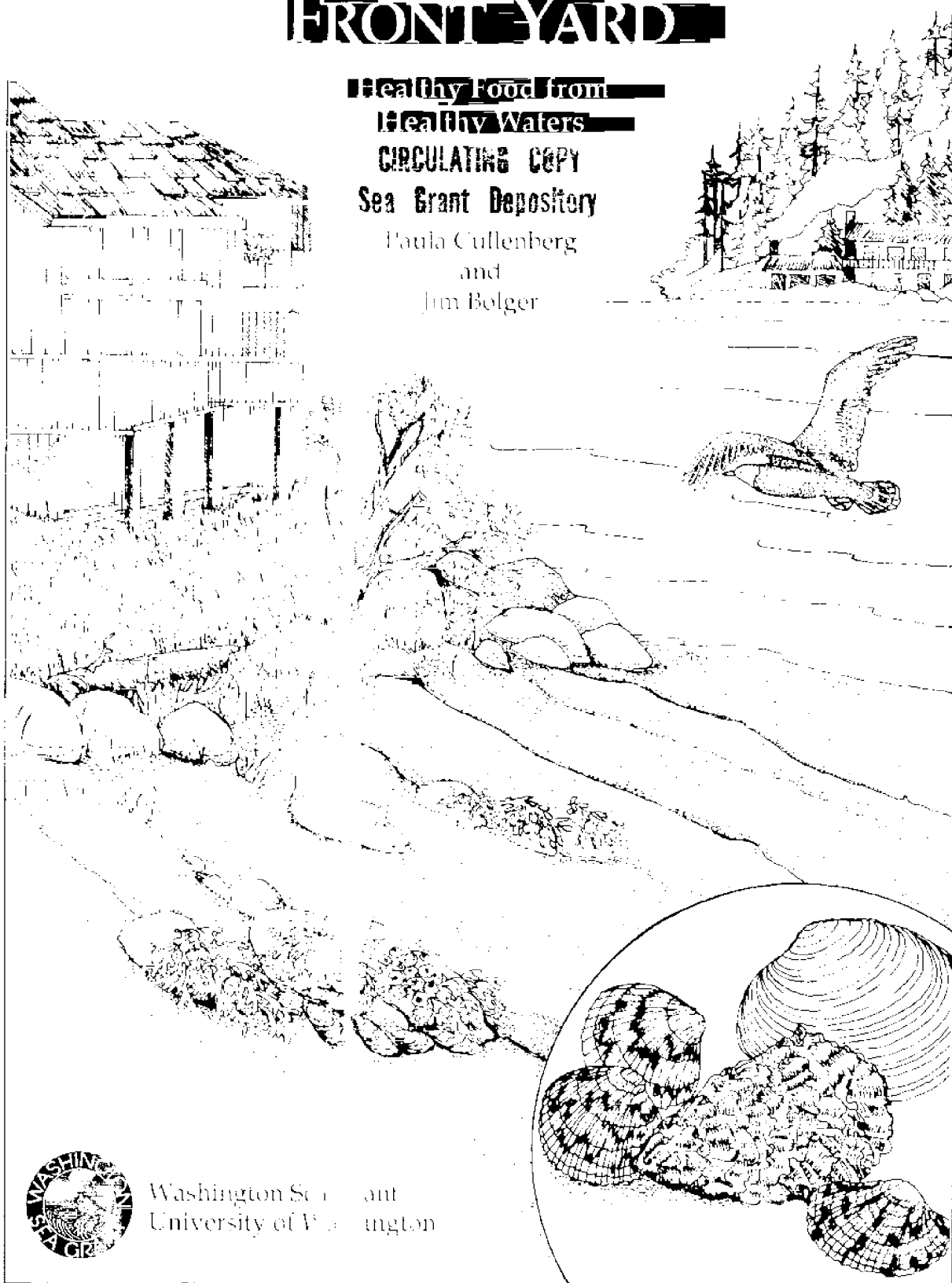


SEAFRESH IN YOUR FRONT YARD

Healthy Food from
Healthy Waters

CIRCULATING COPY
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Paula Cullenberg
and
Jim Bolger



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SHELLFISH IN YOUR FRONT YARD

Healthy Food from
Healthy Waters

Paula Cullenberg
and
Jim Bolger

Washington Sea Grant
Marine Advisory Services, University of Washington
Seattle, WA

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One of the great treasures of Puget Sound is the abundance of intertidal clams and oysters that can be readily harvested. Digging clams and gathering oysters with family and friends can provide hours of enjoyment and a nutritious source of food. Going to your beach and gathering shellfish can be a good way to learn about the animals that depend on the sea.

Harvesting shellfish has been taking place in this area for hundreds of years. Even before white settlers came to Puget Sound, local tribes were harvesting shellfish for food and for ceremonial purposes. Shells were used as tools and as a medium of exchange. Early settlers also gathered shellfish for food, and during the Depression of the 1930's, many people depended on shellfish for protein in their diets. Thousands of residents and tourists still flock to Puget Sound beaches today to enjoy this bounty of nature.

This publication is designed for you shoreline homeowners interested in raising shellfish on your beaches. It will introduce you to a variety of methods available to seed your beach with shellfish or to enhance it so that more shellfish will live there naturally. It will also point out the importance of clean water in producing shellfish that are safe to eat. After you have read this text carefully and consulted the sources listed at the end, you should be able to decide whether to keep going. Even if you have never gathered shellfish on your beach before, with a little effort and the right conditions, you may have clams and oysters growing in the future.



BEFORE YOU GET STARTED . . .

