

EFFECTS OF EROSION

GRADES 6-8

This activity was designed as a companion for the song “Don’t Treat Mother Earth Like Dirt.”

BACKGROUND

The song “Don’t Treat Mother Earth Like Dirt” is all about respecting and taking care of our precious and fragile Mother Earth. When we treat something ‘like dirt’ it usually means we act without really caring about what happens to it and therefore do not try to conserve the value it provides.

In fact, we like to call ‘dirt’ soil in order to give it credit as one of our greatest, most fundamental resources. We need healthy soil to grow food for humans and other animals, and products that we use on a daily basis. We can all see things that live on the soil such as plants, animals, and people, but there are also a lot of things that live in the soil. Some of these soil organisms are big enough to be seen, while others are so small they can only be seen with a microscope. These organisms help keep the precious soil healthy.

OBJECTIVE

Students will first become familiar with soil and erosion terminology, identify pictures of different types of erosion, and discuss forces and actions that cause and prevent erosion. They will also complete an activity to learn about the many helpful creatures that live in topsoil.

In Part I, students will begin to see how vital it is to work together to conserve our soil (especially topsoil), keeping it in place, and protecting it from erosion.

In Part II, student teams will make observations on the school grounds or in other parts of the community to identify evidence of erosion. The class will then come together to talk about how and where they identified erosion, why it is important that we try to minimize erosion (especially thinking in terms of what was learned in Part I), and how they can devise possible solutions for correcting problems they identify.

PART I - EROSION DISCUSSION

TEACHER PREPARATION

- For each person in the class, photocopy “Right Beneath Your Feet” on page 3 and “Bugs In The System” on page 4 of: <ftp://ftp-fc.sc.egov.usda.gov/MT/www/about/SoilAlive508.pdf>
- Pictures of different types of sedimentation and erosion are found at the end of this activity. Print these out to supplement the class discussion.



A river is increasing in sediment as surface runoff increases. The sediment is from upstream soil erosion.

INSTRUCTIONS

1. Have the class individually complete the activities “Right Beneath Your Feet” and “Bugs In The System” referenced above.
2. Define erosion and discuss the different mechanisms of how erosion can occur.
3. Ask students what they think may be some negative effects of erosion. Elaborate on their talking points with the following ideas:

Sedimentation in rivers

- Pollutes water with soil particles
- Damages water ecosystems through reduced sunlight for aquatic plants and animals
- Increases water treatment costs for human use
- Reduces the depth of rivers, creating waterways that can't be navigated by commercial crafts

Removal of topsoil from land areas

- Reduces plant growth
- Reduces the ability to grow crops, lawns, and gardens
- Reduces agricultural food production
- Reduces farming income
- Alters ecosystems, thus reducing biodiversity

Wind erosion

- Increases the amount of particles in the air
- Reduces visibility and air quality
- Causes breathing problems (asthma, etc.)

DEFINITIONS

Erosion: The wearing away of rock and soil material from the Earth's surface.

Splash erosion: The spattering of small soil particles caused by the impact of raindrops on soils. The loosened and spattered particles may or may not be subsequently removed by surface runoff.

Wind erosion: The process of small rocks, sand, and silt being blown across the land; most destructive in areas where there is little to no ground cover.

Running water (fluvial) erosion: The force of moving water dislodging rocks and other solid particles which are carried along by the water. These particles scrape and scour the soil, loosening it and carrying it away.

PART II - GROUP ACTIVITY: FIND EROSION!

MATERIALS

- One camera per group
- One clipboard per group
- One piece of paper for observation per group
- One pencil per group

INSTRUCTIONS

Divide into groups of four or five people, distribute materials listed above to each group, and tell them they are each going to a location in the community to look for signs of erosion.

Assign each group a location in your community. Possible locations include a school parking lot, at the foot of a hill in a park, someone's yard, on the side of a road, or creeks and streams in the area that you have determined shows signs of erosion. (Look for mud along sidewalks, near street gutters, in a field or yard, for example.) You may wish to send a chaperone with each group. Inform each group that they will have the class time to go to their assigned spot, look for signs of erosion, take pictures of them, and write down observations guided by the following questions:

- Describe the physical location in detail.
- What are your first impressions of this area or situation?
- Record one or more hypotheses to explain your observations and/or answer your questions.
- Talk about the size and shape of the erosion, detailing any evidence you observe.

DEFINITIONS

Soil: A loose, thin layer of earthen materials composed of decaying organic matter and weathered minerals which provides nutrients, physical support, and enough air and water for plant growth.

