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# OYSTER RESTORATION IN MARYLAND

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## OVERVIEW

Within Maryland DNR's Fisheries Service the Shellfish Division is responsible for the maintenance and restoration of Maryland's oyster population. In the late 1800's and early 1900's unregulated over-harvesting lead to the initial decline in the oyster population. Then in the 1980's the oyster diseases MSX and Dermo caused another drastic decline in the population. Harvests which exceeded 15 million bushels in the late 1800's and sustained an average of 2 to 3 million bushels through much of the mid 20th century, dropped to 79,000 bushels in 1994. In 1960, the State of Maryland started an oyster repletion program in response to declining harvests. Today, along with many other groups the Maryland DNR works to not only restore oysters for harvest, but also for their ecological contributions to the Chesapeake Bay. It is this balance that DNR tries to maintain, working to have a healthy industry and a thriving oyster population for the Bay's ecology.

## OYSTERS - What Happened?

The Chesapeake once teemed with oysters. Tens of thousands of acres of oyster bottom lined the Bay. Oysters have always been an important part of the diet of those who lived on the Atlantic coast, from the Native Americans and the Colonists to modern America. In the late 1800's the oyster fishery in the northeast United States collapsed, leaving a large demand for product and a large number of watermen out of work. So they and their boats migrated south to the Chesapeake Bay. There were no regulations or limits of any kind, oysters of all sizes and the shell they lived on were harvested and either processed locally or shipped out of state by the train load. As the years passed, the harvest, which peaked at around 15 million bushels, declined to an average of about three million bushels.

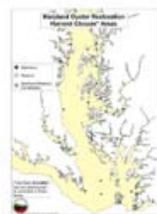


Then came disease. As early as the 1960's the Bay started seeing the effects of the parasites. It wasn't until 1987 that the major impact of the oyster diseases were felt. The diseases, MSX and DERMO, are parasitic organisms that infect the oyster and can lead to its death. The diseases cause mortalities ranging from 30% per year up to 90% in some areas. These rates result in extreme declines in populations, such as the crash of 1994 which resulted in the all time low harvest of 79,000 bushels. While the population has increased some since then, disease still holds sway in the bay. Areas that historically had an average of 5% mortality per year now have levels well above 30%. Trying to restore oysters in the face of these devastating diseases is a daunting task. Both diseases thrive in higher salinities, so that the mortality is much higher in the lower parts of the Bay. MSX is more salinity dependent and is primarily found in the lower Bay though drought conditions have seen it

...dependence is primarily found in the lower bay, though enough conditions exist to advance higher up the Bay. Dermo is found throughout the Bay, but is more deadly to oysters in the higher salinity areas. The main difference between the two is how fast they work. MSX can kill oysters of all ages; it can kill spat as easily as an adult. Dermo takes time to kill an oyster, accumulating the parasite until it reaches a certain intensity and dies. So while an oyster with MSX will die, an oyster with a light Dermo infection can survive as long as the intensity doesn't increase to the critical level.

### **REPLETION - Oysters For The Industry**

The repletion program was started by the State of Maryland in 1960 in response to declining annual harvests. The program consisted of the planting of oyster shell dredged from the upper bay in different areas to restore habitat. The other part of the Repletion program was the moving of seed oysters from State seed bars to areas with low recruitment to boost populations in those areas. These programs continue today, much as they have for the past forty years. It is estimated that about 80% of the harvest comes from areas that DNR has planted with seed and/or shell.



### **RESTORATION - Oysters For The Ecology**

In the late 1980's and early 1990's it was decided that there needed to be efforts to restore oysters purely for the ecological role that they play in the Bay. Restoration efforts use many different methods, but instead of being maximized for harvest potential, restoration sites are designed for maximum habitat and ecological improvement. To allow oysters at a restoration site to grow and flourish into a thriving reef community, they need to be left unharvested. To protect the oysters, restoration sites are made into sanctuaries, where no shellfish harvest is allowed. As a sanctuary the fragile reef community is protected from being disturbed. DNR currently has 24 sanctuary areas throughout the Bay. They range in size from around 5 acres to over 5,800 acres, the entire Severn and Magothy Rivers are examples of two of the larger sanctuaries.

### **RESERVES - The Compromise**

Reserves are areas where restoration type efforts are done and then the site is closed like a sanctuary for a period of five years. At the end of the five year closure the site is opened for a managed harvest, and then when the set amount is harvested from the site it will be closed again. In this way the area gets all the benefits of a good oyster population and the industry has a storehouse of oysters that they will be able to eventually take from. There are currently 19 reserves in Maryland.

### **METHODS - How We Do It**

Repletion and restoration activities use many of the same methods. Projects basically fall into two categories, habitat improvement and population enhancement. Habitat improvement increases the quality of the bottom for growing oysters while population enhancement increases the actual number of oysters.

#### **Shell Planting**

Shell planting has been a part of oyster restoration for forty years. Oyster shell from upper bay deposits are dredged and moved by [barge](#) to selected restoration sites around the bay. The shell is then [planted](#) over the bottom in a layer 4" to 8" thick, depending on the existing bottom conditions. This leaves a nice clean layer of shell which is ready to accept a natural spat set or receive hatchery produced oysters. Shell is the



preferred setting substrate for oyster larvae, and as such has been the keystone of oyster restoration since it began. DNR plants an average of 2.5 million bushels of dredged shell every year.