WATER QUALITY: *Its importance to shellfish*

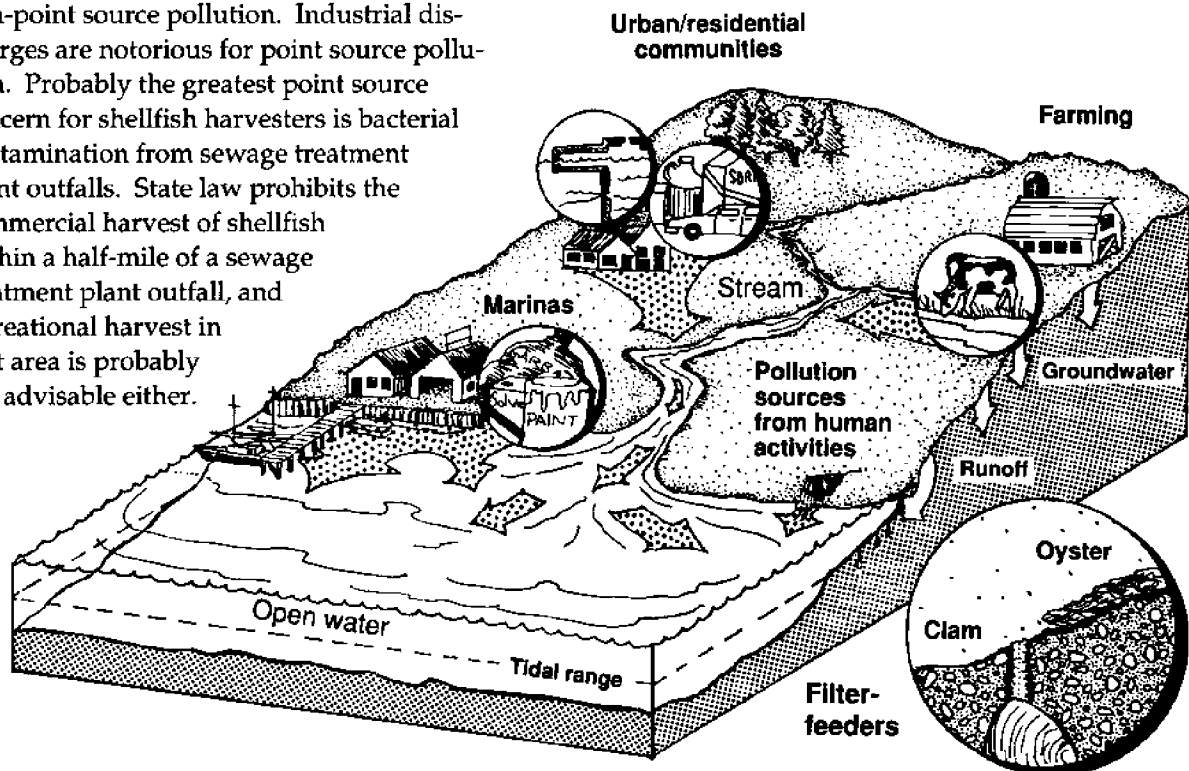
Before you plan a clam bake for your new shellfish beach, it is important to find out whether your shellfish are growing in clean water. Because shellfish are an indicator of the health and quality of marine water, unsafe shellfish could be the first signal that pollutants are contaminating your area. Clams and oysters feed by filtering water. In polluted water, shellfish tend to accumulate bacteria, viruses, and toxic substances in their bodies. When eaten, contaminated shellfish can make humans sick.

Contaminants come from a variety of human and non-human sources referred to as point or non-point source pollution. Industrial discharges are notorious for point source pollution. Probably the greatest point source concern for shellfish harvesters is bacterial contamination from sewage treatment plant outfalls. State law prohibits the commercial harvest of shellfish within a half-mile of a sewage treatment plant outfall, and recreational harvest in that area is probably not advisable either.

In many areas of Puget Sound, however, non-point sources are more insidious polluters. Septic tanks that are infrequently pumped, improperly maintained, or installed in soils too porous or too dense to filter bacteria are common sources of contamination. Runoff from pet wastes in yards is carried by storm drains into salt water. Farm animal manure transported into streams also carries bacteria into shellfish beds. Boater sewage and marine mammal waste can contaminate salt water directly.

Other pollutants such as heavy metals, petroleum products like oil and gas, chemicals from herbicides and pesticides can all be filtered by shellfish. Siltation, a natural process, can suffocate shellfish if improper development of roads or houses dumps excess sedimentation into waterways. This is exacerbated in urban areas, where acres of pavement offer little vegetation to absorb water and to filter pollutants or sediments before reaching surface water sources.

Most areas of Puget Sound are still clean and healthy, but a growing number of locations,



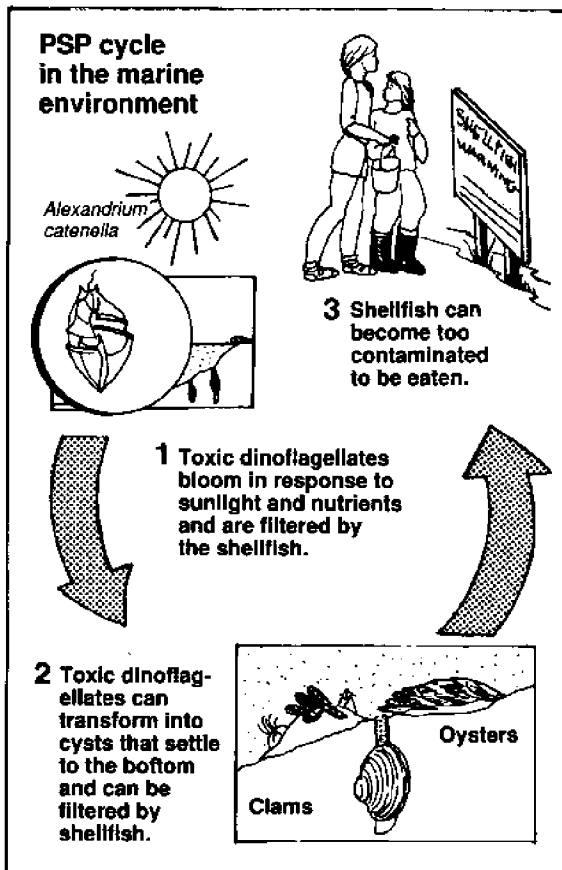
including semi-rural and rural ones, are being closed to shellfish harvest. You can probably get some indication of the safety of your waters from either the county health department or the Washington Department of Health, Office of Shellfish Programs (DOH). If your beach is in the vicinity of a commercial bed, DOH can tell you how that bed is classified since it has the responsibility for monitoring commercial shellfish safety.

The county health department may be monitoring water quality in your area. Chances are, though, that unless you are located directly in the midst of commercial beds or in an area that has been officially closed to commercial harvest, you will have to make your own determination about the safety of the shellfish on your beach. It is possible to take a sample of your shellfish to a lab for bacterial testing. Your county health department may be able to provide you with addresses. Be warned, however, that one test will not be a sure

indication since contaminant levels change in response to seasons, weather, and use patterns both in salt water and upstream of it. *If there are any doubts, do not eat the shellfish.*

PARALYTIC SHELLFISH POISONING

One of the most serious concerns about harvesting shellfish in Puget Sound is paralytic shellfish poisoning (PSP), miscalled "red tide." Once detected in an area, PSP is a constant threat because the dinoflagellate (a plankton) that produces PSP toxins can transform into dormant cysts that settle to the bottom and can be readily filtered by shellfish. The toxins become concentrated in the body of the shellfish when they consume the cysts and dinoflagellates. If humans consume enough of the toxin, it will affect the central nervous system causing paralysis. Boiling does not destroy the toxin. The term "red tide" has been mistakenly associated with PSP because of the reddish-brown pigment *sometimes, but not usually*, seen during a bloom of the toxic dinoflagellates. Before harvesting shellfish on your beach, or anywhere else, call the PSP hotline at 1-800-562-5632 for the latest information about PSP in your area. (See also *Gathering Safe Shellfish in Washington* in references.)



CLEAN WATER BEGINS AT HOME

Clean water is vital to wholesome shellfish and your decision to grow shellfish should be a firm commitment to protect clean water. Educate yourself and your neighbors about the causes of non-point source pollution. Become active in citizens' advisory groups that work with the county health or water quality department.

Make sure that you are protecting your water quality by observing the following practices:

***Septic systems.** Know where your septic system is located and keep heavy vehicles off it. Do not overload the system by excessive use of water or laundry loads. Never pour

household chemicals down the toilet or drain; they will destroy the bacteria in your tank. Keep your septic system in good repair and pumped regularly.

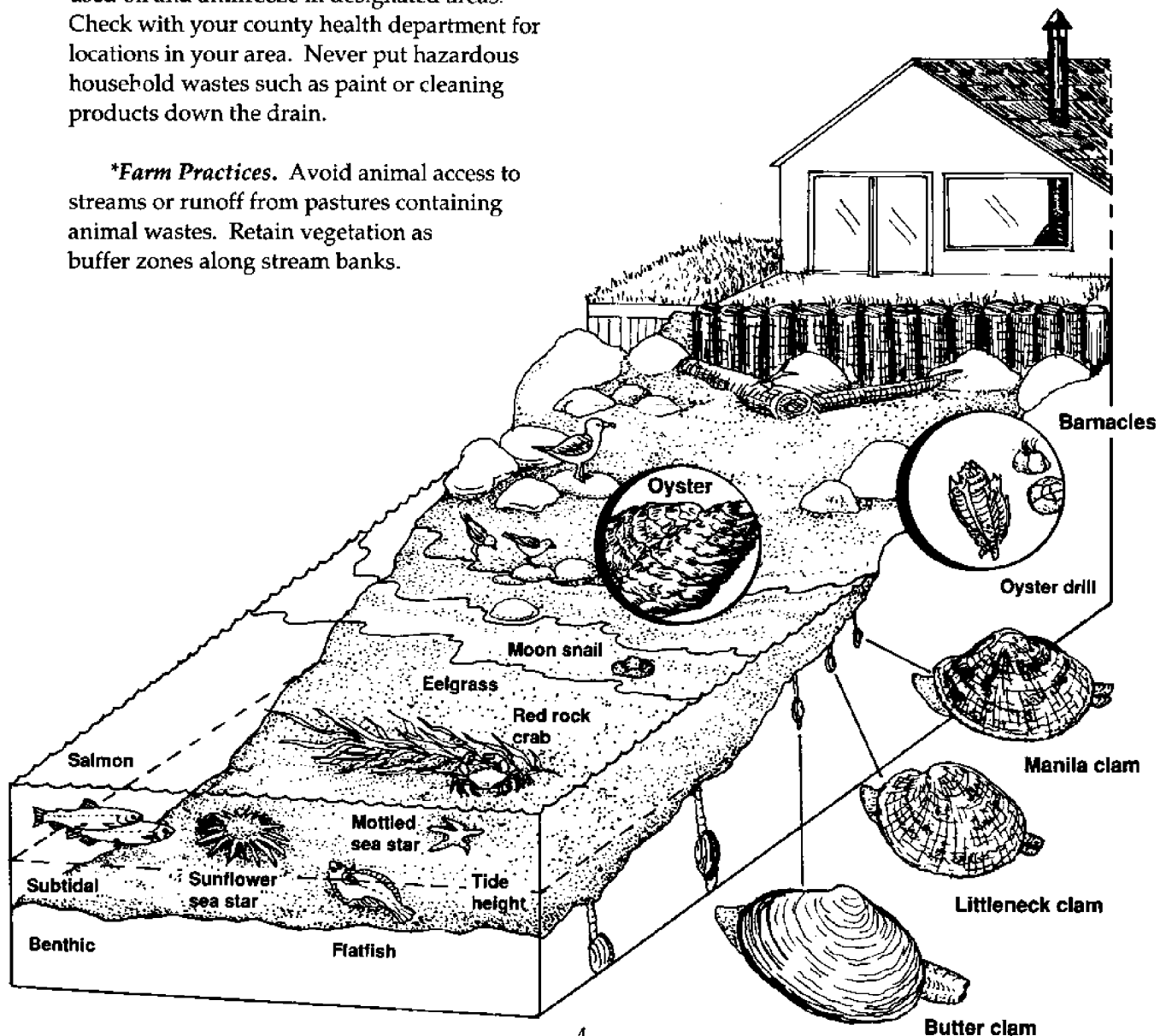
***Runoff.** Clean up pet wastes before rain carries them into stormwater systems. Follow directions when applying fertilizers, pesticides, and herbicides. Using more does not produce better results, just more residue to drain off. Create a buffer zone of ground cover, trees, or shrubs in runoff areas or near streams or wetlands.

***Oil and Hazardous Wastes.** Dispose of used oil and antifreeze in designated areas. Check with your county health department for locations in your area. Never put hazardous household wastes such as paint or cleaning products down the drain.

***Farm Practices.** Avoid animal access to streams or runoff from pastures containing animal wastes. Retain vegetation as buffer zones along stream banks.

BEACH CONSIDERATIONS

Before you start growing shellfish, make sure that you really do own your beach. Washington is one of the few states where private ownership of tidelands exists. Just because you live on the water doesn't guarantee that you own the adjacent tidelands. If you are unsure about ownership, check with your local assessor's office. If you don't own the tidelands adjacent to your property, it may be possible to lease them from the owner. If they



are owned by the state, check with the Washington Department of Natural Resources for conditions on leasing.

Next, walk along your beach and examine it carefully. Fifty to one hundred feet of beach is enough to grow clams and oysters for your own use. However, the materials that make up your beach will have a tremendous effect on what species of shellfish you can grow successfully. For instance, oysters can be grown on a wide variety of surfaces, from solid rock to mud. Clams vary by species, but in general prefer substrates in which they can burrow easily.

Try to judge how your beach is impacted by waves and currents. Beaches exposed to high wave energy or strong currents are unsuitable for raising clams and oysters. Steep slopes generally indicate a high energy beach where fine sediments are washed away, leaving loose gravel or heavier cobbles.