Erosion: The wearing away of rock and soil material from the Earth's surface. It occurs in two forms:

- Earth processes which move material on the Earth's surface over long periods of time, such as weathering and gravity
- Human activity which moves material on the Earth's surface over short periods of time, such as residential and commercial development, farming, etc., that results in the alteration of the landscape and surrounding ecosystem

Organic Matter: A part of any substance which once had life, like plant and animal residues such as leaves, trimmings and manure in various stages of decomposition.

Sedimentation: The process of depositing sediments (loose soil) which have been transported over some time and distance. Sedimentation is caused when something carrying the sediment has to deposit it in an area and the sediment begins to build up. Examples include:

- Gravity causes sediments to move down the slope of a mountain or hill and they are deposited at the base of the slope
- Sediments carried by wind or water are released because currents are slowed and lack the force to continue moving them
- Glaciers melt and the carried sediments are deposited in one area
- Materials that have dissolved in water are left behind as the water is evaporated

In the next class period, after all groups have come back together, discuss the groups' findings as a class and summarize the activity with these points:

How does erosion affect my world and why does erosion tie into treating Mother Earth "like dirt"?

- Removes valuable layers of topsoil so plants and animals may not survive
- Decreases crop production so availability of food decreases
- Lowers water quality so less fish and plant species can survive
- Food sources may become scarce, causing food shortages and/or food prices to rise
- Taking these consequences into account, we must respect Mother Earth and view 'dirt' as soil - a living and precious resource.

What are the different kinds of erosion we've discussed?

- Splash erosion
- Wind erosion
- Fluvial erosion

How do humans contribute to erosion?

- Agriculture, especially bare soil from tilling
- Residential land use
- Logging
- Construction in rural as well as urban areas
- Road building
- These are all very important processes to society for economic and social purposes. However, human actions often contribute to removing existing vegetation, so careful planning helps to minimize damage to the earth.

What can we do to practice soil conservation, protecting it from erosion?

- Talk to your friends, family, and community members about the erosion you observed in the local community and what can be done to minimize it
- Plant native grasses, shrubs, or ground cover plants to anchor soil and provide habitat for local wildlife
- Learn more about the amazing billions of creatures that live in and on the soil and make it healthy
- At home, plant taller or more native grasses that keep the ground protected
- At home, leave grass clippings, compost, and leaves on the lawn to use as organic matter that helps plants grow – try to keep people from walking on this area and compacting the soil
- In agricultural fields, use cover crops between growing seasons to help protect soil
- In agricultural fields, avoid intense tilling or turning over the soil too much, as tilling leaves soil loose and unprotected from wind and water so it can be carried off more easily

IS IOWA TREATING MOTHER EARTH LIKE DIRT?

Here are some facts to share and discuss:

- On average in Iowa, we are losing an inch of soil every 10-15 years, but it takes 500-1000 years for Earth to make one inch of topsoil. That means soil erosion is happening much faster than it is being created.
- Erosion in Iowa averaged 5.2 tons per acre per year, only slightly higher than the allegedly “sustainable” rate of five tons per acre per year for most Iowa soils — the amount that can supposedly be lost each year without reducing agricultural productivity. Across the entire Corn Belt, erosion averaged only 3.9 tons per acre per year, according to the NRCS data.
- In some places in Iowa, however, recent storms have triggered soil losses that were 12 times greater than the state average, stripping up to 64 tons of soil per acre from the land. Farmland in 440 Iowa townships encompassing more than 10 million acres eroded faster in 2007 than the “sustainable” rate. In 220 townships totaling 6 million acres, the rate of soil loss was twice the “sustainable” level.



Dust and sand storms are the most common forms of wind erosion.



Dry soils and heavy wind lead to heavy wind erosion.



A common form of erosion in Iowa is “ephemeral gullies.” During heavy rains, these gullies reappear rapidly on unprotected soil and form “pipelines” that swiftly carry away the water.



Streambank erosion is a contributing factor to sedimentation in rivers.

RESOURCES

For more information on erosion in Iowa, visit the Environmental Working Group's "Losing Ground" report: <http://www.ewg.org/losingground/>

For more information about the difference between dirt and soil, read this introduction: <http://www.butlerswcd.org/Education/KidsSoil.html>

To learn more about soil biological communities, see: <http://www.blm.gov/nstc/soil/communities/index.html>

To read more about soil threats, soil case studies, how long it takes soil to form, and much more: <http://soil.gsfc.nasa.gov/index.php?section=7>

For two great booklets of puzzles, pictures, and more related to soil, see:
<ftp://ftp-fc.sc.egov.usda.gov/MT/www/about/IDigDirt4.pdf>
<ftp://ftp-fc.sc.egov.usda.gov/MT/www/about/SoilAlive508.pdf>