**For this lab, we are going to (at home) collect soils and record soil water holding capacity in at least two different soils. Recall what we know about particle size and soil chemistry, as well as humus (organic compounds) as colloids in soil. Pick two sites that you think will be interesting comparisons (rich in organic material, poor in organic material OR grassland compared to forest… or whatever). . You will repeat this measurement 10 times per sampling location (10 replicates x 2 locations = 20 total samples).**

**Materials Needed:**

• 2 identical plastic or glass containers (e.g., cups, plastic bottles cut in half)

• Fine mesh or coffee filter

• A tablespoon or small scoop for measuring

• Kitchen scale (optional, for more precision)

• A measuring cup (for measuring water volume)

• Soil sample from your garden or nearby area

• Water

• Rubber bands or tape (optional, for securing filters)

**Procedure:**

1. **Prepare the Containers**:

• Take two identical containers. If they don’t have holes at the bottom, create a few small holes at the base of **one** of the containers for drainage.

• Cover the base of the container with holes using a **coffee filter or fine mesh.** Secure it with a rubber band or tape to prevent soil from falling out.

2. **Collect Soil Sample**:

• Take soil from your garden or outdoor space. If the soil contains large debris (e.g., rocks, twigs), remove them by hand or by sifting the soil lightly through a kitchen sieve or strainer. (You are all already rockstars at this).

• Measure out a fixed amount of soil (e.g., 1 cup or a similar volume) and place it in the container with the drainage holes. NOTE: if you have a kitchen scale or other scale, using a mass will be much more accurate! Additional note: your soil should be dry when you do this. I suggest taking your soil sample and setting it somewhere to dry completely (24 hours) before proceeding. As a best precaution, you could set the oven to 105C and dry the soil on a cookie sheet for several hours.

3. **Saturate the Soil**:

• Add dry soil sample to the container with holes, and place the other container below this one.

Start with a known volume of water say 16 oz (note: your containers should be able to hold this volume of water), Slowly add water to the soil in the container with drainage holes. Add water until it begins to drip out from the bottom.

• Allow the water to drip out until the soil stops draining. This ensures the soil is fully saturated and holds as much water as it can.

4. **Measure the Water Volume (Optional)**:

• If you want a precise measurement, place the second container below the one with drainage holes to catch the drained water. This will allow you to measure the excess water that was not held by the soil.

• After the soil stops draining, measure the volume of water collected. Subtract this amount from the total water you initially added to the soil to determine the amount of water the soil retained. HINT: Make sure you know exactly how much water you added to the soil.

5. **Calculate Water Holding Capacity**:

• The amount of water retained by the soil is the soil’s water-holding capacity. If you used 1 cup of soil, and it held 0.5 cups of water before draining, the water holding capacity is 0.5 cups. If you used 10 grams of soil it it held 50ml, then this is 5mlH20/gram of soil which is the most precise measurement (volume water/mass of soil.

• For more precision, you can weigh the soil before and after adding water. The increase in weight represents the amount of water the soil retained (1 gram of water = 1 mL of water).

6. **Repeat for Accuracy**:

• Repeat the experiment a couple of times with the same amount of soil and water to ensure consistent results.

**Repeat this measurement at least 10 times with soil from the same area. Collect soil from a second site that is a useful comparison (for example, garden soil compared to regular backyard soil). You should have a total of 20 recorded samples. 10 of each soil type.**

**Observations and Conclusion:**

• Compare the water holding capacity between different soil types if desired (e.g., sandy, clayey, or loamy soil).

• This protocol helps understand the soil’s ability to retain water, which is essential for healthy plant growth.

**Notes**:

• If the soil is very dry, add water gradually to avoid over-saturating it too quickly.

• This method gives a general estimate of water holding capacity; for more accuracy, a kitchen scale can be used.

* For even greater accuracy, ensure the soil is oven dried for 24 hours at 105C prior to measurements. Also used

**This procedure is simple and uses everyday household items to measure the basic water retention ability of soil. In the lab use standardized water volumes and filter pore sizes to percolate into graduated cylinders for more precise measurements.**

**Assignment:**

Write an introduction that describes the basis for why you picked the soil samples that you picked. What is different about the soil formation environments? Based on these different soil formation environments likely result in different soil properties? Be specific, referencing soil weathering processes, and likely differences in colloid and particle size composition/chemistry (hint! Bonus points if you use the ribbon method to measure soil texture). This introduction should be at least 2 paragraphs and conclude with a third paragraph that outlines your prediction (hypothesis) for soil water holding capacity.

Write a methods section that outlines how you collected your soil and how you measured water-holding capacity.

Results: Describe your data and produce a graph that summarizes your data. HINT: what is your predictor and response variable

Discussion: Based on your hypothesis and your background knowledge, was this what you expected to occur? (this should be 2 paragraphs).

This will be graded using the same rubric as the previous lab assignment.