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UNIT

Plastics: From Pollution to Solutions

Since the post-WWII industrial boom, our reliance on plastics--thanks in part to practical and innovative uses in healthcare and food security--now generates an estimated truckload worth of plastic in the oceans every minute. In what other ways did we arrive at this crisis, and how can we reverse it? In this unit, students learn about plastic pollution and become advocates for solutions.

GRADES

6 - 8

SUBJECTS

Arts and Music, Biology, Ecology, Health, Chemistry, Conservation, Earth Science, Climatology, Oceanography, Engineering, English Language Arts, Experiential Learning, Geography, Human Geography, Social Studies, Civics, Economics, Storytelling

CONTENTS

4 Lesson plans

For the complete unit with media resources, visit:

<http://www.nationalgeographic.org/unit/plastics-pollution-solutions/>

In collaboration with



UNIT OVERVIEW

Marine plastic pollution is one of the major ecological crises of the 21st century. Over five trillion pieces of plastic are estimated to float in the ocean, and that number increases every day. Plastics affect over 600 species of marine wildlife, including species that humans eat.

In the first half of this unit, students learn about this crisis and its ecosystem impacts. They witness wildlife affected by plastics, and conduct a classroom plastics audit. In teams, students create an *Ocean Plastics Movement Model* and *Food Web Infographic*, which form part of their final project, a *National Geographic*-style magazine to help readers take action against plastics.

In the second half of the unit, students learn about the growing global anti-plastics movement, and advocate for solutions of their own. They compare ideas proposed by activists and engineers and pick their favorite solutions. Finally, they choose a target audience for their magazine and propose a concrete action plan for their audience to combat plastic pollution.

Use this [unit at a glance](#) to explore a brief outline of the materials included in this resource.

Use this [pedagogical support](#) to inform your teaching of this project-based learning unit.

Unit Driving Question: *How can humans solve our plastic problem in the ocean?*

LESSON 1: PLASTICS, PLASTICS, EVERYWHERE | 7 HRS 5 MINS



Students learn basic background information about the plastics crisis, including what defines plastics, where plastic pollution comes from, and how it gets into the ocean. Working together as part of a publishing team, they synthesize a variety of multimedia resources to create their own Ocean Plastics Movement Model explaining the forces that affect plastics on a global scale. This lesson is part of the [Plastics: From Pollution to Solutions](#) unit.

LESSON 2: PLASTICS IN THE PLANKTON, PLASTICS ON YOUR PLATE | 4 HRS 10 MINS



Students investigate the impacts of plastics on marine organisms in different marine ecosystems. They construct a food web for an assigned ecosystem, using it to illustrate the principle of biomagnification visually. Students draw on evidence presented in this lesson and in the previous lesson, *Plastics, Plastics, Everywhere*, to justify an argument about whether plastic pollution affects humans as well. This lesson is part of the *Plastics: From Pollution to Solutions* unit.

LESSON 3: POLLUTION SOLUTIONS | 4 HRS 35 MINS



Students research and compare several proposed solutions to the ocean plastics crisis. Then, publishing teams create their own rubrics to evaluate competing solutions and choose a contest winner. Finally, each publishing team identifies a target audience and begins crafting their *Call to Action*. This lesson is part of the *Plastics: From Pollution to Solutions* unit.

LESSON 4: KNOWLEDGE + ACTION = POWER | 4 HRS 35 MINS



Publishing teams finalize their magazine's cover and a *Call to Action* aimed at their target audience. They provide constructive feedback to other teams using the *Final Project Checklist and Rubric*. Finally, teams share their completed magazines and reflect on their experiences in this unit. This lesson is part of the *Plastics: From Pollution to Solutions* unit.

BACKGROUND & VOCABULARY

Vocabulary

Term	Part of Speech	Definition
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Term	Part of Speech	Definition
activist	<i>noun</i>	person who strongly and actively supports an issue or point of view.
adhere	<i>verb</i>	to stick to or support.
apex predator	<i>noun</i>	species at the top of the food chain, with no predators of its own. Also called an alpha predator or top predator.
argument	<i>noun</i>	reason or set of reasons given with the aim of persuading others that an action or idea is right or wrong.
audience	<i>noun</i>	observers or listeners of an event or production.
ban	<i>verb</i>	to prohibit or not allow.
behavior	<i>noun</i>	standard of conduct.
benign	<i>adjective</i>	not harmful
bioaccumulation	<i>noun</i>	process by which chemicals are absorbed by an organism, either from exposure to a substance with the chemical or by consumption of food containing the chemical.
biodegradable	<i>adjective</i>	able to decompose naturally.
biodegradation	<i>noun</i>	process of a material being broken down by decomposing organisms into harmless particles.
biomagnification	<i>noun</i>	process in which the concentration of a substance increases as it passes up the food chain.
circular economy	<i>noun</i>	a system of production that extends the lifespan of consumer goods by maximizing reusing and recycling, and minimizing throwing things away.
community	<i>noun</i>	social group whose members share common heritage, interests, or culture.
compelling	<i>adjective</i>	forceful or persuasive.
compostable	<i>adjective</i>	capable of disintegrating and biodegrading in a compost pile or commercial composting facility.
concentrated	<i>adjective</i>	items gathered closely together in one place.
constraint	<i>noun</i>	limitation or obstacle.
constructive feedback	<i>noun</i>	tool to enhance the teaching and learning process; highlighting strengths and achievements as well as areas for improvement.
Coriolis effect	<i>noun</i>	the result of Earth's rotation on weather patterns and ocean currents. The Coriolis effect makes storms swirl clockwise in the Southern hemisphere and counterclockwise in the Northern Hemisphere.
crisis	<i>noun</i>	event or situation leading to dramatic change.

Term	Part of Speech	Definition
criteria	<i>plural noun</i>	set of standards or rules.
decompose	<i>verb</i>	to decay or break down.
decomposer	<i>noun</i>	organism that breaks down dead organic material; also sometimes referred to as detritivores
detrimental	<i>adjective</i>	harmful.
disperse	<i>verb</i>	to scatter or spread out widely.
economic	<i>adjective</i>	having to do with money.
ecosystem	<i>noun</i>	community and interactions of living and nonliving things in an area.
ecotoxicology	<i>noun</i>	study of substances that are harmful to the environment.
entanglement	<i>noun</i>	the state of being trapped or caught in something
entrenched	<i>adjective</i>	firmly established
extraction	<i>noun</i>	process by which natural resources are extracted and removed from the earth.
feasible	<i>adjective</i>	possible.
food web	<i>noun</i>	all related food chains in an ecosystem. Also called a food cycle.
fossil fuel	<i>noun</i>	coal, oil, or natural gas. Fossil fuels formed from the remains of ancient plants and animals.
hypothesis	<i>noun</i>	statement or suggestion that explains certain questions about certain facts. A hypothesis is tested to determine if it is accurate.
impact	<i>verb</i>	to influence or have an effect on something.
ingest	<i>verb</i>	to take material, such as food or medicine, into a body.
ingestion	<i>noun</i>	the act of eating or consuming.
macroplastics	<i>noun</i>	pieces of plastic larger than 5 mm in size.
marine debris	<i>noun</i>	garbage, refuse, or other objects that enter the coastal or ocean environment.
maximize	<i>verb</i>	to make as big as possible.
meditate	<i>verb</i>	to engage in deep thought, contemplation, or introspection.
microplastics	<i>noun</i>	piece of plastic between 0.3 and 5 millimeters in diameter.
molecular	<i>adjective</i>	having to do with the smallest physical unit of a substance.
obstacle	<i>noun</i>	something that slows or stops progress.
ocean gyre	<i>noun</i>	an area of ocean that slowly rotates in an enormous circle.
photodegradation	<i>noun</i>	process by which a substance is broken down by exposure to light.

Term	Part of Speech	Definition
pollutant	<i>noun</i>	chemical or other substance that harms a natural resource.
pollution	<i>noun</i>	introduction of harmful materials into the environment.
polymer	<i>noun</i>	compound of high molecular weight derived by the addition of many smaller molecules.
primary consumer	<i>noun</i>	organism that eats producers; herbivores.
primary producer	<i>noun</i>	organisms, such as plants and phytoplankton, that can produce their own food through photosynthesis or chemosynthesis; also called autotrophs.
producer	<i>noun</i>	organism on the food chain that can produce its own energy and nutrients. Also called an autotroph.
prototype	<i>noun</i>	early version or model.
publish	<i>verb</i>	to provide a written piece of work, such as a book or newspaper, for sale or distribution.
secondary consumer	<i>noun</i>	organism that eats meat.
socioscientific issue	<i>noun</i>	a problem that requires both scientific knowledge and evaluation of ethical concerns to solve.
supply chain	<i>noun</i>	processes involved in the production or manufacture of a good or service.
sustainability	<i>noun</i>	use of resources in such a manner that they will never be exhausted.
sustainable	<i>adjective</i>	able to be continued at the same rate for a long period of time.
synthetic	<i>adjective</i>	manufactured by people, not occurring naturally.
systematic	<i>adjective</i>	following an orderly method or plan.
tertiary consumer	<i>noun</i>	carnivore that mostly eats other carnivores.
toxin	<i>noun</i>	poisonous substance, usually one produced by a living organism.
trophic level	<i>noun</i>	one of three positions on the food chain: autotrophs (first), herbivores (second), and carnivores and omnivores (third).
ubiquitous	<i>adjective</i>	existing or seeming to exist everywhere.
versatile	<i>adjective</i>	able to adjust to different conditions.
waste	<i>noun</i>	material that has been used and thrown away.
waste disposal	<i>noun</i>	collection, transport, and destruction or storage of garbage and byproducts.

