

# SOIL ANALYSIS LAB

## LAB SCHEDULE

### Day 1

Collect soil sample  
\*Set up Soil Texture test  
\*Set up Soil Moisture test  
General Observations

### Day 2

\*Soil Fertility tests  
\*Soil Porosity test  
Collect Soil Texture results  
Collect Soil Moisture results  
Finish any other data collection

*\* Your group of 4 should split into pairs to complete these tests.*

## **SOIL SAMPLE COLLECTION**

Collect a soil sample by digging a small hole at least 6 inches deep. Remove any stone, roots, grass, or thatch from the sample and place it in a one-gallon plastic sealable bag.

## **GENERAL OBSERVATIONS**

*Observations of the area surrounding collection site:*

Make notes on the surroundings where you collected your sample. What type of setting is it? What kinds of plants are in the area? Is it in the shade or in direct sunlight? Factors such as plant life, buildings, walkways, and paved areas may influence some of your tests and give clues about why you got the results you did.

*Observations of soil sample:*

Take some of your soil sample and carefully place it on a white piece of paper. Look closely at your soil sample. What do you see? Observe and comment on the various particle sizes. Do any sizes dominate? Use a hand lens for a closer look. Use the handout in the lab to determine your soil's structure and consistence. Record the forms of organic matter such as worms, insects, roots, etc.

## **SOIL TEXTURE**

Soil contains mineral particles belonging to three size categories: clay, silt, and sand. The size of soil particles is important. Large particles of sand allow empty space for air and water to enter the soil. Smaller silt and VERY small clay particles help hold the water in a soil so that it does not drain away too quickly to be used by plants. The ratios of these materials, or texture, can be determined quantitatively.

In a 100-mL graduated cylinder, place about 60-70 mL of your soil sample. Add enough water to completely saturate your soil and then keep adding water until the level gets to about the 100-mL mark. Now place your hand tightly over the open end of the graduated cylinder to seal it and shake the whole apparatus until the soil and water completely mix to make a free-moving slurry. This set-up will not work unless the water and soil completely mix. Be sure to break up any lumps in the soil. Now, place the graduated cylinder in a safe place for 24 hours to let the soil particles settle out. The denser, larger sand particles will settle out first and be on the bottom of the cylinder. A layer of silt will settle out on top of the sand and finally, after 12 hours or so, the tiny clay particles will settle out on top of the silt.

After 24 hours, measure your results. Using the calibration on the side of the graduated cylinder, record the height of each layer of soil and the total height of the entire soil sample (NOT the height of the water...just the soil). Calculate the percent of sand, silt, and clay in your soil sample. Plot the percents of these three soil particles on the soil texture triangle provided. Where the three lines intersect is your soil's soil texture type.

## **SOIL MOISTURE**

Remember, soil is made up of a mixture of eroded rock, minerals, organic matter, air, water, and billions of microscopic living organisms. Many of soil's functions are related to the amount of moisture it holds and its ability to retain this moisture.

Make a small tray, or "boat", of aluminum foil and label it with your name(s). Record the mass of the empty aluminum tray. Put several spoonfuls of your soil sample in the tray and record the mass of the tray + soil. Now put the tray with your soil sample into the drying oven for 24 hours at a temperature of 90-90° F. After heating the soil to dryness, let the sample cool and again record the mass of the tray + soil. Any mass loss will most likely be water that was evaporated. Calculate the percent of mass lost to determine what percent of your soil sample was water.

## **SOIL POROSITY**

Porosity is the amount of air space in a soil sample. Porosity is important because it determines the ease with which water, oxygen, and nitrogen can work their way down to the root zones of plants. Recharging of groundwater aquifers also depends on pore spaces between soil particles as it affects the speed at which water can infiltrate the soil.

To determine the porosity of your soil, fill a 250-mL beaker to the 200 mL mark with soil and tamp down gently. Fill a 100-mL graduated cylinder to the 100-mL mark with water. Gently and slowly pour the water onto the surface of the soil until the soil is completely saturated and water *just* starts to pool up on the surface. Record the amount of water left in the graduated cylinder. Use this to determine how much water was poured into the soil sample. This represents the amount of pore space in your soil. Calculate porosity as the percent pore space compared to the volume of soil.

## **SOIL FERTILITY**

Soil fertility is the measure of the nutrients available to plants. Four variables are important in determining the fertility of soils. They are: pH, and the amounts of nitrogen, phosphorous, and potassium. The values of each of these components can serve as a limiting factor in the growth of plants.

Use soil test kits to determine the values of each variable for your sample. Read the step-by-step directions carefully.