

# Lesson Plan

**Grade:** Grade 4  
**School:** Fair Hill Nature Center  
**Subject:** Outdoor Education  
**CCPS Lesson:** Soil Science  
**Season:** Fall 2016 & Spring 2017

**Time Frame:** 3.5 hour lesson

**STEM Approach:** Science, Social Studies

## **Overview:**

This program compliments the *Earth's Changing Surfaces* unit. Students will be introduced to the concept of soil as a Natural Resource and they will examine techniques that people have developed to help protect the soil. Students will take a hike through Fair Hill and will participate in a series of activities which demonstrate the processes of soil formation, examine techniques to prevent soil erosion, and observe ways in which water has shaped the land. Students will fill out a Soil Scavenger Hunt.

**Introduction:** Ask the students to define the term Natural Resource. Ask the students to name some examples of Natural Resources and then discuss dirt/soil as a Natural Resource. Discuss 3 reasons that soil is important: it provides habitat, allows plants to grow, and it cleans water. Explain the 2 ways that soil is made. Define erosion. Earth as an Apple Demonstration. *Define: Natural Resource, habitat, water filtration, erosion.*

**Hike:** The students walk the trail and discuss how water has shaped the land at Fair Hill. Discuss weathering and find wiggle rocks. *Point out: water trails, trail switch-backs, river valley, worm food, weathering vs. erosion.*

**Experiment:** Test the absorption of the soil in 2 places- once in an area that will absorb water quickly, one that will not absorb water. Is it important that soil absorbs water? Which types of dirt absorb more water? *Define: absorption, compaction, flooding, leaf litter/fluffy soil.*

**Erosion Prevention Exhibits (1-3):** Stop the students at each station: Curlex blanket, filter sock and silt fence. Discuss who uses these tools and why. *Define: Silt, erosion, cloudy water, fish gills.*

**Soil Plugs:** The students pair up and take a sample soil plug to show the class. Discuss soil layers- top soil and clay. How long does it take for soil to form? Where does it come from? (dead leaves). What if I raked up all the dead leaves? Ask the students which adults care about soil for their jobs? (Ex: farmers, construction workers, The Ravens. The Leaning Tower of Pisa is a fun antidote. CA farmers vs. MD farmers- Same dirt? Same crops?) *Define: worm food, worm castings, soil scientist.*

**Erosion Table:** Explain the 3 sections of the table (dirt parking lot, backyard, forest) and that you are going to make a rainstorm for 10 seconds over each section and we'll observe the water run down the table and into the buckets. Ask for predictions of what the water will look like in each bucket. Perform the experiment and point out 1) water flows quickly over the dirt parking lot without absorbing and is very muddy when it lands in the bucket 2) less water flows over the backyard and is less muddy/almost clean when it lands in the bucket 3)

almost no water flows over the forest, it all absorbs into the soil. It takes too long to wait for it to land in the bucket. *Discuss: Which land do we want? Which water do we want to swim/fish/drink? Why doesn't the water absorb into the parking lot? Do the plants suck up the water with their roots? (No, the roots just slow the water down)*

**Flood Pictures (1-3):** Show the students the pictures of the Fair Hill flood damage and the downed bridge. Who designs bridges? How did they change the bridge design? *Discuss flood prevention, flood safety and damage.*

**Fossils:** Show the students the fossils and facilitate a conversation about what fossils are and how they are found. Present them with the "Nature Mystery" of the ocean-dwelling trilobite found thousands of miles away from the ocean. Discuss tectonic plate movement, earthquakes, mountains and volcanoes.

**How Long Does it Last?:** Ask the students where their trash goes when they throw it away. Have the students place the "trash" items in order of how long it takes them to decompose. *Define: landfill/dump, plastic, glass, rubber, tin, aluminum, paper.*

**Hunt for Worms:** Use the Worm Juice to find worms. Have the students stand in a circle and collect the worms into a tub of water. *Define: worm anatomy, worm castings, worm food.*

**Weathering:** Have the students make "rock dust" with physical weathering, show them "acid rain" with the vinegar test tube, have them guess which rock is from the river and which is from the land, and have them solve the "Nature Mystery" of the markings on the rock (glacier scars). *Define: glacier, glacial bowl, river valley, acid rain.*

**Closing:** Bring class back together to discuss what they learned and their Scavenger Hunt. *Take home words: erosion, weathering, worm castings, soil is a natural resource.*

**Essential Questions and Enduring Understandings:**

- What is a Natural Resource?
- Why is soil important?
- Why do we need to conserve our soil?
- What is erosion?
- Where does soil come from?

Contents	Science	Technology	Engineering	Math	ELA	SS
(X)	X					X

**Standards Addressed in Lesson:**

Science

*Maryland Environmental Literacy Standards (MELS)*

**Standard 5: Topic A: Human Impact on Natural Processes**

Indicator 1: Analyze the effects of human activities on earth's natural processes.

Indicator 2: Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.

**Topic B: Human Impact on Natural Resources**

Indicator 1: Analyze, from local to global levels, the relationship between human activities and the earth’s resources.

**Standard 6: Topic A: Natural Changes and Human Health**

Indicator 1: Identify and describe natural changes in the environment that may affect the health of human populations and individuals.

**Topic B: Human-Induced Changes and Human Health**

Indicator 1: Describe and explain that many changes in the environment designed by humans bring benefits to society as well as cause risks.

**Topic C: Hazards and Risk Analysis**

Indicator 1: Analyze and explain that human activities, products, processes, technologies and inventions can involve some level of risk to human health.

**NGSS**

4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans

**Social Studies**

**Maryland Content Standards- MP 2**

- 3.D.1.b - Describe ways and reasons people in Maryland and the United States modify the natural environment and the consequences of modifications
- 3.D.1.c – Explain how the growth of communities and suburbs have had consequences on the environment, loss of farmland, and pollution
- 3.D.1.d - Describe how land use and urban growth are influenced by governmental decisions

**Materials/Resources:**

- Soil absorbency test kits
- Soil probes
- Curlex blanket, silt fence, filter sock
- Fossils
- “Trash” items
- Worm Juice (mustard powder)
- Vinegar, pebbles, test tubes, funnel
- Flood pictures

<b>Know</b>	<b>Understand</b>	<b>Do</b>
<p>The definition of:</p> <ul style="list-style-type: none"> <li>● Natural Resource</li> <li>● Soil/dirt</li> <li>● Erosion</li> <li>● Absorbency</li> <li>● Weathering</li> <li>● Fossils</li> <li>● Tectonic Plates</li> </ul>	<ul style="list-style-type: none"> <li>● Soil is a very important Natural Resource that people need to grow food, build houses and to filter water.</li> <li>● When rainwater trickles through the soil layers it is cleaned.</li> <li>● Animals use soil for habitat.</li> </ul>	<ul style="list-style-type: none"> <li>● Observe the Erosion Table.</li> <li>● Participate in 2 soil absorbency experiments.</li> <li>● Take a hike and observe how water has shaped the land.</li> <li>● Complete a Soil Scavenger Hunt.</li> <li>● Use soil probes to view the soil layers.</li> </ul>

<ul style="list-style-type: none"> <li>● Acid Rain</li> </ul>	<ul style="list-style-type: none"> <li>● Erosion is the process of water (or wind) moving soil from where it should be (field), to where it shouldn't be (river).</li> <li>● Water shapes our land.</li> <li>● Soil is made through decomposition of living things and weathering of rocks.</li> <li>● People use different methods to prevent erosion.</li> <li>● Floods can happen when there isn't enough absorbent soil.</li> <li>● Some trash that people make doesn't decompose like natural trash.</li> </ul>	<ul style="list-style-type: none"> <li>● See and touch fossils.</li> <li>● Use worm juice to collect worms.</li> <li>● View flood pictures and talk about flood prevention and safety.</li> <li>● Find wiggle rocks and look for signs of weathering.</li> <li>● Create weathering with physical methods and "acid rain".</li> <li>● Explore the long-term effects of landfills and man-made trash.</li> </ul>
<p><b><u>Assessments: (Evaluation)</u></b></p> <ul style="list-style-type: none"> <li>● Scavenger Hunt results</li> <li>● Teacher evaluation forms</li> <li>● Post field trip discussion</li> </ul>		
<p><b><u>STEM Careers:</u></b></p> <ul style="list-style-type: none"> <li>● Environmental Engineer</li> <li>● Agricultural Engineer</li> <li>● Urban Planner</li> <li>● Forestry Management</li> </ul>		