



FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE



Hurricane Preparation and Recovery in North Carolina

Pine Forest Landowners Guides



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This is 1 of 23 guides to help Southeastern U.S. producers of economically important agricultural commodities build resilience to, prepare for, and recover from hurricane impacts. All guides can be found on the USDA Southeast Climate Hub [Hurricane Preparation and Recovery Commodity Guides website](#).

DISCLAIMER: Information in this document was 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. This guidance should not be interpreted as required actions by regulatory or insurance agencies. STATE OR LOCAL GUIDANCE/REGULATIONS AND INSURANCE POLICIES SUPERCEDE THE RECOMMENDATIONS IN THIS GUIDE. 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.

PESTICIDE STATEMENT: Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Note: Some States have restrictions on the use of certain pesticides. Check your State and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Environmental Protection Agency, consult your county agricultural agent or State Extension specialist to be sure the intended use is still registered.

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 **Southeast Climate Hub**
U.S. DEPARTMENT OF AGRICULTURE



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Hurricane Preparation and Recovery in North Carolina

Pine Forest Landowners Guide

This guide will focus on:

- Pre-hurricane planning for long-term preparedness when managing pine forests
- Short-term pre-hurricane forest planning
- Post-hurricane evaluation and recovery

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Introduction

Preparing for and recovering from hurricane events



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:

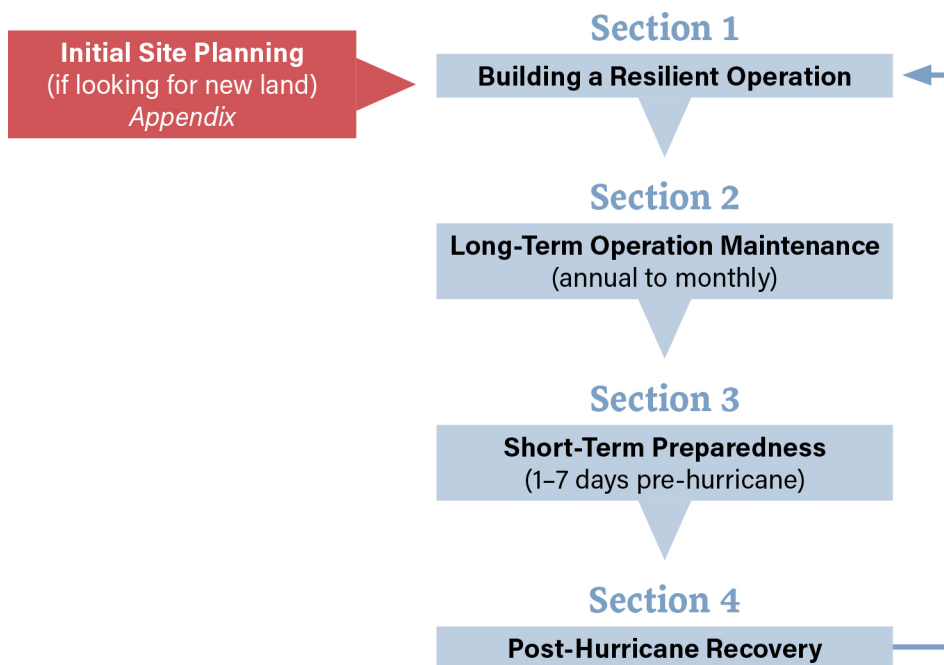
- The **Building a Resilient Operation** section outlines a range of considerations and systems that producers can put in place to increase their resilience to hurricanes.
- The **Long-Term Operation Maintenance** section lists specific pre-hurricane actions and periodic checks to be done on an annual basis (before hurricane season) and monthly basis (during hurricane season).

Introduction

- The **Short-Term Preparedness** section lists specific actions to be done in the week before a hurricane arrives.
- The **Post-Hurricane Recovery** section outlines actions that producers can take to minimize their losses following a hurricane. It begins with actions immediately following a hurricane that are focused on safety, continues with ongoing actions a week out and a month out, and concludes with climate change considerations for building resilience in the future.

The appendix includes an **Emergency Contacts List** template that can be customized with applicable Federal, State and local agency contacts, emergency responders, and contractors; an **Initial Site Planning** guide that can be referenced when considering a new location to establish or purchase forest land; and **Resource Links** to helpful Federal, State, and Extension websites that are also referenced throughout the guide.

The flowchart below shows the layout of this guide and how it is intended to be used. Note that after recovering from a hurricane, producers should start back at the **Building a Resilient Operation** section, and incorporate guidance and any lessons learned into their operational and emergency management plans.



Layout and use of the hurricane preparation and recovery guide.

