

From Brook to Ocean

Lesson Focus: watershed and non point source pollution

Lesson objectives:

- To create an understanding that everyone is part of a watershed and that humans can affect that watershed in positive and negative ways.
- Understand that water flows from higher elevations to lower elevations, which means that what happens in one watershed affects other watersheds.
- Pollution of any water source can affect our oceans.

Enduring Understandings:

- *Each individual's actions can help or harm the environment.
- *Pollution can harm or destroy habitats.
- *Clean water is extremely important to all living things.

Georgia Performance Standards addressed:

S3CS1. Students will be aware of the importance of curiosity, honesty, openness, and skepticism in science and will exhibit these traits in their own efforts to understand how the world works.

*Offer reasons for findings and consider reasons suggested by others.

S3L1. Students will investigate the habitats of different organisms and the dependence of organisms on their habitat.

* Explain what will happen to an organism if the habitat is changed.

S3L2. Students will recognize the effects of pollution and humans on the environment.

* Explain the effects of pollution on the habitats of plants and animals.

* Identify ways to protect the environment.

National Science Education Standards:

Content Standard A: All students should develop

*abilities necessary to do scientific inquiry

*understanding about scientific inquiry

Content Standard B: All students should develop an understanding of

*position and motion of objects

Content Standard C: All students should develop an understanding of

*organisms and environments

Content Standard D: All students should develop an understanding of

*properties of earth materials

*changes in earth and sky

Grade Level: 3rd Grade (This lesson and its activities are written for third grade, but could easily be adapted for use in K-5.)

Materials:

General Items include:

Newspapers

Aluminum pans

Clay

Spray bottles with water

Follow the Water from Brook to Ocean by Arthur Dorros

Various small items such as: sugar crystals, soil, jello/pudding powders

Time Needed:

Activity One: 20-30 minutes

Activity Two: 10-20 minutes

Activity Three: 20-30 minutes

Background Information:

Activity 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. Watersheds are almost always part of a larger watershed. Water flows from higher elevations to lower elevations due to gravity. In some places puddles, lakes, or ponds form because the ground is lower than surrounding areas. 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.

Activity Two: Nonpoint source pollution is a type of water pollution where the pollutant comes from no particular place of origin. 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. As water flows through a watershed, these pollutants eventually make it to coastal waters. Some nonpoint source pollutants include: fertilizers, insecticides, oil, grease, sediment from construction sites, and wastes from livestock, pets and humans.

Activity Three: Our coastal waters are affected more by pollutants from individual's homes than oil spills and wastes from industries. It is important to understand that ocean's 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.

Learning Procedure:

Activity One:

Essential Question: How does water flow?

Materials:

Clay
Newspaper
Spray bottle with water
Aluminum pan
Aprons
Colored toothpicks

1. Have students put on aprons.
2. Give each group of 3-4 students clay, aluminum pan, newspaper, aprons, and spray bottle.
3. Place a large piece of newspaper under the aluminum tray.
4. Form a small hill with several indentions and valleys out of the clay.
5. Ask students to predict where the water will flow if it rains.
6. Spray the top of the hill with water several times and watch the flow of water.
7. Observe what happens to the water.
8. Discuss observations.
9. Ask: Where did the water go? Why?

Think About It: Choose a spot on the model to build a home. They can mark their home using a colored toothpick. Discuss how the pollution of the water next to each of their homes could affect others.

Activity Two:

Essential Question: How does water become polluted?

Materials:

Clay model from activity one
Newspaper
Spray bottle with water
Aluminum pan

Aprons
sugar crystals
soil
jello
chocolate pudding powder

1. Brainstorm ways that water can become polluted.
2. Discuss with students how pollution can affect an area. Follow-up with a question to students, can pollution affect more than one area?
3. Have students carefully dump out water from first activity.
4. Give each group the sugar crystals, soil, jello, and chocolate pudding powder to place on their clay model.
5. Brainstorm with the group what type of pollution each item will represent. List this on the board to avoid later confusion.
6. Spray the model again with water several times and watch the flow of the water.
7. Observe what happened to the items that were placed on the model.
8. Ask: How do pollutants enter the water?