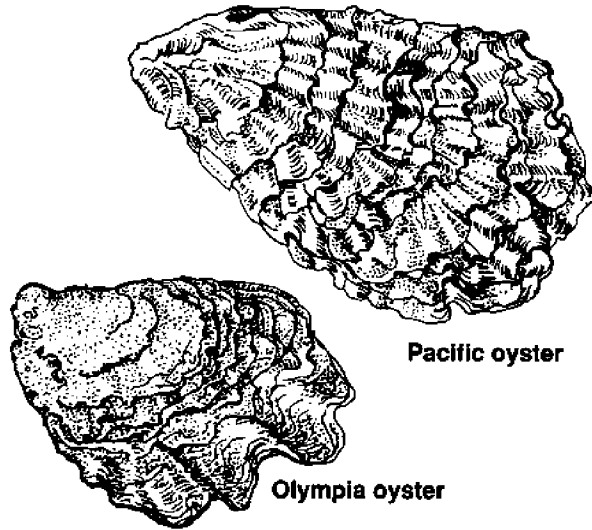
Sandy beaches are also normally high energy ones and do not have the stability needed by clams and oysters. Ideally, a firm, mud-sand and gravel mix in a relatively calm, protected area is best for clams and oysters. Measures to enhance the substrate are discussed later. Anchoring your shellfish may be an alternative for culture on beaches with strong waves or currents.

Take a look at any shellfish that may be living on your beach now. This should give you an idea of what species may grow well there. Focusing on those species may save you time, effort, and money. Puget Sound has more than 50 different species of clams and oysters, but only a few of these are used by man and even fewer can be successfully cultivated on a beach. This brochure discusses the simplest species to cultivate — Pacific oysters and Manila clams — and to enhance — native littleneck and butter clams.



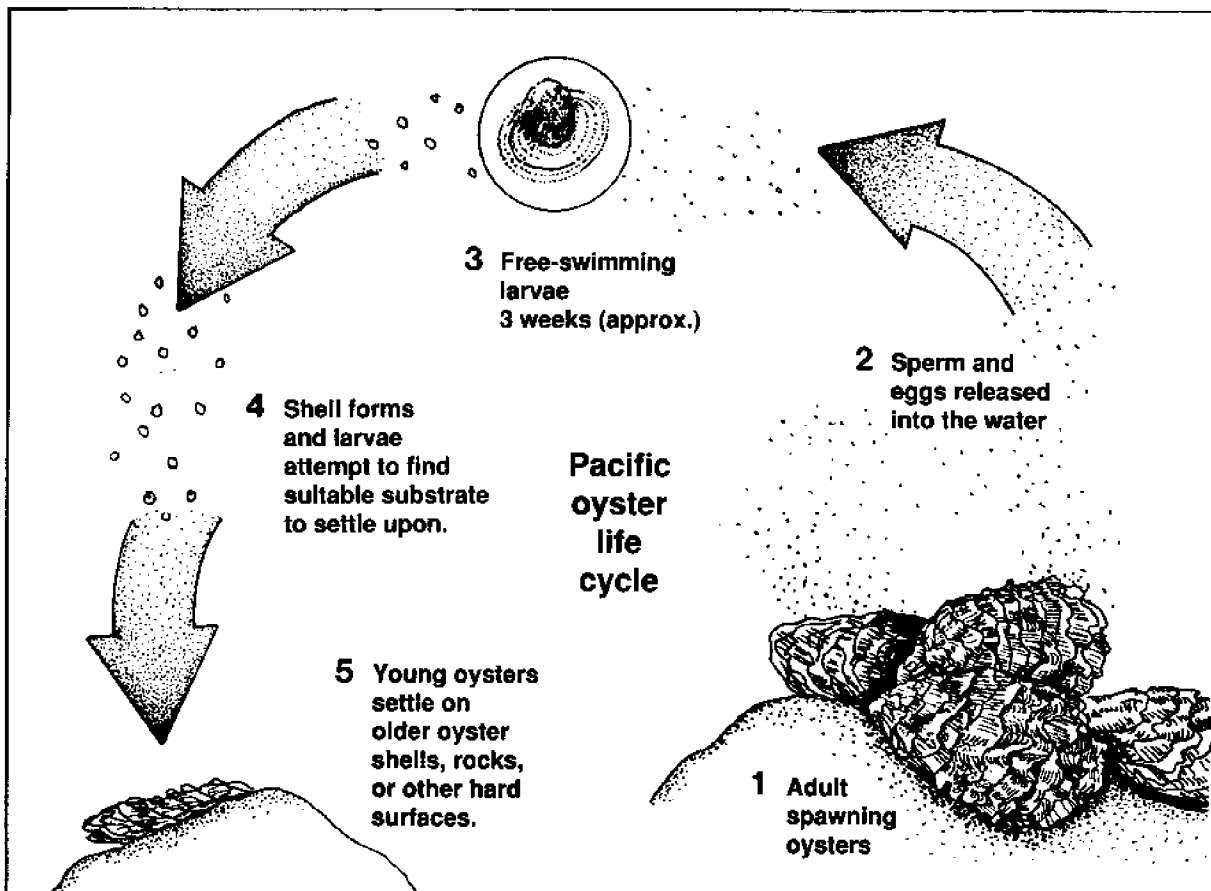
OYSTERS

Oysters were one of the first resources harvested in Washington. The Olympia oyster (*Ostrea lurida*) is native to Washington but has all but been replaced by the larger, more hardy Pacific oyster (*Crassostrea gigas*). Since the Pacific oyster is able to tolerate temperature changes, siltation, and drying much better than the Olympia oyster, it is recommended for novice growers. It also has a very good flavor. How fast Pacific oysters grow varies from place to place, but they can be harvested at any size.



Pacific oysters spawn in the summer when they expel eggs or sperm into the water for fertilization. After about a 3-week swimming stage, the larvae settle onto a firm substrate and grow from there. Commercial oystermen catch the larvae on clean oyster shell, referred to as "cultch." The juvenile oysters, called

"spat", attach and grow on the shell during the fall and winter. Commercial oystermen plant this spat the following spring by spreading the shell on their intertidal beaches. Spring is also the time when shoreline owners can purchase bags of shell covered with spat to plant on their beaches.



Beach Considerations for Growing Oysters

Oysters need to grow in an area where they will not be moved by tides, waves, or wind, or be suffocated by mud or silt. A mixture of firm mud and sand in protected waters is the best substrate for raising oysters on the beach. If the substrate is too muddy, placing a layer of crushed shell or gravel on top may prevent your oysters from sinking into the mud.

Seeding Your Beach

In general, even if you have oysters on your beach, there is no assurance that they will reseed themselves. Just where the larvae eventually settle depends primarily on tides, winds, currents, and water temperature. The only way to guarantee that you will have oysters on your beach is to seed it.

Shoreline owners can purchase bags of seeded shell to plant on their beaches from many commercial growers (see references). Generally, a bag will contain about 150 oyster shells, enough to plant a 6x6 square foot area. The seed on the shells will be about the size of your fingernail when you purchase it.

