

Crumpled Paper Watershed

A Model of a Watershed

Overview Students will use a model to create a watershed. By observing how surface water flow is determined by the shape of the land, students will visually and dramatically observe the physical characteristics of a watershed, and investigate the impacts of human land use decisions.

Lesson Use the table below for lesson planning purposes.

Characteristics

Time Required	15-30 minutes
Key Concepts/Terms	Watershed, runoff, landforms, pollution, land use, water cycle
Prerequisites	Understanding Of The Water Cycle (for help with this see <i>Raindrop Roadtrip</i> , or <i>Ways of a Watershed</i> on the HBF Website: www.fergusonfoundation.org .)
Setting	Indoors (on a desk or table), Individual/Student Pairs

Learning Objectives After completing this activity, students will be able to...

- Define the term watershed;
 - Use a model to show an understanding of the term “watershed;” and
 - Describe how pollution can get into our waterways through runoff.
-

Materials Required Provide the following materials per group or individual:

***Student Sheets – Crumpled Paper Watershed*, pg. 5**

- 2 pieces of plain scrap paper (8.5 X 11)
 - Spray bottle
 - Water
 - Water-based markers (blue, brown, and black)
-

Continued on next page



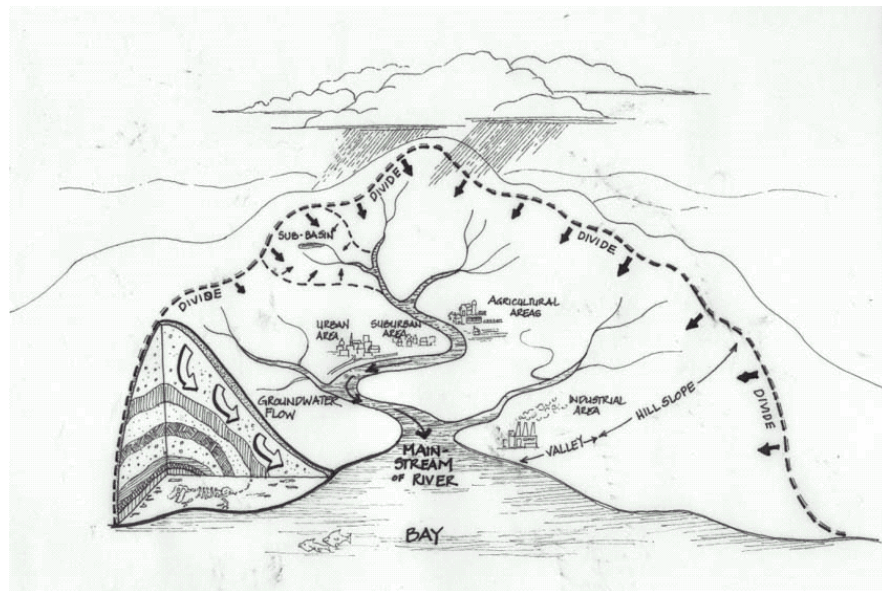
Crumpled Paper Watershed, Continued

Background Information

What is a watershed?

A watershed is all of the land that drains runoff (from precipitation) into a body of water, such as a creek, river, lake, bay or ocean. The boundary of a watershed is the ridgeline of high land surrounding it, like the edge of a bowl. Another term for watershed is “drainage basin.”

As rainwater and snowmelt run downhill, they carry whatever is on the land, such as oil dripping from cars, trash and debris on streets, or exposed soil from construction or farming to the nearest water body.



Our Local Watershed

Everyone lives, works and plays on land that drains to a body of water, like a creek or river. Our local watershed may lead to a tiny creek, but that eventually drains into a river, bay or ocean.

We live in the Potomac River Watershed, which includes parts of Maryland, Virginia, Pennsylvania, West Virginia, and all of Washington, DC. The Potomac River Watershed is part of the larger Chesapeake Bay Watershed (see *Watershed Address*, pg. <http://www.epa.gov/owow/watershed/address.html>).

Continued on next page



Crumpled Paper Watershed, Continued

Procedure

Follow the steps in the table below to conduct the activity. **Sentences in bold are suggestions for what teachers might say to students.** *Items in italics are possible student answers to questions.*

Phase	Step	Action
Engage	1	Say: “Please clear off your desks completely as this activity will get them a bit wet.”
	2	“What happens to rainwater after it falls? Where does it go?” <i>Student answers should include the concept that some rain goes into the ground and some runs downhill.</i>
	3	Pass out <i>Student Sheets – Crumpled Paper Watershed</i> (pg. 5), one sheet of 8.5 X 11 paper, and markers to each student/group.
Explore	4	This activity can be conducted in two different ways, as detailed below: <u>Teacher-directed:</u> You can work through the instructions on the <i>Student Sheets</i> as a class, with the teacher giving instructions orally and demonstrating the steps as necessary, or <u>Self-Directed:</u> Students can read and follow the instructions on the <i>Student Sheets</i> at their own pace, with the teacher monitoring student progress throughout the activity and giving assistance where necessary.
		5
Elaborate	6	Ask students to create models of a watershed using other materials such as modeling clay or aluminum foil.
Evaluate	7	Use completed <i>Student Sheets</i> for evaluation.



Continued on next page

Crumpled Paper Watershed, Continued

Vocabulary

The following terms are useful in this activity.

Term	Definition
Landform	A physical feature, such as a hill, mountain, valley, plateau, river, lake, etc.
Ridge	The high points of a range of hills or mountains
Runoff	An overflow of rainfall or snowmelt that cannot be absorbed by soil and vegetation
Tributary	A stream feeding into a larger stream, lake, etc.
Watershed	All the land that drains water into a creek, river, lake, bay or ocean. The watershed is named for the body of water into which it drains



Student Sheets ~ Crumpled Paper Watershed



Objectives

By the end of this activity, you should be able to ...

- Define the word “watershed;”
- Understand how to tell where the boundaries of a watershed are; and
- Understand how runoff affects our water quality.

Set Up

Experiment #1



Follow the instructions below to set up the experiment.

1. Crumple up the piece of paper your teacher gave you, and then smooth it back out most of the way. It should still be a bit crumpled, showing small ridges (high points) and valleys (low points).
2. Imagine that this paper is a section of land, and find the ridgelines (the tops of the fold-lines).
3. Use a washable blue marker (not permanent) to color along the ridgelines on your “land.”

Make Your Hypotheses

You are going to “rain” on your landform. Answer the following questions to make your hypotheses before conducting the experiment.



1. What do you think will happen to your land when it “rains?”

2. What will happen to the blue ridge lines you colored?

3. Where will the “rainwater” travel?

Continued on next page

Student Sheets – Crumpled Paper Watershed

Run the
Experiment

Follow the directions below to conduct the experiment.

1. Use a spray bottle of water to create a “rainstorm” over your land. You want to create gentle sprays of mist.
2. Observe what happens after every misting.
3. As your “rainfall” accumulates, observe the pathways where the excess “rainfall” travels.



Record Your
Observations

In the space below, record your observations about what happened (Use words and pictures if you wish).

Analyze Your
Data and
Draw
Conclusions

Answer the following questions or complete the activities to analyze and draw conclusions about your data.

1. Explain how your hypotheses were or were not accurate.
2. How did the “rainfall” travel over your land?



Continued on next page

Student Sheets – Crumpled Paper Watershed



Analyze Your
Data and
Draw
Conclusions
(continued)

3. Where did the water collect? Explain why this happened.
4. Find an area on your land where water collected. This is a lake, and you get to name it! My lake is Lake _____.
5. Look for the major stream running into your lake. Name this stream as well. My stream is called _____.
6. This stream may have several tributaries (small streams which run into the larger stream). How many does your stream have? _____
7. With your finger, trace your stream all the way back up to where it starts at the top of the ridge. (This should be a path of blue ink.) When you reach the top, this is the edge of the watershed for your stream and lake.
8. Trace the entire edge of the watershed with your finger, by following the ridgeline. This will be something like tracing the edge of a bowl.

All of the inside, downward-sloping area you have just outlined is the watershed for your stream and lake.

9. Draw a picture of your watershed below. Label your stream and lake.



10. How many other watersheds can you find on your “land?” _____
11. How would you define the word “watershed?”

Continued on next page

Student Sheets – Crumpled Paper Watershed



Set Up Experiment #2

Follow the instructions below to set up the second experiment.

1. On a fresh sheet of paper, draw some of the ways people use the land. Include a house/community, farm, factory, and some streets/highways.
2. Using the color key below, color your areas with markers.

Use this color...	To Represent...	What Might be on this Land that You Wouldn't Want in the Water?
Brown	Farms	
Red	Landfills & Factories	
Black	Houses & Streets	

3. Crumple this paper, and smooth it in the same way you did the first one.
4. Use the blue marker to trace the ridgelines on this paper.

Make Your Hypotheses

Make hypotheses about what you think will happen when you “rain” on your land this time.

Run Your Experiment

Gently mist your new land with water from your spray bottle. Observe what happens, and how the water travels.

Record Your Observations

Record your observations (in words and pictures) here.



Continued on next page

Student Sheets – Crumpled Paper Watershed



Analyze the
Data and Draw
Conclusions

Answer the following questions to analyze and draw conclusions about your data.

1. What happened in your second experiment?

2. What do you think the colors could represent in real life?
 - Brown = _____
 - Red = _____
 - Black = _____

3. Where were the colors in the end? _____

4. Where are you in this watershed? What kinds of pollution do you think you add to the watershed?



Continued on next page

Student Sheets – Crumpled Paper Watershed

Checking For Understanding

Circle the letter of the correct answer for each of the following questions to show you understand the information in this activity.

1. Choose the best description for the **watershed** of a stream:
 - a. the water of a stream and all the tributaries that feed into it, including wetlands
 - b. all the land that slopes toward the stream and drains rain and melting snow into the stream
 - c. a large wet area of land that completely surrounds the stream.

 2. You are hiking along a trail in a hilly countryside. You know that you have reached the watershed of a different stream because:
 - a. the ground changes from soggy soil to dry forest
 - b. you can see another stream
 - c. you are standing on a high spot and the land starts to slope downward again.
-

