Soil your undies

Focus questions	How healthy is your soil? What evidence can be used to support the claim of soil health?
Vocabulary	Microbe, macroinvertebrate, abiotic, biotic

A healthy soil is teeming with hungry microbial and macroinvertebrate life. The ground beneath your feet contains millions of bacteria, fungi, protozoa, nematodes, arthropods, annelids, and more. These organisms are busy transferring key nutrients, eating and decomposing organic material, and stabilizing the soil. Healthy soils keep key nutrients in place for crops and help to decrease soil runoff. Farmers are improving soil health by incorporating diverse cover crops and decreasing tillage patterns for less soil disturbance. Healthy soils mean less soil amendments and more money in a farmer's pocket.

This activity measures the biological activity of your soil by exposing a pair of 100% cotton undies as a microbial buffet. Place your undies in similar soil types with different crop rotations or different tillage management and compare nutrient profiles, rainfall, and microbial activity.

Materials

- 1 (or more) new pair of white 100% cotton undies (no dyes or polyester blends)
- 1 marker flag
- Shovel
- Gallon storage bag
- Lamotte soil test kit
- Hand lens
- Plastic tub or bucket for soil sample
- Soil Food Web diagram (nrcs.usda.gov/wps/portal/nrcs/photogallery/soils/health/biology/gallery/?cid=1788&position=Promo)
- *Optional:* Agar plates
- *Optional:* Sterile swabs

Procedure

1. Draw an accurate representation of your undies before soil exposure.
2. Record the soil type, date buried, and dry mass of the cotton undies to be tested.
3. Dig a trench 15 cm deep in the test soil so that it is large enough to lay the test undies in the trench with the waistband sticking out.
4. Place the test undies into the trench and bury them with the displaced topsoil so that the waistband is exposed.
5. Mark the burial site with a flag so you'll be able to find it again in 2 months.
6. Collect a soil sample from the area where you buried the undies.
7. Back in the classroom, test the soil for pH, N, P, K and record in the data chart below

(using Lesson 2 Soil Nutrients procedure).

8. Look for macroinvertebrates in the soil using a hand lens. Record observations on soil food web diagram.
9. Streak an agar plate with a sterile swab that has been dipped in the soil or soil solution. Observe after 24 hours.
10. Leave the undies buried for 2 months.

Two months later

11. Dig up the undies carefully and place in a plastic bag for transport.
12. Collect a soil sample again from the area to test for nutrients and soil life.
13. Rinse any attached dirt from the undies, dry, and record the final mass.
14. Draw an accurate representation of your undies after soil exposure.

Data

Sample location (GPS)	
Date buried	**Date harvested**
Initial mass	**Final mass**
Soil type	
pH	**pH**
Nitrogen	**Nitrogen**
Phosphorus	**Phosphorus**
Potassium	**Potassium**
Tillage pattern/Disturbance	
Crop rotation	
Initial drawing/description of undies before burial:	**Final drawing/description of undies after burial:**

Reflection

1. What did the undies reveal about the health of the soil? Explain.

2. How does the data in the chart above compare to the final state of the undies?

3. What can a farmer do to improve the overall health of the soil?

Rubric for self-assessment

Skill	Yes	No	Unsure
I collected data: on soil nutrients			
...on soil activity by macroinvertebrates			
...by streaking soil solution on an agar plate			
...and am able to make a conclusion about microbial and macroinvertebrate activity in the soil.			