

DRAFT Crawfish Producers' Information Guide to Preparing for and Recovering from Hurricanes in the Southeast U.S.

This is a draft of guidance being developed by the USDA SE Climate Hub to help crawfish producers prepare for and recover from hurricane damage.

This section will focus on:

- Storm preparation for crawfish production facilities
 - Management response during and after storms
 - Day-to-day, Long- and short-term recommendations for building resilience to hurricanes in crawfish aquaculture
 - Key response considerations during and following hurricanes for crawfish producers
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I. Pre-Hurricane Planning – Long-term Preparedness

Initial Site Planning *The site considerations below could be considered ideal situations, but they all should be taken into account when evaluating a potential crawfish production facility. Sites that appear suitable for crawfish aquaculture (flat land with high clay-content soil and abundant water sources) are often particularly vulnerable to storm impacts. Unique challenges will include access, utilities, topography and infrastructural considerations.*

- Search for sites above the 100 year-flood plain.
- Search for sites located far enough inland to avoid coastal storm surge and flooding.
- Search for areas that are not close to bayous or other water bodies that could flood from heavy rains associated with hurricanes and tropical storms.
- Search for sites with adequate surrounding drainage to reduce the possibility of backwater flooding.
- Search for areas with good roads that will allow multiple escape routes when evacuating from hurricanes and tropical storms.
- Search for areas where farm equipment can be easily moved to higher elevations when needed to avoid flooding.
- Search for areas where utilities and other critical infrastructure can be permanently established on higher ground to avoid equipment and infrastructure damage during flooding.
- Look for areas where saltwater intrusion during storm surge or flooding is not likely to occur. Typically, this includes sites that are 15 miles or more from any coastline or water body with a direct connection to saltwater.

Site Establishment *A specific site can be more or less prone to storm damage, but each site can be developed in such a way as to minimize impacts.*

- Construct crawfish ponds in suitable areas to avoid frequent flooding.
- Establish higher-elevation areas (at or above the 50-year flood elevation) at designated levee junctions throughout the farm, with one elevated area for every 200-300 acres.

- Consider the prevailing winds when laying out ponds. If storm related winds are parallel with the long axis of a pond, excessive wave action can damage down-wind levees during hurricanes and tropical storms.
- Construct levees surrounding the farm and/or ponds in areas that would potentially flood if a nearby water body rose beyond flood stage. Levees should be constructed a minimum of 24" above the highest recorded flood stage for the property.
- Install main drain valves or shut-offs to prevent flood water intrusion from surrounding high water.
- Consider using a PTO powered low-lift pump and large diameter hose to pump ponds out over the levees while drain pipes must be kept raised or shut to keep out floodwaters.
- Clear the farm of large trees that could fall into ponds, block vehicle access or damage electrical or other critical infrastructure during high winds.
- Ensure well casings and caps are located a minimum of 24" above the surrounding grade to help prevent intrusion of floodwater containing high salinity, pesticides, or fertilizers into groundwater supplies. Keep in mind that agriculture well casings installed prior to 1980 only had to extend to grade in some states, so this may still be an issue for older wells on neighboring property throughout the watershed.
- Locate all shop facilities, equipment buildings and bait storage facilities on higher ground or construct elevated pads for these buildings.
- Construct all housing and other structures to a minimum wind rating of 140 mph wind and preferably 180 mph.
- Install gas or diesel backup generators to operate critical buildings. Generators and fuel storage tanks must all be elevated or otherwise protected from flooding.

Seasonal Considerations Outside of Hurricane Season

- Develop a disaster plan that identifies chain of command, with clearly defined primary/secondary roles and responsibilities of various team members. The specific actions outlined below can serve as the basis for most sections of the plan. A 5-day timeline should be included to reflect specific preparation activities leading up to the storm impact. Post-impact actions should also be programmed based on recovery priorities. Incorporate realistic expectations regarding the time involved for both hurricane preparation and response.
- Prepare maps for each block of ponds and all other facilities. Include locations of alternate entry/exit routes, electrical equipment (with shut-off options), fuel storage tanks (both above and below ground), propane tanks, compressed gas (for welding, etc.) and chemical spill equipment. Personnel should be trained in decision-making regarding when to take actions themselves or when to wait on outside emergency responders. All workers at the farm must be trained in:
 - • Use of various types of fire extinguishers
 - • First aid, including CPR
 - • Shutdown procedures for electricity, tractors and other equipment
 - • Chemical spill control (for fuel tanks, stored herbicides, etc.)
- Download one or more of the readily available computer and cellular phone apps that model storm track predictions, send alerts, and track hurricane impacts.
- Purchase and maintain a stockpile of "weather-proofing" supplies on-hand at the facility, such as tarps, and sand bags for buildings, pumps, generators, fuel tanks and damaged levees.
- Purchase and maintain emergency medical supplies, a supply of drinking water, and a dry- and canned food supply adequate for 3 or more weeks of survival for employees that become stranded at the facility or may need to return to the facility before utility and emergency services are restored.
- Maintain good harvest, equipment inventory (including traps), and bait purchase records at all times. This information is critical during recovery and insurance claims. Take these records with you when evacuating

for hurricanes. Establish a procedure to store records digitally on a computer and transmit them weekly to one or more recipients so they will exist and be retrievable on computers in other locations.

Monthly Considerations During Hurricane Season

- Check short and long term weather forecasts and radar at least once daily during hurricane season (May – November).
- Monitor newscasts and weather reports for potential and impending hurricane and other storm threats.
- Perform adequate facility inspections and maintenance to ensure items such as loose roofing materials or improperly/inadequately grounded electrical equipment to not become much more serious threats to life and property during a hurricane.
- Traps should be stored in buildings, trailers or other secure areas so that they will not be lost during heavy winds.
- Any equipment not in use, or equipment used primarily during other seasons (such as harvesting boats, push boats and irrigation pumps) should be stored or secured in a safe location as if a hurricane were already on its way. This reduces the time required for moving and securing equipment in the event a hurricane evacuation needs to be made.
- If secure storage facilities are available on site, arrange for fuel deliveries several days prior to the expected storm impact. Consider fuel needs for tractors, generators and farm vehicles. Remember, any fuel stored on site poses a contamination risk if storage tanks cannot be adequately protected from anticipated flooding.
- Go over emergency preparedness and evacuation plans with employees. A step-by-step plan should already be in place, including a check list of what must be done to secure the facility, fuel supplies, chemical supplies and equipment (including traps) in case a hurricane is forecast to make landfall near the farm.
- Identify and repair potholes in levee tops that might become impassable with heavy rainfall.
- Identify key points on each block of ponds where levee elevations will first become impassable in the event of rising water.

Annual Considerations

- Refresh emergency medical supplies, a drinking water supply, and a dry- and canned food supply.
- Service and test portable and non-portable generators every two weeks.
- Develop a written plan of pre- and post-hurricane responsibilities and job descriptions for personnel.
- Contact your local utility company for guidance on how to disconnect power in the event of downed lines.
- Develop a list of post-hurricane contacts: Local emergency and medical services, local USDA Service Center, private insurance carriers, emergency contact numbers for all employees, mechanics, electrical contractors

II. Pre-hurricane Planning – Short-term Preparedness

When a Hurricane Is Forecast to Impact Your Area (1 to 7 days before)

- Begin working through the facility's step-by-step hurricane emergency preparedness plan check list of tasks that must be done to secure the facility, fuel supplies, chemical supplies and equipment.
- If it is still early in hurricane season, harvest any marketable crawfish prior to the hurricane to generate some emergency funds. Secure any remaining traps in a safe place.
- Secure all bait storage facilities and apply sand bags if necessary. Bait is one of the largest costs of production and losses can occur due to storage building damage or flooding.
- Move all non-critical equipment to higher elevations or store in secure buildings.
- If water is still in the crawfish ponds, lower the standpipes completely 3-4 days before hurricane impact to allow time for draining and make room for excessive rainfall that can occur when the hurricane arrives. NOTE: Be sure to raise standpipes back up before significant rainfalls begin, to prevent water with trash fish and pesticides from backing up into the ponds.

One Day Before a Hurricane is Forecast to Impact Your Area

- Unplug or shut off electrical supplies to any non-critical equipment at the site.
 - Make sure all facility employees have evacuated to secure areas at least 1 day prior to hurricane impact. If some staff will remain on site, confirm that they have access to structures on high ground or elevated slabs/pylons that can withstand hurricane winds and rain, sufficient stores of clean water and food, medical supplies, working radios or cell phones and sufficient battery or generator power.
 - Those workers remaining on site should have cell phone communication with evacuated supervisors and colleagues since local radio and television communications often black out for several hours as a hurricane passes. Local first responders may also be out of communication at the time of hurricane impact.
 - Personnel remaining on site to monitor the farm until the last moment should observe water levels in low-lying and problematic areas to have sufficient warning to allow workers to exit the operation before levees and surrounding roads and highways are blocked with floodwaters.
 - If the decision is made to abandon the farm, tractors and equipment that have not already been moved to the highest ground available must be left in place.
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III. Post-hurricane Recovery

