

Erosion Models

Driving Question: How can I, along with my family and community, positively affect our watershed?

Investigation Supporting Question: How does rainfall on different types of land surfaces upstream affect erosion, water flow, and water quality downstream?

Goal: Students investigate the phenomena of erosion, specifically how different land surfaces impact water flow (runoff) and erosion.

Objectives:

- **Knowledge:** Students understand that surface types are part of a landscape and how each surface type affects water flow and erosion in different ways.
- **Skills:** Students demonstrate following directions, using measuring tools, and using evidence to support reasoning.
- **Values:** Students recognize that the ways we choose to use the land can have positive or negative impacts on water quality and watershed health.

Grade(s): 4th

Special Safety: Water used during the activity could get on the floor and cause a tripping hazard. Be ready to wipe up spills.

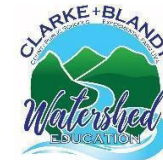
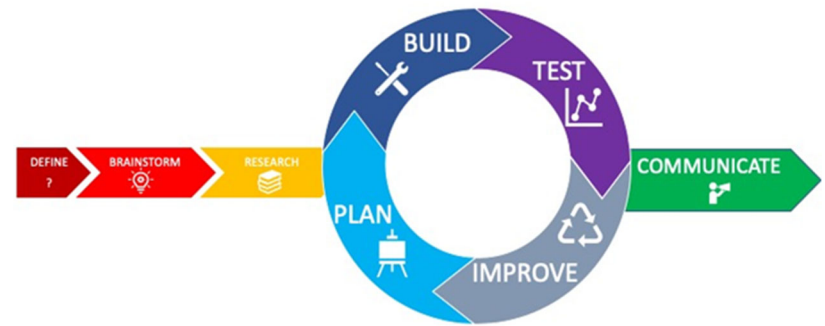
VA Standards Addressed: Science (2018): 4.1b, d, e; 4.8 a,b, d

Plants hold soil in place to reduce erosion, which aids in improving water quality. Soil is an important natural resource.

Mathematics (2016): 4.4 (data analysis in the classroom)

Materials:

- ◇ Erosion Models (clear bins with a runoff PVC pipe in the middle of one side) of Plants & Bare Soil
- ◇ Measuring beakers (1000 ml; 3/group)
- ◇ Graduated cylinders (1000 ml; 1/group)
- ◇ Water buckets (5 gallon) with a beaker in each
- ◇ small garden watering cans (1/group) (Alt: Use large yogurt containers with holes in the bottom)



- ◇ 2-gallon buckets (1/group)
- ◇ Erosion models datasheets; 1/student

Instructional Strategy:

1. Engage/Hook (How will you interest students at the start of the lesson?):

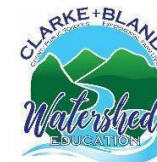
Ask: What is on your tables and what do you think we are going to do with the equipment in front of you?

2. Formative Assessment & Questioning Strategies (How will you elicit students' preconceived ideas? e.g. KWL):

Ask: What ideas do you have about how water will move over these surfaces? Talk in your group and make a prediction. Let's conduct an investigation to explore how this can happen!

3. Investigation Procedure:

- a) Teamwork! Divide students into groups of 3 students. For each group, designate a water measurer, the "rainmaker", the water collector. (Tables will be marked or designated with the roles [water measurer, rainmaker, water collector].)
- b) The water measurer transfers water from the 5-gallon container into a graduated cylinder or beaker. They use the graduated cylinder or beaker to measure 400 mL of water. The rainmaker CAREFULLY pours the water from the beaker through a watering container with holes to "Rain" on the bare soil model.
- c) The water collector holds a beaker below the model to collect runoff. (Students may use a graduated cylinder if precision and accuracy are discussed. This will vary with each class/group.)
- d) On the data sheet, all students record the amount of water in the beaker AND what the water looks like.
- e) When discussing students' observations, bring in terms erosion, sediment, and runoff.
- f) Each group will conduct up to three trials, as time allows. (Water from the bare soil models will be collected in colored 2-gallon buckets, then the entire class's bare soil runoff water will be placed into a small white bucket to be transferred from this station to the turbidity station!)
- g) Repeat steps b-f with the plant models.

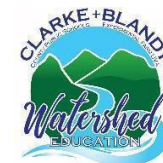


4. Discussion/Reflection:

- After it “rained” on your model, which model had the cleanest water? The dirtiest water?
- What made the water dirty?
- Run-off: We call rainwater that flows on the ground “run-off.”
- What is the process called where rainwater that flows on the ground and picks up and carries away soil particles? Erosion
- There is a special term for the soil particles once they are in the water. What is this term? Sediment
- What are some ways you think we could prevent soil erosion and deposition of sediment in our waterways from happening?

5. Extension: Draw a diagram that illustrates the process of erosion that we learned during this investigation. Label the erosion-sedimentation process components:

Run-off Soil Erosion Sediment Water quality



Erosion Models (page 1 of 2)

1. Predict

What will the water look like after it moves over the different land surfaces?	
Bare Soil	
Plants	

2. Procedure – Each team member will have one of the jobs listed below. Read through the steps before you begin testing your models. Your team will do three trials on each surface: 3 on bare soil, 3 on plants.

Water measurer

- o Measure out 400 mL of water from a large bucket into a beaker.
- o After each trial, you will measure the amount of water that came OUT of the models.

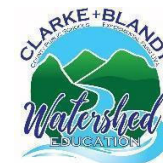
Rainmaker

- o Hold the watering container over the bare soil model.
- o Pour all the 400mL of water over the model.

Water collector

- o Hold the labeled beaker under the model's pipe to collect water. Wait until the drips slow so you collect most of the runoff water!
- o Help the **Water Measurer** read the volume of water.

EVERYONE records their data in their journal- How much water came out, what color is the water?



Erosion Models (page 2 of 2)

3. Test

BARE SOIL. Record the amount of water that flowed out of the models.

BARE SOIL	Water in?	Water out?	Can you see through the water?	What color is the water?
<i>Trial 1</i>				
<i>Trial 2</i>				
<i>Trial 3</i>				

PLANTS. Record the amount of water that flowed out of the models.

PLANTS	Water in?	Water out?	Can you see through the water?	What color is the water?
<i>Trial 1</i>				
<i>Trial 2</i>				
<i>Trial 3</i>				

4. Conclude/Synthesize

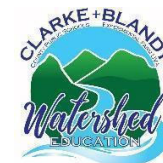
When it rains, what happens to bare soil (soil without any plants)?

When it rains, what happens to surfaces with plants?

Where does water go that runs off the land in our neighborhood?

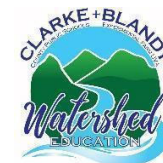
What are some things you can do to reduce erosion?

Draw a diagram to show the process of erosion you investigated. Label it with the terms: Runoff, Soil, Erosion, Sediment, Water Quality





Run off near a construction site during a heavy rainstorm. *Photo by Jon Burge. Used with permission.*





Confluence (joining) of the Shenandoah (left) and Potomac (right) Rivers after a heavy rainstorm.

Image: https://military-history.fandom.com/wiki/Harpers_Ferry,_West_Virginia?file=HarpersFerry_panorama.jpg

