

Educator's Guide



Eco 360

Activity 7: Plastics in Our Oceans

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Backgrounder: Plastics in Our Oceans

Plastics in Our Oceans

Plastic pollution in oceans is a global crisis today. Poor waste management policies around the world have led to gigantic amounts of plastic waste ending up in our oceans. Plastic ends up in oceans either through land-based sources or through marine sources. Land sources include plastic discarded on land that is carried through water and snowmelt into sewers, streams, rivers, eventually making its way to oceans. Marine sources include plastic is discarded directly into water bodies, such as fishing nets, which stays in oceans over time. Plastics can stay in water as macro plastics or microplastics – where microplastics are defined as plastics less than five millimeters in diameter (approximately the size of a sesame seed) (National Geographic, 2019).



Microplastics - source (National Geographic, 2019)

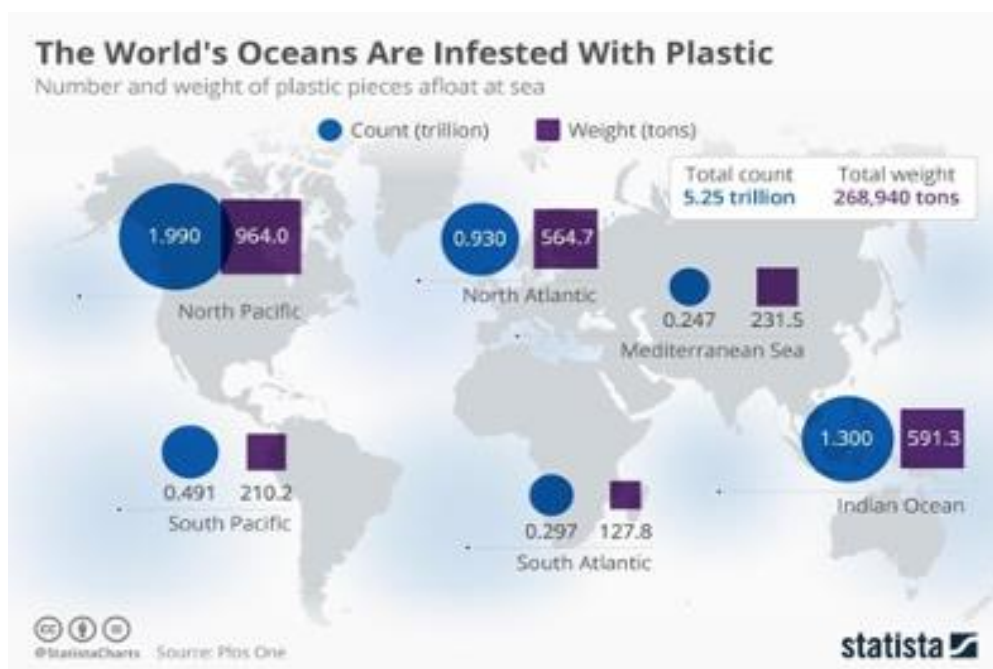
Marine plastics

- Over 300 million tons of plastic are produced every year for use in a wide variety of applications.
- At least 8 million tons of plastic end up in our oceans every year, and make up 80% of all marine debris from surface waters to deep-sea sediments.
- Marine species ingest or are entangled by plastic debris, which causes severe injuries and deaths.
- Plastic pollution threatens food safety and quality, human health, coastal tourism, and contributes to climate change.
- There is an urgent need to explore the use of existing legally binding international agreements to address marine plastic pollution.
- Recycling and reuse of plastic products, and support for research and innovation to develop new products to replace single-use plastics are also necessary to prevent and reduce plastic pollution.

Source: (IUCN, 2018)

With time macro plastic in the environment also breaks down into small pieces and becomes microplastic. In addition to this, microplastics are also found in various consumer products as microbeads, which are small pieces of manufactured polyethylene plastic added to health and beauty products—such as exfoliants, cleansers, and toothpaste (National Oceanic and Atmospheric Administration U.S. Department of Commerce, 2021).

