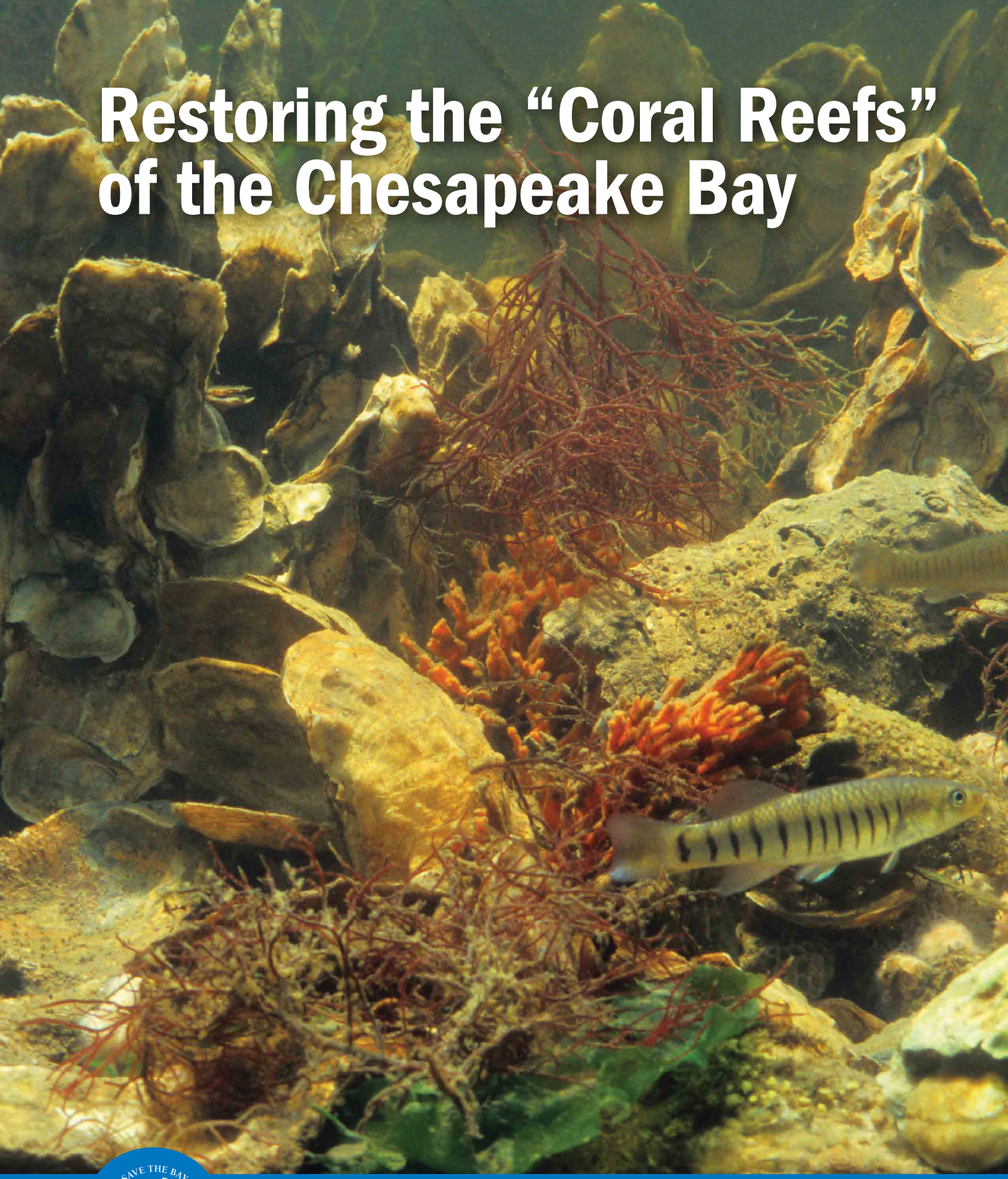
Restoring the "Coral Reefs" of the Chesapeake Bay



