



How to be an Oyster Gardener

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This brochure contains the collective wisdom of a family of oyster gardeners. We've summarized the things we have learned over the past 25 years in a simplified, easy to read format.

Q: What are the Growing Site Requirements?

Growing Site Requirements

Salinity

The salinity of the water at your site should be a minimum of 8 parts per thousand (8 ppt). This can be measured with a refractometer, which many oyster gardeners have, or one could purchase an inexpensive aquarium test apparatus from a pet store.

Depth of water

The oysters in many floats will hang approximately one foot below water level, so the water depth should be greater than 1.5 feet average at mean low water (MLW). The goal is to prevent freezing the oysters during low tides in the winter time, or letting the oysters sit in mud.

Water quality

- You need an Oyster Gardener Permit from the Virginia Marine Resources Commission (VMRC). This permit is required and the application may be found on the TOGA website, www.oystergardener.org.
- The water the oysters live in should be tidal, with enough water movement to bring food and oxygen to the animals.
- If you plan to eat any of your oysters, the water in which they are grown should be in areas determined by the Health Department, Division of Shellfish Sanitation, as approved for the direct harvest for consumption. Many creeks are not approved for the direct harvest for consumption.
- To determine whether your site is in clean water, refer to the Virginia Health Department web site for the Division of Shellfish Sanitation to view maps of the Bay and get information about water quality: https://www.oystergardener.org/_files/ugd/9d48db_6002bd45e1264d899b84b109c354f42a.pdf

Q: What Kind of Baby Oysters Should I Plant?

Almost all native oysters growing on the east coast, from Canada to Mexico are *Crassostrea virginica*, but there are a number of different strains of *Crassostrea virginica*.

Types of Seed (Spat) Available to Gardeners

Diploid Oysters, capable of reproduction.

- **Native Diploids**

Native Diploid oyster seed are spawned from oysters growing naturally in specific parts of the Chesapeake Bay, for instance, Eastern Shore, Rappahannock River, Piankatank, etc. They have two sets of chromosomes, so they can reproduce, and may be best for help in restoring the Bay oyster population.

- **Deby (Delaware Bay) Diploid**

Deby Diploid oysters are laboratory bred oysters with two sets of chromosomes (therefore called diploid) and so can reproduce. They also have been selected to have increased disease resistance. **Selective breeding is not genetic modification.** Debys are not usually recommended if you are growing oysters mainly for restoration of the oyster population to the Bay, since selective breeding to increase disease resistance may have also altered other qualities that would be good for the Bay.

- **LOLAs**

A strain of oyster called LOLA is derived from native Louisiana oysters that grow well in less salty water. They are still the same East Coast Oysters, but a different strain than the local natives. These oysters have been found to grow well in the upper Chesapeake Bay and tributaries that don't have very salty water. If your water is less than about 12 ppt salt, this strain may work well for you.



Bags of spat.

Triploid Oysters

Triploid means that the oysters have three sets of chromosomes and cannot reproduce. They are sterile. Triploid oysters are disease resistant and are best if you are growing them primarily to eat. Oysters that do not spawn, do not have to use energy to make eggs and sperm; they can use all their energy to grow rapidly. The triploid oysters available to gardeners are a cross of Deby and Crossbreed, another strain of selectively bred oysters.

Tip!

Many oyster gardeners like to find out for themselves which strain will do best for them, and so may grow more than one type of oyster at a time. This is fine; just label them so that you can tell which is which and keep a record.

Q: When Should I Start My Garden?

Early Spring. Sometimes commercial growers have leftover seed from the Fall, which they maintain over the winter and then sell in the Spring. Sometimes this seed may actually be runts that did not grow properly last year, and may continue to not grow well. In other cases, the animals have continued to grow over the winter and may be larger than the usual $\frac{1}{4}$ inch seed normally sold. The larger seed will be more expensive than newly spawned seed, but may be available in smaller batches.

Tip!

If you have a neighbor who grows oysters near you and on your tributary, it might be worth asking them what strain of oyster they grow and what their success has been.

Late Spring. Newly spawned oyster seed in the Spring may become available at different times of the Spring in different years. This is due to weather, since the animals will not spawn until the water reaches warmer temperatures. In this case, gardeners will have to wait to start their Spring gardens until the oysters they want can be spawned and are large enough for sale.

Early Fall. In the past, oyster gardeners have been advised to start their gardens in the Fall. The main reason for this is that the small oysters spawned later in the year are not exposed to the warmest summer water with the highest likelihood of disease parasites, such as Dermo and MSX. (See Oyster Diseases, on page 10.)

If the gardener wants to grow Native Diploid oysters, the oysters may be more susceptible to these diseases. Waiting until Fall to start the garden means the oysters will not be exposed to the diseases until the next summer.

If the oyster seed are planted too late in the Fall, they may not have time to grow enough to enable them to withstand the cold weather conditions well. This means usually September or early October planting is advised for the Fall.

Q: What is the Best Type Container to Grow Oysters In?

Commercial oyster growers who sell spat to gardeners used to sell only in bags of 1000 spat, each about $\frac{1}{4}$ inch in size. Nowadays, there may be other sizes available, especially from growers who sell larger spat held over from last Fall. These oysters may be sold in smaller quantities. Their larger size means the bag mesh size you need will be different, too, as well as the number of bags and containers you need.

Tip!

Mark your float with your telephone number so that you have a chance to retrieve it if it comes loose in a storm.

Mesh Bags Are Essential

- First of all, you need a mesh bag to hold the baby oysters, and the mesh size must be small enough so that they don't fall through, but as large as possible so that movement of water and food is optimized for good growth. So if you buy 1000 $\frac{3}{8}$ inch seed, you need one bag with a mesh size of $\frac{1}{4}$ inch.



Graduated mesh bags. You must have one of the smallest ($\frac{1}{4}$ "), two of the next size ($\frac{1}{2}$ ") and four of the largest one ($\frac{3}{4}$ ").

- You also need twice as many bags the next size up. The oysters will grow rapidly and should be divided into two medium mesh bags of about $\frac{1}{2}$ inch mesh size, usually within two months of planting, Spring or Fall.
- The medium size mesh bags will hold about 500 small oysters each. If you maintain your oysters in bags, you will need to double the number of larger bags, about 1 inch mesh size, when the animals grow large enough so that they don't fall through this size mesh. **Keeping the oysters in bags with as large a mesh opening as possible will allow them to grow faster.** You may also dump the larger oysters directly into the bottom of a Taylor float or other container (see below) when they are large enough that they don't fall through the holes. In this case, you might need to buy or build a cover for the float, to keep out predators.

There are now a number of floating containers available for gardening. Commercially built floats are available for purchase, and although they cost more than homemade ones, are convenient for those who may not have the expertise or time or equipment to build their own.

- **Taylor Floats**

These floats were the original containers designed for oyster gardeners. Jake Taylor, of VIMS, designed and built the first Taylor Float. Although early gardeners typically made 8 ft. floats, these were too heavy for many people to manipulate, so TOGA designed a 3 ft. one. The design for this float is available online at the TOGA website, www.oystergardener.org. This float consists of a wire mesh box, to which a PVC frame is attached to make it float. The oysters in their bags sit in the bottom of the float, about one foot below the surface of the water. A 3-foot long Taylor Float will hold 500 adult oysters. The float must be tied to your dock or pier with crab pot line. If the oysters are kept in mesh bags throughout their life span, the bags lie in the bottom of the float and can be retrieved with a boat hook.



Taylor float.



Raft of bags and soda bottles.



Flip float.



Some gardeners have designed and built simple lifts for their Taylor Floats.

- **Rafts of mesh bags**

One commercial oyster grower in the area, Peter Perina of Eastfields Farms, ties two inflated, empty, liter size soda bottles on each side of a mesh bag, then ties the bags together side to side, to form a long raft. The bags can be individually flipped over so that the sunlight cleans them. Such a mesh bag will hold about 150-250 adult oysters. A major disadvantage to this method is that in winter, if the creek freezes over, the oysters are too close to the surface of the water and may be killed by freezing. A solution for this is to partly fill the flotation bottles with enough water to sink the bags below the level that the oysters would freeze, perhaps about a foot or so at the beginning of cold weather.

- **Flip Floats**

Flip Floats are designed to be lighter and easier to manage than Taylor Floats. Flip floats consist of a mesh bag into which the oysters go, and PVC pipes for flotation. The advantage of these floats is that they are lighter, but the disadvantage is that they do not hold more than about 150-250 adult oysters, and you will need to keep building more Flip Floats as the oysters grow. They are inexpensive and may be built at home. Instructions for building these floats, as for Taylor Floats, can be found on the website.

- **Bottom Cages**

These are basically a wire mesh box as for Taylor Floats, with a lid and feet so that they can stand on the bottom. This type of container is best used when the bottom is sandy and hard. They will sink into a muddy bottom. The bottom cages are also good if your growing site is in rough water. Too much wave activity will keep the oysters from opening up and feeding properly, and so putting them on the bottom lets them grow faster.

Regardless of the type of flotation device that is used, the main thing is that it is convenient for you to use, because you will have to manipulate the oysters and containers at times for cleaning. If you are so inclined, you may want to invent a container that works best for you at your site. Sources for supplies may be found on our web site, www.oystergardener.org.

Q: Now What Do I Do?

I know my site is okay, I know what time of the year I want to start my garden. I know what kind of oysters to buy, and how many. Where do I start?

In the fall, the best way to start is to attend TOGA's Float Building Workshop in September. Gardeners can either sign up to build their own containers, or can order or buy new ones from TOGA or from commercial vendors. At this event, one can buy seed of a strain that you think is good for your site. Take a small cooler with an ice pack in the bottom, and a dry towel or rag or newspapers to cover it. You will place the bag of spat (the bag will be about the size of a grapefruit if the spat are small) on top of the dry cloth and cover with a wet cloth so the spat don't dry out. You may just cover the spat with a wet cloth, without the ice pack, if you will not be in a hot car for long. **Never put the spat directly against ice or frozen ice packs.**

Oyster seed, or spat can also be obtained from vendors at other events, such as the Spring Oyster Fair, and from sources listed in the TOGA website, www.oystergardener.org, under How To Start, then click on Resources. If you build your own float, the costs of the materials and a thousand small spat will be less than \$100.00. Small spat are priced at less than \$30 for 1000, but prices go up as the seed get larger.

When you get home with your wonderful stuff, **DO NOT HANG THAT BAG OF SPAT OFF YOUR DOCK**, thinking that you should get them into the water quickly. **Crabs will immediately tear the bag open**, and eat or spill all your spat into the mud before you get back to them. Leave them in the cooler in the shade until you have your cup of coffee and grab your tools.

Prepare your small mesh bag by folding one end over two or three inches and fastening the end closed with three cable ties or hog rings. Cable ties about 8 inches long are really good for this. Empty the small oysters into the bag and close the other end. Shake the bag to distribute the spat evenly.

Place your flotation container into the water and secure it to a cleat on the dock. Put the bag of oysters into the float and into the water. That's it.



Attending a Float Building Workshop is highly recommended.





Cleaning of the bags is essential.

You Are Not Finished Yet!

How Do I Care For the Oysters?

Good oyster gardening sites have moving water. This means that the floating containers are exposed to all sorts of algae and seaweed, as well as living animals that will all try to grab onto the surfaces. Especially in the spring, a floating oyster container will become covered with algae, barnacles and other organisms within days of deployment into the water. TOGA recommends that the floats be cleaned about every two weeks if possible, or whenever the stuff growing on the container and the bag gets thick enough to stop up the openings, so that water cannot freely flow. There are a number of ways to do this.

- Remove the container and bags, or just the bags, from the water and place them on the dock is the first step.
- Do this first step in the morning, on a sunny day. Let the float and/or bags sit in the sun for a couple of hours until the sun has dried them, and the algae will be killed. It can then be brushed off to expose the mesh openings in the bags. Then put everything back into the water. If this is done while the oyster spat are very young, they should not be left out of the water too long, maybe an hour.
- While the bags are out of the water, inspect the contents to be sure there are no blue crabs hiding in the bags. If you see one, open the bag and remove it, or crush it with a stick through the mesh.
- If the above cleaning technique will take too much time, try to flip the mesh bags over, to expose the bottom of the bags, which will be cleaner. This will help keep the algae growth down.



Mud crab.



Blue crabs are a serious threat to the oysters.



Blue crab damage.

Learn to distinguish predators to avoid losing your young oysters.

You will be astonished, the first time you take the bag out to clean it at the large number of neighbors visiting. They include minnows, eels, grass shrimp and many others. None of these is to worry about. They just like the company.

- **Blue crabs** are the most serious threat to your oysters. They will enter the bags while they are very small, and will grow up eating your young oysters. Mud crabs can be just as devastating, especially when the oysters are small. If you don't have time or energy to remove crabs from bags, you can kill them with a sharp pointed rod or ice pick, which will go through the openings in the mesh.
- **Orange sponges** are akin to jellyfish but more like hair, and can foul both oyster shells and mesh bags and floats. This can result in a reduced flow of water to the oysters, and they should be removed. Sponges can be killed by cleaning with fresh water and a brush, or exposure to full sun.

- **Sea grapes**, or **sea squirts**, tunicates, are round and soft, about the size of a large marble, may grow on the oyster shells and floats in water with higher salinity. They are killed by a brine dip (see below).
- **Flatworms**, *Stylochus*, are flat, pale colored worms, usually one inch or less, that slide between the valves of oysters and eat the meat when the oysters are small. They are treated with a brine solution (see below).
- **Polydora worms** produce blisters inside the oyster shell, weakening the oyster until it cannot completely close its shell. In addition, if the blisters are broken during the process of shucking oysters, flakes of shell and mud may be left with the meat and make an unpleasant experience for the half-shell consumer. Polydora can be killed by brine soaks. Commercial growers may control this pest by moving the oysters to a high salinity site, but this may not be available to gardeners.
- **Oyster drills** are snails, about ½ to 1 inch in size. They kill oysters by drilling through the shell and eating the meat. They may be controlled by heavy brine dips, but only if the oysters are large enough to survive this treatment. Oyster drills live in high salinity areas, and are not a problem for most gardeners.
- **People** are some of the worst predators for oysters, especially when the oysters are nearing harvest size. Poaching of market size oysters can happen to gardeners as well as to commercial growers and sanctuary reefs. Living within eyesite of your garden helps with this problem. It also helps to have neighbors to keep an eye out.

Pulling your bags and floats out of the water often enough to see what is happening to the oysters is the best way to care for them. Predators may be removed or killed, if you know they are there.

- Midday sun will kill fouling organisms and some predators,, and is a good first go-round. Small spat should not be left in the sun for more than an hour.
- Another way to do this preventative measure is to flip the bag of oysters over, so that the clean bottom is up and the fouled top is down. This works very well.
- Scrubbing bags and floats with a brush will help with removing severe fouling. Do not use fresh water to clean the bags until the oysters are out of the water for at least a half hour. This amount of time will allow the oysters to close tightly and they will not be hurt by the fresh water.
- Brine dip. A brine dip can be made by mixing salt, such as water softener salt, with fresh water in a trash can until no more salt can be dissolved (a saturated solution). If the container is large enough, a whole bag of oysters can be dipped at once. Just slosh the bag up



Sea squirt.



Flatworm.



Polydora worm damage to shell.



Oyster drill.

and down for five minutes, then put the bag onto the dock to dry in the sun. Many predators and fouling organisms will be killed. DO NOT TREAT VERY SMALL OYSTERS WITH A BRINE DIP.

Bad Weather. If a strong storm, such as a nor'easter or a hurricane is predicted for your area, the safest thing to do is to **haul your oyster containers out of the water and up to high ground.** Even if your lines are strong, you could lose your dock and everything else. Make sure that the oysters are shaded and protected from the sun. They can remain out of the water for several days, until the danger is past and you can get them back in.

Oyster Diseases

Although over harvesting of oysters and habitat destruction account for much of the loss of native oysters from the Chesapeake Bay, they are not the only things responsible.

An oyster parasite called **Dermo** has perhaps always been present in the Bay. With loss of habitat for oyster reefs and overharvesting of oysters, Dermo developed into a serious problem for the oyster population in the 1950s. Dermo, *Perkinsus marinus*, is a protozoan prevalent along the mid-Atlantic coast. It is active at temperatures above 68°F, and in salinities greater than 12-15 ppt. It kills animals during the summer and fall. Dermo is transmitted directly from oyster to oyster.

MSX disease, *Haplosporidium nelsoni*, is also a protozoan. It is not native to this area, but was introduced into the Bay most likely by planting infected oysters from the West Coast into the Bay. It also causes death of oysters during the summer and fall, but the mode of transmission is unknown. MSX can be totally eliminated at salinities below about 10 ppt.

Obviously, gardeners growing in relatively low salinity waters are protected from severe loss due to these two parasites.

Research at the Virginia Institute of Marine Science has resulted in a major increase in knowledge about these two parasites. For more information, see this link: http://www.vims.edu/_docs/oysters/oyster-diseases-CB.pdf. For commercial growers, the development of strains of oysters resistant to these diseases has been a tremendous boon. Selective breeding of native oysters which have withstood the diseases for a long time were used to develop increasingly resistant strains of oysters. These strains have been used for the production of disease resistant Triploid oysters, commonly used for commercial production.

Neither Dermo nor MSX cause disease or illness in humans.

Q: How Do I Harvest My Oysters?

Oysters grown by oyster gardeners may be harvested whenever they are large enough for it to be worthwhile to the gardener. For diploid oysters, remember that they will spawn in early July and may do so again later in the summer. During this period, the oysters will be watery and tasteless. Diploid oysters are best harvested in months with an R in the name, just as they used to say about all oysters. Triploids, of course, do not spawn and are good to harvest all year around.

If your garden site is in contaminated water, as determined by the Department of Shellfish Sanitation, you are at risk of exposure to bacteria or viruses present in the water. Many of these organisms were probably admitted to the water in wild animal feces, and may not cause disease, but you cannot be sure that is always true. Although many people think that cooking the oysters will allow them to be eaten without risk, that may not be true, since cooking enough to kill the organisms may make the oysters unpalatable.

Major rain events. If there is a major rain event, runoff from upstream is increased in quantity and thus increased in possibilities for contamination. Although it is usually contaminants from animal feces deposited on previously dry ground, you cannot always be sure there is not a bacterial or viral contaminant from other sources. **The Division of Shellfish Sanitation recommends that you do not harvest oysters until two weeks after such a rain.**

Of the most importance is that when you have collected the oysters for harvest, take them immediately to cold storage. They must not be left in the sun, but must be quickly chilled until they are consumed. Oysters will keep safely for up to a week if they are refrigerated, not on ice, but with a damp cloth covering them.

To catch native spat, clean oyster shell is placed into mesh bags and hung in the water off your dock just before the expected spawning time, which is usually in early July. Free swimming larvae produced by spawning of wild or cultured diploid oysters, if brought back into your area by the prevailing tides, can set on the clean shell and provide free baby oysters for your garden.



Tip!

When harvesting oysters, always remember to save the shells. Oyster shells are a product that is increasingly difficult to find. Oyster shells may be cleaned by leaving them out in the sun for a week or two. They can then be given to organizations such as TOGA, to help replenish educational oyster reefs, or may be used by the gardener to catch native spat.

References

Much of the information found in this booklet was taken from the Master Oyster Gardener Manuals, prepared for the Master Oyster Gardener Courses by faculty and staff of Virginia Institute of Marine Science.

The Eastern Oyster *Crassostrea virginica*, edited by Victor S. Kennedy, Roger I.E. Newell, and Albert F. Eble, has been an invaluable resource for the author of this booklet. It is a Maryland Sea Grant Book, published in 1996.

Tidewater Oyster Gardeners Association web site is: www.oystergardener.org. There one may find sources for spat, floats and mesh bags, cable ties and other necessary materials. In addition, there are maps to illustrate salinity in different sites and a huge amount of other information about oyster gardening, including how to build your own floating containers. This is an excellent “look up” place for whatever information you need in regard to oyster gardening!

The author has attended all the Master Oyster Gardener Courses held at VIMS, as well as the Refresher Courses, and was a cofounder of Tidewater Oyster Gardener Association.

I would like to express my gratitude to the Virginia Institute of Marine Science for the help they have given us over the years, in all of our educational pursuits. In particular, Mike Oesterling (retired) and Karen Hudson, of Marine Advisory Services, have been very generous with their support and help. TOGA would not be the organization it is now without their guidance.

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Please consider joining TOGA. The application form is on the website. You will receive three newsletters a year, announcing upcoming events and other information of interest to the oyster gardener as well as those interested in helping to restore the Chesapeake Bay.