

Watershed Model: Understanding Nonpoint Pollution and What You Can Do

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Teacher Resource Page

<u>Grade Level:</u> 4-6

Time: 1 - 2 class periods

<u>Adapted From</u>: BTNEP/LSU Ag Center: Nonpoint Source Water Pollution and Save The Bay's San Francisco Bay Watershed Curriculum

Learning Objectives:

- Make a model watershed using simple inexpensive materials.
- Use the model watershed to investigate runoff and nonpoint source pollution.

Rhode Island Grade Span Expectations Addressed:

	ESS1 - The earth and earth materials as we know them today have developed		
	over long periods of time, through continual change processes.		
	ESS1 (K-4) - 2	Use results from an experiment to draw conclusions about how	
Science		water interacts with earth materials	
	ESS1 (5-6) - 2a	Diagramming, labeling and explaining the processes of the	
		water cycle including evaporation, precipitation, and run-off,	
		condensation, transpiration, and groundwater.	
	ESS1 (K-4) - 4	Explain how wind, water, or ice shape and reshape the earth.	
Written and Oral	W – 11 Demonstrates the habit of writing extensively		
Communication	W – 9 Writing Conventions: Applying Rules of Grammar, Usage, and Mechanics		
	OC – 1 Oral Communication Strategies: Interactive Listening		
	C&G 3: In a democratic society all people have certain rights and responsibilities.		
	C&G 4: People engage in political processes in a variety of ways.		
	C&G 4 (3-4) −3	Students participate in a civil society by identifying problems,	
		planning and implementing solutions, and evaluating the	
Civics and		outcomes in the classroom, school, community, state, nation, or	
Government		world and explaining how individuals can take responsibility for	
		their actions and how their actions impact the community	
	C&G 5: As members of an interconnected world community, the choices we		
	make impact others locally, nationally, and globally.		
	C&G 5 (3-4) -3	Students demonstrate an understanding of how the choices we	
		make impact, and are impacted by an interconnected world	

Materials:

- large piece of plastic sheet
- powdered cocoa mix
- colored drink mix powder (red and green)
- torn paper and cut up plastic
- Coarse salt
- Vegetable oil (optional)
- Sprinkles (optional)
- watering can with sprinkler on spout or large water spray bottle
- water supply

- sponges or cloths for cleanup
- a variety of objects to place beneath plastic cloth to create contours
- toy tractors, trees, animals, cars, buildings
- map or aerial photograph of local watershed
- Permanent markers to draw in land types

Advance Preparation:

- 1. Spread plastic cloth on a large, flat surface, either inside or outside. Have materials for mopping up water on hand and containers for holding water.
- 2. Fill spray bottle and/or watering can
- 3. Prepare the "pollutants."
 - a. Cocoa powder can be soil
 - b. Vegetable oil or Cocoa/water mixture in a spray bottle can be used for oil
 - c. Cocoa paste or sprinkles can be dog waste and cow manure
 - d. Red drink mix powder can be pesticides; green drink mix powder can be fertilizers.
 - e. Torn paper and plastic can be litter
 - f. Coarse salt can be road salts in the winter time
- 4. Collect props for the watershed, including:
 - a. Toy cars, trucks, tractors, trees, animals, buildings
- 5. Access an aerial picture of your school and closest water way.
- 6. Understand nonpoint source pollution comes from many widely scattered sources. These include our own lawns, streets, as well as farms, forests, construction sites, parking lots, and oil and gas extraction facilities. The sources of nonpoint source pollution are difficult to identify, making it much harder to control nonpoint source than point source pollution. The table outlines the causes and effects of nonpoint pollutants.

Nonpoint Source Pollutants				
Source location	Pollutant	Potential Effects		
Farms, residential lawns and gardens, parks, golf courses, school grounds	soil/sediment	turbidity in water, affecting aquatic life, clogging culverts and drainage ditches and carrying pollutants attached to soil particles.		
	fertilizers	nutrient overload, which can cause excessive growth of aquatic vegetation (such as algae)		
	pesticides	toxicity		
	livestock, wildlife and pet wastes	nutrient overload, pathogens		
Forestry operations, construction	soil/sediment	turbidity		
sites, roads, parking lots, driveways, gas stations, airports, industrial sites	soil, grease, antifreeze, spilled fuel, solvents	accumulation of organic chemicals in water bodies, oil slicks on water surface, toxicity		

Procedure:

- Assist student in answering the "Questions to think about before you begin." Discuss the definition of a watershed (the area of land where all the water drains to one place), how humans may alter their watershed (buildings, roads, dams, drains, etc) and brainstorm how humans might pollute local water bodies. Download a map of your area from RIGIS website or from Google and put it on overhead or projector. Have students locate their school and identify a close river or stream.
- 2. Explain that the large piece of plastic laid out on the floor (or ground) represent a watershed. The students need to make some topography, or changes in ground elevation. Ask them how they can use some of the objects to change the elevation in the watershed? (Students suggest ways to create topography and put the objects under the plastic sheet.)
- 3. Before adding water to this watershed, ask students where they think the water will go? (If the water will run off the plastic, then assign students cleanup duty to take care of the spills.) Using the water cans or spray bottles, rain on the watershed and have students notice whether their predictions of where the water would travel were correct.
- 4. Have students add other features to the landscape. Have a collection of cars, tractors, animals, trees and buildings, and have students add them in appropriate places to complete the landscape. Have students brainstorm and delineate land-use types such as roads, parking lots, farms, lawns, forests and construction sites by using permanent markers and coloring them in. (Try to keep this simple, so the watershed effect will still work when you add water.)
- 5. Talk about sources of pollution that might exist on the areas they drew. Have students place the pretend pollutants where they might exist:

- a. Loose Soil = cocoa powder (place on plowed fields, construction site, stream bank, etc.)
- b. Pesticides = red drink mix (place on golf course, farm fields, etc.)
- c. Fertilizers = green drink mix (place on yards, farm fields, golf course, etc)
- d. Oils and grease = vegetable oil or cocoa/water mix (place on parking lots, driveways, streets)
- e. Road salts = Coarse salt (place on roads)
- f. Dog and animal waste = cocoa paste or sprinkles (place on yards and farm fields)
- g. Litter = torn paper and plastic (place on roadsides, parking lots, beaches, parks, etc.)
- 6. Have students take turns making it "rain" by spraying the watershed with water from a spray bottle or watering can.
- 7. Students should note where the water takes all of the pollutants left on the landscape. Much of the pollution ended up in the local water body and it looks very polluted, but some remained on the ground or in the ditches.
- 8. Ask students what pollutants might be picked up by rain water on their school yard and where they would go.

Extension:

- Students should use what they learned in this activity to write answers to the extension questions.