Educator Guide

Contents

NATIONAL GEOGRAPHIC

ENCOUNTER

OCEAN ODYSSEY

Cover photo: Shutterstock

About National Geographic Encounter: Ocean Odyssey

National Geographic Encounter is a first-of-its-kind, truly immersive experience that opens with *Ocean Odyssey*. Using technology, students embark on a virtual underwater journey across the Pacific Ocean, exploring some of the ocean's greatest wonders and mightiest creatures. Created in a 60,000-square-foot space in Times Square, students can walk across an ocean floor and investigate a variety of ecosystems that come to life through groundbreaking technology. Video mapping, 8K photographic animation, mega-projection screens, sound, and interactive, real-time tracking bring students face-to-face with sea life—from great white sharks and humpback whales to Humboldt squids and sea lions.

At the completion of the transect, students resurface to learn more about the creatures and habitats they encountered. They engage further with more interactive technologies—such as holograms and touch screens—that highlight important ocean conservation and scientific research themes.

Visit *National Geographic Encounter* for more information on how your students can have the ultimate undersea experience without getting wet!

To the Teacher: Using the Educator Guide

This Educator's Guide provides resources to support students' engagement and learning as they interact with *National Geographic Encounter*. The guide includes optional pre- and post-experience discussion questions and activities that can be used individually to address specific topics, or together as a unit. The pre-experience resources are intended to motivate student engagement and facilitate construction of new understandings before and during the experience, while the post-experience resources facilitate the application of students' new learning. The guide also includes learning objectives, background vocabulary, common misconceptions, facilitator tips, additional resources for further investigation, and connections to national curriculum standards and principles.

BIOSPHOTO / Alamy Stock Photo

Introduction to Oceans

Oceans span 71 percent of Earth's surface, from the shallow shores of the Solomon Islands to the furthest depths of the Mariana Trench (~11,030 meters, ~36,200 feet). Differences in temperature, depth, and nutrient availability give rise to a variety of oceanic habitats, including coral reefs, kelp forests, and deep-sea habitats such as hydrothermal vents. Nearly 200,000 identified species call these habitats home, from enormous humpback whales to the tiniest bioluminescent plankton, with more species being discovered all the time. These species demonstrate a variety of adaptations to their niches, including camouflage, defense mechanisms, and tolerance to low light or oxygen.

Oceans not only nurture life underwater, but they are also instrumental to life on land. Oceans store solar radiation, which allows Earth to retain heat. Circulating ocean currents then distribute heat across the globe, which influences weather patterns, a key part of the water cycle. Oceans represent the largest carbon sink worldwide, and oceanic photosynthetic organisms are responsible for producing more than half of the oxygen we breathe.

Many nations' food security and economies are tied to the oceans, too. Oceans provide the primary source of protein for more than 3 billion people worldwide. Billions of people depend on the oceans for their livelihoods through tourism, fishing, transportation, and renewable wave, tidal, and wind energy.

Did You Know:
Coral bleaching occurs when corals become stressed and expel the symbiotic algae (zooxanthellae) living in their tissues. Since algae give corals their color and provide the majority of their food, bleached corals turn white and may die. The leading cause of coral bleaching is increased ocean temperature due to climate change.

Human activities on land and in the water impact ocean water quality and biodiversity. Sea levels are rising, ocean temperatures are warming, and the water is becoming more acidic due to increasing carbon dioxide concentrations. As a result of these changes, coral reefs are experiencing large-scale coral bleaching events. Compounding the matter, approximately 8 million tons of plastic is dumped into our oceans each year. These plastics break down over time, becoming microplastics, and may accumulate in large gyres of marine debris like the Great Pacific Garbage Patch. Marine debris can directly entangle and drown marine mammals, or be mistaken for food and ingested. Consuming plastics and microplastics can lead to death for some organisms such as turtles and albatrosses.

Did You Know:
While the term "garbage patch" might imply there is an island of visible trash floating in the ocean, most gyres of marine debris are almost entirely made of microplastics that may not be visible to the naked eye.

Degrading plastics can also release chemicals, such as bisphenol A (BPA), which can accumulate up the food chain through biomagnification, meaning that top predators accumulate the most chemicals.

Around the world, individuals, communities, and governments work every day to address the impacts of human activity on oceans, but successfully conserving our oceans will require everyone's help.

Grade Level

For use with Grades 6–8

Guiding Question

How can we work to conserve the water quality and biodiversity of our oceans?

Learning Objectives

The learning objectives are aligned with individual discussion questions and activities and can be achieved using one or more of the resources. Therefore, not all learning objectives may be met depending on which resources are selected for use. Student learning can be assessed using the end products of activities or the responses to the discussion questions.

- Learning Objective 1: Recognize the types and extent of impacts human activities have on the oceans.
- Learning Objective 2: Analyze the differences among ocean habitats and among marine organisms in order to identify niche adaptations.
- Learning Objective 3: Design and evaluate conservation plans to maximize positive outcomes while accounting for cost-efficiency and feasibility.
- Learning Objective 4: Develop an understanding of the many considerations conservation initiatives must take into account while addressing the issues facing oceans.

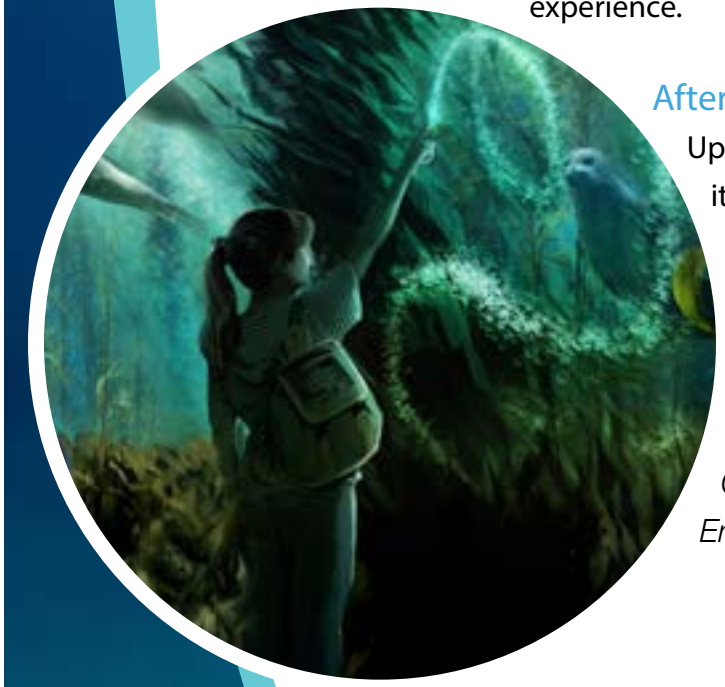
Role of the Facilitator

Before

Prior to engaging with the experience, facilitators should provide an introductory discussion that encourages students to share their existing conceptions and knowledge of oceans in order to build interest in the topic and identify any misconceptions to be addressed. A list of pre-experience discussion questions is included in this guide, which can be used to elicit background information related to biological oceanography, ocean resource use, and marine debris. After the introductory discussion, facilitators can choose to delve deeper into an ocean-related topic by engaging students in one of the pre-experience activities.

During

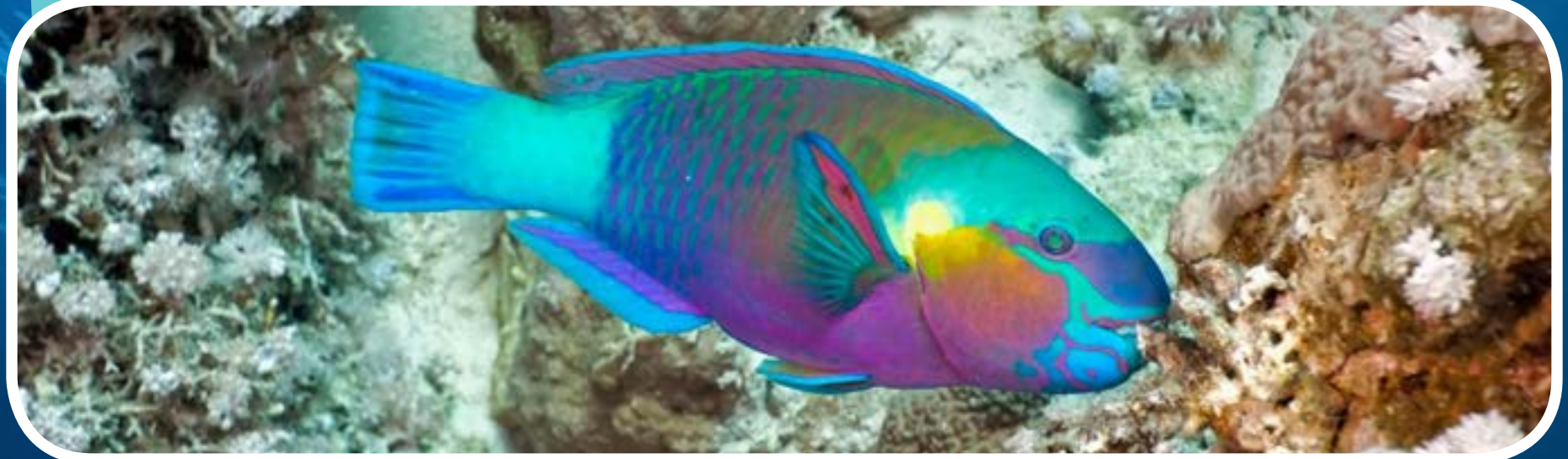
While journeying through *National Geographic Encounter: Ocean Odyssey*, facilitators should circulate among students to monitor engagement and learning. Asking students to describe unique features of the organisms or explain the behaviors and interactions between organisms can prompt students to connect previous discussions and activities with their current experiences. Facilitators can help students maximize their learning by encouraging them to fully engage with the interactive experience.



After

Upon return, facilitators should have students reflect on their personal journey through *National Geographic Encounter* in a short journal entry or as part of a class discussion. Facilitators can probe students' experiences to elicit any conflicts between preconceptions and what they learned or noticed, and then work to dispel existing misconceptions. A list of post-experience discussion questions and activities included in this guide can be used to help students place their new learning in the context of biological oceanography and to begin understanding their own impact on oceans. Once students are introduced to human impacts on oceans, facilitators can extend the learning further by challenging students to consider the consequences of human impacts and to propose relevant and feasible solutions.

Any of the discussion questions or activities can be tailored so as to be more personally or geographically relevant to students, or modified for older or younger students.



Before National Geographic Encounter: Ocean Odyssey

Discussion questions and activities are designed to motivate student engagement with *National Geographic Encounter*.

Discussion Questions

- Terrestrial ecosystems are made of many different habitats, such as desert and deciduous forest. What types of habitats exist in marine ecosystems? How are these habitats different from one another?
- Oceans stretch between continents and can reach depths of approximately 11,030 meters (~36,200 feet). What are some factors that might influence the distribution of species across and within the ocean?

- Many types of interactions can exist between terrestrial organisms in an ecosystem. How are these interactions similar to or different from the interactions between marine organisms in the ocean?
- Coastal and coral reef habitats provide cracks and crevices that small fish can use to hide from predators. What are some ways small fish living in the open ocean might protect themselves from predators (*bait balls*)? How are these behaviors similar to or different from terrestrial animals living in open habitats?
- Humans depend on resources provided by the environment in order to survive. What services do oceans provide for humans? Should humans place monetary value on these services? Why or why not?
- How are oceans impacted by human activity? Does the location of where you live on Earth influence the types of impacts you have on the ocean? For instance, does an individual living near the ocean in California have a different impact than a person living in Kansas? Why or why not?
- Non-biodegradable materials are accumulating in our oceans each day, which scientists refer to as marine debris. What items do you use or throw away that might accidentally end up in the ocean? What are some ways these items might reach the ocean?

Activities

- Have students analyze ocean habitats and animal adaptations to introduce the variety of habitats that exist within the ocean and the many adaptations animals have developed to survive within them. Students will explore three broad ocean habitats within the open ocean and along the ocean floor, then research the types of marine organisms living within each habitat and the adaptations that make them suited to live within the respective environments. In order to develop an understanding of the relationships between organisms, students can extend their

learning by proposing the types of relationships (*predator-prey, competition*) that may exist between animals.

- Have students investigate bioluminescence, an adaptation used by many organisms in coral reef habitats. Introduce this topic using a photo gallery of bioluminescent species. Have students predict how bioluminescence might benefit organisms living among coral reefs. Students then compare their predictions with the known uses of bioluminescence described in the encyclopedic entry and explain how these uses represent adaptations. Connect bioluminescence to the students' immediate environments by having them brainstorm local terrestrial or freshwater organisms that use colors to attract mates, lure prey, distract predators, or camouflage themselves. Then have students research the causes and effects of coral bleaching. In pairs or groups, have students select a bioluminescent coral reef organism (*moray eel, swell shark, warty frogfish, blackbelly dwarfgoby*) and determine how coral bleaching might impact it in the future. To extend learning, challenge students to consider how coral bleaching and the loss of bioluminescent reef organisms might impact the economy (*decreased ecotourism*).

Did You Know:
Bioluminescence is produced by a chemical reaction within living organisms, such as some species of fish, bacteria, and jellies. Though some corals may glow, they are not bioluminescent. Instead, these corals are fluorescent, meaning they absorb a stimulating light and re-emit it without the use of chemical reactions.

. Next, have students investigate biofluorescence, which is the emission of light by an organism or substance that has absorbed light or other electromagnetic radiation. Have them research what species are biofluorescent. Ask them, how might biofluorescence be an advantage or a disadvantage for a species? One organism that fluoresces is coral. Scientists, such as National Geographic

Emerging Explorer David Gruber, are still trying to determine exactly why corals fluoresce. Have students examine some of their theories and ask them to write their own hypothesis based on what they discovered or debate which idea makes the most sense to them.

- Have students explore the resources of the deep ocean and evaluate their usage by humans. Begin by reviewing the characteristics of the deep ocean. Based on these characteristics, have students predict the types of resources that exist in the deep ocean. Students will then read about resources in the deep sea and how this part of the ocean may be useful to humans in the future. Prompt students to discuss potential positive and negative outcomes to obtaining these resources and have them propose solutions that support ocean conservation.

Did You Know:
The combustion of fossil fuels such as oil and gas releases carbon dioxide into the atmosphere, contributing to climate change. Atmospheric carbon dioxide can dissolve into surface waters resulting in ocean acidification.

For an example of a conservation organization's campaign against offshore oil and gas drilling, visit: https://blueyork.org/.

This discussion can lead to a debate of the intrinsic and monetary value placed on deep ocean resources. To extend learning, highlight the connections between climate change, energy extraction, and carbon sequestration in the seabed. Students can then research the impacts climate change is having on ocean water quality.

- Have students investigate the perils of plastic within our oceans. Explain that marine debris can collect in ocean gyres, like the Great Pacific Garbage Patch, and have students predict what types of materials may become marine debris. Students will then categorize and quantify their recyclable trash for a week and use the information to revise their predictions of what may become marine debris. Students can compare the trash they have accumulated

to the information in the encyclopedic entry. Demonstrate that not all trash is easily visible by highlighting the presence of microplastics, which can enter the environment directly or when larger plastics degrade into smaller and smaller pieces. Have students calculate how much trash they produce in a month and year, and then discuss how some of this trash might end up in oceans. Use a map to trace routes from the local environment to the nearest ocean, noting that trash can also be moved by the wind.

Students can research how marine debris, especially microplastics, might harm wildlife. Then prompt students to consider how proximity to the ocean might increase one's impact, and have students debate who is responsible (*which individuals, communities, or governments*) for addressing the issue of marine debris.

Nature Picture Library / Alamy Stock Photo

Did You Know:
Not all marine debris floats at the surface of the ocean. Some debris can sink several meters below the surface, and scientists have discovered that about 70 percent sinks to the bottom of the ocean.

After National Geographic Encounter: Ocean Odyssey

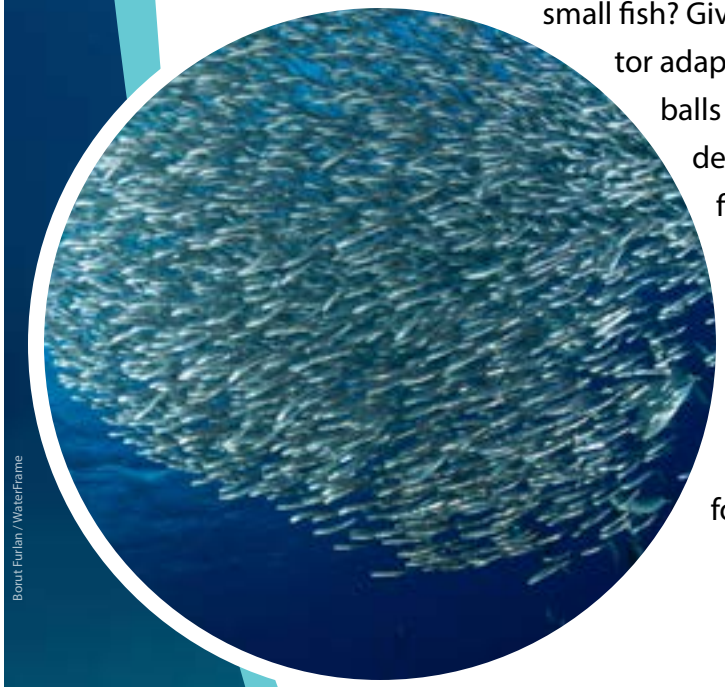
Discussion questions and activities to prompt student reflection and facilitate the application of student experiences from *National Geographic Encounter*.

Discussion questions

- How was the experience similar to or different from what you expected the ocean to be like? How did the experience relate to what you learned about beforehand?
- Marine organisms often have adaptations in the form of unique characteristics or differences in shape, size, and color. What characteristics or adaptations did you notice during the experience? How were

these adaptations a result of the species' niche within the ocean? How are other species adapted to their respective niches?

- Some small fish species, such as Pacific sardines, gather in a tight ball-like formation to defend against predators. These bait balls expose the fewest number of fish to potential predators. How did the predators in the experience attempt to overcome the bait ball in order to feed? How have other predators adapted to counter bait balls in order to still feed on the small fish? Given these predator adaptations, are bait balls a successful defense for small fish species? Why or why not?



Bonut Furlan / WaterFrame

- Pacific sardines act as a food source for many other marine organisms, while great white sharks are an apex predator. Is one species more important than the other to the health of the ecosystem? Why or why not?
- What types of interactions between marine organisms did you notice during the experience? What other interactions exist between marine organisms in the ocean? What implications do these interactions have for the conservation of individual species?
- How did the experience compare to your prior thoughts about the health and biodiversity of our oceans? As humans, are we responsible for conserving the health and biodiversity of our oceans? Why or why not? What might influence an individual's feelings of responsibility?
- Governmental boundaries between countries and international waters do not prevent water, organisms, or debris from moving throughout the ocean. This means that debris produced in one country may end up on the shores of another, or in shared waters. How should

countries divide responsibility for maintaining the health and biodiversity of our oceans? How should we account for differences in the level of development and wealth between countries when assigning responsibility?

- Conserving the health and biodiversity of our oceans will require participation from people all across the world. How can we inspire people to conserve our oceans? What inspires you to conserve our oceans?
- How can you have a positive impact on our oceans? Why is it important to have a positive impact on our local waterways, in addition to oceans?

Activities

- Have students design an undiscovered marine species. Begin by reviewing animal adaptations in the ocean and recalling the various adaptations of species from the experience. Have students research how many ocean species have already been identified by scientists (*nearly 200,000*) and how many species scientists estimate might actually live in the ocean (*~2 million*) but have yet to be discovered. Then challenge students to design and describe one of the undiscovered species. Encourage students to think critically about how the species is adapted to the ocean habitat of their choice and to predict how it would interact with other species in that habitat. Have students share their designs and explanations with other students.

  Share the student-designed marine species with @NatGeoEncounter using #OceanOdysseyUndiscovered.

  Make sure you have received permission prior to posting on social media.

- Have students elect the next marine animal to symbolically represent an organization focused on ocean conservation. Have students research various ocean conservation organizations (Oceana, Ocean Conservancy, Surfrider, WCS, Nature Conservancy, WWF, National Geographic)

to familiarize themselves with the different solutions for maintaining healthy oceans. As a class, recall the species of marine organisms they interacted with during the experience. Have students work in groups to select and research a marine species candidate for representative. Students will design a campaign platform that provides background information about the organism (*physical description and development, feeding habits, territory*) and explains why this species is an appropriate representative for an ocean conservation organization. Students will create a leaflet or poster for each candidate and then hold a public debate in which each species' candidacy is presented. A class vote will be held to determine the winner.

Nicole Duplaix

> Share the winning candidate's poster with @NatGeoEncounter using #OceanOdysseyConservation.
>
> Make sure you have received permission prior to posting on social media.

- Have students research Hudson Canyon and determine if it should be designated as a National Marine Sanctuary by NOAA. First, students will explore NOAA's website to determine the administration's purpose and describe the purpose of National Marine Sanctuaries. Students will then research Hudson Canyon to determine how it was discovered, identify the types of marine species present and how it is used by these species, and outline the possible resources existing in the canyon. Highlight scientists' prediction that the bottom of Hudson Canyon contains pollutants and marine debris that have drained into the canyon from surrounding waterways. Have students predict how

long into the future the marine debris currently entering our oceans may exist. Students will then assume the role of different stakeholders (*conservationists, fishermen, fossil fuel interests, community members*) and debate the advantages and disadvantages of designating the canyon as a sanctuary.

> For an example of a conservation organization's position on Hudson Canyon's designation, visit: https://blueyork.org/.

Finally, students decide whether or not Hudson Canyon should be designated a National Marine Sanctuary and write to NOAA with their determination and justification.

. Next, have students read more about the Pristine Seas Project led by National Geographic Explorer-in-Residence Enric Sala. Ask them to summarize the project and highlight the impacts the team has made so far in protecting the ocean. Direct them to the interactive globe featuring past and ongoing expeditions and areas they have succeeded in protecting and let them investigate each one. Ask them what are the common characteristics of the areas the team is trying to protect. Lead a class discussion on some of the challenges the team faces to getting an area protected (*stakeholder opposition, disconnected government officials and citizens, remote locations*).

- Have students design a solution that will prevent plastics from entering into oceans. Students recall the types and sizes of marine debris found in the ocean gyres and research the behavior of the Great Pacific Garbage Patch (where it moves and how fast). Have students brainstorm and discuss any considerations that should be taken into account while designing (*unintended harm to wildlife, cost-benefit analysis, disposal of collected debris*). Students will then work in groups to design a process or device that can efficiently prevent plastics from reaching the ocean without endangering marine organisms. Have students evaluate each other's solutions

by outlining the advantages and disadvantages, and then make an overall appraisal of the solution. Students can then research current and proposed solutions to compare solutions. To extend learning, have students debate who (*individuals, communities, governments*) should be responsible for producing, deploying, and maintaining these solutions.

> Share student-created solutions with @NatGeoEncounter using #OceanOdysseyRecycling.
>
> Make sure you have received permission prior to posting on social media.

- Have students propose a conservation plan to tackle one of the issues impacting oceans.

> For an example of a current conservation initiative, visit: https://www.billionoyster-project.org/.

Students can begin by researching organizations focused on ocean conservation (Oceana, Ocean Conservancy, Surfrider, WCS, Nature Conservancy, WWF, National Geographic) to better understand the issues and possible solutions. The facilitator will explain that many conservation organizations often have a limited amount of money, which means that they must choose what to prioritize (*habitat restoration, restocking fish populations, reducing pollution, cleaning up marine debris, developing marine conservation zone*). In groups, challenge students to evaluate the different issues facing oceans and reach a consensus on how to prioritize spending of the organization's $1 million budget.

> For an example of specific conservation strategies, visit: https://www.wcs.org/our-work/regions/new-york-seascape.

Students will evaluate the budgetary decisions of other groups during presentations. Connect this activity to students' immediate environment by having them determine if their conservation

priorities are relevant to the nearest bodies of water. To promote critical thinking, students can produce a budget breakdown accounting for all of the expected costs related to the conservation initiative.

- Have students brainstorm a message of marine conservation that should be shared with other people. Is it the importance of keeping our oceans clean? Is it saving endangered marine species? Whatever it is, how can your students inspire others to take action in marine conservation? National Geographic Emerging Explorer Asher Jay shares her message of ocean conservation through her Message in a Bottle project. Have your students create their own message in a bottle that speaks to the ocean conservation message they want to relay to others. Have students decore a recycled plastic bottle to illustrate their marine conservation message.

Rosemary Calvert

For more information on Message in a Bottle and examples of Asher's work visit: http://www.seaspeaksphere.com/ripples-of-reform/message-in-a-bottle/.

Share pictures of student's completed message in a bottle with @NatGeoEncounter using #CleanOceanOdyssey.

Make sure you have received permission prior to posting on social media.

Appendix

Vocabulary

biodiversity - all the different kinds of living organisms within a given area

biofluorescence - emission of light by an organism or substance that has absorbed light or other electromagnetic radiation

biological oceanography - study of the life histories and population dynamics of marine organisms, and how they interact with their environment

bioluminescence - light emitted by living things through chemical reactions in their bodies

carbon sequestration - process of capturing carbon emissions and storing them underground

conservation - management of a natural resource to prevent exploitation, destruction, or neglect

coral bleaching - loss of symbiotic algae (zooxanthellae) in corals, leading to a loss of pigmentation

Great Pacific Garbage Patch - area of the North Pacific Ocean where currents have trapped huge amounts of debris, mostly plastics

marine conservation zone - area of the ocean set aside for protection of aquatic ecosystems

marine debris - garbage, refuse, or other objects that enter the coastal or ocean environment

marine ecosystem - community of living and nonliving things in the ocean

marine sanctuary - part of the ocean protected by the government to preserve its natural and cultural features while allowing people to use and enjoy it in a sustainable way

microplastic - piece of plastic between 0.3 and 5 millimeters in diameter

National Oceanic and Atmospheric Administration (NOAA) - U.S. Department of Commerce agency whose mission is to "understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and

manage coastal and marine ecosystems and resources"

ocean gyre - an area of ocean that slowly rotates in an enormous circle

Pacific Ocean - one of Earth's four oceans, bordered by North America, South America, Australia, Asia, and Antarctica

sustainability - use of resources in such a manner that they will never be exhausted

water pollution - introduction of harmful materials into a body of water

Connections to National Standards and Principles

NGSS Science Standards

- MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

NGSS Disciplinary Core Ideas

- LS2.C: Ecosystem Dynamics, Functioning, and Resilience. Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)
- ESS3.A: Natural Resources. Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

Relevant NGSS Science and Engineering Practices

- Asking questions (for science) and defining problems (for engineering)
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Common Core Standards

- CCSS.ELA-LITERACY.RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

C3 Framework

- D2.Civ.1.6-8. Distinguish the powers and responsibilities of citizens, political parties, interest groups, and the media in a variety of governmental and nongovernmental contexts.
- D2.Geo.4.6-8. Explain how cultural patterns and economic decisions influence environments and the daily lives of people in both nearby and distant places.
- D2.Geo.9.6-8. Evaluate the influences of long-term human-induced environmental change on spatial patterns of conflict and cooperation.

National Geographic Standards

- Standard 14: How human actions modify the physical environment
  - The physical environment can both accommodate and be endangered by human activities
- Standard 16: The changes that occur in the meaning, use, distribution, and importance of resources
  - People can have different viewpoints regarding the meaning and use of resources
  - Humans can manage resources to sustain or prolong their use

New York State P–12 Science Learning Standards

- MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and protecting ecosystem stability.
    - LS4.D: Biodiversity and Humans - Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling (MS-LS2-5).
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
    - ESS3.C: Human Impacts on Earth Systems - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things (MS-ESS3-3).

For Further Exploration

Billion Oyster Project
https://www.billionoysterproject.org/

Blue York: A WCS Campaign
https://blueyork.org/

National Geographic Education: Great Pacific Garbage Patch – Encyclopedic Entry
https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/

National Geographic Education: Biomagnification – Picture of Practice Video
https://www.nationalgeographic.org/media/biomagnification/

National Geographic Magazine Infographic - The Gulf of Mexico: Layers of Life
https://www.nationalgeographic.org/hires/gulf-mexico-layers-life/

Nature Conservancy: Protecting Oceans and Coasts
https://www.nature.org/ourinitiatives/habitats/oceanscoasts/index.htm

Nature Conservancy of New York: Oceans and Coasts
https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newyork/oceans-coasts/

New York Seascape: A WCS Program
https://www.wcs.org/our-work/regions/new-york-seascape

NOAA: Hudson Canyon Cruise 2002
http://oceanexplorer.noaa.gov/explorations/02hudson/logs/sep08/sep08.html

NOAA: Hudson Canyon National Marine Sanctuary Nomination
http://www.nominate.noaa.gov/nominations/hudson-canyon.pdf

NOAA Fisheries: Marine Mammals
http://www.nmfs.noaa.gov/pr/species/mammals/

Ocean Conservancy
https://oceanconservancy.org/trash-free-seas/

Oceana
http://oceana.org/

Pacific Ocean Conservation
http://www.pewtrusts.org/en/projects/pacific-ocean-conservation

Pristine Seas
https://www.nationalgeographic.org/projects/pristine-seas/

Pristine Seas: Marine Invasive Species
http://ocean.nationalgeographic.com/ocean/explore/pristine-seas/critical-issues-marine-invasive-species/

Pristine Seas: Marine Pollution
http://ocean.nationalgeographic.com/ocean/explore/pristine-seas/critical-issues-marine-pollution/

Pristine Seas: Ocean Acidification
http://ocean.nationalgeographic.com/ocean/explore/pristine-seas/critical-issues-ocean-acidification/

Pristine Seas: Overfishing
http://ocean.nationalgeographic.com/ocean/explore/pristine-seas/critical-issues-overfishing/

Pristine Seas: Sea Temperature Rise
http://ocean.nationalgeographic.com/ocean/explore/pristine-seas/critical-issues-sea-temperature-rise/

Surfrider Foundation
https://www.surfrider.org/

Wildlife Conservation Society: Oceans
https://www.wcs.org/get-involved/oceans

WWF: Oceans
https://www.worldwildlife.org/initiatives/oceans

Credits

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