ENVIRONMENTAL CODE OF PRACTICES FOR THE VIRGINIA SHELLFISH CULTURE INDUSTRY

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The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce, NOAA, or any of its subagencies.

This Environmental Code of Practices for the Virginia Shellfish Culture Industry has been endorsed by the following:

- ***Virginia Department of Agriculture and Consumer Services (VDACS),***
- ***VDACS governor-appointed Aquaculture Advisory Board,***
- ***Virginia Farm Bureau Federation Aquaculture Advisory Committee.***

VIRGINIA SHELLFISH AQUACULTURE ENVIRONMENTAL CODE OF PRACTICES

Preamble

Shellfish growers in Virginia, like traditional family farmers are independent food producers. Although shellfish growers are subject to numerous state and federal regulations, they strive to maintain excellence in production practices that reach beyond these regulations. The following set of principles outlines a broad consensus within the industry regarding codes of practices designed to ensure that this valuable food production industry protects and enhances the coast environments within Virginia.

Environmental stewardship

The shellfish aquaculture industry in Virginia is committed to environmentally-responsible, sustainable production of shellfish in Virginia's coastal waters. While engaged in the production of a valuable food commodity, members of this industry also recognize the important role that they play as stewards of the coastal environment and they are committed to continually evaluating and improving their practices to achieve these goals. Virginia's shellfish growers appreciate that they are completely dependent upon a healthy estuarine ecosystem to support their culture activities. As such, they are committed to active involvement in management issues related to shoreline, watershed and water use planning. Further, they are committed to ensuring that their culture and processing activities meet the highest standards of environmental stewardship.

Estuarine ecosystems are sensitive environments on which many other organisms depend. Shellfish growers in Virginia are committed to protecting biodiversity in our coastal waters and maintaining healthy ecosystems. Thus, they encourage scientific research to improve our knowledge about how shellfish farming interacts with the environment, including positive and potentially negative impacts.

Clean water

There is no single factor on which the shellfish aquaculture industry is more dependent than excellent water quality. Virginia's shellfish growers are, thus, fully committed to the protection and maintenance of the highest water quality in shellfish growing areas. This commitment includes setting the highest standards possible in their own practices and serving as advocates for clean water in regional planning activities.

Waste management

Culturing shellfish in our coastal waters requires use of various gears for protection from predators (nets, bags, trays, etc.), marking culture sites and harvesting. Members of this industry are committed to implementing management procedures that minimize the amount and impacts of waste from their production practices. These procedures include, when possible, reducing the amounts of material used, re-using and recycling materials and recovery and removal of waste materials.

Aesthetic considerations and other resource users

Virginia's shellfish growers recognize that they share the Commonwealth's valuable coastal environments with many other users. They are committed to working cooperatively with all other users of this resource to reduce conflict, ensure continued access to these resources and promote environmentally-responsible uses. Shellfish farmers also appreciate the importance of aesthetic considerations from both upland owners and other water users and will strive to reduce unwanted visual impacts from their operations.

Disease management and genetic integrity

The health of Virginia's shellfish aquaculture industry is dependent upon careful management of risks posed by shellfish diseases. Industry members fully support the implementation and funding of state programs to provide disease testing for shellfish. The industry also holds the view that any movement of shellfish seed should be conducted in a responsible manner to minimize the introduction of unwanted diseases and pest organisms. Similarly, since disease susceptibility of shellfish stocks is related to their genetic make-up, shellfish growers are committed to the development and maintenance of stocks that reduce risks from disease.

Regulatory compliance

Virginia's shellfish growers recognize that the waters and submerged land on which the industry depends is a commonly owned state resource. Accordingly, we are aware of the need for regulation and are committed to full compliance with all federal, state, and local regulations relevant to aquaculture. It is hoped that industry compliance with the *Environmental Code of Practices* and the *Best Management Practices for the Virginia Shellfish Culture Industry* will minimize the need for overly burdensome regulatory requirements.

