

## Soil Percolation

## Teacher's Guide

**Subject:** Integrated Science (Life; Earth-Space; Physical)

**Summary:** Students will examine the percolation rates of surface soil at various locations along a transect. Percolation will be related to soil particle size and recharge and runoff rates.

### Equipment

- Coffee Can (aluminum)
- 6 large water jugs (1 gallon)
- 1 liter container (graduated)
- GPS
- Data Sheet & clipboard
- Tape measure
- Stopwatch
- 3 x Spray bottle
- Towel

### Background (Pre-field Classroom Activity)

- **Equipment Training:** Sedimentation tube: Sand-Silt-Clay
- **Vocabulary:** Percolation, Infiltration Permeable, Porous
- **Reference material:** Project WET: Get the Groundwater Picture (warm-up)

### Field Lab Procedure

1. Identify the field sites where the percolation rates will be measured. Identify the main categories of habitat/surface soil types. Identify a location within the identified habitat using the GPS and place a marker at the spot within 3 meters of where the GPS reading is made. Select three other spots within the same “central location.”
2. Divide the students into three groups and assign each group to a different site.
3. Within each site divide the students into groups of three with the following assignments: 1) percolation can placer and water pourer; 2) timer, 3) GPS locator and soil examiner; and 4) measurement recorder.
4. Clear loose leaf-litter to expose soil surface, but try not to disturb the soil surface.
5. Insert one end of the coffee can approximately 5 cm into the soil
6. Pour 500 ml of water into the can and begin the stopwatch. Stop the stopwatch when the standing water is no longer visible and only the soil surface is visible – record the time. This is the Dry Percolation Measurement.
7. Repeat the measurement a second time - now that the ground is saturated. This is the Wet (saturated) Percolation Measurement.
8. While waiting for the water to drain, examine and describe leaf litter
9. Take a minimum of three measurements in one of the habitat areas.
10. After each measurement, collected a small amount of soil in hand from an area within one can length from the measurement (an area not affected by water from the activity) and record dampness/moisture (Wet = if water squeezed out; Damp = if soil holds its shape; Dry = if sample will not hold its shape when squeezed).
11. After conducting the percolation test, collect a small handful of soil and rub a it between the fingers and record texture/content (Gritty = sand; Slippery = silt; Sticky = clay; or some combination sandy-silt).
12. Note other observations such as smell, roots, insects, shells or trash found in the soil in your area.

### Sunshine State Standards

**Science:** SC.D.1.3.1; SC.G.2.3.4; SC.G.2.4.4; SC.H.1.3.6; SC.H.2.3.1

**Mathematics:** MA.A.1.3.1; MA.B.3.3.1; MA.B.4.3.1; MA.E.2.3.1; MA.E.3.3.1

**Language Arts:** LA.A.1.3.3; LA.C.1.3.1; LA.C.1.3.4

**Social Studies:** SS.A.6.3.2; SS.B.2.3.9

**Soil Percolation  
General Information**

**Student Data Sheet**

Full Name:		Date:	
School (teacher):		Time:	

**Student Hypothesis and Rationale**

I hypothesize that the wet percolation rate will be (choose one: less/ more) than the dry percolation rate because... \_\_\_\_\_.

**Field Observations/Measurements**

**Location #1: Latitude:**

**Longitude:**

Observation	Test 1 (500 ml)	Test 2 (500 ml)	Test 3 (500 ml)
Dry Percolation Time			
Wet Percolation Time			
Calculate Rate			
Soil Texture			
Consistence			
Soil Moisture			

**Location #2: Latitude:**

**Longitude:**

Observation	Test 1 (500 ml)	Test 2 (500 ml)	Test 3 (500 ml)
Dry Percolation Time			
Wet Percolation Time			
Calculate Rate			
Soil Texture			
Consistence			
Soil Moisture			

**Location #3: Latitude:**

**Longitude:**

Observation	Test 1 (500 ml)	Test 2 (500 ml)	Test 3 (500 ml)
Dry Percolation Time			
Wet Percolation Time			
Calculate Rate			
Soil Texture			
Consistence			
Soil Moisture			

- Moisture: Wet = if water squeezed out; Damp = if soil holds its shape; Dry = if sample will not hold its shape when squeezed
- Note: If the time extends beyond 7 minutes record as 7:00 plus
- Note: percolation rate = 0.5 liters / percolation time

**Soil Percolation**

**Assessment**

1. Why was there a difference between the dry percolation measurement and the wet percolation measurement?

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2. Why might there be a difference between percolation measurements in a given area with similar soils?

