

Exploring National Marine Sanctuaries

Grade Level

5–8 or higher

Timeframe

Two to three 45-minute class periods

Materials

- Computer and data projector
- Student handouts
- Student access to the internet and/or print sources for research

Key Words

Conservation, ecosystem, environmental stewardship, geology, habitat, Marine Protected Area, national marine sanctuary, resources, species

Standards

NGSS: MS-LS2-4.

CCSS: W.6.10. SL.6.4.

L.7.3a.

Ocean Literacy Principles:

1, 5.

Climate Literacy Principles:

3.

Details at end of lesson



Map showing national marine sanctuaries (circle icons), marine national monuments (triangle icons) and proposed national marine sanctuaries (yellow squares); see a larger version at <https://sanctuaries.noaa.gov>. Map: NOAA

Activity Summary

Students learn about the National Marine Sanctuary System by researching their habitats, species, physical features and cultural importance. They share their discoveries with the class in short presentations with visual aids, such as a map of the sanctuary they create. Students will understand there is a tremendous diversity of ocean environments and life forms. They will realize features on the ocean floor are highly varied and discuss the importance of protecting special ocean areas.

Learning Objectives

Students will be able to:

- Synthesize information from multiple sources to create a presentation on a national marine sanctuary or marine national monument.
- Describe various habitats and identify organisms living in and protected by the National Marine Sanctuary System.
- List physical characteristics that define national marine sanctuaries and marine national monuments.
- Match clues about national marine sanctuaries with name/photo cards of them.
- Describe human interactions with the ocean and explain the importance of protecting marine areas.

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&



**National
Marine Sanctuary
Foundation**

Background Information

National marine sanctuaries and marine national monuments are a network of underwater areas in the ocean and Great Lakes that protect America's most iconic natural and cultural marine resources. The National Marine Sanctuary System seeks to preserve the scenic beauty, biodiversity, historical connections and economic productivity of our most precious underwater treasures. Sanctuaries and monuments harbor a variety of habitats, such as coral reefs and kelp forests, and an abundance of life, including endangered species. Historical and cultural resources, from shipwrecks and lighthouses to archaeological sites and the cultural history of Indigenous communities, are also protected.

An Astounding Variety of Ocean Features

The ocean floor and topography within sanctuary boundaries reveal fascinating geologic features. Seamounts, such as Davidson Seamount in Monterey Bay National Marine Sanctuary, are found in West Coast sanctuaries. At Flower Garden Banks National Marine Sanctuary salt domes make up the underwater geology. As their names indicate, Cordell Bank and Stellwagen Bank national marine sanctuaries are characterized by large rock ledges. Coral atolls abound in Papahānaumokuākea Marine National Monument.



Sealife abounds on the pristine reefs in Papahānaumokuākea Marine National Monument. Photo: Kaleomanuiwa Wong

The varied features provide habitats that support diverse ecosystems. These include chemosynthetic communities, coral and sponge “gardens,” kelp forests and seagrass beds.

Foci of Scientific & Historical Research

Some sites, such as Monitor National Marine Sanctuary and Wisconsin Shipwreck Coast National Marine Sanctuary, focus on protecting historically significant shipwrecks. Beyond their archaeological interest, sunken ships can enhance wildlife habitat. Mallows Bay-Potomac River National Marine Sanctuary protects and interprets the remnants of more than 100 World War I-era wooden steamships, known as the “Ghost Fleet.” Today they support biodiverse communities of plants and animals that can be explored by kayak.

The sanctuary system conducts and supports research and monitoring programs tailored to the needs of each sanctuary. These programs research a wide array of topics including natural and human influences on water, habitat, living resources and maritime archaeological resources. Sanctuaries serve as natural classrooms and laboratories for school children and researchers alike to promote understanding and stewardship of our global ocean and Great Lakes.



A research buoy at National Marine Sanctuary of American Samoa tracks data about our changing ocean. Photo: Nerelle Que/NOAA

Diverse Partners & Stakeholders

The sanctuary system works with diverse partners and stakeholders to promote responsible, sustainable ocean uses that ensure the health of our most valued ocean places. A healthy ocean is the basis for thriving recreation, tourism and commercial activities that drive coastal economies. From restaurants and hotels, to aquariums and kayak operators, the success of many businesses, millions of dollars in sales and thousands of jobs, directly depend on thriving national marine sanctuaries. Some sanctuaries have “multiple use” designation, which allows some extractive activities (e.g., fishing, kelp harvesting) within the site. Often those places or times are strictly managed in order to reduce user conflicts and adverse impacts. In contrast, “no take” areas are highly protected, and removing or destroying natural or cultural resources is prohibited.

Expanding Marine Protected Areas

National marine sanctuaries are just one type of “marine protected area” (MPA), which is a broad term that encompasses a variety of conservation and management methods in the U.S. and around the world. Marine protected areas may be called different names and be governed by different rules in other countries.

The Pristine Seas project, launched in 2008 by National Geographic Explorer Enric Sala, explores and protects vital places in the ocean. Since the project began, it has conducted 36 scientific expeditions and worked with world leaders to inspire the creation of 25 marine reserves that collectively protect more than 6.5 million square kilometers of ocean

(approximately 2.5 million square miles). By acting as responsible stewards of these special places, we strengthen our nation and world, now and for future generations.



A screenshot of Palau fishermen in a Pristine Seas video (see link below). Photo: National Geographic Society

Learn more:

“National Marine Sanctuaries.” NOAA:
<https://sanctuaries.noaa.gov>

“Pristine Seas.” National Geographic Society:
<https://www.nationalgeographic.org/projects/pristine-seas>

“Protecting Marine Ecosystems.” National Geographic Society:
<https://education.nationalgeographic.org/resource/protecting-marine-ecosystems>

“Bringing the Ocean Back: An Introduction to Ocean Conservation.” National Geographic Society:
<https://education.nationalgeographic.org/resource/bringing-the-ocean-back>

Vocabulary	
Conservation	Careful preservation and protection of ecological processes and biodiversity of the environment
Consumer	An individual that eats other organisms to obtain energy, rather than producing its food through photosynthesis or chemosynthesis
Ecosystem	The biotic (living) community and its abiotic (non-living) environment
Environmental stewardship	The responsible use and protection of the natural environment through conservation and sustainable practices to promote ecosystem health and human well-being
Marine protected area (MPA)	A clearly defined geographical space, recognized and managed, through legal or other effective means, for long-term conservation of nature with associated ecosystem services and cultural values
Marine reserve	A marine protected area in which removing or destroying natural or cultural resources is prohibited
National marine sanctuary	Protected waters that include habitats such as rocky reefs, kelp forests, deep-sea canyons and underwater archaeological sites
Producer	An organism that creates food from sunlight (through photosynthesis) or certain chemicals (through chemosynthesis); the first level in any food web

Preparation

- Prepare to project a map of national marine sanctuaries from <https://sanctuaries.noaa.gov>.
- Print and cut sets of “Where Am I?” cards listed with the lesson for each group of 2–4 students.
- Print copies of the “Exploring National Marine Sanctuaries” handout, one per student.
- Print copies of the “National Marine Sanctuary Presentation” rubric found at the end of the lesson for each student or group of 2–4 students.
- Familiarize yourself with ArcGIS Online software so you can coach students with creating a map of their national marine sanctuary or monument: <https://www.arcgis.com/apps/mapviewer/index.html>.
 - Learn how to make polygon shapes and other sketch layers: <https://doc.arcgis.com/en/arcgis-online/create-maps/create-sketch-layers-mv.htm>.
 - ArcGIS Online accounts are not required. However, more features are available, including the ability to save maps and search more layers, if you have a free ArcGIS for Schools Bundle. You can request one at <https://www.esri.com/en-us/industries/k-12-education/schools-software/request>.
- *Optional:* Print paper maps of the sanctuaries for students to help them create their own paper or software-generated maps: <https://sanctuaries.noaa.gov/about/maps.html>.
- *Optional:* Gather colored pencils for students to share if they will be creating paper maps.

Procedure

Engage

- Visit <https://sanctuaries.noaa.gov> and project the map that shows the locations of national marine sanctuaries and marine national monuments.
 - Ask students if they recognize any of the places highlighted on the map. If any of the students have been to any of the locations, ask them to describe what they are like.
 - Ask students what they think national marine sanctuaries and marine national monuments are and why they might be important. Ask them to turn to a neighbor and discuss their ideas in a think-pair-share.
- After a minute or two, discuss their ideas briefly as a class. Clarify that sanctuaries are a network of special underwater areas (like national parks, but underwater) encompassing more than 620,000 square miles of ocean and Great Lakes waters. Sanctuaries are found in the Atlantic and Pacific ocean basins, from Washington state to the Florida Keys, and from Lake Huron to American Samoa.
- Share with students that they will be uncovering some of the ocean’s mysteries by exploring the National Marine Sanctuary System. Tell them that they will find out more about the characteristics of these environments and why they are in need of special protection.

Explore

- Ask students to form pairs or groups of 2–4. Pass out sets of “Where Am I?” cards so that each pair or group has a set. Ask the groups to try to match the clue cards with the sanctuary cards. They can use the sanctuaries website if they need help: <https://sanctuaries.noaa.gov>.
- Tell the students that the first group to correctly match all the cards will be given their first choice of a sanctuary or monument they would like to research. A little competition and choice of which sanctuary to research will increase motivation for most students.
- Pass out the “Exploring National Marine Sanctuaries” handout, one per student. Tell students they will be creating short presentations and maps about their chosen sanctuary. Explain that they will use online and/or print resources to learn more about their sanctuary and answer the questions on the handout. Highlight how they will:
 - Research the habitats and species found at their chosen sanctuary and the sanctuary’s cultural significance using Sanctuary Watch at <https://sanctuarywatch.ioos.us> and/or the sanctuary’s website: <https://sanctuaries.noaa.gov>.
 - Encourage students to restrict their research to websites that end with noaa.gov (except for Sanctuary Watch) so that they find reputable information.
 - Ask students to identify any endangered species found there.

- Some of the wildlife species students could include are in “Creature Feature” videos: <https://sanctuaries.noaa.gov/education/students>.
- Prepare 2–5-minute presentations about their national marine sanctuary or marine national monument, including images or short video clips of habitats, wildlife, cultural features, etc.
- Create a polygon map of their selected site using an ArcGIS Online layer and/or paper maps.
- Record answers to the questions on the handout to aid with planning their presentation.
- Pass out the “National Marine Sanctuary Presentation” rubric that lists important elements to include in presentations. Ask students to complete the “Your Score” column and turn it in to you when they are ready to present.
- Give students the rest of the period to research, circulating to answer questions.
- Assign a deadline (perhaps a week away) when all presentations should be complete.

Explain (Day 2)

- Students present to the class about what it's like at their chosen national marine sanctuary or marine national monument, using their maps and images of habitats, physical features, wildlife, cultural significance, etc. as visual aids.
 - Ask students to hand in their rubric to you with the “Your Score” column filled in if they have not yet done so. Use it to evaluate presentations and provide feedback.
 - Ask the audience to make notes in science notebooks about how the sites students present on are both similar to and different from their chosen sanctuary.
 - They can create two columns in science notebooks, one labeled “similarities” and the other “differences” to track that information.
- Once presentations are complete, fill in details, such as the benefits of sanctuaries and examples of ways they are managed, including multiple uses and no-take areas. Expand the discussion and share that there are other marine protected areas, such as at estuaries, and share information about the National Geographic Society’s Pristine Seas initiative: <https://www.nationalgeographic.org/projects/pristine-seas>. Learn more about MPAs at <https://marineprotectedareas.noaa.gov/nationalsystem/mpa-networks.html>.

Evaluate

- Ask students to summarize what they learned about the habitats, species, physical features and cultural resources found at the various sites. They can discuss their ideas with a partner or small group and record summaries in science notebooks.
- Review student presentations using the provided rubric.

- Ask students to write an essay that supports the statement “Earth has one big ocean with many features” using information they learned about the National Marine Sanctuary System.
- Alternatively, students could write an essay that supports this statement and the importance of national marine sanctuaries: “Although the ocean is large, it is finite, and resources are limited.”

Enrich/Extend

- Show students one of the Sanctuaries 360° virtual reality (VR) videos, such as “Sea Lion Encounter” to inspire them to learn more about our sanctuaries:
<https://sanctuaries.noaa.gov/vr>.
 - Demonstrate how they can access the videos and click and drag to explore in 360 degrees.
 - If you have virtual reality headsets they will add to the experience.
- Ask students to create artwork, such as a labeled illustration or illustrated poem, about how the ocean and the National Marine Sanctuary System directly benefit (or could benefit) their own lives.
- Ask students to think about how the sanctuaries they researched might be impacted by various effects of climate change. They can discuss these with a partner or small group and record their ideas in words and illustrations. Ask students to share their best ideas with the class, which may include increased erosion of beaches from sea level rise and more intense rainstorms, more destructive storm surges from tropical storms, and degradation of habitat for sea birds, sea turtles and marine mammals that depend on beaches to reproduce.

Encourage students to think of solutions to mitigate the destructive impacts of climate change. They can share them with the school and larger community through a medium of their choice, such as posters, public service announcement videos and/or audio recordings, games or skits.

Education Standards	
Next Generation Science Standards	Will vary; examples students can meet for relevant projects: Ecosystems: Interactions, Energy, and Dynamics <ul style="list-style-type: none"> • MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. Science and Engineering Practices: <ul style="list-style-type: none"> • Obtaining, Evaluating and Communicating Information • Engaging in Argument from Evidence Crosscutting Concepts: <ul style="list-style-type: none"> • Cause and Effect

Education Standards	
Common Core State Standards	<p>Writing: W.6.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</p> <p>Speaking and Listening: SL.6.4 Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes.</p> <p>Language Arts: L.7.3a Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.</p>
Ocean Literacy Principles	<p>1. The Earth has one big ocean with many features. (b, h)</p> <p>5. The ocean supports a great diversity of life and ecosystems. (e)</p>
Climate Literacy Principles	<p>3. Life on Earth depends on, is shaped by, and affects climate. (a, c if last Enrich/Extend activity completed)</p>

Additional Resources

“Exploring National Marine Sanctuaries: A Lesson in Habitats and Human Impacts” lesson. NOAA Office of National Marine Sanctuaries:

<https://sanctuaries.noaa.gov/education/teachers/features/lpexplore.html>

“Sanctuaries 360° Virtual Reality Lesson Plans.” NOAA Office of National Marine Sanctuaries: <https://sanctuaries.noaa.gov/vr/lessons.html>

“Marine Protected Areas Exploration” lesson. National Geographic Society: <https://www.nationalgeographic.org/lesson/introduction-marine-protected-areas>

“Pristine Seas” resource collection. National Geographic Society: <https://education.nationalgeographic.org/resource/pristine-seas>

For More Information

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<https://sanctuaries.noaa.gov/education>. If you have any further questions or need additional information, email sanctuary.education@noaa.gov.

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<https://marinesanctuary.org> in collaboration with Rick Reynolds, M.S.Ed. and Krista Reynolds, MLIS, M.Ed. of Engaging Every Student.

Name: _____ Per.: _____ Date: _____

National Marine Sanctuary or Marine National Monument Presentation



Title: _____

Part 1: Content	Maximum Points Possible	Your Score (fill out before presentation)	Teacher Score
Name and location of site clearly introduced	10		
Habitat(s), producers and consumers found in site explained, including any endangered species	10		
Physical features of site and seafloor clearly explained	10		
<ul style="list-style-type: none"> • Importance to humans, including Native peoples, explained • How the site might benefit you personally explained 	10		
All information accurate and obtained from reliable sources	10		
Part 2: Delivery / Audience Engagement			
Speech delivered clearly at appropriate volume and speed (not too fast, slow, loud or soft)	10		
Speed, volume and voice inflection are varied to engage audience and emphasize key points	10		
<ul style="list-style-type: none"> • Speaker connects with audience through eye contact and does not spend too much time looking at notes or screen • Speaker demonstrates enthusiasm for topic throughout presentation; audience is persuaded by speaker 	10		
Part 3: Visuals			
Visuals, including a map, help to clearly explain concepts	10		
Part 4: Writing Conventions			
Grammatical and spelling conventions followed	10		
TOTALS:	100		

Comments: