

SHELLFISH AQUACULTURE MANAGEMENT

Rhode Island Conservation Practice Work Sheet **706SAM**



Definition

Applying environmentally sound management and sustainable aquaculture practices in the husbandry of bivalve mollusk species.

Purpose

- Enhance the sustainability of aquaculture
- Optimize the benefits of shellfish farming on water, plant, animal and human resources, including, but not limited to the protection of marine and estuarine wildlife.
- Ensure dependable quantity and quality of water to support shellfish production
- Ensure adequate quantity and quality of food to support shellfish production

Where used

Intertidal and subtidal areas where propagation and aquaculture of shellfish is licensed and/or permitted by the governing regulatory authorities.

Shellfish Aquaculture Management Plan

A Shellfish Aquaculture Management Plan shall be developed that addresses all of the identified resource concerns, including, but not limited to,

the following:

Water Quality and Water Quantity

The successful growth and harvesting of food-quality shellfish requires high water quality--quality that is vulnerable to the effects of myriad of coastal uses. Chronic degradation of water quality and associated substrate can threaten the health and survival of shellfish.

Bottom-dwelling shellfish, by their very nature, are capable of filtering pollutants and wastes, along with their traditional food items, from the surrounding water and substrate.

Improvement of the aquatic environment is largely dependant on balancing marine resource uses and fostering biodiversity. More direct action by growers shall include the following:

- Ensure that any manipulation of sediment or biofouling removal activities do not impact sites downstream.
- Combustion engines used in the shellfish growing area must be in good repair, with fuel and oil properly contained to avoid the risk of spills.

Maintaining adequate water flow through the growing area is critical and involves the following management activities:

- Monitor nets and other equipment regularly for biofouling.
- When bio-fouling restricts water flow to cultured shellfish, clean and remove the fouling organisms to facilitate shellfish health and growth, or replace the nets with new and/or clean material.
- Use of in-water cleaning methods must not result in accumulation of removed materials downstream where they may cause local degradation of the environment.
- Cycle off-bottom equipment with redundant gear for cleaning and air drying.

Protection of Important, Threatened, Rare and Endangered Species

Risk of accidental loss of aquaculture gear into the environment, due to inadequate securing, excessive fouling and ice/storm damage, shall be managed through adoption of the following management strategies:

- Netting, cages and/or other shellfish containment systems must be secured and well maintained.
- Properly demarcate lease site boundaries to prevent motor vessel collisions which can then result in gear/net entanglement.
- Monitor weather and seasonal conditions (severe storms, ice masses, very low water/air temperatures) to allow proper scheduling of equipment removal or movement.
- Remove or move gear to deep water licensed shellfish growing sites during winter to avoid damage, loss and transport of gear into the environment.
- Cycle redundant gear off-site to reduce excessive fouling.
- Replace nets in a timely manner.
- Collect and properly disposal of nets.
- Keep records of net cycling, replacement, removal and movement.

Implementation of the prescribed Shellfish Aquaculture Management Plan shall be accomplished through the implementation of approved Shellfish Aquaculture Best Management Practices (BMPs). The criterion for the BMPs is set forth in the Shellfish Aquaculture BMP Worksheets. Shellfish Aquaculture BMP Worksheets are based upon the current guidance document *Best Management Practices for the Shellfish Culture Industry in Southeastern Massachusetts* (South Eastern Massachusetts Aquaculture Center, and Massachusetts Department of Agricultural Resources, 2004).

Considerations

All forms of shellfish aquaculture must comply

with federal, state, and local regulations. Shellfish farming is licensed by the Rhode Island

Coastal Resources Management Council (CRMC) (RI General Law 20-10; Section 300.11 Coastal Resources Management Plan) in consultation with local cities and towns and the U.S. Army Corps of Engineers (Section 10 of the Rivers and Harbors Act of 1899; and Section 404 of the Clean Water Act) through the Rhode Island Programmatic General Permit (PGP).

All shellfish farming areas or licensed shellfish growing sites must be properly located in designated waters, and adequately marked and recorded with the appropriate regulatory authority.