SECTION 1

Building a Resilient Operation

Systems that are recommended to be put in place well before the arrival of any hurricane to increase productivity and reduce your risk of damage and reduce recovery time

Forest landowners in the Southeastern United States can implement a range of measures to increase their resilience to hurricanes and tropical storms. See the Southern Regional Extension Forestry (SREF) [Protecting Your Forest Asset: Managing Risks in Changing Times](#) to learn more about minimizing threats to your forest land, and visit the USDA Forest Service [Landowner Resources website](#) for links to additional resources. Contact your county forester, local Extension office, and State forestry commission for resources and guidance applicable to your forest land.

Personal safety

For safety tips and resources that facilitate informed decision making before, during, and after a hurricane strikes, see the Ready.gov [Hurricanes website](#) and U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA) [Hurricane Safety Tips and Resources website](#).

Existing forests

Forest inventory

- Create a complete inventory of your forest, including information on tree species, number of trees, and tree diameters and heights. A relatively current forest inventory (completed within the last 5 years) can provide an estimate of the dollar value of your forest, necessary when estimating the value of the standing timber and losses for tax purposes; can help you determine whether a forest needs to be harvested or needs to have other management activities completed outside of hurricane season, to improve forest health and resilience; and can provide documentation of forest condition prior to damage caused by high winds or hurricanes.
- More information on timber inventories can be found in the University of Florida Institute of Food and Agricultural Sciences (IFAS) Extension [Timber Inventory: a primer for landowners](#).

Financial basis

- Establish your financial basis. The U.S. Department of Treasury Internal Revenue Service (IRS) will not recognize casualty loss until basis has been established. For more information, see:
 - North Carolina Cooperative Extension Eastern Forestry Note [Understanding Your Timber Basis](#)
 - Mississippi State University Extension Service [Forestry Income Tax Series: Basics of Basis](#)

New forests

Assessing soil types, selecting tree species, and planting

- Determine what soil types exist on your land, as this determines which tree species are best suited to your forest site and can give some insight into how trees might respond during a hurricane. Trees are more likely to blow over or “tip-up” in high winds in areas with shallow soils than areas with deeper soils. You can determine forest soil types on your property by using the USDA Natural Resources Conservation Service (NRCS) [Web Soil Survey](#).
- Select the best tree species to manage on your site. Trees native to hurricane-prone areas tend to be more resilient to high winds and flooding associated with hurricanes. For example, during Hurricane Katrina, longleaf pine (*Pinus palustris*) had less mortality (7 percent) than slash pine (*Pinus elliottii* var. *elliottii*) (14 percent) or loblolly pine (*Pinus taeda*) (26 percent)*. Select the tree species best suited to your forest soils, location, and management objectives. The following table provides information on hurricane-resilient pine species for the Southeast.

*Johnsen, K.H.; Butnor, J.R.; Kush, J.S.; [et al.]. 2009. Hurricane Katrina winds damaged longleaf pine less than loblolly pine. Southern Journal of Applied Forestry. 33(4): 178-181.

Characteristics of southern pine trees naturally occurring in hurricane-prone areas

Pine species name	Species characteristics
Loblolly pine (<i>Pinus taeda</i>)	Grows well on sites with high fertility and moisture, including loamy soils that occur in drainages and lands suitable for agriculture. Does not do well on eroded or low-fertility sites. Small or young trees are not fire tolerant. Less resistant to breakage and uprooting than longleaf and slash pines.
Longleaf pine (<i>Pinus palustris</i>)	Grows across a broad range of sites from wet to dry and is more competitive than slash and loblolly pines on drier upland soils. Small or young trees are fire tolerant, and the use of prescribed fire is necessary for successful management. Among the most resilient to strong wind damage.
Sand pine (<i>Pinus clausa</i>)	Grows best on drought-prone sandy soils that rarely, if ever, are saturated with water. Poor wind resistance. (Alabama and Florida only)

Shortleaf pine (<i>Pinus echinata</i>)	More competitive than loblolly or slash pine on upland sites. The use of prescribed fire is necessary for successful management. Low susceptibility to wind damage over most of its range, but uprooting can occur when root systems are shallow.
Slash pine (<i>Pinus elliottii</i> var. <i>elliottii</i>)	Grows on moist, sandy flatwoods (spodosols) and savanna sites. Native to coastal areas. Young trees are not fire tolerant. More wind resistant than loblolly pine, but less than longleaf pine.

Determining tree density

High-speed winds generated by a hurricane are one of the primary causes of damage to trees through breakage and uprooting. Increasing stand density allows trees to lean on each other, and partially buffer themselves against the wind. However, increased forest density can increase the risk for wildfires and southern pine beetle (*Dendroctonus frontalis*) outbreaks. Also, as density increases, individual stem volume growth rates decrease. Better hurricane resiliency must be weighed against these other factors. Determining tree density will establish how many seedlings are needed.

Ordering seedlings

Place your order for tree seedlings early to get the best selection. Tree planting often occurs between December and March, so place your order for seedlings the summer before. Try to buy from a nursery in your region or a local seed source. For example, if your property is in southern Alabama, then seedlings sourced from southern Alabama, Mississippi, Georgia, or northern Florida could all be good choices.

