

What's In Soil?

Name: _____

Date: _____

Background:

CHARACTERISTICS OF SOILS

Soils have physical properties that are useful in differentiating horizons and in identifying the dominant processes occurring in their development. The most important include color, texture, structure, acidity or alkalinity, and capacity to hold and transmit moisture and air. We will consider color and texture here.

Color: This is the most visible attribute. Soils vary from black to brown to reds, yellows, grays etc and near whites. Each color offers a clue to the physical and chemical characteristic of a particular soil. For example, humus is black/brown, and soils high in humus content usually exhibit this color. As the humus content decreases, either as a consequence of low organic activity or leaching, the color gradually fades to light brown or gray. Red and yellow colors are usually due to the presence of iron compounds. In moist environments white indicates that iron has been removed and oxides of silicon and aluminum are present, while in dry climates the same color indicates a high proportion of salts.

Texture: This varies according to the size of the particles that make up the soil. In clay soils particles have diameters less than 0.002 mm. The particles of silt are defined as between 0.002 and 0.065 mm, and sandy soil have diameters between 0.065 and 2.00 mm. Individual particles greater than 2.00 mm are regarded as inert gravel or rock fragments and technically not soil particles. Since no soil is made up of particles of uniform size, the proportions of particles in various size ranges determines the texture of the soil. A loam is a soil texture class in which no one of the three size grades (sand, silt, clay) dominates over the other two.

Soil texture is important in that it helps to determine the capacity of the soil to retain moisture and air, both of which are necessary for plant growth. Soil texture can be determined by sieving the soil through sieves of known diameter and determining the proportion retained in each sieve.

Materials:

Container of dry soil
1 soil sieve set
1 balance
1 magnifier
White paper

Procedure:

1. Describe soil:
2. Record the mass of your soil sample: _____ grams
3. Make sure the sieve sets are arranged from top to bottom in order of largest holes at the top, next-to-largest holes, next-to-smallest holes, smallest holes, and the solid pan is on the bottom.
4. Carefully empty the dry soil into the top sieve.
5. Replace the sieve cover and GENTLY shake the sieve set **back and forth** (NOT up and down) for 90 seconds.
6. Empty the material that remained on the sieve with the **largest holes** onto a white piece of paper. Describe this material (in great detail).
7. Record the mass of this material and calculate its percentage of the total.
Mass: _____ grams Percentage: _____

8. Repeat steps 5 and 6 for the material retained in the sieve with the next-to-largest holes. Describe this material (in great detail).

Mass: _____ grams Percentage: _____

9. Repeat steps 5 and 6 for the material retained in the sieve with the next-to-smallest holes. Describe this material (in great detail).

Mass: _____ grams Percentage: _____

10. Repeat steps 5 and 6 for the material retained in the sieve with the smallest holes. Describe this material (in great detail).

Mass: _____ grams Percentage: _____

11. Repeat steps 5 and 6 for the material retained in the sieve with the solid pan at the bottom. Describe this material (in great detail).

Mass: _____ grams Percentage: _____

12. Clean up your lab by returning all of the soil samples to the soil collection pan. Shake out any remaining soil from the sieve sets and re-assemble them in the proper order. Be sure to clean your work area.

LAB QUESTIONS:

1. Are soils made up of one particle size?
2. What is the largest particle size?
3. What is the smallest particle size?
4. What is the advantage to having many different particle sizes within a soil sample?
5. Assume that the first two pans (largest and next-to-largest) represent sand. What is the total percentage of sand in your sample? _____
Assume the next two pans (next-to-smallest and smallest) represent silt. What is the total percentage of silt in your sample? _____
Assume the solid pan represents the clay. What is the total percentage of clay in your sample? _____
6. Using the soil texture triangle and your answers to question #5, what type of soil did you determine your sample to be?