Think About It: Water doesn't stop when it hits the ground. It moves through the watershed and sometimes quite often connects to other watersheds. Students just observed how pollutants can enter the water by runoff as well as direct contact with the water initially. Brainstorm a list of living things that can be affected by pollution. Talk about plants and animals that depend on lakes, rivers, ponds, streams and oceans for their home or water source.

Activity Three:

Essential Question: Why would I be concerned with the water quality in rivers and streams?

Materials:

Book- Follow the Water from Brook to Ocean by Arthur Dorros

Reading Level: 2

Ages: 5-9

Number of pages: 32

1. Post the essential question and discuss.
2. Ask the students to listen and look for animals that are in or near the water as you read.
3. Read the story. The first time you read the story, you may choose to have the students to look for the animals that live near water. This book could also lead to several extension activities. Some ideas are listed below.
4. Things to point out during the story:

- a. Pages 4 and 5. Talk about the areas in the illustration where water would be absorbed or repelled. This could lead to a later discussion about water absorbing and water repelling surfaces.
- b. Pages 6 and 7. Discuss the flow of water. What types of things would speed up, slow down or change direction of the water?
- c. Pages 8 and 9. This is a good time to revisit the essential question.
- d. Pages 10 and 11. This would be a good time to have someone explain/review the water cycle. <http://www.kidzone.ws/water/> This website explains the water cycle in a kid friendly way.
- e. Pages 12 and 13. What are the negative and positive effects of algae in a water system?
- f. Pages 14 and 15. What are other ways that people use water for fun?
- g. Pages 16 and 17. Discuss how erosion can change the way the earth looks. Talk about the negative effects of erosion on a water habitat. Discuss ways to slow down or prevent erosion.
- h. Page 20. Point out on a map of Georgia where the fall line is and discuss why it's called the fall line.
- i. Page 23. Review the causes of a flood. Discuss flood safety procedures. Several students may have stories to share about floods due to the media coverage of Hurricane Katrina.
- j. Pages 24 and 25. Discuss how humans can control the flow of water.
- k. Pages 26- 29. Make a list of ways that you can prevent pollutants from entering the waterways.

Evaluation:

Choose one of the following:

1. Write a persuasive paragraph explaining how pollution of any water source affects others.
2. Make a poster advertising how to prevent the pollution of our water sources. Include common pollutants and how to prevent these pollutants from entering our waters.
3. Draw and label a watershed. Show how what happens at the start of a watershed can affect others that share that watershed.
4. Design a game board that would teach others about watersheds and pollution.

Extensions:

- Create dams to control the flow of water on the clay models.

- Find areas of erosion on the school grounds and plant bushes, trees or grass. Observe the effects this has on the erosion over a period of time.
- Choose a water plant or animal to further research. Share information about that plant or animal to help others appreciate them.

Resources:

For more information about watersheds, pollution, lesson plan ideas and solutions to pollution, visit the following websites.

Gray's Reef National Marine Sanctuary - www.graysreef.noaa.gov

Georgia Aquarium - www.georgiaaquarium.org

Georgia Environmental Protection Division Watershed Protection Branch

Georgia Project Wet

Georgia River of Words

Georgia Adopt-A-Stream

Georgia Rivers Alive

<http://www.riversalive.org/>

United States Environmental Protection Agency - www.epa.gov/owow/watershed/

Dorros, Arthur. *Follow the Water from Brook to Ocean*. HarperCollins Publishers, 1991. ISBN 0-06-445115-1

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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 that the author participated in. For more information about this workshop, Georgia Aquarium, or Gray's Reef National Marine Sanctuary, please visit our websites at www.georgiaaquarium.org or <http://graysreef.noaa.gov/>