

Density and Texture of Soil



The purpose of this lab is to demonstrate the difference in soil texture and how this difference relates to soil density. Differences in the proportion of soil components are what determines soil texture, which also affect soil properties. Students will also understand other factors such as compaction that affect soil density.

Primary Learning Outcomes

What is soil texture? What is soil density?

Assessed QCC Standards:

Grade: 9-12

Science

Science, Technology and Society

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Topic: Environment

Standard: Analyzes natural factors that contribute to change in ecosystems. 7.1 Generalizes the impact of physical factors, such as weathering, erosion, climatic change, etc., on ecosystems. 7.2 Assesses the state of succession for at least two local ecosystems. 7.3 Predicts the effects of various natural events, such as fire, disease, etc. on natural succession. 7.4 Relates natural variation within populations to ideas of natural selection and evolution. 7.5 Relates mutations due to certain natural causes, such as radiation, chemicals, etc., to natural selection and evolution.

Procedures/Activities

Step 1: Duration: 1 hour 30 minutes

Students will go out into schoolyard and collect representative soil samples from across school campus. Students will measure and record initial mass of soil sample prior to drying. Samples will then be placed in the oven in disposable aluminum pie pans to dry to obtain dry mass. (Note: Samples dry better if they are broken up into smaller pieces prior to drying. Samples should be dried for a total of about 8 – 10 hrs at about 225 degrees F. This drying time can be broken up into smaller segments to accommodate time in which the oven can be monitored. If this is done, drying time will need to be on the upper end of the above mentioned range.) Mass of the dried sample, along with the volume of the soil sampler will then be used to calculate bulk density of each soil sample.

Step 2: Duration: 1 hour 30 minutes

Students will add soil samples with varying textures to a mason jar along with a dispersal agent (Calgon) in a suspension of water. Students will then measure the amount of soil that settles out of the suspension at 15 minutes, 1 hour, and 24 hours to estimate the amount of sand, silt, and clay associated with each soil sample. Students will then use the percentages of each particle along with a textural triangle to determine each soil type.

Materials and Equipment

1. Soil Probes
2. Oven to dry soil samples
3. Calculator to calculate soil density.
4. Mason jar
5. Dispersal agent such as Calgon
6. Balance scales
7. Miniature pie plates to dry soil samples.
8. Soils of varying textures.

Total Duration

3 hours

Assessment

Students will be assessed according to their participation in the lab exercise. A lab report must be turned in by each lab group documenting their work on both activities. Students will also be evaluated on their proper use of laboratory procedures and safety measures.

Bulk Density Data Table

<i>Volume of Soil Probe</i>	<i>Wet Mass of Soil</i>	<i>Wet Density of Soil</i>	<i>Dry Mass of Soil</i>	<i>Bulk Density of Soil</i>

Soil Texture Data Table

	<i>Measurement 1</i>	<i>Measurement 2</i>	<i>Measurement 3</i>	<i>Average</i>
15 minutes (Sand)				
1 hour (Sand/Silt)				
24 hours (Sand/Silt/Clay)				

Soil Texture Calculations

Note: Use the average values calculated in the above data table for calculations in the table below.

<p>Amount of Sand (15 min) _____</p> <p>Amount of Silt (1hr minus 15 min) _____</p> <p>Amount of Clay (24 hrs minus 1 hr) _____</p>	<p>Percent Sand (Sand Amt / 24 hr) * 100 _____</p> <p>Percent Silt (Silt Amt / 24 hr) * 100 _____</p> <p>Percent Clay (Clay Amt / 24 hr) * 100 _____</p>
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Soil Texture (From Textural Triangle): _____

Soil Textural Triangle

