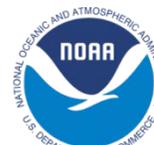


Erosion Models



Grade	4 th & 5 th
Time	45 minutes
Overview	Students investigate the phenomena of erosion, specifically how different land surfaces impact water flow (runoff), erosion, and sedimentation.
Objectives	<p><u>Understanding</u>: Students understand that surface types are part of a landscape and how each surface type affects water flow and erosion in different ways.</p> <p><u>Skills & Processes</u>: Students demonstrate following directions, using measuring tools, and using evidence to support reasoning. Students use models to explore the phenomena of erosion.</p> <p><u>Values</u>: Students recognize that the ways we choose to use the land can have positive or negative impacts on water quality and watershed health.</p>
Essential Question	How does rainfall on different types of land surfaces upstream affect erosion, water flow, and water quality downstream?
Primary VA SOL	Science (2018): 4.1, 4.8 5.1, 5.8
Related VA SOL	Mathematics (2016): 4.4, 5.8

<p>Materials</p> <ul style="list-style-type: none"> • Erosion Models: soil, native plants (1 set/group) • Measuring beakers (1000 ml; 3/group) <ul style="list-style-type: none"> ◦ Label one plants, one labeled bare soil, one blank • Water buckets (5 gallon) with a beaker in each • Rinse buckets (5 gallon) labeled "rinse" • "Rainmakers" (quart sized yogurt container with holes drilled in it) • Data sheet, clipboard, pencil (1 per student) • Erosion Model Procedure directions (1 per group) • Erosion Model Cleanup Directions (1 per group) • Optional: Paint chip cards (various shades of brown and orange for students to compare and name the colors of the runoff.) 	<p>Special Safety</p> <p>Water used during the activity could get on the floor and cause a slipping hazard. Be ready to wipe up spills.</p>
--	--

Set Up

1. For each group, set up two erosion models (one bare soil, one plants), 3 beakers, procedure and cleanup instructions, and enough clipboards, journals, pencils for all students.
2. Fill rinse and water buckets.

Instructional Strategy	
Recommended Grouping/Instructional style	Small groups (not more than 4 per group) Hands-on Modeling Activity
Steps	<ol style="list-style-type: none"> 1. Engage/Hook (How will you interest students at the start of the lesson?): <ol style="list-style-type: none"> a) <u>Ask</u>: What do you see on the tables? What do you think we are going to do based on the materials on your table? Guide student to note the models hold different surfaces, the water can drain off the models. These erosion models are a way that we can observe the process of runoff and erosion on a smaller scale to better understand the phenomena of erosion. 2. Investigation Procedure: <ol style="list-style-type: none"> a) Teamwork! Divide students into groups of 3 students. For each group, designate a water measurer, the "rainmaker", the water collector. Optional: Mark seats at tables with the roles - water measurer, rainmaker, water collector. b) The water measurer transfers 400 mL of water from the 5-gallon container into a graduated cylinder or beaker and transfers. c) The rainmaker pours the measured water into a watering can or yogurt container with holes. They CAREFULLY pour the water from the watering can to "rain" onto the model. d) The water collector holds a 2-gallon bucket below the models to collect runoff. Once the water has stopped dripping, the water collector transfers it to a 1000 ml beaker. (Students may use a graduated cylinder if precision and accuracy are discussed. This will vary with each class/group.) e) On the data sheet, the data collector records the amount of water in the beaker AND what the water looks like. f) Each group will conduct up to three trials, as time allows. Water collected from the bare soil models needs to be transferred to the turbidity station! 3. Discussion/Reflection:

	<ul style="list-style-type: none"> a) After it "rained" on your model, which model had the cleanest water? The dirtiest water? b) What made the water dirty? c) Run-off: We call rainwater that flows on the ground "run-off." d) What is the process called where rainwater that flows on the ground picks up and carries away soil particles? (Erosion) e) There is a special term for the soil particles once they are in the water. What is this term? (Sediment) f) What are some ways you think we could prevent soil erosion and deposition of sediment in our waterways from happening?
--	---

Extensions 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



Image of erosion models. Created with clear storage bins, ½ inch pvc pipes, silicone caulk. The plant one is filled with perlite and native plants. The bare soil is filled with perlite and bare soil.

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**
 - Measure out 400 mL of water from a large bucket into a beaker.
 - After each trial, you will measure the amount of water that came OUT of the models.
- **Rainmaker**
 - Hold the watering container over the bare soil model.
 - Pour all the 400mL of water over the model.
- **Water collector**
 - Hold the labeled beaker under the model's opening to collect water. Wait until the drips are slow so you collect most of the runoff water!
 - 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	Amount of WATER that came out into the beaker (mL)	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	Amount of WATER that came out into the beaker (mL)	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 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 with the terms: **Runoff, Soil, Erosion, Sediment, Water Quality**



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



Photo credit: Steven Angel February 2019 – confluence of Shenandoah (left) and Potomac (right) rivers in Harper's Ferry, WV, after a heavy storm upriver on the Potomac watershed.

Erosion Models Procedure

First make a prediction.

In your journal, write or draw what you think the water will look like after it moves over the different land surfaces.

Next, conduct the experiment with the bare soil model.



- **Water Measurer:** measures out **400 mL** of water from the “Clear Water” bucket into the “Water” beaker.
- **Water Collector:** holds the “Bare Soil” beaker under the pipe opening to collect water while the
- **Rain Maker:** holds the watering container over the model and pours 400 mL of water into the watering container.
- Wait for the water to stop dripping!
- **Each student** records the amount of water in the beaker and what the water looks like on their data sheet.



- Dump the water into the colored bucket under the model.
- Repeat steps 2-5 two more times.
- **Last, conduct the experiment with the plant model.**
- Repeat steps 2-6 with the plant model.

1. **Erosion Models - Clean Up**

2. The water from the bare soil gets dumped into the “Muddy Water” bucket.
3. The water from the plant model gets dumped into the grass.
4. Rinse your beakers in the “Rinse” bucket and put them on the center of your table.
5. Have an adult help you rinse your colored buckets with a little bit of water from the “Rinse” bucket.
6. Put the colored buckets back under the models.
7. Check your table! Are all beakers and water containers in the middle of the table?
8. Wipe your table with a towel and hang it to dry.