

Virtual Summer Camp: River Rangers

Week 6—Pollution Solutions

This Week:

Learn about the effects of water pollution, build a water filter and survey plastics like a scientist!

Friday-Monday: **Review & Prep!** Read through the packet and gather your materials.

Tuesday: **Tune in! Watch** our educators lead a live demonstration at 1pm.

Wednesday: **Experiment & Build!** Follow the activity instructions in your packet.

Thursday: **Share Your Results!** Submit a photo of your results to education@hrpt.ny.gov to be featured on our website. Then, download next week's packet!

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Week 6— Pollution Solutions

Materials Check List

Build a Water Filter (suggested):

- ☐ Cup, bucket, or pitcher
- ☐ Vegetable oil
- ☐ Potting soil
- ☐ Food coloring
- ☐ Shredded paper
- ☐ Recycled water bottle
- ☐ Coffee filter
- ☐ Gravel
- ☐ Tissue paper
- ☐ Fabric
- ☐ Water

Junior Plastic Rapid Survey:

- ☐ Plastic Rapid Survey Worksheet
- ☐ Writing utensil



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Build a Water Filter

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

Ages: 3-8

Prep Time: 10-15 minutes

Activity Time: 20-25 minutes

Activity Summary:

Pollution comes in different forms and from many sources. The pollution we create can often end up in our waterways which then must be filtered out before our community can use it in our homes. Students trial various materials in finding the right combination in order to filter artificial pollution using simple household items.

Goals:

- To understand the issues of water pollution and plastics and its effect on the Hudson River Estuary
- To understand that the Hudson River's health is improving and we can support as NYC residents

Objectives:

- Students will identify and count plastic items
- Students will identify at least one plastic alternative

Lesson Materials:

- **Sample Vessel** - cup, bucket, pitcher, or another container that will hold your contaminated water sample
- **Pollutants**- Pollutants are the materials that will pollute your water sample. Great materials that can be used to contaminate your water include shredded bits of paper, potting soil or ground pepper, olive oil or vegetable oil, dried beans or uncooked rice, and food coloring, bright colored juice, or iced tea. You will add a mixture of these materials into the water in your sample vessel to make your polluted sample.
- **Filter** - There are two main parts to each water filter: the **Container** and the **Filter Media**
 - **Container:** The container will house your filter media, and you will pour your polluted sample into this container so that it can be filtered. The important thing to remember about this container is it should be able to let water pass through the container when poured in, otherwise your sample will not be filtered. You may have to use scissors to poke holes into the bottom of your container for this purpose. Potential containers include: old take out containers, plastic water bottles, colanders, plant pots, etc. Please have an adult help puncture holes in your container.
 - **Filter Media:** Filter Media refers to the materials inside of the filter that water will pass through, getting cleaned up along the way. There are lots of different potential filter materials: you can use sand, paper towels, coffee filters, tissue paper, felt, sponges, rice,

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gravel, beads and more. The important thing to remember is that water should be able to pass through the filter media. Avoid materials that might completely absorb or discolor the water.

- Water

Background:

The Hudson River is a dynamic river, which begins at Lake Tear of the Clouds (the Source) on Mount Marcy, in the Adirondack Mountains, and flows to the Atlantic Ocean (the Mouth). This river is part of the Hudson River Watershed or the area of land where all precipitation and connected tributaries flow downward to the ocean. The Hudson River is the main artery of our watershed.

The bottom half of the Hudson River, from the Troy Dam to the New York Harbor, is a tidal estuary or an environment where salt and fresh water meet becoming brackish water. Salt water from the Atlantic Ocean moves up the River through tides and mixes with the fresh water from Lake Tear of the Clouds. This mixing of fresh and salt water makes estuaries one of the most productive marine environments due to the abundance of food and nutrients it collects. Therefore, the Hudson Estuary is an incredible habitat for a wealth of plant and animal life. The Hudson is also an invaluable resource for humans, providing us with drinking water, endless recreational opportunities and a reliable shipping channel.

The Hudson River, however, has endured decades of pollution and degradation from industrial, recreational, agricultural and domestic sources. Polychlorinated Biphenyls (PCBs) and heavy metals from factories have an especially long half-life and therefore continue to persist in our waters, sediments, and living organisms. Boat traffic has released gasoline and ballast water introducing toxic chemicals and invasive species to the River, while agricultural runoff and sewage has contributed harmful amounts of Nitrogen, Phosphorus and bacteria. Since 1972, with the passage of the federally mandated Clean Water Act, the Hudson's water quality has drastically improved as sewer treatment plants were institutionalized and dumping regulations tightened. However, real time monitoring highlights interesting fluctuations in water quality indicators that speak to the dynamic nature of the system and influence of stressors like runoff, Combined Sewer Outflows (CSOs), climate change and erosion. Monitoring water quality indicators teaches students a great deal about the physical and chemical makeup of the Hudson River and the changes that this river has experienced through time.

