Soil Detectives

Objective: Students will learn that soil is made up of different materials.

Summary: Students will collect soil and make observations, comparing soils from different areas.

Time: ½ hour on two consecutive days

Student Grouping: Three to five students per group

Materials: Trowels, clear containers with lids (clear glass jars), hand lenses (optional), paper and pencils.

Background Information: Soil particles are typically classified as sand, clay, or silt depending on the content and particle size. Soils are made up of broken-down rocks and formerly living materials all mixed together. Sand makes up the largest, heaviest particles. In a jar of soil that has been mixed with water, the sand particles will be the first to settle on the bottom because of their weight. Silt, next in size, is next to settle. The smallest particles, which take quite a while to settle, are clay. Most soils contain all three types of particles. If the soil is more than 50 percent clay particles, it is called a clay soil. If there are 50 percent sand particles, it is considered a sandy soil. A loam soil is ideal for growing most crops; it is 40 percent sand, 40 percent silt and 20 percent clay. Loam soil retains enough water, yet also allows the soil to drain, for optimum water conditions at a plant's roots.

Marin Ag. Facts: The U.S. Soil Conservation Service classifies soils by groups numbered I-VIII. Group I soils will grow just about anything, while group VIII soils are extremely limited in what they can grow. Marin County soils fall into classes II through VII. The most tillable soils are found along the eastern side of Highway 101, the eastern shore of Tomales Bay and the northwestern corner of the county. The rest of the county is categorized as grazing land, soil classes V-VII.

Marin farmers grow various crops, adapting to various soil and climate conditions, and many of our vegetable growers farm in the Bolinas area. If the soil is too clay or sandy, then farmers amend their soils. An example is the Star Route Farms where they grow gourmet organic salad greens. They add manure and homemade compost to their soil to keep it from being too claylike. The manure and compost add material to the clay soil that breaks it up and allows moisture to move through.

Preparation:

1. Assemble materials.
2. Decide where the soil samples will be taken from. If there is little variety available on your school grounds, you may want to assign students to bring in samples from home and other locations.
3. Be prepared for some dirt in your classroom, or set up to do the activity outside.

Procedure:

1. Have students collect soil samples from two different locations. They need to fill their jars about one-third full. Have them label the jar lids with group name and origin of the samples.
2. Have students dump their soil samples on a piece of paper and explore it, making notes on their observations, looking with their hand lens and making sketches. They should keep their samples separate, doing the same study with each sample individually.
3. Have them return the sample to its jar and add water until the jar is almost full and screw the lid on tight. Shake vigorously to stir up all the clumps.
4. Students can take notes on the settling of contents throughout the day if the activity is started in the morning; or, the jars can be left to sit overnight for complete settling. Warn students not to pick up the jars when making observations. This will stir things up again and delay settling.

Questions for Discussion:

- What kinds of things did you see when looking at the soil?
- Did the two samples look different? How did they differ?
- What happened when the soils were allowed to sit after mixing with water?
- What do you think would explain the different layers in the jars of settled soil?

Extensions:

- Allow the samples to dry. Separate the different layers and test how water flows through each by testing them in a funnel lined with filter paper or a paper towel. Time how long it takes for a cup of water to filter through. Which one would let too much water through? Which particle type might hold too much water and drown roots? Test the hypothesis and try growing plants in each type.
- Measure volume (in teaspoons or milliliters) and weight of the various layers when they are dry. If your class is comfortable with complex fractions, compare mass to volume. Which takes up the most room? Which is heaviest?
- Obtain a soil test kit and test for pH, nitrogen and other qualities. These kits vary in price and are available from many gardening supply stores. Or send a sample to a company that does soil tests and see what results they get and what recommendations they have for amending your soil.