Gravimetric Soil Moisture Protocol

Purpose *: To measure the water content of the soil*

Frequency : *Twelve times per year, at regular intervals (weekly to monthly)*

Materials and Tools *:*

Soil Moisture Data Work Sheet
Trowel
5-13 soil collection containers (soil sample cans, small glass jars with tight-fitting lids)

Sharpie permanent marker

Soil drying oven

Thermometer (capable of measuring to 110° C)

Balance or scale with 0.1 g sensitivity
Hot pad or oven mitt
Meter stick
2 Pie pans
GPS

Preparation for Collecting Samples (Record on Soil Moisture Study Site Work Sheet)

1. Label each can with your group number-hour-sample number (3 numbers separated by dashes)

2. Take a GPS reading at the center of the star transect.

Measure the exact distance to the atmosphere study site. Use a compass to give the direction to the atmosphere study site.

Describe the surface of your site. (Select one: natural, plowed, graded, backfill soil, compacted soil, or something else (other)

5. Describe the canopy cover. (Select one: Open, Some trees within 30 m or Canopy overhead (answer this question assuming growing season conditions)

Procedures for Star Sampling

1. Note your surface cover type. Is it short grass (<10 cm), long grass, or bare soil? Scrape or pull this away. Note if there are any trees overhead or nearby.

2. Dig a hole 10 cm in ***diameter*** *and 5 cm deep. Put this soil in your first pie pan.*

3. Sort out and remove any rocks or pebbles larger than a pea (about 5 mm) and remove any worms, grubs, or other animals.

4. Classify the soil (using the ***Soil Characterization Data Work Sheet*** *for these data)*

5. Fill your soil collection container about 3/4 full with approximately 100 g of this soil.

6. Number the container and record the date, time, and depth on your Soil Moisture

Data Work Sheet.

7. Remove the soil down to a depth of about 8 cm. Put this soil in pie pan one.

8. Dig the soil in the hole down an additional 4 cm. (This is your 10 cm sample) Place this soil in the second pie pan.

9. Repeat steps 3, 4, 5 and 6 for this new soil layer.

10. Carefully return the unused soil from the second pie pan back in the hole, then add the soil from the first pie pan.

11. Seal the container and store away from heat or sunlight for transport back to the classroom.

12. Take one soil temperature measurement within 25 cm of your soil sampling point at depths of 5 and 10 cm following the Soil Temperature Protocol.

How to Weigh and Dry the Samples

Preheat the oven to 75 degrees C.

2. Take the mass of the soil collection container ***with the soil sample in it****. This is the wet weight.*

3. Record the date and time at which the sample was collected, the container's number, and the wet weight to nearest 0.1 g on your Soil Moisture Data Work Sheet.

4. Dry the soil by placing the uncovered can in a drying oven using the following

minimum conditions:

Ventilated drying oven, 95° to 105° C, 10 hours,
Dehydrating oven, 75° to 95 °C, 24 hours
Microwave oven, high power, microwave safe container only, repeated 5 minute intervals until the sample(s) do not change in weight by 0.25 g from one drying to the next.

7. 5. Remove the can from the oven with the hot pad or oven mitts. Let it cool for five minutes.

6. Re-weigh the soil collection container with the soil in it to obtain the dry weight.

Record the drying time, the type of drying oven used, and the dry weight to the nearest 0.1 g on your Soil Moisture Data Work Sheet.

8. Calculate the water weight by subtracting the dry weight from the wet weight.

9. Empty the soil out of each container and wipe the can clean with a paper towel.

10. Weigh the dry, empty soil collection container to determine the container weight.

11. Record the container weight to the nearest 0.1 g on your Soil Moisture Data Work Sheet, and calculate the dry soil weight by subtracting the container weight from the dry weight.

12. Calculate the Soil Water Content by dividing the water weight by the dry soil weight, and record your result on the Soil Moisture Data Work Sheet.

13. Repeat steps 1 - 12 for each soil sample.