

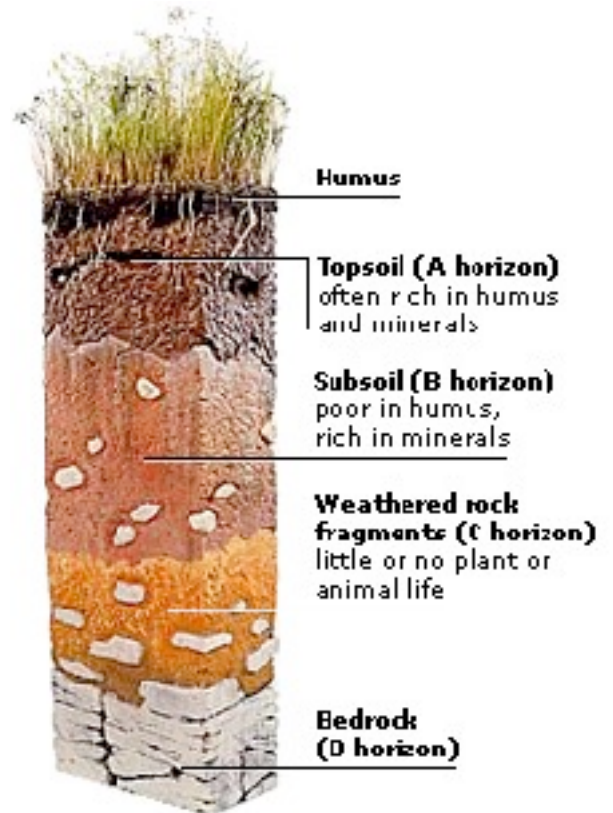
Dirty Decomposers: Grade 5

This field project investigates the soils in multiple habitats at Cedar Tree Neck. Students learn about the habitat type and land use history of each area, use measurement to set



up quadrants, and conduct a variety of soil tests. This investigation engages students in all steps of the scientific process: asking questions, forming hypothesis, making observations, collecting data, and formulating conclusions.

Students may also share the results of their investigation with the school community through the school website and the Cedar Tree Neck Google Earth document.



Massachusetts Science and Technology/Engineering Curriculum Framework- 2016	
<p>Learning Standards:</p> <p>5-ESS3-2 (MA). Test a simple system designed to filter particulates out of water and propose one change to the design to improve it.</p> <p>5-LS2-1. Develop a model to describe the movement of matter among producers, consumers, and decomposers, and the air, water, and soil in the environment to (a) show that plants produce sugars and plant materials, (b) show that animals can eat plants and other animals for food, and (c) show that some organisms, including fungi and bacteria, break down dead organisms and recycle some materials back to the air and soil.</p>	<p>Next Generation Science Standards (January 2013 draft)</p> <p>5-LS2-b. Formulate questions and predict outcomes about how organisms, such as fungi and bacteria, operate as decomposers to restore (recycle) some materials back to the soil for plants to use in local ecosystems.</p> <p>ESS2.A: Earth Materials and Systems: Earth's major systems are the geosphere (solid and molten rock, soil, sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect the Earth's surface materials and processes.</p>
<p>Students will be able to...Skills</p> <ul style="list-style-type: none"> • Use appropriate measurement tools to obtain a soil core, set up a quadrant, take temperature, and record soil depth. • Explain the basic steps of a scientific investigation. • Evaluate soil conditions best suited for farming. <p>Students will know...Concepts</p> <ul style="list-style-type: none"> • Soil is composed of organic and inorganic materials. • Soil is made of layers called horizons. • Soil properties vary with habitat and human land use. • Decomposers are organisms that return organic material to soil, enriching it for plant growth. • Soils with greater organic material better support plant life and cultivation. 	<p>Big Ideas/Enduring Understandings</p> <ol style="list-style-type: none"> 1. Scientists classify soil based on observable characteristics: color, particle size, texture, and the ability to retain water. 2. Soil is formed by weathering of rock and decomposition of organic materials. 3. Human activities, such as farming, can affect the structure and quality of soil. <p>Essential Questions</p> <ul style="list-style-type: none"> • How is soil formed? • What are different ways you can describe and categorize soil? • How do living organisms interact with soil? • How do scientists conduct investigations in nature?

Before You Visit

1. Pre-Unit Performance Task:

See attached sample MCAS open response question about soil properties.

2. Carousel Brainstorming Activity:

Write each of the 4 essential questions (below) on chart paper. Divide students into 4 groups and assign each a chart to begin at. Prompt students to discuss what they know about each question and write their answers on the chart. Have groups rotate until each group has contributed ideas to each chart, then come together and share all ideas with the whole group.

- How is soil formed?
- What are different ways you can describe and categorize soil?
- How do living organisms interact with soil?
- How do scientists conduct investigations in nature?

3. Introduce and begin creating a classroom **Vocabulary Chart** for this unit. Vocabulary words include:

humus	litter	clay	soil profile
organic	horizon	minerals	bedrock
inorganic	subsoil	leaching	

4. Show the **BrainPop video** on soil: <http://www.brainpop.com/science/earthsystem/soil/>

5. **Student Interactive Activity:** <http://www.harcourtschool.com/activity/dirt/index.html>

Students can click and read about different layers and properties of soil, then match descriptive words and phrases to each layer.

6. Watch a video to see a scientist **Setting up a Quadrant** for soil study (scroll down on the page, the link is about 3/4 of the way down the page.)

<http://archive.fieldmuseum.org/undergroundadventure/teachers/quadrants.shtml#>

7. Introduce the **Soil Types Booklet**. Students could read it independently, or teachers could assign sections for partners to read and give a quick presentation about.

8. Use the **Google Earth Introduction** guide to introduce students to the property and preview locations you will visit.

On the Trip:

Students will need to be divided into 3-4 small groups, depending on class size. You can assign groups to the assistant teacher and parent volunteers.

When each group arrives at their study site, they will do the following:

1. Have one student read the Habitat card to the group.
2. Record Site Information and Predictions (see **Soils Investigation file**)
3. Assign students to set up a quadrant (see directions for **Setting Up Quadrants**)
4. Take a soil core and sort materials into organic and inorganic matter.
5. Conduct Soil Tests (See **Soil Test Directions** for procedures) and record data (see **Soils Investigation**)
6. Optional: collect 2 cups of soil from each site to bring back to school for the Mud Shake test (http://archive.fieldmuseum.org/undergroundadventure/teachers/mud_shake.shtml)

NEW!! Field Trip Activities— focus on Decomposers!

1) Comparing the Organic Content from Soil Samples (using Hydrogen Peroxide):

https://gen.uga.edu/documents/soil/activity/My_soil's_Better_Than_Your_soil.pdf

2) Soil is a Filter Test aka The Kool-Aid test (5-ESS3-2). Students choose 3-4 different soil types from their soil cores to use for this test (make sure to have one sand and one topsoil).

<http://www.doctordirt.org/teachingresources/soilfilter>

Discuss and compare results with different soil types. Have students suggest and implement changes to designs to improve filtration abilities of soils that were less effective as filters.

3) Decomposer Search: Students search for the “FBI” or Fungus, Bacteria, and Insects by looking under logs, on trees, in leaf litter, etc. and bring them back to the group to share and identify. Refer to printable field guide at <http://archive.fieldmuseum.org/undergroundadventure/> for identification.

4) Dirty Decomposers: Before leaving CTN, students each choose a soil sample that they think will best decompose organic material, and take 2 cups of that soil back to class in a plastic bag. Each student is given a piece of a carrot to put in their bag to conduct the follow experiment in class (outlined below):

https://www.teachengineering.org/lessons/view/duk_decomposers_mary_less

After You Visit:

Analyze data and draw conclusions. Compile data from each study site onto the **Soil Comparison Chart**. Summarize your investigation and have students post observations to the Cedar Tree Neck Google Map, including photos and observations of soils at the different locations.

Post-Unit Performance Task: See attached sample MCAS open response question about soil properties. Compare student work from the beginning of the unit to the end. The exemplar for a 4 point response is included.

Complete **The Important Thing About Cedar Tree Neck** sheet as a group or individually and return to SMF.

Extensions:

- The Globe Program is an international project that involves collecting and sharing data using specified protocols. They have soil units for both elementary and high school students. Go to: www.globe.gov and join for free!
- Using Soil Analysis to Solve Crimes (hands-on lab investigation):
<http://www.teachersfirst.com/lessons/forensics/soil-lesn.cfm>

Sources and Resources:

- The Field Museum Underground Adventure Soil Investigation Unit:
<http://archive.fieldmuseum.org/undergroundadventure/>
- Vermillion Parish Schools, Louisiana, 5th Grade Science Page
http://www.vrml.k12.la.us/5th/scien/activity_by_Unit/Unit6/act1/un6_act1.htm
- Harcourt School Publishers: <http://www.harcourtschool.com/activity/dirt/index.html>