Tropical Storm and Hurricane Preparedness for Off-bottom Oyster Aquaculture in the Gulf of Mexico

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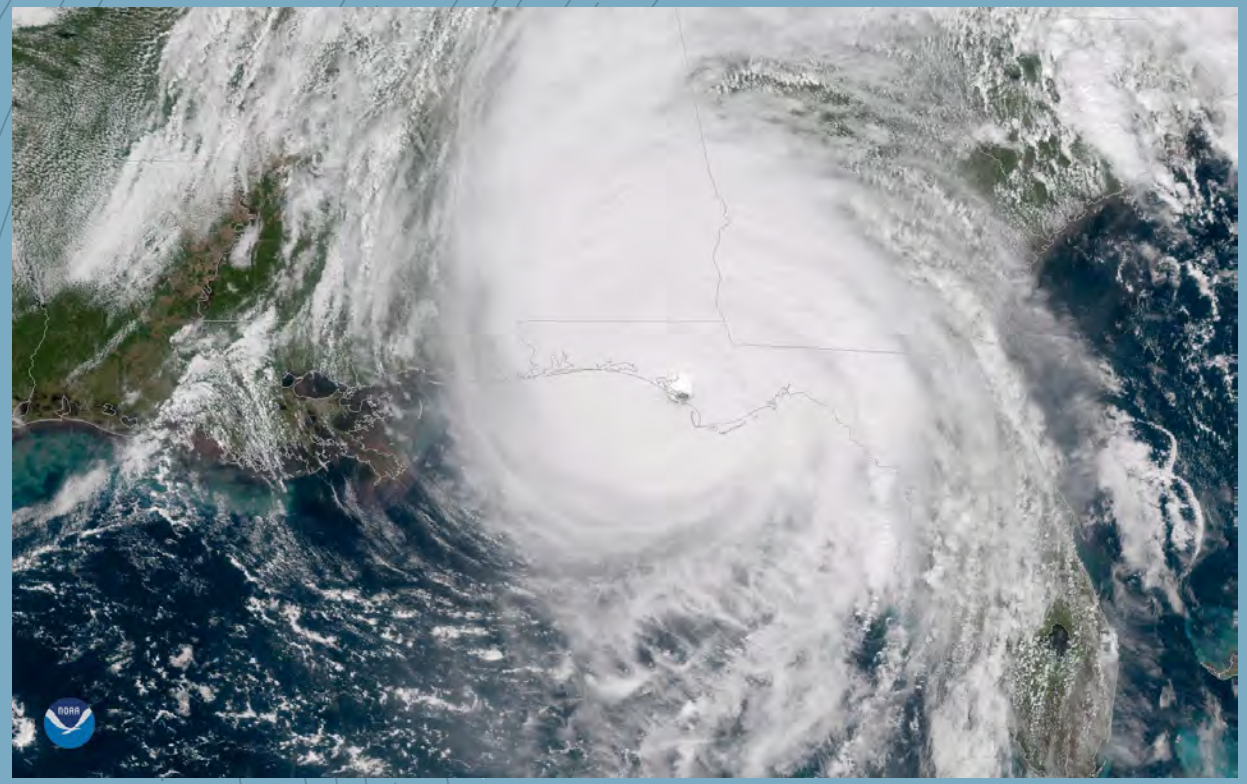
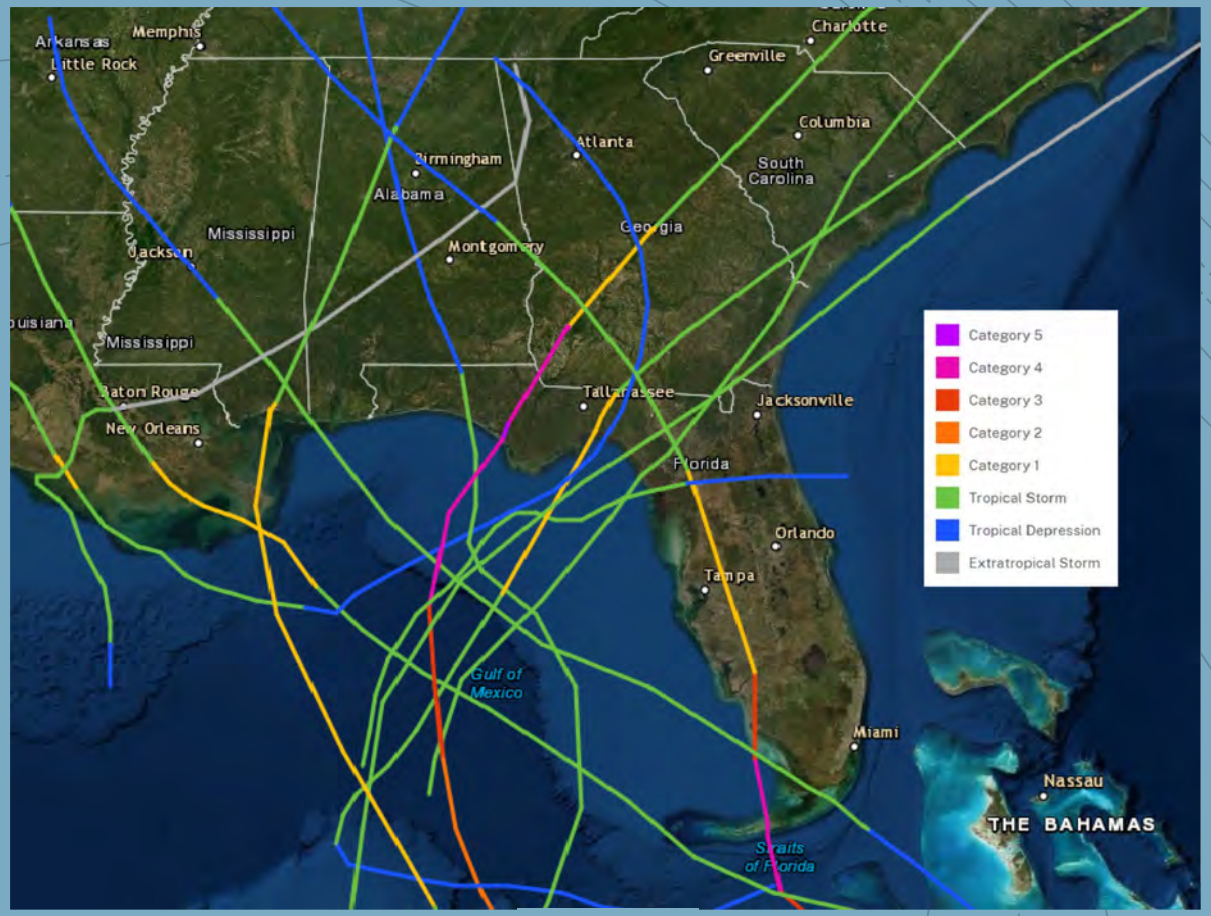


IMPACTS OF TROPICAL STORMS AND HURRICANES

- Risk in coastal waters beyond growers' control
- Off-bottom culture gear vulnerable
- Damages related to wind, surge, and decreased salinity due to flooding
  - Oyster mortality
  - Loss of gear
  - Increased labor costs

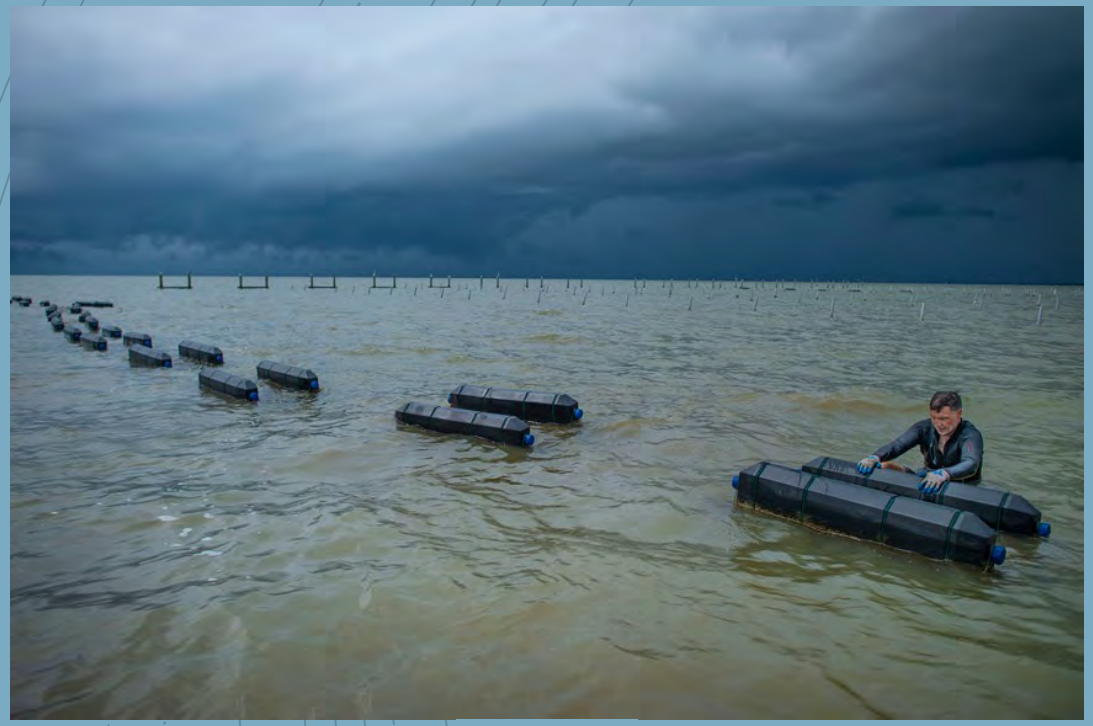
GULF OF MEXICO HURRICANES AND STORMS, 2010-2019



Four oyster-producing states (AL, FL, LA, MS) experienced 5 hurricanes and 7 tropical storms

Hurricane Michael in 2018 made landfall as Cat 5 in FL Panhandle affecting 4 counties

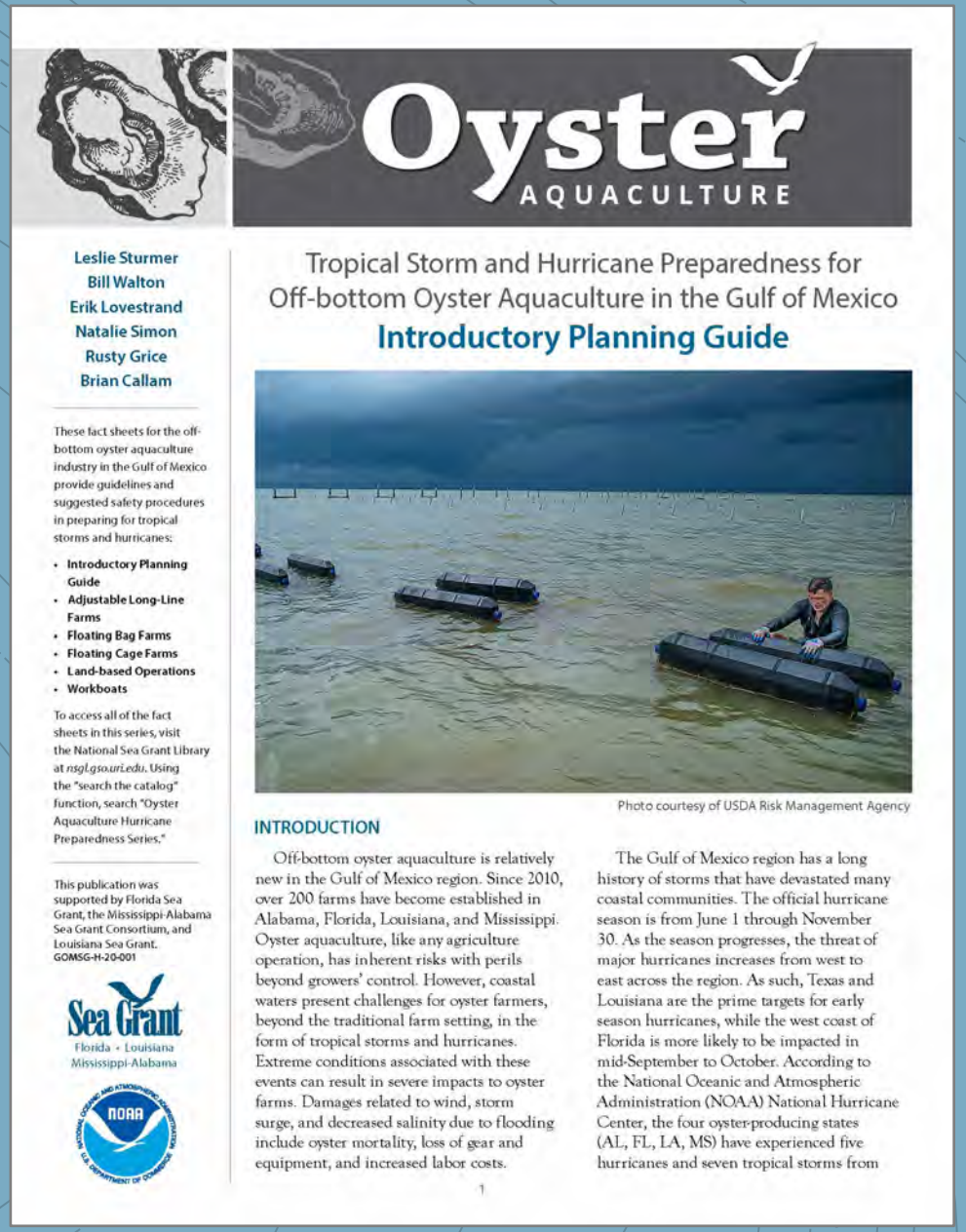
DEVELOPING STORM PLANS



- Essential part of oyster culture operation
- Better chance of minimizing losses
- Make sound decisions before storms
- Increase chances of recovery after storms
- Problems not having a plan in place
  - Insufficient training to execute preparations
  - Inadequate workforce to prepare and recover
  - Lack of proper equipment and supplies on hand

INTRODUCING FACT SHEETS

- Provide guidelines and safety procedures in preparing for hurricanes and tropical storms
- Information obtained from workshops where growers discussed how preparation strategies fared during storm events
- Collaborative effort among extension faculty at UF, AU, and LSU
- Supported by FL, MS-AL, and LA Sea Grant



Oyster
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- **Introductory Planning Guide**
- **Adjustable Long-Line Farms**
- **Floating Bag Farms**
- **Floating Cage Farms**
- **Land-based Operations**
- **Workboats**

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Introductory Planning Guide

Photo courtesy of USDA Risk Management Agency

INTRODUCTION

Off-bottom oyster aquaculture is relatively new in the Gulf of Mexico region. Since 2010, over 200 farms have become established in Alabama, Florida, Louisiana, and Mississippi. Oyster aquaculture, like any agriculture operation, has inherent risks with perils beyond growers' control. However, coastal waters present challenges for oyster farmers, beyond the traditional farm setting, in the form of tropical storms and hurricanes. Extreme conditions associated with these events can result in severe impacts to oyster farms. Damages related to wind, storm surge, and decreased salinity due to flooding include oyster mortality, loss of gear and equipment, and increased labor costs.

The Gulf of Mexico region has a long history of storms that have devastated many coastal communities. The official hurricane season is from June 1 through November 30. As the season progresses, the threat of major hurricanes increases from west to east across the region. As such, Texas and Louisiana are the prime targets for early season hurricanes, while the west coast of Florida is more likely to be impacted in mid-September to October. According to the National Oceanic and Atmospheric Administration (NOAA) National Hurricane Center, the four oyster-producing states (AL, FL, LA, MS) have experienced five hurricanes and seven tropical storms from

DEVELOP A PLAN

- Factors include scale of operation, personnel, gear, equipment, family and personal obligations
- Things to consider:
  - Risks – Farm's vulnerability to wind, surge, flooding
  - Business information – Electronic and hard copies of financial documents, insurance policies, etc.
  - Farm information – Include following in plan:
    - Maps and diagrams of layout and gear
    - Inventory records of oysters, gear, equipment, boats, vehicles
    - USDA Farm Service Agency NAP documents
    - Photographs and videos with time stamps
  - Farm employees – Operational plan identifying personnel, services, equipment, re-opening protocols, records storage, evacuation routes, re-entry requirements
  - Communication – Emergency contact list for personnel, businesses providing services, customers

PREPARE A PLAN

- Preparedness considered during farm installation, pre-storm season, active season, post-storm recovery
- Water-based preparation:
  - Written plan on how to secure and recover gear
  - Practice plan under variety of conditions
  - Time practice drills to assess what can be accomplished
  - Modify plans based on lessons learned
- Land-based preparation:
  - Move equipment and surplus gear to higher ground – where to locate, how much space and time required
  - Keep up with maintenance and update farm inventory lists
  - Check and stockpile equipment and supplies

IMPLEMENT A PLAN

- Install culture gear with hurricanes in mind – overbuild in setting up farm
- Routine farm maintenance is key, check gear regularly
- Replace lines when chafing is observed
- Stock bags at densities that minimize line chafing
- Mark gear with durable tags containing grower's information
- Ensure employees know their responsibilities and trained in equipment and storm plan
- Identify adequate workforce including volunteers
- Determining to activate farm's plan depends on individual operation and personal evaluation of farm's exposure
- Check weather reports and local emergency management offices to help in deciding when to implement plan

- Recovery after the storm
  - Assess impacts
  - Conduct inventory of oysters and gear
  - Notify insurance agents of damages
  - Clean up land- and water-based operations
  - Inspect areas adjacent to farms for lost gear
  - Check on status of shellfish harvesting area
  - Notify suppliers, customers, and even media
- Contact federal and state agencies to find out what programs may be available to help in recovery efforts

RESOURCES

National Information

American Red Cross: 1-800-RED-CROSS (800-733-2767), www.redcross.org

American Red Cross Food, Shelter, and Financial Assistance: 866-GET-INFO (866-438-4636)

Centers for Disease Control and Prevention (CDC): www.cdc.gov

Environmental Protection Agency (EPA): www.epa.gov

Federal Emergency Management Agency (FEMA): 800-621-FEMA (3362), www.fema.gov

FEMA Agencia Federal para el Manejo de Emergencias: www.fema.gov/es

FEMA Disaster Assistance: www.DisasterAssistance.gov

FEMA Hurricane Ready Business Toolkit: www.fema.gov/media-library/assets/documents/152381

National Oceanic and Atmospheric Administration (NOAA): www.noaa.gov

NOAA Extreme Weather Information Sheet (NEWIS) App (only for Apple devices): apps.apple.com/us/app/newis/id669225819

NOAA Gulf of Mexico Disaster Response Center: oceanservice.noaa.gov/hazards/drc

NOAA National Centers for Environmental Information: www.ncei.noaa.gov

NOAA National Data Buoy Center: www.ndbc.noaa.gov

NOAA National Environmental Satellite, Data, and Information Service: www.nhc.noaa.gov/satellite.shtml

NOAA National Hurricane Center: www.nhc.noaa.gov

National Weather Service: www.weather.gov

Ready Home and Business Storm Preparation: www.ready.gov

Ready Business: www.ready.gov/business

Ready 36-hour pre-landfall timeline for coastal residents: www.ready.gov/hurricanes

Salvation Army (donation hotline): 800-SAL-ARMY (800-725-2769)

US Department of Agriculture, Farm Service Agency (FSA): www.fsa.usda.gov

USDA FSA state offices: www.fsa.usda.gov/state-offices/index

US Department of Homeland Security: www.dhs.gov

US Small Business Administration: www.sba.gov

NOAA Extreme Weather Information Sheets

Visit www.nqdc.noaa.gov/newis to download the latest versions of the NOAA Extreme Weather Information Sheets. Fact sheets include pertinent state, county, and national contact information, radio stations, NOAA weather radio, and Department of Transportation information.

Alabama Information

AL Emergency Management Agency: ema.alabama.gov

AL Department of Conservation and Natural Resources (ADCNR): outdooralabama.com

ADCNR Marine Resources Division: Dauphin Island (251-861-2882) or Gulf Shores (251-968-7576)

AL Department of Environmental Management: 334-271-7700, www.adem.state.al.us

AL Department of Insurance: 334-269-3550, www.aldoi.gov

AL Department of Public Health (ADPH)*: 334-206-5300, www.alabamapublichealth.gov

ADPH Environmental Services*: 334-206-5373

AL Department of Transportation: 334-353-6554, www.dot.state.al.us

AL Official State Website: www.alabama.gov

AL Oyster Aquaculture: alaquaculture.com, info@alaquaculture.com (email)

Ready Alabama: www.readyalabama.gov

Florida Information

FL Agency for Workforce Innovation (unemployment claims): 800-204-2418, www.floridajobs.org/job-seekers

FL Construction Industry Licensing Board: 850-487-1395, www.myfloridalicense.com/DBPR

FL Department of Agriculture and Consumer Services (FDACS): www.fdacs.gov

FDACS Division of Aquaculture*: www.fdacs.gov/Divisions-Offices/Aquaculture

FDACS Division of Consumer Services (price gouging and fraud): 800-HELP-FLA (800-435-7352), www.fdacs.gov/Divisions-Offices/Consumer-Services

FDACS Mosquito Control Directory: www.fdacs.gov/Business-Services/Mosquito-Control

FL Department of Children and Families (disaster food stamp hotline), 800-342-9274: www.myflfamilies.com

FL Department of Financial Services (insurance complaints and assistance): 800-22-STORM (800-227-8676), www.myfloridacfo.com

FL Department of Transportation: 866-374-FDOT (3368), www.fdot.gov

FL Division of Emergency Management: 850-815-4000, www.FloridaDisaster.org

FL Emergency Information Hotline: 800-342-3557

FL Official State Website: www.myflorida.com

FL STORMS App: floridastorms.org/app

Louisiana Information

LA Department of Agriculture and Forestry: 866-927-2476, www.ldaf.state.la.us

LA Department of Children and Family Services: 888-LAHELP-U (524-3578), www.dss.state.la.us

LA Department of Environmental Quality: 866-896-LDEQ (5337), deq.louisiana.gov

LA Department of Health (DOH): 225-342-9500, ldh.la.gov

LA DOH Molluscan Shellfish Central Office*: 225-342-7653, ldh.la.gov/index.cfm/page/629

LA Department of Transportation: 877-4LA-DOTD (452-3683), www.sp.dotd.la.gov

LA Department of Wildlife and Fisheries: 225-765-2800, www.wlf.louisiana.gov

LA Get a Game Plan: www.getagameplan.org

LA Office of Homeland Security and Emergency Preparedness: 225-925-7500, www.gohsep.la.gov

LA Official State Website: www.louisiana.gov

LA Seafood Marketing and Promotions Board: www.louisianaseafood.com

LA Workforce Commission (unemployment claims): 225-342-3111, www.laworks.net

LSU Agricultural Research Station: www.lsuagcenter.com/portals/our_offices/research_stations/aquaculture

Mississippi Information

MS Board of Animal Health: 888-722-3106, www.mbah.state.ms.us

MS Department of Environmental Quality: 888-786-0661, www.mdeq.ms.gov

MS Department of Marine Resources (MDMR): 800-374-3449, dmr.ms.gov

MDMR Shellfish Bureau*: 228-374-5167 | 800-385-5902, dmr.ms.gov/shellfish

MS Department of Public Safety: 601-987-1212, www.dps.ms.gov

MS Department of Transportation: 601-359-7001, mdot.ms.gov

MS Emergency Management Agency (MEMA): 866-519-6362, www.msema.org

MEMA Smart Phone App: www.msema.org/about/msema-mobile-application

MEMA Hurricane Preparedness: www.msema.org/preparedness-2/hurricanes

MS Official State Website: www.ms.gov

MS Ready.gov: www.ready.gov/mississippi

* These state agencies monitor and mange shellfish harvesting areas and regulate and inspect shellfish processing facilities.

This fact sheet is the result of a collaborative effort among shellfish aquaculture extension specialists in the Sea Grant programs of Florida, Mississippi-Alabama, and Louisiana. For further information, contact:

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www.laseagrant.org/outreach/oyster-research-lab

Oyster AQUACULTURE

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Floating Cage Farms Guide

Many oyster growers in the Gulf of Mexico region use the floating cage system, an off-bottom gear. This fact sheet provides guidance related to storm preparation and planning for this gear type. It is part of a series providing an overview of storm preparation and planning for other oyster aquaculture operations, including adjustable long-line farms, floating bag farms, land-based operations, and workboats.

The floating cage system uses a series of cages that hold multiple bags of oysters (typically 6), buoyed by twin floats. The cages are typically attached by lateral lines to a main line that is anchored at either end, but anchoring configuration can vary by site. The floats have removable caps, allowing a farmer to fill the floats and sink the cage to the sea bottom. The cage may be raised later, emptying the floats of water to have them floated again. Cages that are flipped on top of the floats allow for air drying, which controls biofouling.

Photo courtesy of Mark Wallheiser

INSTALLATION

During installation of the floating cage system, there are several important considerations.

- ☐ Assess the site's exposure to storms as a primary factor in site selection.
- ☐ Orient main lines parallel to the prevailing wind and waves.
- ☐ Choose an anchoring system suitable to the bottom type.
- ☐ 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 options).

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Many oyster growers in the Gulf of Mexico region use the floating bag system, an off-bottom culture gear. This fact sheet provides guidance related to storm preparation and planning for this gear type. It is part of a series providing an overview of storm preparation and planning for other oyster aquaculture operations, including adjustable long-line farms, floating cage farms, land-based operations, and workboats.

The floating bag system uses a series of bags, typically buoyed by twin floats. The bags are attached to a main line that is anchored at either end, but anchoring configuration can vary by site. The floats may have removable caps, allowing a farmer to fill the floats and sink the bag to the sea bottom, but many float designs do not have this capability. Bags are flipped to allow for partial air drying, which provides some control of biofouling.

Photo courtesy of Orlando Sentinel

INSTALLATION

During installation of the floating bag system, there are several important considerations.

- ☐ Assess the site's exposure to storms as a primary factor in site selection.
- ☐ Orient main lines parallel to prevailing winds and waves.
- ☐ Choose an anchoring system suitable to the bottom type.
- ☐ 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).

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Adjustable Long-Line Farms Guide

Many oyster growers in the Gulf of Mexico region use the adjustable long-line system (ALS), an off-bottom culture gear. This fact sheet provides guidance related to storm preparation and planning for this gear type. It is part of a series providing an overview of storm preparation and planning for other oyster aquaculture operations, including floating cage farms, floating bag farms, land-based operations, and workboats.

The ALS system uses a tensioned monofilament line strung between anchored pilings with riser posts placed at uniform intervals allowing adjustment of the baskets' height in or above the water column. This guidance is primarily for intertidal operations.

Photo courtesy of USDA Risk Management Agency

INSTALLATION

During installation of the ALS system, there are several important considerations.

- ☐ Assess the site's exposure to storms as a primary factor in site selection.
- ☐ Orient lines perpendicular to the prevailing wind and waves, if possible.
- ☐ Invest in durable line that meets the supplier's recommendation with some protection from chafing, such as an outer sleeve.
- ☐ Invest in basket-to-line clips that secure the baskets in position on the line.

Information on Installation, Steps to take Prior to Hurricane, During Hurricane, and Post-Storm Recovery

Tiered approach to preparation allowing growers to stage tasks based on storm's track:
Code Yellow (storm formed in Gulf), Code Orange (storm watch issued), Code Red (storm warning issued)

LAND-BASED OPERATIONS GUIDE

- Follows outline as in Gear Guides
- Provides planning and precautionary suggestions for hatcheries, nurseries, and processing facilities
  - Considerations in siting, designing, and constructing land-based facilities
  - Operational procedures for maintaining stocks (algae, brood, larvae, seed) and product

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Land-Based Operations Guide

Photo courtesy of Emily Colson, University of Florida/IFAS

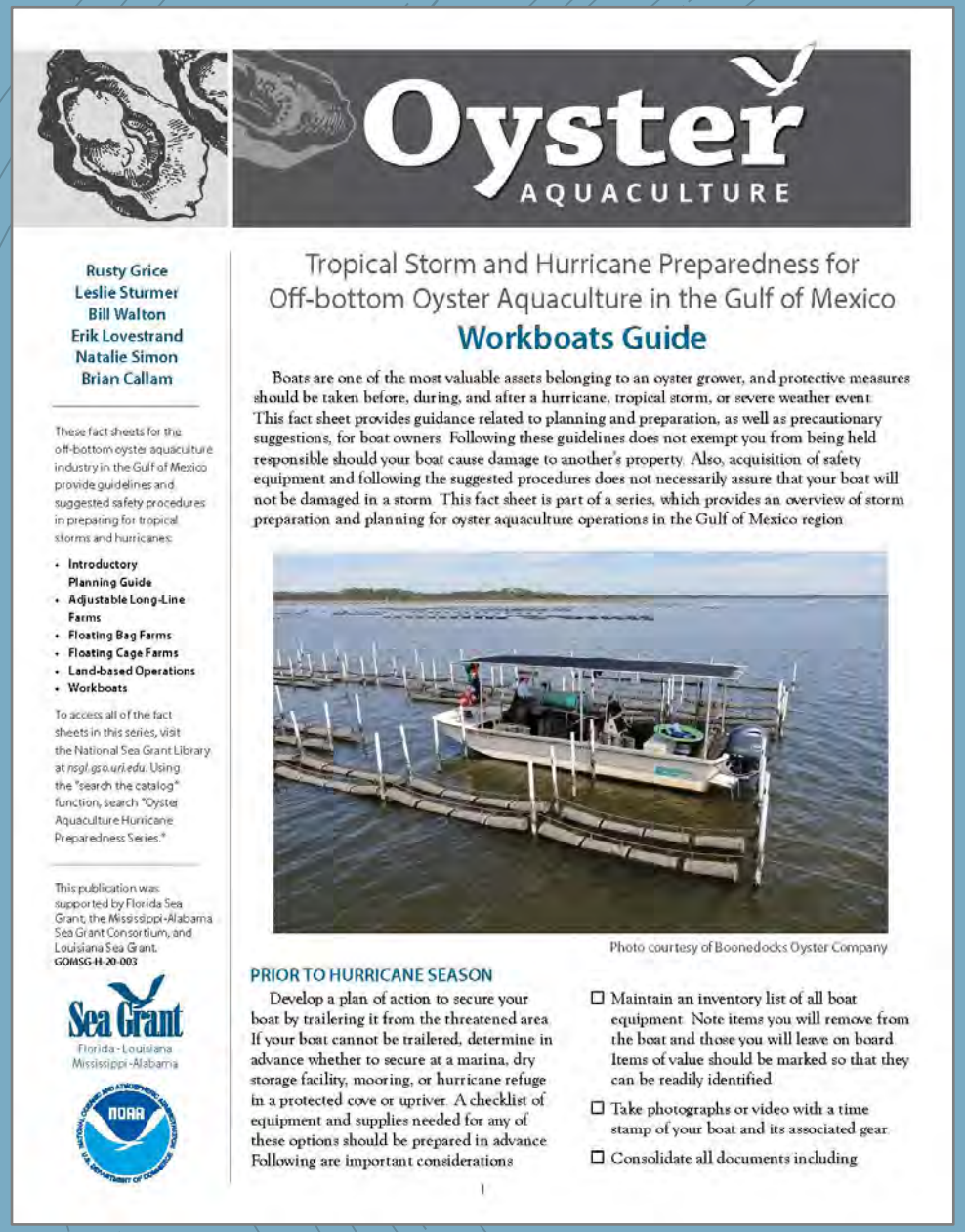
Land-based oyster operations that are vulnerable to hurricanes, tropical storms, or severe weather events include seed production facilities and processing plants. This fact sheet provides guidance related to storm planning and preparation, as well as precautionary suggestions, for seed suppliers and wholesale dealers. It is part of a series providing an overview of storm preparation and planning for oyster aquaculture operations in the Gulf of Mexico region.

As the primary source of seed, hatcheries and nurseries are critical components of oyster aquaculture. These facilities are typically located on waterfront property and are at risk to coastal flooding and storm surge. Inside the hatchery, adult oysters (broodstock) are spawned to create oyster larvae that are grown in tanks and fed cultured microalgae. Oysters complete the larval stages of their lifecycle in the hatchery and are then moved to a nursery setting to be grown large enough for the farm.

Market-size oysters are harvested and delivered by growers to a dealer's processing plant where they are washed, cleaned, sorted, packaged, and stored in a refrigerated cooler prior to distribution. Processing facilities are not necessarily located in flood-prone coastal areas but can be affected by power outages associated with high winds.

SITE SELECTION AND FACILITY DESIGN

There are several important considerations in preparing for storms through proper siting, designing, and constructing of land-based facilities. Buildings and structures used in



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Workboats Guide

Boats are one of the most valuable assets belonging to an oyster grower, and protective measures should be taken before, during, and after a hurricane, tropical storm, or severe weather event. This fact sheet provides guidance related to planning and preparation, as well as precautionary suggestions, for boat owners. Following these guidelines does not exempt you from being held responsible should your boat cause damage to another's property. Also, acquisition of safety equipment and following the suggested procedures does not necessarily assure that your boat will not be damaged in a storm. This fact sheet is part of a series, which provides an overview of storm preparation and planning for oyster aquaculture operations in the Gulf of Mexico region.

Photo courtesy of Boonedocks Oyster Company

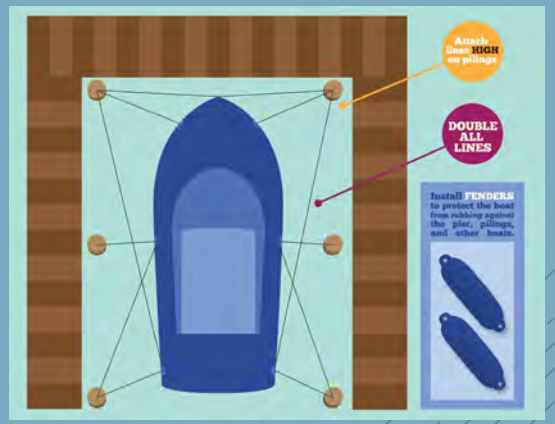
PRIOR TO HURRICANE SEASON

Develop a plan of action to secure your boat by trailering it from the threatened area. If your boat cannot be trailered, determine in advance whether to secure at a marina, dry storage facility, mooring, or hurricane refuge in a protected cove or upriver. A checklist of equipment and supplies needed for any of these options should be prepared in advance. Following are important considerations:

- ☐ Maintain an inventory list of all boat equipment. Note items you will remove from the boat and those you will leave on board. Items of value should be marked so that they can be readily identified.
- ☐ Take photographs or video with a time stamp of your boat and its associated gear.
- ☐ Consolidate all documents including

WORKBOATS GUIDE

- Follows outline as in Gear Guides
- Provides practical information for trailerable and non-trailerable boats
  - How to secure boats on land and at marina, dock, or dry storage
  - Recommendations for necessary supplies, i.e., mooring lines, anchors, fenders, and safety equipment



WHERE TO GET INFORMATION?

- Fact sheets (pdf files) can be downloaded from Resources section
- Work sheets (Word documents) for individualized storm plans available at https://shellfish.ifas.ufl.edu/hurricane-resources
- Contact Leslie Sturmer, UF, Lnst@ufl.edu; Rusty Grice, AUSL, rtg0010@auburn.edu; or Brian Callam, LSU, bcalla3@lsu.edu for further information