

Prodigious Plastic Pollution

By identifying plastics in our daily lives and tracing their pathways to beaches and coastal waters, can we minimize the volume of these harmful pollutants?

Overview

There are many different sources of marine debris. From intentional littering on land and in waterways, to improperly covered trash bins, items often travel by wind and currents long distances before settling on beaches or on the ocean floor. Marine debris can come from anywhere in a watershed, and be carried by rivers, streams, and other waterways into the ocean. Marine debris can also be generated in the ocean through lost cargo and fishing gear, and even dispersed by natural disasters like hurricanes and tsunamis. In this lesson, students learn about plastic marine debris to find out where it comes from, its impacts on wildlife and humans, and how student actions can address the problem.

Essential Questions

- *What are the different types of plastics and how might they be present in our everyday lives?*
- *What are the harmful effects of plastics specifically on marine organisms?*
- *What are the harmful effects of plastics on other living organisms?*
- *What can we do to help prevent the spread of plastics?*

Learning Goals

Students will learn the following:

- *The use of plastic has increased dramatically over the past 75 years.*
- *Plastic can have harmful effects on living organisms when its ends up in the marine environment.*
- *Individual and community actions can mitigate plastic pollution.*

Learning Objectives

Students will be able to:

- *recognize different types of plastics and how each can be reduced, refused, reused, repurposed, or recycled.*
- *describe how plastic ends up in the ocean and on beaches.*
- *make a positive individual footprint.*
- *support the efforts and actions of organizations working to reduce plastic pollution.*

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Grade Level

6-8

Time

five 45-min class periods and one field day

Anchoring Phenomenon

Prodigious Plastic Pollution

Driving Question

By identifying plastics in our daily lives and tracing their pathways to beaches and coastal waters, can we minimize the volume of these harmful pollutants?



Standards

Next Generation Science Standards

ESS3.C – Human Impacts on Earth Systems

Common Core Math Standards

7.SP.B.4

8.SP.A.4

Introduction

Plastic is designed to last for a very long time. But it hasn't been around for very long – only since the early 1900s. Today we are surrounded by more plastic than ever before. Plastic production has surged over the past 50 years, from 15 million tons in 1964 to 311 million tons in 2014, and is expected to double again over the next 20 years.

Plastic has changed the way we live. It's cheap and can be used for many different purposes, from life-saving medical equipment to takeaway coffee cups. But single-use disposable plastic items, though used for just a few minutes, will still be around in hundreds if not thousands of years from now. Only around 9 percent of plastic is recycled, so most discarded plastics end up in landfills or polluting the environment. A huge amount of plastic ends up on our beaches and in our oceans, and this pollution poses a threat to sea life, ecosystems, and human health. The observable phenomenon of accumulated plastic pollution is a wakeup call to act now. For more information, see the [Background for Teachers](#).

This lesson was piloted in a distance learning classroom but can be easily adapted for in-person instruction.

Lesson Procedure

ENGAGE

To introduce students to the anchoring phenomenon, show students the video [Three Seconds](#). Ask students to respond to the Guided Discussion Questions. Then, introduce the topic of marine debris using the Kahoot focused on [Ocean Plastics](#) (20 minutes).

Show students the [What is Marine Debris](#) video from NOAA Trash Talk, and then ask students to formulate their own definitions of marine debris. Have students share their responses with the whole group. Compare and contrast responses and settle on a class definition. Have students reflect on what the most important takeaway from the video might be. Share responses with the class (10 minutes).

Where is marine debris coming from? Have students read [Sources of Aquatic Trash](#) from EPA Trash-Free Waters. You may either have students read the article aloud or silently. After having the opportunity to read, have students turn and share with a partner what they think the focus of the EPA's Trash-Free Waters program is. Have students come together and share whole group responses (10 minutes).

LESSON RESOURCES

Background for Teachers

- Overview ([pdf](#))



Video

- [Three Seconds](#)

Guided Discussion Questions

- What did you already know about human impacts on ecosystems?
- What surprised you in this video?
- What questions do you have after viewing the video?
- What concerns do you have after watching this video?
- How might this video inspire others to "stand up for a clean future"?

Plastic Pollution Introduction

- Kahoot: [Ocean Plastics](#) ([pdf](#))([link](#))
- Video: [What is Marine Debris?](#)
- Article: [Sources of Aquatic Trash](#)
- Article: [My Plastic Footprint](#)



As homework, assign students to complete [My Plastic Footprint](#) at home. Encourage students to try to identify single use plastics at their home when completing this activity.

