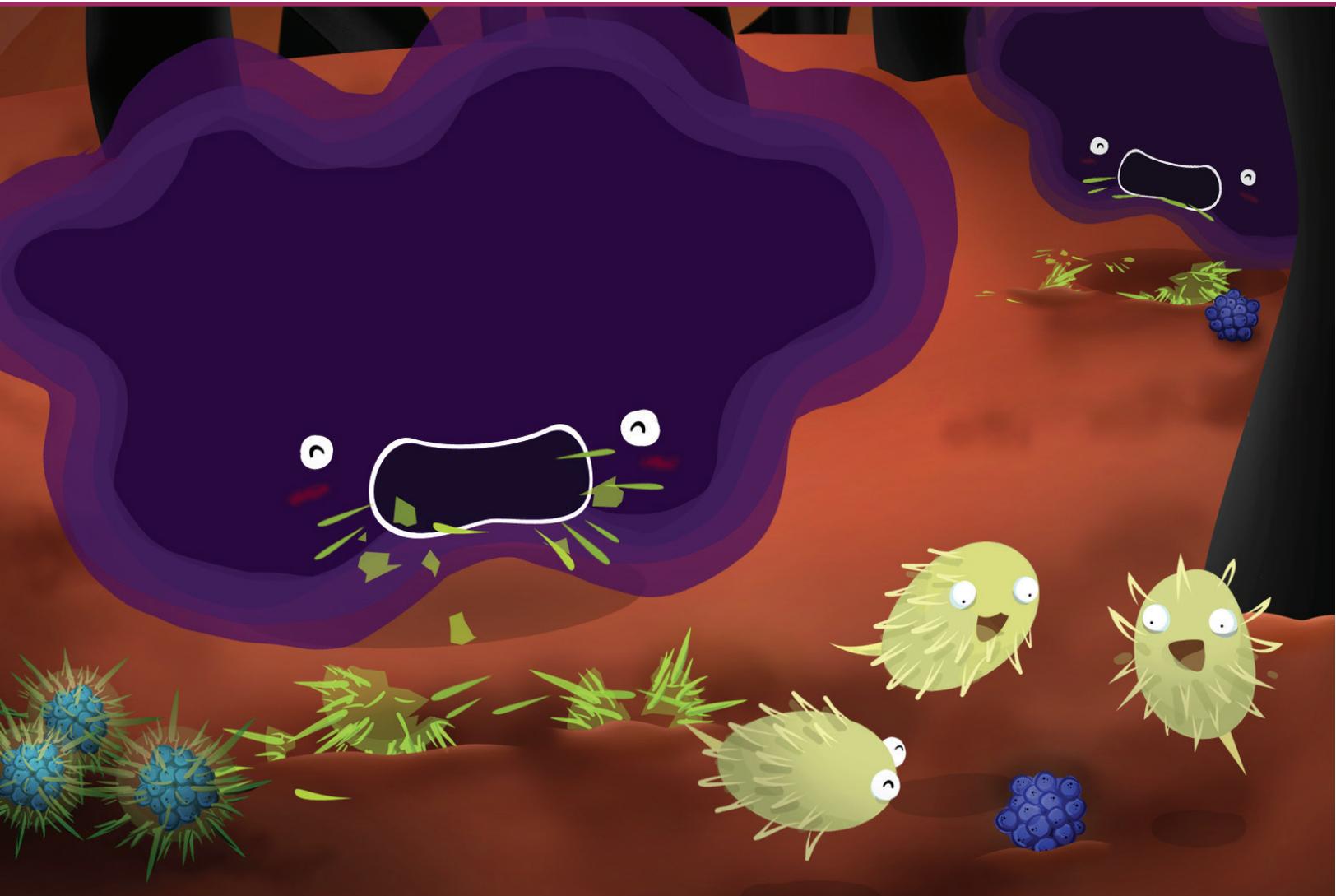


MAGICAL MICROBES

NGSS TEACHER'S GUIDE

Soil Ecology and Nutrient Cycling



NGSS Alignment

CORE IDEAS

Core Idea LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

LS1.C: Organization for Matter and Energy Flow in Organisms

Core Idea LS2: Ecosystems: Interactions, Energy, and Dynamics

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

Core Idea PS3: Energy

PS3.B: Conservation of Energy and Energy Transfer

PS3.D: Energy in Chemical Processes and Everyday Life

Core Idea ETS1: Engineering Design

ETS1.A: Defining and Delimiting an Engineering Problem

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution

CROSS CUTTING CONCEPTS

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: Flows, cycles, and conservation
- Structure and function
- Stability and change

PRACTICES

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics, information and computer technology, and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Learning Objectives

1. To understand that soil health is important to all living organisms.
2. Soil is continuously being formed by geological and biological processes and the organisms that live in the soil create a unique ecosystem in which its inhabitants depend upon and interact with one another.

Essential Questions



1. **What is soil and why is it important?**
2. **How is soil formed?**
3. **What organisms live in soils?**
4. **What roles do organisms play or**
5. **What lives in soil and how do these organisms interact with one another?**
6. **What is decomposition and how is it important to soil formation and ecology?**

By The End of This Lesson...

Students will understand that:

- Soil is comprised of both living and non-living components
- Soil is created by the breakdown of rocks and organic matter
- The health of the soil is dependent on the amount of organic material and nutrient balance

Students will be able to:

- Identify and describe the components of soil.
- Identify the important players in the soil ecosystem and describe the different roles these organisms play in this ecosystem.

PRE-ASSESSMENTS

Pre-Assessment: True or False

Ask students to answer the following questions using only what they already know:

1. Soil covers all of the earth True or False
2. Soil is formed by wind and water breaking down rocks? True or False
3. Soils are the same everywhere True or False
4. Soil can affect climate True or False
5. Soil is made up of only one kind of material True or False
6. Soils are made up only of small pieces of rock True or False

Pre-Assessment: Multiple Choice

Ask students to answer the following questions using only what they already know:

1. Circle the things that are organic: rocks leaves a dead insect
2. Circle the things that are part of the environment in an ecosystem?
 - a. plant
 - b. bird
 - c. rock
 - d. insect
3. Which of these is an organism found in an ecosystem?
 - a. plant
 - b. rock
 - c. water
 - d. sunlight
4. Which of these is a reason why soil is important in an ecosystem?
 - a. soil kills weeds
 - b. soil is very hard like a rock
 - c. nothing lives in soil
 - d. soil gives minerals to plants