Methods for Soil Analysis at St. Olaf College
By Dr. Kathleen Shea and students

Soil Collection

1. At each site, collect soil samples from six – ten different spots across the site.
2. Before you go out label all soil tins with their location and weigh them. After you have transferred your soil into the tin you can simply subtract the weight of the tin and get out the weight of your sample.
3. Collect soil samples with soil corer. When collecting make sure you have a good sample that does not have pockets of loose soil or air gaps.
Fill soil corer to a certain level so that you will be able to calculate the volume of your sample.
4. Remove soil from soil core and place into a soil tin. Be careful not to lose soil when transferring to the tin.
5. Collect additional samples for pH or nutrient analyses.

Soil Moisture

1. Collect soil as indicated above.
2. Weigh tins with the wet soil.
3. Place the tins in the oven for 48 hours at 105 degrees C.
4. After drying, weigh the tins.
5. Calculate the percent moisture lost from the soil in each tin by using the equation (express in terms of dry weight of soil):

$$\frac{\text{(wet weight-dry weight)}}{\text{dry weight}} \times 100 = \text{Percent moisture}$$

Bulk Density

1. Calculate the volume of your soil core. Volume = (area x height) or (πr^2 x height). (For example if you are using the smaller soil corer the diameter is 2 cm and the height is 16.5 cm up to the dashed line. Total volume = 51.81cm^3.)
2. To get bulk soil density divide the dry weight of the soil (as determined for soil moisture) in grams by the volume (cm^3). Your result will be the density in g/ cm^3.

Soil Organic Matter

There are several different methods that various manuals suggest for the determination of the amount of organic material. The method explained here is from Field and Laboratory Methods for General Ecology, Fourth Ed. by Brower, Zar, and von Ende; 1998.

1. Use the soil samples you dried for percent moisture.
2. Put the samples through a 2 mm sieve (A 1.19mm sieve may work best depending on soil composition).
3. Weigh out samples between 4.5 g and 9.0 g to the nearest hundredth of a gram. Place each sample in a crucible and dry in the oven at 105 degrees C for 24 hours.
4. Allow the samples to cool and weigh to the nearest hundredth of a gram.
5. Place the samples in the muffle furnace at 500 degrees C for four hours. Prevent the temperature from going over 550 degrees C.
6. After four hours, place the samples in a dessicator jar (to prevent them from absorbing moisture as they cool). Leave the other samples in the muffle furnace if they do not all fit in the dessicator. Make sure that the dessicator pebbles are blue.
7. When the samples are cool, weigh them to the nearest hundredth of a gram.
8. Find the percentage of organic material by using the equation:

$$\% \text{ organic material} = \frac{\text{weight after 105 C- weight after 500 C)}}{\text{weight after 105 C.}}$$

pH levels

1. Take the pH reading as soon as possible after collection
2. Mix 5 grams of soil and 20 ml of deionized water for each sample.
3. Vortex each mixture for two minutes.
4. Filter these samples using soil analysis filter paper (Hach 2263356) to give 10 milliliters of the filtrate. Fold filter paper so that it is fluted.
5. Use a pH meter to take readings of each sample. Standardize the amount of time before a reading is taken. For example, with the pH sensor submersed, agitate the solution for 15 seconds, allow it to settle for 1 minute 30 seconds, then read. Do not allow the sensor to touch the sides of the test tube.