

# Water Wash

**Grades:** 5 – 8

**Time Allotments:**

Teacher preparation: 45 – 60 minutes  
Lesson/activity: Two sessions, 30 - 45 minutes each  
Closure/assessment: 10 minutes

**Content Objectives: After performing this activity students will be able to:**

- 1) Define what watersheds, ground water and nonpoint source pollution are;
- 2) Describe how rainwater moves on the surface, as well as underground, as part of the water cycle;
- 3) Recognize what flooding is, what causes it and how it can be prevented;
- 4) Describe how nonpoint source pollution moves with rainwater within a watershed and as part of the water cycle; and
- 5) Articulate (in narrative form) the movement of water and pollution within a watershed.

**Process Objectives: Students will:**

- 1) Predict what will occur to water and pollution in simulated watershed and groundwater activities;
- 2) Observe and examine what actually occurs to water and pollution in these activities;
- 3) Document predictions, observations and other ideas;
- 4) Research (and then utilize in narrative form) ten vocabulary terms; and
- 5) Communicate this information in narrative form.

**Curricular Areas and Corresponding Core Curriculum Content Standards:**

Consumer/Family/Life Skills **9.2** (G8) A1 & C2  
Technology Education **8.2** (G8) C3  
Social Studies: **6.6** (G8) B4, C5 & E2  
Science: **5.10** (G6) B1  
**5.8** (G6) B1-2  
**5.1** (G8) A2 & B1  
Language Arts Literacy: **3.4** (G6) B3-4  
**3.3** (G5) C4 (G5-7) A2 & 5 (G7) C2 (G8) A7 & C2  
**3.2** (G5-6) B5, D1-2 (G7-8) B4, D1-2

**Vocabulary:**

Erosion	Percolates
Flooding	Permeable Layer
Groundwater	Runoff
Impermeable Layer	Water Cycle
Nonpoint Source Pollution	Watershed

**Materials Needed for Activity #1:**

- One 3-ring binder (preferably waterproof)
- A stack of books (about 6" - 8" in height)
- One rectangular baking pan slightly longer than the binder
- Source of water
- Food coloring
- One spray bottle (filled with water)
- Enough kitchen sponges (4 – 6) to cover the top cover of notebook binder

**Materials Needed for Activity #2:**

- Three one-gallon plastic milk or water jugs
- Source of water
- Food coloring
- Three baking pans
- Three spray bottles (filled with water)
- One knife
- Three thick rubber bands
- Three pieces of cheese cloth (about 6 X 6" each)
- Paper towels – at least 6 sheets
- Sand – enough to fill  $\frac{3}{4}$  of a one-gallon plastic jug
- Mixture of topsoil and gravel – enough to fill  $\frac{3}{4}$  of a one-gallon plastic jug
- Mixture of topsoil and clay - enough to fill  $\frac{3}{4}$  of a one-gallon plastic jug
- Gravel – enough to fill three bread pans

**Materials Needed for Each Student:**

- Journal or notebook
- Pencils

**Anticipatory Set:**

- Ask students the following questions: “Have you ever visited or hiked along a river, lakeshore, or beach and found litter or trash, even if you’re in an undeveloped area? How do you think litter and trash ends up being in such areas?” Encourage them to share personal examples and brainstorm reasons why this may occur.
- Explain that they will observe two demonstrations that will be performed in the classroom. During and after the demonstrations they will document their predictions, observations and conclusions for each. They will also conduct research for a writing assignment about these demonstrations.
- Encourage them to take notes in their journals/notebooks when explanations are given or information is discussed.
- Write the vocabulary words on the board (before class). Point to each term when it is referred to during the simulation activities.

### **Guided and Independent Practice – Activity #1 (Watershed Simulation):**

- Place the 3-ring binder (closed) on top of the stack of books, making it between 4 - 6" from the top of the desk or table.
- Place the baking pan parallel to, and slightly under, the spine of the binder (the wide section that has the three rings attached to it).
- Moisten sponges (squeeze out all excess water) and lay them on top of the binder, leaving no exposed binder surface except along the edges that are not hanging over the pan. Adjust the height of the binder so that the bottom of the spine touches the edge of the pan beneath it. Move the pan so that neither corner of the binder's spine hangs over the pan.
- The top surface of the binder represents rock. The sponges represent soil on top of the bedrock. The baking pan represents a lake, reservoir or river. Discuss these components with the students and discuss what a **watershed** is.
- Ask them to write down predictions regarding what will happen in this watershed when it rains. When they are finished, raise the top of the binder to a 45-degree angle. Use the spray bottle to spray the sponges with water, simulating rainfall. Spray until water runs and drips over the binder's spine and begins to fill the baking pan. Have the group discuss then write down responses to the following questions:
  - What is happening to the rainwater? Where is the flow of water going? In a real setting, where would water continue to go? (If necessary, review basic information about the **water cycle**).
  - What role does soil play as it relates to water flow? (It can absorb and "hold" or retain water.) When is soil likely to be moved or washed away by rainfall? (When it is "bare" and absent of roots from plants and trees for it to attach to, it can be moved or washed away. What is this process called? (**Erosion**). What can prevent erosion from occurring? (Grass, groundcover plants, bushes and trees, stones and gravel, walls, etc.)
  - What is **runoff**?
  - What is **flooding**? In this simulation, when can flooding occur? (When it overflows the "lake" (baking pan) and/or when the "soil" (sponges) are saturated with water). What are some things that people do to reduce or prevent flooding? (Examples include dams, water releases, dredging, storm pipes and having unpaved surfaces around the water body.)
- Place three drops of red food coloring in the center of the sponges. Discuss what **nonpoint source pollution** is and select examples of the types of pollution the food coloring could represent. (Examples include fertilizers, pesticides, used motor oil, animal waste and household hazardous waste.) Ask them to write down predictions about what will happen to the pollution when it rains. When they are finished, raise the top of the binder to a 45-degree angle and spray the sponges again with water to simulate rainfall.
- Have students discuss then write down responses to the following questions:
  - What would happen to nonpoint source pollution in a natural setting like this – where would rainfall carry it?

- What would happen during a storm if the pollution source occurred directly on hard pavement, like rock or a parking lot? (It runs off the pavement or sits atop it.)
- What role can soil play to retain or reduce certain types of pollution? (Soil can retain pollution when it retains water. During this time pollution can be “broken down” as it becomes diluted with water.)

### **Guided and Independent Practice – Activity #2 (Groundwater Simulation):**

- Use the knife to cut off the bottoms of the plastic one-gallon jugs close to their bottom edges.
- Turn the jugs over and wrap pieces of cheesecloth over their round, narrow mouth openings, securing the cloth tightly with rubber bands.
- Fill one jug with sand, another with the soil and gravel mix, and the third with the mixture of clay and soil. The material in the jugs simulates various types of soils.
- Once the jugs are filled, have three students sit on chairs and hold the jugs, mouths down, between their legs. Place the baking pans beneath the jugs. The jugs should not touch the pans. Layer the bottom of each pan with two paper towels then fill the pans with gravel. The paper towels and gravel represent the porous rock, soil or sand underground that can temporarily trap and hold water underground, slowing down its movement. Discuss what **ground water** is.
- Ask the students to write down their predictions of what will happen in this watershed when it rains. When they are finished, note the starting time on a watch and wet the tops of each jug with water at the same time, spraying at equal intervals from spray bottles (students will be needed to assist with this). Document the time needed for water to pass through each of the jugs to drip from the bottoms. Have students discuss then write down responses to the following questions:
  - When water **percolates** underground, what is it doing?
  - What would happen to rainwater in a natural setting – where would the flow continue to go underground? (Refer back to the **water cycle**. Discuss what a spring is and explain that groundwater
  - What does **permeable layer** mean? Were the materials in all three jugs permeable? (Yes, though clay is very dense.)
  - What would happen if it rained on an **impermeable layer**? (Runoff occurs.) Which type of surface is better for allowing water flow and why? (Permeable layers allow water to pass through.)
- Add drops of food coloring to the tops of each jug, explaining that it represents the same nonpoint source pollution discussed in Activity #1. Spray the jugs again and time the flow of water through each of them then discuss what happens. Remove the paper towels from the bottoms of the pans to see if they absorbed any food coloring.
- Have the group discuss then write down their responses to the following questions:
  - What would happen to nonpoint source pollution in areas having different soil types and geology – where would rainfall carry pollution?
  - Which type of soil material would allow the water and pollution to pass through it quickly? (Soil and gravel, sand) Which more slowly? (Clay and clay mixes)
  - Certain areas in New Jersey have sandy soil and residents in these areas rely on the use of wells for drinking water. Should these residents be concerned about

nonpoint source pollution? Why or why not? (Yes, because water and pollution pass through the sand quickly and can mix with ground water sources.)

**Closure:**

- Assign students the following homework assignment:
  - They are to each write a 2-page narrative that describes what happens after a rainfall and include (in a combined way) their predictions and observations from the two simulation activities.
  - There are ten vocabulary words that were addressed during the simulation activities (refer to list). Their narratives must include, define and correctly use as many of these terms as possible. Students should research the terms when writing the narratives to ensure accuracy.

**Assessment:**

- Written predictions, observations and conclusions regarding the simulations;
- Written narrative; and
- Responses to questions from teacher.

**Extensions:**

- Have students learn more about watersheds local to the school by visiting DEP's "**Surf Your Watershed.**" (<http://www.state.nj.us/dep/watershedmgt/surfnj/>)
- Students can view the **Geology Map of New Jersey** (<http://www.state.nj.us/dep/njgs/>) or further explore the state's geology by using **I-mapNJ.**([http://www.state.nj.us/dep/gis/imapnj\\_geolsplash.htm](http://www.state.nj.us/dep/gis/imapnj_geolsplash.htm))