

# Shared Waters: Making a positive impact on our local watershed



**Authors:** Nanette Marcum-Dietrich, Ph.D.<sup>1</sup>, William McConnell, Ph.D.<sup>2</sup>

**Contributors:** Abdul Ibrahim, Ed.D.<sup>1</sup>, Bradley Showalter<sup>3</sup>, Elizabeth Fulton<sup>1</sup>, Katherine Harnish<sup>3</sup>

<sup>1</sup>Millersville University of Pennsylvania, 40 Dilworth Road, Millersville, PA 17551

<sup>2</sup>Virginia Wesleyan University, 5817 Wesleyan Drive, Virginia Beach, VA 23455

<sup>3</sup>Penn Manor School District

## Preferred Citation:

Shared Waters. (2023). Shared Waters: Making a Positive Impact on Our Local Watershed. Millersville, PA: Marcum-Dietrich, N., McConnell, W., Ibrahim, A., Showalter, B., Fulton, E., & Harnish, K.

## Author's Note:

Nanette Marcum-Dietrich: <https://orcid.org/0000-0001-7535-3984>

William McConnell: <https://orcid.org/0000-0002-7050-2167>

Abdulsalami Ibrahim: <https://orcid.org/0000-0001-7778-3582>

Elizabeth Fulton: <https://orcid.org/0000-0002-1474-708X>

## Copyright:

This work was funded by the National Oceanic and Atmospheric Administration B-WET Grant NA21NMF4570498. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration.

## Correspondence concerning this curriculum should be addressed to:

Nanette Marcum-Dietrich, Ph.D., Millersville University, 51 Lyte Road, Millersville, PA 17551, USA. Email: [nanette.marcum-dietrich@millersville.edu](mailto:nanette.marcum-dietrich@millersville.edu)

## Usage Statement:

Individual teachers are welcome to use the "Shared Waters" curriculum for classroom purposes without seeking permission. However, the use of this curriculum for school professional development or by other professional development providers is prohibited without prior written consent from the authors. Any sale of materials designed and advertised for use with this curriculum is strictly prohibited.



# Lesson 2: Everyone Lives in a Watershed

(2 days)

## Overview:

The Earth is indeed a blue planet with abundant water; the challenge is that only a tiny fraction of this water is freshwater. As a result, freshwater is the Earth's most valuable resource, and it is our job to protect the watershed and use water wisely. In this lesson, we demonstrate how much of Earth's water is freshwater, identify our watershed on a map, and then build a model of a watershed.

The class will begin with a simple teacher-led demonstration showing how much of Earth's fresh water is usable for people and animals. This demonstration reinforces the concept that while the Earth has a lot of water, fresh water is scarce and must be protected and conserved.

In the next activity, we will orient students to their geographic location and define their place in their local watershed by showing a map of the Chesapeake Bay Watershed. A watershed is a system defined by the area of land over which all water drains downhill through a series of streams and rivers to a common outlet (river, lake, bay, or ocean). The local watershed is determined by following the topography downhill to the first body of water (stream, river, pond, or lake). Smaller watersheds are nested inside larger watersheds. As rivers flow downhill and small tributaries combine to form large rivers, more land area affects the water quality in those waterways. We live in the Chesapeake Bay Watershed, and our water flows to the Chesapeake Bay, and what we do impacts the health of the Chesapeake Bay.

In the final activity, we will build a model of a watershed. A common misconception is that water flows from north to south or "down the map." We are going to learn that water flows downhill. Watersheds are divided by ridgelines (the tops of the hills), and each stream has a divide separating the land that drains into that stream from other watersheds. As streams flow together, the watersheds combine to form a larger watershed that drains to the common river. The topography (or shape of the land) determines where the water flows as it moves downhill by the force of gravity.