CHESAPEAKE BAY FOUNDATION
Saving a National Treasure

cbf.org/oysters

The Benefits of Oyster Reefs

Structure and Flow

Three-dimensional reef systems affect the physical environment within the Bay in the same way that mountain ranges affect weather patterns. Reefs interrupt currents, speeding them up and creating turbulence behind the reefs. Many reef organisms have evolved to take advantage of such currents and are less abundant or non-existent in a flat habitat. We know that oysters thrive at the tops of three-dimensional reefs where faster currents bring more food, and mud and silt can't bury them. Reefs also increase oxygen levels as the currents flowing around them mix oxygen down into the water column. One scientist called vertical reefs "an organizing force for the estuarine system."

Habitat and Diversity

Oyster reefs are more than just mounds that change water flow. The intricate latticework of shells provides diverse habitats for many small plants and animals that make their homes on reefs. Some attached animals, such as barnacles, mussels, and bryozoans, lie flat against the oyster shell. Others like redbeard sponges, flower-like anemones, and feathery hydroids branch out into the water. Mobile invertebrates such as mud crabs, oyster drills, and grass shrimp inhabit the nooks and crannies. Small fish—including blennies, gobies, and skillet-fish—are also common on reefs. The abundance of life draws larger animals such as striped bass and blue crabs that come to the reefs to feed. Oyster reefs are like coral reefs in the way they support a diversity of life.

Clean Water

When oysters and other reef species feed in the currents, they filter the water for small particles, usually microscopic plants called phytoplankton. A single oyster can filter up to fifty gallons of Bay water a day. They remove algae, bacteria, and bits of decayed material. Oyster feces and the other matter they discard fuel the reef community where bacteria convert the nitrogen it contains into a harmless form. It has been estimated that the filtering ability of the Bay's oysters was diminished by 99 percent due to their depletion and the destruction of their reefs. The loss of this major natural filter compounds the problems caused by nitrogen and phosphorus pollution and the over-abundance of phytoplankton it causes.

Number of Organisms in One Square Meter of Oyster Reef

	Restored	Un-Restored
Black-clawed Mud Crab	108	3
Flat Mud Crab	90	1
Grass Shrimp	40	1
Scud	43	2
Soft Shell Clam	122	42
Barnacle	3040	89
White Anenome	74	24

Sites restored with high densities of oysters can have ten or twenty times as many organisms as unrestored sites. Three-dimensional substrates like reef balls can double or triple the surface area for oysters and the reef community to inhabit compared with flat bottom.

Chart adapted from W.S. Rodney and K.T Paynter 2006

Two hundred years ago a journey up the Chesapeake Bay required more careful navigation. Instead of a flat sandy surface, the bottom was rich with oyster reefs extending to the surface. It was common for these reefs to pierce the surface at low tide. Although memories of these reefs are gone, it wasn't very long ago that these great reefs, like the barrier reefs of Australia, dominated the underwater landscape in the Bay.

Unfortunately, we have grown accustomed to thinking of a largely flat bottom beneath the Bay's surface. We talk of "oyster beds" and "bars." But this is not the natural state. Oysters grow vertically, one on top of the next, reaching upward through the water. When they spawn, they produce tiny larvae that drift with the currents for a few weeks and then settle and attach to other oysters. Over thousands of years, these "communal" animals that cluster together in colonies created a mountainous landscape that lined the Bay's channels and spread toward its shores.

> "The abundance of oysters is incredible. There are whole banks of them so that the ships must avoid them."
>
> Francis Louis Michel, a visitor to the Chesapeake Bay in 1701.

When the colonists first arrived, a massive reef system extended throughout most of the Bay and its tidal tributaries. Then modern technology came along and scraped them away. Most of the reefs are now gone. What was once a three- dimensional aquatic jungle, is now a flat desert by comparison. Increased harvesting began to shrink the reef system about two hundred years ago, and little is left of it today. The widespread use of oyster dredges during the post-Civil War oyster boom hauled so many oysters from the bottom that the Chesapeake supplied two-thirds of all the oysters eaten around the world.

The scale of the once-booming oyster fishery is evident from this shell pile of a Virginia oyster processing plant (circa 1900).

Black sea bass, reef-dependent fish not seen in the Choptank River in generations, now frequent the oyster-covered reef balls that were placed in the Cook's Point Sanctuary in the lower river.

Trying to Turn the Tide: Bringing Back the Beds is Not Enough

Most often, oyster restoration involves spreading a layer six to 12 inches thick of shell or other material on which hatchery-produced baby oysters are planted. This approach is successful at establishing high densities of oysters and a community of associated organisms. But it does not create the very important vertical structure that restores the bottom topography and reef habitat that once was common in the Bay and its tributaries.

We Need Scaffolding

It took thousands of years for the Bay's reefs to grow naturally. Fully restoring reefs will require us to create vertical structure on the bottom where oysters can grow in an optimal habitat. When available, shell has been used to create vertical relief, especially in Virginia. But oyster shell is in short supply. For centuries it was used for making mortar and roads before its value to the Bay was understood. Today, alternative materials like concrete, granite, and fossilized oyster shell must also be used to provide enough substrate for reef restoration.

Reefs as Part of a Network

Piling up alternative material or placing concrete reef balls or other reef structures is a practice often used for building artificial reefs to attract fish. They may provide hard surfaces for oysters, but they're usually not located or built with oyster habitat in mind. For instance, if there are no existing oyster reefs nearby, there will be no supply of oyster larvae to populate a reef. In the natural state, oyster reefs form networks of complex habitats that feed one another as currents move larvae and small organisms throughout the system.

"Three-dimensional reefs, standing substantially above the bottom, are essential for oyster reproductive success, for predator protection, and to create habitat for other organisms."

Chesapeake Research Consortium report, 1999. *Chesapeake Bay Oyster Restoration: Consensus of a meeting of scientific experts.*

The Chesapeake Bay Foundation, the Maryland Environmental Service, the U.S. Army Corps of Engineers, and others are now using concrete reef structures, like reef balls, to restore vertical structure.

Rebuilding the Reefs

State and Federal agencies are committing millions of dollars annually to restore oysters to the Bay and its tributaries. They are focusing their efforts in targeted areas that are off-limits to oyster harvesting.

As we move forward in our efforts to restore a healthy oyster population, we must consider the important role that vertical structure plays in a healthy reef system. However, some approaches to restoring vertical structure aren't always popular. Opposition has come from certain stakeholders, concerned that reef balls or other materials may interfere with some harvest techniques, such as trotlining for crabs, and navigation.

This mindset disregards the fact that large oyster reefs once pervaded the Bay and shows little appreciation for the immense value of these live structures. Unfortunately, people have grown accustomed to a flat-bottomed Chesapeake Bay. History tells us that three-dimensional oyster reefs belong in the Bay. It's time to jog our collective memory and do what's needed to recreate this vital habitat for oysters and for a healthier Bay.

PHOTO CREDITS: Page 1: Dave Harp; Page 3: Michael Eversmier; National Archives; Page 4: Top to bottom, CBF Staff; Bill Goldsborough/CBF Staff; Tanner Council/CBF Staff

Support Efforts to Restore Three-Dimensional Reefs to the Bay

SPREAD the word to your neighbors and friends about how important oysters are to the health of the waters and wildlife of the Bay.

SHARE your support for oyster recovery—and especially the unique value of vertical reefs—by writing a letter to your local paper or to state officials responsible for oyster restoration.

VOLUNTEER with CBF's active oyster restoration program by building reef balls, cleaning shells, or becoming an oyster gardener. Visit cbf.org/oysters for more info.

Baltimore students volunteered their time after school to count and release about 3,680 baby oysters on a small man-made reef in their local river.

CHESAPEAKE BAY FOUNDATION
Saving a National Treasure
cbf.org