

K-12 IYS Activity



Summary

Participants will explore various factors that influence the amount of runoff that occurs when rain falls on the landscape by simulating erosion by water. They will compare the amount of runoff and soil loss generated from a given area of bare soil, the same area with a portion covered by a grassy substance, and a portion covered with a simulated forest floor. The activity can easily be modified to explore the effects of slope, soil texture, antecedent moisture content, soil bulk density, the amount of impervious area, or soil cover (e.g., mulch, vegetation, erosion control fabrics) on runoff and erosion volume.

Learning Objectives/ Outcomes

1. To investigate the influence of vegetative cover and natural forest floors on erosion and runoff.
2. To investigate erosion effects on water quality and runoff volume.
3. To be able to define erosion, explain where eroded soil goes, and what its effects are
4. To identify or determine how to protect land from erosion; ideally, to make the connection between soil erosion and sediment in water.
5. Related topics include the ability of soil to clean water before it is eventually discharged into surface waters.

Got Clean Lakes? Thank your Soil

Materials (per student, group etc.)

For the class:

- Color photos showing erosion
- 3 small aluminum cake pans, with a notch cut in one end.
- Dry soil
- Grass clippings
- Tree leaves and twigs to simulate a forest floor
- 3 pieces of 2-by-4 lumber, each 9 inches long
- 3 index cards
- Marker
- 3 clear trash bags
- Scissors
- Three measuring cups (at least 500 milliliters)
- Watering can or spray bottle
- Water
- Broom and dust pan
- Bucket

For each student group:

- Drawing paper
- Crayons, colored pencils or markers
- Student handouts

Ages of Audience

1. Elementary
2. Middle School High School

Recommended group size?

Less than 20

Where could you offer this?

Local school

What type of room do you need?

A classroom would work, but there would need to be room to move around and do the water run-off demonstration

Type of Lesson (may be more than one)

1. Hands-on (participants touch the stuff)
2. Small group exercise/discussion critical thinking

Time Needed

1. Scientist prep time + clean up time: 30 minutes prep time
2. Participant/class time: 1.5-1.75 hours

Methods/Procedures

1. Fill the cake pans to the rim with soil. Gently tap on the floor a few times to settle the soil and add more if necessary. Use a board to strike off any excess soil and to create a uniform surface even with the top of the pan. Place grass clippings on the surface of one pan and place the forest floor mixture (leaves and small twigs) on the other.
2. Place the narrow dimension of the filled pan on two pieces of 2 by 4 and the other end of the pan on a single piece of 2 by 4. The runoff will travel the long dimension of the pan.
3. Hold or place one of the clear trash bags at the downslope end of the filled pan to collect runoff.
4. Measure 1000 milliliters (mL) of water into your watering can (or spray bottle or sprayer) and distribute uniformly over the surface of the soil in the filled pan. Try not to place water anywhere but on the soil surface and do not apply water in one place for very long. The water should be added over several minutes. The volume of water should be sufficient to generate at least several hundred milliliters of runoff. If it does not, use more than 1000 mL but keep track of the total amount of water added. After runoff has stopped, use one of the measuring cups to determine the volume of runoff.
5. Compare the runoff from each treatment and discuss what may have caused the differences.

continued...

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Discussion Questions

1. Which site (aluminum pan) experienced the most erosion?
2. If each of these garbage bags is a lake, which would you most like to swim in?
3. Which “lake” would fish prefer to live in? Where might the fishing be better or worse?
4. What would happen if:
 - a. we placed three pieces of 2 by 4 under the pan at the upslope end (increasing the slope)?
 - b. we placed a piece of sod on top of the soil?
 - c. we compressed the soil in the pan before we added the “rainfall”?
 - d. we used sand instead of soil?
 - e. we started with soil that was already wet?

Additional Resources

A similar experiment was described by Robert Gardner (2008) in *Super Science Projects about Earth’s Soil and Water*, published by Enslow Publishers.



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www.soils.org
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