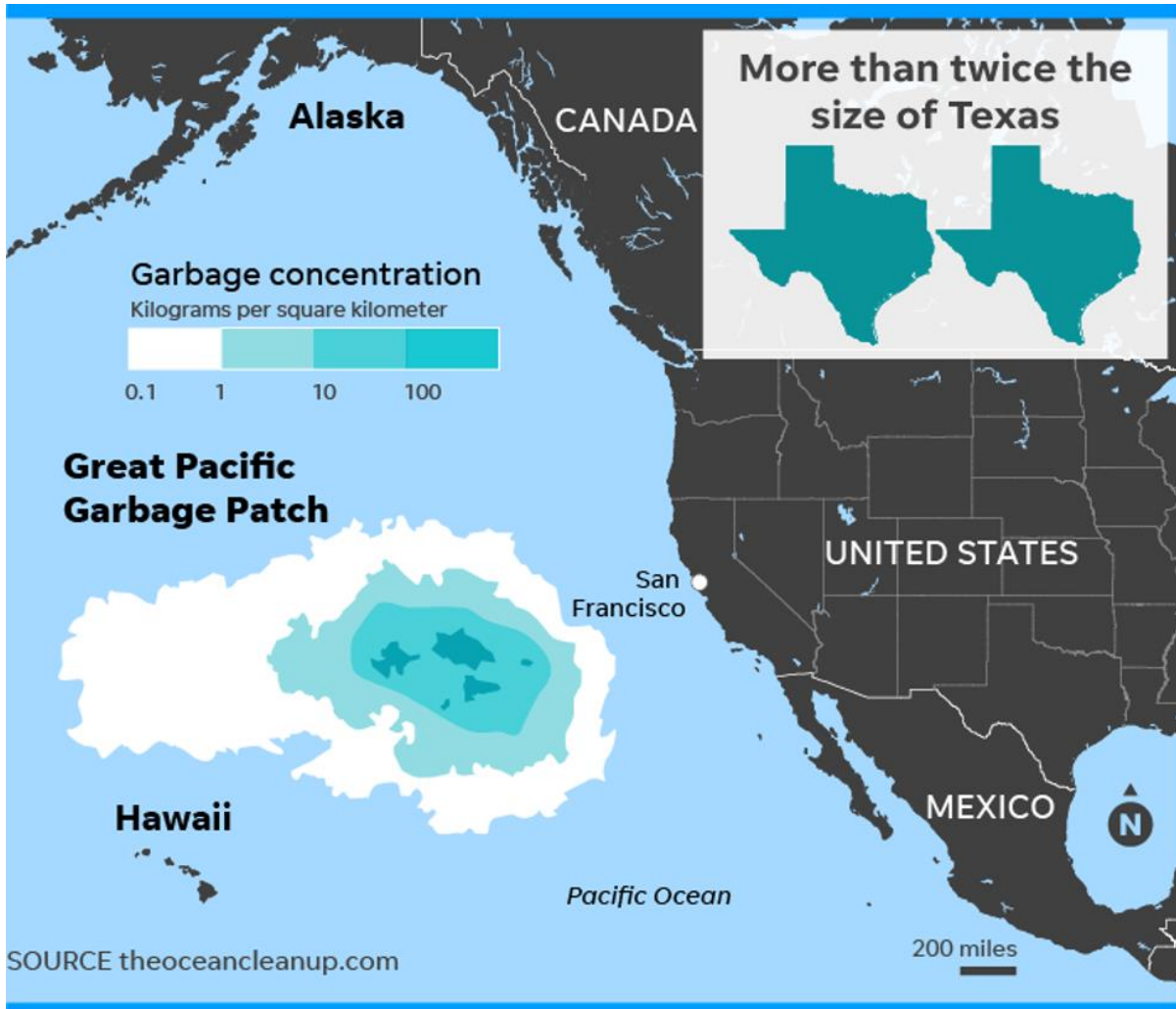
Currently, there are five giant patches of marine plastic in our oceans.



