Before You Start

Time Frame
- Watch *Sea of Sound* DVD (30 minutes). Emphasize the fourth chapter “Anthropogenic Sound” (5:52) and particularly the fifth chapter “Changing the Ocean Soundscape” (6:07).
- Hearing: two 45-minute class periods.

Grade Level: 8-12

Materials Needed
- *Sea of Sound* DVD
- DVD player with television or projection
- Student “Congressional Hearing” handout

Getting Ready
- Watch *Sea of Sound* video.
- Assign roles for Congressional Hearing.
- Reproduce student “Congressional Hearing: Right Whale Listening Project” handout.

Overview

The North Atlantic right whale is one of the most endangered species on our planet. With fewer than 400 individuals of this long-lived species remaining in the wild, the loss of any individual whale—especially calves and reproductive females—has strong effects on the future of the species. The whales travel the east coast of North America, including many heavily trafficked ports. The right whale feeds by scooping large mouthfuls of water near the ocean’s surface, and filtering its food through its baleen plates. Its surface feeding behavior and habitat range place it in the direct path of ship traffic in busy harbors like Boston, Massachusetts.

Scientists and whale advocates have devised a way to use the whale’s own sound to protect it. Computers using underwater microphones, called hydrophones, constantly monitor the ocean. They automatically detect and record one distinctive right whale call type. A team of acoustic experts verifies the call. Then the system automatically transmits the whale’s location back to ship captains in the busy Massachusetts Bay. Ship captains can reduce speeds, greatly reducing the potential for hitting a whale. The system is called the Right Whale Listening Project and you can monitor it at the website ListenForWhales.org.

Who should fund the Right Whale Listening Project?
Taxpayers? Shipping companies? Environmental groups?

Student Activity
Hold an informational hearing for US Senate Committee on Environment and Public Works*, where students represent diverse viewpoints—such as advocates for whales, shipping captains, scientists explaining technical capabilities, or politicians concerned with costs. Students present perspectives more complex than simply pro or con.

*Committee website (bit.ly/fNBX33)
Congressional Hearing

Learning Objectives

Students will:

- know how whales use sound in the ocean, how human activities impact whale communication, and that different stakeholders have different perspectives.
- understand the costs and benefits of protecting endangered species.
- be able to argue a particular viewpoint using fact and data to support their arguments.

Activity Overview

- Students watch Sea of Sound video.
- Students do research and prepare their “testimony”.
- Students hold hearing in class.
- Students write opinion papers using arguments and evidence from class hearing.

Prior knowledge

- **Endangered species**: a group at risk of extinction because its population is so small.
- **Masking**: when one sound covers another sound.
- **Hydrophone**: an underwater microphone.

Teaching Tips

- You may wish to have students work from an electronic version of the handout, because the urls listed in the Student Handout below are long. They are also available online at: www.seaofsound.org
- Students could work in teams to research and prepare testimony.
- Potential stakeholders include: scientists, engineers, fishermen (commercial and recreational), boat captains, commercial shipping owners, harbor police, Coast Guard, environmental activists, animal rights’ groups, or politicians.
- Testifying “experts” should have a short time limit (~4 minutes) and could be required to use visual aids and data to present their cases.
- Testifying experts could also realistically be asked to answer questions from “the committee,” whether this is the entire class, or a designated subset of students.
- Additional role of Committee Chairperson (who runs the hearing) can be assigned, though you may wish to retain control of this aspect of the activity.
- You may also want to assign several coordinators who could organize statements for a group of stakeholders to minimize repetition. These coordinators might (or might not) be responsible for cross-examination of testifying “experts.”
- Evaluation: Students write a short opinion paper after the hearing, synthesizing facts and arguments and presenting their own reasoned, well-supported opinions. This is an opportunity to emphasize the use of evidence and data in supporting arguments.
Resources and Extension Activities

- The Sea of Sound DVD has a webquest using the listenforwhales.org website, as well as a data interpretation exercise, and a fact-sheet about the North Atlantic Right Whale.

- The Sea of Sound DVD also contains a 20-minute interview with renowned researcher Christopher Clark. Relevant sections include information about how whales use sound, the effects of noise on whales, the noise contributions of shipping, and what we can do to improve the situation.

- The Discovery of Sound in the Seas (DOSITS) website has classroom-ready hands-on activities like how to build an inexpensive hydrophone and an activity using sound to track whales in the oceans (dosits.org see Resources on page ???)

National Science Education Standards

UNIFYING CONCEPTS AND PROCESSES: Change, constancy and measurement; Evolution and Equilibrium

PHYSICAL SCIENCE: Interactions of Energy and Matter

LIFE SCIENCE: Biological Evolution; Interdependence of Organisms; Behavior of Organisms

SCIENCE AND TECHNOLOGY: Understanding About Science & Technology

PERSONAL AND SOCIAL PERSPECTIVES: Natural Resources; Environmental Quality; Science and Technology in Local, National & Global Challenges

Ocean Literacy Principles
(http://oceanliteracy.wp.coexploration.org/?page_id=756)

The ocean supports a great diversity of life and ecosystems (5).
- Grades 6-8—B5 and B9
- Grades 9-12—C27 and C28

The ocean and humans are inextricably linked (6).
- Grades 6-8—D18, E1 and E6
- Grades 9-12—D11, D12 and E6

To see alignments by chapter of the video and lesson, please see the Matrix.

