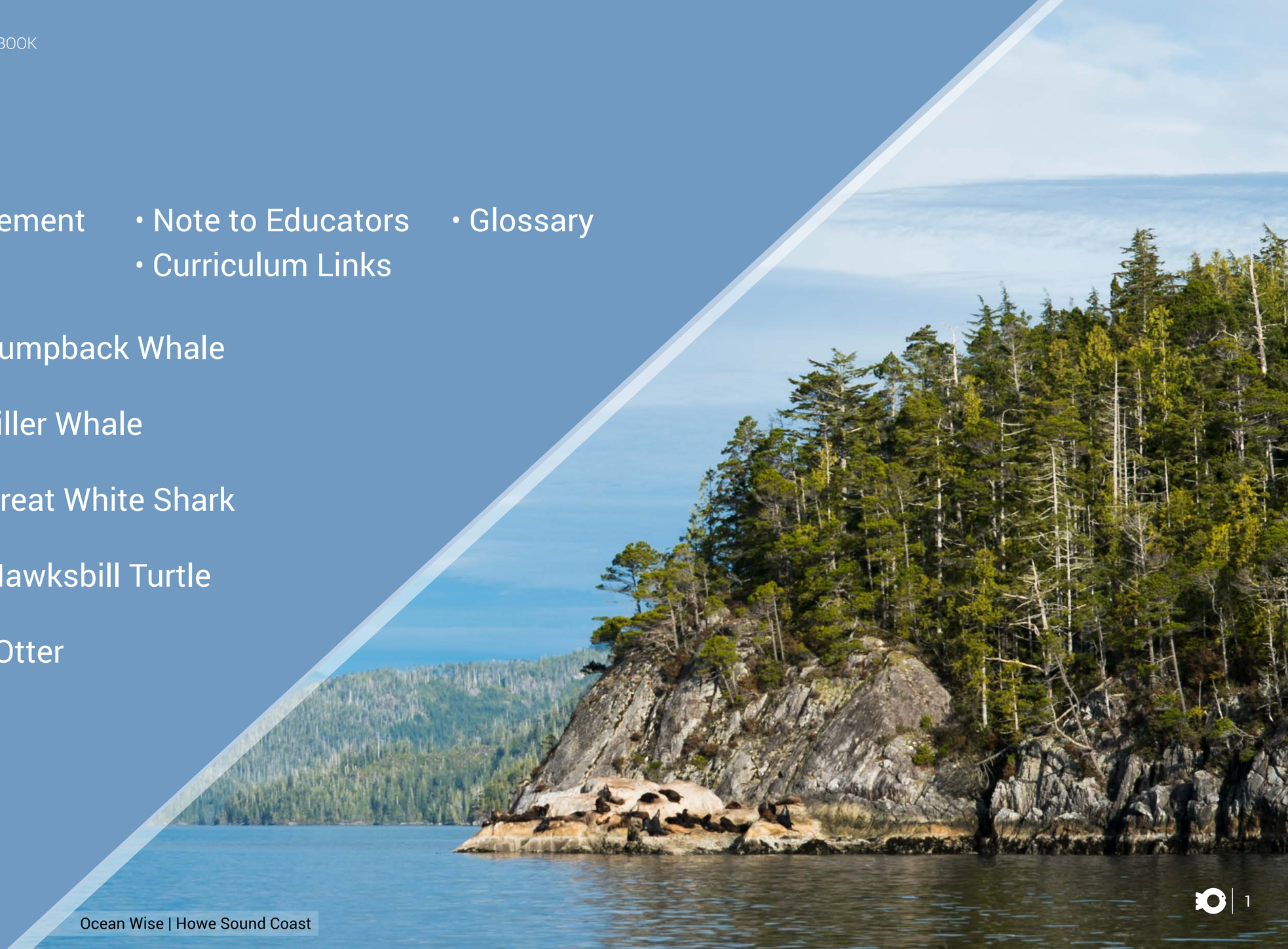
Species at Risk

EDUCATOR GUIDEBOOK

Grades 7 - 8

OCEAN WISE

CONTENTS



Ocean Wise | Howe Sound Coast

LAND ACKNOWLEDGEMENT

We acknowledge and are grateful that many Ocean Wise employees work and play on the traditional, ancestral and unceded territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwxwú7mesh (Squamish), and səl̓ilwətaʔɬ (Tsleil-Waututh) peoples.

INTRODUCTION

The Earth's ocean and its interconnected systems are vital to every living thing on Earth. Marine species play a pivotal role in maintaining the efficiency and balance of these systems, and their role in the ocean has a direct impact on its health. And yet the health of the ocean, and the well-being of all life on earth, is at risk due to human activity.

Everyday thousands of animals fall victim to the anthropogenic threats imposed on the ocean, and species are pushed to the point of extinction. Indeed, as of 2022, as many as 45 thousand marine species are at risk of extinction due to climate change, plastic pollution, and overfishing! It is going to take a deep, transformational change in humanity's consciousness and behaviors regarding the ocean to ensure species protection and to preserve healthy, sustainable life on this planet.

At Ocean Wise, we believe this is possible – but we need to work together. Our youth must become aware of the interconnectedness between our lives and the ocean and understand the important role diverse species play in the health of the environment. By merging our experience with climate change education and the research of our own 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 such as 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 education pedagogies, these lessons aim to guide our youth to become leaders of change. The ultimate objective being to educate, equip and empower students to become ocean champions and stewards for species at risk.

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 acknowledging 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 behavior change, but also through actions that can positively influence large systemic issues.

Finally, we want to thank 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 so they are better equipped to deal with environmental issues. Nonetheless, today you are the leader, leading our youth towards a cleaner and more sustainable future.

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

- Science 7
- Arts Education 7
- Social Studies 7
- Arts Education 8
- Social Studies 8

LESSON 2

- Arts Education 7
- Applied Design, Skills, and Technology 7
- Science 8
- Arts Education 8
- Social Studies 8
- Applied Design, Skills, and Technology 8

LESSON 3

- Social Studies 7
- Social Studies 8

LESSON 4

- Arts Education 7
- Social Studies 7
- Applied Design, Skills, and Technology 7
- Arts Education 8
- Social Studies 8
- Applied Design, Skills, and Technology 8

LESSON 5

- Science 7
- Social Studies 7
- Applied Design, Skills, and Technology 7
- Social Studies 8
- Applied Design, Skills, and Technology 8

GRADE	SUBJECT	BIG IDEAS	CONNECTED LESSON(S)
7	Science	Earth and its climate have changed over geological time.	1
		Evolution by natural selection provides and explanation for the diversity and survival of living things.	5
	Arts Education	Engaging in the arts develops people's ability to understand and express complex ideas.	1, 2, and 4
	Social Studies	Religious and cultural practices that emerged during this period have endured and continue to influence people.	1, 3, 4, and 5
		Economic specialization and trade networks can lead to conflict and cooperation between societies.	3 and 5
	Applied Design, Skills, and Technologies	Entrepreneurship and marketing	5
		Digital Literacy	2 and 4
8	Science	Life processes are performed at the cellular level.	2
	Arts Education	Individual and collective expression can be achieved through the arts.	1, 2, and 4
	Social Studies	Exploration, expansion, and colonization had varying consequences for different groups.	1, 2, 3, 4, and 5
		Human and environmental factors shape changes in population and living standards.	1, 2, 3, 4, and 5
	Applied Design, Skills, and Technologies	Entrepreneurship and Marketing	5
		Digital Literacy	2 and 4

GLOSSARY

- **ANTHROPOGENIC**

The impact on the environment, as it relates to climate change, originating from human activities.

