

An Introduction to Watersheds

GRADE LEVELS: 4-5

ESTIMATED TIME: 45 minutes

OBJECTIVES:

Students will be able to:

- Understand what a watershed is and how we all live in a watershed
- Understand how the land is connected to the sea
- Increase their environmental awareness

MATERIALS:

- Pencils
- Stormwater Management in Your Schoolyard journal (pre/post test) for each student
- Google Earth™ watershed tour on computer and associated projector and screen
- Google Earth™ Watershed Tour Worksheet for each student
- 5 laminated aerial maps of schoolyard watershed
- 5 blue washable markers
- Flat Garden Gnomes (one to three gnomes per class, as needed)
- Flat Garden Gnome Journals (one to three journals per class, as needed)

PROCEDURE:

Part 1: Pre-Test

Estimated Time: 5 minutes

Preparation:

1. Prepare the Stormwater Management in Your Schoolyard journal for each student to complete for this module (Before Lesson and After Lesson).

Directions:

1. Distribute a pencil and a Stormwater Management in Your Schoolyard journal to each student.
2. Have the students fill out their name and their teacher's name on page 1 of the journal.
3. Read the questions on the "Before Lesson" page and have the students complete.
4. Have the students hold onto their pencil and Stormwater Management in Your Schoolyard journal until the end of the module.

Part 2: Google Earth™ Watershed Tour

Estimated Time: 15 minutes

Preparation:

1. Connect the computer to a projector and set up screen
2. Have guided tour ready to play
 - a. Internet access is not needed to play the tour, though you will only be able to take your students to the places selected within the saved Google Earth™ watershed tour.
3. Make enough copies of the Google Earth™ Tour Worksheet for each student to complete while following along with the Google Earth™ watershed tour.

Directions:

1. Give each student a Google Earth™ Watershed Tour Worksheet. Explain to the students that they should try to complete the worksheet during the Google Earth™ watershed tour.
2. Google Earth™ Watershed Tour Script (words in italics, underline, and bold are the answers to the corresponding Google Earth™ Watershed Tour Worksheet):

(Show the earth rotating.) The earth is called the *water* planet. Because water covers three-quarters of the earth's surface, it might appear that there is plenty to go around and that we will never run out of this valuable resource. In reality, however, we have a limited amount of usable fresh water. Over 97 percent of the earth's water is found in the oceans as salt water. Two percent of the earth's water is stored as fresh water in glaciers, ice caps, and snowy mountain ranges (for your own information, see the table below for water percentages).

Oceans	97.2% of total water
Ice caps/glaciers	2.38%
Ground water	0.397%
Surface water (e.g., lakes, rivers, streams, ponds)	0.022%
Atmosphere	0.001%

Source: US EPA, "All the Water in the World"

That leaves only one percent of the earth's water available to us for our daily water supply needs. Our fresh water supplies are stored either in the soil (aquifers) or bedrock fractures beneath the ground (ground water) or in lakes, rivers, and streams on the earth's surface (surface water). Only a small percentage of water is suitable for humans to drink. Not all of the water in the ground and in lakes and rivers is easy to reach or clean enough to drink. Ice caps and glaciers are certainly hard to use for humans, plants, and animals. Some work is being done to take the salt out of ocean water (desalinate the water), but that is an expensive process.

(Show the United States of America.) This is an aerial map of the United States of America. An aerial map is a photograph that is taken from up the sky that takes photographs of the land. Scientists and other professionals use aerial maps to see how the land is being used and to help make decisions on how to use the land.

(Show the Delaware River watershed.) Now, I am going to show you the outlines of some watersheds. A watershed is an area of land that water flows across, through, or under on its way to a stream, river, lake, ocean, or other body of water. Watersheds can be as small as a footprint or large enough to encompass all the land that drains water into rivers that drain into the ocean. We all live in a watershed. A watershed connects the land to the sea. Let's focus on the watersheds that your school is located in. The first watershed that your school is located in is the Delaware River watershed. As you can see, the Delaware River watershed includes states other than New Jersey, like New York, Pennsylvania, and Delaware. So, this watershed covers 4 states! That's a big watershed!

(Show the Cooper River watershed.) Now, I am going to show you the outline of a smaller watershed in New Jersey where your school is also located in it. The second watershed your school is located in is the Cooper River watershed. As you can see, the Cooper River watershed includes 16 municipalities in Camden County and is approximately 40 square miles. The Cooper River watershed is named after William Cooper, who acquired land in what is now Camden City in 1682. The watershed is characterized by extensive residential and commercial development.

(Show the headwaters of the Cooper River watershed.) As you can see, the Cooper River starts in two places. As we move along, we see how the Cooper River collects the water from the streams and creeks. The Cooper River flows west towards the Delaware River. The water from the Delaware River eventually makes its way to the Atlantic Ocean. So, the water that you see flowing by in the Cooper River will eventually make it to the ocean, where you might visit to go swimming or fishing during the summer.

(Show the Cooper River Boathouse.) Here is the Cooper River Boathouse. This is where people go to bring their boats on the Cooper River. There are sometimes boat races here and people might even go fishing here. As you can see, all of these fun activities, like boating and fishing, could not happen if the Cooper River was not here. The Cooper River provides recreation and entertainment for people that visit it.

(Show the 3 schools that we are working at in the Cooper River watershed: Sumner Elementary School, Central Elementary School, and Lindenwold School 4.) Here are the three schools that Rutgers is working with in the Cooper River watershed. There are 4th and 5th grade students just like you at these other schools learning the same things, about watersheds and how they are important. We are going to be learning about the bad things that happen in the watershed too, like nonpoint source pollution

and stormwater runoff, which hurt the Cooper River. We are then going to learn about ways that we can help prevent these bad things from happening. One of the things that we will learn to help protect the Cooper River is a rain garden. I will teach you how to get everything ready for you to build your rain garden on your school grounds. This rain garden will be an outdoor living classroom for you and the rest of the students at your school to use in the years to come. You will be making a big difference in protecting your environment.

(Show examples of nonpoint source pollution.) Remember when I mentioned the bad things that could hurt the Cooper River? Well, one of the bad things is nonpoint source pollution. Nonpoint source pollution is pollution that we cannot point a finger at and blame someone, because a lot of people cause it. One example of nonpoint source pollution is trash that is thrown on the ground and not thrown away in a garbage can or recycling bin. Another example of nonpoint pollution is when people pour their paint into the storm drain because they forget to drop it off at the county paint collection day. We are going to be learning more about nonpoint source pollution and how we can prevent it in the future.

(Show locations surrounding the school.) Now, we are going to go back to your school and visit some places that you might have visited around it. Have you visited these places before? All of these places are in the Cooper River watershed.

3. Provide the students with 2 minutes to finish answering the questions on the Google Earth™ Watershed Tour Worksheet. Afterwards, moderate a brief class discussion to go over the answers to the questions on the worksheet.

Part 3: Introduction to Schoolyard Watershed Model

Estimated Time: 10 minutes

Preparation:

1. Prepare 5 laminated aerial maps of schoolyard watershed. The aerial map of the schoolyard watershed includes the school in the middle, with the surrounding watershed area.
2. Gather 5 blue washable markers to draw on the schoolyard watershed laminated maps.

Directions:

1. Break the class into 4 groups. Give each group a laminated aerial map of the schoolyard watershed. Be sure to keep 1 map for you to demonstrate to the students.
2. Explain to the students that this is an aerial map of their school's watershed.
3. Moderate a class discussion. Ask the students the following questions regarding the water cycle and how it impacts watersheds:
 - a. What is the water cycle? (If desired, you can show the 3 minute NASA Water Cycle video on the computer and project it on screen. This video has audio, so you can turn your computer's speakers on.)

- b. What happens to the water on the ground when it rains? (*When it rains, the rain water goes into a storm drain where it travels through storm drain pipes.*) Explain to the students that another word for the water on the ground when it rains is called "stormwater runoff."
 - c. Where does the stormwater runoff go once it has entered the storm drain? (*The storm drain directs the stormwater runoff to the nearby waterways, then to the Delaware River, and eventually into the Atlantic Ocean.*)
4. Using the laminated aerial map of the schoolyard watershed, point to a place within the watershed that was discussed as part of the Google Earth™ Watershed Tour. (If desired, you can show this place on Google Earth™.) Distribute 1 blue washable marker to each group. Have the students do the following group exercise while following your lead:
- a. Find this place on your aerial map.
 - b. If it was raining, where do you think the stormwater runoff will go? On each group's aerial map, trace where you think the stormwater runoff would go using the blue washable marker.
 - c. Once each group has finished tracing the path of stormwater runoff on their aerial maps, have a representative of each group present to the class why their group chose that particular pathway of stormwater runoff.

Part 4: Putting it All Together and Post-Test

Estimated Time: 5 minutes

Preparation:

1. Prepare the Stormwater Management in Your Schoolyard journal for each student to complete for this module (Before Lesson and After Lesson).

Directions:

1. Moderate a brief class discussion to help pull the module content together. Ask the students the following questions:
 - a. What is a watershed? (*An area of land that water flows across, through, or under on its way to a stream, river, lake, ocean, or other body of water.*)
 - b. When it rains, where does the stormwater runoff go in the watershed? (*The stormwater runoff goes into the storm drains that lead to the waterways. The Cooper River goes into the Delaware River that goes into the Atlantic Ocean.*)
 - c. How is the land connected to the sea? (*Through a watershed. A watershed is an area of land that water flows across, through, or under on its way to a stream, river, lake, ocean or other body of water.*)
 - d. What do you think stormwater runoff is made of? (*Answers will vary, but may include rain water and other things that you might find on the land, like soil, leaves, grass clippings, motor oil, trash, animal feces, etc. The students will learn more in Module 3 that these materials are considered nonpoint source pollutants.*)

2. Direct the students to open their Stormwater Management in Your Schoolyard journals. Read the questions on the "After Lesson" page and have the students complete.
3. Collect the students' pencils and Stormwater Management in Your Schoolyard journals.

Part 5: Introduction to Flat Garden Gnome

Estimated Time: 10 minutes

Preparation:

1. Have a Flat Garden Gnome printed, cut, and laminated (one to three gnomes per class, as needed).
2. Have a Flat Garden Gnome journal per Flat Garden Gnome that will include the following:
 - a. A pocket to store the Flat Garden Gnome
 - b. A letter to the guardians/parents explaining the Flat Garden Gnome Journal project
 - c. Master calendar listing which student will have which Gnome on what week (NOTE: The teacher's assistance is required to create the master calendar)

Directions:

1. Introduce the Flat Garden Gnome to the students. Students are to vote on one of the following three names for their class: Caspian, Irvin, or Kyle.
 - a. These names all mean the word "water," which the class is going to be learning about from the Rutgers guest presentations.
2. Why a garden gnome? Garden gnomes are based on folklore that originated in Germany. In these stories, garden gnomes were seen as helpers that would come to life at night and help maintain people's gardens.
3. Explain to the class how the Flat Garden Gnome will be going home with a different student each week (or every other week, depending on the teacher's master calendar). Show the students the worksheet that they need to fill out while they are spending time with their Flat Garden Gnome. Please have the students complete the following tasks in the journal when they have the Flat Garden Gnome:
 - a. Write a short paragraph (2-3 sentences) on a special moment or something you did with Flat Garden Gnome during its stay with you.
 - b. Write a short paragraph (2-3 sentences) on whether or not you and Flat Garden Gnome saw any water pollution. If you did, write about how you could help stop water pollution. If you did not see any pollution, write about ways in which you and Flat Garden Gnome can help stop water pollution.

Tell the students that they are encouraged to take photographs or drawings of themselves with the Flat Garden Gnome, but it is not required. Explain to the class that the Flat Garden Gnome will live in the school's new rain garden(s) after it visits with each student.