



Turf Mutt Lesson Plan #4

Title: Soil Erosion and Runoff

Grade Level: 3-5

Lesson Overview: In this lesson, students will investigate the role plants, grasses and trees have in preventing soil erosion. Soil erosion can be damaging because soil, chemicals and other particles travel into water sources. After students discover that planted material can help keep soil in place, they will extend their understanding of run-off by exploring ways that people in their community can keep chemicals and dangerous substances out of our streams, rivers, and oceans.

Learning Objectives:

Students will be able to:

- Identify some causes and effects of soil erosion.
- Observe erosion results made with different materials and draw conclusions about the best ways to reduce erosion.
- Explain how planting grass and other plants can reduce erosion and run-off.

Time Frame:

Two forty-five minute sessions plus one extension and one assessment session

Materials for the teacher:

- Dirt/Soil (clean, dry soil is best for this exercise)
- Plastic cover sheet for a table
- Small table fan (only needed as a prop)
- Garden hose (small section will suffice)
- Photographs (included in this lesson)
- Computer with projection device

Materials for students:

- Aluminum baking pans (at least 5cm deep and 40cm – 50 cm long)
- Empty 2 liter bottle with cap (prepare cap by drilling small holes so that water comes out evenly)
- Water supply
- Large blocks or other means to raise one end of the pan so that it has a slope
- Small blocks of wood (5cm – 20cm long, should fit easily within the pan)
- Large plastic tubs to catch runoff
- Computers with internet connection
- Small plants, may be seedlings or tufts of grass with the roots attached (keep the roots moist)
- Craft sticks or other sticks that can be planted in the soil
- Plastic wrap or other materials that students can experiment with in controlling soil erosion
- Science notebook or other means for recording ideas, data and conclusions.
- Optional: inexpensive digital camera to record the erosion test

Classroom Activities:

Session 1:

Engage

1. Show students a small pile of loose dirt on a table in the classroom, as well as an oscillating fan and a garden hose or bucket of water. Ask students to predict what might happen if either of the items were used on this pile of dirt.
2. Use the computer and projection device to show students the images of erosion. Ask what might have shaped the rocks. What happened to this car? Why are the tufts of grass sticking out above the rest of the land? Record students' thinking on a piece of chart paper. You will want to keep these comments and come back to the images once students have studied erosion more closely.
3. Ask students the following essential questions:
 - a. What events in nature might cause dirt or soil to be moved from one place to another?
 - b. Why is it important for dirt or soil to stay in its place in our natural environment?
 - c. What things can be done to help keep soil in its place?
4. You may wish to have students record their thinking in science notebooks or record their responses on chart paper.

Explore

1. This hands-on investigation is usually best done outdoors. (Indoors requires a plastic tarp to handle spills. Using a tarp is usually a good technique for outside investigation as well.) There are a few different options for this exploration, depending on what resources are available to you. The ideal exploration would take place outdoors either on a paved slope or sidewalk. If this is not available, a sloped plot of land where you can temporarily remove the grass material would be a good alternative. If neither of these situations are possible, this exploration can be done with a large aluminum baking pan filled with dirt and propped up to create a slope.
 - a. Divide students into groups of three or four and ask students to predict what will happen to the soil if they pour the water down the slope.
 - b. Now guide students in using the bottles with perforated caps to pour 2 liters of water onto the sloped surface mimicking rain, and observe the results.
 - c. Students should sketch the soil conditions before, during and after the activity in their science notebooks and label the parts. (Optional: Use the digital cameras to photograph before, during and after. Students can download the images and add text to them for labels. The images can be projected so that all students can view the data.)

Explain

1. Have students share the images they collected/drew.
2. They should refer back to the essential questions you gave them and develop answers for the first two. They will be asked to share their ideas about how to prevent erosion during Session 2.

Extend

1. If time allows, you may wish to have students look around the school grounds or their neighborhood for signs of erosion. They should look for erosion, as well as steep hills where erosion is not taking place. Encourage them to think about what is keeping erosion from happening on those hills.

