



K-12 Oysters in the Chesapeake Bay

Grade Level:

Grade 2

Teaching Time:

3-5 30-45 minute sessions

Materials:

- 1-2 live Eastern oysters, *Crassostrea virginica*, Eastern oyster shells
- Glass aquarium or other container
- Images or video of oysters with and without reefs
- Video of oysters filtering water (see Day 1 Exploration)
- Science journal
- Drawing paper
- Chart paper
- Craft construction supplies described in Day 2 Exploration
- Copy of the Student Resource for each student



A Perfect Home

Activity Summary

Students learn about oyster reef building and the inhabitants of oyster reefs. They build model reefs using everyday materials and refine their designs based on additional information.

Learning Objectives

Student will be able to:

- Explain the role of Eastern oysters in the Chesapeake Bay
- Explain the importance of an Eastern oyster reef to oysters
- Use a model and a diagram to explain an idea

Essential Question

How can we clean the water of the Chesapeake Bay to improve the habitat for plants and animals?

Background Information

Oysters, a type of mollusk, are animals that have a soft body surrounded by two calcareous shells that live in coastal waters. Some, but not all, oyster species also form dense clusters that are typically referred to as oyster reefs.

Historically, oysters in North America have served many purposes for the inhabitants of coastal areas. Aboriginal North American Indians found oysters to be an abundant and reliable source of food, and they also used the shells as tools, weapons, ornaments and even currency. Today, oyster harvest and cultivation provide significant economic value to regional coastal communities.

In addition, oyster reefs provide habitat for other species, including some commercially important species. They filter the water and increase water clarity by extracting organic and inorganic particles from the water column. In turn, this increase in water clarity promotes the growth of submerged aquatic vegetation, which also provides habitat for other organisms.

However, the loss of oyster reefs in the United States during the past 200 years has been significant. Due to over-harvesting, increased sedimentation, pollution, invasive species and disease, the amount of oyster harvest has decreased dramatically—reducing income and jobs for workers in the oyster industry. But just as important, the loss has removed habitat for other animals and plants and decreased water quality in estuaries and coastal waters.

Key Words

Bivalve - An aquatic mollusk that has a compressed body enclosed within a hinged shell

Disease - A condition that impairs the proper function of the body or of one of its parts

Ecosystem - All the living organisms that occur together in a particular area

Filter - To separate or remove matter

Habitat - Place where an organism or a community of organisms lives; includes all living and nonliving factors or conditions of the surrounding environment

Harvest – Process of gathering as in a crop

Hatchery – Place where oyster larvae and young oysters are grown

Larvae – Early form of an animal that is unlike its parent; Must change to look like/act like parent

Mollusk - Invertebrate that has a soft unsegmented body and lives in aquatic habitats and often has a shell.

Oyster - Bivalve mollusk with rough irregular shell sometimes eaten as a delicacy and may be farmed for food or pearls

Oystermen – Women and men who harvest oysters to sell to restaurants or to eat themselves

Phytoplankton – Free swimming algae

Pollution – Contamination of air, water or soil with harmful substances

Reef – Strip of oysters rising close to the surface of the water

Restore – Bring back into existence

Spat – Name for oyster larvae after the attach to a surface

Substrate – Base on which an organism lives

Water current - Part of a fluid body (as air or water) moving continuously in a certain direction

Activity Procedure

Day 1

Engagement

Give each student, or team of students, oyster shells. If you do not have actual shells, show images of individual Eastern oysters. Ask them to describe what they see and feel. Have them guess what they are holding or seeing in the images. Ask what they know about oysters, and chart their answers for use on Day 2.

Exploration

1. Show the students a video of an oyster filtering dirty water. Videos are available on YouTube and Teacher Tube by searching “oyster filtering.” Be sure any images or videos you show at this point do not show oyster reefs. Discuss what they think is happening in the video.
2. Place two live oysters in an aquarium or another container full of dirty water the students can observe. Have students record their predictions about what will happen to the water in the container overnight in their journals.

Day 2

Engagement

Show the aquarium or container with the oysters to the students. Ask them what happened and why they think a change occurred? They can record their answers in their journals and share them with the class.

Exploration

1. Pose the following problem to the students, “When oysters filter water from the Chesapeake Bay, they remove sediment and chemicals, which helps keep the Bay ecosystem healthy. There are not enough oysters left in the Bay to clean it as there once were, and animals are suffering. What can we do?”

2. Discuss how the students would solve the problem. (Create/Grow more oyster beds.)
3. Explain to students that scientists have tried a variety of different ways to recreate oyster beds and reefs, and now the students will undertake the same process by designing an oyster reef.
4. Discuss the life-cycle of the oyster, from free-floating spawn, to swimming and crawling larvae, to attached spat, to mature oyster. What factors in their environment will help them survive?
5. Provide the students with a large piece of paper. This will be the substrate on which the oyster reef will sit. Have students choose a substrate based on their observations of the oysters and label it on their paper (sand, mud, deep water, rocks, shells, etc.).
6. Give students a variety of material such as egg carton cups, construction paper, pom poms, pipe cleaners, fun foam, packing peanuts, etc.
7. Have students build their reefs.

Day 3

Engagement

Ask students to share their reefs. Have them explain the parts of their design and why they chose their reef design.

Exploration

1. Ask students to read the Student Information page about oysters. Discuss the topic of the text and draw their attention to the paragraphs describing oyster reefs. Have them talk about the answers to the following questions with a partner based on the reading: How are oyster reefs made? What do you think they look like based on what you read?
2. Share pictures and/or videos of oyster reefs with the students. Discuss student observations about the reefs.
3. Working with a partner, have students compare their reefs with the pictures/videos and discuss how they could change the design of their reefs to look and function more like real oyster reefs.

Explanation

1. Ask students to explain their original design (draw a picture) and the modifications they want to make based on what they learned.
2. Give students time to make changes to their reefs or build a new one if possible.
3. Explain that the process of designing an object and making modifications based on new information is the same process scientists and engineers undertake. This is how they found out that old oyster shells are the best substrate on which to build new oyster reefs.
4. In their journals, ask students to reflect on the activities by explaining why oyster reefs are good for oysters, and for fun, the three favorite things they learned about oysters. They should explain why they chose each one.

Extension

1. Discuss the homes of other animals, especially those that build or grow them like oysters (beavers, rabbits, groundhogs, bees, birds etc.). Show pictures of these homes and talk about the special features of each home that make them a perfect fit for the animal.
2. Ask students to create and draw an imaginary animal. You can draw one for the class to use if time is limited. Label each part. The animals should be based on real characteristics of animals such a long legs, fur, big ears, etc. No animals with computer or robot parts.
3. Now ask the students to design the perfect shelter for the animal by drawing and labeling a picture of their design.
4. Have the students share their designs explaining why they gave their structure certain features and how those features “fit” the animal.
5. In their journals, have the students compare and contrast an oyster reef and the home of the imaginary animal. Make sure they introduce the topic, use facts and definitions to explain the similarities and differences, and provide a concluding statement.

Evaluation

Formative:

1. Class discussions and participation
2. Journal entries

Summative:

1. Model designs and modifications, if applicable
2. Journal reflection on oyster reef design
3. Diagrams of imaginary animals and homes
4. Journal entry comparing and contrasting homes

Education Standards

Three Dimensional Learning		
Disciplinary Core Idea(s)	<p>2-LS4.D: Biodiversity and Humans There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)</p>	<p>How Standard is Addressed Students learn about the locations of oyster reefs and how vital they are to the Bay ecosystem.</p>
	<p>2-ETS1.B: Developing Possible Solutions Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem’s solution to other people. (K-2-ESTI -2)</p> <p>2-ETS1.C Optimizing the Design Solution - Because there is always more than one possible solution to a problem, it is useful to compare and test designs.</p>	<p>Students construct oyster reef models to demonstrate how scientists solve a reef design problem and modify their designs to reflect new information. They also draw and diagrams of homes for imaginary creatures.</p>
Science/Engineering Practice	<p>Planning and Carrying Out Investigations Make observations (firsthand or from media) to collect data that can be used to make comparisons.(2-LS4-1)</p> <p>Developing and Using Models Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)</p>	<p>Students construct oyster reef models to demonstrate how scientists solve a reef design problem and modify their designs to reflect new information they observe from a reading, photographs and videos. They also draw and diagrams of homes for imaginary creatures.</p>
Cross – Cutting Concepts	<p>Structure and Function The shape and stability of structures of natural and designed objects are related to the function(s).</p>	<p>Students learn how oyster reefs are formed, their structure, and the best substrate in which to place reefs.</p>

Common Core Standards		
<p><i>Ties to Common Core</i></p>	<p>RL2-2 Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text</p> <p>RL2-4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.</p> <p>W2-2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.</p>	<p>RL2-2 Students read an informative text about oysters, discuss the topic of the text and focus on one section to gather information to inform their reef designs.</p> <p>RL2-4 Students learn new vocabulary during class discussions and reading. They apply this new knowledge to discussions and in the summative assessments.</p> <p>W2-2 Students write an informative piece comparing and contrasting oyster reefs (homes) with a home for an imaginary creature. They use points about each structure to develop the explanation.</p>
Maryland Environmental Literacy Standards		
<p><i>Ties to MD Environmental Literacy Standards</i></p>	<p>Standard 2 Interactions of Earth's Systems Topic B: Systems Thinking Indicator 2: Use models and computer simulations to extend his/her understanding of scientific concepts.</p>	<p>Students develop and analyze models of oyster reefs.</p>

Additional Resources

Web Resources

Protecting Our Water Resources: Student Activities for the Classroom Water and educational activities for Kindergarten through Ninth Grade

http://www.stormwater.ucf.edu/toolkit/vol3/Contents/pdfs/Student%20Activities/student_activities.pdf

Olly the Oyster: Visit this website for coloring pages, puzzles, word searches, crafts, and more.

<http://www.ollytheoyster.com>

Sammy's Corner: An Oyster Recycling Program: The site contains teacher resources including a poster, curriculum guides, and additional oyster activities.

<http://oysterrecycling.org/sammys-corner/>

How to Make an Oyster Using Egg Cartons: Online instructions showing children and adults how to make an oyster model from an egg carton.

<http://familycrafts.about.com/od/eggcartoncrafts/ss/eggcartoyster.htm>

Note: You can skip a step by cutting adjacent cups and folding them along the divider separating the cups for the oyster's hinge.

YouTube Videos:

- Oyster Filtration: A one-minute time-lapsed video of oyster filtration in action. <https://www.youtube.com/watch?v=saAy7GfLq4w>
- OYSTERFILTER: A one minute and 20 second time-lapsed video of six oysters filtering a gallon of water. https://www.youtube.com/watch?v=LOp3V_QpAyA

TeacherTube Videos:

- Oyster Filtering: Excerpt from The Chesapeake Bay Foundation's documentary "Common Ground." (42 seconds)
- http://www.teachertube.com/viewVideo.php?video_id=211324
- Oyster Rap: An oyster restoration scientist raps about Eastern oysters in the Chesapeake Bay
- http://www.teachertube.com/viewVideo.php?video_id=93158

Book Resources

Allen, Elaine Ann. Olly the Oyster Cleans the Bay. Tidewater Publishers, May 1, 2008. ISBN-10: 0870336037.

Tate, Suzanne. Pearlie Oyster: A Tale of an Amazing Oyster. Nags Head Art, Inc., June 1, 1989. ISBN 10: 0961634472.

The Eastern Oyster in the Chesapeake Bay



Two halves of a single Eastern Oyster.

What are Eastern oysters, *Crassostrea virginica*?

Eastern oysters are **bivalve mollusks**. That means they have two shells. You will see one shell on the left side and one shell on the right side when you open an Eastern oyster.

Where do Eastern oysters live?

Eastern oysters live on the East Coast of North America from Canada to Venezuela.

Very young oysters float in water currents looking for a place to stick to and grow into adults. As they float, they grow a foot. They use the foot to find a hard surface to attach to. Then they make a cement-like glue to stick the foot to the hard surface. They cannot attach to mud and sand or to a place with too much sunlight. They need to be in flowing water where their food (**phytoplankton**) is. Other oyster shells are the best place for oyster **larvae** to attach. Once attached, the larvae are called **spat**. Over time, the spat grow and make shells, and other oyster **larvae** attaches to them. As more and more oysters attach to older oysters, oyster reefs grow.



Oyster spat attached to oyster shell (left), restored oyster beds.

Photo: NOAA

What do Eastern oysters look like?

Adult Eastern oysters have a grey and white bumpy shell. They are shaped like giant kidney beans with one skinny end. They can grow to eight inches long. There were once oysters as big as dinner plates! Those oysters had grown for many years because Native Americans could only **harvest** small numbers of oysters.

Why are Eastern oysters important to the Chesapeake Bay?

For thousands of years, people have eaten Eastern oysters, and Native Americans used oyster shells for jewelry and money in the past. Starting about 400 years ago, people also made money by harvesting and selling oysters.

Eastern oysters filter the water in the Bay. Oysters suck in water and filter out phytoplankton for food. They also filter **sediment** and **pollution** out of the water. Then they spit clean and clear water back into the Chesapeake Bay. Without oysters, the water in the Bay would become cloudy and polluted; not a good place for other animals to live.

Oyster reefs also provide habitat to other animals such as small crabs and fish. The young animals live in the oyster reefs for protection from predators and for food.

What happened to the Eastern oysters?

For hundreds of years, Eastern oysters were known as the best tasting oysters in the United States. Oystermen harvested oysters faster than the oysters could reproduce. Oysters live close together in reefs, and their young like to stick to other oyster shells to grow. There were not enough oysters to reproduce or provide shells for oyster larvae to attach to, so fewer oyster reefs were made. People also used oyster habitat as places for building docks and houses.

Also, in the 1940s and 1950s, scientists found two diseases in Eastern oysters called MSX and Dermo. Both of these kill oysters and make it harder for more reefs to grow in the Chesapeake Bay.



What are people doing to help the Eastern oyster?

People are doing many things to help the Eastern oyster. Scientists are learning more and more about oysters and their habitat, and water currents in the

Chesapeake Bay. They use this information to find the right places to place piles of empty oyster shells to give oyster larvae sticking places. The new reefs are often built on old oyster shells from restaurants.

People are also growing oysters from boat docks in bags that look like mesh socks and give the oysters to oyster **restoration** groups to put onto reefs when the young oysters are large enough. Businesses are growing oysters on floating rafts. They sell the oysters for food and use the shells to help new oysters grow.

What can you do to help the Eastern oyster?

Learning about the Eastern oyster is the first step toward helping more oysters grow in the Chesapeake Bay. You can share the story of the Eastern oyster and its importance to the Chesapeake Bay and to

Maryland with others. You can also collect oyster shells from restaurants and take them to groups around the Chesapeake Bay who are working to **restore** oyster beds. If you live on the Bay, you can grow oysters from your dock in oyster socks and then take the sock to a group that will plant them on an oyster bed. And if you are boating in the Chesapeake, watch for oyster beds. Putting down your anchor on a bed can hurt the living oysters and destroy the bed. Anything you do to bring oysters back to the Chesapeake Bay benefits all Marylanders and Virginians.



Tiny oysters at a **hatchery**.