## Materials:

Materials provided in the [Shared Waters kit](#):

- **Activity 1:** 1-liter measuring cup, 2 medicine cups, food dye, salt
- **Activity 2:** Map of your state's Watersheds
- **Activity 3:** 6 sets of materials for students to work in small groups. Each set includes 1 sheet of art paper, 1 tray, 1 water bottle, 1 green permanent marker, and a pack of washable markers.



Materials you will need to gather:

- [Lesson 2 Powerpoint slide show](#)
- **Activity 2:** Sticker to mark the map
- **Activity 2:** Video [“Where are Your Waters? \(Chesapeake Bay Watershed\)”](#)
- **Activity 3:** 6 copies of the [Model Watershed coloring directions](#)
- **Assessment:** [one copy of the Exit Ticket for each student](#)

## Learning Objectives:

At the completion of the lesson, students will be able to:

- Use data to explain why freshwater is a scarce and valuable resource on Earth
- Use a map to identify their watershed
- Create a model of a watershed and identify watershed boundaries and where water flows when it rains

## Activity 1 (10 min) – How much of Earth’s water is fresh water?

Begin the class by asking students, “How much of the Earth’s surface is covered in water?” Students should remember from yesterday’s lesson that 71% of the Earth’s surface is covered by water. (For specific percentages related to where water is on Earth, you may reference [One Well](#) by Rochelle Strauss, pg. 7.) Explain that we have a lot of water on Earth, but many people say freshwater is the Earth’s most precious resource. Ask students why freshwater is so precious if most of the Earth is covered in water.

To start the demonstration, arrange the materials (1-liter measuring cup, 2 medicine cups, food dye, salt) on a table so students can see them. Fill the 1-liter measuring cup to the 1000ml line with tap water and add a few drops of food coloring to make the water more visible. Tell the class that this cup will represent all the water on Earth for this demonstration. Ask the students, “If this cup is ALL the water on Earth, how much of this water in this cup is Ocean water?” Students may say half,  $\frac{3}{4}$ , etc.

Pour 30 mL of water from the 1000 mL measuring cup into the small medicine cup. Tell students that 97% of Earth’s water is Ocean water. Dramatically open a salt pack, dump it in the 1-liter cup, and stir. Ask: If 97% of Earth’s water is salt water found in the Ocean, then how much is fresh water? The answer is that only 3% of Earth’s water is fresh water.

Ask students, “Did you know that most of our freshwater is frozen in glaciers?” Ask the students how much of our freshwater they think is trapped in glaciers. Pour 21mL of water from the 30mL medicine cup into a new medicine cup



and place it next to the 1-liter measuring cup. Let students know that the water in both cups (1-L and 21mL cups) is unsuitable for human use.

Hold up the cup containing 9mL of water and say, “**Less than 1% of Earth’s water is available for human use!**” Emphasize, “This is why fresh water is a scarce and valuable resource we must conserve and protect.”

**CALL TO ACTION** - Tell students, “By the end of this unit, our goal is to create an action plan that will either improve our watershed or inform others about it. If you are asking what a watershed is, then you are in luck because we will learn all about it.”

## Activity 2 (10 min) – Our Watershed

Everyone lives in a watershed. In this activity, we will orient students to their geographical location and define their place in their local watershed by showing a large, laminated map of the [Chesapeake Bay Watershed](#). We will ask the class where their school is located on the map. Let students guess. Point out the state boundary and the county, then place a dot where the school is on the map. Explain that we live in Pennsylvania, but our streams and rivers flow to the Chesapeake Bay. **We live in the Chesapeake Bay Watershed.** Ask students what a watershed is. Write down some of their ideas on the board.

After discussing student ideas, show this video titled [“Where are Your Waters? \(Chesapeake Bay Watershed\)”](#) and stop at 2:07.

## Activity 3 (30 min) – Building a Model of a Watershed

Before class starts, get ready for the activity by arranging the materials on six separate trays. Each tray should have one sheet of art paper, a water bottle, a permanent green marker, and a pack of washable markers. When the students arrive, divide them into six groups and hand out a tray to each group so they can get started with the activity.

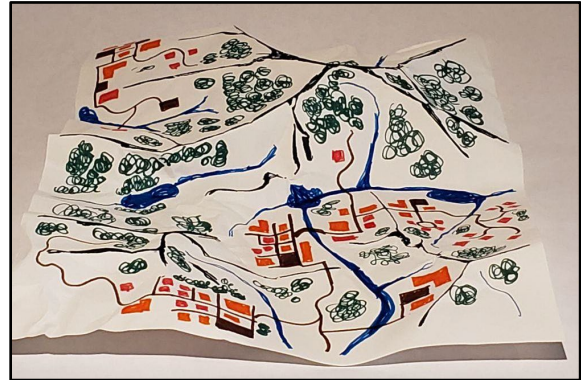
Instruct one member of the group to gently “crumple” the paper and then spread it out on the tray without flattening it. Explain to students that this is a model of the surface of the Earth. They have created a special kind of map called a topographic map, which is a map that shows the hills and valleys.

Give students a copy of the [Model Watershed coloring directions](#) and have them add details to their map using the provided key. Students may need help identifying the ridgelines, and you may want to model finding the ridgelines for students. Encourage students to color the ridgelines deeply. Then,



students should use their markers to create towns, forests, roads, rivers, and lakes. As you circulate, prompt students to think about where rivers and lakes will likely form.

When there are approximately 7-9 min left in class, tell students to stop working and that their maps are now done. Tell them it is time to make it rain on their maps! Using the spray bottle, students should make it rain on the map. Tell them to pay special attention to where the water flows. Walk around the room and help students see that water flows downhill and that water on one side of a ridgeline flows down one side, and water on the other side of the ridge flows down the opposite side. These are the boundaries between two watersheds. Ask them if they can find other watershed boundaries. (There will be many small watersheds on the map. You can find them from the ridgelines.) Also, help the students notice where water collects. This pooling of water is where rivers and lakes form. Students should also see that most ink runs off the map to the rivers and lakes. This creation of brown water reinforces the idea that pollution on the land ends up in the rivers and lakes. One exception is the green marker. Water that falls on the green areas usually soaks into the ground and replenishes our groundwater. If there is time, let students walk around to see other students' maps.



### **Possible Extension:**

Have students repeat the activity. Encourage them to use what they learned from the crumpled paper watershed they created to create a new and better town where the rivers and lakes are blue (not brown and muddy because of run-off).

### **Possible Differentiation Adaptations:**

This activity can be completed as a teacher demonstration. Or, if you have additional time, consider having each student make their own watershed. You can then have students tour each other's watersheds with a quick walk-around to see if other people's watersheds behaved similarly.

### **Assessment:**

Bring the class back together and use what they learned to create a definition of a watershed. A sample definition is **“A watershed is all the land where water drains downhill to a common body of water.”**

End by asking students to give the name of our watershed. Answer: We live in the Chesapeake Bay Watershed. Then, give students an exit ticket to complete individually or in small groups.



[Exit Ticket](#) - Complete **ONE** of the following sentence starters.

1. In a watershed, water flows downhill **because** \_\_\_\_\_
2. In a watershed, water flows downhill, **so** \_\_\_\_\_
3. In a watershed, water flows downhill, **but** \_\_\_\_\_

### Reading Connection:

[Niver, H., 2014. \*Tributaries of the Chesapeake Bay\*. 1st ed. New York: Gareth Stevens Publishing.](#)

[Strauss, R., & Woods, R. \(2007\). \*One well: The story of water on Earth\*. Kids Can Press.](#) (from lesson 1)



VIRGINIA  
WESLEYAN  
UNIVERSITY



Penn Manor  
School District



Norfolk  
Collegiate  
A GREAT EDUCATION.  
AN EVEN BETTER EXPERIENCE.

