Soil Splash Zone

Purpose: This lesson introduces students to soil conservation. Students will be able to demonstrate splash erosion and determine its impact on bare soil

Time: 45 minutes

Level: 5

Materials:

- *Splash Zone Target*
- *Splash Zone Graph*
- About 5 teaspoons of dry soil
- Eyedroppers
- Water
- Rulers

Erosion Terms

Sheet erosion – washing away of a thin surface layer of soil over a large area of land

Rill erosion – Water forms small, well defined channels that carry soil away from the sides and bottom of these channels

Gully erosion – Large rills or channels called gullies form in the soil by rushing water. Tons of soil from the sidewalls and bottom of the gully are removed.

Minnesota Science Standards and Benchmarks

5.3.1.2.2 Explain how slow processes, such as water erosion, and rapid processes, such as landslides and volcanic eruptions, form features of the Earth's surface.

Background

The soil beneath our feet is as important as the air we breathe and the water we drink. Soil does all of the following things that affect our survival and quality of life: sustain plant and animal life, regulate water flow, filter and detoxify water, store nutrients and allow them to complete their life cycle, support structures like homes, schools and roads. Agricultural land and forest land cover two-thirds of Minnesota's soil. Whose responsibility is it to care for this soil? Farmers and foresters have a big role to play, but everyone must help conserve the soil. The goal of soil conservation is to preserve and protect the soil resources so they can continue to impact every ecosystem for many years to come. One large factor that affects soil is erosion.

Erosion is a natural occurring process where soil particles are loosened, transported and relocated – usually due to wind and/or water. The rate and extent of erosion is affected by the type of soil, slope of the land, plant cover, land use and climate. Erosion can negatively affect areas because high quality, fertile soil can be destroyed and removed. In addition, water erosion can bring eroded soil into streams and rivers. These sources for clean drinking water can be turned into health hazards. Soil conservation methods can be used to try to limit erosion and keep soil in its place. A few examples are:

- **Cover crops** - a plant or crop is grow in the soil so the bare surface of the soil is protected from rain erosion. The roots also help hold the soil in place and allow water to infiltrate and percolate through the soil.
- **Contour planting** – planting crops around the curve of a hill rather than up and down the hill
- **Terracing** – farmers can build terraces or wide ridges that go around a hill, to prevent water from rushing down the ill to fast
- **Grassed waterways** – Instead of plowing low areas where water collects, farmers leave grass and other vegetation to keep soil in place.
- **Mulching** – covering soil with a layer of wood chips or other material to prevent water and wind from eroding the soil.
- **Windbreaks** – Rows of trees and shrubs are planted to slow down the wind and prevent soils from blowing

This lesson will focus on water erosion. The most common forms of water erosion are raindrop or splash erosion, sheet erosion, rill erosion and gully erosion. Splash erosion is most obvious on bare ground during hard rainstorms. The raindrops strike the ground and upon impact break soil particles apart, splashing these particles into the air. The impact of this erosion can be lessened by plants or another material covering the soil. This lesson will focus on the affects of splash erosion. The remaining types of water erosion are defined in the column to the left for reference.

Procedure

1. Display a plant growing in a pot of soil. Also show some "dirt" on the floor or clothes/material that has dirt on it. Ask students:
    a. What is the difference between the soil in the pot and the dirt on the floor? (*Dirt is what we wash off our clothes, vacuum out of our carpet and clean from under our fingernails. Soil is the dirt-like material that contains nutrients and supports the growth of plants that animals and humans depend on. Soil is a complex mix of ingredients: minerals, air water and organic matter.*)
    b. What would our school, community, state, world, etc. be like without soil? (*We could not survive! No food, shelter, clothing)*
    c. What factors can cause the soil to be destroyed or negatively impacted? (*pollution, overused by humans, erosion*)
2. Use the background information to explain wind and water erosion. Inform students that you are going to investigate the impacts of splash erosion.
3. Divide your class into teams of 3-5 students. Give each team a *Splash Zone Target*, eyedropper, and water.
4. Instruct students to place enough soil (about 1 teaspoon) in the center of their target to just cover the center circle.
5. Fill the eyedropper with water and hold it about 12 inches above the sample.
6. Drop 5 drops of water directly onto the soil sample. If a drop misses the soil, continue until 5 drops hit the soil.
7. Instruct students to count and record the number of soil splashes visible in each zone on the target.
8. Each group should complete the *Splash Zone Graph* using the information they observe.
9. Have each team share their splash zone target and graph with the class. Lead a discussion or have students record their thoughts to the following questions – using the targets and graphs as a reference.
    a. What did you observe?
    b. How did the soil particles move from the center of the target?
    c. Which zone contained the most number of water drops with soil particles? Why?
    d. Which zone contained the least number of water drops with soil particles? Why?
    e. Why do farmers want to try to prevent splash erosion?
    f. How might you or a farmer try to prevent splash erosion?
    g. How would you decide which erosion control method to use?

