

Brook to Ocean

Georgia Standards of Excellence:

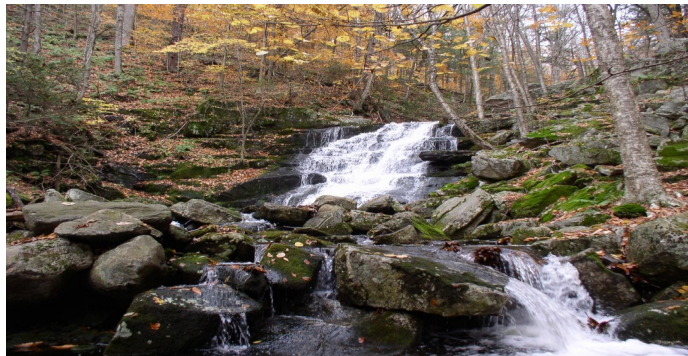
- **S3L2.** Obtain, evaluate, and communicate information about the effects of pollution (air, land, and water) and humans on the environment.
 - **a.** Ask questions to collect information and create records of sources and effects of pollution on the plants and animals.

Next Generation Science Standards:

- **MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on an environment.

Learning Objective:

- Students will create a model of a watershed and observe how watersheds contribute to an ecosystem.
- Students will evaluate how pollution of any water source can affect an ecosystem.



Essential Question:

- How do watersheds contribute to the environment and how is pollution spread through them?

Key Vocabulary:

- Watershed
- Sediment
- Percolation
- Groundwater
- Pollution
- Aquafer

Materials:

- Newspaper
- Aluminum pans
- Clay
- Spray bottles with water
- Toothpicks (one per student)
- Aprons
- Chocolate pudding powder
- Paper Towels
- Sprinkles



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Background Information:

- PART ONE:**

- We are all a part of a watershed. A watershed is an area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater. A watershed is also the area that contributes runoff (such as soil, silt and chemicals) and precipitation to a specific river system. What affects a watershed in one place eventually affects other sites, accumulating as the water proceeds downstream.
- Water flows from higher elevations to lower elevations because of gravity. In some places puddles, lakes or ponds form because the ground is lower than surrounding areas. Rivers are the results of many streams coming together to form a large flowing body of water.
- The water that flows into a river is a result of rain and/or snowmelt from the surrounding watershed. The size of a watershed depends on the elevation of the land. Where rain falls on a hill determines the direction water will flow into a stream. The areas of highest elevation surrounding a stream will mark the outer edges of the watershed with water flowing from upstream to downstream.
 - Sometimes puddles can form because the ground is saturated and can't absorb any more water. If soil becomes too saturated to absorb more water or because the rain is falling harder and faster than the soil can absorb it, a flood may occur.
- Water from a watershed can form groundwater through a process called percolation. This is where the water filters through the ground and collects below the surface in an aquifer. Tapping into groundwater is how people utilize wells for water usage.

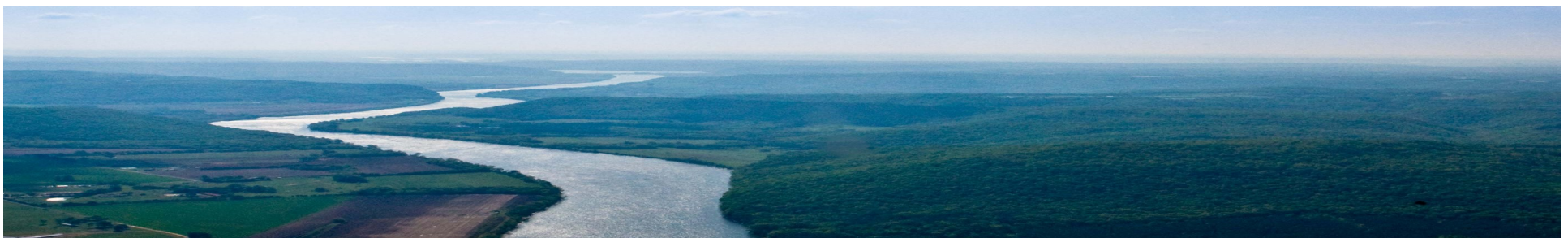


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Background Information:

- **PART TWO:**

- Changes in a watershed affect all living and nonliving things within its boundaries. For example, trees capture water as it moves across land helping it absorb into the soil. When trees and plants are removed, water moves across the land much more quickly resulting in an increased amount of surface water entering streams. As this water flows over land, it picks up soil and other items like branches and leaves, and dumps them into the river system. These sediments in turn impact the aquatic habitats found in a river system and reduce the diversity of plants and animals like invertebrates and fish found there.
- Perhaps the single most important thing to remember about watersheds is that they are single units connected to other watersheds as they are traced downstream. What affects a watershed in one place eventually affects other sites downstream.
- When the rain falls and snow melts, water moves over the land. This is called runoff. As water moves, it carries pollutants to the rivers and streams. Pollutants are an undesired substance or energy introduced into the environment. As water flows through a watershed, these pollutants eventually make it to coastal waters.
 - Pollutants include: fertilizers (used to help plants grow faster), insecticides (used to keep bugs away), oil, grease, sediment like soil from construction sites and wastes from livestock, pets and humans.
- It is important to understand that oceans are important to everyone even if they don't live near the coast. Our oceans are valuable to us for food, medicines, minerals and oxygen. There are more plants and animals in the ocean than are on land. The endangerment of one species affects many other species.



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Activity Instructions:

- **PART ONE:**
- Cover the Part One background information with students.
- Have students put on aprons and if in a class or group setting, divide students into groups of 3 or 4.
- Give each group of students clay, an aluminum pan, newspaper and a spray bottle with water.
- Students place the pieces of newspaper on the surface of the table and then place the aluminum tray on top for easy mess clean up.
- Have students sculpt a hill or two with several indentions and valleys out of the clay.
- Ask students to predict where the water will flow from each of their clay structures if it rains.
- After predicting, students may spray the top of the structures with water several times and watch the flow of water.
 - Did the water form into streams as it ran down the clay?
 - Did the water collect anywhere at the bottom of the clay structure?
 - What could these things represent in real life? (Streams, rivers, lakes, ponds, etc.)

Activity Instructions:

- **PART TWO:**
- Cover the Part Two background information with students.
- Hand out toothpicks to each student and inform them that these represent buildings. Have each student place the toothpicks within the clay anywhere they'd like.
- Predict which building could have the largest impact if pollution came from that source and entered into the watershed.
- Pass out chocolate pudding powder and sprinkles. Have students sprinkle them on the top of their clay close to the toothpicks
 - This will represent pollutants put out by human infrastructure and population.
- Now spray the water onto the model again.
 - What happens to the powder and sprinkles? Where does it go?
 - How could this represent pollutants in the ecosystem?
- Clean up the activity after the conclusion of PART TWO.

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Evaluate:

Choose one of the following:

1. Write a persuasive paragraph explaining how pollution of any water source affects others.
2. Draw and label a watershed. Show how what happens at the start of a watershed can affect others that share that watershed.

References:

- "Water Topics." EPA. Environmental Protection Agency, August 7, 2020. <https://www.epa.gov/environmental-topics/water-topics>.
- Dorros, Arthur. *Follow the Water from Brook to Ocean*. HarperCollins Publishers, 1991. ISBN 0-06-445115-1

Extension:

- Read the story Follow the Water from Brook to Ocean by Arthur Dorros.
- Recommend topics to discuss during the story:
- Pages 4 and 5. Emphasize the areas in the illustration where water would be absorbed or repelled.
- Pages 6 and 7. Have students recall activity one to discuss the flow of water. What types of things would speed up, slow down or change direction of the water?
- Pages 12 and 13. What are the negative and positive effects of algae in a water system?
- Pages 14 and 15. What are other ways that people use water for fun?
- Pages 16 and 17. Recall or use this opportunity to highlight erosion.
- Page 20. Point out on a map of Georgia where the fall line is and discuss why it's called the fall line.
- Pages 24 and 25. Discuss how humans can control the flow of water.
- Pages 26- 29. Make a list of ways that you can prevent pollutants from entering the waterways.



This activity is a product of the Rivers to Reef Teacher Workshop sponsored by the Georgia Aquarium and NOAA Gray's Reef National Marine Sanctuary