Source: <https://www.statista.com/chart/8616/the-worlds-oceans-are-infested-with-plastic/>

“These huge concentrations of plastic debris cover large swaths of the ocean; the one between California and Hawaii is the size of the state of Texas. Sea creatures

eat or get ensnared in plastic debris and can be killed or maimed. Plastic that is consumed by marine organisms, as well as the toxins they absorb from the water, accumulate up the food chain making seafood potentially dangerous for humans as well. Scientists predict that if nothing changes in our plastic consumption habits, by 2050 there will be more plastic in the oceans than there are fish (by weight)" (Earth Day Network, 2018).



Source: (USA Today, 2018)

Impact of Plastic Waste on Our Oceans

The reason why there is a particular emphasis on studying and advocating against marine plastic pollution is that it disproportionately affects marine life in many ways. “Many marine organisms can’t distinguish common plastic items from food... Sea turtles specifically are highly susceptible. They both mistake plastic bags for jellyfish, and frequently are trapped in plastic debris, restricting their growth and movement. Plastic never fully degrades; over time it breaks into smaller and smaller pieces. Eventually, it becomes small enough to enter the bloodstream of marine organisms. Since the organisms cannot ever digest or process the plastic, it remains present until the organism is eaten. This passes all the plastic on to its predator, which is usually fish. If that fish is caught, then the plastics will be passed on to whichever human consumes it” (Earth Day Network, 2018).

Additional resources to learn about marine plastic pollution:

- Plastic Ocean, United Nations: https://www.youtube.com/watch?v=ju_2NuK5O-E&feature=youtu.be
- Oceans Plastic Pollution, Center for Biological Diversity: https://www.biologicaldiversity.org/campaigns/ocean_plastics/
- Plastic Pollution in the Ocean: <https://www.youtube.com/watch?v=aFUHLtaTazQ&feature=youtu.be>
- What really happens to the plastic you throw away, Ted Talk by Emma Bryce: https://www.youtube.com/watch?v=_6xINyWppB8&feature=youtu.be
- Tough truths about plastic pollution, Ted Talk by Dianna Cohen: <https://www.youtube.com/watch?v=fddYApFEWfY&feature=youtu.be>
- Plastics Breakdown infographic, One World One Ocean: <https://oneworldocean.com/blog/the-plastics-breakdown-an-infographic/>

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- USA Today. (2018). *World's largest collection of ocean garbage is twice the size of Texas*. Retrieved from <https://www.usatoday.com/story/tech/science/2018/03/22/great-pacific-garbage-patch-grows/446405002/>

Curriculum Connections

Activity 7: Plastics in Our Oceans

Alberta

- ❖ Bio 20 and 30
 - All units in Bio 20/30 have an STS outcome (science, technology and society) - explain how science and technology have both intended and unintended consequences for humans and the environment

Ontario

- ❖ Grade 9 Geography
 - B1. The Physical Environment and Human Activities: analyze various interactions between physical processes, phenomena, and events and human activities in Canada.
 - C1. The Sustainability of Resources: analyze impacts of resource policy, resource management, and consumer choices on resource sustainability in Canada
- ❖ Grade 9 Bio (B1.1, B2.4, B3.5)

Activity 7: Plastics in Our Oceans

Overall Objective

Learners will learn about impacts of plastic in oceans. Learners will learn about the production of microplastic and how it ends up in our environments. Learners will explore the negative effects of macro and microplastics in our water bodies, in particular our oceans.

Materials

- Internet-enabled device
- Topic Backgrounder
- Eco 360 notebook (we recommend asking learners to maintain a notebook for this program to write down reflections as they go through the program)

Time Required

2 hours

Learning Outcomes

By the end of this activity, learners will:

- Describe what are microplastics and how are they generated
- Identify why and how microplastics end up in the environment, in particular our water bodies
- Describe the negative impacts of macro and microplastics in oceans
- Identify how they can take action to eliminate microplastics from entering our water bodies

Grade Level

Suitable for Grades 9 to 12

Activity Outline

Step One

Using the backgrounder, explain to learners how plastics end up in our oceans. Differentiate between micro and macro plastics and explain how both affect marine life in our oceans.