Additional Activities

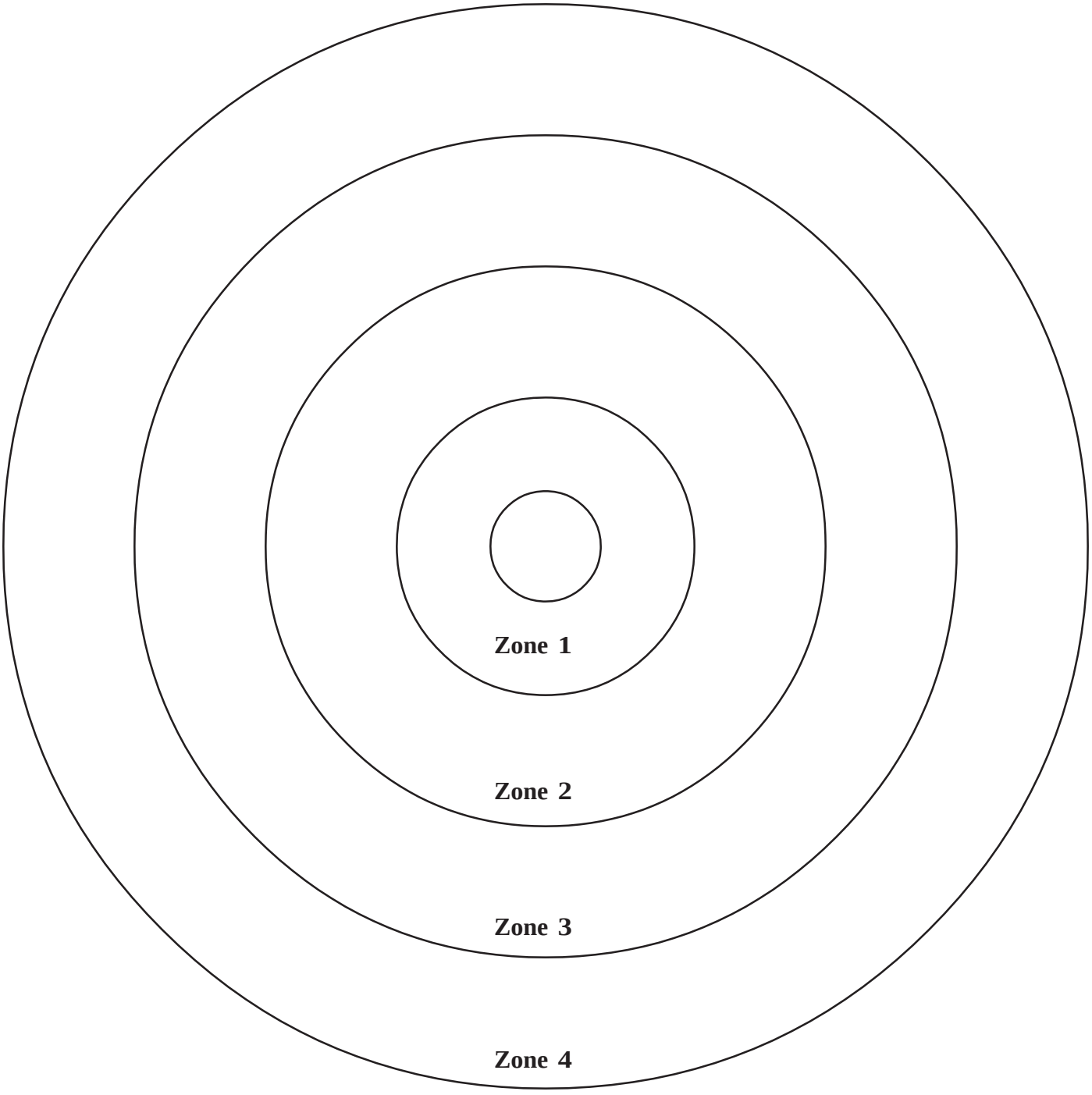
- Use the videos from the MN Ag in the Classroom *Agriculture: Serving Science and Society* project (DVD or on-line stories) to learn about soils in MN and throughout the world. http://www.mda.state.mn.us/kids/videostories.aspx
- Walk around your school or community and look for signs of erosion – especially after a rainstorm. Encourage students to brainstorm strategies for preventing erosion that would work in different locations.

Resources

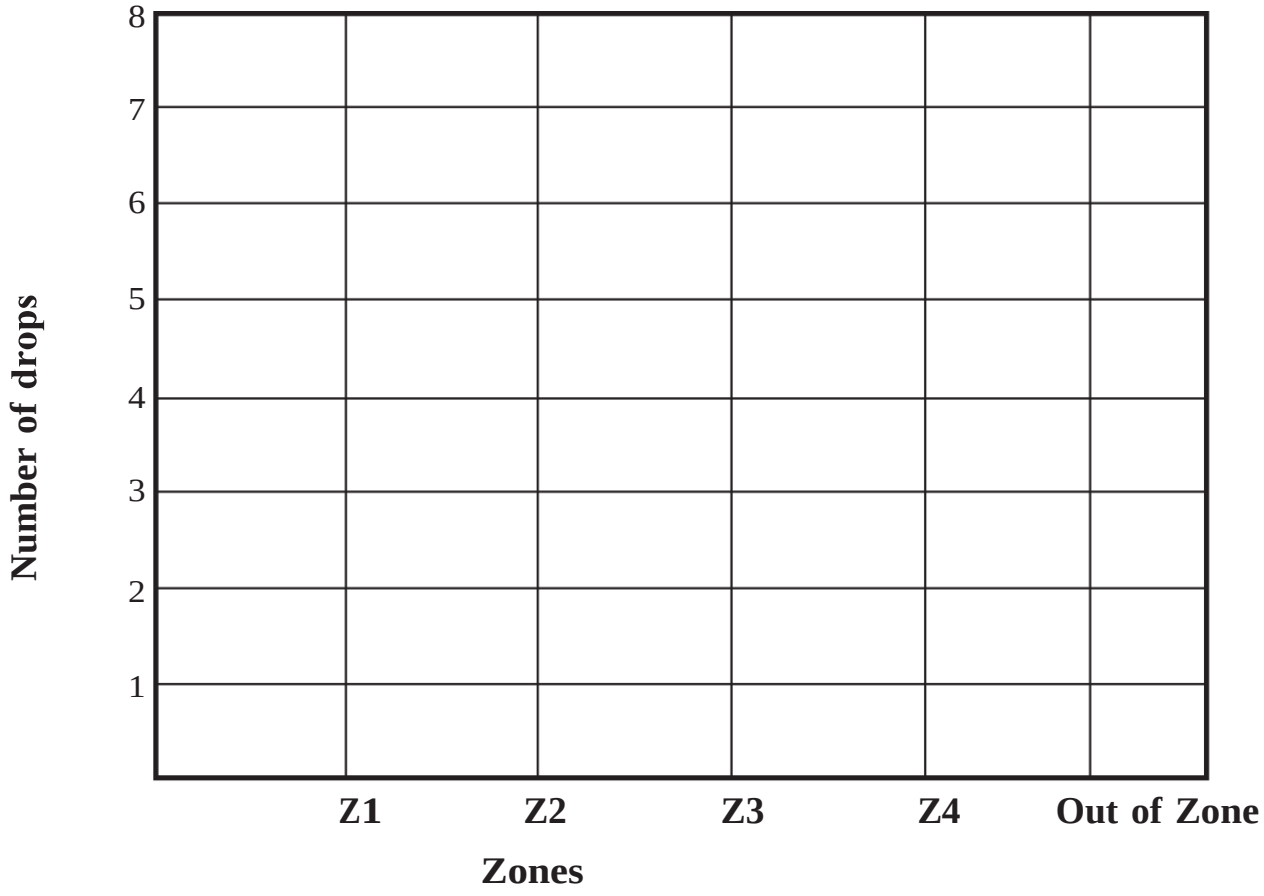
- The book *Dirt, the Scoop on Soil* is book that discusses the nature, uses and importance of soil and the many forms of life that it supports. This book is available through the MN Ag in the Classroom Children's Literature Book bundle.
  http://www.mda.state.mn.us/kids/childrens-lit-bundle.aspx
- Many resources on soil education can be found on the web. A few to check out include:
  http://www.nacdnet.org/education/resources/soils/
  http://forces.si.edu/soils/

Adapted from Utah Agriculture in the Classroom

Splash Zone Target



Splash Zone Graph



Raindrop splash