Session 2:

Explore

1. Today, students will try out some ideas for stopping or slowing erosion. They will repeat the soil erosion test, but this time make a different environment on the soil.
2. Provide them with the variety of materials to try planted grass tufts, mulch on top of soil, soil with small plants. Have them predict how the different environments will withstand erosion and then instruct them to run their tests and record their results in their science journals.
3. Be sure to have them repeat their data collection. If it is possible to use a digital camera, repeat the same camera angle and location for the photos so that they can be compared side by side with the base line test from day 1.
4. Students can share the results from their group with the whole class. Then, the class can compare the different materials used and determine the best environment for the least amount of soil erosion.

Beyond Day 2:

Extend

1. To explore the difference between porous and impervious materials and how they may affect soil erosion runoff, repeat the hands-on investigation using sand or sawdust.
2. Give students a definition of each term, and ask them to name and draw three examples of each type of material. Allow students to choose a website to explore:
<http://www.oceansidecleanwaterprogram.org/kids.asp>
http://www.epa.gov/owow_keep/NPS/index.html
Students can pair up with a classmate who read information from the other website and compare the information they found.
3. Use [Google Earth](#) to show areas of the Southwest United States where erosion has formed the landscape. Canyon areas in Arizona, Utah, and Oregon are good locations. You may wish to have them compare these to a delta, such as the Mississippi delta. Have students look for vegetation in each area.

Explain

1. <http://www.epa.gov/owow/NPS/kids/whatwrng.html>
Ask students to choose one area that was “wrong” from the picture and explain why it’s wrong in ten words or less. Then, using the Jigsaw strategy, form groups of students who chose different areas of the picture to share their findings with their classmates.

Evaluate

1. Students can identify erosion control opportunities around their school or house and present a proposal to their school principal or parents. Students will be graded on the following criteria:
 - a. Did the student identify and describe an area where erosion was a problem?
 - b. Did the student draw or take photographs of the area?
 - c. Did the student identify two possible solutions to the problem area?
2. Students can create a “Do and Don’t” list for a school newsletter demonstrating their ideas about drainage and soil erosion to provide suggestions for preventing erosion to people in the community. Students will be graded on the following criteria:
 - a. Did the student create a title and explain the purpose of the list?
 - b. Did the student include at least 3 do’s and 3 don’ts in the list?
 - c. Did the student make suggestions of how community members can make a difference for the environment?

Use this lesson toward your *Landscapes Across America* contest submission!

1. Complete the “Extend” Activity in Session 1 and walk around your school grounds and neighborhood together to look for signs of erosion. Guide students in discussing why erosion may or may not take place in certain areas.
 - a. How do plants and other turf effect erosion?
2. When you get back to your classroom, display the photographs that the students took previously and lead a brainstorming session about how these specific plants effect erosion in your region.
 - a. What benefits do these plants have on the environment?
 - b. How do these plants protect your local ecosystem?
 - c. Consider how your region is unique when compared to other regions of the United States, in regards to plants and erosion.
3. Record your students’ observations to include in your classroom slideshow.

National Science Education Standards addressed in this lesson:

- 4DESS3.1 The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
- 4FSPSP4.2 Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.
- 4FSPSP4.3 Some environmental changes occur slowly, and others occur rapidly. Students should understand the different consequences of changing environments in small increments over long periods as compared with changing environments in large increments over short periods.
- 4EST1.2 Propose a solution. Students should make proposals to build something or get something to work better; they should be able to describe and communicate their ideas. Students should recognize that designing a solution might have constraints, such as cost, materials, time, space, or safety.
- 4EST1.4 Evaluate a product or design. Students should evaluate their own results or solutions to problems, as well as those of other children, by considering how well a product or design met the challenge to solve a problem. When possible, students should use measurements and include constraints and other criteria in their evaluations. They should modify designs based on the results of evaluations.

Images of erosion and erosion damage:



