Best Management Practices for Shellfish Mariculture in South Carolina

Below are Best Management Practices recommended by SCDNR for South Carolina growers. Many of these will be included in mariculture permits as specific conditions.

Planning and pre-operation considerations

- Mariculture is farming. Farmers are some of the hardest working people on the planet. If you are going to be a shellfish mariculture operator, be prepared to work long and hard.
- Do your homework.
    - Biology
    - Technology
    - Economics
    - Local considerations

Site selection

- Mariculture operations utilize public trust resources for private gain. Mariculture operations are required to allow other uses within the farm area such as recreational shellfish gathering of wild resources, recreational and commercial crabbing, recreational fishing.
- Mariculture operations must have minimal impact on navigation in accordance with State and Federal Law.
- Gear deployment should be planned to permit normal operations and maintenance without impairing or interfering with other activities within and around the farmed area. This might include recreational boaters, fisherman, commercial crabbers, waterskiers, paddleboarders, jetskis, kayaks, birdwatchers, and so on.
- When selecting a site consider other, possibly conflicting uses, and make every reasonable effort to prevent conflict. Identify other uses/users of your proposed site and the surrounding area. Speak with other potential users to assess their concerns and pro-actively address these concerns.
- Shellfish mariculture is dependent on excellent water quality. Avoid sites which might have water quality issues now or in the foreseeable future related to off-site activities (industrial, agriculture, development). Investigate current land use and zoning to predict future land use.

- When selecting a site consider possible environmental impacts of your operation on surroundings. Permitting agencies will require that you minimize any such impacts. Operations which are found to have an impact after being permitted may be required to conduct remediation.

- Identify any known endangered or threatened species/habitat which may be on or near your site.
- Identify any cultural/historical/heritage sites in the immediate area.
- When selecting a site consider ecological carrying capacity. How many shellfish can this waterbody support? How many shellfish are already in the system? Will your operation be exceeding the carrying capacity? Will your operation consume so much carrying capacity that other uses of the water body are affected or precluded?
- When selecting a site, before submitting permit applications, identify and contact neighboring property owners. Early and open discussions with neighbors regarding your culture business and how you intend to operate will help dispel fears of adverse impacts.
- Consider access to the site. Will you be able to reach it at all tides? Can you safely access the site for storm preparations? Can you access the site in a timely manner for routine operations? How long will it take to transport your product to your land-based cooler, a consideration for warm-weather harvest.
- Consider vulnerability to winds and waves when selecting your site. Consider what actions will be needed to secure the site in the event of major storms.
- Your site must provide the biological necessities of your shellfish. Bear in mind salinity, temperature, water flow, water depth, sediment.
- Find out whether your proposed area has suffered disease outbreaks, unexplained mortality or harmful algal blooms.
- Will your site provide room for future expansion?

Permitting/regulatory requirements

- **Applicants for Mariculture Permits must:**
    - Obtain mariculture permits from SCDNR, US Army Corps of Engineers, SCDHEC-OCRM, and SCDHEC-Shellfish Sanitation and follow all permit conditions.
    - SCDNR mariculture permits are valid for five years and may be renewed.

- Obtain and maintain current all licenses and permits required to handle and harvest product (SCDNR and SCDHEC-Shellfish Sanitation). Licenses and permits must be renewed annually.
- Sell all product direct to other properly permitted mariculture operators or to a properly licensed Wholesale Seafood Dealer with a molluscan shellfish endorsement and DHEC certification (this may be the mariculture permittee).

- **Mariculture Permittees must:**
  - Abide by all permit conditions.
  - Sign an affidavit annually declaring the wholesale dealer(s) who will handle all product.
  - Submit operations plans annually to SCDNR and SCDHEC-Shellfish Sanitation which accurately reflect the current operating procedures in use at this farm.
  - Submit an activities report to SCDNR annually on a form provided by SCDNR. The report shall accurately reflect inventory of gear, gear placement, inventory of shellfish, shellfish harvest and sales and any other information requested on the form.
  - Pay annual rent by due date specified on the invoice from SCDNR.

Experience and training

Mariculture permittees should:

- Educate themselves on husbandry requirements and health considerations for the species they will culture
- Educate themselves and all employees on proper handling of shellfish to insure consumer safety
- Take all required training (SCDHEC, SCDNR) annually
- Ensure that all employees and agents of the permittee complete all required training annually.
- Provide training opportunities for employees
- Make every effort to stay informed as BMPs may change.
- Join local, state and/or regional shellfish growers associations and subscribe to relevant list-servs to receive current information.

- Educate your neighbors and local authorities about mariculture

Operations

Mariculture operators will:

Be good neighbors

- Minimize noise and disruption
- Operate machinery in a manner that is considerate to other people on the water or in nearby homes.
- Farm should be neat, orderly and well-maintained
- Gear should be properly anchored and stay within permit boundaries
- Adequate signage/marking should be employed to warn boaters of obstructions
- Notify neighbors in advance of anticipated activities which might be out of the norm
- Communicate with neighbors on a regular basis to insure misunderstandings do not develop
- Remove gear which is damaged, fouled or in poor condition
- Do not block access to other resources
- Assist local residents and visitors in identifying aquaculture site markers and understanding the significance of the markers.
- Be courteous to visitors at your site and use these visits as an opportunity to educate the public about shellfish aquaculture.
- Odor should be prevented and controlled by proper site, vessel and truck hygiene and maintenance.

Protect and maintain water quality

- Maintain the water quality of your site by carefully handling of all fuels and oils.
  Insure that fuel storage area are secure and provide adequate containment to prevent release to the environment in the event of an accidental spill.
- Use non-toxic anti-fouling coatings on vessels instead of paints that contain tin, copper or other compounds typically found in off-the-shelf anti-fouling

paints.

- Work with all interested parties and organizations to enhance the public's awareness of water quality issues.
- Support local water quality monitoring groups by volunteering to monitor conditions at or near your site.
- Strive to improve water quality whenever possible.

Be good stewards of the environment

- Do not place gear on top of natural resources (e.g. oyster bed, marsh grass)
- Torn netting and damaged gear should be removed immediately and taken to high ground for disposal.
- No trash should be discarded into the natural environment. Take particular care if using plastic zip-ties to make sure that these are disposed of properly and not dropped overboard.
- Store unused gear on high land. Never place unused gear in the marsh or intertidal zone.
- Do not use chemicals on your farm. They are harmful to your shellfish and the environment.
- Know the marine species that are protected in your area and work to minimize interactions with them and avoid any "take" of protected species.

Be a responsible farmer

- Growers should keep adequate environmental and husbandry records that allow an examination of the potential impacts of environmental conditions and production practices on the site condition, animal performance and animal health.
    - Maintain records of weather, water/air temperature, and other external factors which may affect operations
    - Maintain product inventory
    - Maintain records of daily activities
    - Maintain records tracking shellfish seed through the farm so that location of each batch of seed is known
- Follow recommended stocking densities and handling schedules to optimize growth and production. Overcrowding is a leading cause of disease.

- Measure growth and survival and maintain records tracking growth and survival
- Monitor animal health; remove sick or dead animals and dispose of these in appropriate upland areas where the risk of reintroducing disease into shellfish areas is minimal, e.g. municipal disposal areas. Do not dump dead animals onsite or at boat landings.
    - Report unusual mortality or other signs of disease or contamination to SCDHEC and SCDNR immediately. Cooperate with state agencies collecting samples to identify the causes of mortality or illness.

Growers should have a predator, pest and fouling management plan. It's a matter of when not whether.

- Learn what predators, pests and fouling organisms are most prevalent in your growing area.
- Inspect for predators regularly. Remove predators by hand – do not use chemicals to control predators.
- Repair damaged nets or cages to exclude predators.
- Have a fouling prevention/removal plan. Fouling will reduce water flow and result in slow growth of your oysters. Consult your gear manufacturer, other growers, and online resources for guidelines on preventing and mitigating fouling.
- Strive to use gear and production strategies that minimize or eliminate the need for on-site wash down and rinsing to reduce biofouling. Strive to use harvesting methods that minimize the re-suspension of bottom sediments.
- For bottom growers: Monitor your site regularly and be aware that sediment burial of your nets/cages/bags can cause mortality. Be aware of heavy natural siltation events at your site and remove any built up organic material from the surface of your net. Decomposing organic material consumes oxygen and may reduce ambient oxygen levels sufficiently to suffocate your crop.
- For off-bottom growers: Cages and bags or nets within cages must be kept as clean as possible to maximize flow.

Seed Importation/Production; Hatchery and Nursery Activities; Broodstock Maintenance

- Mariculture operators must obtain required permits from SCDNR prior to importing shellfish from outside the state.

- It is a violation to import shellfish from other states for placement in SC waters without a permit. This includes purchase of seed, broodstock, product for sale, and germplasm. SC waters include land-based facilities which drain to or are connected to natural water bodies.
- It is a violation to place adult oysters imported from another state into SC waters. This includes salination activities.
- Mariculture operators will notify SCDNR annually of intended seed sources. Out of state seed sources must be pre-approved by SCDNR and each importation will require a separate permit.
- Possession of triploid shellfish requires a permit from SCDNR. Prior to receiving your seed, even from instate sources, request a permit from SCDNR.
- When purchasing seed, talk with the hatchery/nursery about the stock origin. It is to your advantage to grow stock selected for growth in our area or under similar conditions.
- If operating a hatchery, strive to produce shellfish which will be well adapted to our growing conditions. Research the stock history of shellfish you intend to produce.
- Hatchery operators who are in possession of imported shellfish will maintain biosecurity and if requested follow quarantine procedures.
- Mariculture operators who intend to use wild seed collection should consult with SCDNR. Permits may be required.
- Operators who collect wild juveniles will make every effort to ensure that their collection activities, methods and gear do not compromise the sustainability of the wild resource population and do not cause significant negative environmental impacts.
- Holding of tetraploid broodstock requires a permit and adherence to approved quarantine/biosecurity procedures.

Storm Management

- Each mariculture operation must have an approved storm plan which must be updated annually and filed with SCDNR.
- Practice a dry run of your storm management plan within 90 days of gear

installation. If floating gear, sink gear and record time. This will gauge accurate time necessary to sink all gear ahead of a storm.

- Conduct occasional "fire drills" to ensure that all employees are familiar with the storm plan and that your time frames for securing operations are adequate.
- After a storm, retrieve any errant gear in a timely fashion. Remove/repair any gear damaged in the storm.

Harvest and handling

- Obtain all permits required for husbandry (handling of submarket animals) and harvesting. SCDNR requires that all operators handling market-size shellfish have harvest permits. Special permits are required for out of season harvest and for undersize shellfish harvest.
- Follow all SCDHEC harvest, handling, transportation and storage regulations.
- Adopt handling procedures for your company which meet SCDHEC rules. Make sure all employees involved understand and follow the procedures.
- Ensure that all harvesters and responsible parties have had all required training annually.
- Only sell to properly licensed dealers or properly permitted mariculture growers.
- Reasonable precautions must be taken to ensure that any employee with a disease in the communicable stage which may be transmissible through food is excluded from working in any capacity in which the employee may come in contact with food, food contact surfaces, or where the employee may discharge bodily waste to the environment. The diseases that are transmissible through food workers are determined by the U.S. Centers for Disease Control and Prevention, in compliance with the Americans with Disabilities Act, and published in the Federal Register.
- If you purchase shellfish from other states, exercise caution to prevent cross-contamination, introduction of hitchhikers, or introduction of shellfish pathogens:
    - Clean equipment between processing product from different areas
    - Never put shellfish from another state into the waters of SC unless you have obtained a permit from SCDNR which allows this
    - Do not place oysters from other states in SC waters to increase salt content
    - If grading product from more than one state, make sure that culls are segregated
    - Do not commingle product from different states or growing areas

- When shucking product from other states or when recovering shell from oysters roasts which may have included product from other states, shells must be stored on high ground for 6 months to allow all tissue and associated organisms to decay or be removed by scavengers.
- When replanting culls make every effort to keep them alive until replanted. However, do not plant live oysters or fresh culls which originated in other areas as they could carry pathogens or hitchhikers.

BMPs for Closing-Out a Mariculture Operation

In the event that a mariculture permittee ceases operation for some reason, there need to be provisions for removal of all gear. This is included in both the OCRM permit and the DNR mariculture permit.

- All structures and gear shall be removed from the water and stored or properly disposed at upland sites. This includes bags, cages, markings, ropes, floats and other floating structures, pumps, and pipes.
- Product should not be left unattended. Marketable product should be harvested and sold;
  unmarketable or unharvested product should be released.
- Sites must not be left with damages done to the surrounding environment. Any direct or indirect environmental damages must be minimized and or mitigated.

All mariculture permittees are urged to adopt the **Code of Conduct for Molluscan Shellfish Mariculture in the Eastern United States,** developed by the East Coast Shellfish Growers Association:

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 which 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 culturing waste and chemicals 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 shellfish culture when feasible.
10. Encourage other growers to adopt the shellfish code of conduct and better management practices.

All South Carolina Mariculture Operators and Prospective Operators are encouraged to adopt Best Management Practices. The East Coast Shellfish Growers Association has a Best Management Practices manual which contains excellent information on a broad range of issues as well as a template for developing your own BMPs specific to your operation. These can be found at http://www.ecsga.org/ under "Resources".