Soil Particle Size

Overview

Students will learn about soil particle size, soil composition and may reach deeper into soil texture analysis.

Background Information

- "Why is soil important?"
  - Soil provides a foundation for life.
  - It gives a medium for plants to grow plants are food for other living things
  - Soil itself is food
  - Habitat for living things- rodents, bugs, worms, microbes
  - Used in construction- roads, dams, buildings, foundations, etc.
  - Soil absorbs, holds, and filters water
- "What is soil made of?"
  - Soil is made up of water, air, minerals, organic matter, living things and soil particles.
- "What are the three types of soil particles?"
  - Soil particles vary in sizes which are put into three categories: sand, silt, and clay. Organic matter may also be present.
    - The smallest of these three is clay (less than 0.002 mm)
    - The middle of these three is silt (0.002-0.05mm)
    - The largest of these three is sand (0.05-2.0 mm)
    - Anything over 2.0 mm is called gravel or stone

(if using the soil particle size demonstration now would be a good time to use that to give a visual of relative size)

- "Why is particle size important?"
  - Particle size is important because it aids in the movement of water and air
    - The larger the particle, the more space there is between them (pore space). This leaves room for water and air to flow.
    - The smaller the particle, the less space there is which means there is not as much space for water and air to move.
    - Sandy soils tend to drain water whereas soils heavy in clay tend to hold on to water.
- Most soil found in nature is not comprised of just one type of soil particle, but is a mixture of sand, silt, and clay in different proportions.
  - The proportion of particle sizes is what gives soil its texture.

Supplies

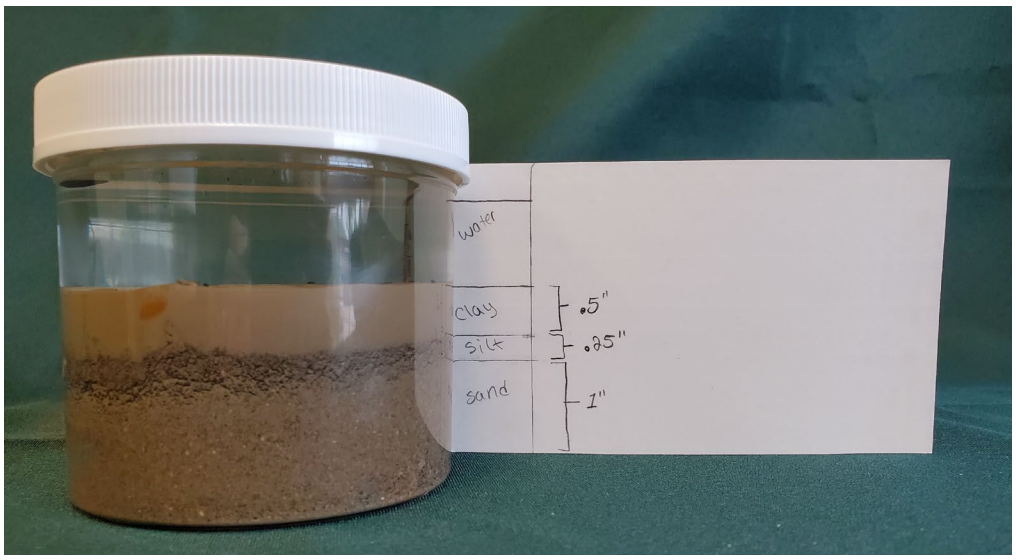
- Soil jars
- Blank note cards *
- Pencil (not included) *
- Calculator (not included) *
- Ruler (not included) *
- *Student Worksheet 1* (master copy included)
- *Student Worksheet 2* (master copy included) *
  *these are only needed if you are doing ***Student Worksheet 2***

Directions

The activity can be done in small groups or individually

1. Give each student/group a jar (if doing ***Student Worksheet 2*** make sure to have equal numbers of each color of jars –red, blue, green, and yellow.)
2. Have the students take the jar and shake it gently until all the soil is loose and mixed into the water
    - As a side note, you can mention this is what happens when it rains hard or there is a weather event. The soil is eroded or stirred up in bodies of water (rivers, lakes, etc.)
3. Allow the jars to sit until the soil settles (depending on soil type some may take up to a few hours)
4. Once it is settled, have the students answer the questions on the ***Student Worksheet 1*** and discuss observations.
5. For older students or a longer lesson, you may want to use ***Student Worksheet 2*** to dive deeper into the discussion.
    - You can also use this calculator online: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167

You can also create your own soil samples by filling a straight sided jar halfway with soil and then fill the rest with water.



Student Worksheet 1

Observation Questions

1. What happened to the soil?

2. How many layers of soil do you observe?

3. What is in each layer? How do you know?

4. Which soil component (sand, silt, or clay) is the heaviest? The lightest?

5. Which soil component (sand, silt, or clay) is the largest? The smallest?

6. Would water move fast or slow through your soil sample? Why?

Student Worksheet 2

Calculate the percentage of each particle type using the directions below.

- Using a blank note card, mark the height of each layer and label
- Use a ruler to measure the total height of each layer
- Take this number and divide it by the total height of all the layers.
- Convert this number to a percentage by multiplying by 100.
- Repeat this for the other layers.
- *Note- not all layers may be present*

Sample Color: _____

Layer	Height	Percentage
Sand		
Silt		
Clay		
Total		100%

Calculate the soil texture using *Figure 1*

- Using the numbers from your calculations above (#6) to determine what the approximate soil texture would be according to the soil texture chart.

Texture: _____

Now, look at the other samples and fill out the table for each.

Sample Color: _____

Layer	Height	Percentage
Sand		
Silt		
Clay		
Total		100%

Texture: _____

Sample Color: _____

Layer	Height	Percentage
Sand		
Silt		
Clay		
Total		100%

Texture: _____

Sample Color: _____

Layer	Height	Percentage
Sand		
Silt		
Clay		
Total		100%

Texture: _____

What are the differences in texture? Why do you think that is? Would other locations have different textures?

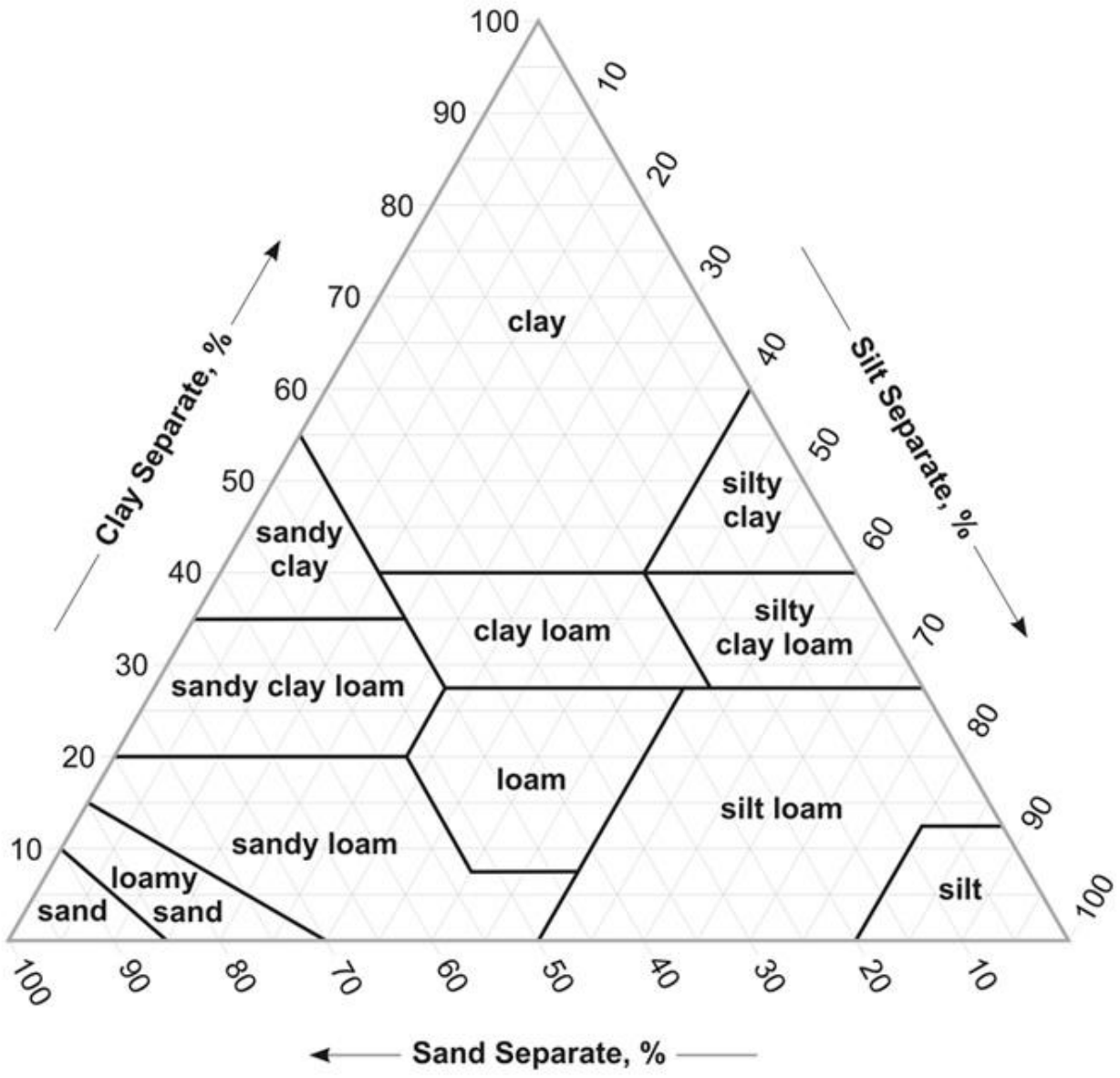

Clay Separate, %
Silt Separate, %
Sand Separate, %
clay
silty clay
sandy clay
clay loam
silty clay loam
sandy clay loam
loam
silt loam
sandy loam
loamy sand
sand
silt
100
90
80
70
60
50
40
30
20
10

Figure 1