Arundel Rivers Federation

Oyster Growers Manual
Welcome to *Marylanders Grow Oysters*, in partnership with the Arundel Rivers Federation, where hundreds of waterfront property owners are growing millions of young oysters in cages suspended from private piers. Their goal? To protect young oysters during their vulnerable first year of life, so they may be planted on local sanctuaries where the oysters enrich the ecosystem and our oyster population.

There is no charge to participants, but the rewards – both personal and ecological – are significant. By fostering these young oysters, our citizen partners are also generating an abundance of fish and other aquatic life and creating live bottom, populated by oysters and other creatures, on sanctuaries closed to harvest.

[www.arundelrivers.org](http://www.arundelrivers.org)
[www.oysters.maryland.gov](http://www.oysters.maryland.gov)

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Published May 2019
Marylanders Grow Oysters
Standard Operating Procedures

The mission of the Marylanders Grow Oysters program is to protect young oysters during their vulnerable first year of life, so they can be planted on local sanctuaries where the oysters enrich the ecosystem and expand our local oyster population. Adherence to proper husbandry techniques is crucial for the survival and well-being of the oyster spat.

1. Oysters Growers should read and adhere to the recommendations in this Manual.

2. Growers are responsible for picking up their oyster spat in late summer or early fall during select spat pickup times.

3. Hanging your Cages
   3.1 Oyster cages must be secured to the dock with a rope. The cages should be suspended in the water column and should not sit on the river bottom.
   3.2 Cages should be tied off about one foot below the surface of the water at low tide. If the tide drops lower than normal, brief exposure to the air is not an issue as long as the air temperature is above freezing.
   3.3 In the winter it is essential that the oysters remain underwater whenever there is a chance of freezing air temperatures. Winter tides can drop very low, so careful observation is needed to make sure the oysters are always in the water – prolonged exposure to freezing air can kill the oysters.
4. **Taking Care of Your Oysters**
   
   The care you provide your young spat is critical to their survival. The cages protect the spat against predation by blue crabs and other predators, and suspension in the water column protects them from burial in the muddy or sandy bottom. However, periodic cleaning and attention to how the cages are hanging from your pier is necessary to rinse off algal buildup and ensure healthy baby oysters.

   4.1 The cages must be cleaned on a regular basis to remove build up of silt and algae. Left uncontrolled, heavy fouling can restrict water flow and reduce oyster growth, or result in oyster mortality.

   4.2 Cages can be shaken by pulling the cages up and down a few times or hoisted onto the pier and hosed off to remove the silt.

       4.2.1 Cleaning must be done at least twice a month, preferably every week.

       4.2.2 If the surface water is frozen, you do not have to break it to get to the cage. As soon as it melts, resume the normal maintenance schedule.

   4.3 To further control fouling, the cage (with the oysters in it) can be left out of the water for up to four to six hours, during which time the fouling organisms will dry out and die. This can be done up to once a week during warmer months, however, the oysters should not be exposed to heat or direct intense sunlight for longer than two hours or they may die.

   4.4 Once you are finished cleaning the oysters, re-hang them from your pier.

5. The Federation encourages growers to deposit their oysters on the sanctuary reef themselves. A map with coordinates for the reef is attached to this Manual. If a grower is unable to deposit their oysters on the reef, it is the grower’s responsibility to contact the RIVERKEEPER to request assistance.

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*Contact the Federation office if you have any questions about any of these processes.*

Office Phone Number: 410-224-3802

South RIVERKEEPER® Jesse Iliff: jesse@arundelrivers.org
Oyster Anatomy

Diagram: Maryland Sea Grant

Diagram: http://lanwebs.lander.edu/faculty/rsfox/invertebrates/crassostrea.html
# Oyster Anatomy: Glossary Terms