Step Two

Watch these two videos with your learners to understand how plastics impact our oceans and why they are harmful for our oceans.

- a. Plastic Pollution Crisis: How waste ends up in our oceans?
<https://www.youtube.com/watch?v=MNFUwVcpZAI> (4:26 minutes)
- b. What happens to microplastics in the ocean?
<https://www.youtube.com/watch?v=Y0Ks8oSUGIs> (3 minutes)

Step Three

Using the backgrounder, introduce ocean currents and ocean gyres, and how they distribute plastic around the globe. Continue on to watch the video below on ocean currents:

- a. Alien Deep: Ocean Conveyor Belt
<https://www.nationalgeographic.org/media/ocean-currents-and-climate/>
(2:33 minutes)

Step Four

Use the resource below to look at major gyres in our oceans and how they have become garbage patches:

<https://www.nationalgeographic.org/encyclopedia/ocean-gyre/>

- a. Slide 1: Subtropical Gyres and Associated Ocean Currents - review the location of these gyres with the learners.
- b. Slide 6: Garbage Patches - review the garbage patches in the ocean, zoom in to see the size of the patches.

- c. Slide 8: Great Pacific Garbage Patch - review the Great Pacific Garbage patch. This is close to home for Canadians, spend some time reflecting on how plastic debris can continue to float in this gyre for years as there is a lack of movement in the region.
- d. Watch a short documentary to further explore the problem - The Great Pacific Garbage Patch Is Not What You Think It Is:
<https://www.youtube.com/watch?v=6HBtl4sHTqU> (8 minutes)

Step Five

Put learners in groups of 3 - 5. Ask learners to reflect on the questions below by creating a mind map of how plastic waste enters the oceans, its journey from there and its impacts on marine life. Learners can use the free online tool MindMeister for this activity: <https://www.mindmeister.com>

- a. On the main page, create a login using a Google Account.
- b. Follow the instructions in the tutorial to get mapping.
- c. Ask learners to add the topic name "Plastic in Our Oceans" to their mind map and continue on to adding the following subtopics as questions. Have learners explore and add their thoughts to each question. Learners are also encouraged to add any research links they may want to reference and adding photos as they see fit. Learners are encouraged to be creative and connect all the concepts they have covered in this activity.
- d. 'Plastic in Our Oceans' mind map questions:
 - i. What are the sources of plastic?
 - ii. How do they make their way into our oceans?
 - iii. What happens to them once they enter the ocean?
 - iv. How do the ocean currents distribute plastic?
 - v. What happens once the debris enters ocean gyres?
 - vi. What happens to the microplastic in the ocean?
 - vii. How is marine life impacted by the plastic in the ocean?

Learner Assessment

Consolidation: Have each group present their mind maps to the class highlighting their key findings. Learners may also print their mind maps for the educator to display in class.

Teaching Tips

Take Action (open-ended):

Share with learners stories from communities across Canada on how they divert plastic waste from ending up in our water bodies and making its way to our oceans. Can your learners take similar action to stop plastics from ending up in our water oceans? Ask your learners to share their ideas with their network on social media and don't forget to tag us @Greenlearning

a. Georgian Bay Case Study (5-minute reading):

<https://georgianbayforever.org/microplastics-collingwood-2/>

b. Caring for Our Watersheds, various initiatives across Canada (5-minute reading): <https://caringforourwatersheds.com/student-actions/>

c. Vancouver Clean Shoreline Community (5-minute reading):

<https://www.aquablog.ca/2017/10/vancouver-becomes-second-official-clean-shoreline-community/>

d. City of Lethbridge River Conservation Study (3-minute reading):

<https://globalnews.ca/news/5148087/conservation-efforts-making-a-difference-in-lethbridge-river-valley-study/>

Optional Extension Activity

In our research we came across an excellent activity provided by 5Gyres that can be done as an extension activity to this topic. Click on the link [here](#) to view and download the activity “You Are What You Eat” on page 59.