens, or help cities plan where to build new houses. Soil scientists help farmers grow better crops and help keep our land healthy.

Average Annual Salary: \$92,000 USD

Botanist (Plant Scientist)

A botanist studies plants and how they grow. Botanists want to understand why plants need soil, what nutrients help them grow big and strong, and how to grow plants in different places around the world. Some botanists work in gardens, greenhouses, or laboratories, and they use tools to study plant roots and how they drink water from soil. They help create new types of plants and solve problems when plants get sick.

Average Annual Salary: \$65,000 USD

Environmental Engineer

An environmental engineer studies how soil, water, and land work together to keep our world healthy. They figure out the best ways to protect soil from pollution, help water soak through soil safely, and design gardens and farms that are good for the Earth. Environmental engineers might design rain gardens, plan ways to clean dirty soil, or help restore areas where soil has been damaged. They care about making sure soil stays healthy for plants and people.

Average Annual Salary: \$98,000 USD

NGSS Connections

Performance Expectation:

- 1-LS1-1: Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Disciplinary Core Ideas:

- 1-LS1.A Structure and Function – Plant roots help plants get what they need from soil
- 1-ESS1.A Earth Materials – Soil is made of weathered rock and organic material

Crosscutting Concepts:

- Structure and Function – Different parts of soil (rocks, humus, water, air) have different jobs
- Cause and Effect – When plants grow in soil, their roots cause soil to be disturbed and moved

Science Vocabulary

- * Soil: The dark, crumbly material on the ground where plants grow and get water and food.
- * Roots: The parts of a plant that grow down into the soil to take in water and nutrients.
- * Nutrients: Special things in soil that plants need to help them grow strong and healthy.
- * Humus: The dark, broken-down pieces of dead plants and animals mixed into soil.
- * Layers: Different sections of soil stacked on top of each other, like a cake with different layers.
- * Weathering: When rocks slowly break into smaller pieces over a very long time.

External Resources

Children's Books:

- In the Garden with Dr. Carver by Susan L. Roth and AG Ford – Explores plants, soil, and growing things through Carver's eyes
- The Tiny Seed by Eric Carle – Shows how a seed grows with water and soil
- Dig, Dig, Digging by Margaret Mayo – Simple, rhythmic text about soil and what lives in it