



**OCEAN  
WISE**

# Ocean Plastics Education Kit

**EDUCATOR'S GUIDEBOOK**  
Elementary School (Grades 3-6)

LESSON 1  
The History of Plastics

LESSON 2  
How Plastics Travel  
to the Ocean

LESSON 3  
Big or Small, Plastics Have  
a Huge Impact

LESSON 4  
Plastics at the Wheel, Driving  
Through Ocean Currents

LESSON 5  
Plastics and Climate Change,  
a Never Ending Cycle

LESSON 6  
Cleanup Your Shoreline for  
a Cleaner Ocean

NOTE TO EDUCATORS

CURRICULUM LINKS

GLOSSARY

LESSON 1  
**THE HISTORY OF  
PLASTICS**

LESSON 2  
**HOW PLASTICS TRAVEL  
TO THE OCEAN**

LESSON 3  
**BIG OR SMALL,  
PLASTICS HAVE A  
HUGE IMPACT**

LESSON 4  
**PLASTICS AT THE  
WHEEL, DRIVING  
THROUGH OCEAN  
CURRENTS**

LESSON 5  
**PLASTICS AND  
CLIMATE CHANGE, A  
NEVER ENDING CYCLE**

LESSON 6  
**CLEANUP YOUR  
SHORELINE FOR A  
CLEANER OCEAN**

REFERENCES



## LAND ACKNOWLEDGEMENT

We acknowledge and are grateful that Ocean Wise employees live, work, and play on the traditional, ancestral and unceded territories of the x<sup>w</sup>məθk<sup>w</sup>əy̓əm (Musqueam), Sk̓w̓x̓w̓ú7mesh (Squamish), and sə́ilwətaʔɬ (Tseil-Waututh) peoples.

**LESSON 1**  
The History of Plastics

**LESSON 2**  
How Plastics Travel  
to the Ocean

**LESSON 3**  
Big or Small, Plastics Have  
a Huge Impact

**LESSON 4**  
Plastics at the Wheel, Driving  
Through Ocean Currents

**LESSON 5**  
Plastics and Climate Change,  
a Never Ending Cycle

**LESSON 6**  
Cleanup Your Shoreline for  
a Cleaner Ocean

# INTRODUCTION

The Earth's Ocean is a large interconnected system that is vital for every living thing on earth. Without our ocean, we wouldn't exist. It produces 50% to 80% of the oxygen we breathe, regulates and controls climate, weather, and temperature, sequesters and absorbs roughly 40% of the carbon dioxide produced by human activities, and provides one billion people with their main source of protein being seafood. There is no mystery as to why we cannot live without our ocean.

In the early 20th century, chemists created plastic, a synthetic polymer which could take any shape that humans desired. From then on, plastics would impact human life and the environment forever - especially the ocean. As it took over the world of consumer goods, plastic rapidly accumulated in landfills and eventually reached our ocean. Today, approximately 13 million tons of plastic enters the ocean on an annual basis, which has resulted in there being more pieces of plastic in our ocean than there are stars in our galaxy.<sup>1</sup> And just to put things into perspective, there are about 100 thousand million stars in the Milky Way! With 400 million tons of plastic produced every year, of which 36% is designed for single use or packaging, and only 9% of which is recycled, it is inevitable that plastics are polluting our ocean.<sup>2,3</sup> Additionally, as plastic enters marine environments it never disappears or decomposes. Instead, plastic breaks up into smaller pieces, known as microplastics. These are then

consumed by zooplankton, contaminating the food chain. There are over 800 marine and coastal species impacted by plastic pollution without counting other species who are indirectly affected, like humans, who eat fish whose food chain is contaminated by plastic pollution.<sup>4</sup>

With plastic being a pillar for modern day life, it is going to take a deep, transformational change in humanity's consciousness and behaviors regarding plastic and our ocean to turn the tables and prevent plastic from harming ocean health. At Ocean Wise, we know this is possible. It starts with youth becoming aware of the interconnectedness of our lives and the ocean, the environmental impact of their consumer choices, and the role they hold in protecting the ocean. By merging our expertise in climate change education and the research of Ocean Wise's conservation teams, we aim to do just that. For over 50 years we have dedicated our work to ocean conservation and education guided by the international community, including the Sustainable Development Goals (SDG) of the United Nations and the International Union of Conservation for Nature (IUCN). Informed by recognized science and climate change pedagogies, these lessons aim to guide youth to become leaders of change by educating, equipping, and empowering them to become ocean champions and plastic reduction ambassadors.



# NOTE TO EDUCATORS

Each lesson follows the same format throughout the kit with critical questions and reflections built into the **activities** section.

The kit follows the overarching theme of **interconnectedness**, integrating decolonization practices with scientific conservation and Indigenous knowledge. The thought book component prompts students to journal on interconnectedness and consider its connection to each lesson's focus. Through reflection students will consider their role in decolonization and climate action so that they are encouraged to be changemakers within their community.

Each lesson ends with ways to **take action**. We invite educators and students to create their own actions. We acknowledge that those provided may not be accessible or applicable to all. We recognize that individual action should be coupled with systemic change. We aim to empower students through active approaches and creative problem solving that address individual or smaller-scale behavioral change, but also through actions that can positively influence large systemic issues.

Finally, Ocean Wise thanks you for promoting climate change education, social justice, and Indigenous knowledge in your classroom. By doing so, you are providing a unique skill set to the future leaders of the world, allowing them to be better prepared to deal with environmental issues, including plastic pollution. Today you are the leader, guiding our youth towards a cleaner and more sustainable future.

**LESSON 1**  
The History of Plastics

**LESSON 2**  
How Plastics Travel  
to the Ocean

**LESSON 3**  
Big or Small, Plastics Have  
a Huge Impact

**LESSON 4**  
Plastics at the Wheel, Driving  
Through Ocean Currents

**LESSON 5**  
Plastics and Climate Change,  
a Never Ending Cycle

**LESSON 6**  
Cleanup Your Shoreline for  
a Cleaner Ocean

# CURRICULUM LINKS

The table below illustrates curriculum connections, outlining the Big Ideas in a variety of courses and detailing which lessons are connected to which Big Ideas. Please note that although this resource is developed with a focus on aligning to the BC curriculum, there exists a lot of overlap across provincial curricula and lesson activities possess room for interpretation so different curriculum objectives can be met, making this kit applicable throughout Canada.

**LESSON 1**  
Social Studies 3, Science 4, Social Studies 4, Social Studies 5, Social Studies 6

**LESSON 2**  
Science 3, Social Studies 3, Arts Education 3, Science 4, Social Studies 4, Arts Education 4, Social Studies 5, Arts Education 5, Science 6, Social Studies 6, Arts Education 6

**LESSON 3**  
Science 3, Social Studies 3, Arts Education 3, Science 4, Social Studies 4, Arts Education 4, Science 5, Social Studies 5, Arts Education 5, Science 6, Social Studies 6, Arts Education 6

**LESSON 4**  
Science 3, Social Studies 3, Science 4, Social Studies 4

**LESSON 5**  
Social Studies 3, Arts Education 3, Social Studies 4, Arts Education 4, Social Studies 5, Arts Education 5, Social Studies 6, Arts Education 6

**LESSON 6**  
Science 3, Social Studies 3, Science 4, Social Studies 4, Social Studies 5, Science 6, Social Studies 6

**LESSON 1**  
The History of Plastics

**LESSON 2**  
How Plastics Travel  
to the Ocean

**LESSON 3**  
Big or Small, Plastics Have  
a Huge Impact

**LESSON 4**  
Plastics at the Wheel, Driving  
Through Ocean Currents

**LESSON 5**  
Plastics and Climate Change,  
a Never Ending Cycle

**LESSON 6**  
Cleanup Your Shoreline for  
a Cleaner Ocean

GRADE	SUBJECT	BIG IDEAS	CONNECTED LESSON(S)
3	Science	Living things are diverse, can be grouped and interact in their ecosystems.	2, 3, and 6
		Wind, water, and ice change the shape of land.	2 and 4
	Social Studies	Learning about indigenous peoples nurtures multicultural awareness and respect for diversity.	1, 2, 3, 4, 5, and 6
		Indigenous societies throughout the world value the well-being of the self, the land, spirits, and ancestors.	2, 3, 4, 5, and 6
	Arts Education	Dance, drama, music, and visual arts are each unique languages for creating and communicating.	3, 2, and 5
4	Science	The motions of Earth and the moon cause observable patterns that affect living and non-living systems.	4
		Matter has mass, takes up space, and can change phase.	1 and 3
		All living things sense and respond to their environment.	2, 3, and 6
	Social Studies	The pursuit of valuable natural resources has played a key role in changing the land, people, and communities of Canada.	1, 5, and 6
		Interactions between First Peoples and Europeans lead to conflict and cooperation, which continued to shape Canada's identity.	1, 2, 3, 4, and 6
	Arts Education	Dance, drama, music, and visual arts are each unique languages for creating and communicating.	3, 2, and 5

**LESSON 1**  
The History of Plastics

**LESSON 2**  
How Plastics Travel  
to the Ocean

**LESSON 3**  
Big or Small, Plastics Have  
a Huge Impact

**LESSON 4**  
Plastics at the Wheel, Driving  
Through Ocean Currents

**LESSON 5**  
Plastics and Climate Change,  
a Never Ending Cycle

**LESSON 6**  
Cleanup Your Shoreline for  
a Cleaner Ocean

GRADE	SUBJECT	BIG IDEAS	CONNECTED LESSON(S)
5	Science	Multicellular organisms have organ systems that enable them to survive and interact within the environment. .	3
	Social Studies	Natural resources continue to shape the economy and identity of different regions of Canada.	1, 2, 3, 5, and 6
		Immigration and multiculturalism continue to shape Canadian society and identity.	1, 2, 3, and 6
Arts Education	Dance, drama, music, and visual arts are each unique languages for creating and communicating.	3, 2, and 5	
6	Science	Multicellular organisms rely on internal systems to survive, reproduce, and interact with their environment.	2, 3, and 6
	Social Studies	Economic self-interest can be a significant cause of conflict among people and governments.	1, 2, 3, 5, and 6
	Arts Education	Dance, drama, music, and visual arts are each unique languages for creating and communicating.	3, 2, and 5



# GLOSSARY

## BIODIVERSITY

The variety and variability of life on a genetic, species, and ecosystem level.

## CARBON SINK

Anything that absorbs more carbon from the atmosphere than it releases.

## ECOSYSTEM

All organisms and the physical environment which they interact with.

## FRACKING

The fracturing of bedrock by liquid pressure. Most often used to obtain natural gasses.

## MICROFIBER

Synthetic fiber/microplastic that typically has a diameter of less than 10 micrometers.

## MICROPLASTICS

Pieces of plastic less than 5mm in size which are often fragments of larger plastics.

## TRADITIONAL ECOLOGICAL KNOWLEDGE (TEK)

Refers to Indigenous and other traditional knowledge, practices, and beliefs concerning the relationship of humans and local resources.

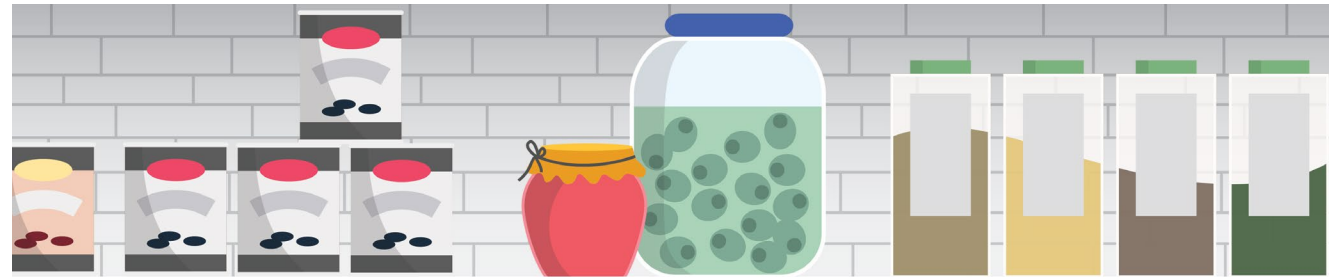
## ZOOPLANKTON

Animals part of the plankton community that are so small they cannot swim and instead drift with ocean currents. They typically occupy lower levels of the food chain.

# Lesson 1

## The History Of Plastics





## BACKGROUND

Since the beginning of time, humans have made objects and goods from materials naturally occurring in the environment. Between wood, rock, animal bones, and shells, the natural materials available to humans were countless. However, in 1907, after years of research in the manipulation of synthetic polymers, Leo Baekeland created the first synthetic plastic, changing the way we live. As chemical companies began to invest in the production of synthetic plastics, people no longer found the need to put hard work and money into the creation of goods from natural materials when cheap, durable, malleable, and multipurpose plastics could be used instead.<sup>5</sup>

When World War II began and natural resources became scarce, the production of synthetic materials, predominantly plastic, became a priority leading to a 300% rise in the production of plastic in the USA!<sup>5</sup> As plastic was being manipulated during production, people soon discovered the endless possibilities that plastic provided as it could essentially be shaped into whatever humans desired. As plastics infiltrated the market and were transformed into products, they were almost always favored by consumers over their more expensive and intricate traditional material counterparts.

However, the untarnished reputation of plastic didn't last long. The same chemical properties that make plastic durable and useful also make it nearly impossible to dispose of. With most plastics taking thousands of years to decompose, our landfills rapidly became overwhelmed.<sup>6</sup> Soon after, in the late 20th century, plastics were invading areas other than landfills like rivers, forests, and the ocean, harming both animals and humans. Since then, the reputation of plastic has suffered, and people, organizations, companies, and governments have become increasingly aware of the environmental impacts of this material. Nonetheless, despite the mistrust most of society has towards plastic, it remains a pillar of modern life.

**LESSON 1**  
The History of PlasticsLESSON 2  
How Plastics Travel  
to the OceanLESSON 3  
Big or Small, Plastics Have  
a Huge ImpactLESSON 4  
Plastics at the Wheel, Driving  
Through Ocean CurrentsLESSON 5  
Plastics and Climate Change,  
a Never Ending CycleLESSON 6  
Cleanup Your Shoreline for  
a Cleaner Ocean**STUDENTS WILL BE ABLE TO:**

- Explain how plastic can be transformed into different objects.
- Create an introductory understanding relating to the environmental impacts of plastics.
- Deepen their understanding of the omnipresence of plastics.

**CRITICAL QUESTIONS:**

- How can plastic take any shape we want it to?
- Look around you, why are you surrounded by so much plastic?
- What makes plastic dangerous for the environment and society?

**RESOURCES:****Watch** ▶ [Where Does All The Plastic Go by Ocean Wise](#)**Watch** ▶ [A Brief History of Plastics by TED-Ed](#)**Read** ▶ [Fur Trade by Britannica Kids](#)**ADDITIONAL RESOURCES:****Visit** ▶ [The Life Cycle of Plastics by WWF](#)**Visit** ▶ [8 Incredible Inventions of The Indigenous Peoples of America by HISTORY](#)



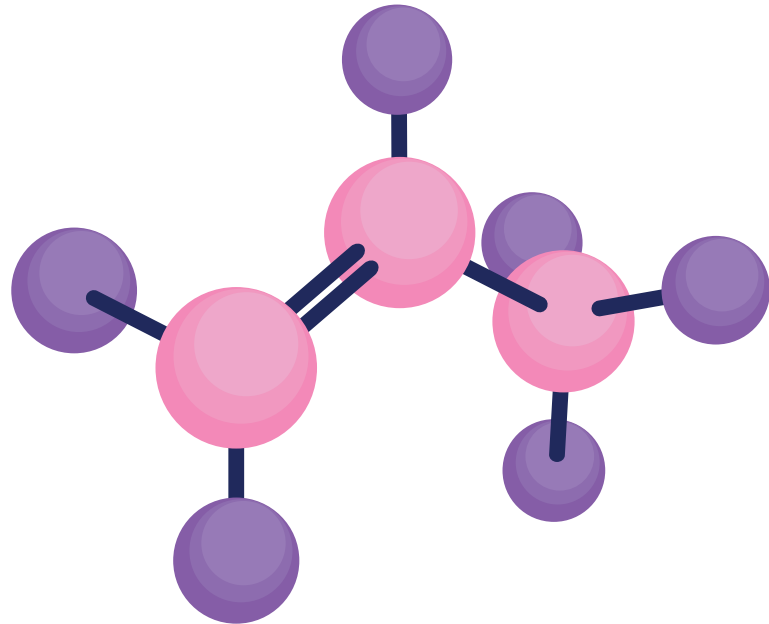
# ACTIVITIES

**1** As a class, watch [A Brief History of Plastics by TED-Ed](#). In their workbooks, task students with drawing a mold to make the plastic products listed. Note that this would simply entail drawing the shape of that product (i.e., for the plastic glove they should draw a hand).

**2** Within their surroundings (classroom, schoolyard, etc), task students with finding a plastic waste item. In their workbooks, students should draw and describe the plastic waste. To help guide their thinking when describing the plastic, refer to the guiding questions below. They should also list some advantages and disadvantages of the product. Encourage them to address the disadvantages from an ecological standpoint.

**3** a) Read [Fur Trade by Britannica Kids](#), and discuss with students the impacts of the fur trade on Indigenous peoples. Allow students to reflect on why other goods, in addition to furs, were traded during this period. Refer to the guiding questions below during your discussion.

**4** Watch [Where Does All The Plastic Go by Ocean Wise](#) and answer the questions in the video. We encourage pausing the video so students can have the opportunity to discuss as a class or reflect on potential answers.



**Guiding Questions:**

- What colour is the plastic?
- Is the plastic transparent or opaque?
- Is the plastic hard or soft?
- Is the plastic strong? Can you tear it?

**Guiding Questions:**

- Do you know of any objects that the colonizers adopted from Indigenous people? If so, which ones?
- Why would colonizers find these objects useful?

# THOUGHTBOOK



## REFLECT

1. How can plastic take any shape we want it to?
2. Look around you, why are you surrounded by so much plastic?
3. What makes plastic dangerous for the environment and society?

# TAKE ACTION



Get the details and specifics about recycling collections in your area!

## THE WHY?

Even though most plastics can only be recycled once, recycling can significantly reduce the number of raw materials extracted, energy consumed, and greenhouse gasses released during the production of synthetic polymers, just like the one you researched. By recycling plastic waste, you are allowing plastics to be used to their full potential and limiting the unnecessary production of plastic polymers by giving the existing ones a second life!



LESSON 1  
The History of Plastics

LESSON 2  
How Plastics Travel  
to the Ocean

LESSON 3  
Big or Small, Plastics Have  
a Huge Impact

LESSON 4  
Plastics at the Wheel, Driving  
Through Ocean Currents

LESSON 5  
Plastics and Climate Change,  
a Never Ending Cycle

LESSON 6  
Cleanup Your Shoreline for  
a Cleaner Ocean

# Lesson 2

## How Plastics Travel to the Ocean







## BACKGROUND

Water is everywhere! Sixty percent of our body is water, it covers 71% of the Earth’s surface, and 97% of it is found in the ocean. There are five major ocean basins around the world which are all interconnected, forming one large world ocean. But how does all this water end up in the ocean? In the hydro-cycle, rain, rivers, streams, and groundwater are responsible for filling the ocean with water, which proceeds to flow around the globe with the movement of the waves, tides, and rotation of the earth.

With water covering such a large area of the globe and entering the ocean from a variety of sources, it inevitably interacts with one of the most dominant forms of pollution on Earth... plastic. However, with the rise of plastic production and consumption, we

aren’t just finding plastic in our ocean... but rather, plastic is becoming our ocean! Every year, 13 million tons of plastic enters our ocean in different ways. And today, there are more pieces of plastic in our ocean than there are stars in our galaxy.<sup>7</sup> This demonstrates that far too much plastic is traveling to the ocean.

Additionally, plastic pollution disproportionately harms Indigenous communities and is infiltrating the natural ecosystems that sustain their traditional way of life.<sup>8</sup> Indigenous peoples are already fighting to sustain and cultivate their Traditional Ecological Knowledge in the face of many other environmental pressures. Plastic pollution is further complicating these issues and making them more challenging.

## STUDENTS WILL BE ABLE TO:

- Understand how plastic goods become ocean pollutants.
- Understand how plastics travel from land to the sea.
- Understand the environmental impacts plastic can have if it reaches the ocean.

## CRITICAL QUESTIONS:

- How can we better show love, care, and respect for the ocean and all it provides to us?
- How can a plastic bag, straw, or cup, make its way from your school to the ocean?
- How could we stop plastic from entering the ocean?

## RESOURCES:

**Watch** ▶ [Yukon Ikaarvik by Ocean Wise](#)

**Visit** ▶ [Ocean Wise's Plastic Lab](#)

**Watch** ▶ [All The Way to The Ocean by Freedom Three Publishing](#)

**Read** ▶ [How Does Plastic End-Up in The Ocean by WWF](#)

**Watch** ▶ [A Whale's Tale – Hope Works by CBC Kids](#)

**Read For Educators** ▶ [Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action by Robin Wall Kimmerer](#)

## ADDITIONAL RESOURCES:

**Watch** ▶ [What Really Happens to Plastic When You Throw it Away by TED Ed](#)

**Read** ▶ [Inuit Researchers Are on The Lookout For Migrating Microplastics by The Narwhal](#)



# ACTIVITIES

- 1** a) As a class, watch [All The Way to The Ocean by Freedom Three Publishing](#). Discuss with students the different ways that plastic travels to the ocean and becomes a plastic pollutant. Educators are encouraged to read [How Does Plastic End-Up in The Ocean by WWF](#) to the class.
- b) In their workbooks, ask students to draw a comic strip illustrating the story of a piece of plastic that travels from land to the ocean. Encourage students to present their story to the class.

- 2** Have a class discussion after a class viewing of [A Whale's Tale – Hope Works by CBC Kids](#). Refer to the guiding questions below during your discussion.

### Guiding Questions:

- How did the movie make you feel?
- How was plastic affecting the animals in the video?
- What did the animals and humans do about plastic pollution?
- In this room, can you see what is made of plastic?
- What are some of the ways the plastic in this room can harm ocean animals?

- 3** As a class, watch [Yukon Ikaarvik by Ocean Wise](#). Bring students into a circle and discuss how water has a cultural importance to Indigenous communities.

- Explain that water is used in Indigenous ceremonies and has “life-giving forces” and they believe all aspects of creation are interrelated with it.
- Tie in the First Peoples Principles of Learning: Learning supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors and learning involves recognizing the consequences of one’s actions.
- Talk to your students about Traditional Ecological Knowledge (TEK) and how it helps, alongside science, with finding solutions to conservation issues. To prepare, explore [Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action by Robin Wall Kimmerer](#).

# THOUGHTBOOK



## REFLECT

1. How can we better show love, care, and respect for the ocean and all it provides to us?
2. How can a plastic bag, straw, or cup, make its way from your school to the ocean?
3. How could we stop plastic from entering the ocean?

# TAKE ACTION



Watch [Take The Pledge by Ocean Wise](#) and visit [Be Plastic Wise by Ocean Wise](#) and take the pledge, whether it be individually or as a class. Go over the different steps on how to stay accountable in this challenge by [Reducing Your Plastic Footprint by Ocean Wise](#).

## THE WHY?

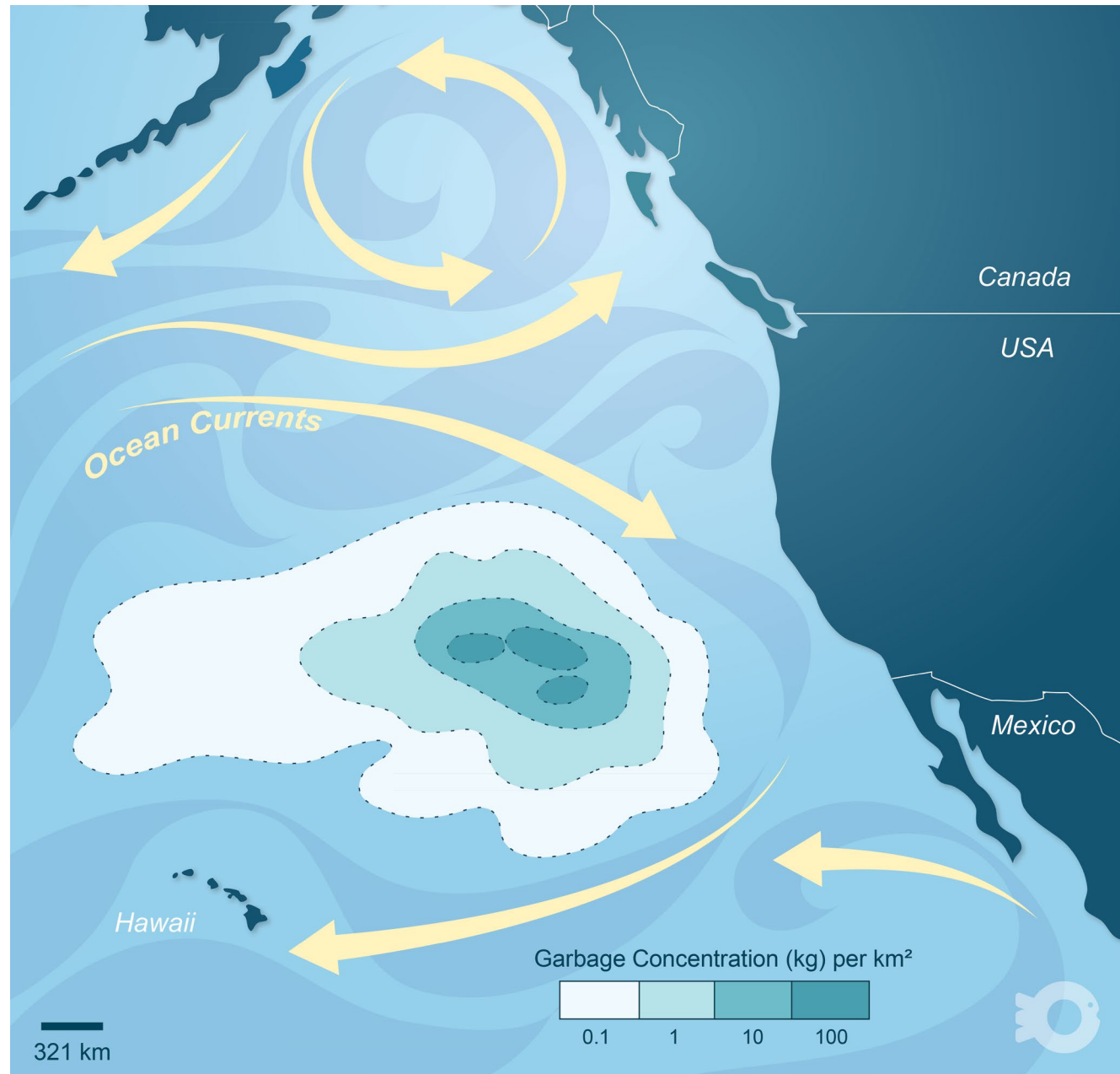
According to experts from the [Ocean Wise's Plastic Lab](#), reducing your plastic footprint is the best way to help protect the ocean from plastic pollution. Removing plastic from the ocean and waterways is important, but if we keep consuming plastics, it will continuously enter the ocean and contribute to the never-ending cycle of ocean plastic pollution! Help to solve this issue by reducing the plastic you use, buy, and discard. Talk to someone you know about the pledge and see if you can inspire action in others around you.



## Lesson 3

# Big or Small, Plastics Have a Huge Impact





## BACKGROUND

Ocean ecosystems are diverse and defined by varying environmental factors including available oxygen, nutrients, salinity, temperature, pH, light, pressure, substrate, and circulation. Ocean organisms ranging from microbes and invertebrates to fishes, marine mammals, plants, and sea birds have adapted to these environmental factors. Ocean ecosystems are interconnected and impacted by environmental factors, and recently a new factor has been added to the list... plastic pollution.

Not all plastics are the same, they can have different chemical compositions, shapes, and especially, sizes. There are two broad classifications of plastic sizes: 1) Macroplastics, which are relatively large pieces of plastic greater than 5 mm in length. This can include items like water bottles, water bottle caps, plastic bags, etc.<sup>9</sup> And 2) Microplastics, which are small fragments, sheets, fibers, pellets, and granules, less than 5 mm in length and typically are residue of a fragmented macroplastic since plastic doesn't decompose but breaks up into smaller and smaller pieces.<sup>9</sup>

Both macro- and microplastics can be found throughout the ocean, and while they both threaten the health of the environment, microplastics are much more pervasive, leading to more extensive impacts. For example, Ocean Wise research has shown that species of zooplankton are taking preference for algae look-alike micro-fibers over their typical diet. This highlights the vulnerability of ocean food webs as microplastics contaminate food chains and bioaccumulate in higher trophic level species which are targets for Indigenous, commercial, and recreational fisheries. In other words, by producing plastic litter, we are enabling plastic to enter our bodies from the seafood we eat as we too are members of the ocean food web. The best way to reduce this harm to humans, animals, and other organisms is to remove plastic and other litter in and around our waterways or, even better, to prevent it from getting there in the first place!

## STUDENTS WILL BE ABLE TO:

- Understand how plastic litter impacts ocean habitats, animals, and other organisms.
- Develop an understanding and personal connection to how plastic pollution negatively impacts ocean health.

## CRITICAL QUESTIONS:

- What are the different ways that plastic impacts ocean animals and habitats?
- Why are small plastics (microplastics) so harmful to ocean animals?
- What are some steps you can take to help reduce plastic pollution/litter in your school?

## RESOURCES:

**Watch** ▶ [The Great Pacific Garbage Patch by Lessplastic Thailand](#)

**Watch** ▶ [Ocean Confetti! by Minute Earth](#)

**Watch** ▶ [The Oceans Are Life by Canada's C3](#)

## ADDITIONAL RESOURCES:

**Read** ▶ [Smart Wash Cycle Design Can Reduce Microfiber Shedding Report by Ocean Wise](#)

**Watch** ▶ [Microplastics, Too Small to See, Too Big to Ignore by Ocean Wise](#)

**Read** ▶ [Microplastics Have Found Their Way Into Our Compost by Ocean Wise](#)

**Read** ▶ [Researchers Find Microplastics in Nearly Every Sample Taken in The Eastern Canadian Arctic by Canadian Geographic](#)

**Read** ▶ [Microplastics by National Geographic](#)

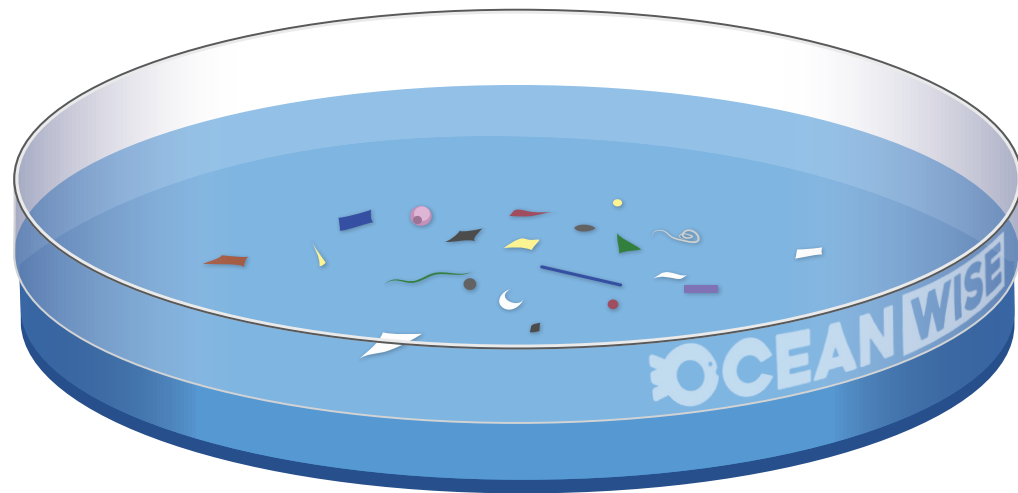




# ACTIVITIES

- 1 Watch [The Great Pacific Garbage Patch by Lessplastic Thailand](#). In the student workbook, there are three different plastic objects of various sizes. Students should describe how each plastic object may harm a specific marine species (i.e. turtle, shark, whale, etc).
- 2
  - a) As a class, watch [Ocean Confetti! by Minute Earth](#). In small groups, invite students to choose an ocean animal affected by plastics or microplastics. For example, sea turtles and seabirds mistake plastic for food, or whales and seals get entangled in plastics. Have students fill out the Plastics and Marine Animals Investigation Worksheet in their workbooks. Please note: students may need time to conduct internet research.
  - b) With the information they researched, students will create a poster style sheet, by drawing an animal of their choice that is labeled (name of animal, type of animal), their prey, their predators, and impacts of plastic on the animal. Optional: have students create a collage with the cut-out images.
  - c) Have students present their animal investigation to the class. Encourage them to have fun with their presentation (Use props! Act it out! Create a skit!). As a group, discuss the impacts of plastic on their animal and its habitat.
- 3
  - a) Watch [The Oceans Are Life by Canada's C3](#) as a class discuss these following questions.
    - When was the last time you stopped to appreciate the lands and waters around you?
    - When was the last time you stopped to think and thank the ocean and trees for the breaths you are able to breathe because of them?
  - b) In their workbooks, task students with writing a letter to the lands or waters near them, expressing their gratitude.

# THOUGHTBOOK



## REFLECT

1. What are the different ways that plastic impacts ocean animals and habitats?
2. Why are small plastics (microplastics) so harmful to ocean animals?
3. What are some steps you can take to help reduce plastic pollution/litter in your school?



# TAKE ACTION



Minimize the microfibers you release into waterways by:

- buying fewer synthetic clothes
- washing synthetic items less often (try spot cleaning!)
- washing clothes in cold water on gentle cycles

## THE WHY?

Researchers have found polyester fibers in the ocean as far away as the Arctic, believed to be from common polyester clothing. When buying new clothes, be sure to check their labels. Generally, clothes composed of more synthetic “ingredients” have a greater risk of releasing microfibers such as polyester, nylon, acrylic, and lyocell. Instead, look for clothing made from hemp, linen, and bamboo. Spot cleaning and washing your clothes less often reduces the number of microfibers released into the ocean. Ocean Wise research found that washing clothes in cold water on a gentle cycle reduces microfiber shedding by up to 70%.



LESSON 1  
The History of Plastics

LESSON 2  
How Plastics Travel  
to the Ocean

LESSON 3  
Big or Small, Plastics Have  
a Huge Impact

LESSON 4  
Plastics at the Wheel, Driving  
Through Ocean Currents

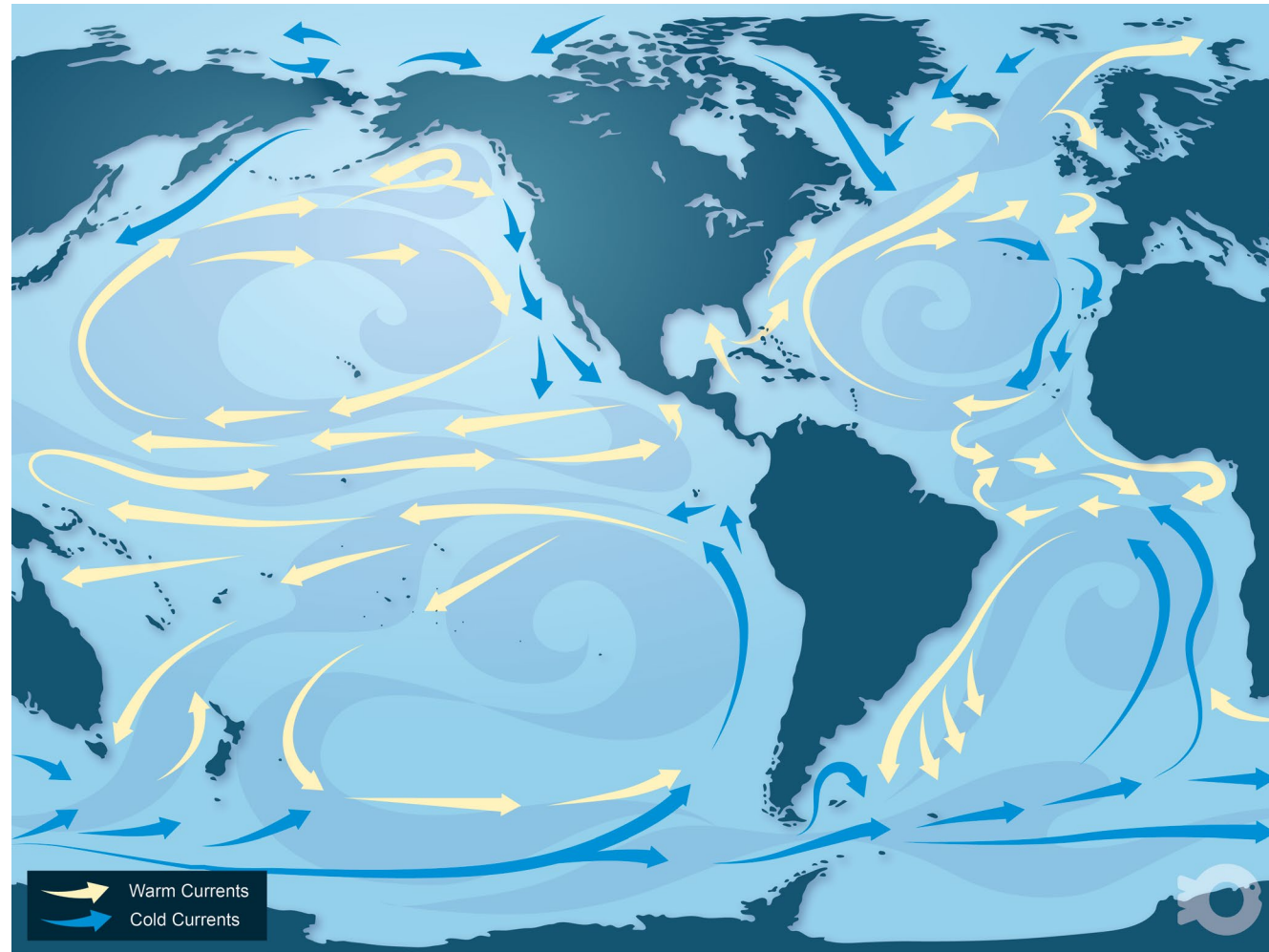
LESSON 5  
Plastics and Climate Change,  
a Never Ending Cycle

LESSON 6  
Cleanup Your Shoreline for  
a Cleaner Ocean

## Lesson 4

# Plastics at the Wheel, Driving Through Ocean Currents





## BACKGROUND

The ocean is the prime regulator of our world’s ecosystems. It acts as an important carbon sink by sequestering 40% of the world’s carbon dioxide production and 90% of the planet’s heat, mitigating the increase of greenhouse gasses and thus, the rise of global temperature. At the center of these processes are ocean currents which help absorb, store, and transfer heat, making the ocean a major influence on weather and climate. The deep underwater currents are known as the thermohaline conveyor belt as they move massive currents of cold and warm water to the tropics and the poles to prevent extreme temperatures from occurring in either region.<sup>10</sup>

While ocean currents are undoubtedly essential to life on earth, they enable the transportation of plastic pollution around the world. In lesson 2, we addressed how plastics travel to the ocean, but what happens once they reach the ocean? Do they sink, float, move around? Unfortunately, both macroplastics and microplastics do all the above. When plastics enter the ocean, they hitch a ride with ocean currents which travel around the world making the possibilities for a final destination endless. For example, a piece of plastic entering the ocean in North America can end up on a beach in Asia. Via ocean currents, plastic can go from one side of the world to the other, end up on the shoreline of some of the most remote areas, or even stay in the ocean for thousands of years before breaking up into smaller pieces or getting eaten by a marine animal.

## STUDENTS WILL BE ABLE TO:

- Create an understanding of the functioning of ocean currents.
- Understand the extensivity of ocean depth.
- Explain how plastics travel throughout the ocean and around the world.

## CRITICAL QUESTIONS:

- How deep is the ocean compared to the large things on land like mountains and skyscrapers?
- How strong are ocean currents?
- How do plastics travel around the world?

## RESOURCES:

- Watch** ▶ [Hokulea Sailed Around The World, But Couldn't Escape Plastic – Ocean Stories by Ocean Wise](#)
- Watch** ▶ [The Water Cycle: The Dr.Binocs Show – Learn Videos For Kids by Peekaboo Kidz](#)
- View** ▶ [Pollution Tracker by Ocean Cleanup](#)
- View** ▶ [Marine Debris – Environmental Science GeoInquiries by ArcGIS](#)
- Watch** ▶ [The Epic Journey of The Plastic Ducks by Emma Dobken](#)

## ADDITIONAL RESOURCES:

- Watch** ▶ [How Do Ocean Currents Work? By TED-Ed](#)
- Listen** ▶ [Short Stuff: Friendly Floatees by Stuff You Should Know](#)
- Watch** ▶ [Plastic Pollution: How Humans are Turning the World Into Plastic by Kurzgesagt In a Nutshell](#)



# ACTIVITIES

**1** As a class, watch [The Water Cycle: The Dr.Binocs Show – Learn Videos For Kids by Peekaboo Kidz](#) and visit [Pollution Tracker by Ocean Cleanup](#). Collect questions students may have.

## **2** The Ocean Traveling Rubber Duckies Activity:

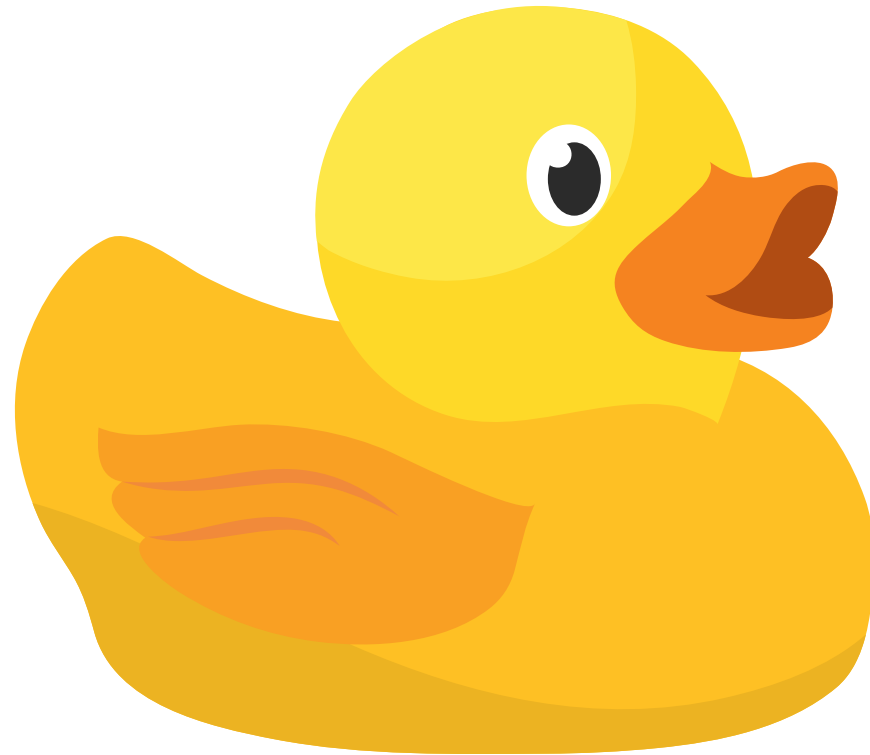
- a) Introduce to the class the Friendly Floaties Spill:
- *As a result of a cargo container falling off a ship near China during a storm, 29,000 rubber ducks have traveled the ocean for 15 years.*

Show students the location of the spill by projecting the [Marine Debris – Environmental Science Geoinquiries by ArcGIS](#) and inserting the coordinates of the spill (44.7N, 178.1E) where it says *Find address*. On the left side of the screen you should see the *Content Menu* (if not, click *Details* in the upper left corner and select *Content*). Ensure that both *Major Ocean Currents* and *Map Notes* are checked. From looking at the map, the direction of the major ocean currents, and the location of the Friendly Floaties Spill, ask students to hypothesize where the rubber ducks may have ended up by circling regions on the world map in their workbook.

- c) Watch [The Epic Journey of The Plastic Ducks by Emma Dobken](#) and discuss with students how their hypotheses are similar and/or different with the information presented in the video.

**3** Watch [Hokulea Sailed Around The World, But Couldn't Escape Plastic – Ocean Stories by Ocean Wise](#) and [How Our Trash Reaches Remote Beaches by Earth Fix Media](#). Discuss with students how plastics impact Indigenous communities and the most remote areas of the world. In their workbook, students should complete the questions relating to these videos.

# THOUGHTBOOK



## REFLECT

1. How deep is the ocean compared to the large things on land like mountains and skyscrapers?
2. How strong are ocean currents?
3. How do plastics travel around the world?



# TAKE ACTION



By checking out the [Plastic Wise Partner Map by Ocean Wise](#), support a plastic reduction partner or encourage your favorite business or restaurant to #BePlasticWise and join the Plastic Wise partners!

## The Why?

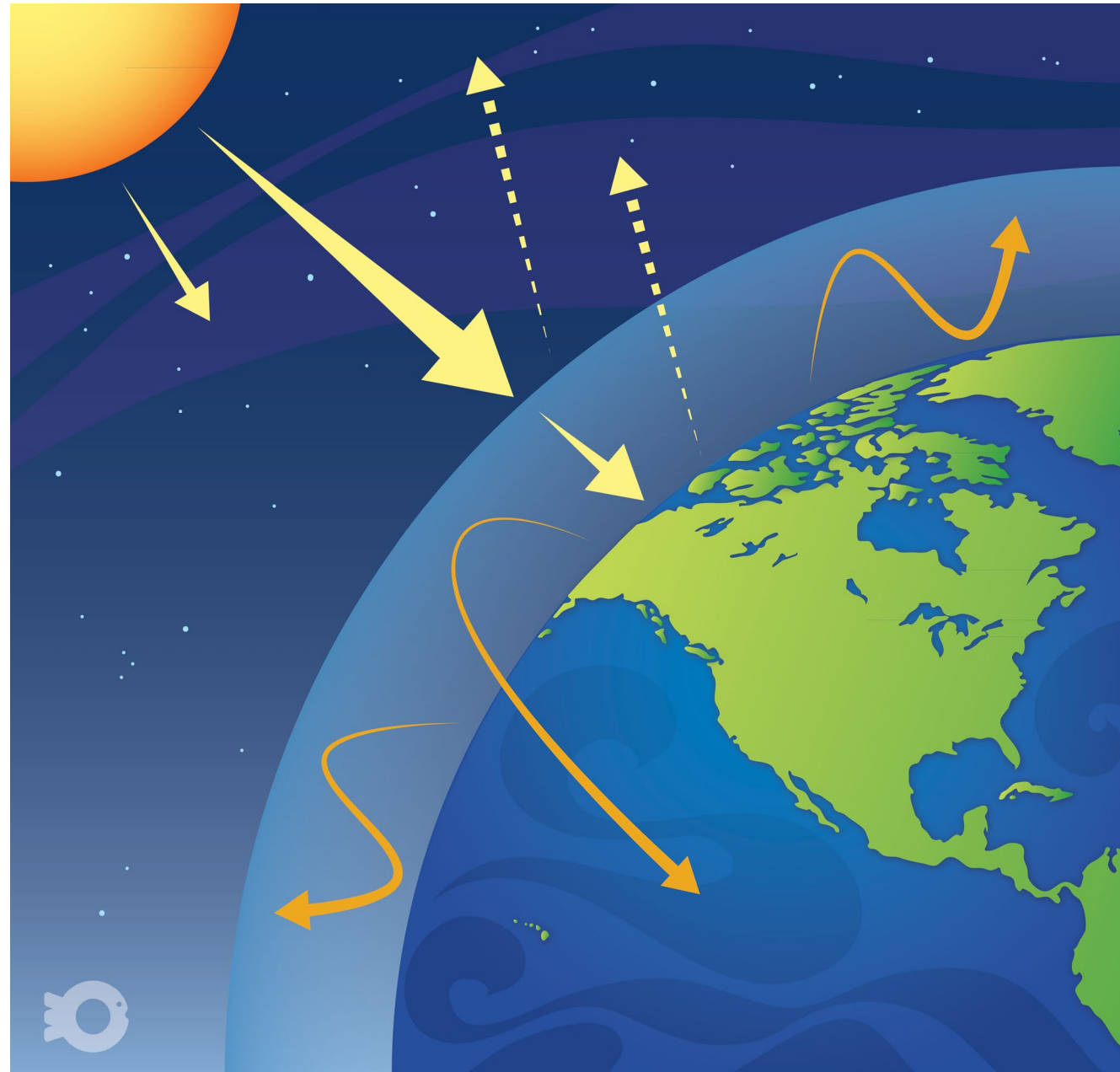
Plastic pollution isn't only produced by individuals or households, it's produced by businesses too. And, like it or not, the choices you make when supporting a business ties you to their plastic pollution. Have you ever gotten plastic boxes and cutlery when ordering take-out at a restaurant, or ordered something online and received it in a plastic bag? Whether you are buying from a business at home or abroad, you are (perhaps unknowingly) contributing to the international plastic pollution problem. By supporting plastic reduction partnered businesses, or encouraging your favorite companies to #BePlasticWise, whether they be local or international, you can help reduce the plastic pollution entering our ocean. This way, it won't be plastic pollution connecting us but the determination and efforts to protect the ocean!



## Lesson 5

# Plastics and Climate Change, a Never Ending Cycle





## BACKGROUND

The impacts of climate change on our ocean are numerous. For the purpose of this education kit, they will be separated into three broad groups: ocean warming, rising sea levels, and ocean acidification. Ocean warming occurs as a result of the ocean absorbing the excess heat trapped in the earth's atmosphere by the increased production of greenhouse gases from human activities.<sup>11</sup> As a result of ocean warming and the thermal expansion of sea water, climate change is also causing a rise in sea levels which is threatening coastal habitats and the species which rely on coastal regions for feeding and breeding.<sup>11</sup> Additionally, as the ocean absorbs heat, it also absorbs carbon dioxide. This excess uptake of carbon dioxide fuels a chemical reaction which decreases the pH of seawater, thus increasing acidity. As the ocean becomes more acidic, species which rely on carbonate to make their shells and skeletons, like corals and oysters, are threatened as this compound is less available in acidic waters.<sup>11</sup>

Plastic leaves quite an impact on our environment. With properties which make them virtually impossible to decompose and instead break up into millions of micro particles, they have managed to infiltrate ecosystems, food chains, and even humans! In brief, the physical impacts of plastic pollution cannot go unnoticed. But did you know that plastic also contributes to climate change? To make matters worse, plastics release greenhouse gases throughout every phase of their lifecycle. Whether it be during their production, consumption, or disposal, plastics are polluting the environment before they are even considered litter by humans! In brief, plastics are leaving their mark in more ways than one as they contribute to the climate crisis.

LESSON 1  
The History of Plastics

LESSON 2  
How Plastics Travel  
to the Ocean

LESSON 3  
Big or Small, Plastics Have  
a Huge Impact

LESSON 4  
Plastics at the Wheel, Driving  
Through Ocean Currents

LESSON 5  
Plastics and Climate Change,  
a Never Ending Cycle

LESSON 6  
Cleanup Your Shoreline for  
a Cleaner Ocean

## STUDENTS WILL BE ABLE TO:

- Develop an understanding of the greenhouse gas effect.
- Describe how plastic harms the environment before it becomes litter.

## CRITICAL QUESTIONS:

- What are greenhouse gasses?
- How does plastic contribute to climate change?
- How can you reduce your plastic footprint?

## RESOURCES:

**Watch** ▶ [What is The Greenhouse Effect by NASA Climate Kids](#)

**View** ▶ [Greenhouse Effect Simulation by PHET](#)

**View** ▶ [Plastic Footprint Calculator by Plastic Bank](#)

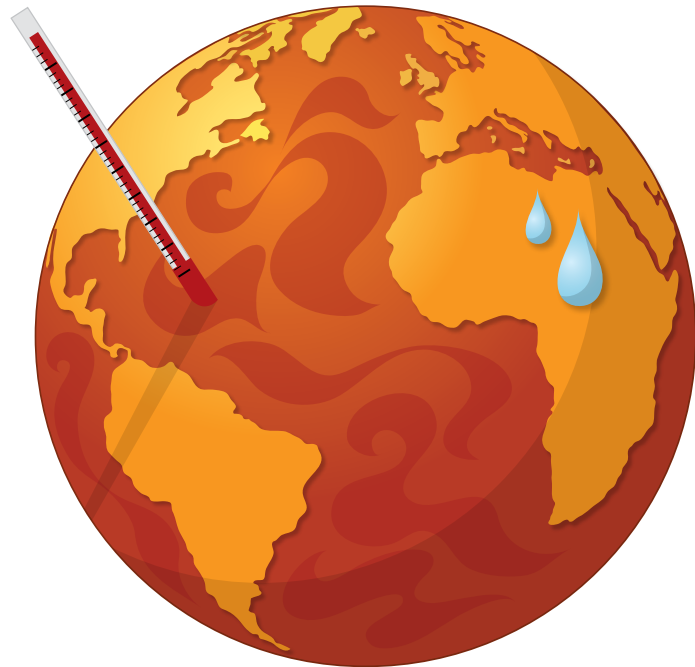
## ADDITIONAL RESOURCES:

**Read** ▶ [Plastic Waste and Climate Change – What’s The Connection? by WWF](#)



# ACTIVITIES

- 1** As a class, watch [What is The Greenhouse Effect by NASA Climate Kids](#). Present the [Greenhouse Effect Simulation by PHET](#) and play around with the simulation (i.e., greenhouse gas concentration). Discuss with students their observations and guide them in answering the associated questions in their workbook.
- 2** As a class, complete the [Plastic Footprint Calculator by Plastic Bank](#) by taking a rough estimate of the values gathered in class. Once complete, task students with creating a poster in their workbooks referring to different ways they can reduce their plastic consumption and their plastic footprint!
- 3** As a class, discuss how the shift from making goods with traditional materials and with Traditional Ecological Knowledge concepts to making them with plastic has increased our plastic footprint.



# THOUGHTBOOK



## Reflect

1. What are greenhouse gasses?
2. How does plastic contribute to climate change?
3. How can you reduce your plastic footprint?

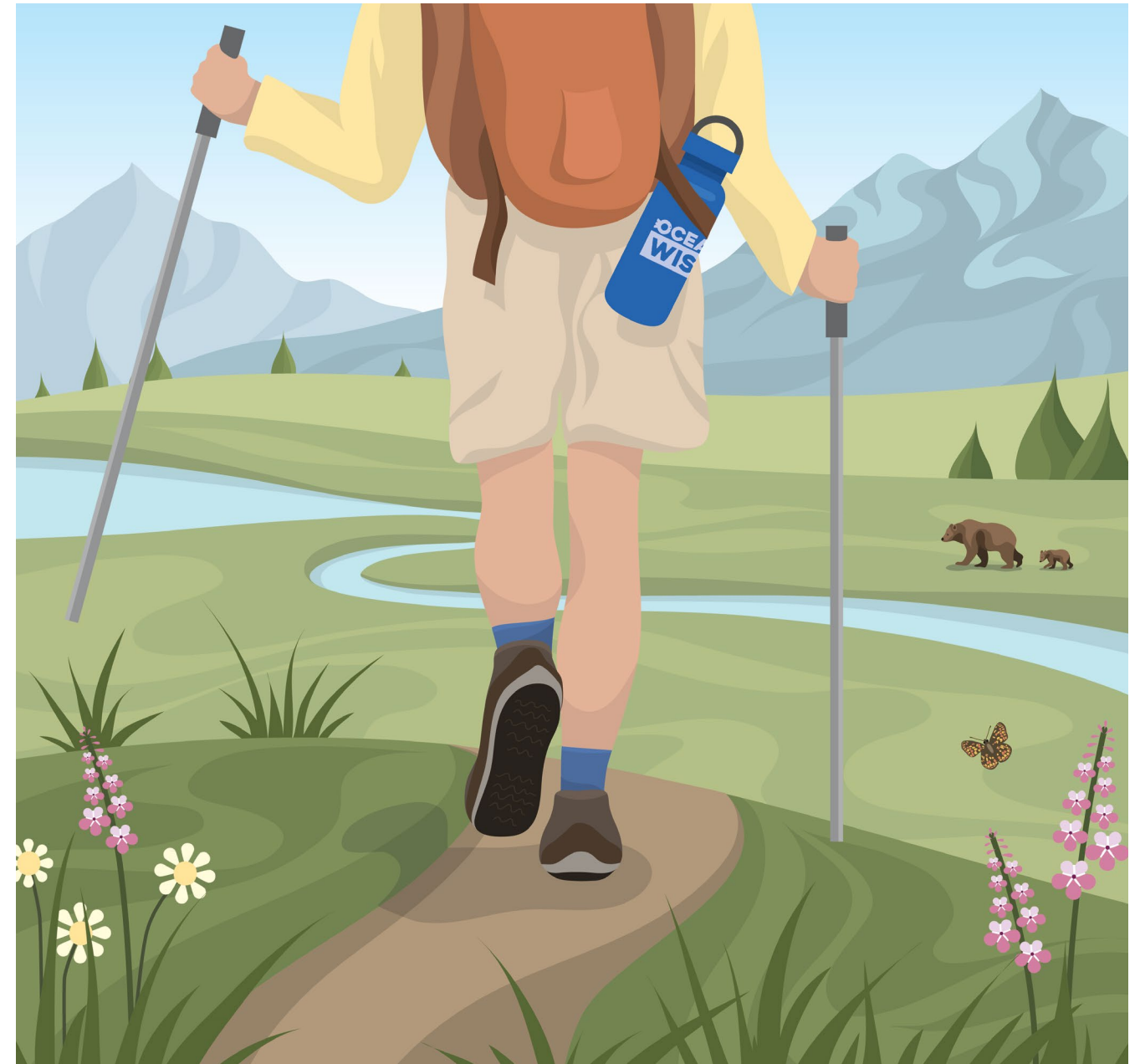
# TAKE ACTION



Reduce your consumption of plastics! Buy a glass or stainless-steel water bottle, a cotton and non-woven polypropylene grocery bag, a bamboo toothbrush, or better yet, re-use items you already have at home!

## THE WHY?

By reducing the amount of plastic you purchase, whether that be single use or multi-use, you are no longer supporting the plastic life cycle which contributes to climate change from start to finish. More specifically, you are preventing your consumer habits from contributing to oil production and fracking, the production of petrochemical byproducts, incineration of plastics, the overwhelming of landfills and recycling centers from plastics, and environmental pollution.



# Lesson 6

## Cleanup Your Shoreline for a Cleaner Ocean





## BACKGROUND

In 1994, employees and volunteers at the Vancouver Aquarium decided to clean up a beach in Stanley Park to protect the city's shorelines from garbage, especially plastic. In 2002, the Ocean Wise Shoreline Cleanup became a national conservation initiative with tens of thousands of volunteers helping restore and protect our world's ocean. As public support for this initiative grew, people became increasingly aware of the harmful effects of shoreline litter on ecosystems, wildlife, and people.<sup>12</sup> Altogether, Shoreline Cleanups have become an opportunity for people to learn, protect, and connect with nature.

Today, the Ocean Wise Shoreline Cleanup is one of the largest recognized direct action conservation programs in Canada committed to inspiring people to keep all shorelines free of litter. And the impact?

Since 1994, Ocean Wise, along with more than 972,000 volunteers during 30,542 cleanups, have collected over 2.1 million kg of trash over 48,428km of freshwater and marine shorelines in Canada and the United States!<sup>12</sup> That's equivalent to the weight of 700 killer whales in garbage and the same distance as walking around the planet!

Shoreline cleanups are a valuable tool for environmental remediation and conservation. They directly address the issue of plastic pollution by contributing to the physical removal of litter from an environment which has the potential to transport it anywhere in the world. Whether it be on the shoreline of a river, stream, lake, ocean, or any other waterway, shoreline cleanups are effective in preventing plastic pollution from continuing their journey and harming wildlife.



## STUDENTS WILL BE ABLE TO:

- Understand the positive environmental impacts of removing plastic pollution from the environment.
- Deepen their sense of leadership and influence when taking direct action for a cleaner future.
- Lead or participate in a Shoreline Cleanup and know how to #BePlastic Wise.

## CRITICAL QUESTIONS:

- How can you help clean up the environment?
- When you take action to protect the environment, how does it make you feel?
- How are you helping the environment, and other people by cleaning up your shorelines?

## RESOURCES:

**Read** ▶ [Ditching the Dirty Dozen by Ocean Wise](#)

**Watch** ▶ [Living Plastic Wise – Ocean Stories by Ocean Wise](#)

**Read For Educators** ▶ [Shoreline Cleanup Site Coordinator Guide by Ocean Wise](#)

**Watch** ▶ [Clean a Shoreline – #BePlasticWise by Ocean Wise](#)

**Watch** ▶ [How to Host a Shoreline Cleanup by Ocean Wise](#)

**View** ▶ [Ocean Wise Clean Up Data Card](#)

**Watch** ▶ [Ahousaht Territory Shoreline Cleanup by Coastal Restoration Society](#)

**Watch** ▶ [T'Sou-ke Territory Shoreline Cleanup by Coastal Restoration Society](#)

**Read** ▶ [Everyone Working Together for a Good Cause by Coastal First Nations Great Bear Initiative](#)

## ADDITIONAL RESOURCES:

**Read** ▶ [Sneaky Plastics – How to #BePlasticWise with Ocean Wise this Plastic Free July by Ocean Wise](#)

**Read** ▶ [The Great Canadian Shoreline Cleanup 2021 Impact Report by Ocean Wise](#)

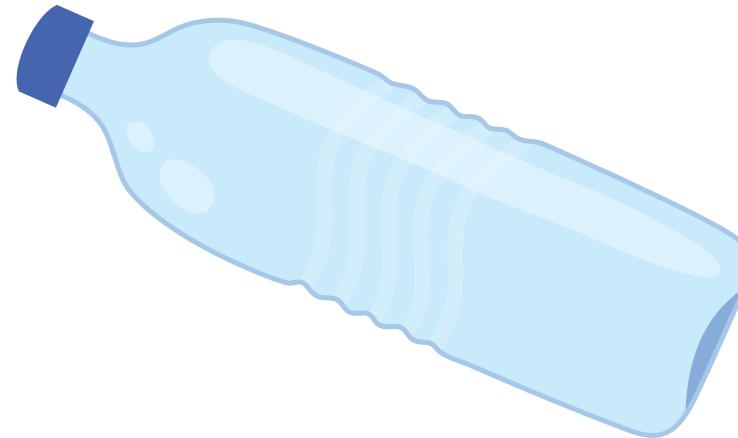
# ACTIVITIES

**1** School Yard or Community Cleanup: You will lead a garbage clean up with your class, whether that be on school property or in your local community. Review the [Shoreline Cleanup Site Coordinator Guide by Ocean Wise](#).

- Before your garbage clean up, as a class, watch [Clean a Shoreline – #BePlasticWise by Ocean Wise](#) and [How to Host a Shoreline Cleanup by Ocean Wise](#).
- Ask students to identify the different types of plastic products gathered during your clean up, and record their observations in the [Ocean Wise Clean Up Data Card](#) found in their workbook.
- Once observations are recorded, and garbage is collected, assist students with garbage triage and disposal.

In their workbooks, ask students to journal about their garbage cleanup experience. Encourage them to mention the type of garbage they collected, the animals they may have seen, how their efforts may help those animals, and how they felt after helping the environment and those who rely on it.

**2** As a class, read through [Ditching the Dirty Dozen by Ocean Wise](#) and watch [Living Plastic Wise – Ocean Stories by Ocean Wise](#). In their workbooks, ask students to list some of the *Dirty Dozen* items that they (or their household) use on a weekly basis. For each item listed, encourage them to find a non-plastic or reusable plastic alternative. Discuss their answers with the class.



**3** Watch [Ahousaht Territory Shoreline Cleanup by Coastal Restoration Society](#) and [T'Sou-ke Territory Shoreline Cleanup by Coastal Restoration Society](#) and read [Everyone Working Together for a Good Cause by Coastal First Nations Great Bear Initiative](#). Discuss with the class the different perspectives and approaches of Traditional Ecological Knowledge compared to that of the western world. Refer to the guiding questions below during the discussion.

## Guiding Questions:

- How would you describe the Indigenous relationship to nature? How would it differ from non-Indigenous people?
- How would you describe the Indigenous perspective of the benefits of a shoreline cleanup for and beyond the environment?

# THOUGHTBOOK



## REFLECT

1. How can you help clean up the environment?
2. When you take action to protect the environment, how does it make you feel?
3. How are you helping the environment, and other people by cleaning up your shorelines?

# TAKE ACTION



Take part in an [Ocean Wise Shoreline Cleanup](#) with your classmates or within your community!

## THE WHY?

So far, Ocean Wise’s shoreline cleanups have removed 13,915kg of litter from coastlines in Canada and the United States. That’s the equivalent of 700 killer whales! Shoreline cleanups have prevented plastics from entering marine ecosystems, reducing fatal impacts on thousands of species, such as the hawksbill sea turtle. Since plastics travel with ocean currents around the world, by participating in a shoreline cleanup, you are directly contributing to the removal of plastics in every ocean and shoreline around the world!



# REFERENCES

1. The PEW Charitable Trusts. (2020). *Breaking The Plastic Wave - A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution*. Retrieved September 26, 2022, from [https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave\\_report.pdf](https://www.pewtrusts.org/-/media/assets/2020/07/breakingtheplasticwave_report.pdf)
2. United Nations Environment Program. (2022). *Beat Plastic Pollution Visual Feature*. Retrieved September 26, 2022, from <https://www.unep.org/interactives/beat-plastic-pollution/>
3. Government of Canada. (2022). *Plastic Waste and Pollution Reduction*. Retrieved September 26, 2022, from <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste.html>
4. Secretariat of the Convention on Biological Diversity. (2016). *Marine Debris: Understanding, Preventing and Mitigating the Significant Adverse Impacts on Marine and Coastal Biodiversity*. Retrieved September 26, 2022, from <https://www.cbd.int/doc/publications/cbd-ts-83-en.pdf>
5. Science Museum. (2019). *The Age of Plastic: From Parkesine to Pollution*. Retrieved September 26, 2022, from <https://www.sciencemuseum.org.uk/objects-and-stories/chemistry/age-plastic-parkesine-pollution#:~:text=Belgian%20chemist%20and%20clever%20marketeer,phenol%2C%20under%20heat%20and%20pressure>
6. Science History Institute. (2016). *History and Future of Plastics*. Retrieved September 26, 2022, from <https://www.sciencehistory.org/the-history-and-future-of-plastics>
7. Ocean Wise. (2022). *Pollution and Plastics*. Retrieved September 26, 2022, from <https://ocean.org/pollution-plastics/>
8. Fernández-Llamazares Á, Garteizgogeoasca M, Basu N, Brondizio ES, Cabeza M, Martínez-Alier J, McElwee P, Reyes-García V. (2020). *A State-of-the-Art Review of Indigenous Peoples and Environmental Pollution*. Retrieved September 26, 2022, from *Integr Environ Assess Manag* (3):324-341.
9. Vassilenko V, Watkins M, Wang S, Chastain S, Etamadifar A, Ross P, Posacka A. (2019). *The Ocean Wise Plastics Lab teams up with apparel firms and MetroVancouver to study the role of laundry in microplastic pollution in the ocean*. Ocean Wise. Retrieved September 26, 2022, from <https://ocean.org/blog/27886/>
10. Boudreau D, Carangelo A, Costa H, Jaszewski J, McDaniel M, Ramroop T, Sprout E, Teng S, Turgeon A. (2022). *Ocean Conveyor Belt*. National Geographic Retrieved September 26, 2022, from <https://education.nationalgeographic.org/resource/ocean-conveyor-belt>
11. Ocean Wise. (2022). *Climate Change and Canada's Oceans*. Retrieved September 26, 2022, from <https://ocean.org/blog/climate-change-and-canadas-oceans/>
12. Ocean Wise Shoreline Clean Up. (2022). *About Us*. Retrieved September 26, 2022, from <https://shorelinecleanup.org/aboutus>

## WHAT IS OCEAN WISE?

Ocean Wise is a non-profit organization whose mission is to empower communities and individuals to take action to protect and restore our world's ocean.

Ocean Wise does this by tackling three critical ocean challenges - climate change, overfishing and plastic pollution – through six intersecting initiatives: seaforestation, changing arctic, plastics, fisheries and seafood, youth, and whales. Through our work we make a real and measurable difference to the health and well-being of the ocean and the people who depend on it. You can learn more about the actions you can take at [ocean.org](https://ocean.org).

## Looking for more Ocean education?

Ocean Wise's Education team offers in-person mobile education opportunities, online virtual programs, and more. Ocean Wise's Professional Development Workshops are designed to train educators on discussing ocean health and literacy for students K-12. Visit [ocean.org](https://ocean.org) or email [education@ocean.org](mailto:education@ocean.org) to learn more.

## Follow us on Social Media

IG: [@oceanwise](https://www.instagram.com/oceanwise), FB: [@oceanwise](https://www.facebook.com/oceanwise), TW: [@oceanwise](https://twitter.com/oceanwise), LK: [@oceanwise](https://www.linkedin.com/company/oceanwise)

Sign up for our [newsletter](#).

## Have feedback? We would love to hear from you!

Please take 4 minutes to [rate us](#).

Illustrations by [Art by Di](#).

This project was undertaken with the financial support of the Government of Canada.

Canada

Waves of Change

green  
LEARNING

TakingITGlobal  
INSPIRE INFORM INVOLVE

OCEAN  
WISE