Peanut Producers Guide to Hurricane Preparation and Recovery in the Southeast United States

This guidance is applicable to the following states and regions:

- Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, Virginia
- Southeastern and Virginia/Carolina production regions

This section will focus on:

- Long and short-term planning and preparation to mitigate the impacts of hurricanes on peanut production
- Potential impacts of wind and water on peanut production
- Rebuilding and recovery after a hurricane

INTRODUCTION

People who live and work in the Southeastern United States are unfortunately familiar with the devastation and loss of life and property that can accompany a hurricane event. While hurricanes have always been a threat to the Southeast, with an average of over two strikes per year since 1900, the threat posed by hurricanes is growing. Recent studies suggest that as ocean temperatures continue to rise, hurricane intensity is increasing. Hurricanes of the future will likely be slower-moving, higher category hurricanes that produce destructive winds and flooding.

To help producers remain resilient and productive in the face of this threat, the U.S. Department of Agriculture (USDA) Southeast Climate Hub developed this guide containing steps that can be taken to prepare for and recover from hurricane events. This guide is separated into four primary sections:

- The **BUILDING A RESILIENT OPERATION** section outlines a range of considerations and systems that producers can put in place to increase their resilience to hurricanes.
- The **LONG-TERM OPERATION MAINTENANCE** section lists specific pre-hurricane actions and periodic checks to be done on an annual basis (before hurricane season) and monthly basis (during hurricane season).
- The **SHORT-TERM PREPAREDNESS** section lists specific actions to be done in the week before a hurricane arrives.
- The **POST-HURRICANE RECOVERY** section outlines activities that producers can take to minimize their losses following a hurricane. It begins with actions immediately following a hurricane that are focused on safety and continues with ongoing actions a week out and a month out.

The guide also includes four appendices, including two customizable templates for a **Farm Emergency Plan** and an **Emergency Contacts List**. Directions on what to include in these two documents is outlined in the **Building a Resilient Operation** section. There use is described in the **Short-term Preparation** section. Both the plan and list should be periodically reviewed, as mentioned in the **Long-term Operation Maintenance** section. The appendix also includes an **Initial Site Planning guide** that can be referenced if purchasing or leasing new land, and **Resource Links** to helpful Federal, State and University Extension websites that are also referenced throughout the guide.

Building a Resilient Operation

This section describes systems that are recommended to be put in place well before the arrival of any hurricane.

Agricultural operations in the Southeast US can implement a range of measures to increase their resilience to hurricanes and tropical storms. Contact your local Extension office and other state and federal resources for further information.

Personal Safety

- For safety tips and resources that facilitate informed decision making before, during, and after a hurricane strikes, see the U.S. Department of Homeland Security (DHS) Ready.gov website and NOAA National Weather Service Weather-Ready Nation Hurricanes website.

Recordkeeping, documentation, and insurance

- The importance of pre- and post-hurricane documentation cannot be overstated. Assistance for disaster recovery may not be available until weeks or months after a hurricane. Therefore, it is important for purposes of insurance compensation and recovery assistance to do thorough record keeping of the damages and losses sustained on your farm as well as your cleanup and recovery efforts.
- The worst time to find out that you do not have enough insurance, or the right insurance, to cover your damages is when you need help recovering. Regularly review your insurance policies with your agent to be sure you have adequate coverage, including flood insurance, for your facilities, vehicles, farm buildings and other structures, and crops. Be aware that there are limitations on how soon insurance coverage will take effect. Generally, insurance policies will not cover damage if the policy was not in place before a hurricane has formed.
- Establish an inventory system so that you know exactly what's on your farm at all times for potential insurance claims and disaster recovery assistance. It is critical to have a documented inventory (photos, videos, and written lists and descriptions) of your farm buildings, vehicles, and valuable equipment on your farm *before* a disaster occurs. Maintain accurate records of harvest, equipment inventories, and supplies purchased. This inventory and documentation will be essential for filing insurance claims after the hurricane. Keep copies of this inventory in multiple places such as on your computer, off-site in a safe location, and on a cloud-based server using an established procedure to update and transmit the information weekly.
- Take these records with you when evacuating for a hurricane.
    - Inventories and documentation for insurance and disaster recovery purposes

    - Farm Emergency Plan
    - Emergency Contacts List
- For more information, see:
    - The USDA Risk Management Agency (RMA) Crop Insurance website for news and information about crop insurance, including the Hurricane Insurance Protection – Wind Index (HIP-WI) Endorsement, for farmers and ranchers. Use their agent locator to search for approved insurance providers.
    - The U.S. DHS Federal Emergency Management Agency (FEMA) National Flood Insurance Program website to learn more about flood insurance options for qualifying home and business owners.

Infrastructure

Buildings

- Consult topography and flood maps when building new facilities
- Locate buildings above the 100-year flood zone whenever possible, and construct buildings and other structures to a minimum wind rating of 140 mph wind; preferably 180 mph. For more guidance on protecting farm structures and buildings from winds and flooding see the FEMA Compilation of Wind Resistant Provisions and Design Guide for Improving Critical Facility Safety from Flooding and High Winds.

Power and back-up power

Circuit breakers

- Know the location of your main circuit breaker and breaker box. The box is generally located inside of buildings, but additional breakers may be located outside.
- Ensure that the breakers, including the main breaker, are correctly labeled. Correct labeling will help you ensure power is cut to the appropriate appliances or to the entire building.

Back-up power

- Create a back-up power plan, and store with your Farm Emergency Plan (see below).
- Check local, county, and state codes for any requirements to supply back-up power during short-term emergencies.

Roads

- The primary driveway into the farm should have adequate drainage to prevent flooding. The road should be well packed with a solid base that will hold up to heavy equipment and trucks during extreme conditions. For more information on maintaining unpaved roads, see the USDA Environmentally Sensitive Road Maintenance Practices for Dirt and Gravel Roads.
- If you do not have a secondary entrance to your farm, construct one if possible to provide alternative access from a different road in the event the primary entrance is blocked.
- If the farm is in a location where all roads leading in and out may flood, purchase or make arrangements to rent or borrow a boat that can safely navigate the flood waters to gain faster post-hurricane access to your property.

Drainage

- Total water management is essential, including irrigation and drainage systems, and must take into account the water table and soil drainage.
- Increased sand content improves drainage, whereas higher silt and clay content reduce drainage. In soils prone to developing a hard pan, perform deep tillage using a sub-soil implement such as a ripper-bedder, or strip tillage to help improve soil percolation and reduce the time that water stands in flooded areas.
- Develop surface and subsoil drainage including a system of canals, ditches, beds, and/or drain tiles. Ditches between beds must have enough capacity to accommodate and channel excess water.
- Consider creating water retention areas to reduce overall flooding during small to moderate-intensity hurricanes.
- Make sure culverts are properly designed regarding size and location.
- For more information about water management, see:
    - Sustainable Agriculture Research & Education's (SARE) *Building Soils for Better Crops* Irrigation and Drainage chapters
    - University of Florida Institute of Food and Agriculture Sciences (IFAS) Extension website
    - Georgia Soil and Water Conservation Commission website
    - Mississippi State University Extension Service website
    - Virginia Cooperative Extension website

Water table

- The amount of flooding will be determined by your land's topography, the amount of precipitation received, and the pre-hurricane water table. The higher the pre-hurricane water table, the more likely that flooding will occur for a given amount of precipitation. The chance of flooding can be estimated by measuring the pre-hurricane water table and considering the effect of varying precipitation amounts:

  A general rule of thumb is that 1 inch of rain will cause the water table to rise about 10 inches in fine textured soils, 6 inches in most of the flatwoods sandy soils, and 4 inches in coarse sands. It may take 4 to 6 days for the water table to return to its desired levels following rains of 1 inch or more. For example, if the water table is at 50 inches, 6 inches of precipitation will cause localized flooding on fine textured soils, but no flooding would occur on sandy soils.

Irrigation

- Locate irrigation pumps in elevated areas to reduce flooding risks to the pump and install them with a backflow prevention device to avoid contamination in case of power loss. Keep the access road to the pump clear so that it is easier to bring in generators or diesel-powered pumps after a hurricane.

Trees and windbreaks

- Remove trees that could potentially blow down and block the entrance to the farm

- If land is elevated and unprotected, consider creating wind breaks along the edge of fields. This is particularly valuable if adjoining land has bare soil and can prevent or reduce sandblasting of plants during a hurricane.
- Trees and shrubs used as a windbreak should be native species that will develop strong, deep root systems and be hardy enough to resist breaking during high winds. Permanent plantings commonly used for windbreaks include pine trees. Red cedar (*Juniperus virginiana*) also resists strong winds well. Keep trees or shrubs pruned and free of dead or dying branches.
- For more information about how windbreaks can protect crops and provide economic, environmental, and commercial benefits, see the USDA National Agroforestry Center website.

Crop concerns

Variety selection

- Choose disease-resistant crop varieties to improve plant health and decrease susceptibility to outbreaks when plants are stressed. Varieties with leaf spot resistance can help slow the development of disease if sprayer or digger access to a field is limited due to weather and soil conditions.
- High-performing varieties are available across a diversity of maturity groups to mitigate risk. Visit the (Alabama Cooperative Extension System website) (University of Florida IFAS Extension website) (University of Georgia Cooperative Extension website) (Mississippi State University Extension Service website) (North Carolina Cooperative Extension website) (North Carolina: Type "peanut variety testing" in the search bar to find the most recent publication) (Clemson Cooperative Extension website) (Virginia Cooperative Extension website) for the latest Official Variety Testing results. (Virginia: Type "peanut performance testing" in the search bar to find the most recent publication)
- Contact your local Cooperative Extension office for recommendations on disease management.
- Virginia market type cultivars generally are at a greater risk due to digging losses during unfavorable conditions. In over mature or poorly drained fields, runner market type peanut varieties may have better pod yields compared to non-runner varieties.

Fungicide programs

- Effective fungicide programs for leaf spot disease can improve overall plant health and can prevent premature shedding of pods if digging is delayed due to excessive rainfall.

Planting dates

- To ensure that any hurricane damage to your crop is covered by your crop insurance, plant your crop before the final planting day for crop insurance in your state. This may vary by county and year, so use the USDA RMA Actuarial Information Browser Tool to determine the final planting date for your crop. While the late planting period continues beyond the final planting date, check with your insurance provider for details that may apply if you plant during this time period. Look closely at insurance policies to determine specific details, as requirements can change.

Seed beds

- Planting on beds, where feasible, can improve drainage and facilitate digging, potentially reducing the time after excess rainfall that digging can begin.

Cover crops and crop rotation

- Fields should be rotated for a minimum of two years out of peanut with a non-legume (corn, cotton, sorghum, grass pasture). Longer rotations of three to four years or more out of peanut can more effectively limit overall pest pressure and help reduce the development of disease should field access become restricted due to a hurricane.
- Consider planting cover crops in rotations of 3 to 4 years to improve soil health, reduce pest pressure, and help reduce the development of disease should field access become restricted due to a hurricane.
- See the following resources for integrating cover crops into your management plan.
  - USDA Natural Resources Conservation Service website
  - Alabama A&M and Auburn Universities Extension website
  - University of Florida IFAS Extension website
  - University of Georgia College of Agricultural & Environmental Sciences website
  - Mississippi State University Extension website
  - Virginia Cooperative Extension website
  - Sustainable Agriculture Research & Educations' Cover Crop Economics: Opportunities to Improve Your Bottom Line in Row Crops
- To learn about cover crops and Federal crop insurance, see the USDA RMA Cover Crops and Federal Crop Insurance website.

Debris disposal

- Create a plan for salvage operations including a method of debris disposal. Learn what materials and the specifications regarding composition of materials the landfill nearest your farm will accept and identify alternatives if needed. For disposal of chemicals or other hazardous materials, follow specific procedures to meet U.S. Environmental Protection Agency (EPA) requirements.

Emergency planning

Farm Emergency Plan

- U.S. Department of Labor Occupational Safety and Health Administration (OSHA) regulations require an employer with more than 10 employees to have a printed copy of an emergency action plan readily accessible to all employees. If you have 10 employees or fewer, the emergency plan may be reviewed orally. For more information about emergency preparedness for farm workers, see the Agricultural Safety Fact Sheet.

- Consider bringing together a disaster planning team, which could consist of the farm owner and engaged family members, the farm manager, an insurance representative, county Extension agent, and other individuals.
- Create your Farm Emergency Plan. See *Appendix: Farm Emergency Plan* for a sample plan that you can customize for your operation. The plan should include a checklist of tasks necessary to secure the facilities, fuel supplies, chemical supplies, and equipment; disconnect electricity and gas service; ensure that critical supplies are well stocked; etc.
- Make sure all your employees know the formats (electronic or hard copy) and locations where the Farm Emergency Plan is stored.
- Consider creating a "hurricane suggestion box" where employees can place ideas for training and planning they believe would increase the operation's resilience and safety in the face of a hurricane, based on their previous experience.

Maps and signage

- Prepare or update maps for all facilities, including 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.

Hurricane tracking apps

- Download one or more computer and mobile device applications (apps) that model hurricane track predictions, send alerts, and track hurricane impacts. Given the rapid advance of mobile technologies, check for new options each year prior to hurricane season. The NOAA National Hurricane Center website is a good source for keeping up to date on the latest hurricane activities. For more information about emergency alerts, see the U.S DHS Ready.gov website.

Roles and responsibilities

- Designate an Emergency Response Team for your farm. Members of the team should be:
  - Thoroughly trained and physically capable of performing assigned duties
  - Knowledgeable about the hazards found on the farm
  - Trained in decision making regarding when to take actions themselves and when to wait on outside emergency responders
- Define a chain of command with clearly defined primary and secondary roles and each person's responsibilities. Some individuals may not be reachable after a hurricane, so alternative level of authority need to be established to resolve critical issues quickly. In your Farm Emergency Plan list who will be responsible for each task, and how they'll report fire, flooding, building collapses and other emergencies. Identify procedures to be followed by the people who remain to handle critical operations.

Communication

Emergency contacts list

- Develop and maintain a list of all people connected with your operation that should be contacted in an emergency. See *Appendix: Emergency Contacts List* for a template that you can customize. The Emergency Contacts List should include names, phone numbers, email addresses, locations, and all other pertinent information for individuals (owners, family members, employees,

employee family members), emergency responders, State and local agencies, contractors and suppliers, and anyone else who is on your farm on a regular basis or provides crucial emergency services.

- Keep copies of your Emergency Contacts List—hard copies as well as electronic copies—in multiple locations including your home, office, and vehicle; with all family members and key employees; and in additional safe locations. It is a good idea to have this information stored on your and your employees' mobile devices.

Lines of communication with local businesses and officials

- Establish communication with your local law enforcement and fire departments, electricity and gas providers, and other key groups to help them understand the nature of your business so that they can respond as needed in the event of a hurricane. Let them know the number of employees typically on site, the potential impact of the hurricane on crops, and the potential hazards that could lead to environmental contamination in the event of a flood or structural damage.

Post-hurricane communications

- Purchase a battery-powered or hand-crank radio to stay up to date about conditions beyond your property in case you lose electricity for an extended period of time.
- Consider ahead of time the locations where producers and others could meet if all communication lines are down (e.g., a local feed or equipment supplier).
- Contact a local AM radio station to see whether it could serve as a communication channel in the aftermath of a hurricane.
- For more information about communicating before, during, and after a major disaster, see the FEMA website.

Electricity and gas

- Contact your local utility company for guidance on how to disconnect power in the event of downed lines. Record their instructions in your Farm Emergency Plan.
- If certain equipment requires specialized shutdown procedures, train employees in these procedures.

Equipment operation

- Train personnel in the safe operation of unfamiliar equipment (such as generators or drainage pumps) that they may have to use in case of a hurricane.
- Make sure that appropriate employees are prepared to set up your back-up generators. They should refer to your Back-up Power Plan for information about where generators and generator fuel can be found, where they should be placed in preparation for a hurricane, and how they are to be connected to the electrical loads they will power.

Drone

- Consider getting an unmanned aerial vehicle (UAV) (i.e., drone) pilot license and purchasing a UAV. Small UAV quadcopters or hexacopters that can be equipped with visual or RGB cameras are relatively inexpensive ($500 to more than $2,000). Use of UAVs will help with damage assessment if accessing fields directly is impossible or unsafe. For regulations and information about operating a UAV, see:

- U.S. Department of Transportation Federal Aviation Administration Unmanned Aircraft Systems website
- University of Florida IFAS Extension Preflight and Flight Instructions on the Use of Unmanned Aerial Vehicles (UAVs) for Agricultural Applications

Chemical safety

- Take the necessary steps to prevent chemical spills from storage tanks containing fuel, herbicides, or other potentially dangerous liquids.

Basic emergency response skills

- Train all members of your Emergency Response Team in the use of various types of fire extinguishers, first aid, and CPR (cardiopulmonary resuscitation).

