

Soil, Please Don't Go!

Essential Question:

How do wind and water impact soil erosion and what can be done to mitigate their affects?

At a Glance:

Learners discover how erosion changes the landscape and can be mitigated as they observe a demonstration and participate in a hands-on activity.

Background:

Review the background information from 'Do the Erosion Boogie' for information regarding the importance of soil and different types and sources of soil erosion.

Erosion is a natural occurring process in nature; however certain human behaviors have greatly increased its negative impacts. The Dust Bowl of the 1930s was quite a lesson for American agriculturalists. Though compounded by years of drought, a major source of these damaging dust storms were poor farming practices. Heavy tilling (plowing) both reduced the amount of topsoil and removed important native grasses that helped keep soil in place. Additionally, farmers did not use erosion control methods such as crop rotation, fallow fields, and cover crops. This resulted in huge dust storms that removed topsoil and made dangerous conditions for humans and animals. Families were forced to leave their lands because they were no longer fertile; by 1940, 2.4 million people had been displaced from the Great Plains. This all occurred during the Great Depression. These windstorms could be so severe that the days would be dark as night and snow would be red or black from the sediment in the air. Winds would carry soil across states, from the Midwest to New York and Washington D. C. and ending up in the Atlantic Ocean.

Wind and water erosion still takes place, causing both human and environmental impacts. Soil particles from Africa have been found thousands of miles away in Brazil and Florida due to wind erosion. Water erosion causes mud and landslides, displacing people from their homes (or worse). These news stories often come from countries like China or India, where populations are very high and sustainable agriculture practices are seldom used.

Several factors can affect surface runoff, one type of water erosion. The extent of runoff is a function (f) of geology, slope, climate, precipitation, saturation, soil type, vegetation, and time. Geology includes rock and soil types and characteristics, as well as degree of weathering. Porous material (sand, gravel, and soluble rock) absorbs water far more readily than does fine-grained, dense clay or unfractured rock.

Erosion is a global problem that can be reduced through preventative measures and proper practices. We should learn from history and try to prevent its reoccurrence in present times.

Location: Outside

Objectives: *Learners will:*

- 1) describe soil erosion.
- 2) identify ways to lessen the impacts of soil erosion.

Skills: listening, observation, communication

Supplies:

- wood plank or stiff cardboard about 2 feet long
- bucket of DRY soil or peat/sand mixture
- trowel or large spoon
- leaves, grass, rocks
- paper cups with holes poked in bottom
- straw
- paper fans or paper plate
- bucket of water
- construction paper
- crayons, colored pencils, or markers

Subjects: science

Time: 45 minutes

Getting Ready:

Prepare and set up the materials for the activity prior to activity. The soil should be very dry. A peat/sand mixture works best, however any loose, dry soil should work. Also have paper fans (paper plates also work), water, and a cup with holes or spray bottle

Erosion Board Set-up: You will need a wood plank or stiff piece of cardboard about 2ft x 1ft. Have a brick, bench, or some other way to elevate the board for the demonstrations. A bucket of soil/sand mixture will be placed on the board in each activity (follow associated instructions). For the Water Erosion activity, you will need to prepare a cup with a hole toward the bottom. Place a straw in the hole, which will represent a focused stream of water. Alternatively, use a spray bottle that would represent rainfall.

Procedure:

Part A: Wind Erosion

1. Provide background information, focusing on the Dust Bowl of the 1930s and the impacts of soil erosion.
2. Learners should set up their erosion boards on outdoor tables or on the ground (see instructions under 'Getting Ready'). Have buckets of soil/sand mixture prepared, along with fans and other supplies.
3. If materials allow, let learners work in groups of 4-5 to prepare an agricultural scene. Otherwise, the activity may be done as a demonstration.
4. Tell learners that they are going to construct their farm to represent how it may have looked after multiple harvests and without a cover crop in the 1930s. The field would have little healthy topsoil left, would be heavily tilled, and no plants to maintain soil from erosion.
5. Once the learners have prepared their site, tell them that a bad windstorm is coming through. Pass out paper fans (or paper/plastic plates). Have learners fan their farm scenes. Use a lot of force to show the damage of wind erosion. NOTE: make sure no learners are standing on the opposite side of the erosion board where fanned soil could get in their eyes.
6. The simulation should show how soil is blown away when there are no plants or topsoil to keep it in place.
7. Next, tell learners to add some 'plants' to their farm. They may place leaves, grass, sticks, etc. to their boards to represent planting a cover crop on off-seasons. They may want to wet the plant material and soil lightly. This will represent rooted plants that would not easily erode away.
8. Fan the farm scenes again. Most of the plant material should stay put, as will the soil. Some may blow away, but remind learners that plants with established roots help hold soil in place.



Part B: Water Erosion

1. Discuss how water erodes the landscape. Mention natural erosion of streambeds, mountain canyons, and coastal areas. Then discuss negative impacts of water erosion that can be related to human activities (flooding, landslides, etc.)
2. See the Water Erosion Diagram A on how to set up the Water Erosion board (instructions under Getting Ready). Use a cup with one hole and straw to do a focused stream of water. Alternatively, a spray bottle may be used.
3. Learners should set up their erosion board with soil and a few rocks.
4. Have learners predict what is going to happen when a hard
5. 'rain' hits their site.
6. Proceed to pour water in the cup or spray water on the Erosion board. You may need to slightly incline the board. Make sure to add enough water that the soil starts to erode away.
7. After the first erosion test, ask: What might happen later to the soil and rocks washed down the slope?
8. Get kids to clean off the erosion board and add a new soil layer.
9. Repeat with the boards at a higher angle/slope. Ask: Why would water flowing down a steeper slope wash away more soil and bigger rocks? (The water has more energy.)
10. Challenge kids to contain the erosion. Create a landscape to control water flow by packing soil around stones, sticks, leaves, roots. Reinforce the need for plant cover to prevent different types of soil erosion.

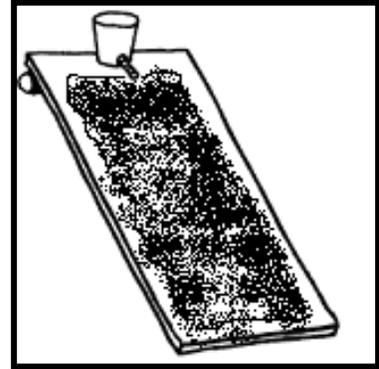


Diagram A

Part C: Save the Soil!

1. Pass out a piece of construction paper and crayons, colored pencils, or markers to each learner or team of learners.
2. Ask them to make a poster about the importance of soil and the negative impacts of soil erosion. Challenge them to be creative in making up slogans and drawing pictures.
3. Allow learners to share their posters with other members of the group.

Discussion/Assessment:

Is erosion a natural process of Garden Earth?

When is erosion a problem?

What can we do to reduce erosion?