UF IFAS Extension UNIVERSITY of FLORIDA

ENH 1054
doi.org/10.32473/EDIS-EP300-2007

Restoring Trees After a Hurricane[1]

Edward F. Gilman, Traci Partin, Ryan Klein, Rich Hauer, Alison Salisbury, Michael Andreu, and Alyssa Vinson[2]

Introduction

This step-by-step outline summarizes the process for restoring trees. Retained and restored trees maintain shade and beauty in a community with reduced risk. Restoration typically requires more than one pruning to develop strong tree structure, so remember that patience is a virtue when dealing with storm-damaged trees.

Various factors determine the period for time necessary for tree recovery: age and health, size, species, and extent of damage. These factors are interrelated and together determine the amount of care a tree will need after a storm. A restoration pruning program typically lasts from two to five years and perhaps much longer for large and severely damaged mature trees.

Know what trees can be restored. The structure of the tree should be intact, without any visible cracks or large wounds on the main trunk, limbs, or main roots. Trees can recover from complete leaf loss or significant damage to the canopy, including several broken limbs, but major trunk damage is often irreparable.

Response Plan for Immediately After a Storm

After a storm, removing unacceptable risks and cleaning tree canopies of broken limbs and dead stubs should be the focus of treatment. Major pruning to alter the tree's structure should not be done at this time. Trees use energy stored in the wood to recover from damage and produce new growth; therefore, during the clean-up process, the least amount of live wood possible should be removed. (Think of the stored energy in trees as the limited funds in a bank account. After paying for repairs on the house due to hurricane damage, homeowners usually do not rush out to buy a new sailboat. Similarly, this is not the time to further reduce the already limited "funds" of the tree by removing live wood.)

Be very careful not to cause additional stress to the tree by injuring the trunk, branches, or roots. Do not top your trees or cut the entire canopy back to stubs (Figure 1).

Many communities in Florida outlaw or discourage topping because it leads to decay and reduces health.



Figure 1. Topping is detrimental to tree health.
Credit: Alyssa Vinson, UF/IFAS

Step 1. Get help with removing potential tree risks.

If a limb has fallen near power lines, make sure that a qualified line-clearance arborist treats the situation. Working near electrical lines is dangerous and may result in fatality for workers who do not follow proper safety procedures. Other potentially risky situations include large hanging limbs or leaning trees that could fall on a person, hit a house, or damage other potential targets if they go down. These situations should be taken care of by a professional before anything else.

Step 2. Stand up and stake small fallen trees, and provide irrigation as needed for stressed trees.

Standing up small fallen trees is a priority because the roots dry out quickly. Experienced professionals have observed from past hurricanes that staked trees with a trunk diameter greater than about 4 inches tend to blow down again in later storms and may not be worth the time and expense to return it to its upright position. The reason for this appears to be that severed roots on bigger trees do not regenerate new roots as well as small (one inch diameter or less) roots do. Also, large, severed roots can decay or rot, making the tree unstable. The exception is recently planted trees, which can be re-staked at any size because they do not have large broken roots. These trees should be treated as new plantings and staked with the help of a professional.

Staking Methods

Research and experience on the effectiveness of different staking methods show that some systems work better than others. Root ball anchorage systems work very well to stabilize trees in the soil. Rigid systems can work, but they need to be adjusted or removed within six months (Figure 2).



Figure 2. Staking systems may cause significant trunk damage if not adjusted as the tree grows.
Credit: Adobe Stock, lstvan

Steps for Standing Up Trees That Have Fallen

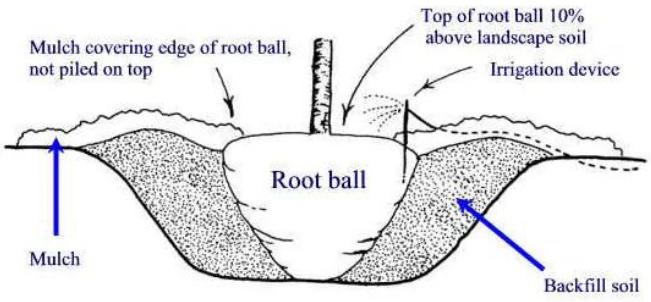


Figure 3. Drawing of correct technique for tree planting.
Credit: Ed Gilman, UF/IFAS

1. Keep roots moist.
2. Excavate a hole to accommodate roots.
3. Use sharp tools to make clean cuts on jagged or torn roots.
4. Pull the tree up as straight as possible, taking care to not damage the trunk or roots.
5. Fill the hole with soil from the site; avoid burying the area where the trunk meets the topmost root (Figure 3).
6. Irrigate the tree with the same frequency as for newly planted trees, approximately three times/week for the first several months. Also, apply water during dry periods. Do not fertilize for one year.
7. Install the staking system. Remove or adjust stakes after six months to one year.

Irrigation for Stressed Trees

Root growth is necessary for tree recovery after the storm, and keeping the soil moist will encourage formation of new roots. During the dry period of October through mid-May in Florida, trees should be irrigated as needed to help them recover from storm damage. When irrigating staked trees, two to three gallons per inch of trunk diameter should be sufficient. Efficient irrigation systems apply water directly to the root ball, rather than spraying overhead. Irrigation is not needed if the root ball is already saturated or wet from heavy rains.

Significant tree dieback due to salt damage can occur in coastal areas that receive storm surge from hurricanes. These trees may require irrigation treatments to remove salt from the soil by flushing with water.

Step 3. Clean tree canopies.

The purpose of canopy cleaning is to remove dead and cracked branches and broken limbs. Canopy cleaning also includes making smooth pruning cuts behind broken branch stubs to allow the proper development of new tissue to close over wounds (Figure 4). Remember that stressed trees need to access energy stored in their limbs to recover. The stored food is necessary for the tree to sprout, produce new leaves, and defend itself against

organisms that cause decay. It is better to leave the tree looking unbalanced and misshapen than to remove large portions of the live canopy at this time. Shaping can be done later as part of the restoration process.

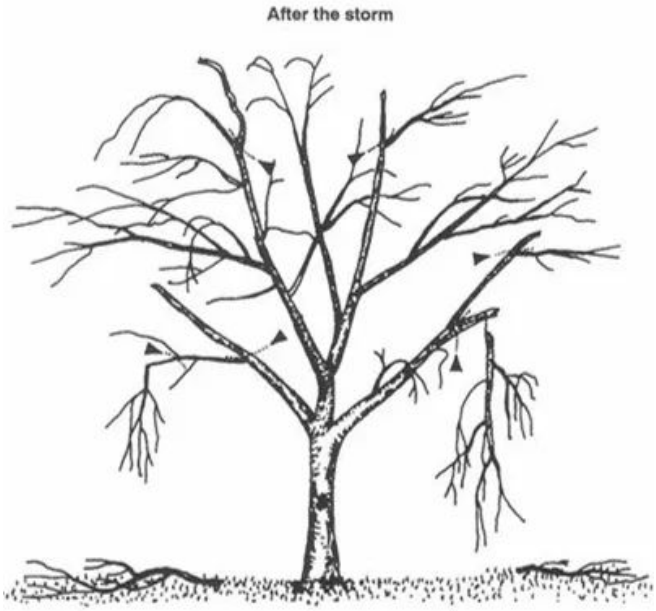


Figure 4. Cleaning the canopy on a storm-damaged tree. Lines indicate where to make pruning cuts.
Credit: Ed Gilman, UF/IFAS

Removal Cut

A removal cut removes a branch back to the trunk or parent branch (Figures 5 and 6). After a hurricane, this type of cut is used to remove broken, cracked, and hanging limbs. Hanging and detached limbs should be removed first so that branches do not fall and cause injury. Be sure there are no cracks along the large, main branches; use binoculars to get a closer look if needed. Arborists can climb trees to check for cracks and other structural defects. A branch with a crack can create a high-risk situation and should be removed if there is a target nearby.

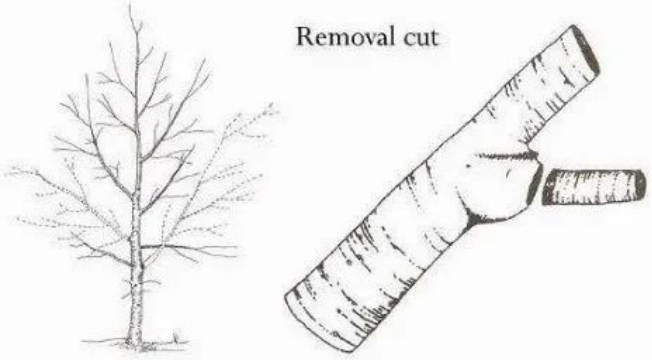


Figure 5. Drawing of a removal cut. After a hurricane, removal cuts are used to remove broken, cracked, and hanging limbs back to parent stems.
Credit: Ed Gilman, UF/IFAS



Figure 6. Photograph of a removal cut. Branch is pruned back to the trunk or parent branch, leaving the branch collar intact.
Credit: Adobe Stock, VSzili

Reduction Cut

A reduction cut shortens the length of a stem by pruning back to a smaller limb, called a lateral branch (Figures 7 and 8). Ideally, the lateral should be at least 1/3 of the diameter of the stem being cut. This type of cut is used for making clean cuts behind the jagged tips of broken branches.

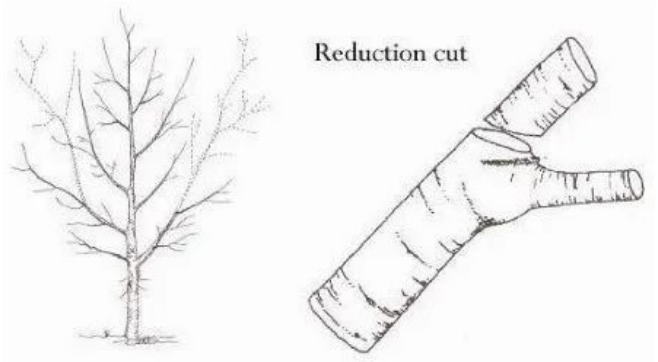


Figure 7. Drawing of a reduction cut. This type of cut is used for making clean cuts behind jagged tips of broken stems and branches.
Credit: Ed Gilman, UF/IFAS



Figure 8. Photograph of a reduction cut. Branch is correctly pruned back to a lateral that is at least 1/3 the diameter of the broken stem.
Credit: Alyssa Vinson, UF/IFAS

Heading Cut

A heading cut is made at a node along the stem and leaves a stub (Figure 9). A node is the bud area from which branches arise, sometimes visible as a line around a stem or a slight swelling. When there is a not a live lateral branch present for making a reduction cut, a heading cut could be a better choice than removing a large limb back to the trunk. Removal of large limbs can take away too much live wood, causing decay and disrupting canopy balance. This can result in poor health or tree failure in the years to come.

Heading cuts are allowed in the American National Standards Institute's national pruning standard as part of restoration pruning. A heading cut used to clean the canopy could look like topping, which is a harmful method of pruning trees, but the practice is dramatically different. Topping severely reduces the entire canopy of a tree (Figure 1), whereas heading cuts used in restoration are made only when necessary. Otherwise, heading cuts should not be used as standard practice for healthy, undamaged trees.



Figure 9. A heading cut may be used instead of a reduction cut if there is not a live lateral branch to reduce back to. Heading cuts should be used only as a last resort.
Credit: Adobe Stock, Tricky Shark

Allow Time for Recovery

Wind damage from hurricanes often strips the leaves from a tree. This interrupts the tree's ability to photosynthesize and store energy. In response to the damage, the tree sends out epicormic shoots, typically referred to as sprouts, found mostly along the top and at the tips of branches. To produce the sprouts, the tree uses energy (starch and oils) stored in the living wood, which temporarily weakens the tree. Allowing sprouts to grow will rebuild the starch reserves and other energy-storing compounds, increasing strength of the tree over time.

BROADLEAF EVERGREEN AND DECIDUOUS TREES

Wait until spring of the following year before determining if a tree is dead. If it does not sprout by the spring or early summer following the hurricane, it is not likely to recover

PINES

Pines sprout very little or not at all. When all the needles are brown, or if there are no needles, the pine is dead. There are some exceptions, such as pitch pine, which can resprout after a loss of needles.

PALMS

All leaves come from one bud located near the top of the palm. On palms with multiple trunks, each stem has a bud near the top. After a storm, it is difficult to determine whether the bud was damaged unless some obvious injury has occurred, like the trunk snapping in half.

Allow at least six months to see whether new growth emerges from the bud. New fronds could be stunted or yellow—leaves may be smaller and abnormally shaped— and it may take two years or more before the palm regains its full set of leaves.

Factors Affecting Recovery

Several factors determine the recovery period needed before initiating restoration pruning.

Tree Age

This is an important factor—young trees have a higher ratio of live to dead wood, which allows a faster recovery. This means you can begin restoring young trees sooner after the storm, within one to two years. Older trees may need two years or longer for sprouts to grow before you remove live branches.

Tree Size

Small maturing trees (less than 30 feet tall at maturity) take fewer pruning visits because structural defects are not as critical. A falling crape myrtle limb will not inflict as much damage as a falling live oak limb, for example. Large trees take priority during hurricane recovery. However, small trees still need time to recover properly. Trying to prune too much live wood on one visit will be just as problematic for the health of a small tree as it would be for a large one.

Tree Species

Knowing the species of a tree is particularly important in forming a pruning plan. Some species are short-lived because they are prone to decay. Therefore, it may be more efficient to focus restoration efforts on trees that resist decay and are more likely to live longer. Common examples in Florida are live oak and buttonwood, which resist decay and recover from damage much better than laurel oaks, which often have severe internal decay.

Tree Health

Health of the tree prior to the hurricane will affect its ability to recover. Healthy trees recover faster than those in poor health. Old trees with decayed root systems, stem decay, and large dead branches are more likely to decline or die than recover. These preexisting conditions might make it more appropriate to remove the tree instead of restoring it.

Extent of Damage

The extent of damage to the tree will also determine the length of time to wait before pruning live branches. The more damage to the tree, the longer you should wait before pruning. Severely damaged trees should be monitored to determine whether they are recovering or declining. Recovering trees will sprout aggressively, while declining trees have fewer slow-growing sprouts and few leaves.

Restoration Pruning Program: Sprout Management

Once a tree has been determined to be worth restoring, its canopy cleaned, and the appropriate length of time has passed for recovery, it is time to begin sprout management. Sprout management is the training of sprouts so that they will grow into strong branches and build structure back into the tree.

First Pruning Visit: Two or more years after storm

Dead portions of branches that did not sprout, and any other dead branches and stubs in the canopy should first be removed. Sprouts on recovering trees grow aggressively, and competition for light and space can lead to long, weak sprouts. Therefore, the goal for the first pruning visit is to reduce some sprouts, remove some, and leave some (Figure 10). The most vigorous sprouts often develop side branches, and these are the ones that should be left. Leave all lower side branches on developing sprouts that will remain to encourage strength. Remove sprouts located near the selected sprouts to allow space for growth. Ideally, the selected sprouts should be spaced approximately 12 inches or more apart. Some sprouts should be reduced rather than removed because they will continue to build energy reserves and increase the strength of the damaged branch. The reduced sprouts will be removed at a later pruning visit, or they may be shaded out and die naturally.

Keep in mind that if the first visit is several years after the storm, there may be touching and crossing sprouts. Restoration pruning should remove or reduce these sprouts to ensure none are touching. Space them apart for optimum development.

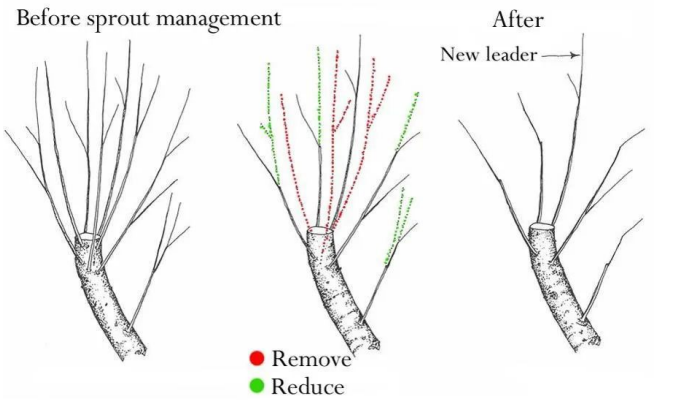


Figure 10. Illustration showing sprout management. Reduce some: Shorten (reduce) 1/3 of the sprouts (dotted). They will continue to store energy but will eventually be removed. Remove some: Remove 1/3 of the sprouts (dashed) to allow space for the most vigorous ones to grow. Leave some: These will develop into the new branches.
Credit: Ed Gilman, UF/IFAS

Second and Third Pruning Visits

Allow about a year between pruning visits. The objective for the second and third visits is to continue sprout management, keeping the most vigorous sprouts to be the new branches, and reducing or removing competing sprouts. Large and severely damaged trees may need more pruning visits, while young or moderately damaged trees may only need a second visit to complete sprout management. Again, patience is important in this process. If sprouts are removed too soon and enough time is not allowed for building starch back into the wood, the tree will resprout, causing a decline in health. If pruning cuts made during the canopy-cleaning process left stubs that are sprouting poorly, consider removing these. Also, remove any dead branches at this time.

The goal of sprout management is for a sprout to become the new branch leader and close over the pruning cut at the branch tip. Large (4 or more inches in diameter) branches are less likely to close over than smaller branches. A new branch leader can be established within a year or two when the diameter of the broken tip is 1–2 inches ((Figures 11a–c).). For larger branches, it could take many years for a sprout to grow over the pruning cut, with more visits needed for reducing and removing sprouts.



Figure 11a. Young tree after the top broke in a hurricane.
Credit: Ed Gilman, UF/IFAS



Figure 11b. The broken stub was removed with a reduction cut back to a lateral branch.
Credit: Ed Gilman, UF/IFAS



Figure 11c. A sprout emerged from just behind the pruning cut and is now closing over the cut after year one of restoration pruning.
Credit: Ed Gilman, UF/IFAS

Later Pruning Visits: Four or more years after storm

Once the canopy has been pruned several times and new leaders and branches have been re-established on broken branches, it is time for structural pruning. The priority of structural pruning is to reduce limbs that are larger than half the diameter of the main trunk. Trees fail in storms at areas in the canopy where there are structural weaknesses like codominant stems, bark inclusions, and unbalanced and overextended canopies.

Restoration of Palms

As with hardwood trees, the priority when restoring palms is to eliminate dead and damaged parts and minimize removal of live tissue. Irrigation two to three times per week can also help palms recover if rainfall is lacking.

Step 1: Remove dead fronds that could fall and hit a target

As with canopy cleaning on trees, the priority when cleaning palms is to remove potential high risk. The palm in Figure 12 has brown hanging fronds that should be removed. However, not all hanging fronds need to be pruned (see Step 3).



Figure 12. Remove dead fronds. Leave green fronds, even those that are bent, unless they pose a hazard.
Credit: Adobe Stock, Abelorz

Step 2: Remove fronds that are smothering the bud.

When broken fronds cross over the top of the palm, they may suppress new growth from the bud. These fronds should be removed.

Step 3: Leave bent green fronds attached to palm until new fronds emerge.

Fronds become bent and will droop down along the trunk in a hurricane. Many of these remain green and are still well connected to the palm (Figure 13). These fronds should be kept until new foliage fully emerges because they photosynthesize and help the palm regain energy reserves and aid recovery.



Figure 13. Leave bent green fronds.
Credit: Adobe Stock, Jillian Cain

Step 4: Leave fronds that are yellowing or have brown tips.

Establish a fertilization program to correct nutrient deficiencies but wait until palms begin growing new leaves before applying fertilizer. This may mean waiting up to six months after storm damage. Yellowing or browning fronds still provide energy for growth and removing too much of this foliage reduces the palm's vigor, possibly even killing it. *Avoid overpruning palms.*

The two most common mistakes made with palms are using the wrong fertilizer and overpruning (Figures 14 and 15). In fact, using the wrong fertilizer often leads to overpruning because typical palm maintenance (though potentially harmful) removes all leaves that are yellowing or have brown tips. Arborists report that overpruned palms suffered more damage in hurricanes than palms that were not pruned. This points to the importance of pruning appropriately. Removing too many fronds exposes the delicate bud to more wind and more potential damage. Remember, palms need older fronds to protect the bud and provide nutrients for growth.



Figure 14. Overpruning is harmful to palm health; leave green fronds.
Credit: Adobe Stock, alicobanoglu

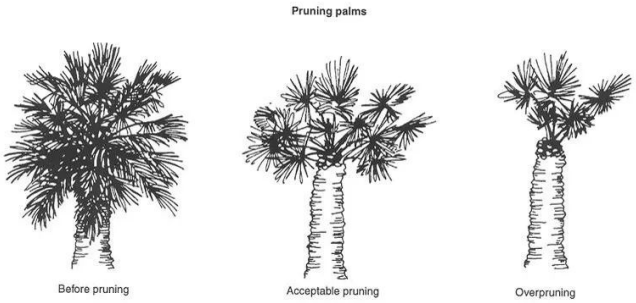


Figure 15. Illustration showing proper pruning of palms vs. overpruning.
Credit: Ed Gilman, UF/IFAS

Start a Tree Management Program

With a team of professionally trained commercial and municipal arborists who provide routine tree maintenance, including appropriate pruning, communities recover much faster after a hurricane. The continued growth of the profession is encouraging, as more communities recognize the need for allocating resources for the care of trees.

[1] This document is ENH 1054, one of a series of the Department of Environmental Horticulture (Urban Forest Hurricane Recovery Program series), UF/IFAS Extension. Original publication date August 2007. Revised March 2026. Visit the Ask IFAS website at https://ask.ifas.ufl.edu/ for the currently supported version of this publication.

[2] Edward F. Gilman, professor emeritus, Department of Environmental Horticulture; Traci Partin, former horticultural information specialist, Department of Environmental Horticulture; Ryan Klein, assistant professor, arboriculture, School of Forest, Fisheries, and Geomatics Sciences; Rich Hauer, professor emeritus, urban forestry, UWSP College of Natural Resources, Stevens Point, WI; Allyson Salisbury, assistant teaching professor, urban forestry, Rutgers Department of Ecology, Evolution, and Natural Resources, New Brunswick, NJ; Michael Andreu, associate professor, forest systems, School of Forest, Fisheries, and Geomatics Sciences; Alyssa Vinson, Extension agent II, urban forestry, UF/IFAS Extension Hillsborough County, Seffner, FL; UF/IFAS Extension, Gainesville, FL 32611.

The Institute of Food and Agricultural Sciences (IFAS) is an Equal Opportunity Institution authorized to provide research, educational information, and other services only to individuals and institutions that operate in compliance with applicable federal and state non-discrimination laws and policies. For more information on obtaining other UF/IFAS Extension publications, contact your county's UF/IFAS Extension office. U.S. Department of Agriculture, UF/IFAS Extension Service, University of Florida, IFAS, Florida A&M University Cooperative Extension Program, and Boards of County Commissioners Cooperating. Andra Johnson, Dean for UF/IFAS Extension.