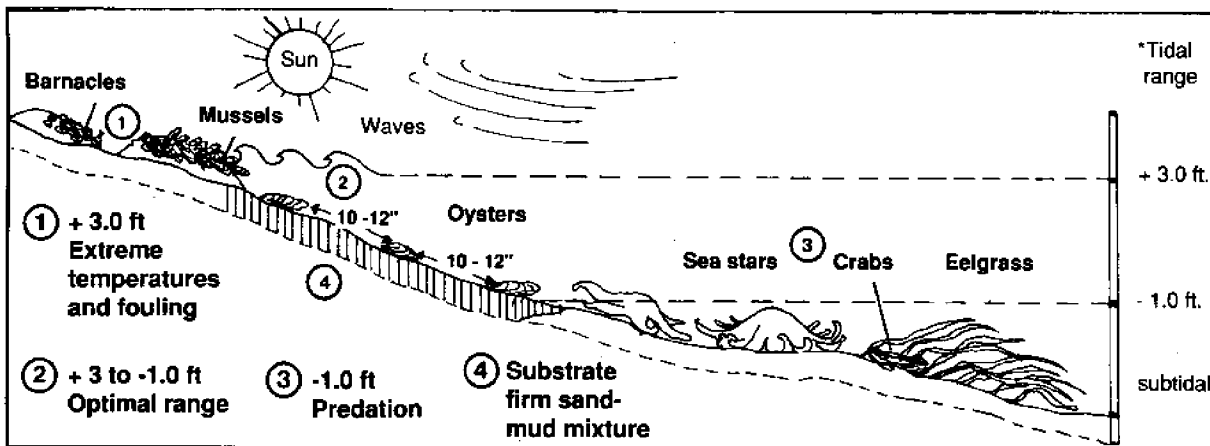
Check to see that the grower has a shellfish transfer permit from the Washington Department of Fisheries. The permit is designed to protect the spread of predators and diseases from beach to beach. If the grower does not have one, apply for it yourself before you buy seed.

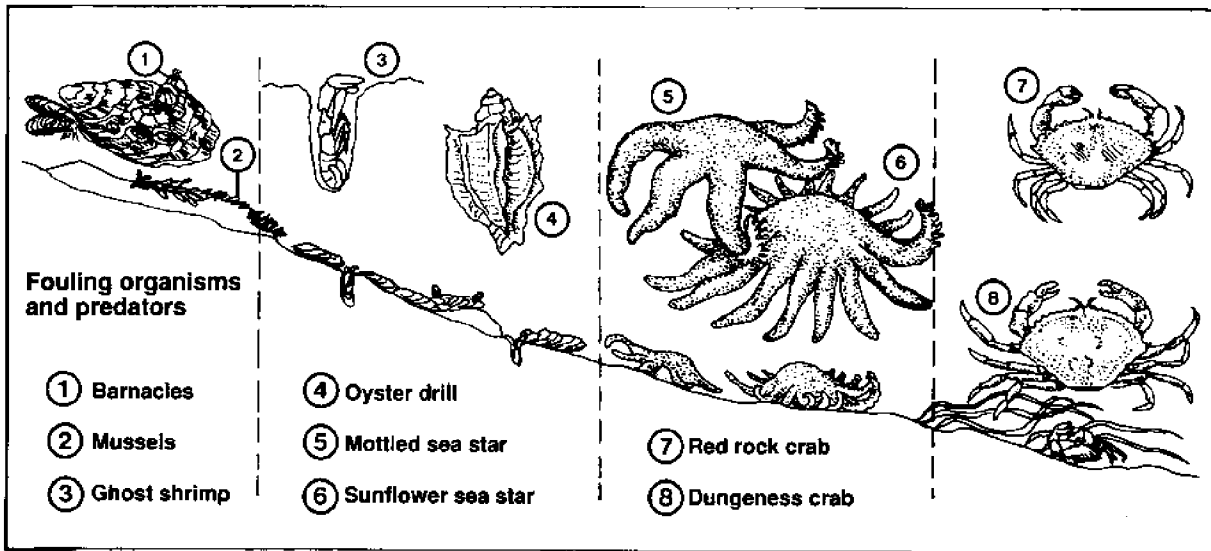
Plan to seed your beach in the spring. Earlier than that, natural food sources are not available and cold water temperatures will slow the oyster growth. Oysters may be planted directly on beaches or attached off bottom. The easiest and most common method for shoreline owners is on-bottom beach culture. For information on more involved culture such as longlines or stakes, check the references at the end of this publication.

On-bottom oyster culturing is straightforward. Seed your beach immediately after purchasing the shell; otherwise keep the shell cool and moist or suspend it in open salt water. Don't put the seed in a bucket of fresh or salt water — it will quickly use up the oxygen in the water and suffocate.

Place oysters in the +3.0 to -1.0 ft. tide level. Below the -1.0 ft. tide level, sea stars are active predators. Above +3.0 feet, oysters will be uncovered by water much of the time, slowing their growth and exposing them to extremes in temperature and to fouling by mussels and barnacles.

Spread the shells on your beach, allowing about 10 to 12 inches between them to prevent crowding. When the seed is about 2 to 3 inches long, separate the shells by striking the base of the oyster clump with a hammer. This will reduce crowding and shell malformation.





Predators, Fouling, and Summer Kill

Sea stars, crabs, and oyster drills are the most common predators of oysters. Barnacles, mussels, seaweed, and ghost shrimp can also hinder oyster growth by competing for food and/or space.

Pick sea stars off your beach if they pose a problem and remove them to other locations. Crabs may be avoided by keeping oyster seed relatively high up on your beach. Oyster drills generally are a danger to young oysters. Remove them by hand.

Inspect your oyster beds once a month and scrape barnacles and mussels off the oysters if fouling is a problem. As an alternative, spray them with a pressure hose or let the oysters dry in the air for a day or two.

Keep in mind that predators play an important role in balancing plant and animal populations. Destroying predators rather than relocating them away from shellfish beds may affect the balance they have created. Remove them only if they pose a serious threat to your shellfish.

Older, larger oysters sometimes succumb to "summer kill." These larger oysters amass gonad tissue in the summer before

spawning. It is theorized that this extra tissue, combined with summer heat, stresses the oysters, making them susceptible to invasion by predators and disease.

Harvest and Enjoy!

