LESSON: WATERSHEDS & THEIR RELATIONSHIP TO LITTER

Activity 3: Float, Sink or Suspend?

U of T Trash Team

OVERVIEW

In this activity, participants will explore how different plastics move and travel within a watershed.

LEARNING OBJECTIVES

After completing this activity, participants will be able to:

- Explain how physical characteristics of plastics affects how they move (or don't move) within a watershed.

SETUP AND MATERIALS

This activity takes approximately 40 minutes.

- Print a copy of the **worksheet** (or recreate your own on scrap paper) and grab a pen or pencil.
- Download the **supplementary sheet: The Great Lakes Watershed**
- Fill a large clear bin with water
- Find an assortment of plastic items from around the home (ideally of different sizes, shapes and densities).
  - Suggested list includes:
    - Variety of plastic toys (Lego, rubber ducky, toy truck, plastic figurines etc)
    - Plastic straw
    - Plastic water bottle
    - Plastic bottle cap
    - Food wrapper
    - Foam cup or tray
    - Plastic bag
    - Fishing line
    - Ziploc bag
    - Fabric scraps
    - Laundry lint (to talk about microfibers, a type of microplastic)
    - Golf ball
    - Bits of rubber - e.g., from a shoe or a tire
    - Plastic PVC piping

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INSTRUCTIONS

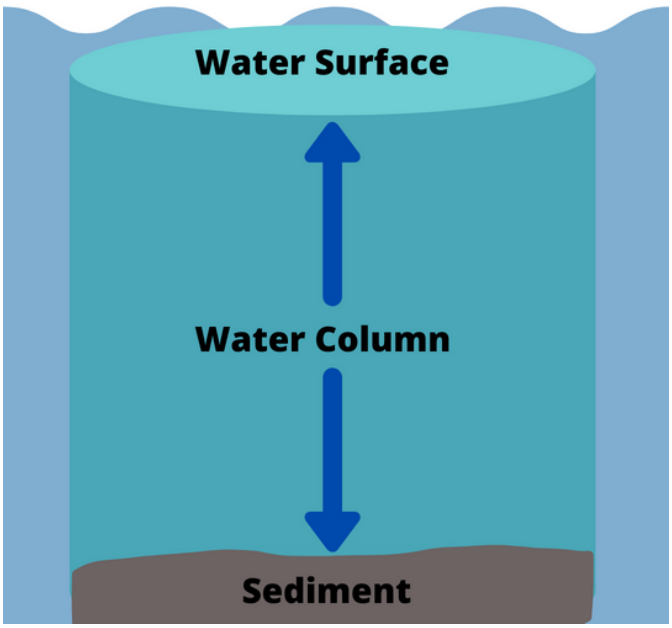
- Provide participants with a copy of the worksheet.

1. Show the connection between the Great Lakes and the Atlantic Ocean.

- Explain to participants that we've just learned all about what's in a watershed and the different sources of pollution and are now going to explore how these items travel in aquatic systems.
- Work with participants to describe how water in their watershed eventually connects to the ocean. The example provided in this activity is for the Great Lakes region.
- Use supplementary sheet: The Great Lakes Watersheds. First show the image of North America that highlights where the Great Lakes are located. Then show image of the Great Lakes and ask participants to find the city they live in and then guess where plastic pollution would flow next on its way to the ocean. If their city isn't listed on the map, search an online map to help locate it. If they don't live near the Great Lakes, encourage participants to pretend and pick any city shown on the map.
- Ask participants to trace this pathway by drawing arrows on the map shown on page 1 of the worksheet.
- Refer to the supplementary sheet for a map with arrows already drawn. You can also refer to the Great Lakes Guide by Swim Drink Fish. They describe the flow-by-flow as follows:
  - From Lake Superior, water drains into the St. Marys River and flows into Lake Huron.
  - Lake Huron and Lake Michigan are connected directly by the Straits of Mackinac.
  - Lake Huron waters flow into the St. Clair River, which drains into Lake St. Clair.
  - Lake St. Clair, in turn, drains into the Detroit River, and empties into Lake Erie.
  - At the end of Lake Erie, water flows into the Niagara River, dropping 52 meters (170 ft) as it flows over Niagara Falls and into Lake Ontario.
  - From Lake Ontario, water flows into the St.Lawrence River and ultimately runs out into the Atlantic Ocean.

2. Introduce the concept of a water column and how items travel in aquatic systems.

- Explain that while moving through a watershed, litter items may reach the water and once there, they can move in different ways.
- Share that plastic products have different sizes, shapes and chemical compositions which can impact how they act once placed in water.
- Some plastics might float at the **water surface** while others might sink then settle and accumulate at the bottom in the **sediment**. Then explain some might be suspended partway in something called the **water column** (an imaginary cylinder of water that extends from the surface to the bottom of the waterbody).
- Explain that because of all the different ways plastic moves, litter may travel and end up in the ocean or some might settle at the bottoms of rivers and lakes on the way out to the ocean or larger body of water.
- Remind them of the pathway from the Great Lakes to Atlantic Ocean.



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INSTRUCTIONS (CONTINUED)

- Explain that a **hypothesis** is something very important to scientists and share definition.
  - ***Definition: A possible answer to a question or explanation of a phenomenon. It accounts for all of the observed facts and is testable.***
- Gather your assortment of plastic items and have participants write them down in the table on pages 3 and 4 of the worksheet.
- Now have participants describe the physical properties of each item in the same table (are they light? heavy? hollow? thin? flexible? etc).
- Ask participants to write down their hypotheses of what will happen once each item is placed in water. Will they float? Sink? Will they be suspended in the water column?
- We'll now test their hypotheses by taking each item, and one at a time, placing them in a large clear bin full of water. Observe what happens.
  - ***Tip: For better results, place items about halfway between the surface and the bottom of your bin and wait for 1 minute to observe if they'll float, sink or become suspended.***
- Record how each item behaves in the table on the worksheet and then compare back with their original hypotheses.
- Refer to the table below for some items we have already tested. If any differ from your results, remember that it could be due to different sizes, shapes, chemical compositions or the way in which they were placed in water (e.g. some fabric materials will eventually sink but others may continue to float). The main thing to emphasize is not all plastics act the same in water.

Physical example to test	Fate in watershed
Rubber Ducky	Float
Plastic straw	Float
Small Plastic bottle (empty) with the plastic cap still on	Float
Plastic bottle cap	Float
Broken coloured plastic bits to represent plastic fragments	Float
Food wrapper (Granola bar, candy wrapper or similar)	Float
Foam cup or foam tray	Float
Scraps of plastic bag	Float and/or suspend in water column
Segments of fishing line	Float and/or suspend water column
Laundry lint to represent microfibers	Suspend in water column
Ziploc Bag – sandwich size	Suspend in water column
Fabric scraps to represent clothing	Should sink eventually (takes ~1 min)
Lego piece	Sink
Bits of rubber (e.g. from a shoe or tire)	Sink
Golf ball	Sink
Plastic PVC piping	Sink
Sinking fish lure	Sink

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FINAL REFLECTION

Now that you have completed all parts of the activity, it's time to reflect back on what participants have learned.

- Have participants return to the last page of their worksheet to answer the questions below.
    - Do you think plastic items that sink will travel far in a watershed? What about items that float? How about items that are suspended in the water column?
    - What are some different areas within a river/lake/ocean that plastics can end up? (answers could include the sediment, surface, water column etc.)?
    - Share how some personal choices might impact local watersheds and list some actions we can take to reduce any negative impacts.
        - ***Potential ideas:***
            - ***Refuse items they don't need, reduce how many products you use, reuse materials as much as possible and recycle properly.***
            - ***Share information about how to properly sort waste into correct bins.***
            - ***Lead cleanups with friends and family.***
            - ***Speak to local companies about how they can reduce their waste footprint.***
            - ***Write to decision-makers to tell them you are passionate about this issue and provide suggestions for changes they could make.***

Congrats, you've now completed all activities in the Watersheds & Their Relationship to Litter lesson!