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3. What might explain the difference between the percolation rates among the different sites?

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4. Under what conditions would the dry and wet percolation tests be very similar? Very different?

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5. What explains the difference in percolation rates between the site along the path and the other two sites?

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## Soil Texture

### Step 1 (Get and moisten sample)

Use the triangle to determine the soil texture of your horizon.

Place some soil from a horizon (about the size of a small egg) in your hand, and, using the spray mist bottle, moisten the soil. Let the water soak in and then work the soil between your fingers until it is the same moisture throughout. Once the soil is moist, try to form a ball. If the soil forms a ball, go on to Step 2. If the soil does not form a ball, go to Step 5.

### Step 2 (Test for Clay)

- A.** If the soil:
- Is really sticky
  - Hard to squeeze
  - Stains your hands
  - Has a shine when rubbed
  - Forms a long ribbon (5+ cm) without breaking.
- Call it a **clay** and go to Step 3.  
**Otherwise**, go to B.

- B.** If the soil:
- Is somewhat sticky
  - Is somewhat hard to squeeze
  - Forms a medium ribbon (between 2-5 cm)
- Call it a **clay loam** and go to Step 3.  
**Otherwise**, go to C.

- C.** If the soil is:
- Soft
  - Smooth
  - Easy to squeeze,
  - At most slightly sticky,
  - Forms a short ribbon (less than 2 cm)
- Call it a **loam** and go to Step 3.  
**Otherwise**, go to D.

- D.** If the soil forms a ball but **no** ribbon, go to Step 4.

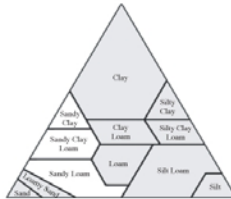


### Step 3 (Refine initial soil texture classification from Step 2 for relative amounts of sand and silt)

Wet a small pinch of the soil in your palm and rub it with a forefinger.

- If the soil:
- Feels very gritty, go to **E**
  - Feels very smooth, with no gritty feeling, go to **F**
  - Feels only a little gritty, go to **G**

- E.** Add the word **sandy** to the initial classification.  
Soil texture is (check one):  sandy clay,  sandy clay loam,  sandy loam  
Soil Texture is complete.



- F.** Add the word **silt** or **silty** to the initial classification.  
Soil texture is (check one):  silty clay,  silty clay loam,  silt loam  
Soil Texture is complete.



- G.** Leave the original classification of (check one):  clay,  clay loam,  loam  
Soil Texture is complete.

### Step 4 (Test for loamy sand or silt)

- If the soil:
- Forms a ball
  - Forms **no** ribbon
  - And is
- H.** Very gritty  
Soil texture is:  loamy sand  
Soil Texture is complete.

- Or
- I.** Very soft and smooth with **no** gritty feeling.  
Soil texture is:  silt  
Soil Texture is complete.



### Step 5 (Test for sand)

- If the soil:  
Forms **no** ball and falls apart in your hand.  
Soil texture is:  sand  
Soil Texture is complete.



## Soil Consistence

Take a **ped** from the top soil horizon. If the soil is very dry, moisten the face of the profile using a water bottle with a squirt top and then remove a **ped** to determine consistence.

Holding it between your thumb and forefinger, gently squeeze the **ped** until it “pops” or falls apart. Record one of the following categories of soil consistence on the data sheet. (Repeat this procedure for each horizon in your profile.)

