



Earth Science Education Activity

Impacts of Groundcover on the Erodibility of Soil

Background: Soil erosion can be detrimental to soil productivity and can release carbon into the atmosphere as carbon dioxide or methane. Erosion can occur through water or wind action. How easily a soil can erode is called its *erodibility*. There are many factors that influence the erodibility of soil, one of which is groundcover. Soil that is covered in grass or plants is said to have groundcover, whereas bare soil lacks groundcover.

Key Question: How does groundcover impact soil erosion?

STANDARDS

NGSS: MS-ESS3-2

SDG 2: Zero Hunger

SDG 11: Sustainable Cities and Communities

SDG 13: Climate Action

Learn more about the United Nation's Sustainable Development Goals (SDGs) and explore resources for educators from UNESCO: <https://en.unesco.org/themes/education/sdgs/material>

MATERIALS

- ◆ large rectangular plastic food container, or similar
- ◆ toilet paper
- ◆ toothpicks, 10–30
- ◆ sand, about 1–2 cups
- ◆ squirt bottle with a mist function
- ◆ water, about 1 cup
- ◆ thin textbook, or similar, to prop up the plastic container
- ◆ Web Soil Survey maps and image handouts



Streambank erosion can be a major contributor of sediment to downstream waters.

Photo by John A. Kelley, USDA Natural Resources Conservation Service



An example of sheet erosion showing how small rocks can protect the surface of the soil from the impact of rain drops.

Photo by John A. Kelley, USDA Natural Resources Conservation Service

U.S. Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) • www.soils.usda.gov

The USDA NRCS delivers science-based soil information to help farmers, ranchers, foresters, and other land managers effectively manage, conserve, and appraise their most valuable investment — the soil.

HANDS-ON INVESTIGATION

1. Create an even pile of sand at one end of the large plastic container.
2. Place 1–4 sheets of toilet paper over half of the sand to represent cover crops. Leave the other half of the sand bare.
3. Stick 10–30 toothpicks vertically into the toilet paper to represent trees and plants with deep roots.



Credit, both: L. Brase, AGI

4. Set the end of the plastic container with the sand on a book so the container is at a slight angle.
5. Make predictions as to what might happen when the model is sprayed with water.
6. Using a squirt bottle set to mist, evenly spray the model with water until noticeable changes occur.

ANALYSIS

1. What did you observe as the model was sprayed with water?
2. What comparisons can you make between the covered and uncovered sand after the water was sprayed?
3. Why do you think the model behaved the way it did? Explain your thoughts using evidence from your observations.
4. How could this model apply in the real world?
5. Discuss the connection between soil erosion and the loss of fertile topsoil. Why is it important to prevent soil erosion?

SYNTHESIS

Look around outside and note areas near you that are covered in pavement, bare soil, and vegetation. Describe the area with words, a map, and/or a diagram. Make a claim about the erodibility of the soil at different locations near you. What areas would you predict to have a high erosion potential? What evidence do you see to support your claim? Explain your reasoning using evidence from this activity and your observations.

EXTENSION

Examine a soil erodibility map of your location and make comparisons with your claim above. Why might certain areas be susceptible to soil erosion? Are areas susceptible for the same reasons as the soil in the model? Are there other factors that may be affecting erodibility? What actions could people take to decrease erodibility? Why is this particularly important in this specific area (consider both the community and the local environment)?