POLLUTED WATERWAYS

Objective: Provide students with hands-on learning about recycling while establishing, expanding and/or maintaining a community wide recycling program.

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Grade Level	7th and 8th
Materials	• Kiddie pool that can be purchased at a discount store • water to fill the container leaving several inches at the rim • Various items of litter gathered by students • pool noodle cut into equal lengths pieces (size depends on size of pool – suggested size 8 inches • enough twine or rope to connect the pool noodles leaving one foot of extra twine on each end of the structure • Vernier water quality sensors • Water table materials (8 ft table, tarp, twine, duck containment pond, water hose, nozzle) • Mobile National Estuary Program (MNEP) Styrofoam incubators • Manufactured incubators for bacterial monitoring • R-Cards for bacterial monitoring

Outcomes and Connections:

Alabama Course of Study Standards

Science	**(Earth and Human Activity -6)** Analyze evidence to explain how changes in human population, and other human activities (e.g., land use, resource development, water and air pollution, urbanization) affect Earth's systems. **(Earth and Human Activity -6)** Implement scientific principles to design processes for monitoring and minimizing human impact on the environment (e.g., water usage, including withdrawal of water from streams and aquifers or construction of dams and levees; land usage, including urban development, agriculture, or removal of wetlands; pollution of air, water, and land) **MS-ES3-3** Apply scientific principles to design a method of monitoring and minimizing a human impact on the environment.

	(Geography-7) Explain how human actions modify the physical environment within and between places, including how human-induced changes affect the environment. **(Geography-9)** Explain how human actions modify the physical environment within and between places, including how human-induced changes affect the environment. **(Civics 12)** Describe how the U.S. can be improved by individual and group participation in civic and community activities.

Learning Outcomes

- List items that pollute water systems
- Demonstrate how solid litter in a body of water can be captured by a litter gitter
- Observe that chemical pollution cannot be captured as easily
- Hypothesize a reason that chemical pollution gets past the litter gitter
- Describe human activities that contribute to water pollution
- Explain how people can improve neighborhoods by taking action on litter
- Learn to implement instructional building guidelines
- Data collection
- Analyzing data from data collected
- Interpreting water quality metrics

Environmental Justice Concepts

1. Reducing items that pollute streams and waterways can benefit low-income, marginalized communities that are often adjacent to waterways which are used for fishing.

Climate Change Concepts

Water pollution contributes to climate change. Plastic especially injures marine life. When people eat fish who have ingested micro-plastic, it can cause problems with liver function, and it has been shown to affect children's behavior in schools.

Local Connection

Africatown borders the Mobile River and Chickasaw Creek. Both are listed as waterways where fish should not be eaten due to pollution. The entire Gulf Coast in Mobile and Baldwin Counties carry this warning as well. Residents of Africatown consume fish from the Mobile River and Chickasaw Creek. Fish who have ingested plastics have chemicals from plastic in their flesh.

Lesson Outline:

<table>
<tr><th colspan="3">Lesson 1</th></tr>
<tr><td>Pre-assignment</td><td colspan="2">Students should gather items of litter they can find near their homes. Instruct students that the litter be dry and not have sharp edges that could hurt someone.
Tell the students to bring their litter items to school and to be prepared to talk about:
• Where did they find the litter?
• What material is the litter? (plastic, paper, aluminum, etc.)
• Where do you think the material originated?
• What could have been done to keep the material from becoming litter?
• Students will build their own incubators (Mobile National Estuary Program (MNEP)– with assistance from community members from MNEP)
• Bay Keepers, Osprey Initiative, and MNEP partners participate in class visits</td></tr>
<tr><td></td><td>Science</td><td>Social Studies</td></tr>
<tr><td>In-Class</td><td>Prior to students' arrival, spread a waterproof tarp on the ground. Have students place their items from home on the tarp.

Discussion: Lead students in a discussion of the prompts from the pre-assignment.

After this discussion, show the following video clip:
Litter Gitter

Instruction/activity:
Tell the students that the class is going to go outside to explore how litter affects water and how we might catch litter and remove it from bodies of water. Take this time to give specific instructions about expected behaviors. (How will we gather around the pool? Don't touch the water in the pool. How should we carry on conversations? How should we react to the teacher and our classmates?)

Arrange to have the tarp with litter at the site of the pool demonstration.

Testing water quality for multiple water bodies.</td><td>Discussion:
Watch the following videos:

Causes and effects of water pollution

Pause and ask students to write down (1) Something they learned or saw that they already knew. (2) Questions that they have about the video

Water Pollution Effects on the Environment

Pause and ask students to repeat the last "quick write"

Instruction/Activity:

Hold a discussion about what the students have written. List the questions generated so that they can be displayed.

Ask students if they have ever seen any of the "…for Dummies" books. (Perhaps display one on the screen or have a physical copy.)

Tell the students that they are going to make a "Water Pollution for Dummies" book.

Divide students into small groups.</td></tr>
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	Analysis of collected data Allow each student to select and item of water and place it into the pool. Ask them to identify what type of litter it is. (Paper, plastic, Styrofoam, etc) Once the pool is littered, discuss why this is a problem. Possible Questions: • Have you seen places littered like this? • What do we use water for (drinking, bathing, swimming, etc) • How would this litter affect those things? Show students to noodle pieces and twine/rope. Ask, "How do you think we could use these things to try to get the litter out of the pool." Allow for answers. (Given that they have seen the video, someone should soon have the idea to string the noodle pieces onto the twine/rope.) Choose a few students to string the noodles. Ask, "What do we do now?" Allow students in pairs to skim the noodles across the top of the water. You could make this a friendly competition to see which pairs "git" the most litter. Possible questions after this activity: • How successful was our noodle rope at capturing the liter? • Was there a strategy that worked better than others when moving the noodle rope? • What materials were easy for the noodle rope to trap?	Assign each group a different "chapter" of the book: • What is water pollution? • What causes water pollution? • What does water pollution do to the environment? • What does water pollution do to people? • How can you keep water pollution away from your community? • What can we as a global society do to mitigate water pollution? Tell students that they can use any of the resources you've used (videos, etc) Gather and supply other resources (articles, books, pictures, etc.) Point students to the displayed questions. Tell students to look for questions that might be related to their chapters. They should find the answers and include them in their chapter. *Assessment:* Allow students to share their chapters. Compile the chapters into a class book. Add this book to the class library.

	• Was there anything that was hard for the noodle rope to trap? At this point ask, "We can see the water pollution we created in the pool. Are there other things that pollute our water that we can't see?" After a chance for discussion, tell students that there are often things we cannot see in the water. (If they did not come to that conclusion with the last discussion question, explain that there are chemicals and other tiny things we cannot see in the water.) While there is still litter in the pool, put drops of food coloring in the water and allow students to watch as it disperses. Choose a few students to try the previous activity (dragging the top of the water with the noodle rope) Ask students what was different about the chemical pollution. Solicit ideas about how to remove chemicals from our waterways. Allow students to participate in cleaning the activity area. Have them sort the litter into categories and deposit items in the proper bins. **Assessment** Have students write in their science journals (or on a piece of paper if journals are not used in your classroom) Include these prompts: • When you saw the pool so polluted, did it make you think of something you have seen? • How does litter get into our waterways? • How does it make you feel when you see polluted water?	

	• Is there pollution in our water that we cannot see? • What could cause invisible pollution?	
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Additional Resources:

Osprey International https://osprey.world/litter-gitter

The Story of Plastic https://www.youtube.com/watch?v=iO3SA4YyEYU

One Drop Foundation Handout https://www.onedrop.org/workspace/uploads/files/about-one-drop.pdf

Alabama Water Watch bacterial monitoring video: https://aaes.auburn.edu/alabamawaterwatch/videos/

Assessment Alignment:

Q8: I understand how studying science can help people fix problems.

Q9: I like thinking about big ideas. *

Q10: I think about what I learn in school when I am trying to solve problems outside of school.

Q11: I have heard the climate is changing.

Q12: I do some volunteer work.

Q13: I would like to do some volunteer work.

Q17: I would like to work with people to help clean up the environment. *

Q18: I know about problems that are happening in my community.

Q19: I would like to talk to people about how these problems can be solved.

Q20: I feel like I can make a difference in the world.

**If students participate in a community event such as Alabama Coastal Cleanup*

Potential 6th Grade Field Trips:

Potential 8th grade Capstone Projects: