

Storm Preparedness Best Management Practices

NC Shellfish Lease and Aquaculture Program

Adapted from FDACS and UF Resource Guides

***Relocating gear and product off lease into public waters is illegal and will result in product confiscation, permit revocations, and fines.**

***Relocating gear or product to another lease outside of the growing area requires resubmergence for 21 days and proper resubmergence tagging (please refer to SS1/SS2 for guidance). The receiving lease must be permitted properly to accommodate any additional gear.**

***Relocating shellfish greater than seed size (clams 12mm in length, oysters 25mm in length) to another lease in a different growing area requires resubmergence for 21 days, proper resubmergence tagging, and recording of resubmergence activities in a logbook (please refer to proclamations SS-1/SS-2)**

***When relocating gear to another lease, the receiving lease must be permitted properly to accommodate any additional gear.**

***Moving product to a land-based cold or wet storage is only allowed by prior approval and permitting by Shellfish Sanitation as a certified shellfish dealer with wet storage permit (as applicable).**

Assessing Risks

A farm's vulnerability to risks, such as wind, storm surge, and flooding, can be assessed by reviewing previous storm trends near the farm's location. The NOAA National Hurricane Center, www.nhc.noaa.gov, has storm information (wind speed and direction, pressure, landfall) archived since 1900, which can be used to determine prevailing patterns for different growing locations. By reviewing characteristics of previous storms that have made landfall near the farm, growers can consider what they would have done to prepare and what should be included in their plan.

Preserving Business Information

Important information that must be safeguarded should be identified in the plan. A list of insurance policies and financial documents should be kept current along with locations where these documents are stored. Most of this information can be stored electronically; however, hard copies of important documents may be useful in the event of power outages. It may be prudent to duplicate some documents and keep them in different locations.

Maintaining Farm Records

Farm information, such as coordinates, maps, and diagrams of layout and gear, should be included in the plan and available immediately after the storm. Timely inventory records (number of culture units and estimated quantity, age, and sizes of oysters) should also be included. Maintaining a spreadsheet with this information is important for record-keeping required by insurance policies, business loans, or crop

disaster assistance programs, such as the U.S. Department of Agriculture (USDA), Farm Service Agency's Noninsured Crop Disaster Assistance Program (NAP). Oyster inventory apps, such as Oyster Tracker or SmartOysters, are available and recommended. Inventory records should also include vehicles, boats, and motors, as well as equipment used on farms (tumblers, pressure washers, cranes or winches, etc.), at shore-based seed facilities (tanks, pumps, filtration systems, etc.), or at shellfish processing plants (forklifts, refrigerated units, etc.). Photographs and videos with time stamps of both water and land-based operations can provide timely and critical documentation.

Farm Employees

The plan should have information available for farm employees, such as an operational plan identifying essential personnel, services, and equipment, re-opening protocols, records storage, and agreements with suppliers and contractors. Information on evacuation routes, reentry requirements, shelter-in-place plans, and alternative reporting locations could be included. It is important to know how many people will be needed to implement the storm plan and who will help as a storm is approaching. Farm employees should be able to implement the storm plan themselves and be cross-trained in tasks outside their normal job duties to assist with securing gear.

Maintaining Communication

An emergency contact list (electronic and hard copies) for key personnel and businesses providing services to the farm and its customers should be developed and phone numbers kept current. Phone numbers for employees to call for information should also be included. Another communication component could be developed for the media, customers, or public with predetermined messages and messaging platforms.

Maintain Insurance Policies

The time to review insurance policies for the business is prior to the hurricane season to ensure there is adequate coverage for flood, wind, fire, theft, general liability, catastrophic loss, loss of income, and product liability. Insurance agents should be contacted to review coverage.

Storm Preparedness Plan Blueprint

*Items in yellow apply to **floating bags**, items in blue apply to **floating cages**. Items in white apply to all intensive gear types.*

Installation

During installation of the farm, there are several important considerations.

1. Assess the site's exposure to storms as a primary factor in site selection.
2. Orient main lines parallel to prevailing winds and waves.
3. Choose an anchoring system suitable to the bottom type.
4. Install substantial, durable anchors (buried to at least 5 feet depth) that will hold in the farm's bottom substrate in the strongest storms (see Figure 1 for some options).
5. Bury anchors (typically helical metal screw anchors) fully in the sediment to reduce projection above the sea floor, corrosion, and tangling hazard.
6. Invest in durable main line that meets the supplier's recommendation with some protection from chafing at friction points (e.g., anchor attachment).

7. Allow sufficient spacing between lines to ensure bags do not collide in bad weather.
8. Use a system that will reinforce the bag to reduce chafing at friction points (see Figure 2 for one example).
9. If floats have removable caps, invest in and practice with a system, such as a mechanical davit or a compressor to fill floats with air (with a back-up system in place), that allows for safe and efficient sinking and re-floating of bags.
10. Invest in and practice with a system, such as a mechanical davit or a compressor to fill the floats with air (with a back-up system in place), that allows for safe and efficient sinking and re-floating of cages. (Figure 2)
11. Place identifying tags on each bag

Prior to Hurricane Season

Prior to the onset of hurricane season, oyster farmers should take these steps to reduce the risk of losses.

1. Check stocking densities and reduce as necessary (though some farmers have had success by overstocking bags to achieve neutral buoyancy just prior to a storm).
2. Check biofouling and control on a routine basis.
3. Check all lines for chafing (especially near the clips) and repair as needed.
4. Check all bag clips are secured and in good condition at attachment points.
5. Have crew conduct timed practices to gauge time needed per line to prepare for a storm.
6. For shoreside operations, pick up loose pieces of equipment and secure bags to reduce loss from flooding and wind.
7. Review storm plan with crew and family so they can account for personal preparations alongside farm preparations.
8. Maintain appropriate stocking densities so that cages are not crowded and heavy.
9. Air dry cages to control biofouling on a routine basis.
10. Make it a habit to check bridles and lines when flipping to ensure lines do not get tangled.
11. Check all door closures to ensure that the attachments are secure and not worn.
12. Have extra caps on hand in workboat.
13. Remove empty cages from the line, as these are prone to come off the line in bad weather.

During Hurricane Season

A tiered approach to preparation, which has been adopted in each fact sheet, allows growers to stage tasks based on the storm or hurricane's track forecast. The authors developed the following color codes to address increasing levels of concern and actions.

CODE YELLOW

Once a hurricane or tropical storm is projected to impact North Carolina, it is time to begin preparations according to the farm's plan. Note that the timeline is fluid and will depend on the storm's speed and track.

1. Re-check stocking densities and reduce as necessary. If opting to overstock bags to achieve slightly positive buoyancy, ensure stocking is appropriate.
2. Farmers opting to sink their bags below the surface but still float off the bottom by overstocking bags should consider taking this step now.
3. Re-check all lines for chafing (especially near the clips) and repair as needed.
4. Ensure all bag clips are secured and in good condition.
5. Secure any empty bags on shore or on lines.
6. Document the condition of the farm with dated photographs and notes.
7. Document the numbers of various sizes of oysters.
8. Review workboat(s) plan.
9. Re-check that all bridles and pucks are in good condition.
10. Re-check that all bag and cage closures are in good condition.
11. Consider consolidating all small seed (e.g., seed held in 2 mm bags) to one section of cages so that you can re-float those cages first once the threat has passed.

CODE ORANGE

Once a hurricane or tropical storm watch has been issued, final preparations should begin. In the case of a fast-moving storm, proceed with tasks associated with final stages of preparation.

1. Sell product as market allows.
2. Track the storm's progress frequently and carefully. When assessing whether to sink bags, keep in mind the amount of time necessary to carry out the sinking operation. Farmers should also weigh the risks of bags and oysters being buried in the substrate.
3. Remember that the day before the storm is to make landfall, farmers should not plan to be on the water. They will need that day for other preparations and the weather will likely not allow for it.
4. If weather conditions do not warrant sinking bags, consider adding slack to anchor lines to allow for storm surge. Alternatively, some farmers opt to tighten their mainlines to pull bags under the water surface.
5. If weather conditions warrant sinking bags, remove both floats from bags and allow them to rest on the bottom or remove one float or alternate floats to partially or completely submerge the bags to keep them just above the bottom. Store floats safely onshore.
6. For systems that have floats with caps, remove caps from floats or alternate floats and ensure all air from floats is removed when sinking.
7. Some growers suggest replacing caps on floats (once all air is removed) to prevent sediment from filling the floats (though this may depend on sediment type). This adds considerable time to preparations.
8. Prepare to implement workboat(s) plan
9. Ensure all air from floats is removed when sinking, and walk or dive over the cages to be sure the pontoons are down, with adjustments made as needed.

*Reminder- it is illegal to relocate gear and product outside the boundaries of your shellfish lease unless they are being relocated to another, properly permitted shellfish lease

CODE RED

When a hurricane or tropical storm warning has been issued and there is a high probability of being in the path of the storm, farmers must conclude final preparations if and only if they can be accomplished safely. Farmers will make a series of personal risk assessments.

1. Conduct last check of farm.
2. Implement workboat(s) plan.
3. Get to safety.

Post-Storm Recovery

Oyster growers and their employees must be ready to take care of the needs of the farm as soon as it is safe and reasonable to do so. After a storm has passed, the following tasks should be considered.

1. Assess risk of returning to farm, and proceed only when safe.
2. Patrol the area upstream and downstream of the farm for significant debris that could entangle or dislodge gear once it is raised, and remove or secure debris.

3. Document the condition of the farm with dated photographs and notes.
4. For shellfish product that has been transported off the lease as a result of the storm, please contact Division staff for guidance.
5. Refloat bags as soon as practically possible by adding flotation and/or reducing stocking densities.
6. If caps were removed from floats, use systems designed for this task, with bags lifted from reinforced points, allowing water to drain out the end caps and being careful to work any bags out of the sea floor if necessary.
7. If necessary, use an on-board washdown hose to rinse sediment off the bags or out of floats and recap once washed down.
8. Assess and document oyster survival, gear condition, and losses.
9. Once mortality risk has passed, resume normal biofouling regimen.
10. Communicate with public agencies about closures and effects of the storm.
11. Communicate with buyers and suppliers to provide situation and outlook reports.

Additional Resource Links

NCDMF Contacts and Resources

<https://deq.nc.gov/shellfish-lease>

<https://deq.nc.gov/about/divisions/marine-fisheries/shellfish-sanitation-and-recreational-water-quality>

<https://deq.nc.gov/about/divisions/marine-fisheries/rules-proclamations-and-size-and-bag-limits/polluted-area-proclamations> (Current Polluted Areas Proclamations)

<https://deq.nc.gov/about/divisions/marine-fisheries/rules-proclamations-and-size-and-bag-limits/fisheries-management-proclamations> (Current SS Proclamations)

University of Florida Storm Prep Resource Guides

(While some of this information is specific to Florida, much of it can be adapted for North Carolina shellfish farms as well.)

- Introduction: <https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.introductory.pdf>
- Land Based Operations: https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.LBO_.pdf
- Workboats: <https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.workboats.pdf>
- Adjustable Longline Guide: https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.ALF_.pdf
- Floating Cage Farms Guide: https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.cages_.pdf
- Floating Bag Farm Guide: https://shellfish.ifas.ufl.edu/wp-content/uploads/oyster.aquaculture.bags_.pdf