

Ocean Plastics Education Kit

STUDENT WORKBOOK Middle School (Grades 7-8)



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 Plastics and Climate Change, Cleanup Your Shoreline for Through Ocean Currents

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 5



a Never Ending Cycle

LESSON 6 a Cleaner Ocean







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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^wmə0k^wəýəm (Musqueam), Skwxwú7mesh (Squamish), and səlilwəta?4 (Tsleil-Waututh) peoples.

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Plastics and Climate Change, a Never Ending Cycle



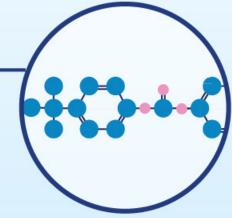
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Lesson 1 The History Of Plastics





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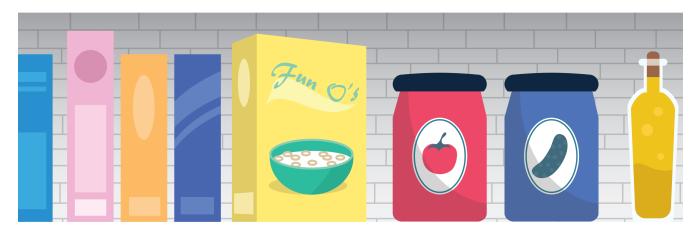


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- Read <u>Properties of Plastic Monomers and Polymer by The Plastic Soup Foundation</u>. From <u>Plastic: It's Not All The Same by Plastic Oceans</u> select a plastic polymer and answer the following questions.
- a) What is the name of the plastic polymer you selected:

Polymer name:

b) List 2 characteristics of this plastic polymer:

1. 2.

c) Name an element in the plastic polymer you selected?

Element:

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2 Fill in the table below by identifying trade goods and the materials they were made with during the <u>fur trade</u> versus <u>today</u>.

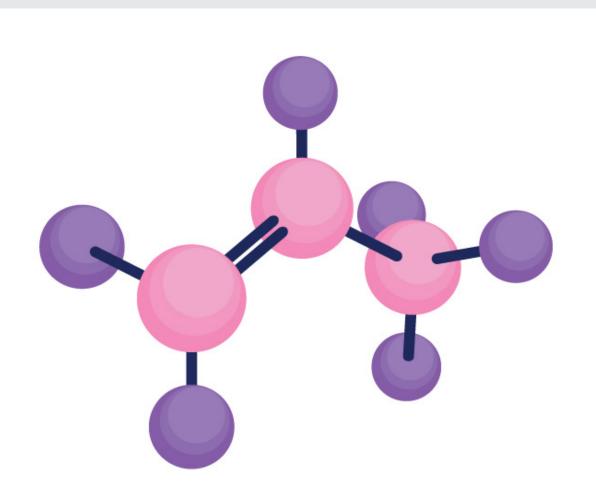
<u>Trade Good</u>	Material Composition fro

d) How many neutrons, protons, and atoms are in the element named above?

Protons:

Neutrons:

Atoms:







<u>om</u>	<u>Material Composition</u> <u>Today</u>



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In this lesson, you have been introduced to plastic as a consumer good and how it has impacted society and the environment. Take a minute to reflect on what you learned, especially regarding the presence of plastics in our modern world.

REFLECT

1. How can plastic take any shape we want it to?









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2. Look around you, why are you surrounded by so much plastic?

3. What makes plastic dangerous for the environment and society?





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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!





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Draw a comic strip illustrating the story of a piece of plastic garbage traveling from your schoolyard to the ocean. You should include one of the ways plastic travels to the ocean mentioned in <u>How Does</u> <u>Plastic End-Up in The Ocean by WWF</u>. If completing this activity online, use a separate sheet of paper for this activity.





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2 What are some of the ideas your group came up with to stop plastic from getting into the ocean? You can describe or draw a prototype of your ideas. If completing this activity online, use a separate sheet of paper for this activity.





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From these activities and discussions, you discovered how plastics go from being a consumer good to an ocean pollutant by traveling to the sea. Take a moment to reflect on the ways that the plastic waste you produce can harm marine environments and coastal Indigenous communities.

REFLECT

1. How might a plastic bag, straw, or cup make its way from your school to the ocean?





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2. What are the different ways we can prevent plastic from reaching the ocean?

3. In what ways can Traditional Ecological Knowledge (TEK) be applied to better understand the impacts and solutions to the world's plastic problems?



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Watch <u>Take The Pledge by Ocean Wise</u> and visit <u>Be Plastic Wise</u> 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 <u>Reducing Your Plastic Footprint by Ocean Wise</u>.

THE WHY?

According to experts from the <u>Ocean Wise's Plastic Lab</u>, 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.



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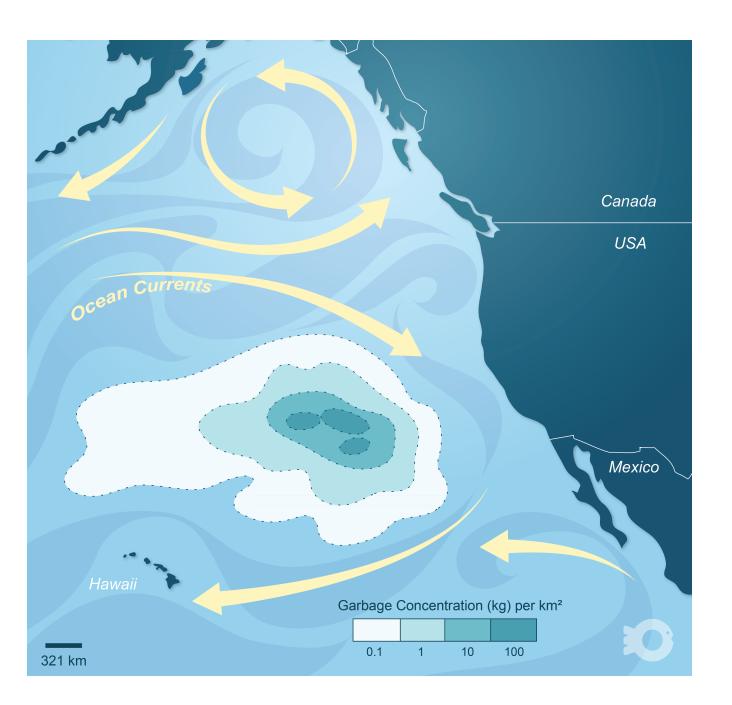
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ACTIVITIES

1 (a) List some of the different types of macroplastics you would expect to find in the Great Pacific Garbage Patch.

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(b) For each macroplastic picture below, explain how this may impact or interact with a specific marine species (i.e., turtle, fish, shark, whale, etc.).



Marine Species Name:

Impact/Interaction:



Marine Species Name:

Impact/Interaction:



Marine Species Name:

Impact/Interaction:





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2 Select a m and Marin	narine animal affected by microplastics and fill out t ne Animals Investigation sheet below.	the information in the Plastics	Impacts of pla	stic:			
Your Nam	ne:			ani	w it impacts the imal (food mistaken entity or entanglement,	What survival n	leed is
Your Parti	ner's Name:		Type of plast		trapment)	affected? And I	
Name of A	Animal:						
Latin nam	ne of animal:						
Type of an	nimal:						
Size:							
Habitat ne	eeds:						
Food/prey	y types:						
Method o	f obtaining food:						
Predators							
Methods	of evading predators:						





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3 Write a thank you letter to the lands or waters near you, expressing your gratitude for them:



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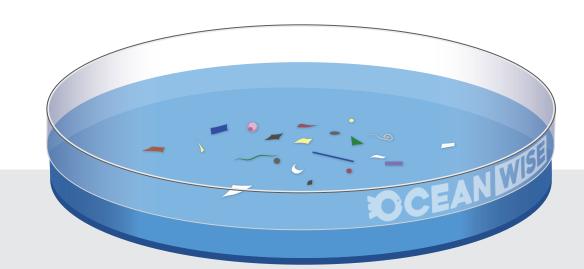
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As you now know, plastics come in all shapes and sizes which affect how they harm ocean health and marine species. While microplastics are tiny, they ironically have a huge impact! Think of this when reflecting on the following questions.

REFLECT

1. What are the various ways that plastic impacts animals and ecosystems in our ocean?





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- 2. How do microplastics pose a more extensive and widespread threat to the environment and humans than do macroplastics?
- 3. What are meaningful and equitable ways to reduce and remediate plastic pollution around the world?



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LESSON 3 Big or Small, Plastics Have a Huge Impact

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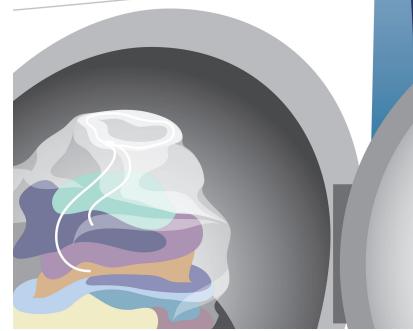
Minimize the microfibers you release into waterways by:

- 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%.







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LESSON 4 Plastics at the Wheel, Driving Plastics and Climate Change, Through Ocean Currents



1 a) Read The Journey of Forgotten Plastics Through Our Ocean Currents by Ocean Blue Environmental News Blog and visit Pollution Tracker by Ocean Cleanup.

b) On the world map below, circle the different areas where the friendly floaties may have traveled to and explain why.

Reasoning:





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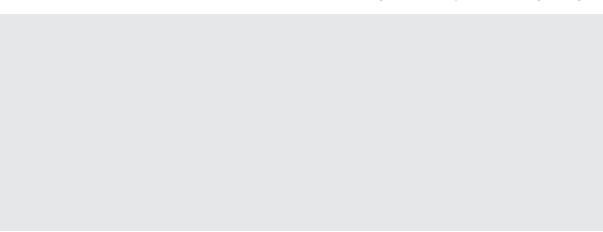


- 2 Answer questions below after watching, <u>Hokulea Sailed Around The World, But</u> Couldn't Escape Plastic - Ocean Stories by Ocean Wise and How Our Trash Reaches **Remote Beaches.**
- a) How are these remote islands and beaches accumulating so much plastic and garbage?

b) What are some key takeaways/messages you found from watching the Hokulea voyage? How can we apply those to our daily lives?

c) What does malama honua mean? How could you take that translation and include it into your life in a meaningful way?

d) What kind of impact would plastic pollution have on people if we had to perform a necropsy on all our own food? Could you see this impacting the way we treat plastic and the ocean?



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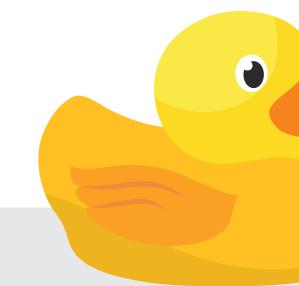
LESSON 4 Through Ocean Currents



Wow, most plastics have probably traveled around the world more than you have! Reflect on what you learned about plastic pollution traveling throughout the ocean via ocean currents.

REFLECT

1. What is the connection between the ocean and the Earth's global temperature?





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LESSON 4 Plastics at the Wheel, Driving Plastics and Climate Change, Cleanup Your Shoreline for Through Ocean Currents

2. How does plastic pollution move around the world?

3. How do ocean currents affect the overall goal of removing plastics from the ocean?



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LESSON 4 Plastics at the Wheel, Driving Through Ocean Currents



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!





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- Answer the following questions based on your observations from the <u>Greenhouse Effect</u> Simulation by PHET.
- a) How does the infrared radiation (heat) returning into the atmosphere change as greenhouse gas concentrations increase?

b) What happens to the surface thermometer and surface temperature when greenhouse gas concentrations increase? Explain why.





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2 Create a poster to inform the public about how the life cycle stage of plastic assigned to your group contributes to climate change. You can refer to More Than Just Litter: Plastic and Climate Change by Foodprint and must include the following information:

- The life cycle stage of plastic that has been assigned to you
- The activities involved • during that stage
- How it contributes to climate change (GHG emissions)

If completing this activity online, use a separate sheet of paper for this activity.

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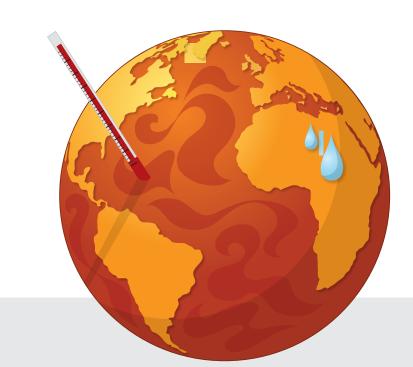
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Would you have ever thought that plastic can also contribute to climate change? Well now you know, and you are aware that the life cycle of plastic begins polluting before it's even discarded by the consumer. Take a minute to reflect on what you have learned and how it might urge you to change your habits.

REFLECT

1. What aspects of the plastic life cycle contribute to the release of greenhouse gasses?





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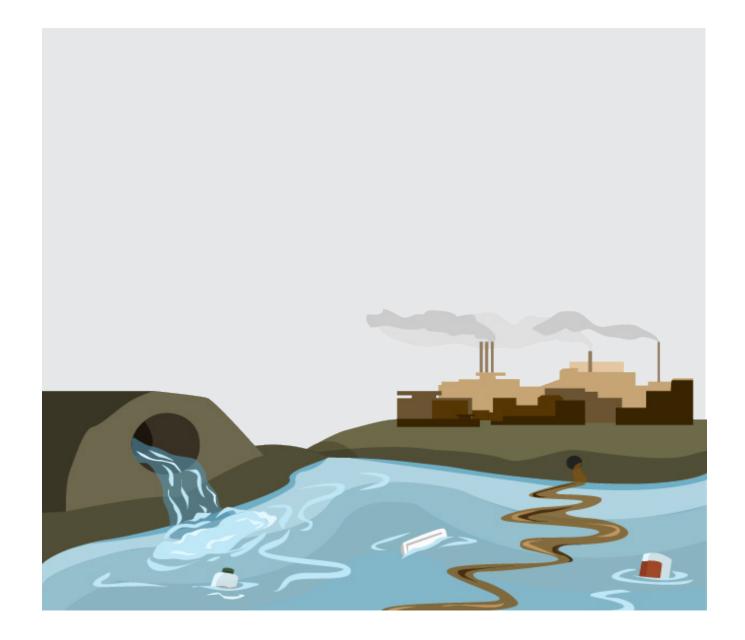
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- 2. How does plastic harm the environment before it physically enters the environment as pollution?
- 3. How can we reduce the contribution of plastic to climate change by learning from TEK?







LESSON 5 Plastics at the Wheel, Driving Plastics and Climate Change, a Never Ending Cycle



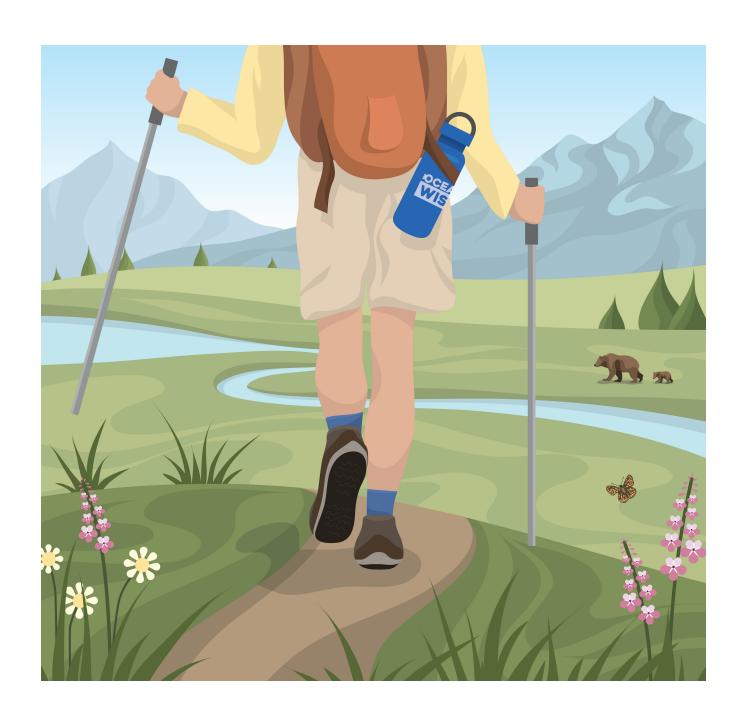
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Reduce your consumption of plastics! Buy a glass or stainlesssteel water bottle, a cotton and non-woven polypropylene grocery bag, a bamboo toothbrush, or better yet, re-use items you already have at home!

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.





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





LESSON 6 a Cleaner Ocean



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ACTIVITIES [✓ _ ✓ _



1 In the table below, write down some of the *Dirty Dozen* items you use on a weekly basis and come up with a non-plastic alternative for each.

Dirty Dozen Item	Non-Plast





tic Alternative	



2 Record the different types of garbage you observed and collected during the garbage clean up in the data card below.



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	CEAN		Tras	sł
W	ISE		MOST LIKELY TO FIND ITEMS:	=
	LINE CLEANUP		Beverage Cans:	
			Coffee Cups and Lids:	
Individual SITE INFORMATION:	Data Ca	rd	Food Containers: (i.e. yogurt or snack cups, milk containers) =
Cleanup Site Name	Cleanup D	ate	Food Wrappers:	
			Glass Bottles:	
Site Coordinator	Distance (Cleaned (км)	Paper:	
			Plastic Bags:	
Total Weight (кс) # of Garb	page Bags # of Recyc	ling Bags	Plastic Bottles:	-
			Plastic Cups:	-
# of Volunteers Working On This Card	Most Unusual Item		Six Pack Holders:	=
			Straws:	-
Citizen scientists: Pick up all lit for the items listed on the back			Takeout Containers:	-
Only numbers are useful. Please			Utensils:	-
when complete.			TOP 3 ADDITIONAL ITEMS:	
EXAMPLE:			Identify the top 3 items found that are not listed on the card	
	<u>{</u>	TOTAL #	1:	-
Plastic Bags:		= 0	2:	
PRESENTING SPONSOR	NATIONAL SPONSORS		3 :	
Loblaw Companies L		O'NEILL	Thank you for co	
•			.	





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LESSON 6 Cleanup Your Shoreline for a Cleaner Ocean

h Collected

TOTAL #	FISHING GEAR:	TOTAL
	Fishing Buoys,	
=	Pots or Traps:	=
=	Fishing Net and Line:	=
	Rope (1 metre = 1 piece):	=
	PRODUCT PACKAGING	
	Soft Plastic Packaging:	TOTAL =
	Rigid Bottles and Jugs:	=
	PERSONAL HYGIENE:	
	Diapers, Wipes, Tampons, Condoms:	TOTAL
:	Syringes:	=
	Personal Protective Equipment: (i.e. gloves, masks)	=
	(.e. gioves, masks)	
	TINY TRASH LESS THAN 2.5 CM:	TOTAL
:	Styrofoam Pieces:	=
:	Plastic Pieces:	=
	OTHER TRASH:	
	Balloons:	TOTAL
TOTAL #	Clothing, Shoes:	=
	Construction Materials:	=
	Large Styrofoam:	=
	Tires:	=
	Toys:	=
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Shoreline cleanups are a powerful environmental remediation and conservation tool. Reflect on how you can bring shoreline cleanups to your local community and make a difference!

REFLECT

1. How does taking direct action to protect the environment benefit the environment and yourself?









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- 2. How can you influence the state of the environment and the lives of the people who rely on it, including yourself?
- 3. How can direct action, especially shoreline cleanups, help and be informed by Traditional Ecological Knowledge?



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Take part in an <u>Ocean Wise Shoreline Cleanup</u> 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!







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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.

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 or email education@ocean.org to learn more.

Follow us on Social Media

IG: @oceanwise, FB: @oceanwise, TW: @oceanwise, LK: @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.

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