Card: Soil Texture

Soil texture is determined by the presence and relative percentages of sand, silt, and soil. Sand and silt are inert and provide the skeleton for the soil, while clay and organic matter are where most of the chemical reactions occur. Depending on the soil texture the soils are going to vary in their capacity to retain water and nutrients.

Sandy soils feel rough because have hard edges. They do not have many nutrients because they have large pores allowing gases and water to move through them rapidly. The sand particles do not hold on to each and cannot stay together to form aggregates.

Silty soils are smooth and powdery and, when wet, make crumbles or ribbons but are not sticky. These soils have smaller pore space than sandy soils, therefore can hold more water.

Clayey soils are smooth when dry and sticky when wet, making balls or ribbons that stay together. Because their particles are so small, they can hold a lot of nutrients, water, and gases.

Soil Texture Methods	Feel Test	Ball Squeeze Test	Ribbon Test
	Take a sample* in your hand and feel it	Squeeze a sample* in your hand and try to form a ball	Make a ball with your sample* and squeeze it between your thumb and forefinger to try to make a ribbon
Sandy	Gritty	The ball breaks with slight pressure and has a coarse texture.	Cannot make a ribbon or is less than 1" long.
Silty	Smooth	The ball stays together but changes the shape easily.	Can make a short ribbon between 1"– 2" long.
Clayey	Sticky	The ball does not break easily.	Can make a long ribbon greater than 2" long.

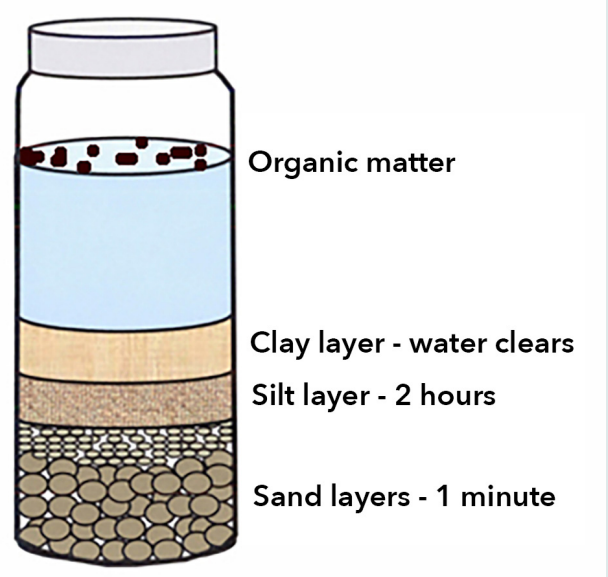
* Sample: Take a small sample of soil in your hand and add 3-5 drops of water to make the soil moist. Use your fingers to "work" with the soil sample.

Quantitative Method to Determine Soil Texture

The Measuring Method is a quantitative method to determine the relative percentages of sand, silt, and clay in a soil sample.

Materials

- Card: Soil Texture
- Clear straight sided jar or canning jar (16-20 oz) with lid
- Erasable markers
- Garden trowel
- Funnel (optional)
- Mallet or mortar
- Newspaper or cardboard
- Non-foaming dishwater detergent (1/2 tsp)
- Ruler
- Soil sample (1 cup). Ask each group to bring a dry soil sample from their backyard or go with the students to collect soil samples at the school. Depending on the number of groups, collect at least three different soil samples from contrasting habitats (e.g. yard, playground, ornamental or vegetable garden, forest, prairie, road side, etc.). Air dry soil samples overnight.
- Water (1 cup)
- Worksheet



Follow the steps to see how much sand, silt, and clay your sample has:

- Spread the soil sample on a newspaper or cardboard to dry overnight. Remove rocks, roots, and trash.
- Crush soil aggregates (lumps, clods) with a mallet or mortar until there is ½ cup of soil is pulverized.
- Fill the jar with ½ cup of soil and 1 cup of water.
- Add ½ teaspoon of detergent and close the jar tightly and shake hard for 2 minutes. This helps breaking the soil aggregates and separating the mineral particles.
- Put the jar where it will not be disturbed for 2-3 days.
- When the water clears up, the soil particles are partitioned out.
- Measure the thickness of each layer (sand, silt, clay) and of the total deposit (all soil layers). Thickness equals the distance between the top and bottom margins of a layer. Measurements should be in centimeters (cm).
- Since layers may not be even, pick a side of the jar to take the measurements where there is an average representation of the layers thickness.
- Calculate the percentages of sand, silt, and soil in your sample by dividing the thickness of each type by the total thickness times 100%.
  - Sand thickness (cm) / Total thickness (cm) x 100% = ___% sand
  - Silt thickness (cm) / Total thickness (cm) x 100% = ___% silt
  - Clay thickness (cm) / Total thickness (cm) x 100% = ___% clay
  - Total thickness of all layers (cm) = 100%

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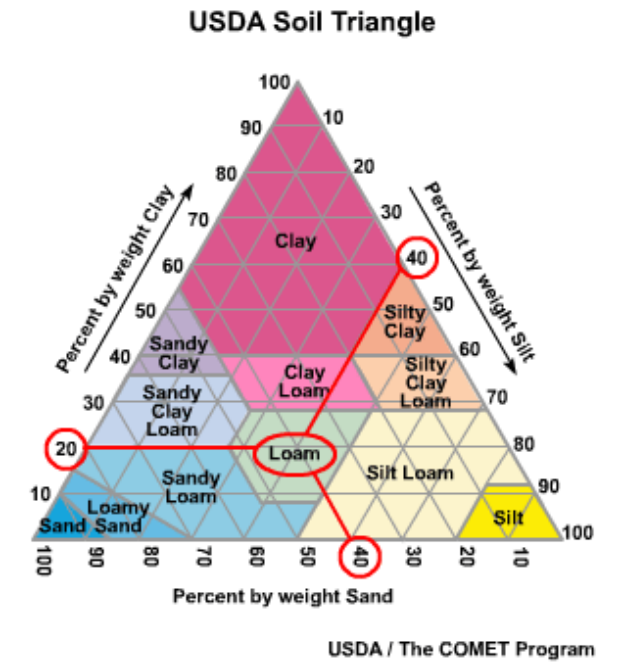
Soil Textural Triangle

Soils are found in different combinations of sand, silt, and clay particles. The soil textural triangle shows the twelve possible soils combinations (texture classes) based on the relative percentages of these particles. The most appropriate soil class for plant growth is loam, a soil composed of mostly sand and silt, and a smaller amount of clay that has a very good water infiltration and retention capacity.



How to Read the Soil Textural Triangle?

If the percentages of soil particles are known from a sample, the Soil Textural Triangle will tell the soil class of the sample using the following steps:

1 – Verify that the percentages of sand, silt and clay in your sample add to 100%.
2 – Locate the percentage of clay on the clay axis, and draw a line horizontally from left to right.
3 – Locate the percentage of silt on the silt axis, and draw a line going down diagonally to the left that goes parallel to the clay axis.
4 – Locate the percentage of sand on the sand axis, and draw a line going up diagonally to the left that goes parallel to the silt axis.
5 – The intersection point of the three lines is in the region of the soil class of the sample.