Lesson Procedure

Pollution comes in different forms and from many sources. The pollution we create can often end up in our waterways which then must be filtered out before our community can use it in our homes. Students will work in teams to trial various materials in finding the right combination in order to filter artificial pollution using simple household items.

As biodiverse as waterways like the Hudson River are, we haven't always treated it with respect. For many years, people polluted the Hudson River. Oil, animal waste, garbage, and chemicals are all pollutants that have a negative impact on the estuary. When pollutants enter our waterways, we want to try to remove them to reduce this negative impact. Today, we will make a contaminated water sample using household materials that mimic certain pollutants in the Hudson River.

Follow the steps below to polluted water and design a filter to solve this problem, and respond to guiding questions along the way:



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1. **MAKE POLLUTED WATER-** To simulate the pollutants we can find in the Hudson River and other local waterways, fill your sample vessel with water, and add different ingredients to it that will represent real types of pollution. If you have potting soil or ground black pepper, that can represent erosion, which is often naturally occurring materials that break down over time and wash into the River (things like soil from gardens and lawns). Olive oil or vegetable oil can represent motor oil the spills out of boats, or even from vehicles on the road which washes into our waterways when it rains. Dried bean or uncooked rice can be used to represent animal waste. Shredded paper will represent trash and litter. Food coloring, colored juice or iced tea can represent chemicals.
2. **DEFINE THE PROBLEM:** Why do you think it is bad that we find these various pollutants in the Hudson River? How do you think it impacts wildlife?

3. **BRAINSTORM:** Look at the list of suggested materials for *Filter Media* found on the previous page. Be thoughtful not to use the same materials for your filter media as you chose for your contaminated water. What materials (choose 3) will you use to filter pollutants out of your sample water? Why?

4. **DESIGN:** Think about in what order you will order your filter media in your container, and assemble your materials.

5. **TEST YOUR DESIGN:** Slowly pour the polluted water sample from your sample vessel through the filter. Make sure there is another container or bowl beneath your filter to catch your filtered water.



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6. **REVIEW YOUR DESIGN:** Rate how well your filter worked to remove each pollutant on the scale below by circling the number score, where 1 = none was removed (all of the pollutant went through your filter) and 10 = all was removed (there is none of that pollutant left in your water):

a. Erosion

1 2 3 4 5 6 7 8 9 10

b. Motor Oil

1 2 3 4 5 6 7 8 9 10

c. Animal Waste

1 2 3 4 5 6 7 8 9 10

d. Trash and Litter

1 2 3 4 5 6 7 8 9 10

e. Chemicals

1 2 3 4 5 6 7 8 9 10

Add up the numbers you circled to find your total score. What is your filter's score? _____/50

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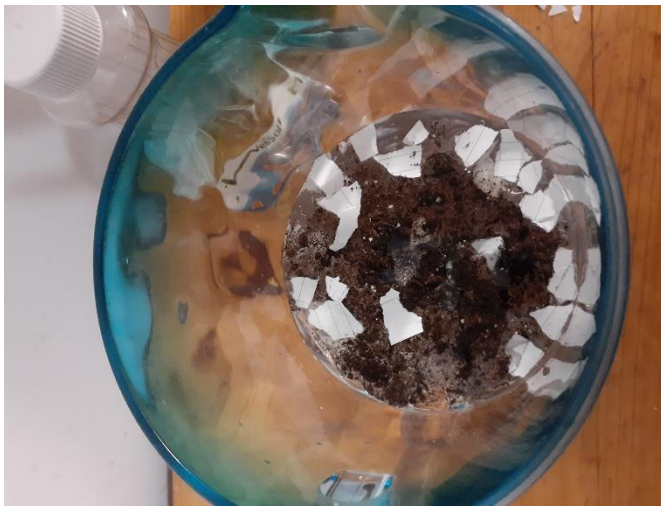
Example Filter Build:

See the images below to see examples of a water filter build and trial. Remember, you might have access to different materials in your home, and that's ok! Be creative and experiment!

