

Oceans for Life Lesson Plan

Biodiversity

OVERVIEW

In this lesson, students will explore the biodiversity of two National Oceanic and Atmospheric Administration (NOAA) national marine sanctuaries. Following a discussion of the term "biodiversity" and why biodiversity is important, students will take virtual trips (via video footage) to Cordell Bank National Marine Sanctuary, located off the California coast, and the Hawaiian Islands Humpback Whale National Marine Sanctuary. They will then work in groups to further explore one of the two ocean treasures, noting the types of wildlife the sanctuary supports, the importance of the ecosystem, and the threats it faces. Groups will also consider how each sanctuary's location might affect its health and long-term outlook. To conclude, the class will come back together to share their findings, and compare and contrast the two national marine sanctuaries.

This lesson is one in a series exploring the history, biology, and ecology of the [National Marine Sanctuaries](#). It was developed for National Geographic's [Oceans for Life](#) program, in collaboration with and with support from the [National Oceanic and Atmospheric Administration](#).

FOCUS

Biodiversity

FOCUS QUESTIONS

- What is biodiversity and why is it important?
- How does the location of a sanctuary affect its long-term outlook?

LEARNING OBJECTIVES

Students will:

- define biodiversity and ecosystem;
- understand the importance of biodiversity to an ecosystem;
- explore the threats to Cordell Bank and the Hawaiian Islands Humpback Whale national marine sanctuaries; and
- consider the relationship between the location of each sanctuary and the long-term outlook for its health.

GRADE LEVEL

6-8

MATERIALS

- Computer with internet access (Note: all information can be pre-downloaded and printed)
- Blank index cards
- Small magnets or tape for attaching cards to the blackboard
- Xpeditions* atlas maps of [California](#) and [Hawaii](#)

AUDIO VISUAL MATERIALS

- [Biodiversity Video](#)

TEACHING TIME

Three to four hours

SEATING ARRANGEMENT

Whole-class instruction and small group activities

MAXIMUM NUMBER OF STUDENTS

No limit



KEY WORDS

Biodiversity, Cordell Bank National Marine Sanctuary, Hawaiian Islands Humpback Whale National Marine Sanctuary, Marine Conservation, Ecosystem, Populations

PREPARATION

- Download and prepare video clips
- Print *Xpeditions* maps

LEARNING PROCEDURE

Opening:

Explain to students that in this lesson, they will be answering the following questions:

- What is biodiversity?
- Why is biodiversity important?
- How does the location of a sanctuary affect its long-term outlook?

As a class, create working definitions for the words *ecosystem* and *biodiversity*. Brainstorm a list of the organisms found in your local ecosystem and write the list on the board. Discuss with the class the importance of biodiversity. Elicit their opinions on why biodiversity is important and in what ways preserving biodiversity enhances the life of local people. Ask students to think of any ways in which preserving biodiversity locally might have a national or global effect. Encourage them to think about the far-reaching effects of habitat destruction and species loss. Some resources to help with this discussion include:

[Loss of Diversity and Extinctions](#)
[Environmental Tourism at the Global Level](#)
[New Medicines at Risk from Biodiversity Loss](#)

Development:

As a class, locate Cordell Bank and Hawaiian Islands Humpback Whale national marine sanctuaries on the maps. Explain that both sanctuaries were established to protect and support marine ecosystems. Have pairs of

students brainstorm a list of characteristics of marine ecosystems. After five minutes, have student pairs share their answers with the class and record the list on the board or on chart paper. Show students the introductory [video clip](#).

Divide the class into research teams of four or five. Assign half of the teams to research [Cordell Bank National Marine Sanctuary](#) and the other half to research [Hawaiian Islands Humpback Whale National Marine Sanctuary](#). Teams may also use the [Encyclopedia of the Sanctuaries](#) for their research. Tell students to focus on the following:

- Location of the sanctuary (have them mark it on the map)
- Characteristics of the ecosystem the sanctuary supports (water temperature, physical geography, etc.)
- Wildlife present in the sanctuary
- Importance of the ecosystem in general or any particular species found in the sanctuary
- Proximity and culture of human settlements near the sanctuary
- Challenges facing the sanctuary, and whether or not they are human-induced

Give each team about 20 index cards. As they research the above points, teams should use index cards to describe the oceanographic, meteorological, and physical features of the sanctuary. They should also create a card for each species found in the sanctuary, writing its name on the front and any other pertinent information about it (is it endangered? what threats does it face? is it unique to this area? what is its food source?) on the back. (These cards will be used later in a whole class activity.) Give groups about 45 minutes to an hour to complete their research. When teams have completed their research, bring the class back together and show the [video interviews](#) with sanctuary managers. Then invite teams to



share their information. Have teams present their findings first for one sanctuary then the other. Instruct the students to take notes on the findings of each team.

After each team has presented their findings, draw a large Venn diagram on the board.

Using one circle to represent Cordell Bank National Marine Sanctuary and one to represent the Hawaiian Islands Humpback Whale National Marine Sanctuary, have the students place their cards on the diagram using magnets or tape. When all the cards have been placed, lead a class discussion about the results. Ask students:

- Which aspects of the physical environment are the same in both sanctuaries? Which are different?
- How many species are found in both sanctuaries?
- Are there more species that are unique to one or the other sanctuary, or can many be found in both? Why do you think this is?
- Which species can be found in both sanctuaries? Do they use the sanctuaries for different purposes (breeding, feeding, etc.)? What does this imply about the importance of the sanctuaries?

Direct students to go back to their teams and return their species cards to them. Tell them they will now be investigating food webs. (A review of food webs can be found [here](#).) Using their species cards, each team should create a basic food web for their sanctuary. Have each team use half of the board to arrange their cards and use arrows to show which animals eat and are eaten by others. When the food webs are complete, have students return to their seats. Ask students to consider the effects of changes to the environment or one or more species in each food web. For example, ask "What would happen if there were a sudden dying of phytoplankton in the Cordell Bank sanctuary?"

Students should note that as primary producers, phytoplankton support the entire food web and the effects would be felt throughout. Help guide students in reflecting on the effects on the various levels of the food web of different changes.

Closing:

Explain that Hawai'i is the most important breeding ground for North Pacific humpbacks, and people and humpbacks are increasing their shared use of the same marine habitats. Ask students how this shared use might pose a threat to the Hawaiian Islands Humpback Whale National Marine Sanctuary's ecosystem. Another population of humpback whales, along with blue whales, visits Cordell Bank in the summer to feed on krill. How might changes in the ecosystem at Cordell Bank affect the whale population? Have groups of students explore some of the threats to these ecosystems (tourism, overfishing, destruction of habitat) and report back to the class.

SUGGESTED STUDENT ASSESSMENT

Have students write essays that provide information about one of the two sanctuaries, focusing specifically on the challenges faced by the sanctuary and the outlook for the future health of the ecosystem. Teachers or students may use this [rubric](#) for evaluation purposes.

EXTENDING THE LESSON

- Have students research a local conservation area and prepare posters detailing the area's biodiversity, threats to its health, and importance of preservation.
- Have students use the [Hotspots Explorer](#) from Conservation International to explore biodiversity hotspots around the globe. Ask students to select three hotspots that they think are most worthy of preservation. Students should be prepared to provide convincing arguments for their choices.
- Research other national marine sanctuaries to compare and contrast their physical



environments and the variety of species found in each underwater treasure.

RELATED LINKS

- [Biodiversity Hotspots](#)
- [Food Chains and Webs](#)
- [Loss of Diversity and Extinctions](#)
- [NOAA Cordell Bank National Marine Sanctuary](#)
- [NOAA Encyclopedia of the Sanctuaries](#)
- [NOAA Hawaiian Islands Humpback Whale National Marine Sanctuary](#)
- [NOAA National Marine Sanctuaries](#)
- [National Geographic News: Conservationists Name Nine New "Biodiversity Hotspots"](#)
- [National Geographic: EdNet—Oceans for Life](#)
- [National Geographic: Xpeditions Atlas](#)
- [National Geographic: Xpeditions—Preserving Biodiversity](#)

CONNECTIONS TO OTHER SUBJECTS

Geography, ecology, biology, social studies

NATIONAL SCIENCE EDUCATION STANDARDS

- C: Populations and Ecosystems: "A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem."
- C: Population and Ecosystems: "The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem."

NATIONAL GEOGRAPHY STANDARDS

- Standard 8: "The characteristics and spatial distribution of ecosystems on Earth's surface"
- Standard 6: "How culture and experience influence people's perceptions of places and regions"
- Standard 14: "How human actions modify the physical environment"

[Ocean Literacy: Essential Principles and Fundamental Concepts](#) (PDF, [Adobe Reader](#) required)

- Principle 5: The ocean supports a great diversity of life and ecosystems
- Principle 6: The ocean and humans are inextricably linked

FOR MORE INFORMATION

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