Immediately After the Hurricane has Passed

- Do not rush back into a facility until you are sure it is safe. Drowning and electrocutions are two of the largest dangers in aquaculture production, and the danger increases several fold in the wake of a hurricane. Proceed cautiously and avoid driving across any submerged roads or levees.
- Check on the safety of any employees that may have remained behind during the storm to care for the facility or animals.
- Check for levee breaches, flooded ponds, rising or incoming water, and evidence of structural fire or damage before entering any buildings on the property.
- Check the entire facility for downed powerlines or other utilities that may pose a hazard or need to be repaired.
- Inspect roofs and cover wind-damaged areas to reduce water damage inside structures like shops or offices.
- Start the process of water removal from the facility by pumping if necessary and if possible. Facility recovery cannot be undertaken until roads, levees, and buildings are no longer flooded.
- If ponds become flooded, determine if water is entering through drain lines or has simply accumulated from rainfall.
- Begin to collect, enumerate, and document damaged equipment, lost bait, lost traps, damage to forage crops and other losses as soon as possible. Also continue to note and photograph any crawfish losses – either dead animals or those leaving ponds due to bad water quality.

Within a Week Following Hurricane Impacts

- Start the insurance claims process (Federal, private or both). Accurate losses of inventory and equipment may not be fully documented yet, but insurance claims can take months to resolve following hurricane events so start the paperwork now.
- Check structural soundness and document any damage to farm buildings.
- Check and document water damage to equipment and machinery.
- Continue to document any dead crawfish or bait spoilage.
- Work to restore electrical and water supplies if needed.
- Get water off of crawfish ponds as soon as floodwaters outside the ponds recede to levels low enough to prevent water entering through drain pipes. Submerged forage crops may need to be replanted.
- Clean out bait storage buildings, bins or other containers with spoiled bait. Thoroughly rinse them with a 10% bleach solution, and allow to dry completely before restocking.
- Ponds that were flooded from the outside (over the levees or via drain pipes) should be fully drained and dried to kill trash fish introduced by floodwaters. Puddles, ruts and borrow ditches that cannot be drained should be sterilized with swimming pool chlorine (using appropriate safety equipment). Unwanted fish that survive until the new season will reproduce, prey on all sizes of crawfish, and reduce or eliminate any profits.
- Contact your local extension agent or state aquaculture Extension specialist for more guidance on recovering from a hurricane disaster.

Within a Month Following Hurricane Impacts

- Continue and follow-up on the insurance claims process. Begin filing for any additional State or Federal disaster assistance programs for hurricane recovery.

- Pond, levee, and road structural repairs should be underway.
- Continue to check for any structural or equipment damages or losses and document each incidence when discovered.
- Drainage ditches and canals should be examined to determine to what extent, if any, they have been silted in by floodwaters.
- Continue to remove undesirable fish species from production ponds, and replant forage crops as needed, if possible.
- Equipment that was flooded should have general and preventative maintenance done to ensure future working order. Keep all receipts for parts and labor, as well as a list of any equipment that is determined to be a total loss.

This draft guidance was developed by subject matter experts from the Louisiana State University AgCenter and Texas A&M University



Water flowing out of a full pond that was not lowered prior to hurricane-related rains.



Once a pond is under water it is difficult or impossible to tell where levees and roads are.



Leaving traps unsecured can result in significant losses and damage in the event of high winds.



Trying to use “free water” from storm related rainfall to flood ponds early in the fall can lead to serious water quality problems and loss of early-crop babies.



Prolonged flooding can force broodstock out of their burrows and high temperatures can leave floodwaters with little or no oxygen.



Trash fish that enter crawfish ponds through drain pipes or over levees must be completely eradicated or they will multiply and eat most of the next season's crop.



From late August onward, if female crawfish are forced out of their burrows by rains or flooding, they will not be able to go back in the ground. If adequate oxygen levels cannot be maintained through frequent flushing, the early crop of crawfish will be lost.



Some crawfish that are forced out of their burrows will go back in the ground as waters subside, assuming water quality conditions remain acceptable.



All equipment, including harvesting boats, should be moved to high, secure areas well before storm conditions set in.

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Getting as much water as possible off the fields before rains begin will allow for more flexibility to keep standpipes up and avoid water entering the ponds through the drains.



Dry flimsy vegetation is poor quality forage, and will breakdown rapidly is flooded in hot weather. This in turn will result in very low oxygen levels and kill any crawfish that are forced out into the pond.



After storm impacts subside, evaluate the extent to which drainage ditches may have silted in due to sediments in floodwaters.