Soil Absorption:

Today we are going to investigate a soil's ability to allow water to infiltrate down through it, or its **absorption**. Absorption is an important property when considering the potential for erosion, or water's ability to carry away soil materials, especially during a rain storm.

Many factors influence a soil's absorption potential including: the soil texture, compaction, macro-pores, and course fragments. We will experiment with some of these soil properties to see how infiltration is affected.

We need:

- 1 two-liter bottle with the bottom cut off
- 2 large beakers (or large cans, or jars)
- several coffee filters
- 1 rubber band
- A chopstick
- Some gravel
- Some sand or a sandy soil
- Some clayey soil
- Some Peat Moss or compost
- A stop watch
- Experiment data sheet

PART 1:

PROCEDURES:

1. Gather a bottle, 2 beakers, 1 coffee filter, and one rubber band.
2. Put the coffee filter over the small end of the bottle. Put the rubber band around the outside to hold the coffee filter onto the bottle.
3. Fill the bottle about 2/3 of the way with your first soil.
4. Record the soil type of your first soil on your lab sheet.
5. Fill one beaker with water.
6. Set the bottle full of soil, the "soil column," over the top of the second beaker, so the small end of the bottle will drip down into the beaker.
7. Place a second coffee filter on top of the soil in the open end of the bottle. This will keep the water from pushing all of the soil aside and running down the inside of the bottle.
8. Start keeping time on the stop watch.
9. Slowly pour water from the beaker into the top of the bottle.
    a. Observe the "wetting front" as water travels through the soil.
    b. Write observations onto your lab sheet
    c. When the water starts to drip from the bottom of the bottle, stop the time, and record the information.
10. When your team is done, put the wet soil from your bottle into the "wet soil" bin.
11. Repeat steps 1 thru 10 with the other soil types.

PART 2:

In Part 1, we experimented with and observed how water absorption changes with different soil types and textures. Now we are going to experiment with soil compaction. When a soil is compacted, the number and size of pore spaces in the soil are reduced. As a result, the water has fewer pore spaces to travel through as it is infiltrates into the soil. If enough water pools up on the top of the soil surface, it may start moving across the surface of the soil instead of infiltrating into it. If the water builds up enough speed, it can start the process of erosion, and carry away soil particles, creating rills, gullies and other erosion features.

PART 2 PROCEDURES:

1. Gather a bottle, 2 beakers, 1 coffee filter, and one rubber band.
2. Put the coffee filter over the small end of the bottle. Put the rubber band around the outside to hold the coffee filter onto the bottle.
3. Choose a soil type that your group would like to work with.
4. Fill the bottle about 2/3 of the way with your first soil.
5. Recordthe type of soil for your first soil on your lab sheet.
6. Fill one beaker with water.
7. Try to compact the soil in the bottle, by pushing down on the soil, shake it to settle it and any other action you can take to reduce the pore space in the soil. What actions can you do to reduce pore space?
8. Set the bottle full of soil, the "soil column," over the top of the second beaker, so the small end of the bottle will drip down into the beaker.

9. Place a second coffee filter on top of the soil in the open end of the bottle. This will keep the water from pushing all of the soil aside and running down the inside of the bottle.
10. Start keeping time on the stop watch.
11. Slowly pour water from the beaker into the top of the bottle.
    a. Observe the "wetting front" as water travels through the soil.
    b. Write observations into your lab sheet
    c. When the water starts to drip from the bottom of the bottle, stop the time, and record the information.
12. When you are done recording time, get a chopstick, or a long thin stick, like a pencil.
13. Use the chopstick to push straight down into the bottle of wet soil several times. Try to go all the wat to the bottom, without puncturing the coffee filter on the bottom.
    a. You are making "macro-pores." These large interconnected pores are important for water drainage and infiltration.
14. After you create several macro-pores, put the coffee filter across the top and repeat steps 10 and 11. How did the rate of infiltration change?
15. When your team is done, put the wet soil from your bottle into the "wet soil" bin.
16. Repeat steps 1 thru 14 with another soil type.

PART 3:

Now that we have experimented with water absorption and infiltration we are going to test soil mixes.

Your team should develop a plan to test how water infiltration will be effected when you mix two or more of the soil types together. Use this opportunity to test out a question about infiltration. As an example, how will the time it takes for water to travel through the bottle change if we mix equal parts sand and gravel together?

Develop a question that can be tested and answered using the materials we have been using for the last couple of days. You also have 2 days' worth of data in which to compare new data to. So you may want to consider a question that includes data from the previous experimentations.

PROCEDURES:

1. Develop a question to test about water absorption and infiltration based in what you have done thus far.
2. Create a data table to collect data on.
3. Gather supplies you will need to test your question.
4. Use the Procedures in Part 1 to run your experiment and collect data.
5. Record your data and interpret the results.

- **Data Table: Part 1:**

SOIL TYPE	OBSERVATIONS AND DESCRIPTIONS OF SOIL	TIME water took to infiltrate (seconds)	OBSERVATIONS AND NOTES ABOUT THE EXPERIMENT

- **Data Table: Part 2:**

Soil type	Infiltration Time compacted (seconds)	Infiltration Time with Macro-pores (seconds)	Observations and Descriptions