Erosion

GRADE LEVELS: 3rd through 5th grade

CONCEPT:

Uncover the processes that create and shape a stream by creating a model that demonstrates the dynamic interactions between water and substrates.

OBJECTIVES: Participants will be able to:

- Understand and manipulate flow in the role of erosion
- Understand and manipulate slope in the role of erosion
- Experience how different substrates are affected by erosion

CONTENT STANDARDS:

Science: Earth Science: 3.3, 3.5, 4.8, 4.9, 4.10, 5.6
Science: Scientific Inquiry: 3.1, 3.2, 3.4, 4.1, 5.1
Science: Scientific Ways of Knowing: 3.4, 3.5, 4.1, 5.2

VOCABULARY WORDS:

Erosion- The moving or washing away of soil by water.
Slope-ground that has a natural incline
Flow-The movement of a liquid
Sediment-Any loose material including sand, mud or gravel that is washed off by erosion and carried by a river or other eroding force.

EXTENSIONS AT COSI:

Big Science Park –Prairie. Learn what role prairies play in erosion.
Ocean-Erosion Table. Observe the process of erosion through sand.

ADDITIONAL RESOURCES:

http://www.whoi.edu/seagrant/education/focalpoints/erosion.html
http://www.dnr.state.oh.us/soilandwater/water/streammorphology/default/tabid/9188/Default.aspx
http://en.wikipedia.org/wiki/River_morphology

SAMPLE TEST QUESTIONS:

1. Erosion is more common on _____.
   A. Level Ground
   B. Steep Slopes
   C. In Valleys
   D. On small hills

2. How does erosion affect topsoil?
   A. Keeps it moist
   B. Makes it more fertile, easier plant growth.
   C. Washes it away
   D. Moves the topsoil to other areas where it is needed more.

3. What is a human influence that causes soil erosion?
   A. Farming
   B. Raising livestock/farm animals
   C. Construction
   D. All of the above

4. Why is soil erosion more common in areas where there are not many plants/trees?
   A. The plant roots keep the soil in place.
   B. Plants make the soil more fertile.
   C. Plants produce special nutrients to keep the soil in place.

Erosion Pre Visit Activities

Identifying Erosion

Objective: Students will be able to identify erosion and explain the causes of erosion.

Materials:

- potted plant
- soil
- water
- rocks
- disposable aluminum pans
- container for water
- newspapers

Procedure:

Day 1--

Class demonstration (20 minutes):

1. Take a potted plant out of the pot, with soil intact. Discuss how the roots of the plant help to hold the soil in place. Ask what would happen if the plant was not in a pot, but in the ground and water keep running over it. Introduce the term erosion and discuss how wind, water, and ice can cause erosion. Ask students if and where they have ever seen the effects of erosion.
2. Explain that the class is going to go out to the playground to examine the effects of erosion on our playground and surrounding school property. Ask students to remember how plants hold soil and to pay special attention to the placement of trees and shrubs on the school grounds. Students will be asked to take a pencil and notebook to write and draw evidence of erosion on the school property.

Outside activity (25 minutes):

1. As a class, point out evidence of erosion on the school grounds. Some good examples are often near drains, drain pipes, and at the edges of the blacktop.

2. Then have the students pair up with a partner to examine the rest of the area to look for other signs of erosion. Don't forget to set boundaries where students may explore.
3. When students find examples of erosion, they are to describe it in their journals and draw a labeled rough sketch of the erosion.

Closing discussion (15 minutes):

1. After students are back in the room, ask them to share what they have written in their journals about the effects of erosion on the playground and school property.
2. Ask if anyone noticed the placement of trees and shrubs. Ask the students if the trees and shrubs were placed in particular areas to help stop the effects of erosion.

Day 2--

Classroom review (10 minutes)

1. Review the term erosion and how plants help stop erosion.
2. Discuss the forms of erosion that were witnessed on the playground and school property. Explain that most of the erosion that was witnessed on the playground was caused by water.

Computer Activity (20 minutes):

1. Have students view the effects of wind, water, and ice on soil and rocks by going to these sites. Instruct students to read the information and view the pictures.
    - Wind Erosion - http://www.uwgb.edu/DutchS/EarthSC202Slides/WINDSLID.HTM
    - Water Erosion - http://science.nationalgeographic.com/science/photos/weathering-erosion-gallery/#baffin-island_832_600x450.jpg
    - Glacial Erosion http://science.nationalgeographic.com/science/photos/weathering-erosion-gallery/#bernard-glacier_835_600x450.jpg

Follow-Up/Extension Activity (20 minutes):

1. Provide each pair of students with a disposable aluminum baking tray, enough soil to fill the tray, water, small container, newspapers and some rocks. Cover each working area with newspapers.
2. Instruct students to fill their tray with soil, patting down to firm in place. Position rocks in the soil so that they cannot move about freely.

3. Place the narrow side of the tray filled with soil and rocks on a book, so as to place the tray on a slant.
4. Next have one of the students pour little drops of water, starting at the highest part of the tray, so the water can run down the soil.
5. Ask students to notice if any changes are taking place in their trays. See if the soil or rocks are moving out of position.
6. Direct the other student to pour larger amounts of water at the highest part of the tray. Again, ask the students to describe what changes are taking place in the tray. Are they seeing signs of erosion?

