

MARINE PLASTIC UNIT: Middle School Level

Grade: 7/8	Marine Plastic Unit
Big Ideas:	<ul style="list-style-type: none"> • Science (Gr. 7) <ul style="list-style-type: none"> - Evolution by natural selection provides an explanation for the diversity and survival of living things. - Earth and its climate has changed over geological time. • Applied Design, Skills and Tech (Gr. 7 & 8) <ul style="list-style-type: none"> - Complex tasks require the acquisition of additional skills. - Design can be responsive to identified needs. • English Language Arts <ul style="list-style-type: none"> - Exploring and sharing multiple perspectives extends our thinking. (Gr. 7) - Questioning what we hear, read and view contributes to our ability to be educated and engaged citizens. (Gr. 7 & 8) • Arts Education <ul style="list-style-type: none"> - Engaging in the arts develops people’s ability to understand and express complex ideas. (Gr. 7) - Artists often challenge the status quo and open us to new perspectives and experiences. (Gr. 8)
Critical Questions:	<ul style="list-style-type: none"> • What is plastic? What are microplastics? • How does plastic end up in the ocean? • How does plastic impact the ocean? • How does plastic impact living things in the ocean? • Why should, and how can, we reduce the need for single use plastics? • What can we do to help the oceans?
Unit Rationale:	<ul style="list-style-type: none"> • Today’s students are the future caretakers of Earth. Knowledge about marine plastics will help them make informed decisions for the future. • Plastics are polluting our oceans at a fast rate. Plastic litter affects more than 660 marine species in our oceans. These plastics can damage or kill the marine life that interacts with them. There are alternatives to the use of plastics. We need to do our part to improve the environment for all living things in our ocean.
Students will use the following CORE COMPETENCIES:	<ul style="list-style-type: none"> • Communication • Creative Thinking • Critical Thinking • Social Responsibility

<p>Students will apply the following CURRICULAR COMPETENCIES:</p>	<p>Science (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Questioning and predicting; demonstrate curiosity, observe objects and events in similar contexts, ask questions, and make predictions. <i>eg. Plastic Decomposition Experiment</i> • Planning and conducting; control variables, perform tests, make and record observations, safely manipulate materials. <i>eg. Plastic Decomposition Experiment</i> • Processing and analyzing information; interpret local environment, represent data using different models, seek pattern and connections in data, and draw conclusions. <i>eg. Shoreline cleanup, Marine animals and plastics investigation</i> • Evaluating; reflect on quality of data and investigation methods, exercise healthy skepticism, consider implications of findings from their own and others' investigations. <i>eg. Shoreline cleanup, Debate, Plastic Decomposition Experiment</i> • Applying and innovating; transferring knowledge to real-life scenarios, contribute to care for self, others, community, and world through personal or collaborative approaches. <i>eg. Clean Seas Pledge, Body Scrub, T-shirt shopping bag</i> • Communicating; share ideas and findings, reflect on learning. <i>eg. Shoreline cleanup, Marine animals and plastics investigation, Debate</i> <p>Social Studies (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Use inquiry processes and skills to ask questions; gather, interpret, and analyze ideas; and communicate findings and decisions. <i>eg. Debate, Comic strip</i> • Demonstrate debating skills, including identifying, discussing, defining, and clarifying a problem, issue, or inquiry.. <i>eg. Debate</i> • Perspective: Explain different perspectives, compare values and worldviews of other societies. . <i>eg. TED Talk</i> <p>English Language Arts (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Comprehend and connect (reading, listening, viewing). <i>eg. All activities</i> • Create and communicate (writing, speaking, representing). <i>eg. All activities</i> <p>Arts Education (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Exploring and Creating – Demonstrate an understanding and appreciation of personal, social, cultural, historical and environmental context in relation to the arts. <i>eg. Vortex exhibit virtual visit</i> • Reasoning and Reflecting – Reflect on works of art to understand the artists motivations and meanings. <i>eg. Vortex exhibit virtual visit</i> • Communicating and Documenting – Describe, interpret and respond to works of art. <i>eg. Vortex exhibit virtual visit</i>
<p>Students will know the following CONTENT:</p>	<p>Science (Gr. 7)</p>

	<ul style="list-style-type: none"> • survival needs (all organisms need space, food, water, and access to resources) and natural selection of organisms. <i>eg. animals and plastics investigation, C3 Microplastics video</i> • chemical changes. <i>eg. What is Plastic? video</i> • compounds. <i>eg. What is Plastic? video</i> • climate change: change in climate affects: <ul style="list-style-type: none"> - the interconnectedness of plants and animals, and their local environment. <i>eg. C3 Microplastics video</i> - • impacts of humans: <ul style="list-style-type: none"> - humans are capable of changing Earth’s landscape, climate, and systems. <i>eg. Plastic Ocean video</i> - efficacy of sustainable practices. <i>eg. Litter-less lunch, Comic strip</i> <p>Applied Design, Skills and Technologies (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Entrepreneurship and Marketing: development of a product or service, including its features and benefits. <i>eg. Body Scrub, T-shirt shopping bag</i> <p>English Language Arts (Gr. 7 & 8)</p> <ul style="list-style-type: none"> • Metacognitive strategies for talking and thinking about learning (e.g., through reflecting, questioning, goal setting, self-evaluating) to develop awareness of self. <i>eg. Post video discussions</i> <p>Art Education (Gr. 8)</p> <ul style="list-style-type: none"> • Symbolism and metaphor to explore ideas and perspective. <i>eg. Vortex exhibit virtual visit</i>
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RESOURCE GUIDE LAYOUT

Page 1:	Cover Page; Marine Plastic: A Resource Guide for Teachers Leading Change
Page 2:	Table of Contents
Page 3-4:	Importance of the Ocean, facts on plastic, facts Canada’s coastline
Page 5:	Connections to Canada-wide curriculum
Pages 6-12:	Seven Lesson Plans for teachers – all aligned with the 7 Ocean Principles
Page 13:	Resource Page <ul style="list-style-type: none"> - Links to other ocean education- related organizations, initiatives and networks in Canada - Does your class have a story you would like to share? Send it here and share it with our news section! https://ocean.org/plastic-wise/

LESSON PLANS: #1-7

	Topic	Objectives	Activities and Duration	Resources	Assessment/ Criteria
1	<p>The ocean, and the life in the ocean shapes the earth ~</p> <p><i>Plastic is changing the ocean environment.</i></p>	<ul style="list-style-type: none"> Students will describe the chemical composition of plastic Students will describe, interpret and respond to an artist's interpretation of the plastic pollution problem in the oceans. 	<p>Critical Questions: What is Plastic? How does plastic impact the ocean? How has the ocean changed our environment? What happens when plastic is added to an environment?</p> <p>Background Information: The action of the ocean changes the shape of the land. It does this by the slow, continuous movement of seawater, erosion of land deposition of the ocean sediments across geological eras worked together to create the landscape. Sea level changes, wave and tidal action and tectonic activities also influence the many possible formations of the world's coastal areas, including the geological structure of hills and mountains. The same is true for the environments within the ocean, and the organisms that live in or near it. Most organisms have adapted to the slow changes throughout geological time, but rapid change diminishes an organism's ability to adapt.</p> <p>Vortex exhibit: Acclaimed west coast artist Douglas Coupland's Vortex is a new radical art installation at the Vancouver Aquarium. As you step into Vortex, take an imaginative journey to the Great Pacific Garbage Patch, and immerse yourself in the ocean plastic pollution crisis. Coupland's exhibit will make you think about plastic – a seductive yet sinister material – in a relevant, contemplative, and transformative way.</p> <p>Key Takeaway: Plastic changes the environment.</p> <p>Task: Examine and analyze items of plastic found on ocean beaches. Draw, or describe an item from the Vortex exhibit. Include a reflection on why that item stood out to you. Describe the symbolism of the four figures in the boat</p> <p>Action: <i>My ocean promise is to walk around my neighbourhood picking up garbage and disposing of it correctly..</i></p>	<p>Intro: The Majestic Plastic Bag: A Mockumentary</p> <p>What is Plastic - Brain Waves Episode 1</p> <p>Prior to viewing the Vortex exhibit, watch these videos about the making of the exhibit: Douglas Coupland's Vortex at the Vancouver Aquarium</p> <p>Email: onlinelearning@ocean.org To organize a virtual program Vancouver Aquarium Virtual Programs</p> <p>for classroom display: -Sea Change Ocean Literacy Poster -Giant Pacific Garbage Patch Poster from NOAA -Marine Debris poster (choose Marine Debris – How Long Till It's Gone)</p>	<p>Formative: Can student describe what plastic is? Can student describe the symbolism of the figures in boat in Vortex exhibit?</p> <p>Summative: Responses/Reflections Rubric</p>

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2	<p>The ocean made the earth habitable ~</p> <p><i>Marine life is affected by plastics everyday, whether mistaking for food, or becoming bound or entrapped by plastic.</i></p>	<ul style="list-style-type: none"> • Students will describe ways the ocean influences their life and they influence the ocean • Student will investigate and describe how plastics impede an animal's ability to meet basic survival needs 	<p>Critical Questions: How has the ocean made the earth habitable? How does plastic impact the ocean?</p> <p>Background Information: Scientists have theorized that life on Earth most likely originated in the sea. Therefore, the study of marine organisms can teach us about the history of life on earth. The ocean is not only where life is thought to originate but it has also generated much of the oxygen that is required by many of Earth's organisms. Phytoplankton living in the ocean's surface waters produce oxygen through photosynthesis. Some abandoned plastic such as fishing lines and nets will entangle animals; others are mistaking plastics for food.</p> <p>Key Takeaway: Oceans are essential for life as we know it on earth. When we impact the oceans we affect life on land as well.</p> <p>Task: Investigate marine animals that are known to have problems mistaking plastics for food. E.g. sea turtles, birds OR Investigate how plastics affect marine animals in other ways. Eg. Entanglement, entrapment, tangled in abandoned fishing nets</p> <p>Action: <i>My ocean promise is to go through my recycling bin at home, and identify the plastics that would be most harmful they found their way into the ocean. I will modify the plastic to be less hazardous (cut 6-pack rings, put lids on plastic bottles, etc).</i></p> <p><i>Find a local company that will recycle the plastic items not accepted in your municipal recycling program.</i></p>	<p>C3 video and Inquiry Guide: Oceans are Life (answer Q1, 2, 5, 6)</p> <p>People Free Sea Lion Entangled in Garbage</p>	<p>Formative: Have students present their findings in a small group, and/or to the whole class.</p> <p>Summative: Presentation Rubric</p>

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3	<p>The earth has one big ocean with many features ~</p> <p><i>Plastic litter knows no borders.</i></p>	<ul style="list-style-type: none"> Students will explain how plastic get into the ocean and why it is a problem. Students will determine if plastic is biodegradable. 	<p>Critical Questions: How does plastic end up in the ocean? Is plastic biodegradable?</p> <p>Background Information: The ocean is made up of five ocean bodies (Atlantic, Pacific, Arctic, Southern and Indian) but these are interconnected as one global ocean. The connections between them allow seawater, matter and organisms to move from one basin to another. This interconnection is powered by winds, tides, the force of the earth's rotation, the sun and density differences. This circulation system creates a moving conveyor belt of linked surface and deep-water currents. This global ocean conveyer belt moves water throughout the ocean basins, transporting heat and energy around the world and thus serving as a key ingredient in the planet's climate system. Water systems dominate planet earth since approximately 71% of the earth's surface is covered by water and about 96.5 of this water is contained in the global ocean. The remainder of the earth's water exists in atmospheric water vapor, rivers and lakes, ice, soil and many forms of life.</p> <p>Key Takeaway: Litter knows no borders. Wind, wave and currents move it. Pieces from British Columbia's coast take about six years to reach the Great Pacific Garbage patch, while those from Japan take about a year.</p> <p>Task: Decomposing Plastic Experiment OR Natural and Man-Made Fiber Decomposition Experiment</p> <p>Draw a comic strip for primary students that shows some plastic garbage and its travels from your school to the ocean.</p> <p>Action: <i>My ocean promise is to take a reusable bag with me when I go shopping.</i></p> <p><i>Make a cloth shopping bag using an old t-shirt</i> How to Make a No Sew Shopping Bag from a t-shirt</p>	<p>How Does Plastic End Up in the Ocean?</p> <p>For classroom display: Giant Pacific Garbage Patch Poster from NOAA -Marine Debris poster (choose Marine Debris – How Long Till It's Gone)</p> <p>-Decomposing Plastics Science Project</p> <p>-Natural and Man-Made Fibers Decomposition Experiment</p> <p>Clean Seas (UN) video: Turn the Tide on Plastic</p> <p>Take the Clean Seas pledge</p>	<p>Formative: -Can student explain how plastic gets to the ocean? -Can student explain if plastic is biodegradable? -Exit slip: 3-2-1 (from Sea Smart)</p> <p>Summative: Presentation Rubric for comic strip</p>

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4	<p>The ocean supports a great diversity of life and ecosystems ~</p> <p><i>Plastics are changing the ecosystems of marine life.</i></p>	<ul style="list-style-type: none"> Student will participate in a local activity to clean up litter. 	<p>Critical Questions: How does plastic impact living things in the ocean? What can we do to help the oceans?</p> <p>Background Information: Ocean ecosystems are numerous and diverse. They are defined by environmental factors and by the community of organisms living there. These factors include available oxygen and nutrients, salinity, temperature, pH, light, pressure, substrate and circulation. Marine biodiversity reefs to the variety of living organisms in the ocean. These include microbes, invertebrates, fishes, marine mammals, plants and birds. These are all interconnected with the environmental conditions in which they occur in their ecosystems. Plastics in the ocean affect marine animals in a variety of ways. By removing plastics and other litter from around and in waterways we can reduce this harm.</p> <p>Key Takeaway: Marine animals are being harmed by plastics in the ocean. We can help reduce this harm by keeping plastics out of waterways.</p> <p>Task: Great Canadian Shoreline Cleanup – organize a cleanup of a local area (stream, river, ocean) or the playground and neighbourhood around school (storm drains ultimately lead to the ocean!).</p> <p>Action: <i>My ocean promise is to participate in a local litter clean-up.</i></p>	<p>Saving Sea Lions: Why Marine Plastic Matters</p> <p>How to Host a Shoreline Cleanup</p> <p>Great Canadian Shoreline Cleanup</p>	<p>Formative: -Are students actively engaged in the cleanup? - Exit slip: 3-2-1 (<i>from Sea Smart</i>)</p> <p>Summative: Engagement in Activities Rubric</p>
5	<p>The ocean is a major influence on climate and weather ~</p>	<ul style="list-style-type: none"> Student can explain how plastic travels to the arctic ocean Student will illustrate how plastic can 	<p>Critical Questions: How does plastic impact the ocean? How would plastic change the climate and weather? How does this impact us?</p> <p>Background Information:</p>	<p>Thermocline Circulation map</p> <p>Clean Seas video</p>	<p>Formative: -Can student explain how plastic litter from your neighbourhood</p>

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	<p><i>Plastic in our ocean is impacting the climate and weather.</i></p>	<p>increase the temperature of water.</p>	<p>Ocean currents allow the ocean to absorb, store and transfer heat. . these abilities allow the ocean to have a major influence on climate. Most rain that falls on land originally evaporated from the ocean. As water evaporates from the ocean it transforms into water vapour that is incorporated into the atmosphere. Some of this water vapour rises and helps to form the clouds from which rain falls. Large accumulations of plastic can affect the temperature of the ocean and the ability of sunlight to penetrate into the ocean.</p> <p>Karmenu Vella, EU Commissioner for Environment, Maritime Affairs and Fisheries: “The oceans are very much the prime regulators of climate, they are absorbing 90 percent of the planet’s heat, they are absorbing 30 percent of the planet’s carbon dioxide, they are giving the planet some 50 percent of the oxygen that we need. So we are getting all these benefits from the oceans. “Unfortunately, what are we giving in return? We are giving the oceans a lot of plastic litter, we are giving the oceans lots of acidification, eutrophication, pollution, over-fishing. So the oceans are getting warmer, sea levels are getting higher, we are seeing all these climatic disasters around us, flooding, droughts and everything.”</p> <p>Key Takeaway: Plastic travels great distances from its source, so plastic pollution is a global concern. Everyone needs to do their part to reduce it.</p> <p>Task: Trace the potential path of plastic litter from a local source to the Arctic ocean. Conduct a crude simulation of plastic impacts on water temperature.</p> <p>Action: <i>My ocean promise is to bring reusable cutlery and containers for my lunch at least once a week.</i></p>	<p>Break Up PSA: It's not me, It's you</p> <p>How does your Plastic end up in the Arctic?</p> <p>Giant Pacific Garbage Patch Poster from NOAA</p>	<p>could end up in the Arctic ocean?</p> <p>Summative: Engagement in Activities Rubric</p>
6	<p>The ocean is largely unexplored ~</p>	<ul style="list-style-type: none"> Student can recognize that plastic impedes and animal’s ability to 	<p>Critical Questions: What are microplastics? Can plastic travel to unexplored part of the ocean? How? What can we do to help the oceans?</p>	<p>What are Microplastics - 60 Seconds</p>	<p>Formative: -Can student effectively share information from reading?</p>

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	<p><i>Microplastics are everywhere!</i></p>	<ul style="list-style-type: none"> meet basic survival needs. Student will understand the physical and chemical ways plastic changes over time. Students can identify sources of microplastics and potential alternatives to their use. 	<p>Background Information: Everyday lives are connected to the ocean depths. There are challenges and opportunities in this previously hidden realm, and yet, despite the size and importance of the ocean, less than ten percent of it has been explored. The global map of the ocean floor is less detailed than maps of Mars, the Moon or Venus! Microplastics are being found throughout the ocean, even in newly explored regions.</p> <p>Key Takeaway: Microplastics are everywhere! Large organisms in the depth of the ocean are being found with plastics in their stomachs.</p> <p>Task: Research microplastics in cosmetics using the jigsaw strategy. Where are they currently used and what are the alternatives? Read Executive Summary Plastic ingredients in Cosmetics 07 2014.pdf This article includes suggestions for cosmetic companies A Review on the Impacts of Microbeads Used in Cosmetics How To: Plastic Free Personal Hygiene Ocean Wise Aquablog How To: Plastic Free Personal Hygiene</p> <p>Action: <i>My ocean promise is to make a body scrub gift for a sibling or parent using natural materials.</i></p>	<p>C3 video and Inquiry Guide: C3 Microplastics</p> <p>What happens to microplastics in the ocean?</p> <p>Researching Microplastics at Washing Machine Lab - Field Notes - Ocean Wise</p> <p>Natural Body Scrub recipes : Easy Homemade Sugar Scrub</p> <p>Lemon and Thyme Salt Scrub</p>	<p>-Can student identify sources of microplastics and potential alternatives to their use? -Exit slip: 3-2-1 (from Sea Smart)</p> <p>Summative: Responses/Reflections Rubric Engagement in Activities Rubric</p>
7	<p>The ocean and humans are interconnected ~</p> <p><i>Education is key – we can become plastic wise and break our pattern to protect our ocean!</i></p>	<ul style="list-style-type: none"> Student will recognize the interconnection of oceans to other systems Student will know cultural significance of water in a local environment Student will understand the impact of plastics and the 	<p>Critical Questions: Why should, and how can, we reduce the need for single use plastics? What can we do to keep plastics out of the ocean?</p> <p>Background Information: People rely on the ocean for many resources, including food that feeds billions of people and animals a day. The ocean is a source of organism that provide new and potent medicines and products. The ocean supports the livelihood of more than three billion people, as well as national economies. Humankind health and wellbeing depends upon the services provided by ecosystems and their components: water, soil, nutrients and organisms. Therefore, ecosystems services are the processes by which the environment produces resources utilized by</p>	<p>Modern Science, Native Knowledge NCC</p> <p>UN Plastic Ocean</p> <p>6 Countries Tackling Plastic Pollution - Ocean Wise</p> <p>Plastic Bank:</p>	<p>Formative: -Can student recognize the interconnection of oceans to other systems? -Can student explain cultural significance of water in a local environment? -Does student understand the impact of plastics and the need to care for our oceans?</p>

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		<p>need to care for our oceans.</p>	<p>humans such as clean air, water, food and materials. Plastics are negatively impacting life in the oceans. Communities have starting making changes to improve the health of the oceans.</p> <p>Key Takeaway: Humans are intricately connected with the ocean and there are changes we can make now that will help reduce the plastic in our oceans. Be part of that change!</p> <p>Tasks: Debate the Topic: Be it resolved that stores in our community ban single use plastic shopping bags. Use Middle School Debate Format example and Middle School Public Debate Program OR Organize a Plastic Aware event for your school community.</p> <p>Action: <i>My ocean promise is to spread my knowledge about how we can improve our oceans!</i></p>	<p>The surprising solution to ocean plastic - TedTalk</p> <p>Ocean Optimism</p> <p>Homemade Cleaning Products</p>	<p>Summative: -Middle School Debate Program Rubric -Engagement in Activities Rubric</p>