

JOURNAL OF ARBORICULTURE

August 1984
Vol. 10, No. 8

HURRICANE TREE CARE

by Lloyd Siegendorf

Fifty-seven major hurricanes (winds greater than 110 mph) have struck the United States on an average of twice every three years between 1899 and 1983. Several of these storms have inflicted catastrophic losses to the urban vegetation of Atlantic and Gulf Coastal Communities. Extreme examples are provided by the Labor Day Hurricane of 1935 which wiped out a 40-mile section of the Central Florida Keys and the New England Hurricane of 1938 which destroyed one million shade trees.

The challenge of reducing storm-related damage to plant material is compounded by a relatively low frequency of tropical storms during the past 15 years. Many communities have become too complacent with the result that little has been done in the area of hurricane-plant management.

Fortunately, several important strategies can be adopted before and after a hurricane strikes to reduce damage in the landscape. Before the hurricane season each landscape should be surveyed to identify dangerous trees that could pose a threat to life and property (Tables 1, 2, 3, and 4). The most dangerous tree is one that is tall, densely crowned, and has repeatedly performed poorly in past storms. In established landscapes, consideration should be given to removing dangerous trees while leaving or planting the tough ones.

The greatest measure for reducing breakage and windthrow of trees involves pruning. The concept is to reduce the surface area of a tree, allowing more wind to pass through. Pruning should allow 10-25% of sunlight to pass through small and young trees and 25-40% of sunlight through large trees. Greater movement of wind through the crown can be facilitated by thinning horizontal

limbs so that remaining ones have a spacing of 16-18 inches. Reducing a tree's height can seriously disfigure a tree. No more than 20-30% of a tree's top should be removed.

Keep in mind that not all trees are amenable to pruning because of their shape. As a general rule, trees with columnar habits are less amenable to pruning. The pines, sycamore, and Italian cypress are a few of the specimens that display this habit. During pruning operations, large fruit such as coconuts should be removed since they can become airborne and damage structures in high winds. Pre-hurricane pruning practices should be repeated every 4-5 years. Figure 1 illustrates the proper method of pruning mature trees to reduce wind damage.

Trees that are declining due to disease or insect attack are subject to storm damage and should be removed. For example, pines are most likely to snap where fusiform rust galls are located. In some trees, decline can be identified by observable symptoms (i.e., presence of galls) while in others it may not be readily apparent (i.e., internal wood decay).

Following hurricane conditions, quick action needs to be taken to rescue damaged trees and plant material. Various opinions exist on the potential for rehabilitating uprooted and leaning trees.

At least 4 factors should be evaluated before a decision is made to save a damaged tree: sentimental value, growth rate, condition, and transplantability. If a damaged specimen has sentimental value, the homeowner may be willing to take the chance and incur the expense of saving it. Fast growing trees tend to be short lived and it may not be worthwhile resetting them. Damaged trees already declining due to insects or disease should be removed. Various species have root

Table 1. Resistance of species to hurricane-related damages* (in descending order of resistance).

<i>Breakage</i>	<i>Uprooting</i>	<i>Salt</i>	<i>Deterioration by Insects and Disease</i>
Live oak	Live oak	Live oak	Live oak
Palm	Palm	Palm	Palm
Bald cypress	Bald cypress	Slash pine	Sweetgum
Pond cypress	Pond cypress	Longleaf pine	Water oak
Sweetgum	Tupelo gum	Pond cypress	Sycamore
Tupelo gum	Red cedar	Loblolly pine	Bald cypress
Mimosa	Sweetgum	Red cedar	Pond cypress
Dogwood	Sycamore	Tupelo gum	Southern red oak
Magnolia	Longleaf pine	Bald cypress	Magnolia
Sweet bay	Mimosa	Sweetgum	Tupelo gum
Southern red oak	Southern red oak	Water oak	Sweet bay
Water oak	Magnolia	Sycamore	Hickory
Sycamore	Slash pine	Sweet bay	Pecan
Longleaf pine	Loblolly pine	Southern red oak	Red cedar
Slash pine	Sweet bay	Hickory	Red maple
Loblolly pine	Water oak	Mimosa	Mimosa
Red cedar	Red maple	Pecan	Dogwood
Hickory	Dogwood	Magnolia	Longleaf pine
Red maple	Hickory	Red maple	Slash pine
Pecan	Pecan	Dogwood	Loblolly pine

* Touliatos and Roth, 1971.

systems that do not transplant well, hence they too should be removed.