- **APEX PREDATOR**

A predator at the top of their food chain with no natural predators. This term excludes humans.

- **BREACHING**

When whales use their powerful tail to launch themselves out of the water.

- **BY-CATCH**

Fish or non-target species that are caught unintentionally while fishing for another species.

- **CETACEANS**

An order of aquatic mammals that includes all whales, dolphins, and porpoises.

- **FORAGING/FORAGE**

When animals actively search for food in their environment.

- **INTERNATIONAL UNION OF CONSERVATION FOR NATURE (IUCN)**

An international organization working in the field of nature conservation and the sustainable use of natural resources.

- **KEYSTONE SPECIES**

An organism that significantly defines how an ecosystem functions. Without this species, the ecosystem may be dramatically altered or cease to exist.

- **OVERFISHING**

Removing a species of fish from the ocean, through fishing activities, at a rate greater than the species can replenish its population.

- **TROPHY**

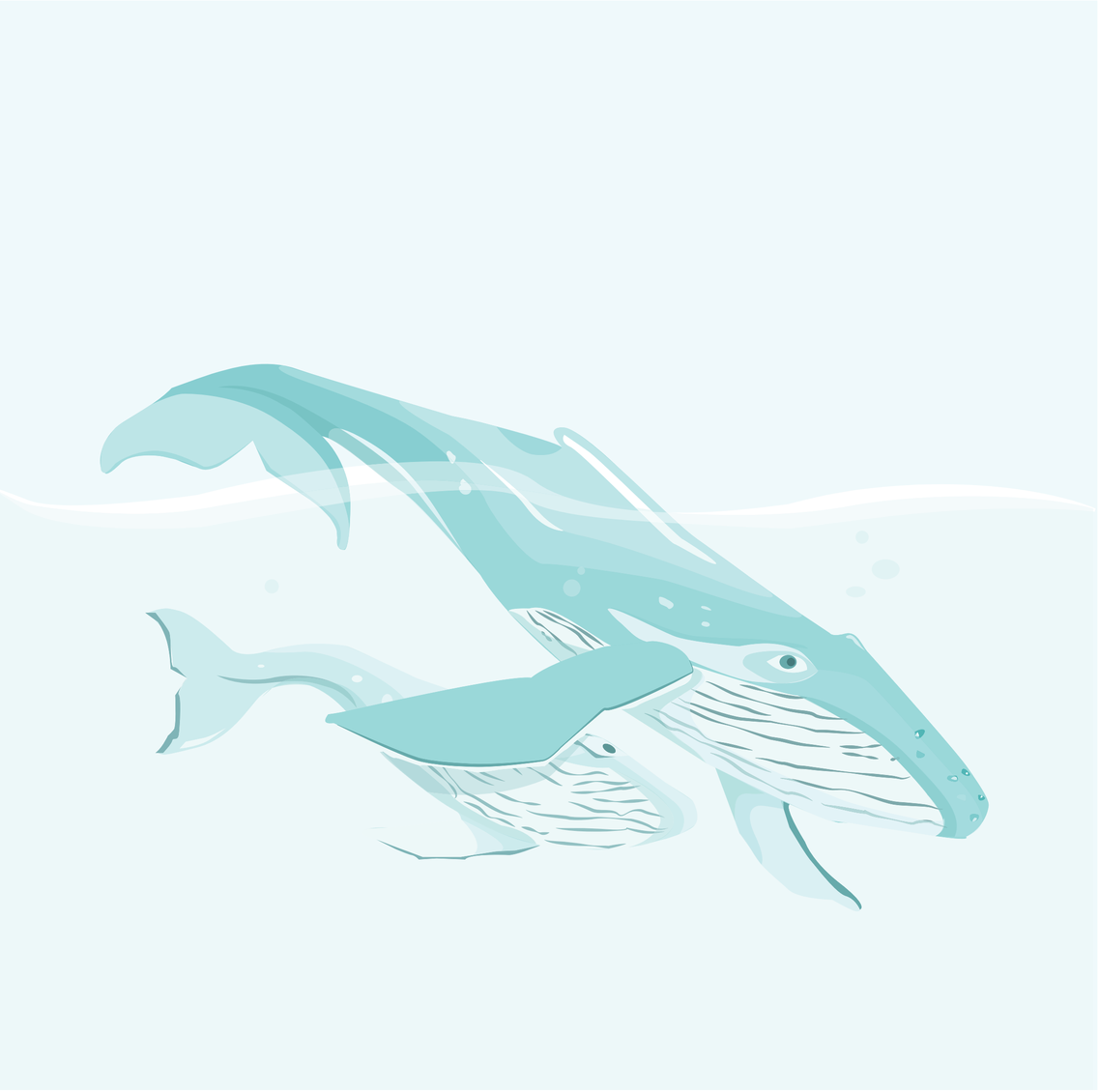
A fish that is captured only for its large size and not necessarily used for subsistence.

- **URCHIN BARREN**

A part of the ocean where the urchin population growth has gone unchecked causing the destructive grazing of kelp forests.

Lesson 1

Climate Change - Humpback Whale



BACKGROUND

The humpback whale is found in all major oceans and is a highly migratory species. They feed in cold productive waters during the summer and travel to warm tropical waters for the winter to breed. As an animal that lives mostly in nearshore areas and is known for its spectacular surface-active behavior, including breaching and tail slapping, the majestic humpback whale is incredibly popular among whale watchers. However, not too long ago, the humpback whale was a target for a much more gruesome activity - whale hunting. The humpback whale was one of the five large whale species hunted throughout the 19th century and consequently, some populations were dramatically reduced by almost 95%! Today, the humpback whale population has mostly recovered due to conservation efforts to prevent whaling and has been listed as a species of least concern by the International Union of Conservation (IUCN). However, a more contemporary issue is now threatening their existence.

Research has shown that climate change disproportionately affects ecosystems at higher latitudes, which the humpback whale relies on for intensive feeding throughout the year. As climate change warms ocean waters and melts sea ice, changes in the food web decreases the abundance of the humpback whale's prey. As they have less to feed on, these whales are unable to meet certain survival requirements. In fact, the higher number of unsuccessful pregnancies and lower calving rates of the humpback whale population in the north Atlantic has been attributed to the lack of available prey. Indeed, 65% of the humpback whale's breeding grounds are projected to be adversely impacted by climate change this century. As water temperatures rise above the range tolerated by humpback whales, they may stop using these areas altogether further reducing their breeding rates.

As the humpback whale population just began to show signs of recovery from their exploitation by whalers, they now face the impacts of climate change. While humans have contributed to the successful protection of the spectacular humpback whale, there is still lots of work for us to do, especially as it relates to climate change mitigation.

STUDENTS WILL BE ABLE TO

- Develop an understanding of how climate change affects ocean health and species
- Make connections between mitigating climate change and protecting species.
- Deepen their understanding of the urgency of the climate crisis and its patterns.

CRITICAL QUESTIONS

- What are the most awe-inspiring ways that the ocean supports life on earth?
- What are the most significant ways that the changing climate can impact ocean health?
- What are some of the ways marine animals can help mitigate climate change?

RESOURCES

- Watch: Our Planet - Humpback Whales by Netflix
- Watch: Scientists Study Humpback Whales for Clues on Climate Change Impact by ABC News
- Watch: Research Dives Deep to Understand Climate Impacts on Whales by Griffith University
- Watch: How Whales Can Help Us to Fight Climate Change by Terra Mater
- View: The Climate Change Machine by NASA
- View: Footprint Calculator
- View: Land Use, Climate Change Adaptation, and Indigenous Peoples by Our World UN University
- Watch: Human-Whale Relationship in The Face of Climate Change - Dr. Chie Sakakibara by UN University

ACTIVITIES

1. Watch: ***How Whales Can Help Us to Fight Climate Change by Terra Mater***. Discuss as a class the ways that marine organisms, such as the humpback whale, can help mitigate climate change.

- Ask students to select a species and make a poster advocating for its protection by demonstrating how it can help regulate global climate change. Have students refer to the guiding questions in their workbook.

2. Have students visit the Carbon Dioxide and Global Temperature topics on the ***Climate Change Machine by NASA***. Discuss with students their observations. Refer to the guiding questions below during the discussion:

GUIDING QUESTIONS

- **Were there any overlaps of the patterns (spatial, intensity, etc) observed between the two topics?**
- **What are some economic activities that have intensified over the years and have contributed to these observed patterns?**
- **How have these economic activities contributed to the change in Carbon Dioxide and Global temperature (i.e., greenhouse gas effect)?**

3. Have students calculate their carbon footprint using the ***Footprint Calculator***. Discuss with students the different ways they can reduce their carbon footprint and how systemic change will be needed to make meaningful change. Use the guiding questions below for reference during your discussion:

GUIDING QUESTIONS

- **Which consumption category was your highest and what are some of the ways you can reduce it?**
- **To what extent do you think other systemic forces (economic, political, social) may be contributing to your carbon footprint? What impact does this have on climate change?**
- **What are some ways that you can ignite change and encourage friends, family, government, and large corporations to reduce their carbon footprint?**

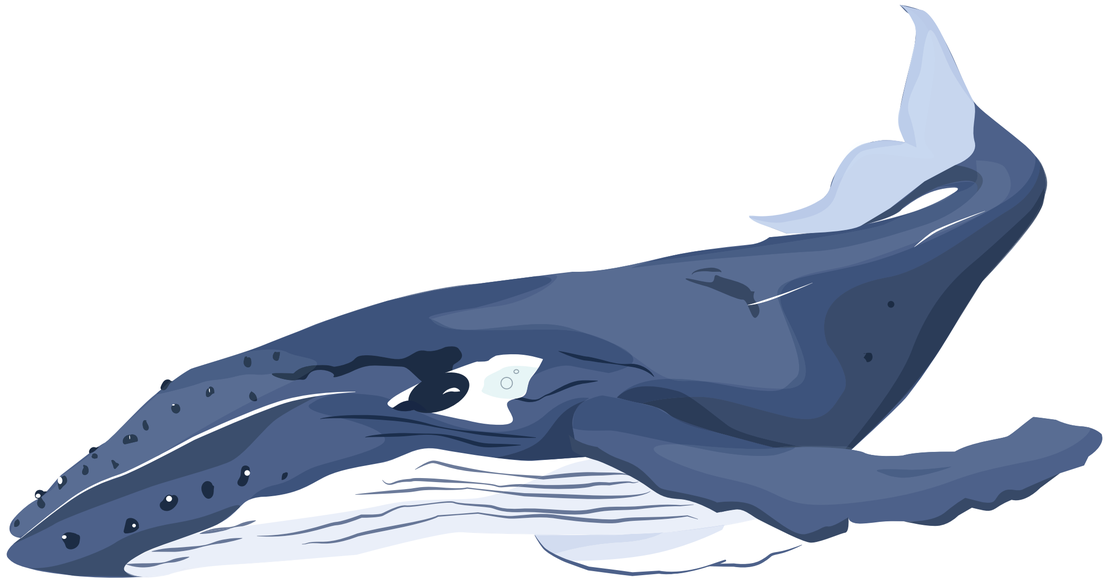
- View ***Land Use, Climate Change Adaptation, and Indigenous Peoples by Our World UN University*** and scroll to “People of the Whales”: A story of hope in the face of loss. Read through this segment with the class and watch ***Human-Whale Relationship in The Face of Climate Change - Dr. Chie Sakakibara by UN University***. In their workbooks, students should draw a cycle which illustrates how climate change impacts Indigenous communities who have strong relationships with whales, such as the humpback whale. Discuss with students how the relationships that exist between Indigenous communities and whale populations can be used to inform and advocate for climate change mitigation.

THOUGHTBOOK

This lesson focused on the different ways we contribute to climate change and how we can change our practices to reduce our impacts.
Take time to journal on your thoughts and things you have learned.

REFLECT

1. What are the most awe-inspiring ways that the ocean supports life on earth?
2. What are the most significant ways that the changing climate can impact ocean health?
3. What are some of the ways marine animals can help mitigate climate change?



TAKE ACTION

Report a whale sighting using ***The Ocean Wise Whale Report Alert Sysem***.

THE WHY

Reporting a whale sighting provides researchers with information about the abundance of a species in order to properly determine the status of the population (i.e., improving, steady or declining). It also informs scientists about the distribution of whales and how feeding and breeding grounds may be impacted due to climate change. With a better understanding of the abundance and distribution of whales, people in the vicinity can be made aware of their presence and reduce the risk of vessel strikes and other human inflicted disturbances. By helping provide more information to scientists and the community, you can have a role in contributing to climate change mitigation and conservation measures to help protect species like the humpback whale!

Lesson 2

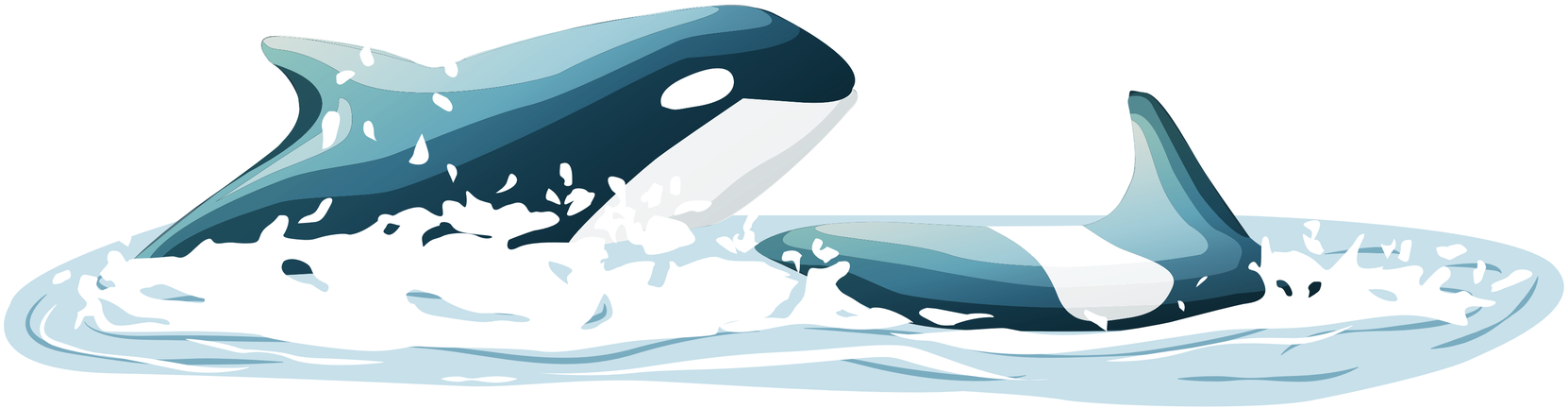
Ocean Pollution - Killer Whale

BACKGROUND

Orcas, more commonly known as killer whales, are the largest marine mammals belonging to the dolphin family. Despite living mostly in colder regions where their prey is most abundant, killer whales can be found all over the world feeding on a variety of different prey. In fact, this species has the most varied diet and foraging behavior of all cetaceans. Despite being so widely distributed and easily recognized by their signature black and white coloring, it has been extremely difficult for researchers to accurately gather information on species distribution and population size as they are found in such remote areas. This has led to the IUCN listing the killer whale as a data deficient species on their Red List.

Although little is known about the killer whale, scientists have shown that their greatest threat is ocean pollution. While ocean pollution affects all marine animals, it has a disproportionately greater effect on killer whales as they are a top (apex) predator. This means that they are found at the top of the food chain where the bioaccumulation of ocean pollutants is at its highest. Bioaccumulation occurs when a toxin enters the food chain via primary producers (i.e., algae) and increases in concentration as it moves up. Top predators, such as the killer whale, will possess the highest concentration of that toxin. Killer whales are most likely to be harmed by industrial and household chemicals, which persist through the food chain over several decades by storing itself in the blubber of the killer whale's prey. As a result of their chemical contamination via feeding, killer whales across the world are facing high rates of infertility, high calf death (due to mothers offloading chemicals to their calves via milk), and poor immune system functioning, which has contributed to a decline in their population.

There is no doubt that the ban of certain ocean pollutants has significantly mitigated the effects of its bioaccumulation in killer whales. However, we must recognize that we have yet to act on countless unregulated pollutants entering our ocean. We still have lots of work to do.



STUDENTS WILL BE ABLE TO

- Understand the interdependence of ocean health, the food chain, and trophic structure connections as it pertains to ocean pollution.
- Understand the interconnectedness of species within the same food chain in an ecosystem.
- Develop a meaningful understanding of advocating for better ocean health and climate change mitigation.

CRITICAL QUESTIONS

- What are the most significant ways that humans impact ocean health?
- What pollutants have the most impact on ocean health?
- How do pollutants affect all species in an ecosystem? Why are certain species more affected by ocean pollutants than others?

RESOURCES

- Watch: Bioaccumulation and Biomagnification: Increasingly Concentrated Problems! by Catalina Island Marine Institute
- Read: Ocean Wise Blog: Tracking Contaminants in Killer Whale Habitats by Ocean Wise
- View: The Ocean Wise Pollution Tracker by Ocean Wise
- View: Impact of Pollution on Native People by Native Knowledge 360
- View: Missing Polar Bear Poster by Endangered.org
- View: Endangered Orcas Campaign Poster
- View: White Roofs Campaign
- View: Rhino, Panda, Gorilla
- View: IUCN Red List
- View: Ocean Wise Plastic Pledge

ADDITIONAL RESOURCES

- Watch: Killer Whales Under Threat, a film by Ocean Wise
- Read: OCEANWATCH Spotlight – Pollution Hotspots in Killer Whale Habitat Pinpointed by New Conservation Tool by Ocean Wise
- Read: Parallels Drawn Between Endangered Orcas and Indigenous Experiences by CBC
- Read: Native American Killer Whale Mythology by Native Peoples

ACTIVITIES

1. Watch ***Bioaccumulation and Biomagnification: Increasingly Concentrated Problems! by Catalina Island Marine Institute*** and read ***Ocean Wise Blog: Tracking Contaminants in Killer Whale Habitats by Ocean Wise***.

- In small groups, ask students to select a top ocean predator and draw their respective food chain.
- Students will research an ocean pollutant that affects this food chain and identify at which level (i.e., at which species) the pollutant enters the trophic structure and if this pollutant has an effect on the top predator.
- Discuss as a class some of the similar patterns in their findings, refer to the guiding questions below during your discussion.

GUIDING QUESTIONS

- **Are your top predators herbivores, omnivores, or carnivores?**
- **At which trophic level does the pollutant enter the trophic structure?**
- **Is the top predator directly or indirectly affected by the pollutant?**
- **From the information in the video you just watched, which animal in your trophic structure would you say is the most affected by the pollutant?**

2. View ***The Ocean Wise Pollution Tracker by Ocean Wise*** and ***Impact of Pollution on Native People by Native Knowledge 360***. Using the interactive map, students should select one pollutant and a coastal location where it was measured. Ask students to research how it may impact ocean health and disproportionately affect Indigenous communities. They will be tasked with creating a poster advocating for its ban and how this may positively impact the ocean and coastal Indigenous communities. They should include specific examples of what they can do to help!

3. Discuss with students what makes a good species survival campaign. Show the examples listed below and encourage students to comment on what captivates their attention the most, or what makes them feel most strongly about the species.

- View: ***Missing Polar Bear Poster by Endangered.org***
- View: ***Endangered Orcas Campaign Poster***
- View: ***White Roofs Campaign by Greenpeace***
- View: ***Rhino, Panda, Gorilla by WWF***

Individually or in small groups, students will create a poster to advocate for saving an aquatic species at risk. Posters could include:

- Images such as the organism's habitat, the major threat(s) it faces, and tangible actions that anyone can take to help with the survival of the species.
- Students can use the ***IUCN Red List*** to search for a species at risk.

THOUGHTBOOK

In this lesson, you learned about ocean pollution and how it impacts not one, but nearly all species in a food chain or ecosystem, as well as pollution's negative impact on all species, especially those most at risk. Take a moment to pause and reflect on what you have learned and how it made you feel.

REFLECT

1. What are the most significant ways humans impact ocean health?
2. What pollutants have the most impact on ocean health?
3. How do pollutants affect all species in an ecosystem? Why are certain species more affected by ocean pollutants than others?

TAKE ACTION

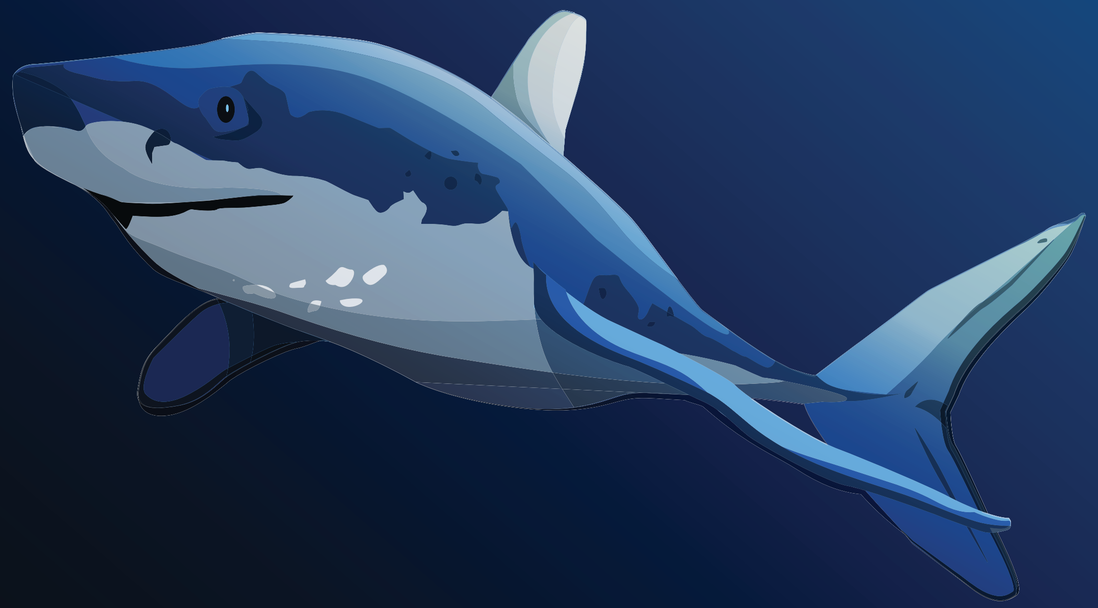
Take the ***Ocean Wise Plastic Pledge***. Reduce your consumption of single-use plastic, for example: bring a reusable water bottle or reusable containers in your lunchbox!

THE WHY

Not only does reducing your consumption of single-use plastic (such as plastic straws or bags) prevent plastics from entering the environment, but it also discourages their production and the release of harmful chemicals used to create them (including industrial chemicals harming killer whales!) By taking the Ocean Wise Plastic Pledge and reducing your use of plastics, you are contributing to the reduction of not one, but two types of ocean pollutants from entering our waterways.

Lesson 3

Fishery Bycatch - Great White Shark



BACKGROUND

Perhaps one of the most iconic shark species, the great white shark is the largest predatory fish on earth. They are found in oceans around the world where they feed on seals, whales, and seabirds. Despite humans not being their prey, they can sometimes make mistakes! Each year, a third to a half of the 100 shark attacks reported throughout the world are caused by great white sharks attacking people who harass them or try to feed them. However, they are not trying to eat us! Unlike what is portrayed in the media, such as in the film Jaws, great whites are not malicious creatures that intend to cause harm, but simply mistake us for prey. In fact, humans pose a greater threat to them by killing around 100 million sharks and rays every year.

The great white shark population is in decline owing to years of being hunted by humans for their highly valued fins and teeth or as trophies. Over the past 150 years, global populations have declined by an estimated 30%-49%. Today, despite the value of shark products, great whites are rarely caught on purpose by commercial fisheries as they target other shark or fish species whose meat is more desirable for food. Instead, great whites, especially juveniles, are accidently caught in fishing nets as by-catch. During their yearly migration, great whites pass through areas with high levels of fishing activity increasing their vulnerability to becoming by-catch. These fisheries also pose an additional threat as they contribute to the overfishing and abundance reduction of the great white's prey.

With the great white shark's population in decline, the IUCN has listed the species as vulnerable on their Red List. They are also listed as endangered under the Canadian Species at Risk Act (SARA) and many other legislations across the world. Being listed in legislation gives great white sharks legal protection, however, simply listing their name on a piece of paper is not enough to protect this species, especially if fisheries continue to use unsustainable and dangerous fishing practices.

STUDENTS WILL BE ABLE TO

- Deepen their personal connection to global environmental issues.
- Deepen their understanding of how unsustainable fishing and resource use by humans impacts ocean and species health.
- Improve the ability of individuals and communities to make informed and responsible consumer choices regarding seafood and other ocean resources.

CRITICAL QUESTIONS

- What are the differences between the sustainable and unsustainable use of ocean resources?
- What are the most damaging effects that human seafood consumption has on ocean ecosystems? How has our reliance on seafood impacted ocean health?
- How can traditional Indigenous Knowledge and practices inform fisheries on how to use and manage ocean resources sustainably and respectfully?

RESOURCES

- Read: The Ocean Literacy Principles on pg.5 of Ocean Literacy
- View: OCEARCH Shark Tracker
- Watch: What is Bycatch - A Cartoon Crash Course by Pew
- Watch: Will the Ocean Ever Run Out of Fish by TED-Ed
- Play: The Fish Game by the Cloud Institute
- Read: Want to Save BC Salmon? Bring Back Indigenous Fishing Systems, Study Says by Stephanie Wood
- View: Ocean Wise Seafood Partner Map
- View: Ocean Wise Seafood Recommendations

ADDITIONAL RESOURCES

- Watch: Living Legends: The Teachings of The Salmon by Indigenous Tourism BC

ACTIVITIES

1. Using ***OCEARCH Shark Tracker*** – Ask students to choose a shark and record information on their species, name, tag date, location, and tracked movement. Allow students to present their findings and a fun fact about the species to the class.
2. Watch ***What is Bycatch - A Cartoon Crash Course by Pew*** and discuss with students species characteristics or behaviors that may make them more vulnerable to becoming by-catch. Try to relate these characteristics back to the great white shark.

GUIDING QUESTIONS FOR CLASS DISCUSSION

- **Does species size influence by-catch, and how?**
- **Does prey type influence by-catch, and how?**
- **Does species habitat and distribution influence by-catch, and how?**
- **Does species feeding behavior influence by-catch, and how?**

3. As a class, watch ***Will the Ocean Ever Run Out of Fish by TED-Ed*** and play ***The Fish Game by The Cloud Institute***.

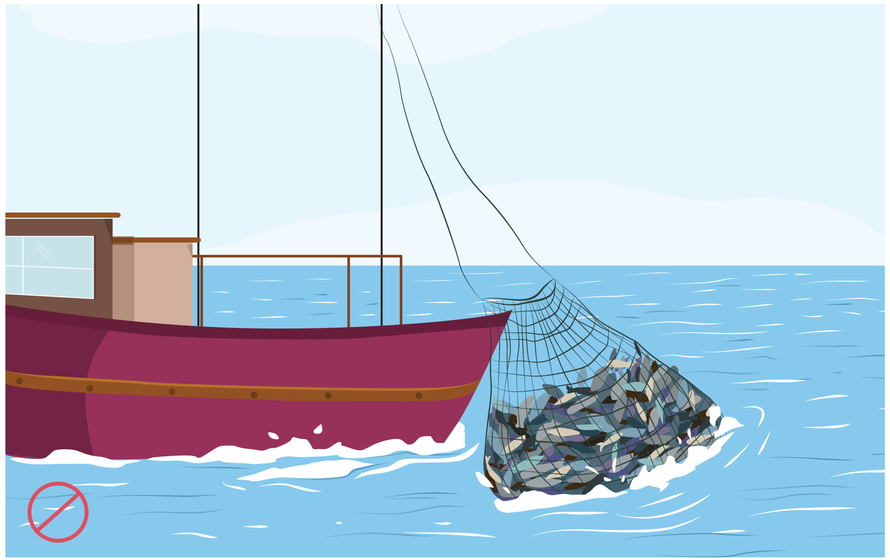
- The game has 4 scenarios, and you are encouraged to play with each scenario. Make sure to read the rules and conditions of each scenario to the class.
- Discuss how changing the number of fish captured and different scenario conditions affected the results of the game and how they may compare to our actual overfishing situation. Tie in concepts from the video.
- Read ***Want to Save BC Salmon? Bring Back Indigenous Fishing Systems, Study Says by Stephanie Wood*** and discuss with the class how implementing Indigenous fishing systems would change the results of the game and benefit fisheries.

THOUGHTBOOK

From these activities, you should understand how unsustainable fishing practices, such as overfishing and by-catch, impact ocean health. Reflect on the environmental cost of the overexploitation of ocean resources such as seafood.

REFLECT

1. What are the differences between the sustainable and unsustainable use of ocean resources?
2. What are the most damaging effects that human seafood consumption has on ocean ecosystems? How has our reliance on seafood as food impacted ocean health?
3. How can traditional Indigenous Knowledge and practices inform fisheries on how to use ocean resources sustainably and respectfully?



The Ocean Wise Seafood symbol is your assurance of an ocean-friendly choice.

TAKE ACTION

Use the ***Ocean Wise Seafood Partner Map*** and the ***Ocean Wise Seafood Recommendations*** before purchasing a seafood product and look for our logo on seafood packaging!

THE WHY

Ocean Wise's seafood recommendations identify sustainably farmed or fished seafood products. By using the variety of tools created by Ocean Wise, such as the Seafood Partner Map and Seafood Recommendations Search Tool, you can easily make an informed choice regarding the sustainability of the seafood that you are purchasing. By doing so, you will be directly contributing to ocean sustainability by supporting fisheries which have implemented the appropriate measures to protect and respect our ocean and its resources and encouraging others to do the same.

Lesson 4

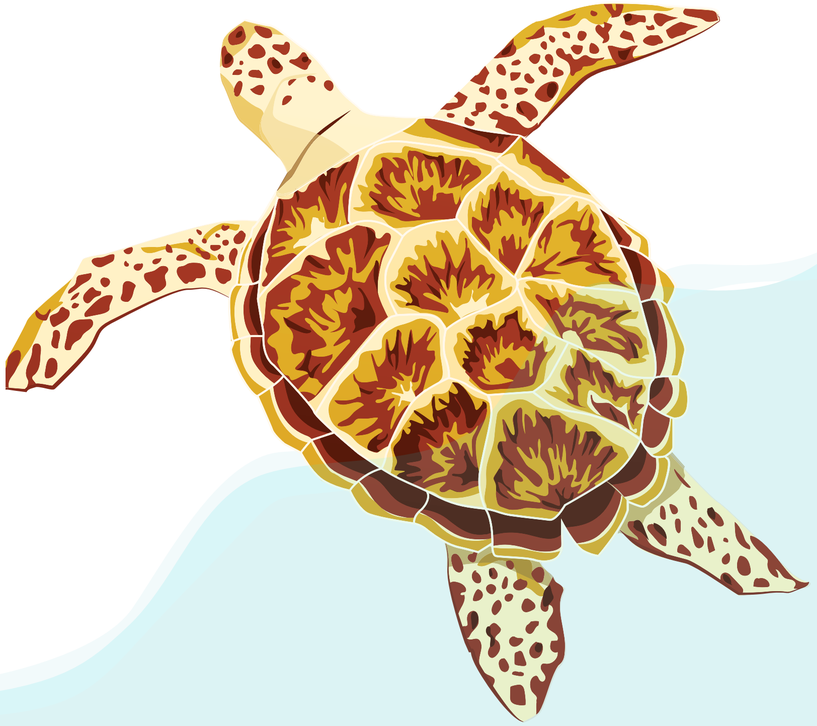
Plastic Pollution - Hawksbill Turtle

BACKGROUND

Hawksbill turtles are globally distributed throughout the tropical and subtropical waters of the Atlantic, Indian, and Pacific oceans. They can be found migrating in the open ocean between breeding and foraging sites, however most of their time is spent near reefs and on sandy beaches reaching from Australia and Indonesia to Mexico and Puerto Rico. Unfortunately, it is their frequent appearance on beaches and in coastal waters which make them vulnerable to threats such as hunting, loss of habitat, fishery by-catch, and marine pollution.

The hawksbill turtle is known for the uniqueness and beauty of their shell making them a target for hunters and illegal wildlife trade. They are also particularly vulnerable to habitat loss from coastal development as they lay their nests further in-land compared to other sea turtle species. However, the most severe threat to the hawksbill turtle's global population is that of marine pollution, more specifically plastic pollution. The threat of plastic pollution to the hawksbill turtle is multifaceted. Marine plastic debris can often be mistaken as food and ingested, (a floating plastic bag is mistaken for a jellyfish for example), causing reduced growth rates and reproductive output, poor health, and death. While fisheries threaten the hawksbill sea turtle through bycatch, they are also contributors to plastic pollution by leaving ghost fishing gear in the ocean. Turtles get entangled in this gear causing fatal lacerations and drowning. When plastic pollution washes up on the shoreline, it threatens nesting mothers as they can't dig through to lay their eggs and they will often get entangled or injured by beach litter. Furthermore, plastic pollution on the shoreline can barricade hatchlings from reaching the ocean.

Despite being only one type of pollution, the variety of impacts that plastic has on the hawksbill turtle is what make it such a powerful threat. With the increasing amount of plastic entering our ocean, it is no surprise that the hawksbill turtle has been listed as critically endangered by the IUCN. Unfortunately, this situation is not getting any better. While we have already lost 85% of the species, their population is still in decline. Therefore, we must act fast and reduce our plastic consumption to save the hawksbill turtle and many other species!



STUDENTS WILL BE ABLE TO

- Understand how plastic pollution impacts ocean health and species.
- Create an understanding of the applicability of small-scale conservation and citizen science initiatives.
- Deepen their understanding of how plastic pollution affects species in nearby and further away ecosystems.

CRITICAL QUESTIONS

- How does plastic pollution adversely impact ocean health and marine species?
- What are some alternatives to single-use plastic that are less detrimental to the environment?
- How can we use citizen science to inform small-scale conservation initiatives?

RESOURCES

- View: Ocean Wise Shoreline Clean Up Data Card
- Watch: Waste Services - What Goes Where? by the City of Edmonton
- Read: iNaturalist Introduction
- View: iNaturalist App Download
- Watch: How to Make an Observation on iNaturalist using our Mobile App by iNaturalist
- View: Getting Started by iNaturalist
- Watch: How Ocean Plastic Threatens Sea Turtles by Newsy
- Watch: 30 Days Without Single Use Plastics - One Small Step by Now This
- Read: How Seabirds and Indigenous Science Illustrate the Legacies of Plastic Pollution by Stephanie B. Borelle et al.
- Read: Plastic Found Inside Arctic Char Has Nunavut Hunters Fearing For Local Food Sources by CBC

ACTIVITIES

1. GARBAGE CLEAN UP X CITIZEN SCIENCE

STEP 1 - GARBAGE CLEAN UP

- As a class, conduct a garbage clean up either on school property or in a local outdoor community by following the garbage clean up guidelines in the appendix.
- Ask students to identify the different types of plastic products gathered during your clean up and record their observations in their ***Ocean Wise Shoreline Clean Up Data Card***.
- Watch ***Waste Services - What Goes Where? by the City of Edmonton***. Once observations are recorded and garbage is collected, assist students with garbage triage and proper disposal.

STEP 2 – SPECIES ID

- Once the garbage clean-up is complete, ask students to take out their phone/tablet and open ***iNaturalist*** (app needs to be ***downloaded*** before hand) or distribute a local species ID guide that can be found online. If using iNaturalist, watch ***How to Make an Observation on iNaturalist using our Mobile App by iNaturalist*** and view ***Getting Started by iNaturalist***.

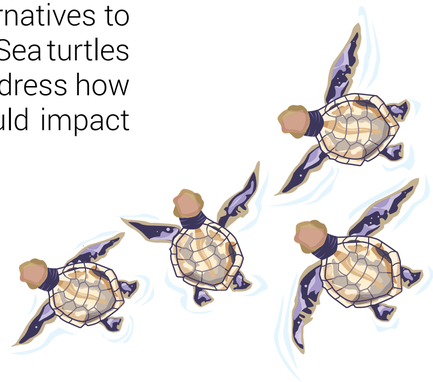
  Note:if students do not have access to the internet, they can take pictures and upload them once back in the classroom.

- Ask students to walk around and try to identify different animals or insects in the vicinity of where the garbage clean up took place. If students use iNaturalist, their observations will automatically be recorded and saved and can be found in the “me” section at the bottom of the screen. If students use a local species ID guide, they are encouraged to take note of their observations on a piece of paper.

STEP 3 - RESEARCH AND DISCUSS

- Ask students to think of, or research ways, that the garbage they collected, most notably plastic, could harm the species they have identified. Discuss as a class thoughts and findings.
- Watch ***How Ocean Plastic Threatens Sea Turtles by Newsy*** and discuss how the plastic pollution they observed may harm the hawksbill turtle if it ended up in waterways.
- As a class, read ***How Seabirds and Indigenous Science Illustrate the Legacies of Plastic Pollution by Stephanie B. Borelle et al.*** and ***Plastic Found Inside Arctic Char Has Nunavut Hunters Fearing For Local Food Sources by CBC***. Discuss how Indigenous communities are disproportionately harmed by the type of plastic pollution observed during the garbage clean up.

2. Watch ***30 Days Without Single Use Plastics - One Small Step by Now This***. Have students create a poster advocating for alternatives to single-use plastics, using the video above for inspiration. Sea turtles can be used as the target species of their poster and address how the observed plastics during the garbage clean-up could impact this species.



THOUGHTBOOK

Now that you have participated in your own garbage clean up and/or citizen science project targeting plastic pollution, reflect on the positive impact you brought to your school or community, marine species, and the environment!

REFLECT

1. How does plastic pollution adversely impact ocean health and marine species?
2. What are some alternatives to single-use plastic that are less detrimental to the environment?
3. How can we use citizen science to inform small-scale conservation initiatives?

Ocean Wise | Shoreline Cleanup

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. Shoreline cleanups have prevented these 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 organizing or participating in a shoreline cleanup, you are contributing to the removal of plastics in every ocean and shoreline around the world!

Lesson 5

Habitat Loss - Sea Otter

BACKGROUND

The southern sea otter once called the entire West Coast home, with populations stretching from Baja, California, to the Pacific North-West. However, when the hunting of this charismatic creature for their fur began in the 1700s, the population was rapidly decimated to the point that they were thought to be extinct. In 1977, a small population was discovered on an island 500 km off California's coastline, and this led to huge efforts to repopulate their species! Today, efforts to keep the animal thriving have intensified thanks to various conservation organizations, including Ocean Wise. While the wild population has been holding steady in the thousands for nearly a decade, it has not grown significantly. Of the 13 otter species, the IUCN lists 5 as endangered, 5 as near threatened, and 2 as vulnerable. Researchers believe that the lack of population growth is a result of competition for food and various anthropogenic threats.

Sea otters are vulnerable to many human inflicted threats including pollution, habitat destruction, poaching, overfishing, and entanglement in ghost nets and rogue fishing gear. As many live near major oil tanker routes, oil spills are another major threat to sea otters. Oil destroys the insulative properties of the sea otter's fur which is responsible for keeping them warm. Therefore, when sea otters unintentionally wander into an oil spill, they become more susceptible to hypothermia as their fur encounters oil.

The changing environment is another threat to sea otters, especially with changes observed in kelp forests. Sea otters are a keystone species in kelp forests as they forage on kelp-grazing invertebrates, such as sea-urchins, keeping their population to a minimum and preventing the formation of urchin barrens. In return, kelp provides sea otters with cover from predators, habitat, and nurseries. As ocean warming persists and sea otter populations are threatened, the intensifying degradation of kelp forests is leaving sea otters out in the open ocean, stranded and helpless with no protection. In just the last 30 years, over 725 sea otters have been stranded. However, in areas with at least 10% kelp cover, virtually no strandings have been reported. This shows that there are hopeful solutions to restore sea otter populations including Seaforestation. By growing kelp to restore underwater forests, Seaforestation can help support ecosystems and save the sea otter population!

STUDENTS WILL BE ABLE TO

- Understand the connection between human actions and the degradation of a food web.
- Understand the importance of kelp forests to all living things.
- Understand the interconnectedness of ecosystem functioning and ocean health.

CRITICAL QUESTIONS

- What are the potential effects, negative or positive, of removing a species from an ecosystem?
- What are some ways we can protect critical ecosystem relationships?
- How does ocean health depend on ecosystem relationships?

RESOURCES

- Watch: The Importance of Kelp by the Hakai Institute
- Watch: Sea Otters: This Kelp Forest's Best Friend by National Geographic
- Read: What Are Keystone Species by the National Marine Sanctuary Foundation
- Read: Seaweed Days' Home Page
- View: Kelp Scones | Ocean Kitchen by Ocean Wise Seafood
- Read: Return of Sea Otters to B.C. Coast by CBC
- Read Indigenous People and Nature: A Tradition of Conservation by UNEP
- Watch: Cultural Significance of Oregon's Sea Otters by Elakha Alliance

ADDITIONAL RESOURCES

- Watch: Sea Otters vs Climate Change by One Earth
- Read: Seaforestation: Benefits to the Climate, the Ecosystems, and the People of British Columbia by Ocan Wise
- Watch: Ocean Wise Seaforestation Plant Kelp Fight Climate Change by Ocean Wise
- Watch: Learn About Seaforestation with Ocean Wise

ACTIVITIES

1. Watch ***The Importance of Kelp by the Hakai Institute*** and ***Sea Otters: This Kelp Forest's Best Friend by National Geographic***. Discuss as a class what may have happened to kelp forests when sea otter populations were decimated in the 1700's and how this may have contributed to climate change.
2. Watch ***Some Animals Are More Equal than Others: Keystone Species and Trophic Cascades by Bio Interactive*** and read ***What Are Keystone Species by the National Marine Sanctuary Foundation***.Have students create an informative and annotated food web that highlights the role of humans and keystone species in an ecosystem using the guiding questions below.

GUIDING QUESTIONS

- **What 'producer' did you include, and why?**
- **Is your keystone species a predator, ecosystem engineer, mutualist, plant or prey?**
- **After creating your food web, brainstorm the impacts of removing a distinct life form from this ecosystem. What would those impacts be?**
- **How would your habitat/ecosystem change? Would certain species increase or decrease and why?**
- **In your own words, identify what keystone species or trophic cascade was in your food web and explain how. Share your observations with the group.**

3. Ask students to create a business plan for a kelp product.

a) Review the business plan guide in the student workbook.

b) View: ***Seaweed Days' Home Page*** & ***Kelp Scones | Ocean Kitchen by Ocean Wise Seafood***.

c) After viewing the above resources, get students into small groups to brainstorm their dream kelp product by using the business plan guide. Encourage them to pull ideas from the resources. Ask students to present their business plan or dream product to class.

4. Have the class read: ***Return of Sea Otters to B.C. Coast by CBC***. Separate the class into two groups to debate the pros and cons of reintroducing a species to an area where it had previously been eliminated as a conservation technique. Each side should be assigned a pros and cons approach and should both consider perspectives from an Indigenous and non-Indigenous lens. You shall be the moderator of the debate.

THOUGHTBOOK

Now that you have a better understanding of how each species has a special role in an ecosystem, especially keystone species, you should also better understand the consequences if one of those species disappears. Reflect on the role of all species as it relates to the integrity of an ecosystem.

REFLECT

1. What are the potential effects, negative or positive, of removing a species from an ecosystem?
2. What are some ways we can protect critical ecosystem relationships?
3. How does ocean health depend on ecosystem relationships?

TAKE ACTION

Buy a sustainable kelp product!

THE WHY

Similar to your business ideas, there are many great products with kelp in them! Next time you go to the grocery store, take a look at the toothpaste, shampoo, salad dressings, dairy products, and/or frozen foods to see if they contain kelp. By buying sustainable kelp you are supporting and ensuring the planting of kelp. In other words, you are enabling greater carbon storage by kelp and better protection of sea otters and other ocean creatures which rely on kelp for a home! Kelp is also incredibly healthy and considered to be an excellent source of micronutrients, antioxidants, vitamins, and dietary fiber. So, buy a sustainable kelp product to make sure you and the ocean stays healthy!

APPENDIX

FOR LESSON 4

Garbage Clean Up Guidelines

When conducting a garbage clean up, the most important thing is your safety. Please read and follow the guidelines below when conducting a garbage cleanup to make sure that you and all participants are safe.

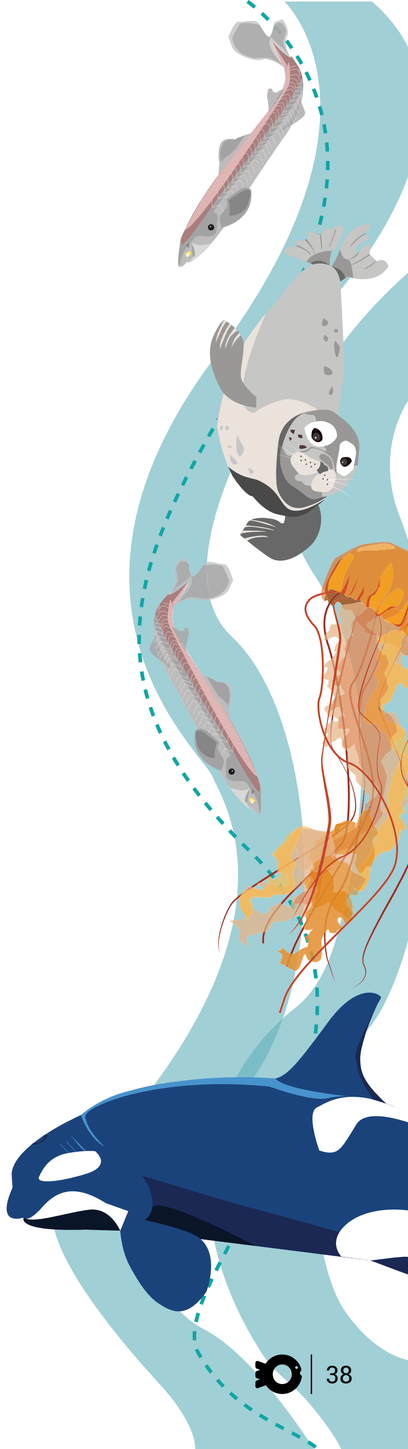
1. Survey your clean up site. You want to make sure that the area where you will be conducting your clean up does not pose any threat to students. Things to look out for; hidden ditches, high traffic areas, clifts, etc.

2. Gather supplies. You will need:

- Gloves - preferably reusable safety or garden gloves to avoid single use plastic gloves. You can encourage students to bring their own.
- Buckets or garbage bags - to place the garbage in.
- Sharps container - note that garbage such as broken glass, broken hard plastics, metal, etc should be placed in the sharps container and handled by the educator or host of the clean up. A sharp container can be a bucket or box which cannot be torn or pierced by a sharp object.
- Data cards - should be printed for each student. You can find a PDF version ***here***.
- Pickers (optional) - to pick up garbage. You can encourage students to bring their own.

3. Go to the clean up site and divide the class into small groups (3-4 students). Designate a rough area to each group where they will conduct their garbage cleanup. Make sure students record their findings in the data cards.

4. At the end of the garbage clean up, assist students with separating garbage (plastic recyclables, paper recyclables, cans, etc) so they can be disposed of properly.



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

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Have feedback? We would love to hear from you!

Please take 4 minutes to ***rate us***.

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