Compatibility with Other Coastal Uses

Shellfish growing areas shall be marked with standard U.S. Aids to Navigation to improve public safety and reduce boat strikes, and thereby reduce the risk of petrochemical spills, loss of gear and livestock. A log book shall be kept of buoy maintenance and replacement.

Spacing within an aquaculture area shall allow for normal operations and maintenance on the site, without impairing or interfering with activities within and around the farmed area.

Buffer zones or unplanted areas between adjacent shellfish growing areas shall be established to provide space for site access and gear manipulation, while providing barriers to infective disease transmission.

Rafts or other floating equipment must be maintained so as not to impede normal navigation through the area.

SPECIAL CONSIDERATIONS

Wherever possible, avoid areas that contain significant amounts of pre-existing submerged aquatic vegetation, or areas within designated critical or priority habitat for aquatic or upland species identified as important, threatened, rare or endangered.

Access routes to sites should be planned to minimize the need for motorized transport, and transport over private property.

If wetland buffer zones are involved in the accessing of sites, proper permitting must be obtained by the grower.

Layout and placement of gear should be

designed to minimize impact on the natural function of the ecosystem, while allowing for normal activities of the farmer.

Consider using biodegradable materials when available to reduce the environmental risk of accidental losses.

Keep records of all notifications filed with local harbor masters and other regulatory authorities.

Design measures to avoid depredation by birds or other animals.

Growers should be aware of locally important, state and federally listed species that may be encountered in the area. Consider using a wildlife identification field guide, and keeping a journal to log sightings of protected or endangered wildlife species in and around the growing area.

Operation and maintenance

A plan for operation and maintenance shall be prepared for use by those responsible for the system. This plan shall provide for inspection, operation, and maintenance of the aquaculture management system. O&M plan components shall include, but are not limited to the following:

- Maintain site markers, particularly during periods of high use of the coastal zone.
- Maintain shellfish growout gear in water deep enough to minimize the risk of collision with surface water traffic.
- Remove all unused or unnecessary equipment from the site.
- Mark all equipment left on-site with distinctive marks for identification as required by CRMC (i.e 4" lettering "CRMC + Lease Number"), and secure it properly to minimize risk of damage or offsite movement.

- Inspect growing areas following storm events, and repair any damage.
- Monitor and keep records of the following:
 - gear replacement cycles
 - water temperatures and weather conditions
 - mortality or disease episodes
 - wildlife sightings
- Winter maintenance:
 - Position all equipment and materials out of the range of influence of winter ice.
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 - Position all equipment and materials out of the range of influence of winter ice.
 - Carefully secure all gear to the substrate with supplemental attachment devices during winter or remove materials off-site to an upland or deep water licensed shellfish growing site.
 - Ensure that any net or other gear left on-site during the winter is free from fouling to reduce the potential for attachment of ice to netting.
 - Replace marker buoys on-site with winter sticks or other marking devices that are approved by the appropriate authority to minimize the risk of movement by ice.

REFERENCES

Best Management Practices for the Shellfish Culture Industry in Southeastern Massachusetts, 2004. Massachusetts Shellfish Growers and South Eastern Massachusetts Aquaculture Center.

Massachusetts Aquaculture White Paper. Massachusetts, 1996. Office of Coastal Zone Management.

PLANS AND SPECIFICATIONS

Plans and specifications for shellfish aquaculture management shall be in keeping with Interim Conservation Practice Standard 706 and shall describe the site-specific requirements for applying the practice to achieve its intended purpose.

Shellfish aquaculture management plans shall include the following:

- Plan map, showing gear layout, access points, buffer zones, and any other relevant information.
- Identification and location of environmentally sensitive areas.
- Location of priority or estimated wildlife habitat, and identification of protected or endangered species.
- Plan narrative, describing management strategies and activities that are planned to achieve the purpose and criteria of the practice.
- Shellfish Aquaculture Management Plan Schedule of Operations.
- Guidance documents necessary to aid the grower in implementation of the practice.

Shellfish Aquaculture Management – Job Sheet

<i>For:</i>	<i>Farm #:</i>
<i>Field(s):</i>	<i>Tract #:</i>
<i>Designed By:</i>	<i>Approved By:</i>
<i>Drawing No(s):</i>	<i>Signature:</i>
<i>Date:</i>	<i>Date:</i>

Purpose (check all that apply)	
<input type="checkbox"/> Enhance the sustainability of aquaculture	<input type="checkbox"/> Ensure dependable quantity and quality of water to support shellfish production
<input type="checkbox"/> Minimize adverse impacts of shellfish farming on water, plant, animal and human resources	<input type="checkbox"/> Ensure adequate quantity and quality of food to support shellfish production

Shellfish Management Worksheets (check all that apply)	
<input type="checkbox"/> Gear Waste Disposal	<input type="checkbox"/> Record Keeping for: <ul style="list-style-type: none"> ○ Wildlife Monitoring ○ Environmental Monitoring ○ Disease Monitoring
<input type="checkbox"/> Outboard Engine	
<input type="checkbox"/> Fuel/Oil Spill Prevention Kit	
<input type="checkbox"/> Gear Cycling	
<input type="checkbox"/> Grant Delineation Markers	

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Shellfish Aquaculture Management – Job Sheet**Shellfish Aquaculture Best Management Practice – Gear Waste Disposal**

Purpose: Waste gear from an aquaculture site can be a problem when left in the marine environment. Unused or damaged structures left on a site can cause entanglement and death to marine life. Waste gear must be removed from the water within 48 hours. This is a component of a Shellfish Aquaculture Management Plan.

Specifications: Growers will take away and/or dispose of shellfish gear that has been removed from service in their growing area within 48 hours.

- Minimum documentation¹ requirements for certification include:
1. A dated weight slip from the receiver of the disposed waste gear.
 2. A picture of each load of disposed gear.
 3. Record of date and type of unused gear removed from farmed site.

Cost Share Rate based upon: There is a Not to Exceed Rate (NTE) of 3000 lbs/acre/year for three years at \$0.50/lb.

¹ in Rhode Island NRCS *Shellfish Aquaculture Record Keeping Guide*

Shellfish Aquaculture Management – Job Sheet

Shellfish Aquaculture Best Management Practice – Outboard Engine

Purpose: Petrochemical emissions into the marine environment adversely affect air and water quality. Older, conventionally carbureted two stroke engine emissions far exceed current EPA requirements.

Most shellfish farming access requires an engine powered boat, capable of carrying gear, product, disposal waste, etc, to and from the farm plots.

Cleaner, direct fuel injection, low-emission outboard engines reduce oil and fuel contamination by 75 – 95 %.

Specifications: Growers with older, 2-stroke engines that require boat access to their farm are eligible for a comparable powered, low-emission outboard.²

Not only do 4-stroke outboards qualify to meet the standard, but the new direct injection 2-stroke engine technology meets the 2006 EPA requirements as well (manufacturer's information must be provided).

➤ Minimum documentation³ required for certification includes:

1. Photograph and serial number of currently used old engine to be replaced.
2. Documented proof of disposal of the decommissioned engine..
Note: Old engine MUST be permanently decommissioned from any water use.
3. Receipt of purchase of new outboard.

Cost Share Rate based upon: Not to Exceed Rate (NTE) (materials and labor to install engines and a \$100 cost for engine decommissioning and certification fee) is \$113 per horsepower.

² Only outboard engines that are dedicated solely to the shellfish operation (100%) and are less than 225 Hp will be qualified.

³ in *Rhode Island NRCS Shellfish Aquaculture Record Keeping Guide*

Shellfish Aquaculture Management – Job Sheet

Shellfish Aquaculture Best Management Practice – Fuel/Oil Spill Prevention Kit

Purpose: Fuel and oil spills can be hazardous to marine life. When petrochemicals enter the marine system they can adversely affect water quality and marine life. If a spill occurs, it is important to contain the spill and remove the oil or fuel from the water. This is a component of a Shellfish Aquaculture Management Plan.

Specifications: Grower must maintain a fuel/oil spill prevention kit that includes the following:

- Fuel spill warning placard with proper emergency number displayed.
- Fuel splash absorbing collar.
- Two oil-sorbent sheets.
- One bilge sock absorber or an additional oil-sorbent sheet (whichever fits to your bilge setup).
- Water repellent tag with local, state and federal emergency response telephone numbers and procedures for reporting spills.

Grower must replace socks sheets and collars when saturated and must dispose of material appropriately.

- Minimum documentation⁴ requirements for certification include:
1. Receipt of purchase for kit.
 2. Record of replacement for collars, sheets, and socks.
 3. Photo documentation of kit in use (placard, collars, sock, and sheets in place).

Cost Share Rate based upon: \$100 per URI-FAVS designed kit per approved boat.

⁴ in Rhode Island NRCS Shellfish Aquaculture Record Keeping Guide

Shellfish Aquaculture Management – Job Sheet**Shellfish Aquaculture Best Management Practice – Gear Cycling**

Purpose: The practice of gear cycling can significantly reduce biofouling on aquaculture equipment. Biofouling is the growth of plant or animals on gear, and can severely reduce water flow to a shellfish crop. The reduced water flow can lead to slow production and/or loss of product. Extreme biofouling can lead to abandonment of gear. Abandoned gear is a physical hazard in the marine system and is a visual nuisance. Gear cycling is a component of a Shellfish Management Plan.

Specifications: Growers must purchase 20% extra gear (20% of the gear should be kept off site to dry for re-use at a later date).

When gear on site becomes fouled, the grower will replace fouled gear with clean gear. The fouled gear will be dried and cleaned in an approved (RI CRMC) area off site. This cycle will continue throughout the growing season.

➤ Minimum documentation⁵ required for certification includes:

1. Receipts of new gear purchased
2. Record of date and type of gear that has been cycled
3. Picture of fouled gear drying (NRCS will inspect the cycled gear)

Cost Share Rate based upon: Not to Exceed Rate (NTE) of \$5.00 per bag for insert bags.. Cage and tray costs will be based upon planner's estimates (cost dependent on size, gauge and mesh openings plus labor).

⁵ in Rhode Island NRCS *Shellfish Aquaculture Record Keeping Guide*

Shellfish Aquaculture Management – Job Sheet

Shellfish Aquaculture Best Management Practice – Grant Delineation Markers

Purpose: Grant delineation is important for protecting aquaculture sites (including gear) from damage by boaters and other marine operations and to assist in delineation of areas targeted for protection as SAV conservation areas.. Aquaculture is often located in areas where there is boat traffic (recreational and commercial). Boat strikes and inadvertent entanglement can damage sensitive coastal resources where targeted plant and/or animal species are being managed. Boat strikes and/or vessels towing commercial fishing gear or other instruments can dislodge shellfish farm nets and other gear into the marine environment. When gear is lost or transported off the farm site by these means, the shellfish farm nets, cages, and bags become a hazard to marine life via trapping and entanglement. Stray gear is also a visual nuisance. By marking aquaculture areas with a standard system, boaters will be more likely to avoid such areas.

Specifications: Grower will mark the outer edges of the aquaculture block (as required by RI CRMC, US Coast Guard, and Cities and Towns) with appropriate boundary markers. This reflects the fact that boundary markers are required by CRMC to use 4" lettering on standard lobster pot buoys in most cases. Some lease sites are required by USCG or city and town ordinances to deviate from this requirement in special circumstances.

Grower will replace the buoys with winter sticks as part of a winter management plan (where depth of operation is appropriate).

Grower will replace the buoys if they are lost, stolen, or damaged. Buoys are to be anchored with screw auger and polypropylene line or chain or equivalent.

Each Grant delineation will have minimum of four (4) corner markers and one side marker every 300 feet (max).

➤ Minimum documentation⁶ required for certification includes:

1. Receipt of purchase (including all components for anchoring)
2. GSP map and Pictures of buoys in place.

Cost Share Rate based upon: Not to Exceed Rate (NTE) of \$3,000 per CTU will be allowed (this is a one time cost per contract for a 10 year life span).

⁶ in Rhode Island NRCS *Shellfish Aquaculture Record Keeping Guide*

Shellfish Aquaculture Best Management Practice – Record Keeping for the protection of wildlife (fish, shellfish, and invertebrates) populations through: *Plant & Wildlife Monitoring, Disease Monitoring and Environmental Monitoring*

Purpose:

Plant & Wildlife Monitoring - Shellfish aquaculture may affect (positive and negatively) species of critical concern such as SAV. Biofouling organisms that are considered to be invasive aquatic species can negatively affect the ecology of estuarine and marine communities. Also, predatory species can severely impact the production of a shellfish farm.

Disease Monitoring - Shellfish diseases can result in significant crop productivity loss. Mortality rates of up to 95% have been observed in infected shellfish beds. Therefore, it is imperative that the shellfish grower manages the farm to minimize the risk of disease introduction into wild populations and ultimately product loss.

Environmental Monitoring - Bivalve mollusks are mostly sedentary and thus highly dependent on their surrounding biogeochemical environment. water movement and current velocity, soil/sediment characteristics, temperature, dissolved oxygen, and food availability are all important factors affecting the health and productivity of shellfish species.

Specifications:

- Minimum Documentation⁷ required for certification includes:
 1. The completion of the recorded keeping handout included with the Shellfish Management Plan for each of the following concerns:

- **Plant & Wildlife Monitoring:**

Grower is to be aware of the locally important, invasive, rare and endangered species and to record organisms observed at the farm site (date, identification, abundance).

Carefully inspect shellfish seed to prevent the introduction of small predators or unwanted species with the seed and document organisms removed (date and identification--(list of species provided by University of Rhode Island-Department of Fisheries, Animal & Veterinary Science (URI FAVS)).

Use netting or wire mesh barriers to exclude predators from the crop. Be vigilant in monitoring your site to ensure that barriers are maintained.

Record and Document notable occurrences of biofouling organisms observed at your location (date, identification, photographs---list of species provided by URI FAVS).

Egg cases of large predatory snails are easily recognized and can be readily removed. Learn to identify egg cases of oyster drills, whelks and moon snails. Document any occurrences of these organisms.

Minimum documentation required for certification includes completion of the record keeping handout included with the Shellfish Management Plan.

⁷ in Rhode Island NRCS Shellfish Aquaculture Record Keeping Guide

- **Disease Monitoring:**

Follow established biannual disease monitoring protocol established by URI FAVS

When monitoring the crop for disease, the following symptoms may indicate the presence of pathogens:

- For infaunal species, large numbers of live shellfish or empty shells appearing at the surface of the sediment.
- Unexplained mortalities where die-offs appear to be happening over specific time intervals.
- Abnormal occurrence, such as large numbers of shellfish gaping.

Early detection is the best prevention - regularly monitor the condition and appearance of the crop.

Planting density can dictate the development of disease. Maintain planting densities at a level to optimize crop growth.

If disease is present at your site, monitor mortality and immediately remove any diseased shellfish. Removal of infected stock reduces the level of exposure to the crop.

Do not dispose of diseased shellfish in an area where further contamination could occur.

If a disease is suspected, the shellfish must be collected for inspection by an aquaculture extension agent and/or an aquatic animal pathologist for diagnosis.

Only purchase shellfish seed that is certified by the state Aquaculture Coordinator (RI-CRMC).

Do not move shellfish from one water body to another without consulting the state Aquaculture Coordinator (RI-CRMC).

Minimum documentation required for certification includes completion of the record keeping handout included with the Shellfish Management Plan.

- **Environmental Monitoring:**

Water temperatures are to be recorded using NRCS approved digital remote deployed temperature loggers.

Record observations (date, time, condition) of notable weather, sea ice formation, storm or tide events.

Minimum documentation required for certification includes completion of the record keeping handout included with the Shellfish Management Plan.

Cost Share Rate: Not to Exceed Rate (NTE) of \$3,000 per year per CTU. Maximum of three (3) years of cost share.

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