If the decision is made to save a windthrown tree, every effort must be made to protect the exposed root system and prevent it from drying out. Mud, moist burlap sacks, or sphagnum moss can be put on exposed roots until the tree is reset. Damaged roots should be removed so that a tree can be reset at ground level.

Satisfactory rehabilitation depends on a proper balance between the crown of a tree and its roots, so approximately 20-30% of the above ground portion should be pruned. Once the tree is in an upright position, the soil should be compacted somewhat to prevent air pockets. A water basin at least 3 feet in diameter and 6 inches high should be constructed around the tree to encourage infiltration and percolation to the immediate root area.

Trees that have been defoliated by high winds should be saved as most specimens will refoliate. These trees, as well as those severely pruned, should be protected from sun scald and moisture loss. White water based vinyl, latex or acrylic

Table 2. Twelve potentially dangerous South Florida trees (as identified by Fontana, 1981).

<i>Name and comments</i>	
<i>Cupressus sempervirens</i> , Italian cypress	Columnar habit makes it susceptible.
<i>Termanalia catappa</i> , tropical almond	Brittle wood.
<i>Harpullia cupanoides</i> , tulipwood	Many V crotches
<i>Pithecellobium dulce</i> , ape's earring	Subject to windthrow, brittle wood
<i>Spathodia companulata</i> , African tulip tree	Brittle wood
<i>Delonix regia</i> , royal poinciana	Subject to windthrow, brittle wood
<i>Grevillia robusta</i> , silk oak	Tall tree with dense crown, breakage and windthrow
<i>Persea americana</i> , avocado	Dense crown and brittle wood
<i>Bischofia javanica</i> , bischofia	Same as avocado
<i>Acacia auriculiformis</i> , ear-leaf acacia	Brittle wood in older trees.
<i>Araucaria heterophylla</i> , Norfolk Island pine	Tall tree with columnar habit
<i>Casuarina</i> spp., Australian pine	Problem when shallow rooted.

HURRICANE TRACKING CHART

REMEMBER, hurricanes are large powerful storms that can suddenly change direction. Check frequently on the storm's progress until all Watches and Warnings for your area from the National Weather Service are canceled.

- HURRICANE WATCH:** hurricane may threaten within 36 hours
- Be prepared to take action if a warning is issued by the National Weather Service.
 - Keep informed of the storm's progress.

- HURRICANE WARNING:** hurricane expected to strike within 24 hours
- Leave beachfront and low lying areas.
 - Leave mobile homes if more substantial shelter.
 - Stay in your home if it is sturdy, on high ground, and not near the beach, but if you are asked to leave by authorities, Go!
 - Stay tuned to radio, NOAA Weather Radio, or television for hurricane advisories and safety information.