Another aspect of shell planting is [fresh shell](#). Fresh shells are the byproduct of Maryland's oyster shucking and packing industry. Approximately 200,000 bushels of fresh shell come from Maryland's processors every year, but amounts are declining as the harvest declines. Most of the fresh shell is planted like the dredged shell, while some goes to the State oyster hatcheries for production of spat-on-shell.

Having been a part of Maryland's efforts for over forty years, the areas from which the State collects buried shell are almost exhausted. New areas exist in the Bay but obtaining permits to remove the shell is difficult and debatable. It is important, therefore, to conserve the remaining shell supply. To conserve the remaining shell, DNR is looking at new methods of habitat restoration, such as the use of alternate materials and bar cleaning.

### **Seed Planting**

[Seed planting](#) is another staple for the State's restoration and repletion activities. Seed essentially comes in two different forms, natural seed and hatchery seed. Natural seed is a product of the repletion program. DNR makes large shell plantings in areas that receive a regular spat set to catch the natural larvae which are in the water. These areas are usually in the lower part of the Bay where recruitment is good, but disease will limit survival. The spring after the larvae set DNR comes back and [harvests](#) the new oyster seed. It is then moved to different parts of the Bay where natural recruitment is low, but disease pressure is less and survival will be better. In this way areas of high productivity but low survival can help supplement those areas of low productivity and high survival. So we can help maintain a harvest in certain areas that on their own may not be able to sustain themselves.

[Hatcheries](#) allow us to have a higher level of control over the oyster production. Seed produced at hatcheries is used mostly for the restoration program. In the hatchery we can select the broodstock which is used, the amount of larvae, the food, temperature and a number of other variables that are uncontrollable out in nature. The seed produced for the restoration program is called spat-on-shell. Oyster shell, which comes from Maryland shucking and packing houses, is placed in [mesh bags](#) and placed in tanks at the hatchery. The tanks are filled with water and larvae produced at the hatchery area added, where they will then set onto the shells. After a few weeks at the hatchery the spat-on-shell is moved out and planted at various restoration sites. Since there is so little time between setting and planting, the hatchery produced oysters are nearly always disease free, and thus preferred for restoration projects. Hatchery seed results in clumped oysters, compared to natural seed, due to the high setting densities on the shell. A hatchery clump may have between 5 to 10 oysters per shell.

### **Alternate Materials**

The upper Bay shell reserves which have supported the shell program for forty years are running out. Within the next few years these areas will be exhausted of the shell the program needs. To help conserve the remaining shell we need to look into alternate types of materials to take the place of shell. Recycled brick, concrete, stone and slag are just a few examples of the types of materials being considered. Another material would be preformed concrete modules that would provide both a setting substrate and structure for fish and other organisms. These materials would either form the base of the planting and then be covered with a veneer of shell or would be planted by itself and receive a seed planting over it. Shell is a finite resource and the use of alternate materials will help conserve shell for the projects where it is needed the most.

### **Bar Cleaning/Shell Excavation**

The other main option to conserve dredged shell is to use the shell that is already at the project site but may be silted over or buried under a layer of sediment. Heavy use of the

watershed for development and other needs has resulted in vast amounts of sediment polluting the Bay and covering once plentiful oyster habitat. Both natural bars and the many shell plantings made by the State have over the years become silted over. DNR is looking at different ways in which we could utilize that shell, bringing it back to the surface to once again be usable by oysters. There is a wealth of shells in the Bay bottom now.

In the past bar cleaning mainly comprised of "Bagless Dredging". This consisted of taking a harvesting dredge, removing the catch bag or opening it up and dragging it across lightly silted bars to stir the shell up to the surface. This technique met with limited success. The method which is being looked at now, shell excavation, uses escalator dredges on clam boats to dig around a foot into the bottom to bring shell up. The shell gets much cleaner and can be moved to a nearby area of firmer bottom. Use of "in situ" shell is going to be a critical part of restoration in the future, but cleaner and more efficient methods of bringing up the shell need to be developed. The use of clam rigs is small scale and experimental.

### **PARTNERSHIP - Working Together**

Forty years ago the State was the only group doing oyster restoration activities in the Chesapeake. Today there are a wide variety of interest groups involved in oyster restoration. From the Federal government to Non-governmental organizations and local community groups, the array of people who are a part of the restoration effort keeps growing. The 2000 Chesapeake Bay Agreement set forth the restoration goal that all the partners are working towards. This is the 10-fold increase in oysters in the Chesapeake Bay by the year 2010, starting from the population's lowest point in 1994. The expertise, manpower and funding these groups have been able to bring to the effort is considerable. And will be necessary to make progress towards the 10-fold goal.

The major partners are:

- Federal government
  - US Environmental Protection Agency
  - NOAA
  - US Army Corps of Engineers
- State Government
  - -Maryland Department of Natural Resources
  - Maryland Environmental Service
  - Maryland Department of The Environment
  - Maryland Department of Transportation
  - University of Maryland
- Non-Governmental Organizations
  - Chesapeake Bay Foundation
  - Oyster Recovery Partnership
  - Living Classrooms Foundation
- Community Groups
  - Magothy River Association
  - South River Federation
  - Severn River Association

There are opportunities to help out as an individual also. The Chesapeake Bay Foundation has an excellent oyster gardening program for people with waterfront property or pier access, to grow oysters for planting in sanctuaries. Also the Oyster Recovery Partnership is often looking for volunteers to help out with various projects. So go out and get involved, from spending some time getting dirty planting oysters to spending some money so that others can, the Bay needs your help.