An Instructional Guide to Hurricane Preparedness for Florida Aquaculture Producers

The aquaculture industry in Florida was not adequately prepared for the hurricanes of 2004 and 2005. These hurricanes caused significant damage to crops and infrastructure.

The purpose of this hurricane preparedness guide is to assist Florida aquaculture farmers in planning and preparing for a hurricane to reduce the potential damage a hurricane can cause to their facilities and crops.

Hurricanes are storm systems fueled by the heat released when moist air rises and the water vapor condenses.

Hurricanes develop off the coast of Africa and intensify in the Atlantic Ocean and the Caribbean.

The warm tropical waters of the Gulf of Mexico and the Atlantic Ocean make Florida especially vulnerable to hurricane and tropical storm systems.

Each year, hurricane season officially begins on June 1st and ends November 30th.

On average, ten tropical storms develop and approximately six become hurricanes.

Hurricanes are categorized according to wind strength using the Saffir-Simpson hurricane scale.

There are five categories of hurricanes, based on the hurricane's present intensity.

A Category 1 hurricane has sustained winds of at least 74 miles per hour to 95 miles per hour. This type of hurricane causes minimal damage.

A Category 2 hurricane has winds from 96 to 110 miles per hour. Moderate damage is expected.

A Category 3 hurricane has winds from 111 to 130 miles per hour. This type of hurricane causes extensive damage.

A Category 4 hurricane causes extreme damage with winds from 131 to 155 miles per hour.

A Category 5 hurricane causes catastrophic damage with winds greater than 155 miles per hour.

A hurricane watch is issued for an area when a hurricane becomes a threat to that area within 36 hours.

A hurricane warning is issued for an area when a hurricane has sustained winds of 74 miles per hour or higher and is expected to strike that area within 24 hours or less.

The aquaculture industry in Florida suffered severe losses from the hurricanes of 2004 and 2005.

Docks, boats, hatcheries, growout facilities, and processing plants were damaged or lost.

Many aquaculture farmers that sustained 100% damage lost their immediate revenue and their revenue for the next year or two.

Some farmers were not in a situation to put their first dollars back into their business. They had to direct the money to reestablishing their household and making repairs.

As a result, many farmers were forced out of business.

Hurricanes can have major impacts not only on loss of infrastructure and livestock, but also on the business. Hurricanes can also disrupt research programs setting back the science of aquaculture.

We had four storms that came through in 04 or were tracked to come thru our area, so we had at least a week's prep time in each of those storms, and a half week to a week of disassembly time after the storm, so we had a lot of productivity loss, as much as a month and a half to two months out of a 12 month period was lost. Productivity was lost in terms of research, in terms of production, and when strictly towards hurricane prep and hurricane prep dismantling.

Disruptions in transportation services such as air freight can result in loss of sales and revenue.

All the airlines were shut down in the Tampa area too, nobody was buying any fish, nobody was flying anything out so that was a big problem, not moving any product.

Recovery after a hurricane can be slow and many farmers may find it difficult to return to their pre-storm profitability level.

When you are producing at a level that meets the demand then your profitability can be gauged.

When you interrupt that supply line for eight months or ten months or two years, you've lost markets there and recovering those markets and recovering your profitability is a serious problem and it's not something that these individual businesses can do much about.

There are several things you can do to protect your facility and minimize the damage from a hurricane such as having a hurricane plan, purchasing a generator, and obtaining insurance.

The first way to minimize risk takes place long before any hurricane appears on the horizon, and that is to build a facility capable of withstanding all but catastrophic hurricane winds and flooding.

Planning proactively when building new structures or renovating existing structures will help to minimize damage from storms.

Land-based facilities should be built outside of a floodplain or structures should be physically elevated.

A good portion of this property is potentially in a floodplain so all of our structures and many of our structures that we built, we physically elevated the grade two and a half feet before we placed the structure.

Local building departments or emergency management offices should have flood maps available for your review.

Consultants and engineers can help with facility design.

There are a number of ways buildings and infrastructure can be reinforced and protected depending on the scale and type of operation.

Greenhouses are widely used in Florida because they provide cost-effective protection from adverse weather conditions and the ability to control environmental parameters such as temperature and light intensity.

Instead of plastic film covers over the greenhouse, aquaculture farmers are investing in metal clad buildings.

The biggest change that we've made in the facility based on the hurricane experience is, as much as possible not build greenhouse structures but to look at a higher wind rated building such as a wood framed or steel framed metal clad building that has a 130 plus wind rating to it.

Besides taking a greenhouse and covering it with a metal sheeting, another way to make it more

secure is to build insulated rooms inside the buildings.

They also add some infrastructure strength internally to the buildings. And it's an inexpensive way to build a stronger building for your recirculating indoor systems.

The spacing between the bows of a greenhouse and how the bows are secured to the ground are important features to ensure a strong building.

We switched from a six foot spacing to a four foot spacing in our hoops in the greenhouses because for one it's structurally more sound, the house is able to handle higher winds.

The bows should be firmly secured in cement to prevent them from being detached from the ground.

After building a hurricane-tight facility, being prepared for a hurricane suggests having a hurricane plan in place to detail the steps needed to minimize damage and lost productivity.

Having backup equipment and supplies will also help you to be back in business shortly after a storm.

Knowing that power failures are very likely to occur during or after a storm, acquiring a generator as a backup power source is recommended.

Generators for your systems should be sized adequately to meet the electrical demand.

To select a generator for your facility, make a list of items that need to be powered, make a note of starting and running wattage, and calculate total power requirements in kilowatts.

An undersized generator can be damaged during use, and it can also damage the equipment it is connected to.

An electrical engineer can assist you in properly determining the needs of your facility.

There are many considerations when selecting a generator such as fuel type, wattage capacity, portability, and price.

There are two basic types of generators: standby and portable generators.

Standby generators are installed permanently as an emergency power source.

Portable generators are temporarily used and are much smaller and cheaper than standby generators.

They also typically operate on gasoline.

In general, a standby generator could cost $300 to $500 per kilowatt, installed.

The cost includes delivery, setup, connection, and the transfer switch.

Standby generators can run on different types of fuel such as gasoline, diesel, and propane.

Diesel fuel is the most popular type as it is dependable and cheaper to operate.

Generators running on diesel also have a longer life expectancy than those running on other types of fuel.

Depending on the size of your farm, you may decide to have one generator servicing your entire facility, or multiple units to power different buildings and systems.

A backup generator is also ideal in case the main generator is damaged or fails in a storm.

In the three storms that we had, we were out of power for many days in each case. I think the least time we were out of power was six days but up to nine days in each storm. Our backup systems functioned perfectly for us. We had a generator failure but the generator had been sent from the factory without the battery charger being hooked up.

Locate generators in a protected area and where they can be easily accessed for routine maintenance.

Generators should be kept on a monthly maintenance schedule to check all critical components.

Start your generators weekly to make sure the power transfers over smoothly.

Generators should be exercised at a minimum load of 30% of their rated output and not exceeding 80%.

This will ensure that they can handle the electrical load in the event of a real emergency.

Lack of use can cause fuel system damage and buildup of deposits.

If it is within your budget, build or acquire a sturdy shelter in a protected, elevated area.

You can temporarily store your most valuable animals such as broodstock and research animals, inventory records of your livestock and supplies, sales records, and employee information inside the shelter.

If you do not have a hurricane shelter, take important documents with you and secure your facility as best as possible.

If you do not have a hurricane plan for your facility, it is important that you create one.

It should delineate everything that needs to be done in the event of an impending storm.

When creating the plan, evaluate your situation and consider the worst case scenario.

Think about how you will support your system requirements after a storm with no power, no water, and a lack of staff.

If you have a large facility, you may want to create a plan with different sections that covers each area of your operation.

For example, have a section that describes what needs to be done for the hatchery, one for the nursery, and one for the growout area.

Have a staff member responsible for making sure tasks are completed in each area.

A well thought-out hurricane plan can save you a great amount of time and protect your investment.

In preparation for the hurricane season, consider having adequate insurance for your facility since hurricane insurance cannot be obtained once a hurricane has formed.

If you already have insurance, be sure you understand your coverage and that your coverage is up-to-date.

Aquaculture farmers can apply for insurance coverage through private insurance companies and government agencies.

The Noninsured Crop Disaster Assistance Program, also known as NAP, is managed by the United State's Department of Agriculture's Farm Service Agency.

It provides financial assistance to eligible producers of non-insurable crops affected by natural disasters including hurricanes, earthquakes, and floods.

NAP provides catastrophic coverage for up to 50% of the crop value at 55% of the market value.

To be eligible, you must be a landowner, tenant, or a sharecropper who shares the risk of producing an eligible crop.

The application must be filed annually and registration must occur by September 1st.

To apply for coverage, contact your local farm service agency office.

Aside from checking your insurance coverage, check your inventory of supplies on hand.

Make a checklist of supplies that are needed and set aside funds to start purchasing them.

Have everything on site so that you do not have to buy many supplies after a storm.

We try to get our supplies really in order so that we have everything on hand and we can get back into operation as soon as possible.

Essential supplies for hurricane preparedness include:

Dust masks, safety goggles, and gloves for protection during storm cleanup

Heavy duty garbage bags for cleaning up

Sand bags in case of flooding

Tools for repairs and removing debris

Plastic sheeting for coverage and repairs

Extra PVC piping to repair leaks and pipe bursts

Tarps for covering equipment or other supplies

Mops and brooms for clean up

A tractor or ATV to move heavy items

Plywood to board up windows and doors, or hurricane shutters

Duct tape

Rock salt in case you need to increase salinity levels after a heavy rainfall event

A first aid kit to cover all types of injuries

A portable weather radio to obtain the latest storm information

Containers to hold potable water

Gas cans

Flashlights and other emergency lighting in case of power loss

A camera to take pictures before and after the storm for documenting purposes

Extension cords

Small portable generators

Batteries for radios and flashlights and cash in case you cannot obtain it after a hurricane since ATM machines will not operate without electricity.

If a storm looks like it will threaten your area, start preparations immediately.

Monitor the weather in the tropics and plan to spend a minimum of two to five days to do a full preparation with all staff on site.

Have a meeting amongst your staff to start executing your hurricane plan.

Determine a designated meeting place and time for after the storm.

Update and distribute an employee emergency contact list to your staff. Include an emergency contact that is outside the impact area for each employee on the list.

If possible, have a call in number to communicate and distribute information to your employees in case landlines and cell phones are not operable after a storm.

To start preparing your systems, back flush and do a water exchange 24 hours prior to a hurricane approaching your area.

Euthanize non-native species if there is a chance of escapement.

If your greenhouses are covered with plastic film, consider removing it to protect the structural components from damage by high winds.

If you can remove all the covering from the greenhouse, the shadecloth and the plastic, then the winds almost no matter how strong they are will blow right through the steel structure and you'll be left with your steel structure after the storm, which is a good thing.

If the plastic film is removed from the greenhouse, make sure to move your stock and moveable items to a safe building or secure items tightly to minimize damage.

Some farmers have intentionally attached the plastic film to their greenhouses so that it will blow off

by itself when the winds become strong enough.

In the original design, I designed the facility so the roofs would blow off at 80 miles per hour, and they do. But they blow off before there is damage to the underlying structure. After Andrew, which was a major storm, all the roofs blew off but the greenhouse stayed intact.

To prepare ponds for a hurricane, drop the water level to accommodate heavy rainfall.

This will prevent stock, especially non-native species, from escaping into the surrounding environment.

If there is plastic on the ponds for overwintering, you might consider cutting that plastic off. In heavy winds, the plastic will not only tear off but it oftentimes can bend the hoops.

Clam farmers can do little to protect their submerged lease sites from the ravages of a hurricane.

It is not feasible to move clam bags because there may be hundreds to thousands of bags on a site at any given time.

If clam bags have been recently planted, add additional stakes to secure them and minimize the risk of dislodging.

Planting clam bags in the early spring and summer months instead of the late summer is ideal since the longer clam bags are on the bottom, the harder it is for them to become dislodged by wave or surge action because they are buried in the sand.

Most of the preparation for clam farmers is done on land such as pulling boats out of the water and securing land-based systems.

It is recommended to keep a supply of lumber for rebuilding damaged docks.

You can't go shore up a dock if it's being blown away in a storm, it's just one of those things that happen, you just have to figure on rebuilding when you get back after the storm.

If you are operating a clam nursery during hurricane season, clam seed can be easily relocated if necessary, and kept for 1 to 3 days in a cooler with ice packs.

These are small seed, a million seed for example could fit into a five gallon bucket for example, that's your seed, that's your next year's crop so you really want to focus on that because you might be able to do some proactive steps with that. You may even want to relocate it to another part of

state, know some folks or farmers in another part of state that can hold onto your seed in their systems.

If possible, keep your inventory of marketable clams low during hurricane season.

Maintain GPS coordinates for your lease corners so you can find your site after a hurricane in the event markers have been swept away.

It is recommended to stop feeding your fish two to three days before a hurricane approaches to ensure the food gets through their intestinal tract, reducing oxygen consumption and ammonia load on the systems.

If you have a large inventory of feed stored at your facility, store it in a strong structure so it is protected from the weather. Make sure it is kept cool at all times.

Broodstock may be spread out amongst the entire facility to dilute the risk of a system failure in one area or moved to another facility away from the impact area.

Live feeds such as artemia, rotifers, and microalgae are an important component of most larval fish and shrimp diets and should be protected.

Artemia can be harvested and microalgae and rotifer starter stock cultures can be transported away from high risk areas.

Harvesting your stock in advance of a storm provides the benefits of reducing the amount of stock at risk as well as meeting customer needs for inventory that may not be available immediately after a storm has passed.

Contact your customers and adjust shipping schedules as needed to take advantage of transportation systems while they are still in operation.

All empty vessels should be filled with water to act as their own anchor. All water reservoirs should be filled with water to provide a backup water source for your systems.

Gather and secure all loose items and store in a protected area.

Arrange to empty dumpsters as necessary. These will be needed after the storm and might be

difficult to get emptied.

Fuel supplies may be limited after a storm so it is essential to have an emergency supply on site.

A week's supply of gasoline is recommended, as operational gas stations may be a long distance away, and lines could be long.

Fill the tanks of motor vehicles, pumps, generators, and other equipment operating on gasoline, propane or diesel.

Liquid oxygen tanks can be used as a backup in the event of a power outage. They should be filled as delivery after a storm may be delayed.

In preparing your buildings, board up all windows and doors.

Vulnerable office equipment and other water-damageable items should be covered and moved to higher ground in case of flooding.

Backup computer files and make copies of all important documents such as insurance coverage information and inventory files. Store originals in a waterproof container in a secure off-site location.

Shut down and unplug non-vital electrical equipment and place in storage bins.

After a storm, return to your facility as soon as possible or permissible to assess the damage and tend to your property and crops.

Be cautious as roads may be impassable because of downed power lines, trees, and flooding.

Once you arrive at your facility, check your systems and buildings and check for safety hazards such as fallen objects and trip hazards.

Assess the situation and take photos to document the damage for insurance purposes.

Photos are the driving force if you're able to put all that forward and document as you go through the storms, that might help you.

Dispose of any mortalities properly and use chlorine for disinfection.

We actually had our worst fish mortality after hurricane Wilma which was in 2005. We lost quite a number of tanks of full-grown hybrid striped bass so we ended up digging a mortality pit on the property and disposed of them in that pit, covered them over, and so that was our situation for any dead animals that we had.

Encourage your staff to return to work to help with storm cleanup.

The staff was so willing to come to work no matter how difficult it was to get here, no matter how difficult it was to work here because of no electricity and all that sort of stuff. But the staff was really instrumental in making sure that we as a business continued on.

If you need aid, contact appropriate agencies and public adjusters for help and guidance after a hurricane.

It is important to be aware of your resources and know where funding is available.

You have to be aware you have to make sure that you ask where this funding is available because they're not gonna come just knocking on your door and say fill out this form. So you have to be knowledgeable, you have to do your homework. But if you do, they are very helpful once you get a hold of these folks and making sure you get the right forms and helping you fill out the forms if you need them. There's all this help, it's available online, if you need to talk to someone they've got phone numbers you can call them and talk to them and I know the Division of Aquaculture for us was very helpful.

The Division of Aquaculture also conducted workshops around the state to inform aquaculture farmers of existing federal disaster programs and how they could take advantage of the programs that were offered.

The Division of Aquaculture is a great resource for information. Contact them with your questions.

The main message is to be prepared. Build the strongest facilities you can. Have a hurricane plan and execute it as soon as there is a potential hurricane threat to your business. With some forethought, preparation and diligence, the most damaging effects of a hurricane can be avoided, allowing your farm to resume operation's quickly, with minimal loss to the business or your research.

For additional information, visit the following websites:

The Florida Department of Agriculture and Consumer Services, Division of Aquaculture – www.doacs.state.fl.us

The Federal Emergency Management Agency or FEMA – http://www.fema.gov

The Florida Division of Emergency Management – http://www.floridadisaster.org

The National Hurricane Center - http://www.nhc.noaa.gov

The Institute of Food and Agricultural Sciences Shellfish Aquaculture Extension Program provides educational, technical, and organizational support to clam farmers around the state - http://shellfish.ifas.ufl.edu

The University of Florida Tropical Aquaculture Laboratory serves the ornamental fish industry in Florida through research and education - http://tal.ifas.ufl.edu

The Florida Automated Weather Network or FAWN - http://fawn.ifas.ufl.edu

Ready America - http://www.ready.gov

The Indian River Research and Education Center - http://www.irrec.ifas.ufl.edu

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