Soil 2125 Laboratory Manual - pdf edition

Nic Jelinski

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Preface

"Tell me an I forget, teach me and I may remember, involve me and I learn."

- Benjamin Franklin

> **ⓘ Laboratory Schedule**
>
> Note that the laboratory portion of this course is self-paced. The lab has open hours and is self-paced so you can return as often as needed to complete the lab exercises (Laboratory TA's will be in the lab during all open hours to help you). **Make sure you sign in and out**.
> Labs take approximately 1-2 hrs to complete. You will sign up for a timeslot of your choice. Open times: W 9:00 AM - 8:30 PM Th 9:00 AM - 8:30 PM F 9:00 AM - 4:30 PM *241 Borlaug Hall*

Logitstics and Laboratory Philosophy

###Whys is this lab self-paced and what does that even mean?

Something here about pedagogy

How will I fit the lab into my schedule?

details here

Anything else?

dunno

Lab Teaching Team

Teaching Support and Lab Coordinator

Nora Pearson

pear0747@umn.edu

Office Hours (Zoom):

M 9:35-10:25AM, and by appointment

Laboratory TAs

XXXXX

XXXXX

1 Soil Texture, Color, and Structure

1.1 INVESTIGATION A: Using a Hydrometer to Determine Particle Size

1.1.1 Theory

Particle size distribution has become a standard means for characterizing and classifying the fine earth fraction of solid soil particles, and is used to determine the soil texture class. This experiment uses a Bouyoucos hydrometer to measure the density (grams per L) of a liquid mixture ("slurry") of soil and water.

Using the hydrometer allows us to determine soil texture by measuring the grams of the soil particles (sand, silt, and, clay) that remain suspended in the cylinder after a specific period of time. Different sized soil particles are separated by their different sedimentation rates – e.g. larger particles will settle faster in a column of water, while smaller particles remain suspended much longer in the solution (based on Stokes Law).

i Watch this video before you start Investigation A

1.1.2 Preparation

The two cylinders in this investigation each contain **60** grams of oven-dry dispersed soil – one soil is from an E horizon and one is from a B horizon. After mixing thoroughly with a stir stick, the largest particles (sand) will quickly drop to the bottom of the cylinder. After 40 seconds, only silt and clay particles are left suspended in the water. After two hours only clay-sized particles remain.

Example of a citation Knuth (1984). testing inline citation (Knuth 1984).

1.1.3 Measurements

1.1.3.1 *40 Second Measurement*

1. Carefully use the stirring rod (approximately 18 inches long with a disk on the end) to completely disperse the soil in the cylinder. This requires that you *slowly* lower and lift the stirring rod up and down in the cylinder until ***all the sediment is removed from the bottom of the cylinder.***

2. After stirring, immediately note the time to the nearest second. *Carefully* and *slowly* insert the hydrometer (**the hydrometers are extremely fragile**) into the cylinder. Please refer to the figure on page 2. (*Note*: you may need to use your finger to stop the hydrometer from bobbing).

3. After 40 seconds, read the number (at liquid level) on the hydrometer.

4. This reading must be corrected for temperature. Add 0.4 g/L for each degree above 20°Celcius or subtract 0.4 g/L for each degree below 20°Celcius.

1.1.3.2 *2 Hour Measurement*

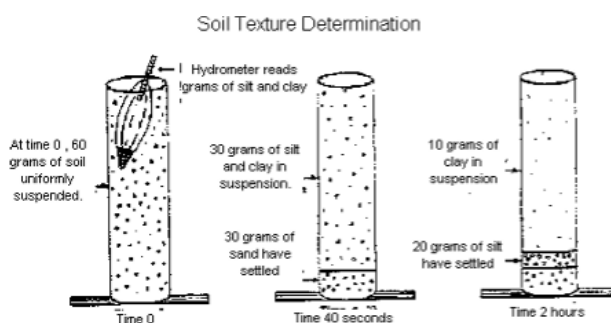1. Due to time constraints, two hour readings will be provided in lab.

Figure 1.1: Hydrometer Process

(Note: The soil in the diagram has (60-30)/60 x 100= 50% Sand; 10/60 x100= 17% Clay; 100-50-17=33% Silt)

1.1.3.3 *Calculations - note: correct readings before calculating sand, silt, and clay!*

$$Sand(\%) = \frac{M_{sample,ovendry} - 40s reading}{M_{sample,ovendry}} x100$$

Table 1.1: Hydrometer Measurement Results

Measurements	Sample 1	Sample 2
Sample mass (oven-dry)	60 g	60 g
40s reading (uncorrected	g/L	g/L
Temperature (C)	g/L	g/L
40s reading (corrected)	C	C
% Sand	%	%
2hr reading (uncorrected)	g/L	g/L
Temperature @2hr (C)	C	C
2hr readng (corrected)	g/L	g/L
% Clay	%	%
% Silt	%	%

1.1.3.4 *Results*

note just trying to cut out tables to see if that works

1.2 INVESTIGATION B: Using the Texture Triangle

1.2.1 Background

A soil's textural class is determined by that soil's respective content of sand, silt, and clay. The USDA textural triangle is used to classify the texture class of a soil. The sides of the soil textural triangle are scaled for the percentages of sand, silt, and clay (0-100%). Clay percentages are read along the lines from left to right across the triangle. Silt is read along the lines from the upper right to lower left. Sand along the lines from lower right to the upper left portion of the triangle. The intersections of the three sides on the triangle give the texture class name. For instance, if you have a soil with 20% clay, 45% silt, and 35% sand it falls in the "loam" textural class name.

1.2.2 Results

Using the soil particle percent data from Investigation A determine the texture class for the soil sam-
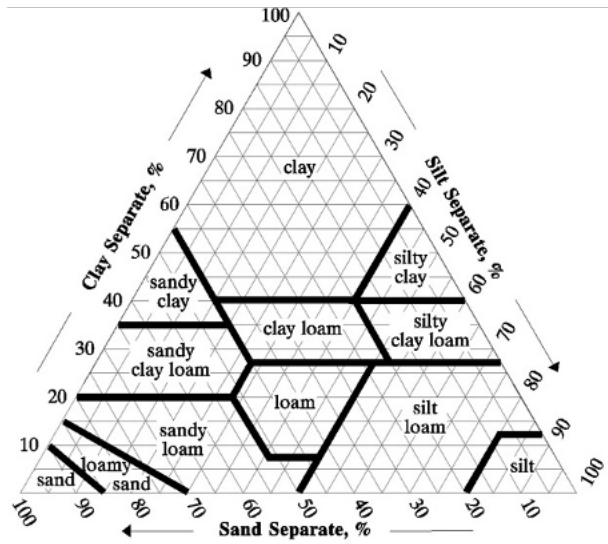
Figure 1.2: USDA Soil Texture Triangle

ples 1 and 2.

2 Summary

In summary, this book has no content whatsoever.

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1 + 1
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[1] 2
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References

Knuth, Donald E. 1984. "Literate Programming."
  Comput. J. 27 (2): 97–111. https://doi.org/10.
  1093/comjnl/27.2.97.