An Ocean Plastic Activity

Objectives
Students will be able to describe that different types of plastics float, sink, or stay neutrally buoyant once they enter the ocean. Students will be able to begin to make connections between where a marine organism lives and feeds and their likelihood of debris exposure.

Introduction
Whether it sinks or floats, plastics in the sea pose a threat for all the animals in the ocean. Show students how the buoyant properties of different plastics allow some to float, some to sink, and some to stay in the water column. Guide students to infer which types of marine organisms can be affected by plastic debris, depending on where in the water column it is.

Next Generation Science Standards
Science & Engineering Practices

- Planning and carrying out investigations
- Developing and using models
- Constructing explanations and designing solutions

Crosscutting Concepts

- Cause and effect
- Systems and system models
- Structure and function

Disciplinary Core Ideas

- LS2.(A-D): Ecosystems: Interactions, energy, and dynamics
- ESS3.C: Human impacts on Earth systems
- ETS2.B: Influence of science, engineering, and technology on society and the natural world

Supplies

- Fish tank, tub, pool, or bucket
- Water (Optional: Add 35 grams of salt per liter of water to replicate oceanic saltwater)
- Variety of trash pieces - try to represent each plastic resin code (you can use items from previous cleanup efforts or trash audits)

Procedure
1. Intro. Ask students how they think marine debris may impact wildlife. Lead a discussion about the danger of marine debris to animals and ecosystems (be sure to discuss entanglement, ingestion, and habitat damage). Some helpful resources for these discussions include:

- Watch Ocean Today's TRASH TALK video "How does marine debris impact the ocean, animals, and me?"

- Try to find pictures of animals entangled or ingesting marine debris.
- For full lesson plans exploring entanglement or ingestion, visit the NOAA Marine Debris Program website.

Following your discussion of the impacts of marine debris on wildlife, discuss the oceanic zones in which marine animals live and feed.

- Surface zone - where the water meets air and things float where they can be seen.
- Pelagic zone - the open water column where fish swim and plankton drifts.
- Benthic zone - on or near the ocean floor.

Different types of plastic will impact different animals depending on certain properties of the plastic and the zone in which the animal feeds. Some animals may become entangled in it while others may consume it. Have students brainstorm what types of animals might live and feed in each of these zones.

- Students can do a quick research activity on the NOAA Fisheries - Find a Species website to find out what kinds of marine animals live in each zone. Have students pick an animal in each zone and brainstorm what kinds of plastic marine debris they could come into contact with. What kind of encounter would this be? Would they become entangled, or are they most likely to consume it? What else could happen?
- For older students, you may also consider using the attached plastic resin code table (**Appendix A**) to discuss the different types of plastic. Ask students to think about how different types of plastic would behave in the ocean. Would it sink or float? (See Extension)

2. Set up. If you have more than one tank/tub/pool, split students into groups, otherwise this can be a full group activity. Fill tanks/tubs/pools with water and stir in salt if using. Distribute plastic trash pieces to students.

3. Sink or Float. Have students drop each plastic trash piece into the water one at a time and observe what happens. Does the plastic stay at the surface? Sink to the bottom? Or float somewhere in between? Using the worksheet provided (**Appendix B**), for each piece, have students write down their predictions, observations, and which marine zone they think the plastic would reside in if in the ocean (if applicable). Then have students come up with 2-3 marine organisms that could be affected by each piece and how.

- Be sure to leave pieces in the water long enough to see if time is a factor in determining which zone the piece of plastic would end up. For example, a plastic bottle without a lid may float, until water gets inside causing it to sink.

5. Discussion.

- How do different types of plastics behave differently in water? And how can this affect marine species and ecosystems?
- From your observations, is there a marine zone you think is more likely to be impacted from plastic pollution than others? If so, which one and why?

- Are there any other impacts besides wildlife interactions that plastic could have in each marine zone? (e.g., habitat degradation, navigational hazards, etc.)

6. Assessment.

- Have the students imagine they are an animal that lives in different marine or aquatic environments, like a fish, a crab, or a turtle (this could be based on previous discussion of marine zones and wildlife). Ask them to write a story about what they would feel as they watched debris and litter enter their "home".
    - You can ask the following types of questions to help the students imagine the situation: How would you react to people throwing trash into the water from boats or from the shore? What would you think about a piece of trash floating in the water? How would you feel about cans and bottles blocking the entrance to your favorite cave? What would happen if you mistook the piece of trash for food or accidentally got entangled?
- Have the students draw pictures, write a paragraph, or design a video to illustrate how a piece of trash (paper bag, coffee cup, soda can, etc.) on a street can be moved by rain into a storm drain, into a nearby stream, and then into the ocean, and what happens to it once it reaches the ocean.

7. Extension.

- Conduct the same activity but this time pay attention to the resin code on each piece of plastic (if applicable). Record the resin code along with the other observations and evaluate whether all types of plastic with the same resin code number have the same buoyancy? Would they all end up in the same marine zone?
    - Use the attached resin code table and teacher answer key (**Appendix C**).
- Have students design a new experiment to explore other ways debris may behave in the environment. Suggested questions can include: Will it get blown around by wind (you can test this using a table fan)? Will it get swept up by rain (you can test this using a watering can)? Support students in using the scientific method to identify how different materials (including different resin codes) are transported throughout the environment.

References

- Plastics in the water column - Curriculum 6-8 (Monterey Bay Aquarium)
- You Are What You Eat: Plastics and Marine Life (PBS)

Worksheet Appendices

- **Appendix A: Resin Code Table**
- **Appendix B: Worksheet: Sink or Float?**
- **Appendix C: Teacher Answer Key**

Resin Code Table adapted from [What You Eat: Plastics and Marine Life]

Name	Plastic Resin Code	Description	Uses	Some Examples
PET, PETE Polyethylene terephthalate	1	High strength; transparent; barrier to gas and moisture, resistant to heat	Plastic soft drink and water bottles, mouthwash bottles, peanut butter and salad dressing containers	
HDPE High density polyethylene	2	Tough; chemical and moisture resistant; permeability to gas; translucent or opaque matte finish	Milk, water and juice containers, trash and retail bags, liquid detergent bottles, yogurt and margarine tubs, cereal box liners.	
PVC Polyvinyl chloride	3	Hardy; chemical resistant; resistant to grease/oil; transparent, translucent or opaque	Clear food wrap, piping, medical tubing, wire and cable insulation.	
LDPE Low density polyethylene	4	Tough; lightweight; barrier to moisture; can be nearly transparent or opaque; low to high gloss.	Bread bags, frozen food bags, squeezable bottles, fiber, tote bags, bottles, clothing, furniture, carpet.	
PP Polypropylene	5	Hard; resistant to chemicals; resistant to heat; barrier to moisture; resistant to grease/oil; transparent, translucent, or opaque	Ketchup bottles, yogurt containers and margarine tubs, battle caps, medicine bottles.	
PS Polystyrene	6	Stiff; transparent or opaque; smooth surface	Compact disc jackets, medical test tubes, some disposable cups.	
EPS Expanded polystyrene	6	Lightweight; heat resistant; insulating; opaque; foamed	Food service containers, grocery store meat trays, egg cartons, cups, plates.	
Other	7	This code indicates that the product is made with a resin other than the six listed above, or is made of more than one resin listed above.	Three and five gallon reusable water bottles, pens, computer cases, baby bottles, sippy cups.	

Worksheet: Sink or Float?

Does plastic sink or float in the ocean? Why do you think that?

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Item	Prediction (sink/float)	Observation (sink/float)	How might this item impact the environment?	Other Notes (time, resin code, etc.)

Teacher Answer Key

Resin Code	Sink or float?
#1 **PET, PETE** Polyethylene terephthalate	Typically sinks in water. Some products may float if filled with air (e.g. an empty plastic water bottle with a lid)
#2 **HDPE** High density polyethylene	Floats in water
#3 **PVC** Polyvinyl chloride	Sinks in water
#4 **LDPE** Low density polyethylene	Floats in water
#5 **PP** Polypropylene	Floats in water
#6 **PS** Polystyrene	Sinks in water
#6 **EPS** Expanded Polystyrene	Floats in water
#7 **Other**	Variable