EXPLORE

[Presentation #1](#) provides a guide for this section, and includes a pre-quiz, TedEd video, follow up questions, and additional information about plastic pollution.

Begin with having students complete a [Pre-quiz](#) about plastic pollution (5 minutes). Share answers with students and have students self-assess their scores. When complete, debrief the activity using the provided Discussion Questions.

Next, have students watch the TedEd video [A Brief History of Plastic](#). After the video, have students respond to the *Discussion Questions*, and to support their responses with evidence.

Add more context to the topic by walking students through slides 10-15 of Presentation #1.

On slide 16, introduce the seven types of [Plastics and their Uses](#), each of which is identified by a number encircled by chasing arrows. [The Truth Behind the Chasing Arrows](#) article explains that the chasing arrows does not mean that an item is recyclable but rather it simply identifies the item's petrochemical components.



Together, students revisit their inventory from the My Plastic Footprint homework assignment, sharing the different items that they found in their kitchens and bathrooms. What were the total amounts of plastic items found in each room? Have students identify which of these were single-use only (10 minutes).



Next, have students watch [The Majestic Plastic Bag](#) mockumentary. Discuss with students their reactions to the video (5 minutes). Finally, show students the TED Ed video [What Really Happens When You Throw Plastic Away](#) (10 minutes). [Check for Understanding](#) with the review quiz.

The History of Plastics

- [Presentation #1](#)
- Pre-quiz ([pdf](#))([doc](#))

Pre-quiz Discussion Questions

- What surprised you about plastic?
- Did you change any ideas about plastic that you had before? If so, what caused these changes?
- What questions do you have about plastics now? (5 minutes)

TED Ed Video

- [A Brief History of Plastic](#)

Discussion Questions

- Why is it that we can describe plastic as an “Inconvenient Truth”?
- How long in human history has it taken plastic pollution to become a crucial environmental problem?

Additional Resources

- Handout: [Plastic and their Uses](#) ([pdf](#))
- Article: [The Truth Behind the Chasing Arrows](#)
- Video: [The Majestic Plastic Bag](#)
- TED Ed Video: [What Really Happens to the Plastic You Throw Away](#)
- Quiz: [Check for Understanding](#)

Extension

Encourage students to go to the beach and collect a plastic item. Have students create a timeline for how that item arrived at the beach. Students can choose to present their narratives graphically, visually, or with a short story. Encourage students to try to imagine a reasonable narrative to describe the plastics path.

EXPLAIN

In this section, students learn about the impacts of microplastics and nanoplastics on aquatic organisms and humans guided by the [Presentations #2](#) and [#3](#), respectively. Begin by asking students an Open Ended Question: Why do you think it is important to look at the effect of plastics on the smallest species in the ocean?

IMPACTS OF TINY PLASTICS ON AQUATIC ORGANISMS

[Presentation #2](#) guides the flow of this section. It begins with the video [Why We Need to Stop Plastic Pollution in our Oceans For Good](#) which addresses the effects of plastic on marine organisms. Have students respond to the video with their takeaways, either as a whole class or with a partner (10 minutes).

Next, read aloud the first paragraph on the [Research Activity and Questions](#) worksheet, which describes the study organisms and their general position in the ecosystem. Ask students to make predictions on why it is important to observe the data, and what this data must reveal. Give students the opportunity to turn and talk with a partner and share their hypothesis (5 minutes).

Have students work either independently or with a partner to complete the worksheet. When students have finished completing the worksheet, have them share their answers to the Reflection Questions with the rest of the class (30 minutes).

Get active! Help your students model the impacts of plastics on wildlife. The [Plastic Pollution Curriculum and Activity Guide](#) from 5 Gyres has many activities. For example, page 22 holds instructions for “The Feeding Game: A Simulation of the Perils of Plastics” which helps students understand how the consumption of plastics even in the smallest of species affects the entire marine ecosystem.

IMPACTS OF TINY PLASTICS ON HUMAN HEALTH

[Presentation #3](#) guides the flow of this section. First, poll the students to ask how often they think the average human consumes plastic. Then, have students look at the [Pollution Facts](#) infographic from Plastic Oceans for two minutes and jot down their wonderings. Share the [Microplastics and Humans](#) infographic, and again have students jot down their wonderings.

After they have had a chance to independently think, have students share with a partner for 30 seconds each. Then have students share with the group their findings on the collaborate board. Engage students in discussion of findings as thoughts are shared on the board (Total 10 minutes).

Impacts on Aquatic Organisms

- [Presentation #2](#)
- Video: [Why We Need to Stop Plastic Pollution in our Oceans For Good](#)

Research Activity

- Research Activity and Questions ([pdf](#))([doc](#))
- Behavior Video ([mp4](#))

Research Reflection Questions

- What do the data reveal about plastic pollution in our oceans?
- How might this affect other species?
- What might the data reveal for other species?
- What is your main takeaway from this research?

5 Gyres Activities

- [Plastic Pollution Curriculum and Activity Guide](#)

Impacts on Human Health

- [Presentation #3](#)
- Graphic: [Pollution Facts](#)
- Graphic: [Microplastics and Humans](#)



Have students watch the video [Plastic Pollution: How Humans are Turning the World Into Plastic](#) from UN Environment Clean Seas campaign. Ask students to jot down three questions that they have from the video. When students have finished watching the video, have students share their questions with the group. Give students seven minutes to research and explore the solutions to their questions. Finally, have students to choose one question that they researched to share with the class (10 minutes total).

Have students read [A Summary of the Effects of Plastics on Human Health](#), first reading and highlighting critical information. Then have students take notes using the [Guided Notes](#). After reading the article, have students complete a venn diagram on nearpod interpreting how marine life and humans are connected by the plastic problem (15 minutes).

As an extension, have students complete the [My Plastic Consumption](#) worksheet (15 minutes).

ELABORATE

In this section, students search for individual and community-level solutions to marine plastic pollution, and identify actions that can make a difference to reduce the problem.

Following up on the content students encountered in the EXPLAIN section, now ask students some of the ways they think they personally might consume plastic.

Next, arrange students into small groups and have them brainstorm solutions for individuals and community on ways they can curb plastic waste (5 minutes). Bring the whole group back to compile a class list as an idea resource (5 minutes).

Then, show students the National Geographic video [Kids Take Action Against Ocean Plastic](#). Ask students to compare and contrast the list they created with the solutions presented in the video, and examine the Guiding Questions. After reviewing their responses, show students the EarthX video [Plastic Seas – Plastic Solutions](#) and have them revisit the Guiding Questions and respond to the prompts.

If possible, take the class on a field trip to the coast to participate in a beach clean-up. Find protocols and other solutions-related lessons in the [Marine Debris STEAMSS](#) curriculum.

Impacts of Tiny Plastics on Human Health, cont'd

- Video: [Plastic Pollution](#)
- Reading: [A Summary of the Effects of Plastic on Human Health \(pdf\)\(link\)](#)
- Worksheet: [Guided Notes](#)
- [My Plastic Consumption \(pdf\)\(ppt\)](#)



Taking Action

- Video: [Kids Take Action Against Ocean Plastic](#)

Guiding Questions

- What is one word you have to describe the plastic pollution problem? How does this describe it?
- What are ways mentioned in the "Kids Take Action" video that can reduce the amount of plastic in the environment?

"I am only one drop, but it is many drops that make an ocean."

- How does the quote above relate to your impact on the plastic pollution problem?
- What can you do to make a difference?

More Solutions

- Video: [Plastic Seas-Plastic Solutions](#)
- Activities: [Marine Debris STEAMSS](#)

EVALUATE

Have students get into groups and create a poster to bring awareness to the plastic problem that can be shared with the school and bring awareness to the school community.

Additionally, divide the class into groups of three and have students compose a letter to the legislator for their District urging them to support solutions to managing plastic production and pollution.

STANDARDS

Next Generation Science Standards

Performance Expectation:

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Science & Engineering Practices:

Asking Questions and Defining Problems
Analyzing and Interpreting Data
Using Mathematics and Computational Thinking
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence
Obtaining, Evaluating, and Communicating Information

Disciplinary Core Idea:

ESS3.C – Human Impacts on Earth Systems

Crosscutting Concepts:

Cause and Effect

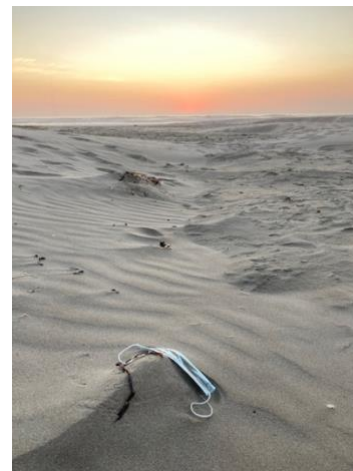
Common Core Math Standards

Math Standards:

7.SP.B.4 – Draw informal comparative inferences about two populations
8.SP.A.4 – Investigate patterns of association in bivariate data

Math Practices:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



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See more lessons on the ORSEA webpage:
oregoncoaststem.oregonstate.edu/orsea

