Soil texture…

## Lab 3: Sieving Soils and Soil Texture

These samples will need to be sieved for several of the laboratories we plan to conduct. Why do you think this is necessary? Before sieving, let’s gather the necessary equipment.

Each small group should have a sieve a mortar and pestle and a plate. Lets have each group process at least two

To grind the soil

* place a small amount of soil into the mortar, filling it about a third of the way.
* Using the pestle, gently tap the soil aggregates to break them up.
  + This is *not* a ‘Hulk smash’ kind of procedure.
* Once the large aggregates are broken up; please gently grind the remaining particles with a twisting motion.
  + Bear in mind that you are not trying to pulverize rocks; you are just breaking down the remaining small aggregates.
* Once these particles are broken down, place the ground samples in a 2 mm sieve atop a plate that will collect the material that passes through the mesh.
* Gently shake the sieve and pan so that soil falls through, leaving the larger aggregates, rocks, and intact organic material.
* Place the sieved material into a Ziploc bag and label it with the sample number.

### Soil Texture

### Introduction

There are several ways to evaluate texture (by feel, hydrometer, fractionation), but the pipette method is generally preferred given its precision.

The pipette method takes subsamples (aliquots) of soil suspended in solution at different times.

Using Stokes Law, we can evaluate how much time it takes for differently sized particles (sand diameter=0.05-2mm, silt diameter=0.05-0.002mm, clay diameter<0.002mm) to settle out of solution:

Stokes law is best represented by the formula below:

where

* v is settling velocity (cm / s)
* Ds is particle density (g / cm3)
* DL is water density (g / cm3)
* g is acceleration due to gravity (cm / s2)
* r is radius of particle (cm)
* η is water viscosity (g / cm-s)

Sand particles will settle out in 48 seconds,

while silt will settle out in 8 hours.

So, if we sample the solution after 48 seconds, the aliquot will contain clay and silt, and after 8 hours, it will only contain clay.

We then dry and weigh these aliquots to measure the particle mass, which we then extrapolate to the volume of the whole sample.

### Instructions

1. Weigh 20 g of dry, sieved soil and transfer it to a beaker.
2. Fill the beaker with 5% sodium hexametaphosphate solution to a depth of 10 cm. This is a dispersing agent that prevents the soil from clumping in the suspension. It should already be premade, but if not, here are the instructions for making it:
   1. Put a magnetic stir rod into a 2000 mL Erlenmeyer flask, taking care not to crack the bottom (i.e., don’t drop it in!).
   2. Pour 1000 mL of water into the flask.
   3. Place the flask atop a stir plate and start the plate to make a gentle swirl, not a typhoon.
   4. Using a funnel, pour in 50 g of sodium hexametaphosphate and let the solution mix for about 15 minutes.
3. Stir with a stirring rod for 5 minutes or use a stirring plate and magnetic stir rod.
4. Pour the slurry into a 500 mL graduated cylinder and top it off to 500 mL with deionized (DI) or reverse osmosis (RO) water.
5. Cover the cylinder with parafilm, rubber glove, or rubber stopper and invert it upside-down and right-side up to mix for one minute. Do this over a sink!
6. Set the cylinder on a benchtop and immediately begin a stopwatch timer.
7. Attach 25 mL pipette to a pipette pump.
8. At 48 seconds, take a 25 mL sample (i.e., aliquot) from the upper 10 cm of the solution with a pipette by “scrolling” with the roller on the side of the pipette pump.
9. Weigh an empty evaporating dish (labeled with the sample # and time of sampling), and deposit the sample into the dish.
10. At 120 minutes, take a 25 mL aliquot from the upper 5 cm of the suspension with a pipette. Normally, we would wait 8 hours to let the silt settle out completely, but it should settle out from the top 5 centimeter of solution at least during this time period).
11. Again, weigh an empty, labeled evaporating dish, and deposit the sample into the dish.
12. Place the samples into a drying oven set at 105 C.
13. Let them dry for at least 24 hours, or until all the water is evaporated.
14. Use the following formulae to determine the percentages of the soil particle sizes and determine soil texture using the soil texture triangle (Figure 4):

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Record the sample ID and texture into the class data sheet.

Percent clay:

Percent silt:

Percent sand:

