

STEM ACTIVITY OF THE WEEK

Plastic Rapid Survey

Theme: Plastic Consumption; Water Quality; Combined Sewer Overflows; Pollution; Human Impact on the Hudson River Estuary

Ages: 8-14 years old

Prep Time: None

Activity Time: 30-40 minutes

Activity Summary:

The Hudson River has historically endured years of pollution and degradation. Today, we see that the health of the River's ecosystem has improved due to protective measures set in place through environmental activism, policy change and scientific monitoring of the river's water quality. However, one of the most persistent pollutants that still exists in our environment is plastic. After several years of researching microplastics and marine debris in the Park's waters, Hudson River Park began the [Park Over Plastic](#) initiative in 2019 to reduce single-use plastic use Park-wide and improve the health of the River.

This lesson demonstrates how plastics end up in our waterways and prompts students to investigate plastic use in their daily lives. Students will conduct a survey to explore differences between single-use and reusable plastic items found in their home. The activity concludes with a brainstorm of alternative materials to minimize our demand for plastic and ultimately protect our environment.

Goals:

- To understand the prevalence of plastics in our everyday lives
- To understand that plastics come in a variety of forms and used in different ways
- To consider solutions in creating a plastic-free environment

Objectives:

- Students will identify the difference between single-use and multi-use plastic
- Students will identify at least three plastic alternative materials

Lesson Materials:

- Plastic Rapid Survey Worksheet
- Calculator
- Pencil
- *Optional* Plastic Rapid Survey Answer Key

Background:

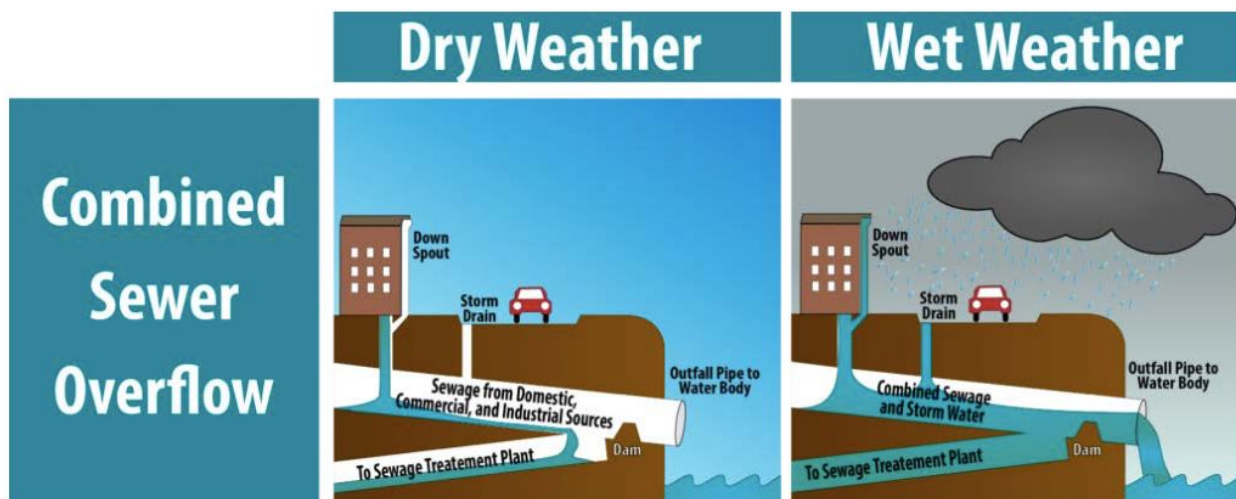
The Hudson River has endured decades of pollution and degradation from industrial, recreational, agricultural and domestic sources. A few examples of historic pollutants to the estuarine ecosystem are chemical runoff from farms and factories, and leaking (or in some cases, intentional dumping) of sewage and gasoline from motor vehicles and boats. Thankfully, in 1972, the United States government passed the Clean Water Act, which mandates that certain measures are taken to protect our country's

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waterways and the wildlife that inhabit them. Today, the health of the Hudson River ecosystem is improving, with continued help from scientists and stewards all along the river's 315 miles. In Hudson River Park, scientists are monitoring a variety of water quality parameters to better understand how human behavior impacts the health of the estuary. This information helps guide the Park in its mission to protect these natural resources.

Plastic is common in our daily lives; it is malleable, durable, lightweight and cheap to produce. These characteristics make it suitable for infinite purposes. It is a highly practical material, but there is a downside to consider: when we are done using these plastic items, that durability means the material lasts in the environment for years to come. This is part of what makes plastic one of the most prevalent forms of pollution in our urban environment. Unlike materials like wood, paper, cotton, etc. plastic is synthetic, or manmade. It can not be broken down by natural processes and returned to the earth. In other words, it is not biodegradable. Plastic can break into tiny pieces that are undetectable to the naked eye, but it never really disappears. This leads to a couple questions: (1) How does plastic end up in the Hudson River? (2) Why does it matter?

- (1) In New York City, plastic ends up in our waterways for a number of different reasons but one of the major routes is our sewer system. NYC's wastewater primarily runs on a combined sewer system. This is a system in which storm water from the streets are combined with sewage pipes in our homes, schools, and businesses. In the event of heavy rainfall, the system is overwhelmed and both the sewage and storm water drains directly into our waterways such as the Hudson River. It is during these **Combined Sewer Overflow** events (**CSOs** for short) that plastic litter on our sidewalks and plastic debris from our homes, such as fibers from our clothes and products that are flushed down the toilet, get washed into the River.



Source: Sewerequipment.com

- (2) When plastic enters the Hudson River, it is exposed to heat and UV rays from the sun. These factors cause the integrity of the plastic to break down. As larger plastic items break into smaller pieces and float through the water, wildlife confuses these bits of plastic mistaking it for food.

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Eating these plastics is harmful because while animals might feel full, they have not actually consumed any nutrients they need to survive. Additionally, plastic contains toxic chemicals such as bisphenol A (BPA) and PS oligomer, which can make the animal that consumed them sick. In a process called biomagnification, the wildlife that depends on those sick animals for food are harmed by the chemicals stored in the bodies of those that ate the plastic in the first place.

One of the Hudson River Park's monitoring projects is the ongoing [Microplastics Survey](#), conducted with partners at Brooklyn College. This study determines the concentration of microscopic plastic fragments floating in the Park's waters by trawling, or pulling a fine mesh net through the water, at various locations in the estuarine sanctuary. Another is the [Marine Debris study](#) that relies on volunteers from our community to help count, categorize and remove plastics from the shorelines at Gansevoort Peninsula and Pier 76. This study focuses on plastic items larger than one inch and looking for trends in the types of plastic and what kind of products most commonly found washed up along the shore.



By following along with the Plastic Rapid Survey Worksheet, you will conduct a mini-survey of your own that determines the abundance of different types of plastics used commonly at home. All you need is the Plastic Rapid Survey Worksheet, a writing utensil and a calculator, and you're ready to go!

Part 1: Learning Your Plastics

First, choose a room in your home in which you will conduct your plastic survey and gather the materials listed above.

The two main categories you will need to sort items into are single-use and multi-use plastics. **Single-use** plastics are products designed to be used only once. We often repurpose these items and use them again, but we still count them as single-use because of the intent of the manufacturer. **Multi-use** plastics are products designed to be used over and over again.

Take a few minutes and brainstorm some of these items you use and write them down on the worksheet

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Part 2: Survey Your Plastics

Start off by writing down what room you have chosen to survey at the top of the Plastic Rapid Survey Data Chart.

Next, begin your survey by tallying ALL the single-use and multi-use plastics found in this room. Record your tallies in the spaces provided in the Data Chart. Tally by writing a line for each plastic item. Every 5th item, cross a line through the previous 4. This will make counting your total much easier.

Example:



If you are not sure what material something is made of, you can inspect the object for a label or ask someone at home for help. Feel free to reference the Plastic Rapid Survey Answer Key too.

Once this is complete, count up your tallies for single-use plastics and record the numbers in the space provided below the tally box. Do the same for your multi-use plastics.

Add together your total number of single-use plastics and your total number of multi-use plastics to find your “Total Plastic Items Counted.”

Part 3: Analyze Your Results

Finally, take some time to review your findings. Refer to your data to the questions in this section.

For Question 1, use a calculator and the following formula to find out what percentage of your total was single-use.

$$[\text{Total Single-Use Plastics}] \div [\text{Total Plastic Items Counted}] \times 100 = \text{Single-Use Plastics}\%$$

For Question 2, Use a calculator and the following formula to find out what percentage of your total was multi-use.

$$[\text{Total Multi-Use Plastics}] \div [\text{Total Plastic Items Counted}] \times 100 = \text{Multi-Use Plastics}\%$$

For Questions 3 and 4, reflect on your findings. Brainstorm which products you could be replaced with ones made from non-plastic materials. Think about things you know exist in various manufacturing designs (example: a plastic just of milk vs a glass bottle).

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Question 5 is a challenge question. It requires an understanding of the background information provided in this lesson plan, and critical thinking skills. All students are encouraged to give this question a try, and if you hit a roadblock, please refer to the Plastic Rapid Survey Answer Key.