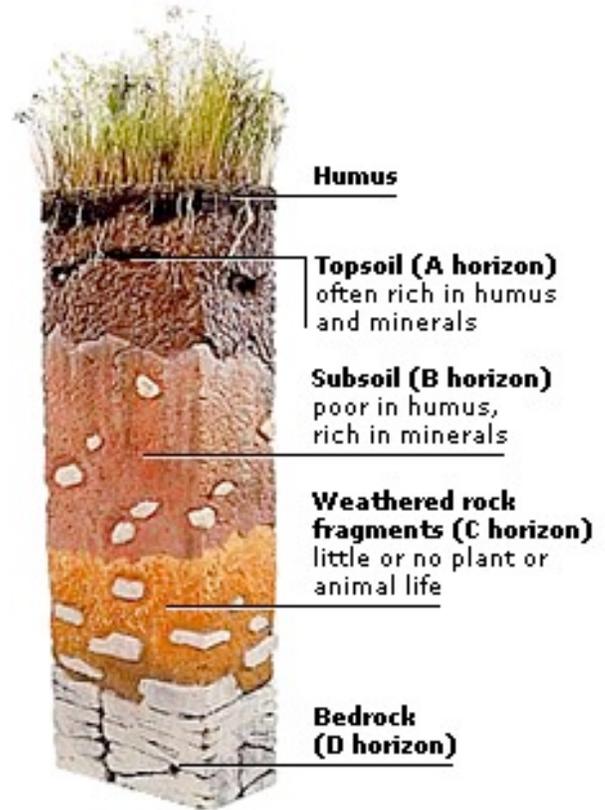


# Soil Sleuths

## 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.

<b>Massachusetts Science and Technology/Engineering Curriculum Framework- 2006</b>	
<p><b>Skills of Inquiry, Experimentation, and Design: Grades 3-5</b></p> <ul style="list-style-type: none"> <li>• Ask questions and make predictions that can be tested.</li> <li>• Select and use appropriate tools and technology in order to extend observations.</li> <li>• Keep accurate records while conducting simple investigations or experiments.</li> <li>• Conduct multiple trials to test a prediction. Compare the result of an investigation or experiment with the prediction.</li> <li>• Recognize simple patterns in data and use data to create a reasonable explanation for the results of an investigation or experiment.</li> <li>• Record data and communicate findings to others using graphs, charts, maps, models, and oral and written reports.</li> </ul>	<p><b>Learning Standards:</b></p> <p>Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from the decomposition of plant and animal remains).</p> <p>Recognize and discuss the different properties of soil, including color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.</p> <hr/> <p><b>Next Generation Science Standards (January 2013 draft)</b>  <b>5-LS2-b.</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.  <b>ESS2.A:</b> 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><b>Big Ideas/Enduring Understandings</b></p> <ol style="list-style-type: none"> <li>1. Scientists classify soil based on observable characteristics: color, particle size, texture, and the ability to retain water.</li> <li>2. Soil is formed by weathering of rock and decomposition of organic materials.</li> <li>3. Human activities, such as farming, can affect the structure and quality of soil.</li> </ol>	<p><b>Students will know...Concepts</b></p> <ol style="list-style-type: none"> <li>1. Soil is composed of organic and inorganic materials.</li> <li>2. Soil is made of layers called horizons.</li> <li>3. Soil properties vary with habitat and human land use.</li> <li>4. Decomposers are organisms that return organic material to soil, enriching it for plant growth.</li> <li>5. Soils with greater organic material better support plant life and cultivation.</li> </ol>
<p><b>Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How is soil formed?</li> <li>• What are different ways you can describe and categorize soil?</li> <li>• How do living organisms interact with soil?</li> <li>• How do scientists conduct investigations in nature?</li> </ul>	<p><b>Students will be able to...Skills</b></p> <ul style="list-style-type: none"> <li>• Use appropriate measurement tools to set up a quadrant, take temperature, and record soil depth.</li> <li>• Explain the basic steps of a scientific investigation.</li> <li>• Evaluate soil conditions best suited for farming.</li> </ul>

## 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](http://archive.fieldmuseum.org/undergroundadventure/teachers/mud_shake.shtml))

## 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](http://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](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>