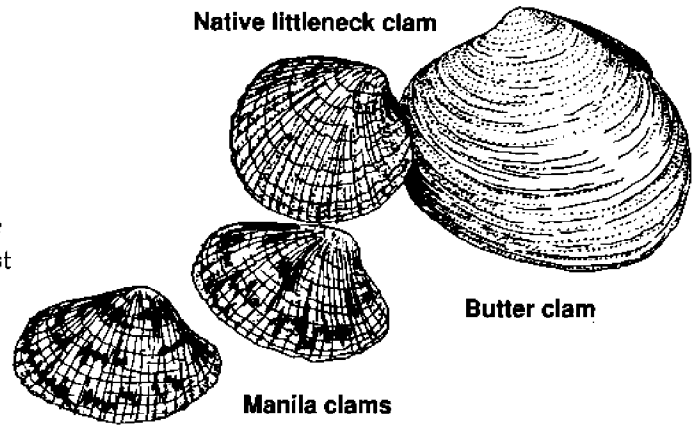
Oysters can be harvested at any size or time of the year, although some people prefer to avoid the summer months since spawning may make oyster bodies soft. Tideland owners are allowed to harvest any number of oysters from their shorelines.

Non-commercial oyster growers have the option of registering their operation as an Aquatic Farm with the Washington Department of Fisheries. The permit is free and is the first step toward selling your shellfish. Check the references at the end for information about starting a small commercial operation.



CLAMS

Butter, native littleneck, and Manila clams are the favorite species for homeowners to harvest from their beaches. Butter clams (*Saxidomus gigantus*) are the largest of the three, growing to up to 5 inches in length. They are found about 4 to 12 inches deep. Native littlenecks (*Protothaca staminea*) are smaller, growing to about 2 inches in length and generally located 6 to 10 inches deep. They are distinguished from Manila clams by concentric rings as well as radiating ridges. Manila clams (*Venerupis japonica*) were introduced to Western Washington from Japan. They are about the same size as littlenecks, but grow faster, reaching edible size in 2 to 3 years, compared to 3 to 4 years for littlenecks. Manila clams, located 2 to 4 inches deep, are the easiest to harvest.



Manila clams are found between the +6 ft. and the +2 ft. tide level, in a substrate of muddy gravel in quiet waters. Native littlenecks and butter clams often are found on the same beach, preferring mixed gravel, cobble, and mud. Littlenecks are found from a +4 ft. tide level down to a -1 or -2 ft. level. Butter clams are seldom found higher than the 0 ft. tide level.

Beach Considerations for Growing Clams

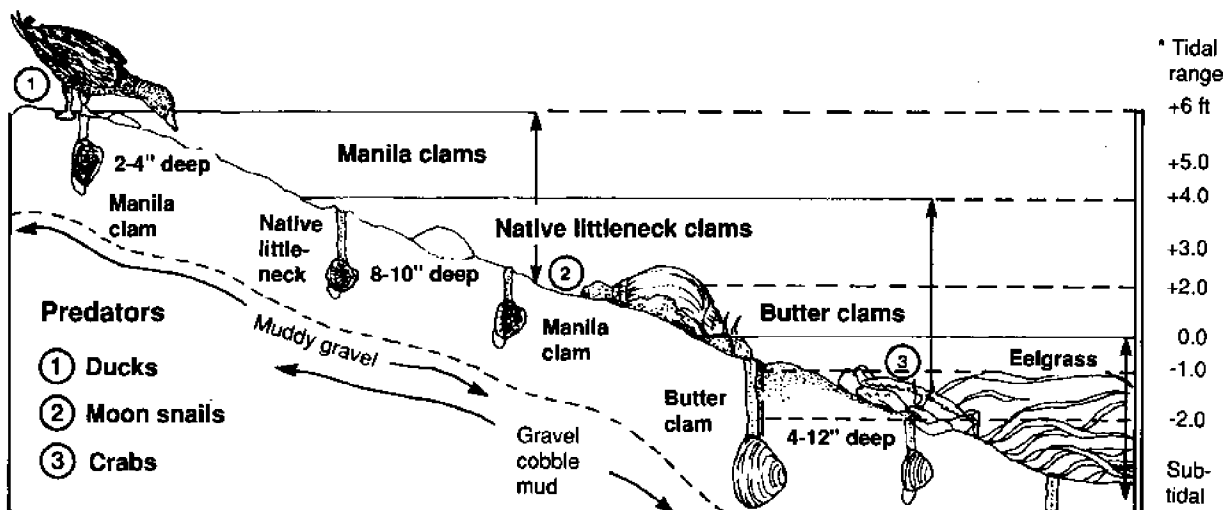
Once Manila, littleneck, and butter clams burrow into a beach, they are relatively immobile, so their survival depends on whether or not a particular beach fits their needs. Erosion, fill, or predator populations can all reduce their numbers.

Predators

Ducks, crabs, and moon snails are the major predators on Manila, native littleneck, and butter clams. Plastic netting, described below, is probably the most effective means of discouraging predators. Otherwise, remove crabs and moon snails to other areas.

Enhancing Your Beach

If you already have clams growing on your

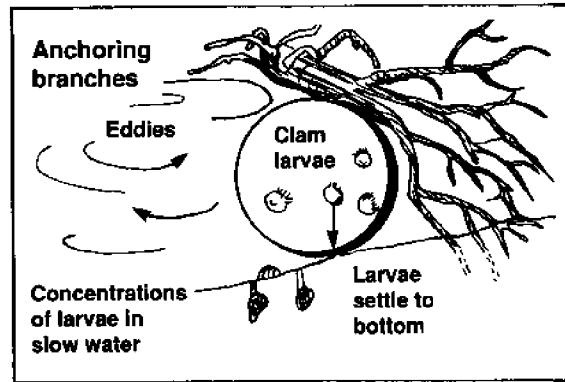


beach, a little habitat modification may increase their productivity. Simply digging some clams can enhance the growing conditions for the rest of the population. Particularly in hard-packed beaches, digging or turning over the beach exposes gravel and shell, allowing water and oxygen to reach the remaining clams. When you do dig clams, be sure to replace the small ones so they can continue to grow. Refill the holes that you have dug.

Clam larvae, similar to oyster larvae, are free-floating. As a result, there is no guarantee that clams on your beach now will ensure clams for the future. There are a few things you can do, however, to enhance the natural set of clam seed on your beach.

Deciduous brush such as alder or willow, anchored to the beach, may encourage the natural set of clams by slowing water and creating eddies. This may concentrate floating larvae, allowing them to settle to the bottom.

If the makeup of your beach is stable mud or sand and the beach is protected from strong wave action, layering several inches of pea gravel or shell on top of the mud may create a better surface for natural clam set and growth.

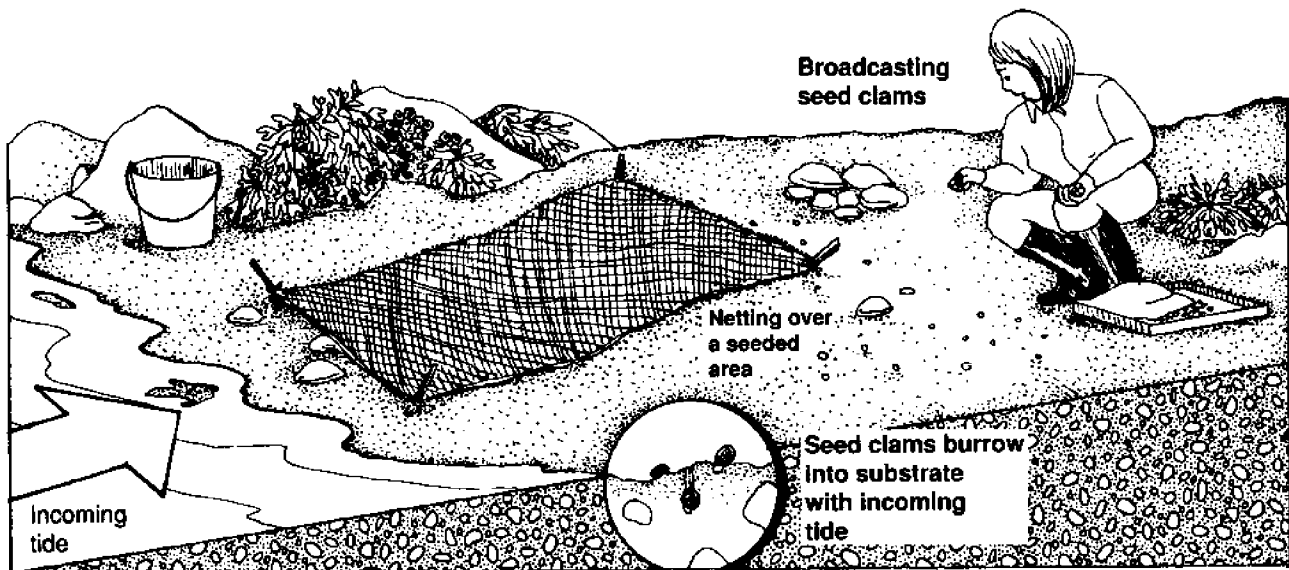


Once a beach is gravelled, it is also a good substrate for seeding clams. However, this method is expensive and is generally used only by commercial growers.

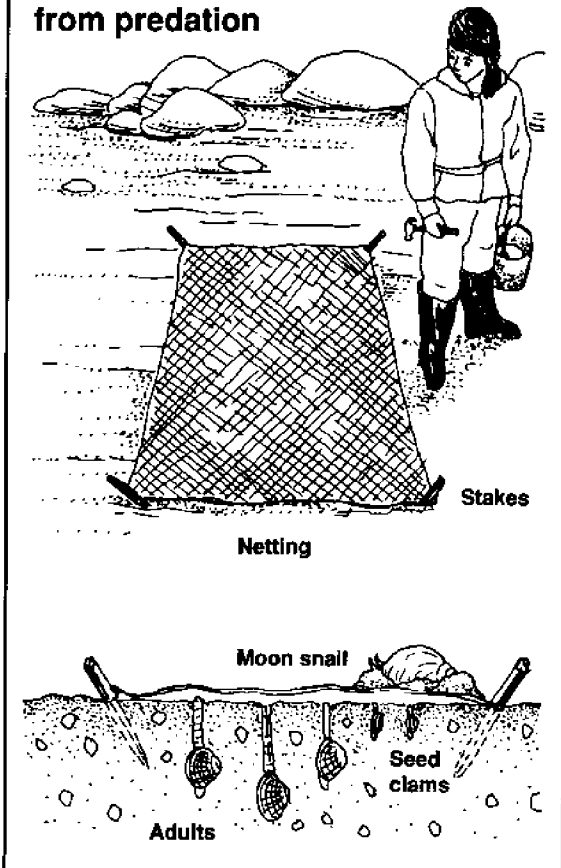
Gravelling requires several permits. Contact your county planning department to see if your activity is consistent with the state Shoreline Management Act. Also, before you consider gravelling your beach, check the references at the end of this pamphlet for more specifics.

Seeding Clams

Manila clams are relatively hardy and are the only species that has been successfully seeded. One hundred to five hundred Manila clams,



Protecting clam beds from predation



an inch and a half in length, can be produced on a seeded square yard.

You can seed clams between May and November, although spring seeding takes advantage of the summer growing season. Purchase seed from a commercial shellfish grower (check references). Rake or till your beach to remove large rocks. Keep the seed moist until you use it, but not immersed in water. Seed the juvenile clams by broadcasting them on the beach in front of an advancing tide. Spread them at a density of about 30 to 50 clams per square foot at the +3 to +6 ft. tide level. Healthy clams will dig into the beach within a few minutes of the tide's covering them.

Cover the seeded area with a light mesh netting anchored on all four sides to discourage predators. Bury the edges of the net in a trench about 8 inches deep and stake it down

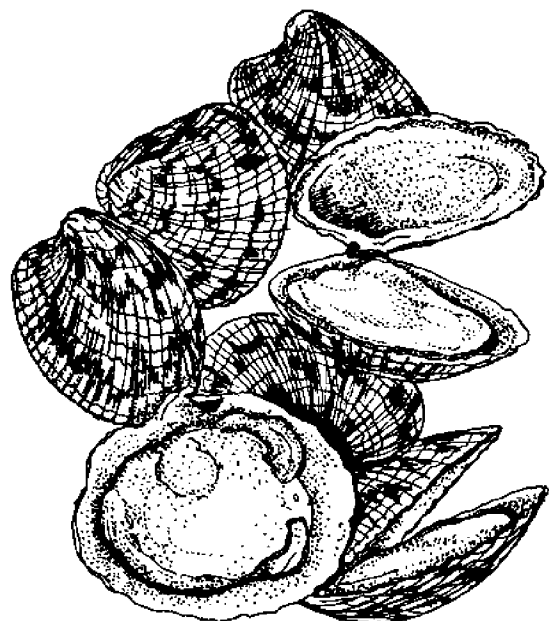
in several areas. Keep the netting in place until you harvest the clams.

A 50% survival rate of seeded clams is excellent; 30% survival is more common. Remember, don't assume that if you transplant one generation of clams to your beach, they will necessarily continue to populate the beach. Their floating larvae may be scattered for many miles.

Harvest and Enjoy !

The clams should be ready for harvest in about two years. As was the case with oysters, beach owners can harvest any number of clams. You must register as an Aquatic Farm with the Washington Department of Fisheries if you have any intention of selling any of your clams.

If you are successful in your first attempt to grow clams or oysters on your beach, you are to be congratulated. If you are not successful, use the references or contacts listed below to determine the reasons. You may be encouraged to try again.



Important Contacts

For information on the water quality in your area, contact:

Washington Department of Health
Office of Shellfish Programs
Mail Stop LD-11
Olympia, WA 98504
(206) 753-5959
PSP Hotline 1-800-562-5632
or your county health department

Washington Sea Grant
Water Quality Office, Mason County
9 Federal Building
Shelton, WA 98584
(206) 427-9670

Washington Sea Grant
Water Quality Office, Kitsap County
Courthouse Annex, MS-16
Port Orchard, WA 98366
(206) 876-7157

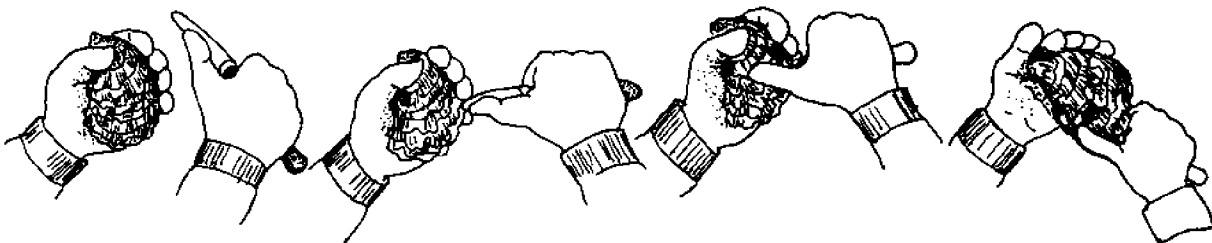
WSU Cooperative Extension
Water Quality Office, Thurston County
921 Lakeridge Dr. S.W.,
Rm. 216
Olympia, WA 98502
(206) 786-5445

WSU Cooperative Extension
Water Quality Office, Jefferson County
P.O. Box 572
Port Townsend, WA 98368
(206) 385-9158

For shellfish transfer permits, contact:
Washington Department of Fisheries
Point Whitney Shellfish Laboratory
1000 Point Whitney Road
Brinnon, WA 98320-9799
(206) 796-4601

For aquatic farm registration forms, contact:
Washington Department of Fisheries
Licensing Division
115 General Administration Building
Olympia, WA 98504
(206) 753-6590

For information about leasing tidelands from the state, contact:
Washington Department of Natural Resources
Division of Aquatic Lands
Mail Stop QW-21
Olympia, WA 98504
(206) 753-5330



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Elston, R. A. 1990. *Mollusc diseases: Guide for the shellfish farmer*. Washington Sea Grant, WSG-IS 90-03. Available from University of Washington Press (800) 441-4115, ISBN 0-295-97001-4. \$9.95.

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Matthiessen, G. 1989. *Small-scale oyster farming*. Available from National Coastal Resources Research and Development Institute, 2030 S. Marine Science Dr., Newport, OR 97365. \$4.00, plus \$2.50 shipping and handling.

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Northwest Indian Fisheries Commission. 1990. *From time immemorial: The story of the shellfish and the tribes*. Available from Image Productions, P.O. Box 2077, Olympia, WA 98507. \$25.00.

Nosho, T. 1989. *Small-scale oyster farming for pleasure and profit*. Washington Sea Grant, WSG-AS 89-01. Available from Washington Sea Grant, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. \$1.25.

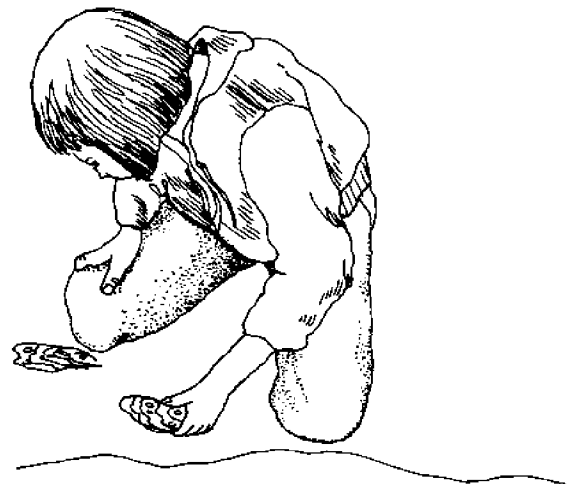
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Quayle, D. B. 1988. *Pacific oyster culture in British Columbia*. Available from Canadian Government Publishing Centre, Supply and Services, Ottawa, Ont. K1A 0S9 Canada. \$19.95.

Skidmore, D., and K. K. Chew. 1985. *Mussel aquaculture in Puget Sound*. Washington Sea Grant, WSG-AS 89-01. Available from Washington Sea Grant, 3716 Brooklyn Ave. N.E., Seattle, WA 98105. \$5.00.

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Oyster and Clam Seed Suppliers

Contact seed suppliers well ahead of time with your order. Additional seed sources, particularly for small orders, may be found by checking with other local clam and oyster farms.

Coast Oyster Company
1200 Robert Bush Drive
PO Box 166
South Bend, WA 98586
1-800-545-9429 (206) 875-5557
Pacific oyster seed on shell in bags
Minimum order \$100
As available

Rock Point Oyster Company
187 Chuckanut Drive
Bow, WA 98232
(206) 766-6002
Attn: Bill Dewey
Pacific oyster seed on shell in bags
Minimum order - none

Taylor United
130 SE Lynch Rd.
Shelton, WA 98584
(206) 426-6178
Attn: Dave Robertson
Pacific oyster seed on shell in bags
30-day advance notice
Minimum order - none

Wiegardt and Sons, Inc.
P.O. Box 309
Ocean Park, WA 98640
(206) 665-4111
Attn: Lee Wiegardt or Sue Cudd
Pacific oyster seed on shell in bags
Minimum order - none

Dahman Shellfish Co.
393 SE Dahman Rd.
Shelton, WA 98584
(206) 426-9880
Pacific oyster seed - singles
Manila clam seed
As available

Tokeland Oyster Co.
Box 533
Tokeland, WA 98590
(206) 267-0122
Attn: Tom Rotta
Pacific oyster seed on shell in bags
Manila clam seed
As available
One-month advance notice

Sound Sea Farms
Box 100
3801 Haxton Way
Bellingham, WA 98226
(206) 647-6261
Attn: Dick Poole
Pacific oyster seed on shell in bags
Manila clam seed
Minimum order - none

Olympia Clams, Inc.
6331 Murray Court NW
Olympia, WA 98502
(206) 866-7417
Attn: Judy Rogers
Manila clam farming kit
- Instruction manual
- Predator control netting
- 10,000 seed clams
Price - \$150

Kuiper Mariculture, Inc.
3025 Plunkett Road
Bayside, CA 95524
(707) 822-9057
Attn: Ted or Linda Kuiper
Manila clam seed
Minimum order - \$250

