



OYSTERS:

Oysters and a Clear Bay

Watch CBF's LEARN OUTSIDE, LEARN AT HOME Oyster Habitat Observation video. cbf.org/news-media/multimedia/video/cbf-education-videos/oyster-habitat-observations.html

What aquatic species has been worth its weight in gold in Virginia and Maryland?

What aquatic species was the subject of ferocious wars during the late 1800s?

What aquatic species filters sediment and lives in bars?

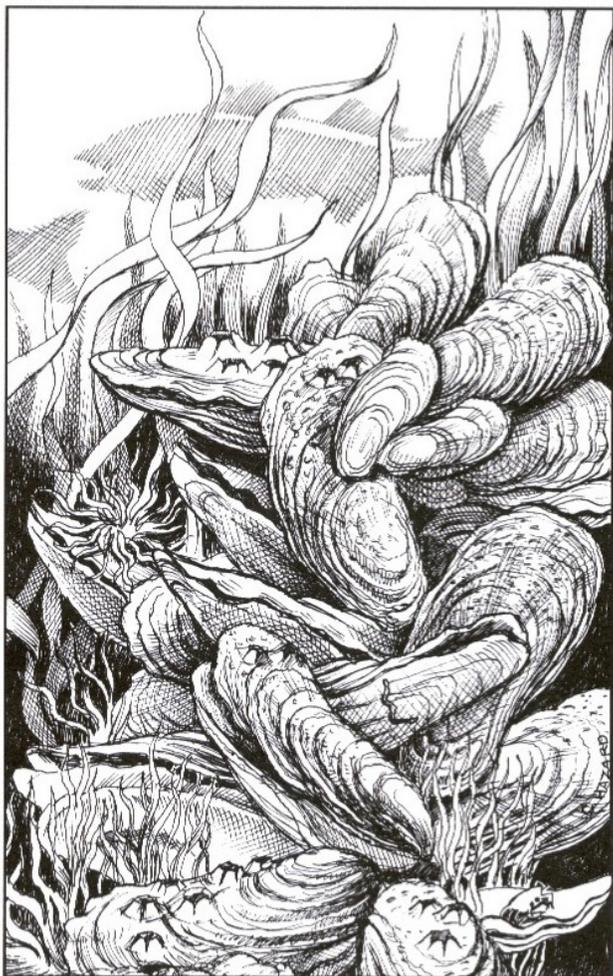
If you guessed the oyster, you are correct! Beneath the drab and lumpy shell of the oyster lies a very colorful animal and history. In addition to its wild popularity as a tasty meal and its economic importance to both Maryland and Virginia, the oyster has helped to keep the Bay clean and to provide a place for many Bay species to find shelter, food, and hiding spots.

Investigative Questions

In this investigation, you will answer two questions:

1. What has happened to the oyster?
2. What does the oyster's scarcity mean for the Bay?

To answer these questions, you will develop a timeline showing the oyster's history, investigate the oyster's ability to filter and compare your own filtering device to the filtering ability of the oyster.



Charles R. Hazard

Materials You Will Need

PART I

- Chart Paper
- Colored Markers

PART II

- Soil
- Tap Water
- Measuring Spoon
- 2 Clear Collection Containers
- Graduated Cylinder or Measuring Cup
- Stopwatch or Watch with a Second Hand
- Various Filtering Device Materials

PART II

- Calculator
- Colored Markers, Pens, or Pencils or Crayons

Vocabulary

- filter
- oyster bar
- oyster dredge
- oyster reef
- oyster tong
- oyster wars
- spat

PROCEDURE: PART I

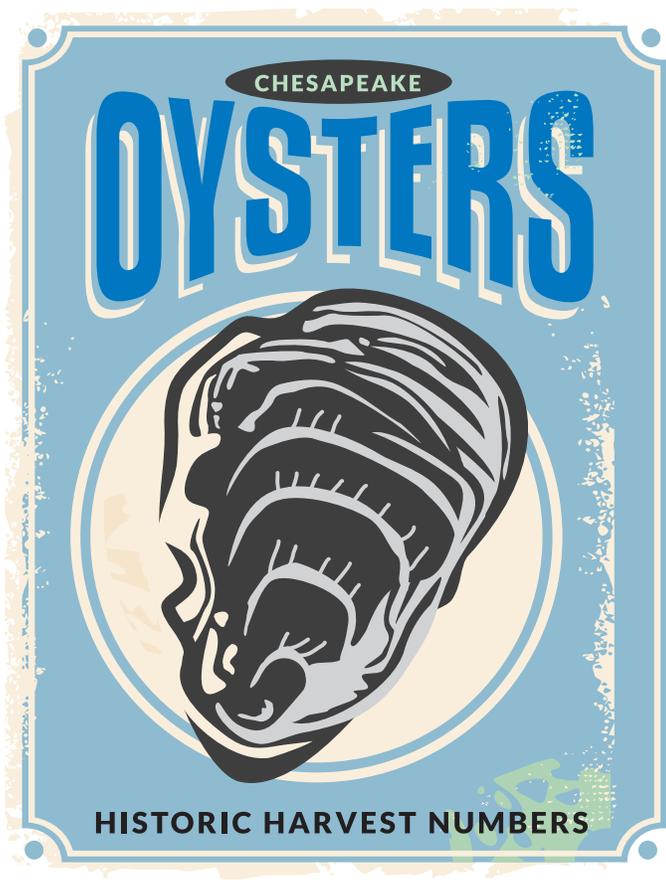
What has happened to the oyster over the past 150 hundred years? Investigate the colorful history of the Chesapeake Bay oyster to answer this question.

1. Look at the charts on the *Chesapeake Oysters Historic Harvest Numbers* page.
 2. Create a graph on a separate piece of paper to reflect the data from each section. You can choose the graph type and the scale. For example, you can choose to plot the data with a bar graph or a line graph. Be sure to make your graph big enough to include additional information later.
 3. Next, take a look at the *Oystering Events of the Past* page. This timeline describes some of the events and regulations that have had an impact on oysters over the past 150 years.
 4. On your graph, add in the events that occurred during the harvest years using the *Oystering Events of the Past* timeline. Write the events below the line or bar portion of the graph.
 5. Now look at the timeline and graph together. What conclusions can you draw from the timeline and graph about the history of Maryland and Virginia's oyster harvest? Use the space below to explain your answer.
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6. Choose two historic events plotted on your timeline. Below, explain how you think that each event affected the oyster harvest. Support your explanations with evidence from the *Oystering Events of the Past* timeline and your readings in Part I of this investigation.

Event #1:

Event #2:

7. Who or what might be affected by the scarcity of oysters in the Bay? Below, list three possible consequences of the declining trend in oyster harvest documented by your timeline.



VIRGINIA OYSTER HARVEST IN POUNDS

Year reflects season beginning

1880.....	47,861,240	1995.....	387,989
1888.....	25,651,031	1996.....	133,722
1890.....	42,518,175	1997.....	316,783
1891.....	43,134,602	1998.....	275,792
1897.....	49,166,936	1999.....	333,096
1901.....	42,473,683	2000.....	22,949
1904.....	53,286,023	2001.....	31,166
1908.....	35,525,000	2002.....	42,859
1912.....	43,442,686	2003.....	23,523
1920.....	27,744,983	2004.....	79,680
1925.....	30,494,912	2005.....	173,890
1930.....	19,617,877	2006.....	106,305
1935.....	14,317,200	2007.....	95,453
1940.....	17,713,900	2008.....	103,449
1945.....	17,536,400	2009.....	125,389
1950.....	15,547,500	2010.....	216,612
1955.....	19,990,400	2011.....	258,496
1960.....	13,511,600	2012.....	408,612
1965.....	10,890,400	2013.....	532,816
1970.....	7,288,600	2014.....	600,977
1975.....	5,679,200	2015.....	634,953
1980.....	7,316,300	2016.....	596,019
1985.....	4,171,897	2017.....	632,004
1990.....	1,111,937	2018.....	457,379

MARYLAND OYSTER HARVEST IN BUSHELS

Year reflects season beginning

1870.....	8,947,803	1932.....	1,626,214	1961.....	1,495,235	1990.....	416,720
1875.....	14,000,000	1933.....	1,835,364	1962.....	1,243,498	1991.....	318,128
1879.....	10,600,000	1934.....	2,100,233	1963.....	1,383,617	1992.....	123,618
1884.....	15,000,000	1935.....	2,407,693	1964.....	1,340,177	1993.....	78,817
1889.....	10,450,087	1936.....	3,081,063	1965.....	1,645,144	1994.....	164,673
1890.....	9,945,058	1937.....	3,245,816	1966.....	3,014,670	1995.....	193,629
1891.....	11,632,730	1938.....	3,403,549	1967.....	3,000,272	1996.....	171,630
1892.....	10,142,500	1939.....	3,129,403	1968.....	2,509,701	1997.....	278,292
1897.....	7,254,934	1940.....	3,430,269	1969.....	2,533,275	1998.....	413,010
1900.....	5,685,561	1941.....	2,792,069	1970.....	2,395,528	1999.....	370,784
1904.....	4,500,000	1942.....	2,328,541	1971.....	2,900,547	2000.....	342,879
1906.....	6,232,000	1943.....	2,413,349	1972.....	2,925,236	2001.....	150,594
1910.....	3,500,000	1944.....	2,436,133	1973.....	2,845,924	2002.....	55,828
1916.....	4,120,819	1945.....	2,322,185	1974.....	2,559,112	2003.....	25,843
1917.....	2,461,603	1946.....	2,157,838	1975.....	2,449,440	2004.....	72,357
1918.....	3,743,638	1947.....	2,027,381	1976.....	1,891,614	2005.....	153,693
1919.....	4,592,001	1948.....	2,702,814	1977.....	2,311,434	2006.....	165,059
1920.....	4,959,962	1949.....	2,495,787	1978.....	2,197,457	2007.....	82,966
1921.....	4,435,186	1950.....	2,170,556	1979.....	2,111,080	2008.....	101,076
1922.....	3,687,489	1951.....	2,339,976	1980.....	2,532,321	2009.....	188,666
1923.....	3,440,810	1952.....	2,642,147	1981.....	2,308,619	2010.....	107,150
1924.....	2,787,047	1953.....	2,129,115	1982.....	1,481,942	2011.....	116,859
1925.....	2,367,122	1954.....	2,878,755	1983.....	1,076,884	2012.....	345,621
1926.....	2,571,540	1955.....	2,799,788	1984.....	1,142,493	2013.....	431,013
1927.....	2,260,898	1956.....	2,259,882	1985.....	1,557,091	2014.....	394,767
1928.....	1,993,591	1957.....	2,190,074	1986.....	976,162	2015.....	383,090
1929.....	1,839,772	1958.....	1,968,894	1987.....	363,259	2016.....	224,681
1930.....	1,775,738	1959.....	2,114,899	1988.....	397,180	2017.....	182,425
1931.....	2,041,043	1960.....	1,635,123	1989.....	413,113	2018.....	136,954

OYSTERING EVENTS OF THE PAST

A Timeline

- 1607: Captain John Smith writes in his journal about the abundance of oysters and other shellfish present in the Chesapeake Bay. Colonists at Jamestown feed on oysters as “hardship” food.
- 1785: The Compact of 1785 is signed between Maryland and Virginia in an effort to control violence on the Chesapeake Bay over oyster harvesting in the Potomac River, Pocomoke Sound, and the Eastern Shore.
- 1852: The Baltimore & Ohio Railroad reaches the Ohio River, expanding the market for oysters westward. People in the western states begin to buy over three million pounds of oysters annually.
- 1865: The oyster dredge, formerly prohibited in Virginia and Maryland, is legalized after the Civil War. Dredging flattens high-rise oyster reefs into oyster beds or “bars” on the bottom of the Bay. This makes the oysters easier to harvest, but also leaves them susceptible to suffocation from sediment. Wars between oyster dredgers and oyster tongers continue well into the 20th century.
- 1868: Over nine million bushels of oysters are harvested and sold for an average of 45 cents per bushel. The Chesapeake Bay oyster harvest becomes a 50-million-dollar industry. The “oyster police” form to collect license fees, enforce fishing restrictions, and protect private grounds.
- 1882: An Oyster Commission is formed to survey oyster beds. It recommends conservation measures and oyster fanning.
- 1893: The Culling Law is enacted. It sets a minimum legal size of three inches for market oysters and requires watermen to return shells with spat and young oysters to the oyster bars.
- 1914: World War I begins when Austria declares war on Serbia. The United States later joins Serbia and several other countries against Germany and Austria. Many watermen join the effort, but oyster harvest is primarily low due to disrupted trade, as well as harsh winter conditions on the Bay.
- 1933: While America is in an economic depression due to the crash of the stock market, few watermen are affected. It is the hurricane of 1933 that causes devastation to the oyster industry, when millions of gallons of freshwater are dumped into the Bay.
- 1941: When Japanese bombers attack Pearl Harbor, Hawaii, the United States enters World War II against Japan, Germany, and Italy. As with World War I, many watermen quit the oystering business to join the war effort, particularly in the Coast Guard.
- 1950s: A large number of watermen return to the oyster industry. There is a mini-boom when a huge oyster reef is discovered at Swan Point in the Potomac River. The oyster disputes of the previous century continue.
- 1960s: The Potomac Fisheries Bill is signed by President John E Kennedy in 1962. This bill sets up a bi-state commission to govern oyster dredging in the Potomac River and ends the conflicts over the Potomac River.
- 1972: Hurricane Agnes brings a massive flood of freshwater and sediment (dirt) into the Bay.
- 1980s: Two oyster diseases, MSX and Dermo, enter the Bay. Although they do not harm people, the diseases kill oysters as they reach market size (three inches).
- 1990s: People all over the world, from the Philippines to Japan to the United States, are experimenting with raising oysters in hatcheries to meet the growing demand for them and supplement the native stocks.
- 2000: Chesapeake Bay Program partners commit to increasing oyster populations 10-fold over the 1994 baseline by 2010 when they sign the Chesapeake 2000 Agreement.
- 2008: The final programmatic environmental impact statement for the potential introduction of a non-native oyster in Chesapeake Bay is published. Based on extensive scientific research and evaluation, Bay Program partners reject proposals to introduce a non-native oyster from Japan and re-commit to restoring the Bay’s native oyster species.
- 2009: President Barack Obama signs Executive Order 13508 directing a number of federal agencies to coordinate the restoration of Chesapeake Bay, including its oyster populations.
- 2014: Chesapeake Bay Program partners sign the 2014 Chesapeake Bay Watershed Agreement, committing to restore oyster populations in 10 Bay tributaries by 2025, charting a new course for large-scale oyster restoration in Chesapeake Bay.
- 2015: Construction on Maryland’s first restoration tributary, Harris Creek on the Eastern Shore, is complete.
- 2018: Construction on Virginia’s first restoration tributary, the Lafayette River, is complete.

PROCEDURE: PART II

In this section, you will attempt to create a filtering device that can out-filter the oyster. One of the most important functions of the oyster is its ability to filter sediment and pollutants out of the water.

- 1.** Collect materials from your house that you think will act as a filter (cotton balls, cheesecloth, gravel, sponges, rubber bands, coffee filters, strainers, etc.). The filtering ability of your device will be compared to the oyster in terms of EFFECTIVENESS (how clean it makes the water) and SPEED (how fast water gets through the system).
- 2.** You may build your machine in whatever way you think is best, but you must follow the guidelines below:
 - Give your filtering device a name.
 - Draw a plan or “blueprint” of your device before you begin to build it.
 - Build your test model.
- 3.** Now, do a test run to test the effectiveness of your filtering device.
 - Add 5 milliliters of soil to 250 milliliters of water.
 - Stir to mix thoroughly.
 - Pour the mixture into your filtering device (scrape out any mud from the bottom of the cup). Start timing as soon as you begin pouring and stop timing at the end of one minute.
 - At the end of one minute quickly remove the collection container from your filtering device (place another container beneath your filter device so that it does not continue to drip onto your table).
 - Measure the water that filtered into the collection container in a clean graduated cylinder or measuring cup.
- 4.** What happened? Does your filtering device clean the water both quickly and effectively? Answer the following questions to find out:
 - How fast was your filtering device? In the space below, record the quantity of water filtered in one minute.

 - How clear is the water that was collected after filtering? Describe the clarity (clearness) of your water in the space below (compare it to what it looked like before it went through your filtering device).

 - In the space below, explain why your device was (or was not) an effective filtering device.

MACHINE vs. NATURE**Your Filtering Device****The Oyster**

<p>Rate How long would it take to filter 7.6 milliliters of water? (See question 1 in Part III.)</p>		
<p>Fuel What is needed to power the filter? (fuel, people power, habitat etc.)</p>		
<p>Maintenance How is the device maintained?</p>		
<p>Cost What does it cost to build the filter?</p>		
<p>Benefits How does the Bay benefit? How do people benefit?</p>		
<p>Disadvantages What are the disadvantages?</p>		

5. Although oysters still face many problems, people around the Bay are finding ways to help bring oysters back to their former abundance by restoring oyster reefs and raising oysters in hatcheries and oyster gardens. Look at the timeline that you constructed in Part I of this activity and add the years 2020-2040 to your timeline.
6. Considering the efforts to restore oysters, but also the problems that oysters continue to face, draw an extension to the timeline that predicts oyster harvests until the year 2040. Use a different color for this prediction part of the timeline.
7. If your prediction shows a rise in the oyster population, explain what might bring about the increase. However, if your prediction shows a further decline in the oyster population, explain what might bring about the decrease.

8. You can affect the future of the oyster in the Chesapeake Bay. Brainstorm to come up with two actions that you can take to help increase the population of oysters.

9. Comic strips and cartoons are often used to express opinions or educate others about serious issues in a fun way. On a separate sheet of paper, use one of your ideas from step 8 to create a comic strip to educate others about the importance of oysters. Be creative!

DIVE DEEPER:

- Read: *The Lord's Oyster*** by Gilbert Byron **Read: *Oyster Moon*** by Margaret Meacham



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