BEST MANAGEMENT PRACTICES FOR THE VIRGINIA SHELLFISH CULTURE INDUSTRY

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Introduction

The USDA 2005 Census of Aquaculture ranked Virginia in the top ten US producers of aquaculture products. This high ranking was achieved due to the strength of the shellfish culture industry within the Commonwealth. In the most recent Virginia Agricultural Statistics Service report, hard clam and oyster aquaculture, with gross sales of over $23.1 million, accounted for over 66% of the total gross sales for all aquaculture products, both fresh water and marine (VASS, 2003, "Virginia Aquaculture Report"). More recently, Murray and Oesterling (2007) indicated that the value for hard clam and oyster sales (seed and market) exceeded $32.0 million in 2006. All indications are that the Virginia shellfish culture industry will continue to grow and expand, especially in the area of oyster culture. Shellfish culture is an important part of our economy.

Shellfish culture is not a new industry in Virginia. Extensive, on-bottom oyster culture has been occurring for over 100 years. Oyster planting on privately leased grounds is considered a traditional use of Virginia water resources, with a well-regulated management system in place. The hard clam culture industry along the entire east coast can trace its beginnings to the Virginia Eastern Shore; as early as 1956, a private clam hatchery operated on the Eastern Shore. With the development of predator control strategies by Virginia scientists and industry members, the hard clam culture industry expanded during the latter-part of the 20th century.

The continued health and expansion of shellfish culture depends upon good water quality. More than any other factor in the culture business, good water quality is critical to the success of shellfish aquaculture. For this reason, it is incumbent upon members of the shellfish culture industry to be advocates for the maintenance of water quality and to act as role models for environmental stewardship during the course of their business operations. Conducting their business in an environmentally responsible manner promotes the sustainability of shellfish culture, increases product quality control and contributes to the overall value of their shellfish. Additionally, by practicing responsible environmental stewardship in their day-to-day operations, shellfish culturists set an example for others enjoying the waters of Virginia .

At the same time that the Virginia shellfish culture industry is flourishing, it must to be recognized that there are other users of Virginia's coastal resources. By its nature, much of shellfish culture activities occur in the nearshore areas. These same areas support a variety of both recreational and commercial activities, some of which are not compatible with shellfish culture. This leads to potential user conflicts. For shellfish culturists working within the coastal community, it is important that they coexist with other marine and shoreline users.

What are Best Management Practices and why should they be implemented?

In their purest form, Best Management Practices (BMPs) are voluntary measures taken by members of the shellfish culture industry to help preserve the very water quality they depend upon, reduce their impacts on the environment, and contribute to the sustainability of their industry. BMPs can also serve to highlight the proper operational parameters or "normal industry practices" that novice culturists may want to implement. BMPs should minimize the impact on the environment, while serving to maintain or increase crop production and quality.

Besides preserving the environment, BMPs can also address societal issues. In many instances this could be characterized as being a good neighbor, respecting rights of others to appreciate and use the coastal environment. Shellfish culturists must recognize the concerns of all coastal inhabitants about the impact of shellfish farming activities on other interests. It is critical that public support exists for the continued growth and expansion of shellfish culture. This support can be facilitated by adhering to a set of "good neighbor" BMPs.

It must be understood that no single BMP will cover all shellfish crops or all shellfish growing sites. Shellfish culture is very site-specific, so that any BMPs implemented must take into account site conditions, economic opportunities and local environmental conditions. All BMPs should be accepted as guidelines or goals which the shellfish grower should aspire to achieve.

Organization

This document is separated into four major subject areas: Social Management; Operational Management; Biological Management; and Food Safety and Quality Management. Under each subject area, different topics are identified under which BMPs will be listed. A short description of the topic will provide rationale for its inclusion, followed by the suggested BMPs.

I. Social Management

Social management issues are present in all aspects of shellfish aquaculture, from initial site selection through the culture process until the ultimate harvesting of finished product. Social management could be likened to being a good neighbor, respecting the rights of others to enjoy the amenities of the coastal environment. As shellfish aquaculture continues to expand, the potential for conflicts between the various users of the coast will intensify. Shellfish growers can reduce the potential negative impact that their business has on enjoyment of coastal resources by others by practicing a good neighbor policy. By listing social management issues first in this document, shellfish growers recognize the importance that public perception can play in their business. Besides demonstrating good environmental stewardship, the shellfish grower should adhere to a policy of openness and consideration for the rights of others.

Social management issues are also those that are regulatory in nature or that relate to potential user conflicts. Following legal guidelines and reducing potential user conflicts will permit the shellfish grower to concentrate on his shellfish culture business without time-consuming interruptions to deal with disputes.

Issue I-1. Site Selection

The selection of a culture site is the most important decision that a shellfish grower will make. In determining where to site a culture operation, the prospective grower must consider both biotic and abiotic factors.

Best Management Practices

I-1-A. Depending upon the species of shellfish to be cultured, biological requirements of the shellfish must be known. Prospective culture area environmental parameters should be as closely matched as possible to the requirements of the target species.

I-1-B. Besides the biological needs, water quality regarding classification for harvesting must be considered, both for the present and for the future.

I-1-C. A thorough investigation of all other land uses in the vicinity should be conducted to identify potential areas of conflict or possible future water quality problems.

I-1-D. Prior to the initiation of any culture operation, the grower should investigate the availability of support services (e.g., electrical, mechanical, transportation, etc.).

I-1-E. In evaluating a potential culture site, the grower should be aware of the proximity of any sensitive environments, including shoreline vegetation and submerged vegetation.

I-1-F. Shellfish nursery and grow-out operations should give consideration to at least one site that is protected from coastal storms.

Issue I-2. Permits

Regulatory issues are a fact of life. For the shellfish culturists, these include local, state, and federal regulations. All shellfish culture businesses should operate in a legal manner.

Best Management Practices

I-2-A. Shellfish growers should obtain all necessary state, federal, and local permits for their business.

Issue I-3. Access

Access can apply to the shoreline, leases, riparian, over-water or private property. In some cases, these are legal issue, other times part of the good neighbor policy.

Best Management Practices

I-3-A. Shellfish growers should become familiar with "traditional" uses and users in the area.

I-3-B. In recognizing other users, shellfish growers should acknowledge the access rights of others, as well as restrictions to limiting access to leased growing areas.

I-3-C. If floating gear is to be used, shellfish growers should be aware of navigational rules.

Issue I-4. User conflicts

This is the good neighbor policy. Shellfish growers need to recognize the rights of other users and understand how their business practices may impact upon these rights. By being sensitive to the rights of other users, shellfish growers can reduce the potential for user conflicts.

Best Management Practices

I-4-A. Early and open discussions with neighbors regarding your culture business and how you intend to operate will help dispel fears of adverse environmental impacts. Educating your neighbors to the beneficial environmental aspects of shellfish aquaculture should reduce potential negative impressions of your operation.

I-4-B. Shellfish growers should be sensitive to scenic vistas in all aspects of their business, from shore-side operations to the marking of growing grounds to day-to-day operations.

I-4-C. All operations, on or off water, should maintain a neat appearance. Included here is the timely and proper disposal of solid wastes.

I-4-D. Noise should be kept at a minimum.

I-4-E. At all times, the shellfish grower should be polite to visitors, on or off water. This should be viewed as an opportunity to educate the general public about the shellfish culture industry and as a means to reduce potential user conflicts.

II. Operational Management

While there are similarities in the general approach to shellfish aquaculture, no two culture operations adhere to the same operating procedures, schedule or degree of maintenance. Each shellfish grower has their own methods, styles, or biases regarding the proper way to culture shellfish. However, there are common areas during the day-to-day operation of culture activities where best management practices can be applied to reduce the overall environmental impact of the business and reduce the potential for adverse public opinion. This section addresses more of the abiotic aspects of shellfish culture.

Issue II-1. Upland Site

The upland site of a shellfish culture operation is a focal point for attention by local residents and passers-by. This often is the first point of contact for individuals not familiar with shellfish culture operations and can influence how the entire culture industry is perceived.

Best Management Practices

II-1-A. Consideration should be given from the earliest planning stages through construction and daily operations to the facility layout of structures and equipment storage in order to minimize visual impacts and to streamline access to the facilities.

II-1-B. At all times the facility should maintain a neat appearance.

II-1-C. When storing equipment and gear, it should, as much as possible, be out of sight and maintained in a neat manner.

II-1-D. Excessive vehicular traffic should be minimized.

Issue II-2. Trash Management

Shellfish culture activities generate trash at both onshore and offshore locations. This could consist of general garbage, no longer needed gear or other debris. Good stewardship dictates that trash be handled in an environmentally accepted manner.

Best Management Practices

II-2-A. All trash and debris should be removed and disposed of in an appropriate upland location.

II-2-B. Collect all trash/debris from water sites for appropriate upland disposal.

II-2-C. Protective netting should not be released into the environment, but brought to shore for appropriate disposal.

II-2-D. Whenever possible, unneeded materials should be recycled. Likewise, reuse of materials should be encouraged.

II-2-E. The shellfish culture manager should educate staff on the importance of waste management and make every effort to ensure that staff behaves in an environmentally friendly fashion.

Issue II-3. Vessels

Vessels are an integral part of any shellfish culture operation. They are the working platforms which perform many different functions for the shellfish grower. They are also a very visible part of the day-to-day operations of the culture operations.

Best Management Practices

II-3-A.	Vessels should be maintained in proper working condition.
II-3-B.	Vessels should be kept clean, with equipment/gear stored neatly onboard.
II-3-C.	The release of any contaminants should be prevented.
II-3-D.	Noise impacts should be reduced. This includes loud talking by culture personnel, as well as operating the vessel motor in a reasonable manner.
II-3-E.	During vessel operations, the grower should avoid damaging any sensitive natural habitat or marine life.

Issue II-4. Grow-out Site

The grow-out site for shellfish culture operations has many issues involved with proper management. Some will be regulatory, others relate to access or the type of gear being used to grow the shellfish. They all reflect on the grower, how he conducts his business and his perceived dedication to good environmental stewardship.

Best Management Practices

II-4-A.	Grow-out sites must be clearly marked, following all regulatory requirements.
II-4-B.	While following legal marking requirements, the shellfish grower should be sensitive to scenic vistas.
II-4-C.	Individual markers should be maintained in good condition, replacing fouled or damaged ones in a timely manner.
II-4-D.	All regulatory requirements regarding the type of grow-out gear being utilized must be followed.
II-4-E.	Efforts should be made to educate visitors to the potential consequences of their presence on your growing grounds.
II-4-F.	The shellfish grower should be ever vigilant of his grow-out site and others in the vicinity, for signs of vandalism, theft, or equipment damage.
II-4-G.	The condition of grow-out gear and other equipment, as well as site markers, should be monitored regularly and cleaned when necessary.
II-4-H.	Debris should be removed in a timely manner.
II-4-I.	The shellfish grower should be watchful for abandoned gear from others and remove it, notifying the proper owners when known.
II-4-J.	All grow-out gear should be made of durable, long-life, non-polluting materials.

Issue II-5. Worker Safety

While many shellfish culture operations are small one-man or family enterprises, some businesses employ outside personnel. Culture businesses with employees must consider the safety of these hired individuals

Best Management Practices

II-5-A. All employees must be properly educated on the procedures being used during culture operations.

II-5-B. All employees must be supplied with the appropriate safety equipment during culture operations.

Issue II-6. Water Release

Release of culture water may be necessary during some phases of onshore shellfish rearing. With the reliance on good water quality, it is not surprising that any releases from onshore shellfish hatcheries are as clean, or in some cases cleaner than, the incoming water. These are benign releases.

Best Management Practice

II-6-A. The shellfish culturist should obtain and follow all necessary permits.

III. Biological Management

Shellfish growers are farmers raising living animals. As such, they must deal with biological factors which may potentially impact their crops. Shellfish growers must be concerned about maintaining the proper conditions for maximizing production, while at the same time remaining vigilant for other potential threats to their businesses. These include such diverse topics as predator/competitor control, diseases, and genetic integrity.

Issue III-1. Water Quality

As a sustainable, environmentally-friendly business, shellfish aquaculture depends upon the maintenance of good water quality. Initial site selection should be based upon the proper water parameters for the species intended to be cultured. However, during the culture process, water quality issues need to be continually addressed.

Best Management Practices

III-1-A. Routine water quality monitoring should be a part of normal operating procedures. Periodic measurements of pertinent water parameters should be conducted and recorded for future reference.

III-1-B. The shellfish grower should be vigilant for the presence of algal blooms and potential negative impacts on growth or marketing of shellfish.

III-1-C. Shellfish growers should be aware of activities within their watersheds that threaten wetlands and other buffers between the uplands and shellfish culture areas and report any questionable activities to the appropriate authorities.

III-1-D. Shellfish growers have a responsibility to work within the community to promote public awareness and policies that support the maintenance of good water quality.

III-1-E. Shellfish growers should report activities within the watershed that threaten water quality to the appropriate authorities.

III-1-F. Shellfish growers should work closely with the Division of Shellfish Sanitation of the Virginia Department of Health to identify any potential sources of fecal coliform inputs into their growing waters.

III-1-G. Because of threats to water quality posed by petroleum-based products, shellfish growers should take all necessary precautions to reduce the risk of spills or leaks in their operations. All containers with fuel, oil and other petroleum products that are taken on or stored near the water should be properly sealed and secure. All machinery using these products should be maintained in good working condition, free of leaks. Boats working on culture sites should be equipped with absorbent materials designed for cleaning up oil spills.

III-1-H. Evidence of any oil spill should be reported to the proper authorities.

Issue III-2. Predator Control

A distinguishing feature of shellfish aquaculture is the need to provide protection from predators. Predator exclusion has the potential to contribute to marine debris problems.

Best Management Practices

III-2-A. The shellfish grower should use the appropriate predator control gear/equipment for the shellfish species being cultured. It should be properly installed, presenting a neat and orderly appearance.

III-2-B. When possible, all predator control gear should be identified by ownership.

III-2-C. Predator control gear should be maintained in good condition, periodically being inspected, with damaged gear being repaired or replaced. Inspection should be conducted after every major storm event.

III-2-D. All predator control equipment should be removed from grow-out sites when not in use.

III-2-E. Predator control gear no longer needed should be disposed of in an appropriate upland site. Never dispose of predator control gear in the field.

III-2-F. Shellfish growers should remove any derelict predator control gear encountered and make attempts to find the owner.

III-2-G. Shellfish growers should be mindful of any effects on non-target species and work to correct any undesirable consequences.

Issue III-3. Fouling Organisms

Fouling organisms represent both competitors for food resources and contributors to reduced water quality for cultured shellfish. Additionally, the presence of heavy fouling growth can result in aesthetic complications, both on and off shore.

Best Management Practices

III-3-A. Predator protection gear should be inspected regularly to identify potential water flow reduction resulting from excessive fouling growth.

III-3-B. If practical, predator protection gear should be cleaned of fouling organisms at the grow-out site. Material removed from the gear should not be permitted to accumulate or become a nuisance.

III-3-C. Heavily fouled gear should be removed and disposed of properly in an upland site.

III-3-D. Grow-out site markers should be inspected regularly for excessive fouling growth and cleaned as appropriate, using proper fouling organism disposal.

III-3-E. When conducting any onshore activities with fouled gear, be considerate of adjacent property owners by being aware of potential odor issues.

III-3-F. Public landings, boat ramps, and parking lots should not be used for conducting gear cleaning.

III-3-G. The use of anti-fouling paints on shellfish culture gear is not appropriate.

Issue III-4. Diseases

Shellfish are subject to diseases which do not pose a human health threat, but which can be devastating to the shellfish.

Best Management Practices

III-4-A. The shellfish grower should become familiar with the different shellfish diseases and learn to recognize warning signs of possible infection.

III-4-B. The shellfish grower should be mindful of the conditions under which he is holding his shellfish, maintaining a proper stocking density for size of shellfish under culture. Shellfish which are stressed, such as by overcrowding, during the culture process can be more susceptible to disease.

III-4-C. The shellfish grower should have suspected disease-infected shellfish tested by the Virginia Institute of Marine Science or other certified shellfish pathologist.

III-4-D. All regulatory requirements for the importation of shellfish seed from out-of-state hatcheries should be followed to prevent the introduction of diseases or unwanted species. All purchased shellfish seed should have a disease-free certification.

III-4-E. Shellfish growers are encouraged to obtain seed produced at in-state hatcheries to reduce the risks of importing pathogens from out-of-state.

Issue III-5. Genetics

The reuse of brood stock animals for seed production can lead to inbreeding problems if care is not taken. On the other hand, selective breeding can facilitate the expression of favorable growth characteristics. Additionally, interest has been expressed in the use of non-native or exotic shellfish species for culture.

Best Management Practices

III-5-A. Non-native or exotic species must be grown under proper permitting/licensing, as well as containerized, if required by permit.

III-5-B. Shellfish seed from out-of-state sources should be of genetic background to not adversely impact local shellfish populations. Shellfish growers should provide out-of-state hatcheries with local brood stock for seed production.

III-5-C. Shellfish hatcheries should be aware of possible negative impacts from repeatedly using the same brood stock or limited numbers of spawners.

III-5-D. Selective breeding programs should be encouraged to develop shellfish stocks with superior characteristics.

Issue III-6. Habitat Protection

Shellfish culture occurs within the waters of the Commonwealth and in most cases on bottoms leased from the state. It is incumbent upon shellfish growers to protect all natural habitats, ensuring continued environmental health for our natural resources.

Best Management Practices

III-6-A. Prior to any activity, either onshore or offshore, the shellfish grower should document the current conditions on the site.

III-6-B. The shellfish grower should be aware of any submerged aquatic vegetation in the vicinity of intended grow-out activities and avoid those areas.

III-6-C. The shellfish grower should follow all regulatory requirements when planting in the vicinity of submerged aquatic vegetation.

III-6-D. When crossing areas of submerged aquatic vegetation, potential impacts should be minimized by lowering speed and/or raising the propeller to avoid bottom contact.

III-6-E. The shellfish grower should avoid crossing marshes or disturbing shoreline vegetation when accessing planting grounds.

III-6-F. The shellfish grower should always be aware of good environmental stewardship and serve as an example for others in your respect for our natural resources.

IV. Food Safety and Quality Management

Previous sections have dealt with how best to limit potential shellfish culture impacts on the environment or prevent adversely affecting the rights of others to access and enjoy our natural resources. Here, we address two issues that do not relate to natural resources or access rights, but are equally important to shellfish growers and should be part of their best management practices.

Shellfish growers are producing a food item destined for human consumption. In many cases, their products will be consumed raw. This raises issues pertaining to food safety and human health. The occurrence of any shellfish related illnesses, regardless of source, can cause economic hardships for shellfish growers.

Virginia shellfish growers are proud of the quality products that they put out on the market. It is in the industry's best interests to continue to market shellfish with the highest quality standards.

Issue IV-1. Human Health

Being implicated in a shellfish related illness can have devastating effects on an aquaculture business. Adhering to the strictest of policies to prevent the possible occurrence of a shellfish illness is in the best interest of all shellfish growers.

Best Management Practices

IV-1-A. The shellfish grower should obtain all required permits for the sale of shellfish for human consumption.

IV-1-B. The shellfish grower should follow all requirements of the Virginia Department of Health, Division of Shellfish Sanitation, for the handling and sale of shellfish for human consumption.

IV-1-C. Only non-toxic packaging materials should come in contact with marketable product.

IV-1-D. All personnel should be educated on the importance of proper personal hygiene and cleanliness of equipment in order to maintain a safe, wholesome product.

Issue IV-2. Market Quality

Providing a high-quality product should be a goal of all shellfish growers.

Best Management Practices

IV-2-A. Shellfish to be marketed whole, in-the-shell, should be clean, with the shell free of excessive mud or other fouling organisms.

IV-2-B. Shellfish should be properly graded for consistency in size.

IV-2-C. Shellfish should be packaged in approved containers, made of non-toxic materials.

IV-2-D. Product labels should comply with all existing regulations.

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