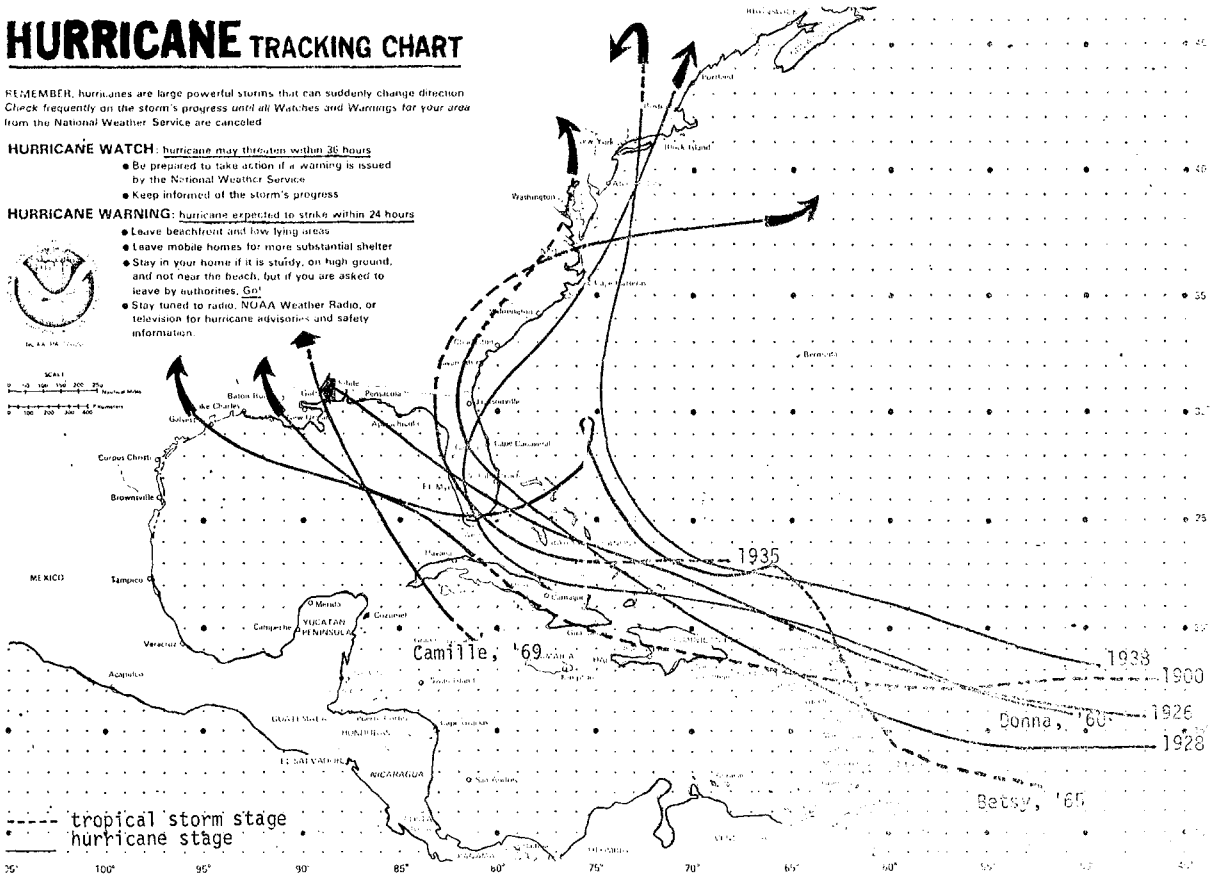


Figure 1. Severe hurricanes of the 20th Century. Fifty-seven major hurricanes have affected the U.S. since 1899 — an average of two strikes every three years.



Figure 2. One does not have to be a prophet to know that this tree was a prime candidate for windthrow. In fact, it blew over like a matchstick in a thunderstorm in which winds reached 40 mph (estimated). Note absence of root system. Trees which are seriously stressed due to construction damage, insects or diseases should be removed to protect life and property.



Figure 3. Tall, densely crowned trees with little taper are prime candidates for breakage and windthrow in hurricane-force winds. Each landscape should be surveyed to identify "dangerous" trees that could pose a threat to life and property (see tables). Consideration should be given to removing dangerous trees if they are within striking distance of a building.

Table 3. Recommended trees for South Florida (as identified by Siegendorf, 1981).

Name and comments
* <i>Liqustrum lucidum</i> , tree liqustrum, to 30'; usually 15-20'
<i>Parkinsonia aculeata</i> , Jerusalem thorn, to 25'
<i>Eriobotrya japonica</i> , loquat, to 25'
<i>Quercus virginiana</i> , live oak, to 60'; native; longlived
<i>Quercus laurifolia</i> , laurel oak, to 60'; native; shortlived
* <i>Plumeria rubra</i> , frangipani, to 25'; colorful
<i>Bursera simaruba</i> , gumbo-limbo, to 60'; usually 25'; native
<i>Chrysobalanus icaco</i> , cocoplum, to 15'; edible fruit
<i>Conocarpus erectis</i> , buttonwood, to 40'; tolerates wet soils; native
<i>Calophyllum brasiliense</i> , Santa Maria, to 60'; usually 20-30'
<i>Calophyllum inophyllum</i> , beauty leaf, to 60'; usually 20-40'
* <i>Lagerstroemia speciosa</i> , queen crape myrtle, to 45'; colorful
* <i>Illex cassine</i> , Dahoon holly, to 40'; native
<i>Cordia sebestena</i> , Geiger tree, to 25'; native
* <i>Sapium sebiferum</i> , Chinese tallowtree, to 30'
* <i>Xylosma</i> spp., xylosma, to 20'
* <i>Malpighia glabra</i> , Barbados cherry, to 12'
<i>Myrica cerifera</i> , wax myrtle, usually 10-15'; native
* <i>Psidium littorale</i> , cattleya guava, to 10-15'; edible fruit.
<i>Noronhia emarginata</i> , Madagascar olive, to 30'
<i>Cocoloba uvifera</i> , sea grape, to 30'; usually 15-20'; native
<i>Manilkara zapota</i> , sapodilla, to 45'
<i>Averrhoa carambola</i> , carambola, to 25'; edible fruit
<i>Fortunella</i> spp., Kumquat, to 20'; edible fruit
<i>Citrus</i> spp., limes, oranges, to 15-30'; edible fruit
<i>Bucida buceras</i> , black olive, to 30-40'; native
<i>Palm species</i> spp., coconut, Sabal palm, characteristics vary with species

* Slightly or not salt tolerant.

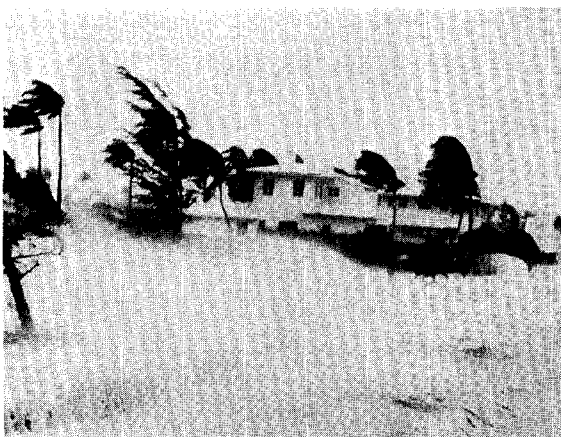


Figure 4. The effects of salt spray may be felt anywhere from a few miles to 40 or 50 miles inland. Salt damage was experienced as far inland as 45 miles following the New England Hurricane of 1938. Leaching root systems and watering foliage will help minimize salt damage. Photo credit: American Red Cross; hurricane of September 1947, Miami Beach, FL.

paints have proved to be effective, nontoxic, and durable and can be painted on the main stem.

Once reset, trees should be supported by guying and staking. Trees two inches or less in diameter can be supported by a 2 X 4 inch stake extending up to the first whorl of branches. Stakes 8 feet tall should be attached to a tree by a wire which is run through a piece of hose. Trees larger than 2 inches are supported by three guy wires attached to stakes driven in the soil.

Despite the fact that many trees and shrubs remain upright following the storm, they may have been tossed back and forth creating a hollowing of soil near the primary trunk at ground level. Additional soil can be added to this area and compacted around the plant to eliminate air pockets.

Following the storm, trees should be watered at least once every 5 to 7 days. Fertilizing should be delayed 3 to 4 months. Fertilizing trees with damaged roots may interfere with water uptake and cause physiological damage to a tree.

Standing trees will often experience moderate to severe breakage and several wounds during hurricanes. Severe pruning will be necessary to remove damaged and weak branches. Bark injuries should be treated immediately. Damaged

Table 4. Performance of shade trees in New England Hurricane 1938 in descending order of resistance (from Chadwick, 1939).

Name and comments
<i>Ginkgo biloba</i> , ginkgo
<i>Liquidambar styraciflua</i> , sweetgum
<i>Fagus grandiflora</i> , American beech
<i>Gleditsia triacanthos</i> , honeylocust
<i>Platanus occidentalis</i> , sycamore, broken limbs.
<i>Quercus coccinea</i> , scarlet oak
<i>Quercus palustris</i> , pin oak
<i>Quercus alba</i> , white oak, uprooted in woods
<i>Acer platanoides</i> , Norway maple, little damage
<i>Robinia pseudoacacia</i> , black locust, windthrown
<i>Aesculus glabra</i> , Ohio buckeye, broken limbs and trunk
<i>Ulmus pumila</i> , Chinese elm, severe limb breakage
<i>Liriodendron tulipifera</i> , poplar, broken limbs, windthrown
<i>Fraxanus americana</i> , white ash, windthrown
<i>Acer rubrum</i> , red maple, severe breakage
<i>Aesculus hippocastanum</i> , horse chestnut, broken limbs
<i>Acer saccharum</i> , sugar maple, windthrown, breakage
<i>Salix</i> spp., willow, windthrown, breakage
<i>Ulmus americana</i> , American elm, windthrown, split crotches
<i>Acer saccharinum</i> , silver maple, severe breakage, windthrown

and isolated scraps of bark should be removed. Reshaping the wound to conform to an ellipse will promote healing. The wound surface should be smooth with all splintered wood removed. Orange shellac, commercial tree paints, grafting waxes, and house paints are a few of the materials that are often applied to wounds.

Salt damage can result from inundation from the storm surge but is more likely to result from wind-driven salt spray. The following guidelines should be followed to minimize salt damage following storms:

- Foliage and branches should be washed with a stream of water to remove salt, mud, and debris.
- On porous soils, leaching of the salt can be accomplished by building a basin 3 to 4 inches deep around the plant or bed. Fill the basin, allowing water to remain no longer than three hours during the cooler part of the day (to minimize evaporation). This process should be repeated several times.
- Surface soil that has been eroded can be replaced if the landowner can afford it. This practice is limited to small 'prize' shrubs.
- Trees and shrubs that have incurred salt damage should be watered every third day.

In summary, while there is no way of preventing loss caused by hurricanes, following the recom-

mendations stated and adopting those arboricultural practices that promote healthy trees will go a long way toward minimizing losses.

References

- Chadwick, L.C. 1939. *New England hurricane damage to trees*. *Arborist's News* 4(1): 1-4.
- Curtis, R. and V.W. Yingst. 1980. Drowning yard needs quick rescue after storm. Lee County Coop. Ext. Service, Ft. Myers, FL.
- Fontana, Emilio. 1981. Twelve dangerous trees. *Miami Herald*, June 14, 1981. Sec. H-6.
- Goldweber, S. 1981. *Resetting wind damaged trees*. *Fruit Fact Sheet No. 54*. Florida Coop. Ext. Service, University of Florida, Gainesville.
- Hall, D.S. 1965. Flooded lawns and plant materials. Louisiana Coop. Ext. Service, New Orleans, LA.
- May, C. and L.R. Schreiber. 1976. Pruning shade trees and repairing their injuries. USDA Publication No. 83. 15 pp.
- Meserve, A. 1951. *Pruning for prevention of storm damage*. *Proc. National Shade Tree Conference* 27: 50-57.
- Neumann, C.J., G.W. Cry, E.L. Caso, and B.R. Jarvinen. 1978. Tropical cyclones of the North Atlantic Ocean, 1871-1977. National Climatic Center, Asheville, NC. 170 pp.
- Touliatos, P. and E. Roth. 1971. *Hurricanes and trees: ten lessons from Camille*. *J. Forestry* 69(5): 285-289.

Urban Horticulturist
Salt Lake City, Utah 84110

ABSTRACT

SYDNOR, T.D. 1983. **Ohio's shade tree project seeks well-adapted trees**. *Ohio Report* 68(6): 83-84.

The Ohio Shade Tree Evaluation Project was established in 1966 on a 12-acre site in the Secret Arboretum at the Ohio Agricultural Research and Development Center. It was established as a cooperative venture between the OARDC, eight Ohio electric utility companies, the Ohio Chapter of the International Society of Arboriculture, and the Ohio Nurserymen's Association. During the early years, trees were evaluated primarily for visual characteristics and growth rate. The goal was to evaluate new plant selections and to identify trees with desirable characteristics for planting and survival in urban environments. Many desirable trees for different urban situations were identified during the first 10 years of evaluation. Today, the emphasis of research with the Ohio Shade Tree Evaluation Project has shifted to one of evaluation of individual characteristics.