Preparing the site

- Site preparation is key to the successful establishment and early survival of tree seedlings, allowing for the best root growth to give trees a strong anchor in high winds. Herbicide treatments may be needed in areas with heavy grass or woody vegetative cover. Subsoiling techniques such as “scalping” (which provides a furrow in which to plant the seedling) and “ripping” (which also provides a furrow but goes deeper into the ground to fracture hardpans that can limit deep root growth) may also be needed. Ripping is a good technique to use in clay soils or areas that have been in agriculture or grazing rotations in the past.
- For guidance onsite preparation and forest management, see:
 - North Carolina Forestry [Best Management Practices Manual to Protect Water Quality](#)

Securing a contractor

Work with a reputable tree planting contractor. Secure a contractor during the summer months for planting that will take place from December to March. Be sure you have a contract; it is important for forest landowners to have a legally enforceable, written contract for every land management activity completed on their property. A reforestation contract should outline the following:

- Who will do the work and when the work will be done
- Who will pay for the work and how much will be paid
- Planting specifications, including planting depth, density (trees per acre), container versus bare-root seedlings, and if seedlings will be planted by machine or by hand
- Property location and acres to be planted
- What actions will be taken if the work is not completed to specifications or on time
- For more information about securing a contractor, see:
 - Alabama Cooperative Extension System [Tree Planting Contracts for Landowners: FAQs](#)
 - North Carolina Cooperative Extension [Steps to Successful Pine Planting—Writing Tree-Planting Contracts](#)

Planting considerations

- Be onsite during the planting process to check planting quality, density, etc. Seedlings that are planted at the correct depth, and not j-rooted or drastically root pruned, have better chances of survival and forming healthy root structures in the long term. Contact your planting contractor immediately if you have any concerns.
- For more information about planting considerations, see:
 - North Carolina Cooperative Extension [Steps to Successful Pine Planting — Keys to Successful Tree Planting](#)
 - Mississippi State University Extension Service [Planting Southern Pines: A Guide to Species Selection and Planting Techniques](#)

Drainage

Plantation drainage depends on the soil type, which can vary widely from sandy, well-drained soils to poorly drained organic pocosins. Waterlogged soils restrict root growth, reduce productivity, and prevent trees from anchoring well in hurricanes, so install drainage systems if needed.

Addressing fertility and wildfire hazard

- Prescribed fire is one of the best tools for reducing plant competition and pests, releasing nutrients back to the soil, and controlling wildfire fuel accumulation.
- Hurricane-caused branch loss can increase fuel loading, so frequent prescribed burns are needed in hurricane-prone areas.
- Supplemental nitrogen (and phosphorus) fertilizer will improve forest growth but can also increase tree susceptibility to wind damage.
- Maintaining proper forest density will reduce the risk of southern pine beetle outbreaks.

Professional relationships

Build relationships with timber buyers and loggers in your area. If your lands are damaged during a hurricane, others in the area will most likely be as well, meaning that there will be many people making calls to have their timber salvaged following the hurricane. It is during these times of crisis that personal relationships help to get your calls answered and logging crews deployed to salvage your timber quickly. If timber harvest is delayed due to an oversupply of wood in a locally glutted market, downed trees begin to lose value due to rot or blue stain.

Recordkeeping, documentation, and insurance

The importance of pre- and post-hurricane documentation cannot be overstated. Assistance for disaster recovery may not be available until months or years after a hurricane. Therefore, it is important for purposes of insurance compensation and recovery assistance to do thorough recordkeeping of the damages and losses sustained on your forest land as well as your cleanup and recovery efforts.

Insurance coverage

- 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 vehicles, equipment, and forests. 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.
- In general, there are two types of timber insurance:
 - Standing timber insurance that can help offset losses in mature timber stands that are merchantable and due to be harvested
 - Reforestation insurance that can be used to help a landowner replant non-merchantable stands lost to wind and fire events

- Both types of insurance can be costly, so landowners are urged to work with legal and insurance professionals to determine what is best for their situation.
- For more information about managing risk, see the Mississippi State University Extension Service [Risk Management Options for Family Forests: Timber Insurance](#).

Inventories and documentation

A recent forest inventory is useful for determining pre-hurricane fair market value of your forest land, assessing loss after the hurricane, and filing for casualty loss with the IRS. Keep copies of this inventory in multiple places such as on your computer, offsite in a safe location, and on a cloud-based server.

Infrastructure

Roads

- Slower moving hurricanes can produce large amounts of rainfall in a very short period which can cause erosion, undermine roads, and wash away culverts. Consider upgrading current roads or constructing higher quality roads that are crowned and graveled for better access to your forest during wet weather.
- Check roads for any signs of erosion and fill in any holes or ruts with gravel or compacted fill. Check culverts and bridges to make sure they are sound and are sized to provide adequate drainage. Remove trees and vegetation that are within 6 to 10 feet of the road edge, as this allows for roads to dry more quickly after rains and helps to reduce the number of trees that might fall across forest roads during high winds. Work with an experienced road construction contractor to make sure that stream crossings meet your State's best management practices and culverts are properly sized to prevent blowouts during periods of high-water flow.
- For more information on constructing and maintaining forest roads, see:
 - USDA Forest Service [Forest Road Construction and Maintenance Handbook](#) and [Environmentally Sensitive Road Maintenance Practices for Dirt and Gravel Roads](#)
 - Alabama Cooperative Extension System [Forest Roads and Construction of Associated Water Diversion Devices](#)

Drainage

Make sure culverts are properly designed regarding size and location.

Emergency planning

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 Ready.gov [Emergency Alerts website](#).

Post-hurricane communication

- 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.
- 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).
- For more hurricane-related communication recommendations, see the U.S. Federal Communications Commission [FCC and FEMA: How to Communicate Before, During, and After a Major Disaster website](#).

Equipment operation

Check that equipment needed to access the sites (e.g., chainsaws, chains, heavy equipment) is in good working order.

Drones

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

- U.S. Department of Transportation (DOT) 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](#)

SECTION 2

Long-Term Operation Maintenance

Periodic checks of systems already in place
(described in the previous section)

Prior to hurricane season

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

Annual review of emergency planning tasks

Personal health and safety tasks

- Make sure you and your family have up-to-date tetanus shots.
- For information and links to time-specific guidance for preparing yourself and your home, see the 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

- At the time of renewal, review your insurance policies with your agent to be sure that you have adequate coverage.
- 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 as described in the Building a Resilient Operation section above.
- Loss due to a casualty event (defined as causing sudden mortality of timber) can be tax-deductible if it is an investment or part of a business. You would need to know the adjusted basis of the timber and fair market value of the timber before and after the casualty event. The portion that is tax deductible is the lesser of the two values.

Infrastructure

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 DOT 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.

Forest inventory, management, and monitoring

- Conduct regular forest inventories after establishing a stand and then every 4 to 5 years and prior to timber harvests. These inventories will help you optimize harvest schedules and prevent timber stands from becoming overcrowded. Tree growth often slows in stands that are overstocked, and the crowding can make trees more susceptible to disease and damage caused by high winds during hurricanes (consult a Registered Forester or your local forestry commission office for details specific to your situation [e.g., species, stems per area]). For more information on timber inventories, see the University of Florida IFAS Extension [Timber Inventory: a primer for landowners](#).
- Perform thinning operations outside of hurricane season, as this will give trees time to recover and become more wind-firm.
- Monitor your forest for insects, disease, invasive species, and other forest health issues (e.g., dead and declining trees). Monitoring allows you to detect issues that aren't visible at certain times of the year, thus providing a better opportunity to identify and treat issues. For more information and guidance on forest insects, diseases, and invasive plants, see the SREF [Forest Health website](#).

SECTION 3

Short-Term Preparedness

Bracing for the hurricane: specific actions to be done in the week before a hurricane arrives

1–7 days before a hurricane is forecast to strike

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

Communications

- Continue to monitor hurricane track and strength updates. Listen closely for evacuation orders in your area.
- Ensure that all communication equipment is in good working order. 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 the phone networks may be overwhelmed.

Supplies

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.

Recordkeeping and documentation

- Take pictures of your forest stands. These will serve as a record of stand conditions prior to the hurricane. See the Journal of Extension [Using Modern Digital Photography Tools to Guide Management Decisions on Forested Land](#) to learn more about photo-documenting the condition of your forest land.
- If you are involved with a cost-share program, contact the supporting State or Federal office to obtain information on what will be needed and required pre- and post-hurricane. Place all documents including forest inventory numbers in a safe location.

Equipment

Move any equipment to a secure location, and have sufficient fuel stored to clear roads to assess damage.

Infrastructure

Roads

To prevent damage to forest roads and your personal property, close and lock gates prior to the hurricane's arrival. This will prevent unauthorized individuals from traveling wet roads and causing rutting or other damage and prevent unauthorized travel to areas that might be hazardous due to downed trees and limbs, flooding, or muddy or washed out road conditions.

Drainage

Check to make sure that all drains and channels are clear.

Forest management

Delay thinning operations until after the hurricane. Depending on the degree of stand closure, immediately following a thinning the remaining crop trees are usually more susceptible to uprooting until stems can adapt to the open conditions. In addition, stronger wind currents in more open stands are likely to cause more stem breakage.

SECTION 4

Post-Hurricane Recovery

Activities that can be taken to minimize losses
within a week after and a month after a hurricane

Immediately after hurricane impacts

The impacts from a hurricane can vary considerably across and within forests and may include damage to infrastructure (e.g., roads, dykes, levees, facilities) or damage to trees (e.g., bent/broken stems, broken tops, or uprooting). Additionally, hurricane related storm surge can push salt water into forest lands and cause loss of tree vigor and productivity. In turn, tree stress can increase forest susceptibility to insect and disease outbreaks that further reduce post-hurricane productivity.

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:

- U.S. Department of Health and Human Services [Disaster Mental Health Resources website](#)
- North Carolina Cooperative Extension [Tips for Handling Family Stress After Disasters](#)

Communications

The local supply/seed stores 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.

Within a week following hurricane impacts

Recovery assistance

Do not begin cleaning up or repairing damage until you have thoroughly documented the damage. Contact your insurance adjuster as soon as possible to decide on the best plan moving forward with potential damage to your forest.

Documentation of 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.

SECTION 4: Post-Hurricane Recovery



When assessing hurricane damage, be aware that roads may be washed out and trees may be down, blocking access to your forest. Courtesy photos by Becky Barlow, Alabama Cooperative Extension System, Auburn University.

Initial assessment

- When it is safe to do so, walk or ride property boundaries and roads to assess the damage to timber, roads, fences, gates, and stream crossings. This should be one of your initial steps when assessing hurricane damage because access will be needed for timber assessment and salvage operations.
- Use care when driving on forest sites impacted by hurricanes, as roads may be washed out and trees may be down. Do not travel forest roads if you are unsure of their condition. Check culverts and stream crossings prior to driving across them.
- Obtain assistance from a professional forester and accountant. The professional forester can assist in determining your options for the property going forward, the fair market value pre- and post-hurricane, and salvage considerations. An accountant can assist with determining what your loss limitation is for the event and assist with filing tax returns.
- For more information about post-hurricane timber assessments, see:
 - USDA Forest Service [How to Evaluate and Manage Storm-Damaged Forest Areas](#)
 - North Carolina Cooperative Extension [Decision Making Guidelines for Storm-Damaged Trees](#)

Photos and video

- Take photos or video first before beginning any cleanup or repairs. Photograph and take video of damaged facilities 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.

- Obtain aerial imagery of hurricane-damaged areas. State agencies such as State forestry commissions usually conduct a survey flight to ascertain general areas of impact. Satellite imagery may also be available to see impacts with more precision.
- Sketch distinct areas of blowdown on forest stand maps where feasible. If possible, establish sample sites representative of the range of damage categories in order to define reasonably distinct zones of damage.

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 your forest land. Some 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 [USDA Farm Service Agency \(FSA\) Office](#) to report any losses or damages and inquire about available assistance programs, application procedures, and deadlines.
- Check in with your local 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 [Disaster Recovery Center Locator](#) and [Individual Assistance website](#) to find the closest recovery center and other resources to assist you during your recovery
 - USDA [Disaster Resource Center website](#) for updates on emergency designation areas and available assistance programs
 - [Farmers.gov Recover website](#), 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 [Disaster Unemployment Assistance Program website](#)

- To learn more about USDA Disaster Assistance Programs that may be right for you, see:
 - [Emergency Forest Restoration Program \(EFRP\)](#)—FSA program that provides funding for qualifying nonindustrial private forest landowners to restore land damaged by a natural disaster
 - [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 the land
 - [EWP—Floodplain Easement Program \(EWPP-FPE\)](#)—NRCS program option for converting land to permanent easements for the purpose of improving flood plain 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

Insurance claims process

Begin the claims process as soon as possible. Accurate losses of inventory and equipment may not be fully documented yet, but start the paperwork now since insurance claims can take months to resolve following hurricane events.

Within a month after hurricane impacts

Recovery assistance and insurance claims

- After many natural disasters that result in widespread damage, additional programs may become available to aid with timber 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.
- Keep good records related to the timber casualty event.
 - Document what the event was that caused timber loss, and when it occurred.
 - Keep documentation (e.g., photos and certified cruise volumes) demonstrating that the loss was directly related to the event.
- 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 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.

Federal income tax casualty loss deductions

- Forest landowners may be able to reclaim a portion of their lost timber investment through a casualty loss deduction when filing their Federal income tax. Timber destroyed by an abrupt, unusual, and unexpected event such as a hurricane is eligible for a casualty loss deduction.
- The timber loss must be a direct and immediate result of the hurricane rather than of a slow decline in value. Trees that decline in value or die due to insects are not included.
- The monetary value of the loss must be assessed and take into account any insurance proceeds or salvage value received.
- Financial returns from salvage harvests will likely provide lower returns than normal harvest. This is due to the decrease in timber value from individual tree damage, the impacts of hurricanes on local timber markets, and increased costs associated with harvest. Selling timber following a major hurricane will bring lower prices because of the large quantities of timber entering the market. The costs associated with logging will also likely increase due to poor site conditions following a hurricane.
- The IRS requires that a reasonable effort be made to sell damaged timber that is still considered merchantable; then, what is not merchantable or salvageable likely will meet the definition of a casualty loss. The first step is figuring out the amount of the loss. As of 2020, tax law allows you to take a deduction in the amount of the lower of a (1) reduction in fair market value or (2) your adjusted basis for the property (the original basis plus or minus any investments or reductions such as timber sales). Consult a tax attorney to discuss your specific situation.
- For more information, see:
 - USDA Forest Service [Income Tax Deduction on Timber and Landscape Tree Loss from Casualty](#)
 - Mississippi State University Extension Service [FAQ about Timber Casualty Losses](#)
 - National Timber Tax Website [Casualty Losses](#)

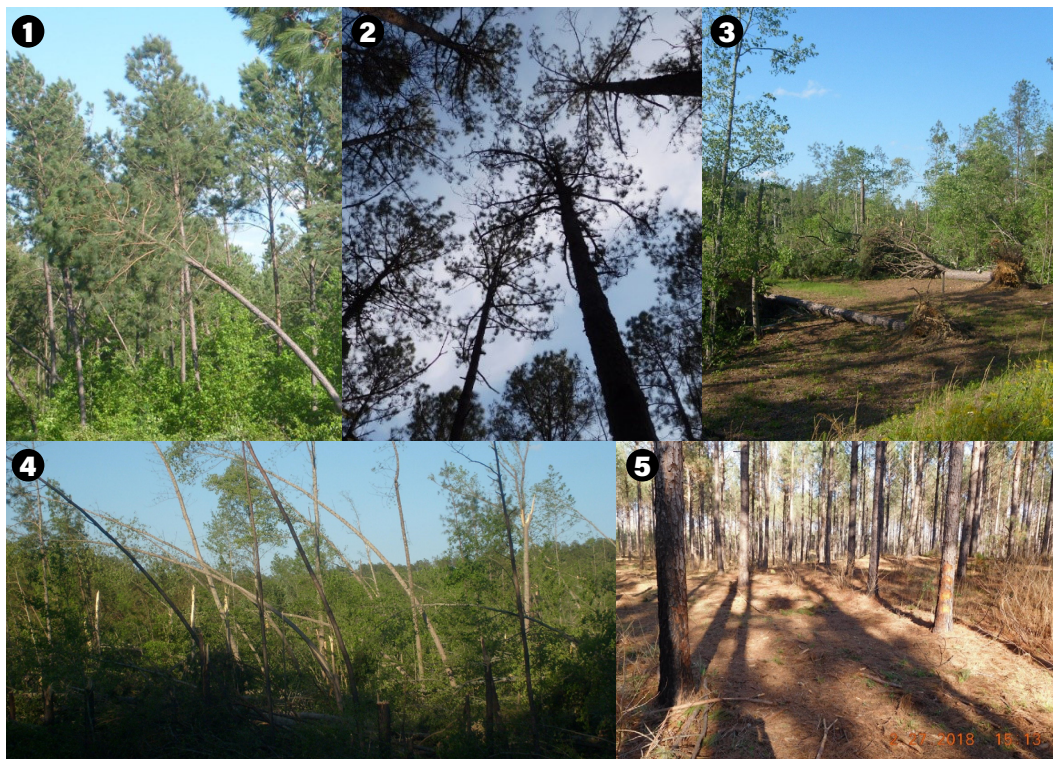
Drainage

Examine drainage ditches and canals to determine to what extent they were silted in by floodwaters. Dredge and/or repair them if necessary.

Forest land

Assessing damage

- Work with State or private consulting foresters to conduct forest inventory assessments. These will be used to determine salvage value of forest stands and followup management needs such as salvage thinning, full clearcut and replant, pre-commercial thinning, etc., and should be based on the long-term goals and objectives, and economic feasibility.
- Following your initial assessment of infrastructure and areas of timber damage, perform a thorough examination of the timber by sampling plots within the stands to estimate the amount and severity of damage. Below are recommended actions and example photos of several categories of tree damage, ranging from minor to severe.



(1) Minor bending/leaning; (2) Broken tops with most of the crown in place; (3) Uprooted trees; (4) Severely bent or snapped main stems and broken tops; (5) Major wounds. Courtesy photos by Becky Barlow, Alabama Cooperative Extension System, Auburn University

Recommended actions for different types of damage to pine forests

Damage	Prognosis	Recommended action
Minor bending/leaning	Trees in this category can naturally recover and are not a priority for immediate salvage (photo 1).	None
Minor wounds	Trees with minor wounds will often naturally recover.	None
Broken tops with most of the crown still in place	If these trees are reasonably straight and free from severe crown loss, they will likely survive and can be retained in the stand (photo 2).	Closely monitor these trees for signs of insects that target stressed and damaged trees.
Uprooted trees	Uprooted trees are less likely than trees that have bent or snapped to have severe damage to wood and generally have a longer window (several months) of time for harvest (photo 3). However, they are susceptible to insects and fungi that can degrade wood quality much sooner.	Timber markets are often flooded with lumber after a hurricane. Check the salvage value against the harvesting cost. If a profit can be made by selling downed trees, remove them. Otherwise, monitor the stand for insect and disease outbreaks originating from the uprooted trees.
Severely bent or snapped main stems and/or severe broken tops	These trees typically have internal wood damage and are often only harvestable as pulpwood, mulch, or firewood (photo 4).	Harvest these trees as soon as economically possible.
Major wounds	Trees with major wounds (>1 square foot) are prime targets for insects, which can potentially be catastrophic for the remaining trees (photo 5).	Remove trees with major wounds.
Saltwater intrusion	Trees impacted by salt water will have decreased vigor, sparse crowns, and increased mortality. Post-harvest seedling establishment may also be impaired.	See Saltwater Intrusion and Salinization on Coastal Forests and Farms website

Prioritizing harvests

- Estimate the percentage of trees that are in each of the above classifications and prioritize harvests. Salvage harvests should be prioritized based on the type and severity of damage, with trees of higher value that need to be removed being considered first. Depending on the severity of the damage, the entire stand or tract may not need to be harvested.
- Plan your management activities based on established damage categories.
 - **Lightly damaged stands** may not need salvage and can be left alone if merchantable stands do not have enough timber for a commercial harvest or pre-merchantable stands are likely to recover over time.

- For **moderately damaged stands**, you may need to decide between a partial or complete harvest based on damage level and distribution. It can be difficult to accurately assess how well a stand may recover or estimate how much timber can be left for future growth and income. These can be complex decisions, so you may want to enlist the services of a professional forester.
- Severe or catastrophic damage** will require a salvage operation to recoup any value that can be recovered from the stand. This would likely mean a complete harvest.
- Harvesting should be prioritized based on the value of and damage to the trees. Markets are often flooded with salvaged timber and pulp following a hurricane, so prices will likely be highly suppressed. The increased cost of harvest and reduced product value should be determined before harvesting begins to avoid negative returns.
- **Veneer and sawtimber**—Harvest first. After 4 to 6 weeks, a blue stain fungus will degrade the quality of these high-value trees, and they will have to be sold for pulpwood.
- **Pulpwood**—Remove within 8 to 12 months.

Replanting

- When it is necessary to replant, contact your local Extension agent and choose species that are most resilient to future hurricane damage. Longleaf pine, with its deeper rooting characteristics, less taper, and higher specific gravity, is less susceptible to hurricane damage than other pines.
- Do proper site preparation in hurricane-damaged areas. Wildfires and invasive species are of concern due to increased fuel loads and site disturbance. Often a combination of prescribed burning and herbicide treatments may be needed to properly prepare the site for replanting.

Hardwood forests

While this guide focuses on pine forests, the following considerations can be applied to hardwood stands:

- Hardwood trees will likely survive as long as some crown is present following a hurricane.
- Forest management practices that maintain a healthy forest (e.g., removing diseased, insect-infested, broken, or poorly formed trees; thinning to maintain full stocking) will also provide the best protection against hurricane impacts.
- Harvest uprooted trees and trees with major damage to the trunk or crown. Subsequent decay in the latter can weaken trees and become a hazard in future hurricanes.

Looking to the future

With increasing climate variability and potential shifts in tree species ranges, landowners should carefully consider the best species for their land in the future. The information outlined in this guide can help landowners determine what tree species may be most resilient to hurricane-related impacts of wind and flooding. Soil type, topography, drainage, species timber value, and other factors contribute to the proper choice of species beyond just resiliency to disturbance. For example, landowners who live in hurricane-prone areas may opt to shift their forests from loblolly pine plantations to more wind-resistant longleaf pine. Even though longleaf pine may grow slower than loblolly pine, it has shown much higher resistance to bark beetles. Similarly, landowners in the northern portions of the Southeastern United States may decide to transition their forests to species such as shortleaf pine because of its fire, drought, and ice-storm resilience.

Climate models point to a future in which warmer temperatures and atmospheric moisture may lead to powerful hurricanes that are more frequent and/or more damaging. If hurricane-force winds move farther inland, forest management may shift to a shorter rotation period to minimize catastrophic timber loss. Warmer temperatures are also extending the traditional range of many species, including longleaf pine, creating new opportunities for adaptive management farther north.

APPENDIX

Emergency Contacts List

You may customize this for your operation. Delete items that do not pertain to your commodity or location and add companies or organizations specific to your commodity.

Emergency Services

Organization	Name(s)	Phone number(s)	Notes
Emergency medical responders			
Hospitals			
Fire department			
Law enforcement			
Emergency management agency			

Insurance and Contractors

Organization	Name(s)	Phone number(s)	Notes
Insurance agent			
Timber buyer			
Logger			
Road repair/dozer operator			

Federal, State, and County Organizations

Organization	Name(s)	Phone number(s)	Notes
State Department of Agriculture			
Local Extension office			
County emergency management agency			
County Health Department			
USDA Farm Service Agency			
USDA Natural Resources Conservation Service (NRCS)			
U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA)			

Initial Site Planning

Considerations when deciding on a new location
to establish or purchase forest land

Hurricane risk

No model or long-term forecast can determine when and where hurricanes will strike during any given hurricane season; however, return period maps have been developed to give a good indication of relative hurricane risk. Return period maps display the number of years between hurricane events and help quantify the vulnerability of coastal areas to hurricanes. To learn more about your area's hurricane return period, see the NOAA [What are the chances a hurricane will hit my home? website](#).

It is important to remember that return period maps represent a long-term average and that even if the average return period for a hurricane is 25 years, hurricanes can still occur at one spot on successive years or even in the same year. It is also important to understand that while most data show only where hurricanes have made landfall, hurricanes can also move hundreds of miles inland causing significant wind damage and flooding.

Use NOAA's [Historical Hurricane Tracks tool](#) for a map and dates of hurricanes that have impacted your area in the past 150 years. The timing and track of historic hurricanes may be different than those for future hurricanes and should be used with caution.

Site characteristics

Topography and drainage

- When planning for long-term preparedness, evaluate a potential site for your forest land with an eye to reducing the risk of surface flooding or coastal storm surge. It is unlikely that all risks can be avoided. However, the negative considerations of an elevated open site are often less than those of low-lying areas susceptible to flooding.
- Land should be gently sloping with adequate drainage. Avoid steeper slopes if possible.
- Channeled and ditched pocosins can be extremely productive, but the benefits need to be weighed against the increased hurricane impact risk in coastal areas.
- Drained plantations need to have well-installed and maintained ditch and channel systems.

Flood risk and storm surge

- Assess historic and predictable patterns of flooding to determine which areas are at the highest risk of damage during extreme weather.
- Consult the following Federal and State resources for estimating flood risk:
 - FEMA [Flood Map Service Center website](#) (for official flood maps)
 - North Carolina [Flood Risk Information System website](#)
- Determine proximity to bodies of water at risk for storm surge. In some areas, storm surge can cause flooding many miles inland from the coast. See the NOAA [National Storm Surge Hazard Map](#) to assess your risk.

Resource Links

Extension, State, and Federal websites

North Carolina

Extension Websites	Purpose
Forestry*	Resources to help private forest landowners improve management and productivity
Extension Office Locator*	Contact information for Extension agents in your county
Disaster Information Center	Resources to help prepare for and recover from hurricanes and other disasters
Extension Disaster Education Network (EDEN)	Information and program resources to help with hurricane preparedness and recovery

* North Carolina Cooperative Extension

State Websites	Purpose
North Carolina Governor’s Office	News and information from the Governor, including evacuation orders and emergency declarations
North Carolina Department of Agriculture and Consumer Services	Main source for answers to your agriculture-related questions
North Carolina Forest Service	Technical information to help private forest landowners improve their forest land and increase resilience to threats
County Forester Locator	Contact information for County Foresters if you need technical assistance on your private forest land
North Carolina Department of Public Safety Emergency Management	News and resources to help you prepare for, respond to, and recover from emergencies, including hurricanes

State (FSA and NRCS) and Federal

State Websites	Purpose
USDA FSA North Carolina USDA NRCS North Carolina	Focus on State FSA and NRCS resources, including financial and technical information sharing
Federal Websites	Purpose
Ready.gov Hurricanes	Resources to help individuals prepare for and recover from hurricanes
U.S. Department of Agriculture (USDA)	News and announcements related to agricultural commodities and disaster recovery programs
USDA Disaster Resource Center	Resources to help you build long-term resilience to and recover from hurricanes and other disasters
USDA Office Locator	Contact information for USDA offices in your county, including FSA, NRCS, Rural Development, and Conservation Districts
USDA Farm Service Agency (FSA)	Assistance with securing loans, receiving payments, and applying for disaster relief programs
USDA Natural Resources Conservation Service (NRCS)	Financial and technical assistance for farmers, ranchers, and forest landowners
USDA Risk Management Agency (RMA)	Assistance with Federal crop insurance and managing risk
USDA RMA Agent Locator	Contact information for local RMA offices in your county
U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA)	Resources to view historical, current, and predicted hurricane activity and warnings in your area
NOAA National Hurricane Center	Current and forecasted tropical cyclone activity, educational resources, and advisory warnings for your area of interest
NOAA National Weather Service Weather-Ready Nation	Latest news, information, and technology to enable informed decision making before, during, and after a hurricane strikes
U.S. Department of Homeland Security Federal Emergency Management Agency (FEMA)	News and information to help you prepare for and recover from hurricanes and other disasters



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