1. Contaminated Sample vessel with Contaminants (paper, soil, vegetable oil)



2. Contaminated Sample



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3. Filter Container (make sure that water can pour through the container. If utilizing an old takeout container like this example, make sure to poke holes in the bottom!)



4. Assemble Filter Media (example uses paper towel, sand and tissue paper layers. Remember to try experimenting with your own types of filter media!)



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5. Pour contaminated sample into your filter! Make sure that you have a container under your filter to collect the filtered water!



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Junior Plastic Rapid Survey

Theme: Plastic Consumption; Water Quality; Combined Sewer Overflows; Pollution; Human Impact

Ages: 5-7 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.

Students will conduct a survey to explore plastic items found in their home. The activity concludes by inviting the family to brainstorm 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 and count plastic items
- Students will identify at least one plastic alternative

Lesson Materials:

- Plastic Rapid Survey Worksheet
- Writing utensil

Background:

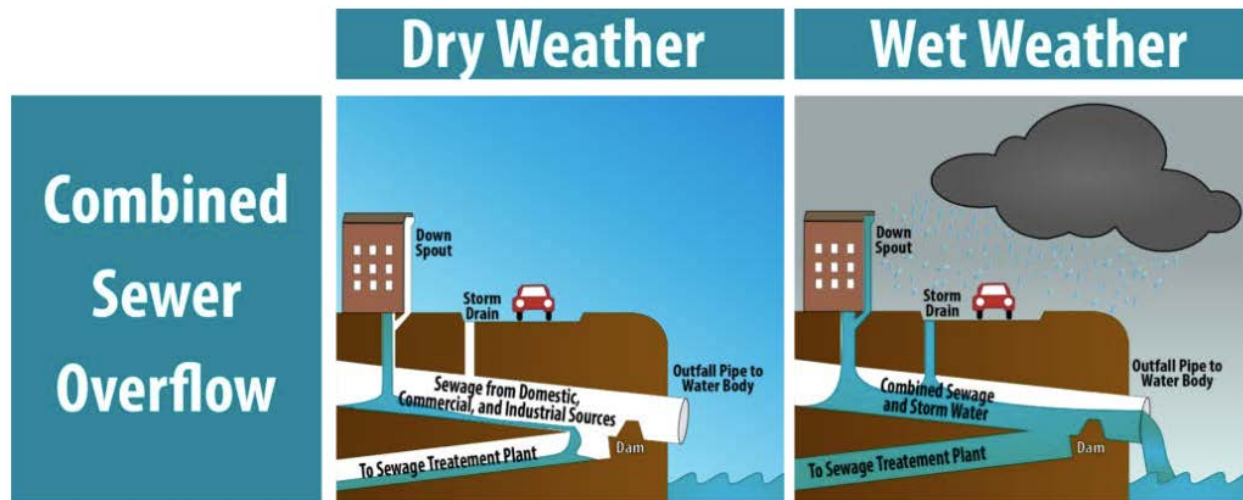
The Hudson River has endured decades of pollution and degradation from industrial, recreational, agricultural and domestic sources. A few examples of historic pollutants to the estuarine ecosystem are chemical runoff from farms and factories, and leaking (or in some cases, intentional dumping) of sewage 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 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

VIRTUAL SUMMER CAMP: RIVER RANGERS

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. 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.

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By following along with the Plastic Rapid Survey Worksheet, you will conduct a mini-survey of your own that finds the number of different types of plastics used at home.

Part 1: Find a spot to count!

A good place to start would be a room with lots of items like your kitchen. You can choose just one cabinet or a corner. For a challenge, try counting in the entire room!

Part 2: Count Your Plastics!

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

Count as many plastic items as you can find like grocery bags, toys and wrappers. Plastics come in all shapes, colors and sizes so 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.

Once you've finished, write your total number of plastics at the bottom of the chart and create a pledge on the last page!

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Plastic Rapid Survey Worksheet

Plastic Rapid Survey Data Chart
Survey Room:
Use this space to keep track of your counting or draw examples of plastic items in your survey!
Total Plastic Items Counted:

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Take the pledge!

Too much plastic makes our Earth sick, especially the kind of plastics that we throw away after using once. This type of plastic is called single-use plastic. What can you do at home to use less single-use plastic? Talk with family members to find a solution together! Draw or write your answer and have everyone sign at the bottom. Print and place the pledge where everyone in your home can see it as a reminder to make the Earth a cleaner place!

Our Plastic-Free Pledge



Signature:
