



# *Oceanography:* *Cadette/Senior/Ambassador* Patch Program

Oceanography: The science that deals with oceans, the delimitation of their extent and depth, the physics and chemistry of their water, marine biology, and the uses of the ocean's resources.

## 1: Skill Builders

Choose **Two**:

- There are several branches of oceanography, including marine biology, coastal geomorphology, and hydrology. All are important in their own ways. Explore at least three different branches of oceanography, and describe at least five ways that people are becoming more dependent on knowing about the oceans.
- What are ocean currents? Describe the effects of ocean currents on weather and climate. Compare and contrast ocean and air currents.
- Explore and experiment with the way water carries things like sand grains, and what happens to them when they are left behind. Do at least **two** of the following activities:
  - Shake up a jar of water with some sand, gravel, silt, small shells, and/or clay. Observe which things settle first and how the layers of sediment form. Why do you think this happens?
  - Make a long trench using wood, metal, and/or plastic. Place some gravel, sand, silt, small shells, and pieces of wood at one end. Use a hose to simulate a stream. Does the speed of the water affect the amount and size of material carried by the water? Try raising one end. Does this affect what is carried by the water? What about the amount of water? Try pushing the material up a slope using water, the way oceans do. What do you observe?
  - Visit the ocean shore! Look closely along the shoreline for debris such as shells, pebbles, plants, bottles, beach glass (pieces of glass that have been polished smooth by the sea), and decaying matter. Where did these things come from? How did they get there and what is likely to happen to them? What are flotsam and jetsam?
  - Most ocean water is not perfectly clear. Find out what causes cloudiness in water. You may need to use a filter, plankton net, magnifying glass, or even a microscope.
- Learn about waves by doing **one** of the following activities:
  - Learn about and describe ocean waves. Where do waves get their energy?

What accounts for the different types of waves? Explain how breakers are formed. Explain the difference between sea swell and surf. What are the differences between a storm surge, tsunami, tidal wave, and tidal bore? How do all of these things relate to the Massachusetts coastline? What accounts for the different kinds of beaches (rocky coasts, barrier islands, marshy areas, etc.)? How have "nor'easters" and other storms affected the area?

- Observe waves in motion. If you cannot go to the coast to observe the following structures, make a model of a beach to help you analyze shorelines. Observe how the effects of waves on the shoreline may be altered by a jetty (a wall that is built out into a body of water), a groin (a short wall built at right angles to the shore to trap moving sand), or a breakwater (a structure protecting the shore from breaking waves). Observe the changes in the behavior of the waves.
- Draw a cross-section of underwater ocean topography. Show what is meant by the continental shelf, continental slope, and abyssal plains. Show and label the following: seamount, guyot, deep rift, valley, canyon, and trench. Compare the depth of the ocean with the height of the mountains. Learn about the underwater topography of Boston Harbor. Where are the deep water channels? Where can large freighters or "Tall Ships" be brought in? Share what you have learned with others.
- List the main components of seawater, including salts, gases, and microscopic plants and animals. Describe the importance of these to life in the sea. Why is George's Bank (off the coast of Massachusetts) such a lush feeding ground for sea life? Why is George's Bank now a protected area?
- Explain the meaning of phytoplankton, zooplankton, nekton, and benthos. What is the importance of phytoplankton? Make a food chain illustrating the importance of plankton to sea life. Expand it into a food web that includes examples of both sea and land creatures. Share what you have learned with others.

## 2: Technology

Choose **one** of the following activities:

- Learn to read an ocean chart. Find out what the symbols mean and how mariners use them to navigate. Learn to plot a course using an ocean chart and a compass, or take a boating safety course.
- Participate in a marine science boat trip. Use different scientific methods and devices (such as a Secchi disk, CDT sensor, plankton net, or otter trawl) to measure the biologic, chemical, and physical conditions during your trip.
- Make a plankton net. Tow the net from a dock, wade with it, hold it in a current, or tow it behind a boat for about twenty minutes. Examine what you have caught under a microscope or high-powered magnifying glass. Identify and draw the three most common types of plankton in the sample.

- Measure and record the water temperature one foot below the surface of a body of water three or four times daily, at the same times each day, for six consecutive days. Measure and record the air temperature at the same times. Record the cloud cover and roughness of the water surface. Show your findings on a graph. How does water temperature change with respect to air temperature? What other conclusions can you draw?

### 3: Give Back

Choose **one** of the following activities:

- Investigate how pollution is affecting a harbor, salt marsh, or the ocean. What are the long- and short-term effects of this pollution? What is being done to clean-up and/or prevent further pollution? Prepare a pamphlet or display of your results.
- Make a list of some of the endangered species that live in or depend heavily upon the ocean. Research at least one of these species, and include a drawing or picture, a description, why it is endangered, and what, if anything, is being done to protect the species and its habitat. Share your findings with others.
- Organize or participate in a beach or water clean-up.
- Help younger Girl Scouts earn the Oceanography badge or Try-It by sharing what you have learned and completing games and activities with them.
- Educate your community about coastal erosion or the problems pollution is causing along the coast. What are the effects of the increasing use of lawn chemicals and/or the increasing number of septic systems in coastal communities like Cape Cod?
- Create a brochure about the effects of ocean pollution. Include details about where and what can be dumped overboard and the time it takes for common items to break down in the ocean. (For example: It takes an orange peel 3 months to decay in the ocean.)

### 4: Careers

Choose **one** of the following activities:

- Visit an oceanographic research vessel or oceanographic institute. Learn about various careers in the oceanography field. Why is their work important? What educational background is needed for a career in oceanography? Share what you learn with others.

- Visit an aquarium and take a behind-the-scenes tour. Interview 2-3 staff members and find out about some of the jobs at the aquarium. Who takes care of the fish if they are injured or sick? Who sees to the nutrition of the fish? Do they rescue injured animals out at sea or stranded on shore? Share what you learn with others.
- Make a list of careers that relate to oceanography. Learn about the different types of training or education needed to do these jobs. Research three colleges or other programs that provide this type of training.
- Arrange to meet a professional in the field of oceanography. Meet with this person at his or her place of employment, or have them come to a troop meeting.
- Research a scientist who has made an important contribution in the field of oceanography. If possible, interview the scientist in person, or by phone, letter, or e-mail.

**Resources:**

- Enchanted Learning ([enchantedlearning.com](http://enchantedlearning.com)): info, coloring books, and connect-the-dots pages
- Sea Education Association ([sea.edu](http://sea.edu))
- National Oceanic Atmospheric Administration ([noaa.gov/education](http://noaa.gov/education))
- SeaWorld and Busch Gardens have educational materials, including a collection of books for grades K-3 and 4-8.
- The Marine Mammal Center ([marinemammalcenter.org/education](http://marinemammalcenter.org/education))
- Woods Hole on Cape Cod has an aquarium, and is home to the [marinemammalcenter.org/education](http://marinemammalcenter.org/education) Woods Hole Oceanographic Institute (WHOI), which has an exhibit center with information about deep sea explorations and short videos about the sea.
- The National Sea Shore on Cape Cod has a visitor's center with exhibits, self-guided tours, and videos about the sea and a geologic history of Cape Cod.

Congratulations you've now completed your Oceanography: Cadettes/Seniors/Ambassadors patch. Patches are available for purchase in the [GSEMA shop](#).