Acknowledgments

By Elizabeth Rice, Ph.D. Creative Curriculum, for Sea of Sound. If reproducing the lesson, please cite Sea of Sound Cornell University, Cornell Lab of Ornithology as the source and provide the URL:

www.seaofsound.org
Mock Congressional Hearing: The Right Whale Listening Project

The North Atlantic right whale is one of the most endangered species on our planet. With fewer than 400 individuals of this long-lived species remaining in the wild, the loss of any individual whale—especially calves and reproductive females—has strong effects on the future of the species. The whales travel the east coast of North America, including many heavily trafficked ports. The right whale feeds by scooping large mouthfuls of water near the ocean’s surface, and filtering its food through its baleen plates. Its surface feeding behavior and habitat range place it in the direct path of ship traffic in busy harbors like Boston, Massachusetts.

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Who should fund the Right Whale Listening Project?

Taxpayers? Shipping companies? Environmental groups?

Potential Stakeholders

- **Technical:** How does the system work?
  - Biologists: How do right whales use sound?
  - Physicists: How does sound move in the ocean? Why is this important for the whales?
  - Bioacoustics experts: How can you use sound to protect whales? How does the Right Whale Listening Project work? What are the challenges of the system?
  - Engineers: What are the challenges of recording sound in the ocean? What is unique about the buoy system used in the whale listening project?

- **Animal Advocates:** How does the system protect right whales? Why do they need protection? What happens to a whale that is struck? Does changing boat speed affect a whale’s chance for survival?
  - Conservation biologists: How many right whales are left? Why are there so few? How does their biology (behavior, range, and life history) affect their chances for recovery?
  - Environmental activists: How does human-derived sound and human-created threats affect right whales and their chances for recovery?
  - Animal rights’ groups: How are whales affected by humans?
  - Lawyer: How does the endangered species act apply?
  - Wildlife biologists: Does changing a ship’s speed change a whale’s chance of survival? How and why?

- **Other users of the Bay:** What effect does the system have on others?
  - Ship captains: When the warning system sounds, what are captains supposed to do? What do they actually do? Why?
• Fishermen (commercial and recreational): Are fishing boats required, by law, to slow down if a right whale is nearby? What effect does slowing down have for a fisherman? What are the costs of going more slowly?
• Commercial shipping owners: How much ship traffic goes through the Bay? What are the costs of going more slowly? What are the costs (monetary, political, etc) of a ship hitting an endangered whale?
• Gas terminal managers and ship captains: What role did the gas terminal play in developing and maintaining the system? What are the costs and benefits of the system for the gas terminal? What are the costs (monetary, political, etc) of a ship hitting an endangered whale?
• Harbor police/Coast Guard: Is there additional enforcement associated with the warning system? Who is responsible? Who bears the costs? What happens to those who don’t comply?

➢ Government: What are the costs of the system?
• Gas terminal owners: Who currently pays for the system?
• Politicians: Who benefits from such a system? Can we afford such a system?
• Congressional Budget Office: What might such a system cost?

Resources

(Short cut—either click the links or find them online at SeaOfSound.org)

Right Whale Listening Network—www.listenforwhales.org
• North Atlantic right whale background—bit.ly/ecV1d0
• Threats to whales—bit.ly/hHaARS
• How does the Whale Listening Project work?—bit.ly/fIDpVv
• How do the buoys work?—bit.ly/guiykM, bit.ly/gWrzQh
• How are boat captains warned?—bit.ly/fKsIUP

The North Atlantic Right Whale Consortium—www.rightwhaleweb.org
• Right Whale News—bit.ly/gIaBBs

NOAA Fisheries: Office of Protected Resources—www.nmfs.noaa.gov/pr/
• North Atlantic right whale background—bit.ly/i4eORI
• The Endangered Species Act—bit.ly/fIDpVv
• Rules for boat speeds—bit.ly/ghPKbA

John Kerry introduces bill to reduce ship strikes to whales—bit.ly/dTI2p8

News articles
• Vineyard Gazette “Law to Protect Right Whales May Hamper Ferry Operations”—bit.ly/i9etLU
• Washington Post “OMB Hits the Brakes on Right Whale Rule”—wapo.st/iiFhgo
• Whale in the Cape Cod Canal—wp.me/paGo0-1bw
Gloucester Times “System uses sound to find whales, avoid ship strikes”—bit.ly/gx7Q4v
WHOI-Oceanus Magazine- Excelerate Energy, Cost of system and buoy design—bit.ly/i0TTOR
The Boston Globe, “Undersea detection system helps to guard against collision with ships—bit.ly/iaVd0f
Perspectives from boat captains, fishermen etc. may be found in articles and opinion pieces from local papers around the Bay.