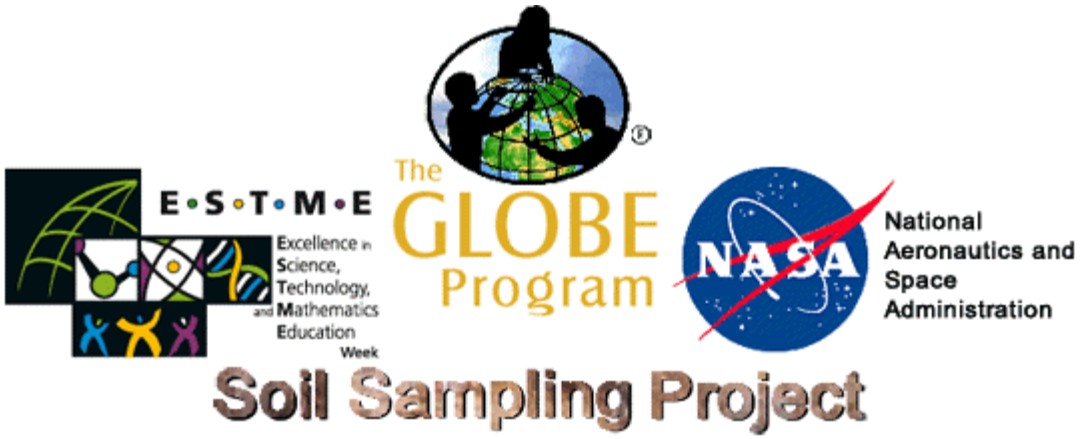


Student Worksheet

Introduction

This worksheet will allow you and your students to collect and report information about your local soils. Print out this document and follow the ***Measurement Steps*** given below to collect information about your local soils. Record the information that you collect on the *Soil Sampling Project Data Sheet*, which can be downloaded from the project web site at www.globe.gov/estme. Then report the information that you have collected through the *Online Data Entry Form* located on the project web site.

By participating in this project you and your students will learn about your local soils and share what you find with others. While you do not have to do all the parts of this worksheet, but the more that you do, the more you will learn and the more you will contribute to knowledge of soils around the world!

What You Will Need

- **Trowel or shovel**
- **Squirt bottle filled with water**
- **Paper towels (to clean off hands)**
- **A ruler with centimeter units**
- **Pen or pencil**
- **Printout of this *Worksheet***
- **Printout of the *Soil Sampling Project Data Sheet*** (can be downloaded from the project web site at www.globe.gov/estme)

Measurement Steps

1. Fill out the ***School Information*** section at the top of your *Soil Sampling Project Data Sheet*.
2. Find a site location that is safe (and you have permission, if appropriate) to dig a small hole with a trowel or shovel.
3. Fill out the ***Site Information*** section of your *Soil Sampling Project Data Sheet*.

4. Remove any grass, leaf litter, or other cover from an approximately 25 cm by 25 cm area of the soil surface at your site.
5. In the center of this cleared area, dig about 5 cm into the soil surface with your shovel or trowel and remove a sample of the soil gently with your hands.
6. Examine the soil sample to determine its structure, color, texture, the amount of roots present, and the amount of rocks present by following Steps *6a, 6b, 6c, 6d,* and *6e* given below.
7. Record your findings in the ***Soil Information*** section of your *Soil Sampling Project Data Sheet.*
8. Report your data through the *Online Data Entry Form* located on the project web site at www.globe.gov/estme.

Step 6a - *Measuring Soil Structure*

Soil particles can stick together to form structures known as "peds". Soils that form structured peds are classified as *granular, blocky, prismatic, columnar,* or *platy* depending on the shape of the peds. Soils that do not form structured peds are classified as either *single grained* or *massive*. Definitions and illustrations of these classifications are given below.

It is important to know about the structure of a soil, since it affects how easily water, heat, and air can flow through the soil. The structure of the soil also helps determine how well plant roots will grow in the soil.

To determine the structure of your soil:

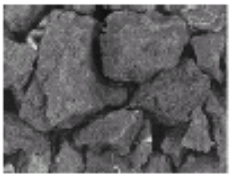
i. Hold the sample gently in your hand and look closely at the soil to examine its structure.
ii. Look through the "List of Soil Structure Classifications" below and come to a consensus with the other students in your group about which classification best describes your soil sample.
iii. Check the box on your *Soil Sampling Project Data Sheet* that best corresponds to the structure classification of your soil sample.

List of Soil Structure Classifications:

Structured Soils -

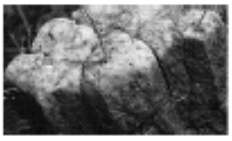
Granular: Resembles cookie crumbs, peds are usually less than 0.5 cm in diameter. Commonly found near the soil's surface where roots have been growing.


Blocky: Peds are irregular blocks that are usually 1.5 - 5.0cm in diameter.




Prismatic: Soil is formed into vertical columns that might be a number of centimeters long. Usually found deeper in the soil.


Columnar: Soil is formed into vertical columns that have a white, rounded salt "cap" at the top. Found in arid climates.

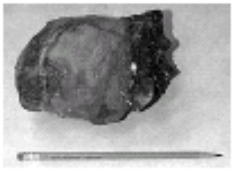
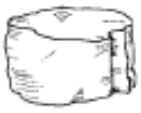



Platy: Thin, flat plates of soil that lie horizontally. Usually found in compacted soil.


Unstructured Soils -

Single Grained: Soil is broken into individual particles that do not stick together. Commonly found in sandy soils.

Massive: Soil has no visible structure, is hard to break apart and appears in very large clods.

Step 6b - *Measuring Soil Color*

The color of soil depends on a variety of factors. Chemical coatings on the soil surfaces, organic matter in the soil, moisture in the soil, and the drainage of the soil all affect its color. Soil color tends to be darker when organic matter is present. Minerals such as iron can cause shades of red and yellow. Soil in dry areas may have white coatings due to accumulations of calcium carbonate. Soil color differs depending upon how wet or dry the soil sample is and how long it has been freely draining or saturated with water.

To determine the color of your soil:

i. Take a sample of soil in your hand and look at it closely.
ii. Classify the color of your soil as best you can. The choices for color are: *black, dark brown, light brown, red, orange, yellow, grey*, or *other color.*
iii. Check the box on your *Soil Sampling Project Data Sheet* that best corresponds to the color of your soil sample.

Step 6c - *Measuring Soil Texture*

Texture describes how a soil feels when it is squeezed in your hand. The soil texture determines how much water, heat, and nutrients will be stored in the soil profile as well as many other properties. Texture is determined by the amounts of *sand, silt,* and *clay* particles present in the soil sample. Human hands are sensitive to differences in the sizes of soil particles. Sand particles are the largest, and feel gritty to touch. Silt particles are medium sized, and feel smooth or like baking flour. Clay particles are the smallest, and are sticky and hard to squeeze. So, the terms sand, silt, and clay refer to the size of a soil's particles, not to the material that the soil is composed of, as some people believe.

To determine the texture of your soil:

i. Take a handful of soil and moisten it with water.
ii. Squeeze the soil in your hand until it sticks together into the size of an egg.
iii. Close your eyes and feel the moist soil between your fingers. Which of the following comes closest to describing the way that it feels:
    a. Gritty and rough? (call it *sandy*)
    b. Smooth and silky? (call it *silty*)
    c. Sticky and hard to squeeze? (call it *clayey*)
    d. A combination of all 3 of the above? (call it *loamy*)
iv. Check the box on your *Soil Sampling Project Data Sheet* that best corresponds to the texture of your soil sample.

Step 6d - *Measuring Roots in Your Sample:*

An estimate of the amount of roots present in the soil shows how deep the roots need to go to obtain nutrients and water. The more roots that are found in a soil sample, the more water and nutrients are being removed from the soil, and the more organic matter is being returned to the soil. By knowing information about the amount of roots in the soil at various depths, scientists can estimate information about the properties of the soil such as the amount of nutrients available to plants, how compact it is, and its water holding capacity. For example, a very compact soil will stop roots from growing where as a porous soil may not.

To determine the amount of roots in your soil:

i. Separate the roots from your soil sample and put them in their own pile.
ii. Decide if there were *none*, *few* (less than about 25% of the sample), or *many* (about 25% or more) roots in your soil sample.

iii. Check the box on your *Soil Sampling Project Data Sheet* that best corresponds to the amount of roots that were in your soil sample.

Step 6e - *Measuring Rocks in Your Sample:*

Estimates of the amount of rocks present in soil at various depths helps scientists to understand the movement of water, heat, and air through the soil as well as providing information about root growth, geologic and climate history, and the amount of soil material involved in chemical and physical reactions. In GLOBE, rocks are defined as being larger than 2 mm in diameter (2 mm is the largest possible diameter for a sand particle).

To determine the amount of rocks in your soil:

i. Separate the rocks from your soil sample and put them in their own pile.
ii. Decide if there were *none*, *few* (less than about 25% of the sample), or *many* (about 25% or more) rocks in your soil sample.
iii. Check the box on your *Soil Sampling Project Data Sheet* that best corresponds to the amount of rocks that were in your soil sample.

Remember to PERFORM MEASUREMENT STEP 8 and share your data through the *Online Data Entry Form* located on the project web site at www.globe.gov/estme. Sharing data is an essential step in performing real science, and by doing this you are helping to increase the knowledge that exists about the Earth's soils.