Long-Term Operation Maintenance

Prior to hurricane season

This section describes periodic checks of systems already in place (described in the section above).

Contact your local Extension office and other State and Federal resources for further information specific to your circumstances.

Annual review of emergency planning tasks

Farm Emergency Plan review and reassessment

- Review your Farm Emergency Plan with your employees to ensure that they are familiar with all elements. Make any necessary additions or updates.
- Review your Emergency Contacts List with your employees and update it with current names and contact information.
- Review items provided in the "hurricane suggestion box," and add them to your Farm Emergency Plan or training list as relevant.

Employee training

- Identify key tasks that employees will need to complete during hurricane preparation and recovery operations.
- Once each year, provide training for all employees that will participate in the key tasks identified above.

Personal health and safety tasks

- Make sure that you and your employees have up-to-date tetanus shots.
- For information and links to time-specific guidance for preparing yourself and your home, visit the U.S. DHS Ready.gov Hurricanes website.
- Download the FEMA Mobile App to learn emergency safety tips, receive real-time weather alerts and important disaster planning reminders, information about shelters and recovery centers, and more.

Recordkeeping, documentation, and insurance

- Meet with your crop insurance and/or USDA Farm Service Agency (FSA) representative to make sure you are signed up for eligible programs. At the time of renewal, review your insurance policies with your agent to be sure that you have adequate flood insurance and coverage for vehicles, farm buildings and structures, and crops.
- Keep records of harvest, equipment inventories, and purchases of supplies up to date. Long-term records will help to establish a production baseline from which losses can be determined. Be sure that copies of each are in a safe location chosen in "Building a Resilient Operation" above.

Infrastructure

Buildings and facilities

- Inspect all buildings and all facilities for structural soundness. Perform maintenance on facilities and infrastructure to repair items such as loose roofing materials or improperly/inadequately grounded electrical equipment to reduce hazard risk during a hurricane.

Drainage

- Clean out culverts and ditches and other drainage areas especially before and during the peak hurricane season. Keep ditches clear through a good maintenance program including chemical weed control. Regrade areas of the property that are prone to flooding to improve drainage.
- Check any new construction areas, housing developments, or Department of Transportation projects nearby to see whether they are affecting your land's drainage. Determine where the water is draining now, and address any new drainage needs before hurricane season begins.

Maintenance of trees, windbreaks, and roads

- Trim trees around field edges and removing weak, dying, or dead trees to help minimize debris removal if a hurricane strikes.
- Maintain windbreaks with regular pruning, especially if they are close to aerial power or telephone lines. To learn more about proper pruning practices, see:
  - Inland Urban Forest Council A Practical Guide to Proper Pruning of Trees and Shrubs
  - University of Florida IFAS Extension Pruning Shade Trees in Landscapes website
  - OSHA Line-Clearing Tree Trimming Operations website
- Evaluate roads for any repairs or improvements needed before hurricanes arrive. Look for alternative egress and ingress to the fields and buildings in the event of flooding.

Equipment

- Purchase or ensure that you have access to additional harvest equipment (e.g., diggers and combines) for increasing row capacity, as this can reduce the total amount of time required to harvest portions of available peanut acreage under time-limited windows, such as when a hurricane is approaching. The demand for this equipment will rapidly increase as the hurricane approaches so plan early for this contingency.

Generators

- Do routine maintenance and service generators annually. Replace old stored fuel with new, fresh fuel. Replace fuel filters, test all generator circuits, and make sure to have all necessary supplies on hand, including spare belts and fuel filters.

- If the generator is run at less than 30% of its kW rating for 30 minutes per month or more, you may need to test using load banks annually.
- Ensure that all essential equipment functions when powered by the backup generator.

Emergency supplies

- Maintain an ample supply of emergency medical supplies and have raincoats and boots available for employees.
- Maintain a supply of drinking water and dry and canned food sufficient for at least 2-weeks for employees who become stranded at the facility or who need to return to the facility before utility and emergency services are restored.
- Maintain an ample supply of weather-proofing supplies such as tarps and sandbags; fencing supplies; plumbing supplies; lumber, construction tools, nails, and ropes; portable lights; batteries; and battery-powered or hand-crank radios.

Soil samples

- Collect soil samples from growing areas to establish a baseline for chemical or heavy metal contamination. If flooding does occur, soil samples are a useful tool to determine when previously flooded fields may be safe for replanting. A baseline from previously collected samples will assist with pre-planting risk analysis to determine if floodwaters may have introduced chemical hazards into the soil.

Crop concerns

Monthly considerations during hurricane season

See Appendix: Resource Links for local Extension offices and other State and Federal resources which you may consult for further information.

Weather monitoring

- During the June to November hurricane season, pay regular attention to long-term weather forecasts. Check your weather tracker daily if a hurricane is forecast to move closer to your area.

Equipment and supplies

- Check list of equipment and supplies for repairs that may be needed after the hurricane.
- Note supplies that take longer to deliver and order early to ensure they are available after a hurricane. Stockpile chemicals that are essential for your operation
- Refresh emergency medical supplies, water, and dry and canned food supplies.
- Obtain sufficient quantities of plywood to protect windows and doors and store in a dry area. As the hurricane gets closer, plywood may be scarce or unavailable.

Farm equipment

- Make sure that sprayers, tractors, and harvest equipment are in good working order to ensure that the crop can be harvested as efficiently as possible when conditions allow. Make repairs as necessary. Inspecting and maintaining harvest equipment at least one month before anticipated harvest can help reduce unanticipated problems.
- Contact your equipment manufacturers to establish procedures for dealing with damaged equipment. Make sure you won't invalidate your warranty if you attempt repairs yourself.

Fuel

- Consider fuel needs for tractors, generators and farm vehicles. Any fuel stored on site poses a contamination risk if storage tanks are not adequately protected from flooding, especially if stored at a low elevation. If secure storage facilities are available on site, arrange for fuel deliveries several days prior to the expected hurricane impact.

Generators

- Verify there is adequate fuel to power the generator for at least 2-weeks.
- Test generators weekly and inspect monthly, both outside and inside hurricane season. New generators generally require more frequent oil changes.

Crop

- Manage peanut fields to control weeds, insects, and diseases and to maintain general crop health. Healthy vines have the best chance of weathering inclement weather.

Short-Term Preparation

Bracing for the hurricane

(1-7 days before a hurricane is forecast to strike)

First and foremost, take whatever precautions necessary to protect your family, your employees, and yourself. After that is accomplished, focus on protecting your farm. Once forecasters have put your area in a hurricane's path, there are a number of precautions you should take to prepare.

Employees' roles and responsibilities

- Review your Farm Emergency Plan with all employees and discuss each person's responsibilities.
- Continue to monitor hurricane track and strength updates. Listen closely for evacuation orders in your area.
- Determine whether individual employees plan to evacuate or stay during the hurricane. For those who evacuate, establish a schedule for checking in after the hurricane so that they know the extent of the damages and when it is safe to return. For employees who stay, be sure they have safe lodging, sufficient food and water, and an established plan for checking in.
- Ensure that all managers know their responsibilities prior to, during, and after the hurricane. Handling the hurricane damage is too much work for 1 or 2 people.

- Ensure that personnel have training in first aid and key personnel know how to operate unfamiliar equipment (for example, a chainsaw to remove trees blocking roads).

Communications

- Ensure that all communication equipment is in good working order. Mobile devices are good for communication, but ensure radios are available and in working condition. Keep mobile devices fully charged. Have rechargeable battery packs or charging cables for your vehicle to maintain communication. Texting may be a more valuable form of communication than calling when mobile networks may be overwhelmed.

Food, water, and cash

- Make sure your operation still has at least a 2-week supply of drinking water as well as dry and canned food.
- Secure cash reserves for purchasing supplies after the hurricane. In widespread power outages, credit and debit cards will not work, and many vendors do not accept checks.

Records and documentation

- Ensure that important documents are in a safe dry place and that duplicates are in alternative locations off site.
- Document the condition of your facilities and your peanut crop—field by field. If flooding is likely to be an issue in certain fields, pull some plants to document their pre-hurricane status (maturity and general health). Take photographs and video (where helpful), record crop maturity, and estimate yield, as this will aid with insurance claims and disaster recovery assistance. If crops are damaged or lost, these records will help with the damage assessment and post-hurricane claims. Check with your Extension or crop advisor on the best way to calculate a yield estimate for your crop.
- If you have insurance through FEMA's National Flood Insurance Program, your policy may cover up to $1000 in loss avoidance measures such as sandbags and water pumps to protect insured property. Check with your insurance provider to confirm. Keep copies of all receipts and a record of the time spent performing the work and submit these documents to your insurance adjuster when you file a claim to be reimbursed.

Equipment

- Ensure that all emergency equipment is ready (e.g., compressors and heavy machinery).
- Make sure chain saws are in good working condition. Stock up on fuel mixture and bar and chain oil. Sharpen the chain, keep the saw file and saw wrench close at hand, and make sure you have a spare chain.
- Move equipment to protected areas that are away from trees or debris that could cause damage during high winds and to higher ground in case of flooding. Move all non-critical farm equipment to higher elevations or store in secure buildings.
- Move pesticides, herbicides, and fertilizers to a secure place, on high ground above any potential flooding if possible.
- Ensure that tanks containing fuel, fertilizer, and other liquids are kept full and tied down.

- Make sure that farm equipment you will need after the hurricane, such as tractors with front-end loaders or skid-steer loaders, is fully fueled and operational.
- Unplug computers and other electronic equipment to protect from electrical surges and store these items safely.

Infrastructure

Back-up generators

- Be sure your backup generators are fully operational, with full fuel tanks and portable fuel storage tanks. Your generators may have to run for several days until the power company can restore electricity. Review the owner's manual for the maximum run time and other unit specifics.

Fuel

- Maintain at least a 2-week supply of diesel and gas. Be sure the supplier understands how much you use daily and that it is necessary for farm operations.
- Service stations will not be able to supply fuel if they do not have electric power for the pumps, so make sure portable fuel storage tanks are full.

Electricity and gas shut-off

- Consult your Farm Emergency Plan and follow procedures for disconnecting electrical power and gas to some or all buildings and any non-critical equipment in danger of being flooded. Turn off electrical breakers and switches to pivots, buildings, and other areas until the power is restored.

Buildings and grounds

- Secure building components—Check on the security of roofing and siding materials and windows and doors, and make sure all other building components are tied down securely.
- Secure outdoor objects—Secure outside objects around your farm so that they don't blow away or become hazardous projectiles.

Roads

- If the roads leading to the farm are likely to flood, stage your boat in a secure, easy-to-access location.
- Perform a final inspection of your farm to ensure that roads and buildings are fully prepared for the hurricane. If the roads leading to the farm are likely to flood, stage your boat in a secure, easy-to-access location.

Drainage

- Check drainage ditches and culverts around your facilities and remove any debris.
- Pump down all water from ditches to the maximum extent possible.

Irrigation

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Supplies

- Review inventories and order any additional supplies that can be delivered before the hurricane. Supplies that take longer to deliver should be reviewed monthly to ensure they are available during a hurricane.

Crop

Harvesting

- If flooding is likely in certain fields, it is probably better to delay digging until after the hurricane has passed, since the peanut plants can float and be pushed by the wind across flooded fields. While freshly dug plants that are still green are less likely to be blown around by the wind, plants that have dried are more susceptible to be moved by wind and wind-blown rain.

Application of fungicides

- Consider application of fungicide to slow epidemics that could develop from pathogens and subsequent disease.

Pivots

- Park pivots in locations that are: (1) accessible to repair in case they topple, (2) away from low-lying areas that could flood, (3) away from areas where trees and other debris could impact systems.

Personal safety the day before the hurricane hits

- Perform a final verification of the hurricane track and strength. Listen closely for evacuation orders for your area.
- Obey all mandatory evacuation orders. Failure to do so, can put you and your workers at risk, and could tie-up rescue resources. Do not require your personnel to be present on the farm under a mandatory evacuation, since they also have to prepare themselves and their families
- Make sure your employees have evacuated to secure areas at least one 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 or 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 will likely need to rely on cell phone/text 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 keep an eye on water levels in low-lying areas so that they may give sufficient warning and allow workers to exit the operation before levees, surrounding roads, and highways are blocked with floodwaters.

Post-Hurricane Recovery

Immediate and latent damage will vary widely by the stage of the crop when the hurricane strikes. Hurricanes that strike during the vegetative and early reproductive stages of peanut growth are less likely to cause immediate damage because the plants are low-growing and minimally susceptible to wind

damage, the harvestable crop is below ground, and the crop has more time to recover before harvest. However, early-season hurricanes have the potential to cause latent or indirect damage due to interruptions in crop inputs such as fertilizers, fungicides, herbicides, or insecticides. Hurricanes that occur near the time of harvest can cause significant, immediate damage to the crop directly or through delayed or prevented harvest.

Immediately after the hurricane has passed

This section describes activities that can be taken to minimize losses immediately after, a week after, and a month after a hurricane.

Safety

- Make safety your first priority. Injuries and fatalities often occur during the immediate and short-term, post-hurricane recovery, so regardless of the recovery activities, err on the side of caution due to the unstable nature and potentially injurious situations presented by weakened trees, damaged structures and equipment, and damaged electrical systems. Never prioritize recovery activities before personal safety.
- Continue to watch the weather forecast. Are waters still forecast to rise more than they are now? Some floodwaters peak up to a week after the hurricane.

Electricity and gas

- Avoid downed power lines as these may still be live and represent an electrocution hazard. Operate on the assumption that all downed power lines are live. Remember that a downed power line on a fence may energize the fence.
- When restoring electricity to buildings that have flooded, use extreme caution and consult with an electrician and your power provider. See the Alabama Cooperative Extension System guidance on restoring electrical power after flooding.
- Once electrical power is restored, note that it can be unstable for several weeks and even months after the hurricane; therefore, protect sensitive equipment such as computerized pivot controls, etc. by [doing X].
- Natural gas or LP gas leaks can cause deadly explosions. Check for natural gas or LP gas leaks, and if a leak is suspected, turn off the gas, evacuate the area, notify your gas company and the authorities. Tell employees to stay clear.

Groundwater

- After a flood event, groundwater should be used with caution if contamination is suspected anywhere in the general vicinity.

Roads and buildings

- Before entering any buildings, check for levee breaches, rising or incoming water, and evidence of structural fire or damage.
- As soon as it is safe, call in the employees needed for inspection and clearing debris from roads. Cordon off areas that are unsafe.

Security

- Watch your farm for unwelcome visitors like looters. Secure your equipment and farm entrances, and make sure your security cameras are operational.

Recordkeeping, documentation, and insurance

- Do not begin cleaning up or repairing damage until you have thoroughly documented the damage. Contact your crop insurance adjuster as soon as possible to decide on the best plan moving forward with potential damage to your crop. (See "Within a week following hurricane impacts" below regarding post-hurricane documentation.)
- If you have experienced flooding and have flood insurance through the FEMA National Flood Insurance Program, visit their website for more information about starting a claim.

Within a week following hurricane impacts

Personal health and safety

- Take care of yourself during recovery. Disasters and the recovery period afterward take a toll on human health. Disaster recovery takes a long time and can be very stressful. For guidance to help you through this difficult time, see:
  - Colorado State University Extension Coping with Natural Disasters
  - North Carolina Cooperative Extension Tips for Handling Family Stress After Disasters

Communications

- The local supply/seed store are often natural sources of information if the power is down and electronic communication is limited. In addition, radio stations have generators that allow them to transmit if their towers are not damaged.

Recovery assistance

- Before beginning cleanup, talk with your insurance company and consult with disaster assistance program agents to learn about available programs, eligibility requirements, and application procedures. (See "Disaster assistance" below for more information about assistance programs.)

Documentation of damage

- Conduct a broad assessment of crop and infrastructure damage. Many disaster assistance programs will become available after the disaster, perhaps even years later, and an operation can only receive assistance for damage that was documented. For instance, the Emergency Conservation Program (ECP), administered FSA can compensate farmers for repairing damage due to a natural disaster which would create new conservation problems. The work must be documented and farmers must have gotten authorization from their local USDA office in advance.

Photos and video

- Take photos or video first before beginning any cleanup or repairs. Photograph and take video of damaged crops and property, with written notes describing what is in the pictures and where they were taken. This "after" documentation will be used with your pre-hurricane, "before" documentation to clearly show your losses.

Drone

- If you own and have a license to operate a UAV (i.e., drone), utilize it now to take aerial photographs of damage to fields and infrastructure. Local Extension offices might have access to drones and personnel with a drone pilot license to assist you.

Written records

- Keep a notebook with you throughout the recovery period. Describe the work you did and record all expenses. Keep a running log of names and what was discussed during conversations with insurance, State, and Federal agency contacts to create a valuable, third-party record of your recovery efforts that can be used later as documentation for disaster assistance programs. You may not remember everything that was discussed at these meetings, so have a second person involved in the conversations if possible so that one can ask questions and the other can take notes.

Disaster assistance

- Communicate early and often with recovery assistance contacts. Check in with them throughout the recovery process. Note that assistance will vary from one hurricane to the next and one budget year to the next.
- Call your local FSA Office to report any losses or damages and inquire about available assistance programs, application procedures, and deadlines.
- Check in with your local Cooperative Extension office, USDA agencies, and your State department of agriculture to see what assistance may be available following the hurricane.
- Consult the following resources:
    - FEMA Individual Disaster Assistance website to find the closest recovery center and other resources to assist you during your recovery
    - USDA Disaster Resource Center's Storm website for updates on emergency designation areas and available assistance programs
    - Farmers.gov, including the five-step Disaster Assistance Discovery Tool to learn which USDA disaster assistance programs are available to assist you with your recovery
    - U.S. Department of Labor's Disaster Unemployment Assistance Program website

- To learn more about USDA Disaster Assistance Programs that may be right for you, see:
    - Noninsured Crop Disaster Assistance Program (NAP)—FSA program that provides assistance for eligible farmers who suffer losses or are prevented from planting agricultural commodities that are not eligible for protection by Federal crop insurance
    - Emergency Farm Loans—FSA program that provides eligible farmers and ranchers low-interest loans to help them recover from production and physical losses
    - Disaster Set-Aside Program—FSA program that allows eligible FSA borrowers to skip an annual installment payment and move it to the end of the loan repayment period
    - Emergency Watershed Protection (EWP) Recovery Assistance—NRCS program that provides financial and technical assistance to quickly address serious and long-lasting damage to infrastructure and land
    - EWP Floodplain Easement Program (EWPP-FPE)—NRCS program option for converting land to permanent easements for the purpose of improving floodplain management and reducing the threat to life and property
    - Environmental Quality Incentives Program (EQIP)—Year-round NRCS rehabilitation program with funding authority to provide financial assistance to repair and prevent excessive soil erosion caused or impacted by natural disasters
    - Emergency Conservation Program (ECP)—FSA program with technical assistance through NRCS that helps eligible farmers and ranchers repair damage to farmlands caused by natural disasters

Insurance claims process

- Begin 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.

Infrastructure--assessment and repairs

- Assess damage to equipment and infrastructure and create a prioritized list of needed repairs. Ensure that buildings and storage sheds that will be used for crop maintenance and harvest operations are safe for occupancy and stable.
- Determine the impact of equipment damage on upcoming harvest operations. This will help in developing a plan for the coming weeks and months.
- Make plans to repair damaged equipment that will be needed most urgently such as sprayers, tractors and harvest equipment. Gather quotes from qualified vendors to make repairs to facilities and equipment. Vendors are often overwhelmed in the months following a hurricane, so making contact soon after the hurricane is important for an expedient response. If repair is unfeasible, leasing needed equipment may be an option.
- Monitor fuel levels in backup generators and order additional fuel as needed.
- Remove trees and other debris from field turn-rows that could impede tractor and implement traffic.

Flood water contamination

"Floodwater" refers to the overflow of external sources of water such as creeks, rivers or ditches and not to direct precipitation that may pool in or near your fields or facilities. When water from external sources stands in peanut fields, the crop is considered adulterated, cannot enter the commercial trade, and must be destroyed.

Food and water

- All water should be tested prior to use for drinking, cleaning food contact surfaces or produce, or for production activities. Ground water sources should be submitted for microbial and chemical testing, regardless of whether the wellhead was flooded, to ensure that the aquifer was not contaminated and to monitor wells for coliform contamination. This is particularly critical for drinking water and water that will come into contact with food. Some growers on municipal water systems, particularly those a substantial distance from the distribution center, may be advised to submit a microbial water test (after boil water advisories are no longer in effect) to verify the integrity of the distribution line to their farm or operation. If a surface water source was flooded, water should undergo microbial and chemical testing prior to reuse for production activities. If microbial levels exceed acceptable levels, a water treatment system (e.g., ultraviolet [UV] light, peroxyacetic acid) may need to be used until subsequent tests indicate the levels have stabilized.

Crops

Soil contamination

- If floodwater entered your fields, consult your local U.S. Food and Drug Administration (FDA) office and State, industry, and/or university Extension specialists for guidance on how to proceed. The U.S. FDA recommends determining the source of floodwaters (and the likelihood that they carried human pathogens), letting fields dry before reworking, and testing for pathogens. Other specialists suggest a 30- to 60-day wait period to reduce bacterial contamination of soil. Chemical contamination may require a longer waiting period depending on the chemical and the level of contamination.
- Collect soil samples throughout the flooded portion of your fields and test them for known contaminants and general chemical contamination. For more information about soil testing, visit the (Alabama Cooperative Extension System website; University of Florida IFAS Extension website; University of Georgia College of Agricultural & Environmental Sciences website; Louisiana State University AgCenter website; Mississippi State University Extension System website; North Carolina Cooperative Extension website; Clemson University Extension website; Virginia Cooperative Extension website.)
- See U.S. FDA Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.
- Take measures to avoid cross-contamination between flooded and non-flooded fields. Do not use equipment in a non-flooded field that was used in a flooded field unless it has been cleaned and sanitized.

Crops for human consumption

- According to Food and Drug Administration regulations, if floodwater has contacted the edible portion of the crop, it is prohibited from entering the human food supply. Keep it separate from uncontaminated portions of the crop and dispose of it. This applies to surface crops; underground crops; crops with a hard skin or shell; grain, nuts, corn, and similar crops; and others. See the U.S. FDA's:
    - Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption
    - Safety of Food and Animal Food Crops Affected by Hurricanes, Flooding, and Power Outages
- If floodwater was nearby but did not contact the edible portion of the crop, work with State regulators and U.S. FDA offices to determine whether the crop is considered adulterated.

Crops for animal consumption

- If your crop was intended for animal food, see FDA guidance at:
    - Crops Harvested from Flooded Fields Intended for Animal Food: Questions and Answers
    - Resources for Animal Food Producers in Flooded Areas

Food-handling equipment

- Thoroughly clean and sanitize all food contact equipment and food handling environments that may have become contaminated during the hurricane. First, physically remove dirt or debris with a brush or with water and a detergent. Then, sanitize with an antimicrobial chemical to reduce microorganisms on the surface of the equipment.

Crop

- Peanut plants that are submerged for 3 or more days will die prematurely and likely will provide limited peanut pods for harvest.

Fungicide application and harvesting

- Scout the peanut fields to determine priorities for fungicide or insecticide applications and/or harvest.
- Identify fields in most immediate need of fungicide application and make plans to apply by ground when the conditions allow. If it appears that the timeframe for ground-based application will extend too long, make arrangements for aerial application. Note that aerial applications of fungicides are less effective than applications by ground.
- For fields that had been dug and inverted, determine the likely time frame for harvest. Keep in mind that buying points may not yet have electrical power required to dry the crop and adjust the harvest time accordingly.
- Assess equipment damage and take this into account for upcoming harvest operations. This will help in developing a plan for the coming weeks and months.
- Any fields that were damaged but not flooded and are able to be harvested should be prioritized from the least to most damaged to minimize profit losses.

Diseases, pests, and weeds

- Diseases may develop if the crop has been flooded for 3 or 4 days.

- If your fields have been flooded with off-farm water sources, be aware of weed seeds that could have been carried in, presenting a new weed problem on your farm. Be aware of the management implications in subsequent seasons.

Potential salt damage

- Higher soil salt levels can accompany hurricane surges and cause severe damage and die-back to your crops. Peanuts are classified as moderately sensitive to salt water and yields will decrease with elevated salt levels. Avoid measuring electrical conductivity (EC) with a probe, as this will result in artificially high values.
- The most important salts to be aware of after a hurricane surge are sodium, chloride, and some extended nitrates. To manage sodium and chloride, do additional watering after the flooding to leach out some of the salts until the EC is reduced to an acceptable level. The water amount depends on the outside temperature and water needs of the plant.
- Contact your University Extension office if you suspect your crops have been damaged by salt water.

Within a month after hurricane impacts

Recovery assistance and insurance claims

- After many natural disasters that result in widespread damage, additional programs often become available to aid with agricultural losses. These programs are not guaranteed, however, and are generally handled on a case-by-case basis depending on the hurricane's impact. In addition, some programs require additional processing time for a special appropriation from the U.S. Congress and Presidential approval.
- While a special allocation may not be immediately available, it is important to document losses and to illustrate to your legislators the impact of the hurricane on your operation. This information will help promote policy decisions and additional allocations that may become available.
- Continue to follow up on the insurance claims process. Begin filing for any additional State or Federal disaster assistance programs for hurricane recovery.
- Visit the USDA Disaster Resource Center Storms website for updated information about FEMA aid and other disaster programs.
- Continue to document everything and keep a record of conversations with agency contacts. This creates a valuable, third-party record of your recovery efforts that may be used later as documentation for assistance programs.

Organic certification

- If your farm is organic, it is important to consider how the hurricane impacts may affect your certification. Temporary variances from some organic practices are possible, so contact your certifier to determine whether your practices qualify. It is most important to report prohibited substances that may have infiltrated your farm during the hurricane.

Infrastructure and equipment

- Continue to gather quotes from qualified vendors to make repairs to facilities and equipment. Vendors are often overwhelmed in the months following a hurricane, so making contact soon after the hurricane is important for an expedient response.
- Monitor buildings for water damage or mold development and monitor wells for coliform bacteria.
- Continue to refill fuel tanks and check backup generators until full power is restored.
- Remove debris (both construction and natural) from yards, fields, and other areas where it may impede work progress or create hazards for workers.
- Perform general and preventative maintenance on any equipment that was flooded. Keep all receipts for parts and labor, as well as a list of any equipment that is determined to be a total loss.
- Examine drainage ditches and canals to determine to what extent they were silted in by floodwaters. Dredge and/or repair them if necessary.

Crops

Caution about adding wood debris to agricultural land

Following recent hurricanes, farmers have been approached by contractors wishing to spread chipped and shredded tree debris on their land, often for hundreds of dollars per acre. While these additional dollars may be very helpful at this time, you will need to consider how this influx of carbon will likely require additional nitrogen inputs to maintain crop productivity in the future. If you are approached about considering this type of contract, ask lots of questions, know exactly what is going to be applied and at what rate, and factor in additional nitrogen fertilizer costs. If you want help determining the impact of a land application for your specific operation, contact your local county Extension agent. Like many other farming decisions, this all comes down to how much income it will produce versus the additional management it will require. For more information view Considerations Before Contracting for Chipped or Shredded Wood Debris Application on Agricultural Land.

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DISCLAIMER

This document was drawn from information provided by USDA and various university Extension staff and based on shared experiences preparing for and recovering from hurricane impacts. However, individual producer situations will vary, and STATE OR LOCAL GUIDANCE OR REGULATIONS, AND INSURANCE POLICIES SUPERCEDE THE RECOMMENDATIONS IN THIS GUIDE. This guidance should not be interpreted as required actions by regulatory or insurance agencies. Check with your local Extension agent; county, State, or Federal contact; consultant; or insurance agent regarding the appropriateness of these recommendations to your specific situation.