

Mar 07, 2025

Soil moisture measurements (adapted from NEON protocols)

DOI

<https://dx.doi.org/10.17504/protocols.io.kxygxy19zl8j/v1>

Ellen Dow¹, Anna McLoon², Elisha M Wood-Charlson³, Carlos Goller⁴, Aaron Schirmer⁵, Benjamin Allen⁶, Courtney Meier⁷

¹Berkeley Lab - KBase; ²Siena College; ³KBase;

⁴Biotechnology Teaching Program (BIT), North Carolina State University;

⁵Biology Department, Northeastern Illinois University; ⁶KBase, Oak Ridge National Laboratory;

⁷National Ecological Observatory Network (NEON)

MICRONet



Anna McLoon

Siena College

Create & collaborate more with a free account

Edit and publish protocols, collaborate in communities, share insights through comments, and track progress with run records.

Create free account

OPEN  ACCESS



DOI: <https://dx.doi.org/10.17504/protocols.io.kxygxy19zl8j/v1>



Protocol Citation: Ellen Dow, Anna McLoon, Elisha M Wood-Charlson, Carlos Goller, Aaron Schirmer, Benjamin Allen, Courtney Meier 2025. Soil moisture measurements (adapted from NEON protocols). **protocols.io**

<https://dx.doi.org/10.17504/protocols.io.kxygxy19zl8j/v1>

License: This is an open access protocol distributed under the terms of the **[Creative Commons Attribution License](#)**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working

We use this protocol and it's working

Created: July 31, 2024

Last Modified: March 07, 2025

Protocol Integer ID: 104380

Keywords: soil microbiome data, metadata about soil moisture, soil sample, soil moisture, using soil, microbiome data, metagenomic sequencing, soil condition, soil, national ecological observatory network, version of the national ecological observatory network, rocks from the sample, metadata, sample, drop in the sample, moisture, sampling, sequencing, student use

Funders Acknowledgements:

NSF

Grant ID: Research Coordination Network for Undergraduate Biology Education Incubator: KBase Educators: Program for Microbiome Workforce Development [# 2316244]

NSF

Grant ID: Research Coordination Network for Undergraduate Biology Education: Microbiomes in Computational Research Opportunities Network (MICROnet) [# 2418285]

Abstract

This protocol is designed to collect metadata about soil moisture using soil collected for metadata (NOT the sample reserved for metagenomic sequencing) during the sampling protocol. Students will begin by weighing a metal or glass weighboat before and after adding the soil sample (with as much non-soil material removed as possible). The sample will be heated for at least 48 hours to 105 degrees C, and then students will weigh the sample and weighboat again to calculate the drop in the sample's mass, which represents the moisture. We recommend discussing or practicing how carefully samples should be processed to remove roots and rocks from the sample before weighing. This protocol will generate metadata that should be included with soil microbiome data to describe soil conditions, and adapts a version of the National Ecological Observatory Network's best practices intended for student use.

Materials

- balance (preferably analytical balance)
- aluminum or glass weighboats
- Scoopula
- forceps
- Glassware oven or other oven that can be set to at least 105 degrees.
- autoclave gloves



Safety warnings

 In order to prevent burns, be careful when placing samples into or removing samples from the oven. Also remove samples from oven and transport samples carefully to prevent spilling the open weigh boats.

Before start

We recommend discussing an/or practicing removing roots, rocks and other non-soil sample components before beginning the protocol. Large pieces of plant matter or rock will make your data less representative of the soil.

- 1 Ensure that a drying oven is set to 105 degrees C or higher and that it can hold its temperature (slightly above this is acceptable, but record the actual temperature in your log).
- 2 Tare the balance (should read 0).
- 3 Label an aluminum or glass dish, recording the label on the dish on your data sheet

- 4 Place the dish onto the balance and WITHOUT TARING write down the mass of the dish on your log sheet.
- 5 Add approximately 10 g of soil onto the dish. This is your last chance to remove any roots or sticks or bugs that you missed earlier. Record the combined mass of the dish plus soil on your log sheet (after removing and roots, etc.).
- 6 Calculate the soil mass before drying (subtract dish mass from total mass).
- 7 Place entire dish into the preheated drying oven (set to 105 degrees C). Let the sample oven-dry for at least 48 hours.
- 8 Leave your dish with soil uncovered in the drying oven for at least 48 hours. Record total drying time here_____
- 9 Remove from oven (using autoclave gloves) and set the dish on a heat-proof surface. Let it cool enough to handle safely.
- 10 Turn on and tare the balance again without the sample on it.
- 11 Place the entire dish onto the balance and record the total mass after drying (dry soil + dish).
- 12 Calculate the dry soil mass by subtracting the mass of the dish and record this value in your log.
- 13 Calculate soil moisture by (before drying soil mass – after drying soil mass)/before drying soil mass) and record the value in your log.



- 14 Discard soil in the trash and wash out the weighing dish.

Protocol references

Stanish, L. (2024). TOS Protocol and Procedure: SLS – Soil Biogeochemical and Microbial Sampling. NEON.DOC.014048 version P. NEON (National Ecological Observatory Network).