Soil Your Undies for Healthy Soil

Introduction

In the summer of 2022, the Pennsylvania Soil Health Coalition sponsored a state-wide “Soil your Undies” campaign to help farmers and gardeners think about the health of their soil. In late spring, participants were asked to bury a pair of cotton underwear in their field or garden and dig them up 60 days later. In the images below, a woman shows what happened to the underwear she planted—one pair in her vegetable garden and one pair under the grass in her lawn.

Image A

Image B

Fall 2024

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a. Fill in the chart below with your observations:

I <u>notice</u>...	I <u>wonder</u>...

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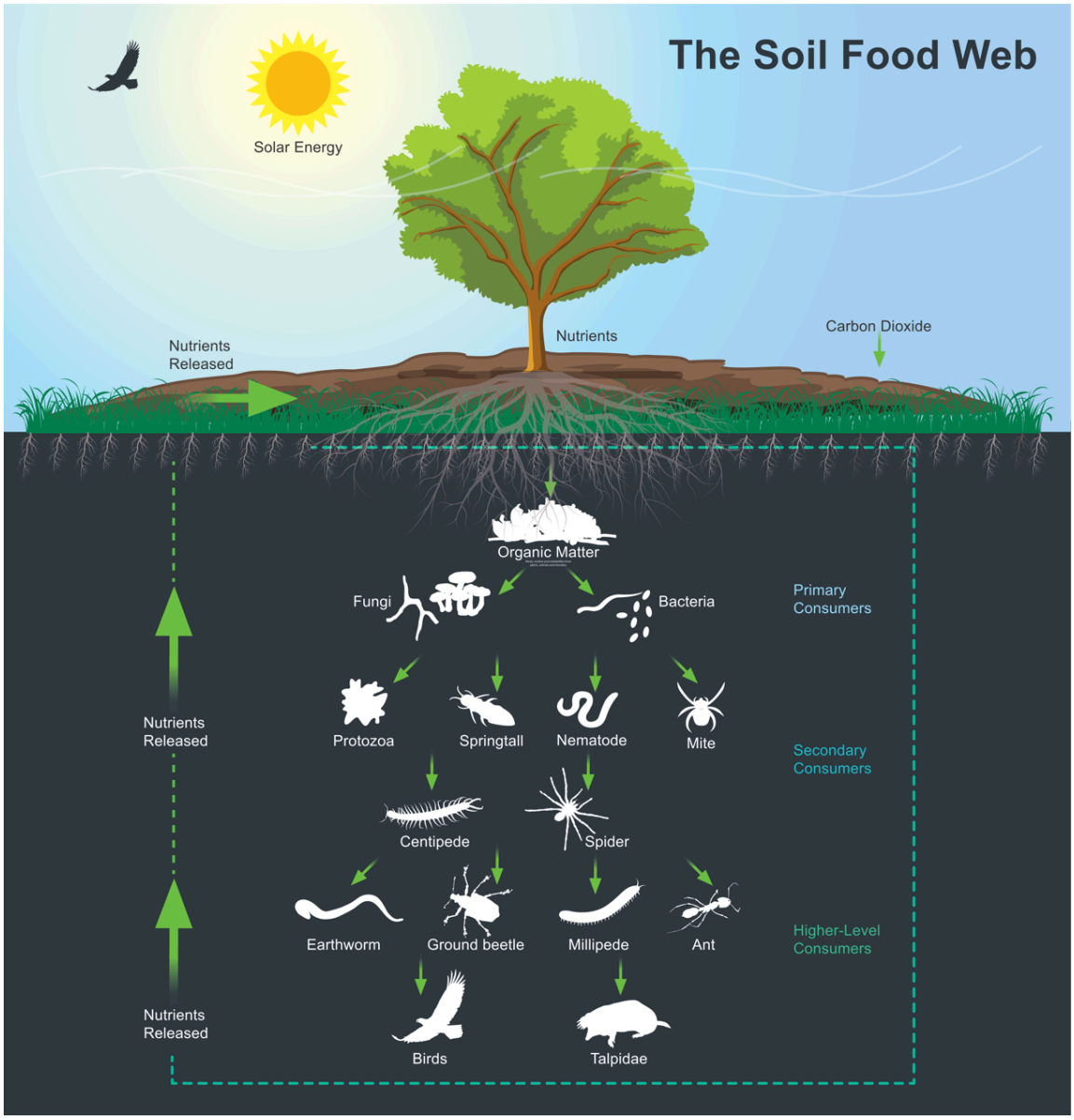
Prompt 1

Did you know the soil is an ecosystem, full of interactions between living organisms like bacteria, fungi, and insects, and non-living components such as minerals, water, and air? These interactions work together to support plant growth, cycle nutrients, and maintain the soil stability and structure (how the soil particles or aggregates are grouped). Soil is teeming with life, making it much more than just dirt beneath our feet.



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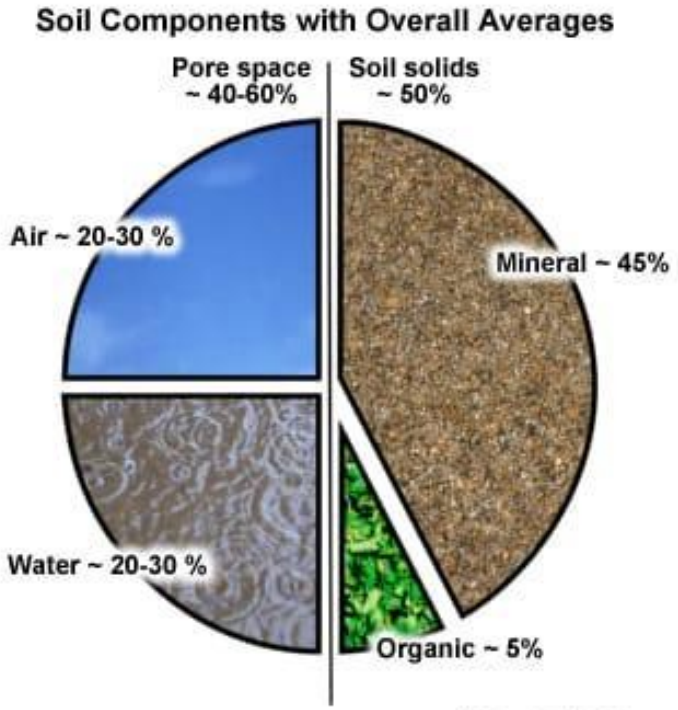

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a. List the living organisms and non-living components that make up a soil ecosystem.

Living Things	***Non-Living Things***

b. Using the information from the graphics, along with what you already know, explain (using models and/or words) three ways living organisms interact with the non-living components of the soil in the soil ecosystem. In your answer, refer to specific examples from the soil food web and the different components of soil shown in the graphics.

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c. Using the information from the graphics, along with what you already know, explain (using models and/or words) three ways living organisms interact with other living organisms in the soil ecosystem. In your answer, refer to specific examples from the soil food web and the different components of soil shown in the graphics.

d. Using information from the graphics, along with what you already know, explain why stable air pockets are important in the soil ecosystem.

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e. Soil organic matter (SOM) is the part of the soil that comes from living things. It includes living organisms, dead and decomposing plant and animal matter, and metabolites and wastes from living organisms, such as worm casings and manure. Using information from the graphics, along with what you already know, explain the role of non-living SOM in the soil food chain and nutrient cycle.

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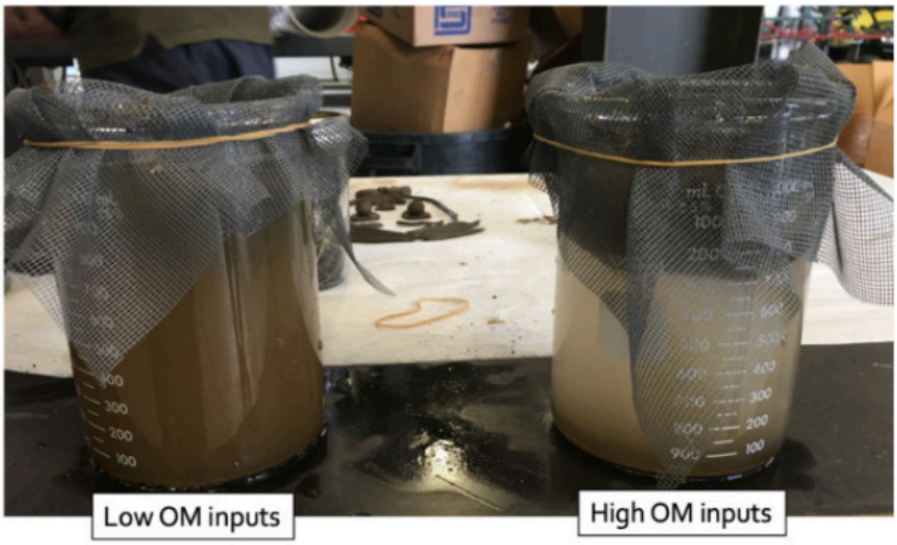
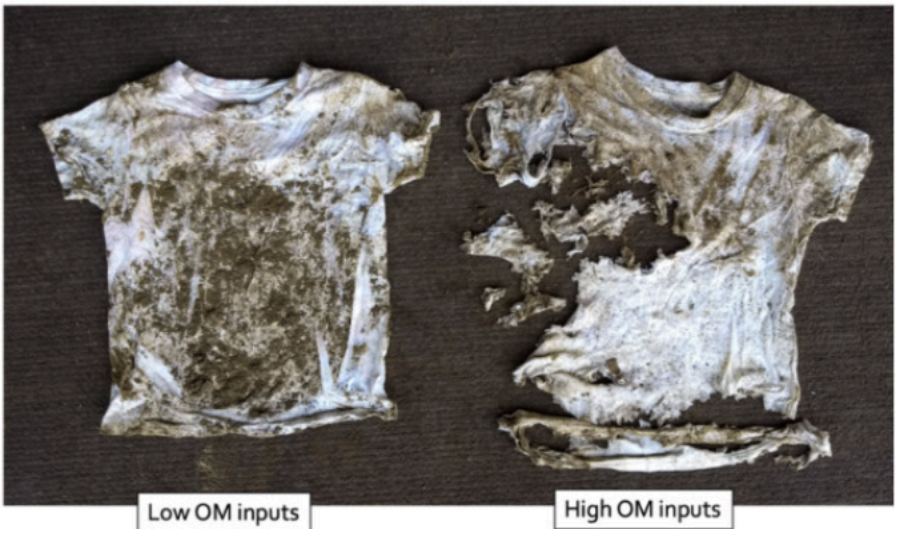
Prompt 2

Below are pictures showing the results of a soil test called the slake test and a test called the t-shirt test. Beaker A contains soil from an agricultural field that receives low organic matter (OM) inputs, meaning the farmer adds/leaves only a small amount of decaying plant and animal matter, such as manure, compost, or chopped-up leaves and stalks from the previous year's crop. Shirt A was buried in this same field. Beaker B contains soil from a field that receives high OM inputs, which is also where Shirt B was buried.





Field A Field B

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Below is information about performing a slake test from the University of Wisconsin-Madison.

The slake test – a simple way to evaluate soil structure

The slake test demonstrates the stability of soil aggregates in water. When a chunk of topsoil is placed into water, the water is drawn into the soil and displaces air. If the large pores within the soil are stable, water can move into the soil without causing the aggregate to break apart ("slake"). Biological processes such as earthworm activity, root growth and decomposition, networks of root-associated fungal hyphae, and sticky exudates from other soil organisms including fungi and bacteria all contribute to soil aggregation and the stability of macropores. Stable macropores allow better infiltration of water into the soil, reducing water runoff, erosion and surface crusting.

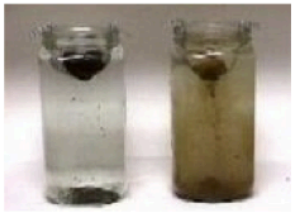
Tillage has a major impact on soil quality, physically disrupting soil and causing decomposition of organic matter. Over time, tillage reduces soil biological activity and thus the ability of soil organisms to stabilize soil aggregates. Comparing soil aggregates from an untilled area such as a fencerow with a regularly tilled production area allows you to evaluate your soil's structural integrity.

To do the slake test, you will need:

- two clear glass or plastic containers

- mesh supports (eg made from hardware cloth) that will fit into the top of the container and hold the soil in the top half of the container

- soil aggregates collected from the surface layer of soil, from a tilled area and from a nearby untilled area such as a fencerow



soilhealth.osu.edu

Steps:

1. Insert the wire meshes into each jar and fill the jars with water to a depth that will submerge the soil aggregate samples.

2. Simultaneously place each soil aggregate sample into the separate jars.

3. Watch to see which soil holds together and which one falls apart. Aggregates from soil with poor structure will break apart in water.

Helpful YouTube videos:

- Soil Aggregation and Water Infiltration https://youtu.be/d1M7EFqqsMM
- How to Conduct the Field Slake Test https://www.youtube.com/watch?v=z8xj5EiNNRo
- Slake and Infiltration Test https://www.youtube.com/watch?v=CEOyC_tGH64
- Slake Test and Capilliary Flow of Soil Quality & Water Movement (kit) with USDA NRCS SD https://www.youtube.com/watch?v=GOos10UyRwY

Prepared by Ruth Genger based on NRCS resources (nrcs.usda.gov).

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Department of Horticulture
125 years and growing

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a. Using the slake test information sheet, explain what a slake test can tell us about a particular soil.

b. Using the slake test information sheet and the graphics from the previous prompt, explain how the interactions of living and non-living things impact soil stability.

c. Describe the results of the slake tests for fields A and B. Which soil is more stable?

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d. Using the slake test information sheet and the soil food web model, predict some differences between the soil ecosystems in fields A and B.

e. How did soil stability impact the buried t-shirts?

f. Using the food web model and everything you have learned today, describe how a t-shirt buried in physically stable soil is affected more than one buried in unstable soil.

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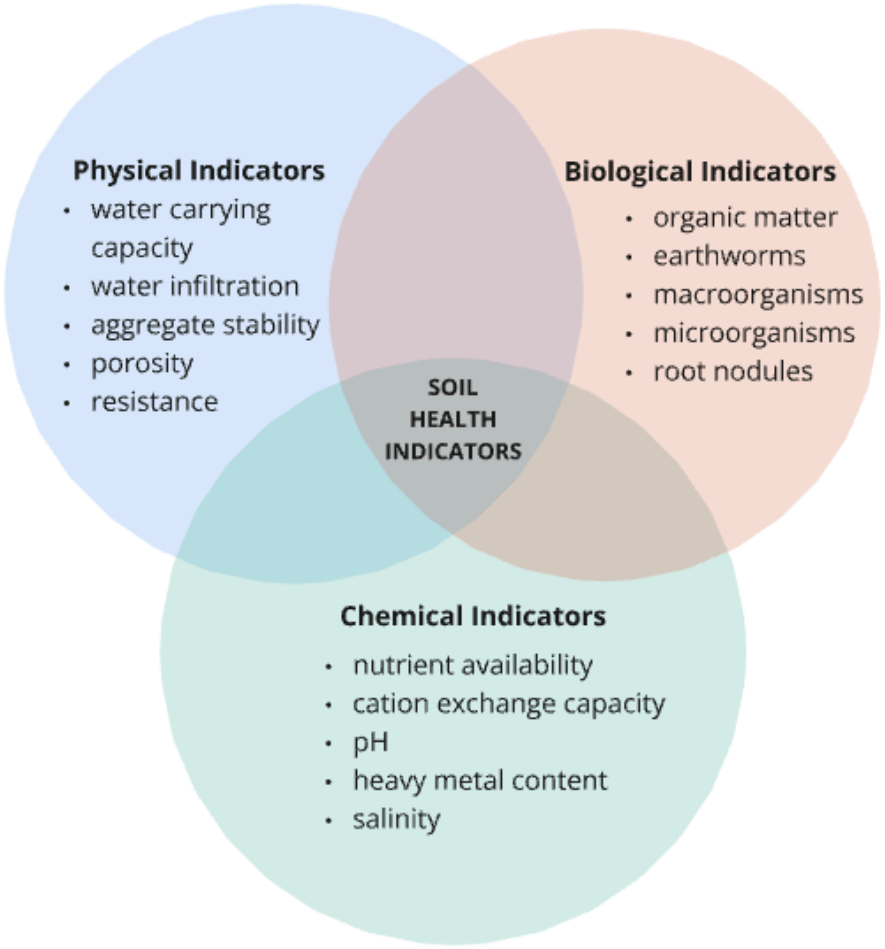
Prompt 3

Just like doctors use vital signs to check our health, scientists use special indicators or measures to determine if the soil ecosystem is healthy. These indicators include living and non-living parts of the soil, including:

- Chemical indicators, like pH or carbon levels in the soil
- Physical indicators, like how well the soil holds its shape or filters water
- Biological indicators, like how many worms or tiny organisms live in it

Understanding soil health is a bit like solving a puzzle—each piece of information, or indicator, helps us see the bigger picture.



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Results of the Soil Your Undies challenge.

a. Describe the results of the underwear from the Soil Your Undies Challenge above. Which pairs of underwear were buried in the healthier soil? Which were buried in less healthy soil?

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b. Describe how the results of the Soil Your Undies Challenge demonstrate interactions between living and nonliving components of a soil ecosystem.

c. Use evidence from the soil health indicators diagram, the soil food web model, and the Soil Your Undies Challenge to support or refute the following argument: *Healthier soils are more stable and decompose organic matter at a higher rate than less healthy soils.*

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