

# Best Practices for Mud Creek Shellfish

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## Code of Conduct for Molluscan Shellfish Culture

The shellfish culture code of conduct is modeled after the Code of Conduct for Responsible Fisheries developed by the United Nations Food and Agriculture Organization (FAO). The shellfish code encompasses a set of common-sense precepts that most growers follow instinctively as good stewards of the environment and as producers of wholesome food. We agree that these statements belong at the beginning of every farm BP document.

### Shellfish farmers shall:

1. Conduct aquaculture operations in accordance with all applicable laws and regulations, and acquire and maintain all pertinent permits.
2. Make the best effort to produce and handle products of the highest quality and ensure product safety.
3. Make a best effort to communicate early and openly with water-based and land-based neighbors about any facet of their operation that might affect them.
4. Work to benefit the local economy by patronizing local businesses and through employment and contributions to the tax base and infrastructure.
5. Site, plan, develop and manage aquaculture operations in a manner that minimizes negative environmental impacts.
6. Site, plan, develop and manage aquaculture operations in a manner that ensures the economic and social sustainability of the operation.
7. Take all appropriate measures to avoid and contain disease outbreaks and report them quickly to the proper authorities if suspected.
8. Dispose of culture waste in a manner that does not constitute a hazard to human health or to the environment.
9. Consult and collaborate with government and authorities, researchers, other producers and stakeholders for the development and implementation of regulations, technologies and standards to achieve environmentally, economically and socially sustainable when feasible.
10. Encourage other growers to adopt the shellfish code of conduct and better management practices.

## Good Neighbor Policy

As growers we recognize that we operate our farm in the commons and that our ability to farm there is a privilege, not a right. That's why we make the effort to be good neighbors, both on the water and in our community.

We work hard to be a good neighbor by taking every opportunity to inform and educate the public on the benefits of shellfish aquaculture, introducing ourselves to neighbors and looking for opportunities to be friendly, maintaining membership in local or state aquaculture associations, pro-actively engaging with elected officials and regulators and offering them tours of our farm, encouraging policy makers to make room for shellfish leases and to preserve commercial access to farm sites, being courteous and minimizing disruptions to other users of the area.

We continue to inform and educate our neighbors by maintaining good signage explaining what is allowed and what is prohibited or dangerous on the farm, welcoming public discourse and using it as an educational opportunity to explain regulations and what it takes to run a safe operation, sharing info about our operations on social media.

We also will respect the wishes of property owners and will maintain operations within the leased area and not on adjacent property held by the Parker Refuge, Essex Greenbelt Association, and Mass Audubon Society.

### Noise Mitigation

Pumps, power washers, tumblers/sorters, audio players – all produce noise that may be annoying to others. Sound carries over water for great distances, particularly on calm days. We are considerate of waterfront homeowners and other boaters. Although we often need to start early in the day or run late into the evening due to weather constraints, wind conditions and tides, whenever possible, we avoid excessive noise when it is likely to irritate others.

We reduce the noise from farm operations by painting metal tumblers with rubberized coatings, using quiet four-stroke engines, being aware that sound carries over water and not yelling loudly or broadcasting loud music when working on the water, applying mufflers and baffles to motors.

### Odors

Most people living near the shore recognize that low tide will bring certain smells. Decaying sea squirts and dead shellfish can smell especially unpleasant, and we recognize that it is the farmer's responsibility to keep noxious odors to a minimum.

We keep offensive odors in check by removing the offensive material as rapidly as possible -especially in warmer weather, never placing fouled gear or decaying material in public areas, adhering to a schedule of routine fouling control so that fouling does not become so bad that it requires mitigation measures that generate noise or excessive odors.

## Multiple Use Conflicts

Most states allow other users certain types of access over leased areas. Activities such as fishing or boating are often permitted, as long as shellfishing and anchoring are avoided. Regulations governing those activities differ from state to state and in some cases from lease to lease. Often a lease-holder has exclusive use of an area for floating gear, but other uses might be allowed over bottom gear or bottom-planted shellfish. Some growers may permit lobster traps, fish pots or conch traps around the periphery of their leases. Shellfish farms often make great fishing spots as long as the fishermen know where to go so they don't get hung up on growers' gear.

We minimize multiple use conflicts by posting clear signage explaining what is allowed and what is prohibited on the lease - such as no anchoring or shellfishing - in order to avoid conflicts and gear damage, practicing good communication by explaining to folks we see on the water what we are doing and what other uses and activities are permitted or prohibited.

### Upland Gear Storage

Most shellfish farms require upland areas to store gear while not in use, and this is commonly regulated by private property laws and town zoning laws.

## Seed Sourcing

Almost all the shellfish grown on the East Coast are considered native species (or established non-natives). While some seed shellfish are still collected for aquaculture from wild larval sources, the majority of growers now depend on hatchery-reared larvae and seed. Of paramount concern is preventing the introduction of novel diseases into growing waters where these diseases have yet to be established. Every state has regulations pertaining to the transport of shellfish seed across state lines, and most require that seed be inspected by professional pathologists and certified free of disease.

The resulting patchwork of regulations and moratoriums have made it difficult to acquire seed in certain states. After years of work trying to harmonize the regulations, a group called the Regional Shellfish Seed Biosecurity Program (RSSBP.org) has developed maps showing the distribution of known pathogens, and has created an advisory panel to help provide resource managers with guidance on seed transfers. They have developed Best Practices for hatcheries and a hatchery certification program that involves inspections and audits.

We do everything we can to avoid transferring and introducing diseased seed on our farm by following state regulations regarding the inspection of seed by a competent pathologist prior to import, using seed certified by the Regional Shellfish Seed Biosecurity Program whenever possible, purchasing seed reared from stocks that are adapted to local growing conditions, transferring small seed or larvae to minimize the potential of transferring infected seed, purchasing lines of seed that have been selected for disease resistance whenever possible, promptly sending samples to a pathologist for evaluation if we experience an unexplained mortality event.

## Nursery Systems

In-water nurseries can be as simple as putting shellfish seed into fine-mesh bags and placing the bags on submerged racks or on surface floats. Many growers prefer to use upwellers to

pump food-rich water to small seed, either on land or in floating upwellers (FLUPSYs). But whatever methods are used, regular maintenance is a must to ensure the fine mesh does not become fouled, blocking the flow of water.

Fine-mesh bags on submerged racks or floating on the surface often require weekly fouling removal. Frequent flipping will help avoid fouling buildup and ensure the seed has access to food. If seed become infested with sea squirts or encrusting tunicates it may be necessary to treat the seed with freshwater or saturated-brine dips, acetic acid or chlorine. Although the chemicals will quickly break down in seawater to harmless component chemicals, the bath or dip water should be heavily diluted before dumping into growing waters or disposed of in a sewer.

We perform regular maintenance of our shellfish seed nursery system by thinning stock often to prevent overcrowding, being considerate of the noise and spray and timing of cleaning operations whenever using power washers, cleaning up adjacent boats and the surrounding dock areas after fouling treatment to reduce odors whenever working in a marina setting, cleaning gear often to prevent the accumulation of fouling material.

## **Fouling Control**

Most growers use netting, mesh bags or cages to protect their crops from predation. Invariably, these hard surfaces will attract various types of fouling organisms, such as seaweed, tunicates, bryozoans, sponges, worms, barnacles, and mussel and oyster overset. Unfortunately, these fouling organisms will block the flow of food-rich water to the shellfish and result in slower growth. Some fouling organisms also compete for food or degrade the quality of the product. In extreme cases fouling can smother the crop altogether. Fouling control is one of the chief challenges of shellfish farming and often accounts for much of the work expended on a farm.

The options for fouling control consist of prevention, avoidance, mechanical removal, air-drying, heat treatment. Each method has advantages and drawbacks, and may be effective for different crops and different types of fouling organisms.

Fouling control usually takes place on the farm site. Although cleaning gear at a land-based facility with subsequent land-based disposal of fouling material is an option, it can be impractical and cost-prohibitive. Some farms regularly swap out fouled gear with clean gear and treat the fouled gear on land, but most farms combine fouling control with the cleaning of gear on land only when gear is ready to be repaired or stored.

We have adopted best practices for fouling control by scheduling fouling-control efforts so as to prevent significant reductions in water flow to crops, avoiding accumulations of decaying fouling material in areas that could result in environmental impacts or foul odors, removing decaying fouling debris from public areas such as boat landings and docks and marinas, never storing fouled gear in public areas, removing fouling prior to storing gear on land if neighbors are close enough to object to odors, being respectful of others by not using pressure washers or trash pumps within earshot of others at odd hours, minimizing pump noise by using mufflers and baffles, using only non-toxic environmentally friendly anti-fouling coatings on gear.

## **Predator Control**

Shellfish predators can sometimes appear in significant numbers and cause a lot of damage to the crop. For shellfish in bags, cages or other gear or under netting, the mesh material is usually quite effective at excluding most large predators like crabs, fish and sea stars (starfish). Uniquely, sea stars are able to consume shellfish inside the mesh bag while remaining on the outside by everting their stomachs right through the mesh. Crabs and sea stars can also get into bags and cages as larvae or juveniles and then grow inside the gear to a size where they can prey on the crop.

In the case of clams grown under nets, some crabs, rays and predatory gastropods can reach the crop and cause damage despite the presence of netting, and it is important to control them. Some shellfish predators such as blue crabs and conchs can be removed and sold for consumption, while others such as the invasive green crab can be harvested and sold as bait or fertilizer.

Several species of birds are voracious consumers of shellfish. Diving ducks can eat huge numbers of seed clams and mussels each day, and large flocks can wipe out a crop in a few weeks. Because some birds are considered protected resources, lethal control is not an option (even repellents may be frowned upon). In these cases, farmers should work with NOAA, USDA APHIS Wildlife Services and state authorities to decide on an appropriate course of action. Although clam netting is usually effective against predation by diving ducks, mussel farmers have found it quite challenging to deter them. Growing mussels suspended from rafts allows growers to encircle the crop with netting to keep the ducks away, but this becomes yet another item that demands fouling control. An effective means to deter birds is by augmenting floating cages or sinking cages so they sit 6cm below the water level. This has been shown to decrease bird activity (such as roosting) by 37 fold.

We control predators on our farm by encouraging fishermen to trap commercially valuable predators near our lease, staying vigilant for predators that have gotten into gear or under netting and removing them before they do significant damage, deterring or repelling protected resources using only methods approved by the NOAA Fisheries Office of Protected Resources.

## **Storm Preparation**

A written plan for storm preparation is a must for all farms and gear types, and we have a written storm-contingency plan describing the steps we will take depending on the predicted intensity of the storm (*Storm Preparedness Plan*). Our plan contains appropriate emergency numbers and checklists of tasks such as: securing floating gear, inspecting gear, filling gas cans, filling SCUBA tanks, planning for when the power goes out for a few days, detailing how we will secure boats at the dock or mooring if we decide not to pull them out of the water.

## **Gear Maintenance, Disposal and Recycling**

One of the biggest potential adverse impacts of aquaculture is generating derelict aquaculture gear and marine debris. Loose netting, rope and other gear can get wrapped around propellers, and is both dangerous and a nuisance. Gear that washes up on shore or in marshes can entangle wildlife, is unsightly, and can negatively impact the public enjoyment of coastal areas. For any gear that may break free during a storm will be immediately removed once conditions are safe enough. All gear will be labelled with name and permit ID tag. Although not all gear loss can be prevented, especially in severe weather, it is important to

be as diligent as possible to minimize losses. Examples of good management practices include using proper anchoring and mooring systems, using sufficient tie-downs for nets (if used), and promptly removing unused or derelict netting and cages from farms. Some growers tag their gear with an identifying marker, which enables wayward items to be returned to the farm by people who find them, but more importantly shows the public that the farm takes responsibility for its gear. Increasingly, gear marking is becoming a regulatory requirement because it identifies bad actors and encourages gear recovery. Unfortunately, if not properly affixed to the gear, the labels themselves can become another source of marine debris.

It is strongly recommended that growers avoid single-use zip ties when bungees, straps, stainless steel hooks and clips, or twine can be used instead. Recently introduced biodegradable zip ties may be an option to consider. Zip ties that are used for the life of the gear often can be replaced with stainless steel hog rings. The proliferation of zip ties (and other aquaculture-related debris) in shoreline wrack gives the industry a bad name and may make it harder for established farms to get permission to expand or for new farms to get permitted.

For most types of shellfish aquaculture some loss of gear is inevitable, but periodically organizing or participating in a beach clean-up is a great way to demonstrate the farm's environmental stewardship. Most gear (such as rebar, ADPI bags, clam bags and cages) can be cleaned, repaired and reused for several years. Some netting, cages and ropes can be recycled. As rebars rust away they become dangerous rusty spikes in the sediment and should be removed. Once gear has passed its useful life it must be disposed of in an appropriate manner and in accordance with local regulations.

We follow best practices for gear maintenance, disposal and recycling by properly anchoring and tying down all gear, inspecting anchor lines bridles and other rigging on a routine basis and repairing them as needed to prevent breakage, promptly surveying the farm after storms to look for damaged or lost gear, promptly recovering lost or damaged gear, avoiding single-use plastic fasteners and instead opting for reusable bungees or hooks or clips or twine, clearly labeling gear so it can be returned if lost and ensuring that labels are well fastened, removing derelict gear for recycling or disposal in accordance with local regulations, organizing and participating in beach clean-up events.

Fuel Handling and Waste (note: technically these are regulations and not Best Practices) Fuel, lubricating or hydraulic oils, and other hydrocarbons can have a deleterious environmental impact on coastal waters and on cultured shellfish. These compounds usually come from boat operations, but can also come from farm vehicles and other machinery. All precautions should be taken to minimize any spills or leaks of these fluids, and waste oils should be disposed of properly. It is prudent to keep a supply of oil-absorbent towels or socks on board in case of accidental spills.

Federal law requires that any chemicals, lubricants or fuel on harvest vessels must be properly labeled and stored to prevent contamination of shellfish. In cases where harvesters use a truck instead of a boat to access their farms, the truck is considered the harvest vessel. It is also a violation of federal law to dispose of waste material overboard. Every vessel should have a container for any waste brought aboard, such as food wrappers or bottles, and for garbage that may be recovered from the water.

Human waste is subject to special regulations. It is illegal to dispose of human (or pet) waste overboard. Untreated waste can carry millions of pathogens and can contaminate large areas. Vomit can also be a source of pathogens and should not be disposed of overboard. Federal law requires every harvest vessel to have an approved Marine Sanitary Device (MSD) on board. At a minimum an MSD may consist of a bucket with a tight-fitting lid that is labeled "HUMAN WASTE" in 2-inch-tall uppercase letters.

We handle fuel and waste responsibly on our farm by never disposing of waste overboard and having designated trash containers on board at all times, properly stowing chemicals and fuel in well-marked containers, keeping oil-absorbent towels or socks on board to capture spilled oil or fuel, having approved MSDs on board all harvest vessels or on trucks used for harvest, notifying authorities if we observe someone vomiting overboard so they may initiate an investigation to ensure that the shellfish in the area is safe for harvest. This is preferable to potentially sickening hundreds with contaminated shellfish.

### **Best Practices for Floating Gear**

#### Site design

It is especially important to consider the prevailing winds, currents and other environmental factors when choosing a site for floating gear. Working a string of gear aligned with the prevailing wind is generally easier than working a line in a cross wind. The location of the farm is nestled in Mud Creek which has protection from marsh and woodland on both sides of the channel.

We have taken pains to design our farm so that the final product is neat, tidy and professional looking by organizing floating cages in strings and not overcrowding the lease area. Each string will contain 12 floating cages per string and each string will be spaced 8 feet apart (*see proposal for details*). By allowing for space in-between cages and strings this will reduce damage to the gear. The gear attached to the mainline will be held in place by helical screw anchors and 3/8 chain has shown to effectively hold floating gear during turbulent weather.

## **Bird Deterrence and Bird Waste Management**

Somewhat unique to floating and intertidal gear is the potential to attract roosting birds or mammals, and the potential for pathogens in their waste to contaminate the shellfish and make consumers ill. In extreme cases, bird guano can elevate coliform levels, forcing regulators to downgrade the status of the harvest area or close it altogether. While almost any structure - buoy, piling, float or boat - can attract birds, the impacts on food safety and water quality will depend on the numbers and size of birds (or mammals) in relation to the size of the area, the depth of the water and the velocity of the flushing tidal currents.

The goal is to deter birds from landing on gear, not to harm them. Any devices used to repel birds are likely to be species-specific. Ideally, deterrents are easy to maintain, durable, economical and don't interfere with operating (flipping) the gear. Most birds will acclimate to deterrents quickly, so it may be necessary to use multiple deterrents and switch them up often. Human presence makes for a great deterrent in which on most days workers will be present on the farm. Gear augmentation such as the addition of a metal pyramid structure that sits on top of the gear can have a 37 fold decrease in bird activity. Submerging gear by 6cm has also shown to significantly deter birds from landing on the gear. All three methods will have a non lethal positive impact on reducing bird activity on the farm.