



Taking a Bite Out of Lunchroom Waste

Lesson 2: How does trash become marine debris?

Anchoring Phenomena:

How can we **reduce** marine debris?

Investigative Questions:

How does trash get into the water/become marine debris?

Lesson Goal:

What students will do: Students will explore how trash gets into the water. Students will investigate the common types of marine debris in the Great Lakes. Students will learn how trash (plastic) impacts ecosystems and animals, including people.

What students figure out:

- How trash gets in the water
- That plastic doesn't just float
- How trash in the water can harm animals
- Ways to refuse single-use items

NGSS Alignments

Investigative questions	Grade Level Performance Expectations	Disciplinary Core Ideas	Science and Engineering Practices	Cross-cutting concepts
How does trash become marine debris?	<p>K-ESS3-3 Earth and Human Activity - Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.</p> <p>5-ESS3-1. Earth and Human Activity - Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.</p>	ESS3.A Natural resources	<p>1- Asking questions (for science) and defining problems (for engineering)</p> <p>3 - Planning and carrying out investigations</p> <p>8 - Obtaining, evaluating and communicating information.</p>	<p>1- Patterns</p> <p>2 - Cause and effect</p> <p>7 - Stability and change</p>

	<p>MS-ESS3-3. Earth and Human Activity - Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</p> <p>MS-ESS3-4. Earth and Human Activity - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems</p> <p>HS-ESS3-4. Earth and Human Activity</p>			
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Materials:

- [Top 10 Great Lakes Marine Debris cards](#),
- [Great Lakes Feeder cards](#)
- [Great Lakes water column](#)
- [Monterey Bay's Plastics in the Water Column Lesson](#)
- [Trash Talk Debris Cards](#)
- Clear plastic container like a fish tank
- [Bits of plastic sample for floating activity](#)
- [Student Journals](#)
- Biodegradable packing peanuts
- [White cheddar cheese puffs](#)

Lesson Prep:

Explore claims, evidence, and reasoning (CER):

- Reviewing this video [CER Planning](#) (9 minutes)
- Read about an example for [using CER from MiSTAR](#)
- Review the [CER Appendix](#)
- Review the [expanded CER \(KLEWS\)](#) as options for engaging students in CER.

Lesson Steps:

Invitation

1. Revisit the BIG idea - How can we reduce marine debris?

2. Reflection: In their [journal](#), have students answer the question: “Why is understanding how trash gets into the water important?” Students will write what they think now; let them know they will fill in the other half at the end.
3. Take a walk on your school campus or through your school’s neighborhood to view storm drains where water enters. If possible, follow the storm system to the storm drain outlet or use a map back in the classroom to trace its path. Many storm drains outlets go directly into rivers or lakes. In the coastal communities of the Great Lakes, storm drains often dump unfiltered stormwater directly into the nearest Great Lake.
4. Choose one of the following videos on storm drains to watch:
 - a. [Journey of Plastic Litter: Do You Know Where Your Plastic Cap Goes?](#) (4 minutes) from Cafeteria Culture. They have [many other student-made videos](#) to check out as an extension.
 - b. [How Storm Drains Work and Why They Are Important](#) (2 minutes) from King County Department of Natural Resources and Parks
 - c. [Storm Water Runoff](#) (3.5 minutes) from Thank You Ocean 2015

Exploration: How does trash get into the water/become marine debris?

5. Have students discuss in small groups: how does trash end up in the water? Where does it come from?
 - a. Have small groups share out, round-robin style until they have listed all the sources of marine debris in our water. Use [Talking Trash and Taking Action: Marine Debris Sources](#) as a reference list.
 - b. *Extension - Next Generation Science Standards 4th grade unit on waves: [Why do things wash up on the beach and others don't?](#)*

Concept Invention (each item 6, 7, and 8 could be a separate class period)

6. What items are **most commonly collected** during marine debris cleanups?
 - a. GREAT LAKES ACTIVITY: Provide each pair/small group of students with the [10 common marine debris items from the Great Lakes Basin cards](#) (source: Alliance for the Great Lakes Adopt-a-Beach Program)
 - b. Ask students to try to arrange them in order from 1-10.
 - c. Using Claim, Evidence, Reasoning (CER), have each pair/student group answer the question: What item do you think is number one on the list?
 - i. **Claim** sentence starter/example: The number one item on the list is: “plastic caps.”
 - ii. **Evidence** sentence starter/example: We found lots of “caps” when we did our clean up.
 - iii. **Reasoning** sentence starter/example: Since we found so many “caps” when we did the beach cleanup, we think they are number one on the list.
 - d. Have each pair/small group share their CER for their #1 item
 - e. Show or write out the correct order of common marine debris items: [List of Top 10 Great Lakes Basin Litter Items](#)

- i. Ask students to record in their journal: What do you notice? What do you wonder? Which items from this list could come from our school or our lunches? Have students share their thoughts with a partner or in a small group.
 - f. *Extension - OCEAN ACTIVITY: Use the Talking Trash Activity: [Top 15 Marine Debris Items](#) (Ocean) and associated [Debris Card Deck](#)*
 - g. *Extension - [Compare the Great Lakes top marine debris list with the International marine debris list.](#)*
 - i. *Extension - Learn about current programs [Great Lakes | Marine Debris Program](#)*
 - h. *Extension - Explore how plastic is made. Video: [Mystery Doug - How is plastic made?](#) (5 minutes)*
- 7. Exploring **properties of plastic**: density and buoyancy
 - a. Share the focus question and have students brainstorm: Where in the water do you find marine debris? Floating on the surface? On the bottom? Suspended in the water?
 - b. Complete Monterey Bay Aquarium's [Plastic in the Water Column](#) lesson using the [Great Lakes Feeder Cards](#) and the [Great Lakes Water Column](#) as a substitute for Ocean Feeder Cards and Ocean Water Column. Modify as necessary for your grade level.
 - c. Watch the first 2 minutes of the student-made video: [Microplastics 101](#). This describes how plastic ends up in our waterways. [Plastics 101](#) is another great student-made video that talks about plastic bioaccumulation (when plastic makes its way up the food chain).
 - d. *Extension - Watch how inventors are developing ways to remove plastic from our waters with [the Great Bubble Barrier](#) (1 min video)*
 - i. *Rewatch the video "[We Collected 300,000 pounds of plastic in 8 Months](#)" and compare the types of barriers used in it with the bubble barrier.*
 - ii. *Research other barriers that are being used.*
- 8. Exploring the **impact of marine debris on wildlife**
 - a. Once again, show the [Lifespan of Trash](#) chart/graph from Lesson 1 and remind students that plastics do NOT biodegrade and can remain in our environment for a very long time.
 - b. Complete the [Cheese Puff Activity](#)
 - c. Making connections between plastics in the water column and animals that live in the Great Lakes. Have students use CER to answer the question: How might plastic affect seagulls (or assign another specific animal) that live in the Great Lakes?
 - i. Claim sentence starter/example: Plastic in the Great Lakes is harmful to herring gulls.
 - ii. Evidence sentence starter/example: Herring gulls eat insects that float on the top of the water. Some plastics float on top of the water.
 - iii. Reasoning sentence starter/example: Herring gull's food (insects) can be confused with plastic floating on the surface.
- 9. *Extension: Explore the [Winged Ambassador lessons](#) and a video: [What's the Deal with Albatross Vomit?](#) (13 minutes) to learn about Albatross and their boluses. (U.S. Fish and Wildlife Service partners may be able to ship you a bolus for dissection).*
- 10. How can we reduce marine debris?
 - a. Watch/rewatch [Microplastics 101](#) (8:00- 8:55) that show a few ways to reduce single-use plastic in lunches.

- b. *MS/HS Extension: Watch [The Story of Change](#) video (6.5 minutes). This video shows what is needed as a community, school, city, county to work together to make lasting change through policies and laws. It may connect and the connection to [The Story of Stuff video](#) used as an extension in lesson 1B.*

Application

11. Ask students to look at the trash sample from Lesson 1 and list the items that could cause the most harm as marine debris: PLASTICS.
12. Ask students why they think these items could cause the most harm.
13. Give each pair of students a plastic trash item. Tell them that their job is to list at least two ways they can refuse to use the plastic item. They can outright refuse but they should also consider creative alternatives - even if they seem silly. Example: a plastic takeout container. 1. Bring your own container 2. Ask the server to wrap your items in foil 3. Refuse to single use and share the food with your dinner companions

Reflection

14. Ask students to use the second half of the page in their journal titled, "Why is understanding how trash gets into the water important?"
 - a. On the other half, ask the students to write what they think now.
 - b. At the bottom, have students write one thing they will do to reduce plastic waste.

[Great Lakes Literacy Principles Connections:](#)

- (1) The Great Lakes, bodies of fresh water with many features, are connected to each other and to the world ocean.
- (5) The Great Lakes support a broad diversity of life and ecosystems.
- (6) The Great Lakes and humans in their watersheds are inextricably interconnected;
- (8) The Great Lakes are socially, economically, and environmentally significant to the region, the nation and the planet.