Exploring Soil Sample Characteristics

You will create a data set from analyzing soil samples.

This is a hands-on activity that will require you to process, prepare, measure. Describe and identify different characteristics between the soils samples.

Starting directions

Newspaper on table
Layout materials provided
Cup of water
Paper towels
Measuring physical characteristics of soil samples
WHAT WE WILL COVER

- Soil Textural Triangle (handout)
- Sand-Clay-Silt Comparison (activity)
- USDA County Soils Series (Book/Online Atlas)

HANDOUT USED IN CLASS
- Do all your work on top of newspapers for easy clean-up.
- Grind soil sample with wooden dowel in the pail.
- You will need around one cup of loose material.
- Sift soil sample with strainer... sift it over the lid
- You will need around enough material to fill two of the clear containers
- Continually place sifted material into clear container until filled to top
- When filled level off with pencil
- Set to side for later
- If you spill un-sifted material into the pile, you will have to start over
- Leave a mound of sifted material in the lid
-Make a mound of sifted material
-Make a depression in the middle of the mound
-Add a little water and mix enough to make a couple of marble-sized balls
-Do not try to wet the whole pile
-Do not have it too wet – it should not be shiny looking, only damp

-Too Wet
-Each person make a marble sized ball by rolling the material in your palms
-These balls will be used to have you test how they differ between four subjectively measured activities described in the next set of images:
  1. Ribbon – Length
  2. Squish – Easy/Hard Resistance
  3. Roll – Slippery/Gritty/Stiff
  4. Sticky – Adhesion
1 - Ribbon Test

- Slide and compress between your thumb and forefinger to make a ribbon about two pennies thick
- Description of your sample
  How long of ribbon did it make?
- Do this to at least three other stations
  (clean hands between each station)
- How did yours compare to the other stations?
2 - Squish Test

- Compress between your thumb and finger tip to about two pennies thick
- Description of your sample
  How much pressure did it take?
- Do this to at least three other stations
  (clean hands between each station make the same size ball)
- How did yours compare to the other stations?
3 - Roll test

- Compress and roll back and forth between your thumb and finger tip to about paper thin

- Description of your sample
  
  What does it feel like?
  
  Slippery
  Gritty
  Stiff
  (Combination of the above)

- Do this to at least three other stations
  
  (clean hands between each station and start with the same size ball)

- How did yours compare to the other stations?
4 - Sticky Test

- Compress between your thumb and finger tip to about ¼” thick
- Quickly lift your thumb and finger apart
- Description of your sample
  Did it stick or fall off?
- Do this to at least three other stations
  (clean hands between each station make the same size ball)
- How did yours compare to the other stations?
Measuring physical characteristics of soil samples

**Ribbon**

The longer the ribbon the more clay and silt
The short ribbons have high sand content

**Squish**

Easy – low clay/silt content

Hard – high clay content

**Roll**

Slippery – greasy feel is due to the high silt content
silt acts like small ball bearings

Gritty – grit is sand abrasion, usually 20% sand if you feel any grit
the more abrasion, the more sand

Stiff – high clay content, clays are plates and the stiffness
or resistance is due to the friction between the plates

**Sticky**

Adhesion relates to the lack of air spaces and infers higher
silt or clay contents
Measuring physical characteristics of soil samples

Infiltration – Permeability – Porosity - Soil Moisture

Each of the next steps are shown in the following slides

- Put filter in funnel
- Dry material in funnel
- Put funnel in narrow top beaker
- Put 40ml water in clear beaker
- Pour over soil sample within 10 seconds
- Record volume every 30 seconds for 5 minutes
- After 2 minutes add second 40 ml water
- After 10 minutes record water volume
- Put information on chart
Measuring physical characteristics of soil samples
Infiltration – Permeability – Porosity - Soil Moisture

Put paper filter in funnel

Put soil sample in clear container paper filter in funnel
Measuring physical characteristics of soil samples
Infiltration – Permeability – Porosity - Soil Moisture

- Put funnel in in a beaker with ml marks
- Put 40ml water in spare cup
- Put 40ml water in clear beaker
- Everyone start at same time to add water and calculate data below
- Pour over soil sample within 5 seconds
- Record volume through every 30 seconds for 5 minutes
  (1 watch time, 1 watch volume)
- After 2 minutes add second 40ml water
- After 10 minutes record values on board
- How much water did not go through of the 80ml?
Measuring physical characteristics of soil samples
Infiltration – Permeability – Porosity - Soil Moisture

Plot information on board (time vs volume through sample)
  Each sample should be plotted with different colors or patterns
How many samples took a long time to soak into the top? – Infiltration
How fast did some samples go through? – permeability
How many still had water dripping out? – porosity
How much water was still in the sample? – soil moisture
How did this data compare to the texture analysis earlier?
When done

- Put dry and wet soil samples back in pail
- Do not put lid on pail
- Wipe off all materials used
- Throw away paper filter

Do not eat the leftovers
- Mark soil number and volume every 30 seconds (make dot and connect as line on graph).

- Plot data on chart below.
- Use different colors or patterns for each pail number.
<table>
<thead>
<tr>
<th>PAIL #</th>
<th>80 ml (IN)</th>
<th>TOTAL OUT</th>
<th>TOTAL OUT</th>
<th>VOLUME</th>
<th>AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>5 MINUTES</td>
<td>10 MINUTES</td>
<td>STILL IN SOIL</td>
<td>RATE PER MINUTE</td>
</tr>
<tr>
<td>1</td>
<td>80 ml (IN)</td>
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<tr>
<td>10</td>
<td>80 ml (IN)</td>
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</tr>
</tbody>
</table>

**INfiltration**

**Permeability**

**Porosity**

**Soil Moisture**
MARK SOIL NUMBER AND VOLUME EVERY 30 SECONDS (MAKE DOT AND CONNECT AS LINE ON GRAPH)

VOLUME

25 ml

20

15

10

5

4

3

2

1

0

SECONDS>

30

90

150

180

210

240

270

300

MINUTES>

60

120

150

180

210

240

270

300

1m

2m

3m

4m

5m
-GRIND
-SIFT (FILL CLEAR DISK FULL/LEVELED)
(MAKE A SECOND PILE IN TRAY)
-DAMPEN (WET NOT SHINY)
-MAKE MARBLE SIZE BALL
  RIBBON - LENGTH?
  SQUISH - EASY/HARD RESISTANCE?
  ROLL - SLIPPERY/GRITTY/STIFF?
  STICKY - ADHESION?

INfiltration
Permeability
Porosity
Soil Moisture

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