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<tr>
<th>Term</th>
<th>Description</th>
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<tr>
<td>Adductor Muscle</td>
<td>A prominent organ situated in the posterior region of the oyster body, consisting of an anterior translucent part and a smaller, white crescent-shaped region. It functions to close the oyster shells (relaxation of the adductor muscle allows the shells to gape open).</td>
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<tr>
<td>Anus</td>
<td>The opening of the rectum into the cloacal chamber.</td>
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<td>Cilia</td>
<td>Hair-like structures used for motility in some protozoans and for the movement of particles or fluids in certain cells of more advanced organisms.</td>
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<td>Cloacal Chamber</td>
<td>A chamber which passes excess water and waste from the oyster into the environment. In addition, it houses the adductor muscle and rectum.</td>
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<td>Digestive Gland</td>
<td>The gland responsible for the production of digestive enzymes.</td>
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<tr>
<td>Epibranial Chambers</td>
<td>A chamber that is formed by the fusion of the mantle and visceral mass and the base of the gills and houses the gills, mouth and labial palps.</td>
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<tr>
<td>Esophagus</td>
<td>Tube that connects the mouth with the stomach.</td>
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<td>Gills</td>
<td>The gills are the largest organ in the oyster's body and consists of four folds of tissue. Along with the mantle it is the chief organ of respiration. They create water currents, collect food particles, and move food particles to the labial palps for further sorting. Also serve to separate masses of eggs released from the ovary during spawning into individual ova for efficient fertilization.</td>
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<tr>
<td>Hinge</td>
<td>The area formed by the joined valves at the anterior of the oyster.</td>
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<tr>
<td>Intestine</td>
<td>Organ used for the transport of undigested material and transport of nutrients.</td>
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<tr>
<td>Labial Palps</td>
<td>Consist of two pairs of large, soft flaps that have a roughly triangular shape and have a smooth surface and a rough surface. These specialized organs are known to control the total amount of food ingested, but may also sort food before ingestion, perhaps on the basis of particle size or chemical composition.</td>
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<tr>
<td>Mantle</td>
<td>Two fleshy folds of tissue that cover the internal organs of the oyster and are always in contact with the shells but not attached to them. Its principal role is the formation of the shells and the secretion of the ligament as well as playing a part in other biological functions (i.e., sensory reception, egg dispersal, respiration, reserve stores, and excretion).</td>
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<tr>
<td>Mouth</td>
<td>The inverted U-shaped slit located between the inner and outer labial palps.</td>
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<tr>
<td>Pericardial Cavity</td>
<td>Cavity containing the heart.</td>
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<tr>
<td>Pseudopodia</td>
<td>&quot;False feet&quot; that extend from the hemocyte that enable mobility and capture of foreign bodies and other materials.</td>
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<tr>
<td>Rectum</td>
<td>Organ that is the continuation of the intestine; it runs dorsally over the adductor muscle and ends in the anus, and aborts water while consolidating feces.</td>
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<tr>
<td>Stomach</td>
<td>A large sac-like organ that is divided into two chambers used in the digestion and sorting of food particles</td>
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<tr>
<td>Tentacles</td>
<td>Small sensory organs attached to the edge of the mantle used for the detection of environmental stimuli.</td>
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<tr>
<td>Umbo</td>
<td>The anterior end of the oyster. It is pointed and the oldest part of the oyster.</td>
</tr>
<tr>
<td>Valves</td>
<td>The two shells of the oyster.</td>
</tr>
</tbody>
</table>

Source: Maryland Sea Grant: Oysters in the Classroom: [www.mdsg.umd.edu/issues/chesapeake/oysters/education/glossary.htm](http://www.mdsg.umd.edu/issues/chesapeake/oysters/education/glossary.htm)
Oyster Life Cycle and Disease

Oyster Over-Harvest, Disease and Habitat Loss
Source: Chesapeake Bay Program

Historic over-harvesting
In the seventeenth century, huge numbers of oysters lived in the Bay. European settlers reported enormous oyster reefs that thrust up from the Bay’s bottom, posing navigational hazards to their ships. Colonists first used hand tongs to harvest oysters, but by the 1800s, dredges were also in use. In the 1850s, more than 1.5 million bushels of oysters were harvested from the Bay each year; three decades later, this number jumped to 20 million. At the turn of the twentieth century, the Bay’s oyster fishery was one of the most important in the United States. But over-harvesting removed huge volumes of oysters from the Bay and led to the demise of the Bay’s healthy reefs. Because these reefs have been scraped away by dredges, oyster beds are now often limited to flat, thin layers of dead shell and live oysters spread over the Bay’s bottom. These damaged habitats offer less surface area for reef-dwelling critters to inhabit, and can be easily buried by sediment.

Disease
In 1949, scientists discovered Dermo in the Bay. MSX was discovered in the region a decade later. Dermo, or Perkinsus marinus, is a parasite that most often infects oysters during their second year of life, causing slowed growth rates and death. MSX, or Haplosporidium nelsoni, also leads to oyster death, but can affect oysters of all ages. Both diseases are contracted between May and October, and their prevalence can be affected by water temperature and salinity. Overcoming the effects of Dermo and MSX has posed a challenge to oyster restoration. It is estimated that by age three, 80 percent or more of a single oyster year class in a high disease area (like the Virginia portion of the Bay) will die due to disease.

Habitat loss
Over the past century, the watershed has experienced a change in land use, as urban, suburban and agricultural areas have replaced forested lands. This has increased the amount of nutrients and sediment entering our rivers and streams.
and contributed to the poor water quality that affects aquatic life. Excess nutrients, for instance, fuel the growth of algae blooms that create low-oxygen “dead zones” that hinder the development of oyster larvae; sediment can suffocate oysters and other shellfish. Stress related to poor water quality can make oysters more susceptible to disease.  
Source: https://www.chesapeakebay.net/issues/oysters

More About Oysters

Oysters are vegetarians.  
They eat algae -- microscopic plants that are rich in nutrients. The algae are filtered from the water by their gills. Mucous on the gills trap the algae. Special cilia on the gills move the trapped algae to the oyster’s mouth.

Oysters reproduce in summer.  
Oyster larvae float in the water for about 10-18 days, and then they settle to the bottom where they attach to a hard clean surface. After attaching, they grow into oysters and never move again.

Newly attached oysters are called spat.  
Spat are oysters less than 1 year old. Oyster spat require a hard clean surface on which to attach. While oyster shells are preferred for spat settlement, spat can attach to other types of shells and even rip rap, bulkheads, stones and other hard surfaces. Larvae that settle on mud or sand will die.

Oysters change sex.  
Young oysters are mostly male. At 2 years old, most have changed to females. Older oysters are almost all female.

An oyster bar is a rich, diverse ecosystem.  
Oysters provide habitat to many other creatures, making an oyster bar a living reef. Numerous attached organisms grow on the outside of oysters, such as mussels, barnacles, sponges, hydroids, amphipods, worms and bryozoans. These organisms attract fish and crabs.

Oysters grow about an inch a year; a 3-inch market oyster is about 3 years old.  
They grow slower in lower salinity (like the South River--about 1/2 an inch per year), and faster in higher salinity, sometimes reaching market size in 2 years.

Oysters filter water.  
In ideal laboratory conditions, mature oysters can filter upwards of 50 gallons a day. However, our Rivers do not present ideal conditions and a mature oyster in the River most likely filters closer to 10-20 gallons of water in a day. Today’s depressed oyster population requires improvement in issues like stormwater runoff controls to make the Rivers healthier for the oysters and enable them to reach their full filtering potential. Healthier Rivers will yield healthier and more efficient oysters.
Frequently Asked Questions

How big are the cages?
The cages are 18” long by 1 foot wide.

What do I do with my cage in the winter when the creek freezes over?
Simply adjust the line and lower your cages until they are several inches above the bottom, but not on it. The oysters must be totally under water at all times for the oysters to survive. Your oysters will not freeze as long as they are in the water. If they are exposed to sub-freezing air, they can die.

Do I need to feed my oysters?
No. Oysters eat algae and the Bay provides it for them.

I can't see any spat. Did I get blank shells?
Spat from the hatchery are very small and may not be readily visible. Let them grow about a month or two and they will be larger and easier to see. If by then you still do not see any spat, let us know.

What if my oyster cage becomes heavily fouled?
Scrub your cage with a brush (no detergent or soap) and dip it in the water or hose it down. This accumulation of fouling organisms (similar to what grows on your pilings) is normal but can accumulate and become a nuisance. It can also make your cage very heavy.

Why are my spat growing so slowly?
Slow growth could be due to siltation, low salinity, or low temperatures. The only thing a grower can do to help is make sure the spat are clean.

What happens at the end of the growing period?
In May and June you will have the opportunity to plant the oysters in the sanctuary yourself by boat or drop them off by car during a collection date. You will keep the cages to begin care-taking another group of spat if you choose to continue participating in the program. If not, please return your cages to the RIVERKEEPER.
Where will my oysters go?

Will the oysters I grow be moved away from my river or do they stay here?

The oysters will be planted in a sanctuary located in your river. You and your fellow growers are working to help your area, hence the oysters stay there. If you are in a creek off the river, your oysters will be moved to the main river for planting in the sanctuary because small creeks and coves rarely have suitable bottom for planting oysters.

To give the oysters the best chance at long term survival in the South River, they will be placed in the Glebe Bay Sanctuary. We are currently exploring new areas for sanctuary reefs in the West and Rhode Rivers, and Herring Bay.

Location of the Sanctuary in Glebe Bay
Do Not Eat Your Oysters!

The goal of this project is to make a contribution to the ecology of the river. The oysters you grow will be planted in a sanctuary where an oyster reef community of fish, crabs and other organisms can develop. You may find that fishing over the reef is better than in other locations.

The Maryland Department of the Environment advises that oysters from this project not be eaten due to the potential presence of harmful pathogens in near-shore waters where the cages are kept. Shellfish are filter feeders. As they strain the water for algae they also trap disease-causing organisms that may exist near the pier. The oyster seafood industry is highly regulated, and deeper waters where oysters are harvested are carefully monitored to ensure that the seafood is safe for human consumption.

See Fact Sheet MDE RECOMMENDS AGAINST EATING OYSTERS GROWN FROM PRIVATE PIERS for more information.

If you have any questions about this issue, please contact MDE at 410-537-3608. Source: MDE
Arundel Rivers Federation Oyster Research Project

In an effort to expand our understanding of growing oysters in our Rivers, Growers are invited to participate in a research project to monitor oyster growth and mortality. Participants will measure the length of spat and track mortality levels throughout the growing season. A random, unbiased sample must be used to create the most accurate representation of your entire oyster population. It is important not to intentionally select shells that exhibit a certain characteristic because that will skew the data. These measurements must be taken a minimum of once a month excluding the times when the surface water is frozen over. Data will be recorded on the following data sheets and submitted to Jesse Iliff at jesse@arundelrivers.org.

How to Measure your Oysters

- Measure each live oyster from umbo to bill (lengthwise). Do not measure the old shell used to set the spat.
  - You are measuring the spat, not the shell they are on.
  - Note: A dead oyster or box, will be gaping open or discharge water when squeezed.
- A standard ruler or calipers may be used. If you use calipers, place the oyster on the inside as seen below.
- Report your measurement in millimeters.
- When you are finished, place all oysters, live and dead, back into the cage and call in or email your results to the RIVERKEEPER.
Arundel Rivers Federation Oyster Data Sheet

From one of your cages, select 20 oyster shells at random. Measure each live spat present on the shell in millimeters. Do not measure the “dead” adult shells. See guide book for a review on measurement.

Name:______________________________ Date:______________________________

Cage #:______________________________ Dissolved Oxygen: __________________

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<th>Shell #</th>
<th>Live</th>
<th>Box</th>
<th>Scar</th>
<th>Spat in millimeters</th>
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Marylanders Grow Oysters
Partner Tributaries

Initial Tributary in 2008
- Magothy R.
- Severn R.
- Mill, Whitehall & Meredith Creeks.
- Oyster Cr.
- South R.
- Rhode R.
- Chesapeake Beach
- Patuxent R.
- Wicomico R.
- Breton Bay
- St. Mary's R.

Additional Tributaries Since 2008
- Magothy R.
- Severn R.
- Mill, Whitehall & Meredith Creeks.
- Oyster Cr.
- South R.
- Rhode R.
- Chesapeake Beach
- Patuxent R.
- Wicomico R.
- Breton Bay
- St. Mary's R.