

Lesson

Soil Properties

Duration: 1.5 hours or two 45-minute sessions

Purpose:

Using skills of observation, comparing, classifying, and communicating, students will discover the different characteristics of soil and how soil properties impact their daily life.

North Carolina Science Competencies:

- 2.01 Observe and describe the properties of soil color, texture, and capacity to hold water.
- 2.04 Identify the basic components of soil: sand, clay, silt, and humus.

Life Skills:

- Learning to Learn:** Is curious, asks questions, learns how to do the process, how to observe, learns by doing.
- Problem Solving:** Seeks solutions to simple problems and is able to consider a few selected alternatives.
- Critical Thinking:** Ask questions before, during, and after acquiring information.
- Communication:** Engages in group discussion.
- Cooperation:** Has cooperative group experiences.
- Leadership:** Learns to be a group member, learns to listen when others speak.

Materials (For 30 Students):

- 30 paper cups
- 8 trowels (or soil probes)
- 30 magnifying glasses
- Newspaper (to limit the mess)
- Paper, pencils
- 30 clear, 20-oz. soda bottles
- 2 cups powdered dish detergent
- Rulers
- 1 basketball, 1 golf ball, 1 BB pellet
- 1 water spray bottle
- Funnel
- Masking tape
- Overhead projector & Dissecting Microscopes



Let's Explore the Soil!

Background Information:

Soils are important, from the growing of our food and favorite ornamental plants, to providing the materials to build the houses we live in, filtering impurities out of our water, helping us recycle wastes, and providing recreational activities we enjoy. Soils contain four parts: **weathered minerals**, organic matter, water, and air.

Soil texture refers to proportion of sand, silt, and clay particles. Texture affects many fundamental soil properties, such as fertility, erosion, water-holding capacity, pollution, and **compaction**. Soil color can reflect the different mineral content, **aerobic** or **anaerobic** conditions, and the presence of organic matter.

Humus is the organic part of the soil that results from highly decomposed plant and animal matter. Humus contributes to nutrient exchange with plants and helps bind soil particles into **aggregates**. Humus also holds water well and, therefore, improves drought tolerance.



Lesson 1: Soil Properties

Scratching the Surface:

Begin with a brainstorm about soil's importance. Have pairs of students list as many ideas as they can on how soil is important in our daily lives. After a few minutes of cooperative brainstorming, ask for volunteers to voice their ideas.

Collect the ideas by writing them down on a piece of large paper hanging on the wall or a bulletin board. Use this as your "Soil Wonder Wall." Students will use this space to add to their initial list of ideas and as a place to record questions.

Think about engaging students in recognizing their work together as a group. Leading questions might be: Do you think you get more ideas working alone or a group? Why? How did you decide what roles your group members would play? What did you learn about communicating with others?



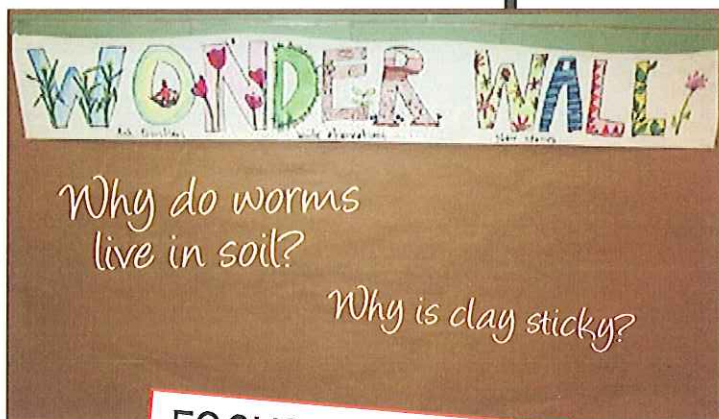
Digging in:

Break the class into teams of three. Go outdoors and ask the students to help you identify three unique spots for soil samples. Ask them why a location may have different soils. You may want to define a unique spot as the edge of the playground where wildflowers grow, a compacted place beneath play equipment, on the soccer field, etc. Demonstrate how to take a soil sample (www.soil.ncsu.edu/publications/Soilfacts/AG-439-30/AG-439-30.pdf).

At each stop, have one teammate fill a paper cup with soil. Bring the samples into the classroom and pour the samples onto pieces of newspaper for observation. (Students may also want to share soil samples brought from home.) Use magnifying glasses and **dissecting microscopes** for a closer look.

Have students record their descriptions and sketches of each soil. What does the soil feel like? What does the soil look like? Is it heavy? What color is it? Is there evidence of plant material or other living materials?

Encourage students to write down questions or interesting things they find in their soil explorations and put it on the Soil Wonder Wall. Take time for reflection about student findings and their questions.



FOCUS QUESTIONS:

- WHY IS SOIL IMPORTANT?
- WHAT IS SOIL?
- WHAT DOES IT LOOK AND FEEL LIKE?
- WHY ARE THERE DIFFERENCES BETWEEN SOILS?



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Digging Deeper:

Hand Texturing

Hand texturing is a field exercise soil scientists use to determine soil texture, or whether the soil is made up of sand, silt, or clay.

Have students take an egg-sized soil sample, and spray it with water to lightly moisten it. Have them knead the soil. If it is too dry, and completely falls apart, spray more water. Conversely, if it is too wet, add dry soil.

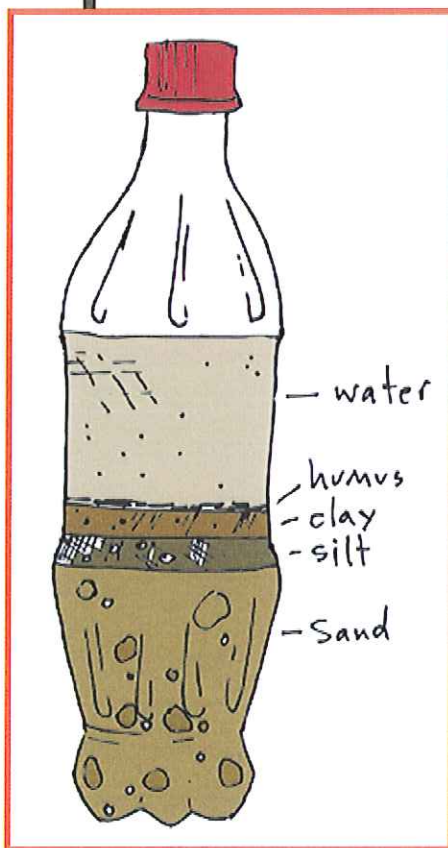
Sand tends to have a gritty texture, like salt or sugar, and it falls apart when squeezed into a ball. Soil with a lot of silt has a silky feel, similar to flour. Clay tends to be sticky and greasy, and it easily forms a ball. Most soils have varying amounts of these particles, and will have a combination of the properties. Once you have a moist soil ball, gently press your thumb and push the soil over your forefinger into a ribbon.

The longer you can make your ribbon, the higher the clay content. Clayey soil can ribbon out or three-fourths of an inch or greater. If your ribbon is short (less than three-fourths of an inch) and cracks, the soil is considered to have a loamy texture (usually containing varying amounts of sand, silt, and clay).

Project the soil texture key (found at the end of the lesson) onto the overhead.

As a whole class, work together to figure out the soil texture. Does it match with previous finding? Why is soil texture important?

Rarely are soils ever composed of one size of soil particle, but if a teacher has access to separate samples of sand, silt, clay, and humus, the students can further their soil sample observations by feeling and looking closely. Students should record any descriptions and sketches they make.



Soils are composed of particles of different sizes:

- **Sand** (.05 to 2 mm)
- **Silt** (.002 to .05 mm)
- **Clay** (smaller than .002 mm)
- **Humus** (decomposed organic matter)

What does the soil feel like?