An Apple as Planet Earth

Description: Students will see in this demonstration how much of the Earth is available for habitation.

Materials:

- An apple
- A knife

Procedure:

Cut the apple according to the percentages below.

What Is Going On?

A simple illustration using an apple helps students understand the importance and limited aspect of soil as a resource. The earth is shared with about 6.8 billion people, who depend on to produce all the food, fiber and lumber to feed, clothe, and shelter them all, so that the populace does not end up hungry, naked and homeless.
The basic facts you need to complete the demonstration include:

Approximately 70% of the earth's surface is covered with water (simplify it for cutting an apple to about 75%, three-fourths)

Half of the part that is not water is in polar ice caps and high mountain ranges (1/2 of 1/4 - note use of math skills, 1/8 remains)

Of the remaining 1/8, 3/4 of it is too hot, too cold, too steep, too shallow, too wet, too dry, or has some other problem so that it cannot be used to produce the food, natural fibers and lumber to help feed, clothe, and shelter the 6.8 billion people on the planet. This leaves 1/4 of 1/8, or 1/32 of the earth's surface that is used in food, fiber and lumber production.

Keep in mind that the soil is only the thin skin (peel a fraction of the remaining slice, so that the peel hangs down. When comparing it to the actual earth, the peel will represent the surface (1-2 meters) of the earth, which is the part used to produce the food, fiber, and lumber.

Each year, the population grows, and the soil available for food, fiber, and lumber production decreases due to desertification, salinization, sodification, urban sprawl and industrial development, etc. So, farmers around the world have to produce more and more food on less and less land every year.

Erosion Post Visit Activities

How are Soils Classified?

Objective: Students will be able to list the three texture groups soils are classified in and classify a soil sample as sandy, silty or clay coil.

Materials:

- Sandy soil
- Silty soil
- Clay soil
- Magnifying glass
- water

Procedure:

1. Have the students work in pairs.
2. Obtain a sample of sandy soil, silty and clay soil.
3. Break and rub each soil sample between your thumb and finger. Describe how each soil feels.
4. Look at each sample under the magnifying glass. Compare and describe each sample.
5. Add water to each soil sample until it sticks together and you can make a ball. Then try to roll each sample into a cigar shape.
6. Can this test be used to classify sandy, silty and clay soils? How?
7. If the sample will roll into a cigar shape, let is dry overnight.
8. After the sample dries, does it still hold it shape?

Extensions:

- Obtains soil samples from various locations around the school yard and have the students classify them.
- Have the students plant beans in each of the different soil types and compare the growth rate of the plants.

What is going on?

Soils are composed of mixtures of mineral and organic materials, but are classified according to the size of their mineral particles. The three main texture groups are sandy, silty, and clay.

Sandy soil contains particles that can be seen with the naked eye and feels gritty when rubbed between the thumb and Forefinger. Sandy soils will generally not stick together when wet.

Silty soil contains particles which are smaller than sand particles but larger than clay particles. Silt feels powdery when rubbed between thumb and Forefinger. Silty soil sticks together when wet, but will not hold its shape after it is dry.

Clay soil contains the smallest sized particle. Clay particles form a sticky soil when wet and will generally hold a shape after drying. Soils are rarely composed of just sand, silt or clay. They are usually a mixture of the three with a larger percentage of one size of particles.

Edible Soil

Objective: Students will create layers of soil using food.

Materials: (per student)

- Clear plastic cup
- An Oreo cookie
- Crumbled cookies
- Prepare vanilla pudding
- Prepared chocolate pudding
- Gummy worms
- Sprinkles (Jimmys)

Procedure:

1. Put the Oreo cookies at the bottom of the cup.
2. Place crumbled cookie next.
3. Put vanilla pudding next.
4. Next layer is chocolate pudding, add gummy worms to this layer.
5. Sprinkle jimmys on top.

What is going on?:

Bedrock – Oreo cookie in the bottom of the cup.

Bedrock is solid rock. Parent material is formed from the bedrock after a long weathering process. There are two basic ways that weathering can happen – physical and chemical. Physical weathering includes things like wind or water erosion, glacial activity, freezing and thawing, and biotic activity (plant roots, animals, micro-organisms). Chemical weathering includes leaching, oxidation, carbonation, and hydration.

Parent Material – Crumbled cookies as the next layer.

This is the C horizon in a soil profile. It is called the parent material because it is the weathered rock and partly weathered soil from which the soil layers above are formed. What influences does the parent material have on the other horizons? (Size of the particles would determine the texture of the soil.)

Subsoil – Vanilla pudding as the next layer.

This is the B horizon from the soil profile. Why is it lighter in color than the A or O horizons? It is lighter in color because it has less top soil and organic matter.

Topsoil – Chocolate pudding as the next layer. Add a gummy worm to the pudding.

This is the top layer of soil. Nutrients, bacteria, fungi, and small animals are abundant. Plants thrive in it because of the nutrients in it.

Litter – Sprinkles on the top.

The sprinkles represent the organic matter. This layer is usually less than an inch thick. Litter decomposes into nutrients that enrich the soil. In areas where the temperature is lower, the composition of organic matter is slower.