



# NC Trees & Storms: **Readiness**



*Preparing Your Landscape Before the Storm Hits*

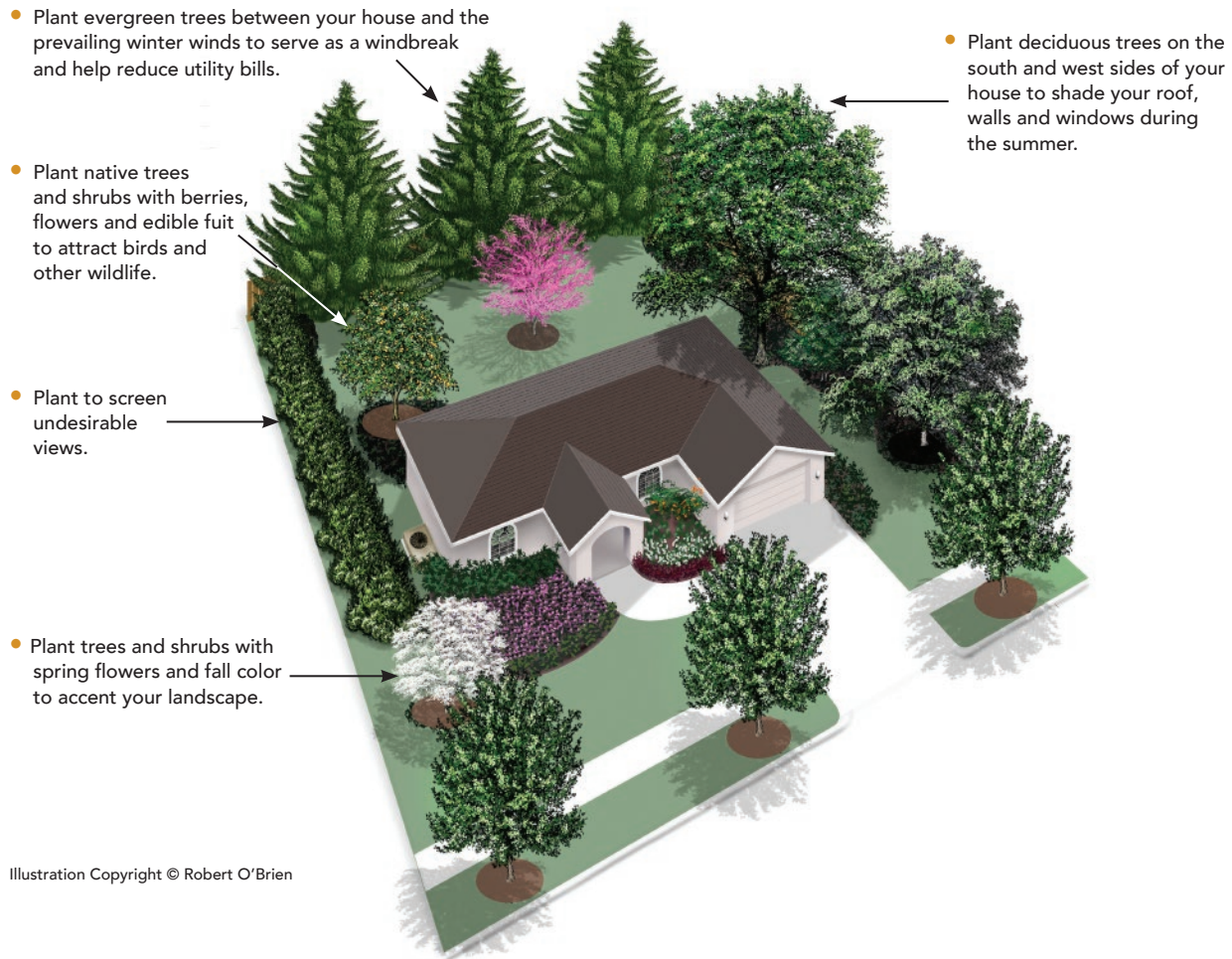




# Readiness

Thunder/lightning storms, hail, tornadoes, snow/ice storms, and straight-line winds are relatively common occurrences in North Carolina. As a home owner, being prepared well before these storms hit can help you prevent and minimize damage to your landscape trees. How can you get ready? Plant the right trees in the best location in your landscape, use proper maintenance practices throughout their life, and enlist the assistance of a Certified Arborist to help manage your trees. The bottom-line is that healthy, well-maintained trees are better able to protect your home and to withstand storm damage. To get you and your trees ready for the coming storms we present the following information and easy-to-follow steps.

## Step One: Choose the right trees for your landscape



There are many factors to take into account when choosing plants for your landscape. You may consider aesthetics, mature size, life span, functionality, light requirements, and so forth. However, to be storm ready you may also want to think about planting tree species with moderate to high wind resistance. Wind resistance describes a tree's ability to survive hurricane force winds and are therefore less likely to uproot or break apart. Table 1 lists tree species that will grow well in most of North Carolina and that have moderate to high wind resistance.

The trees listed in Table 2 are those trees with low to medium wind resistance. These species may be more prone to blowing over and could sustain serious damage, but with proper, proactive maintenance will still be an integral part of your landscape. In Table 3, we list those trees with the lowest wind resistance. We recommend that you avoid planting these trees

close to structures and utility lines. If you already have the species from Table 3 in your landscape, do not worry, they may still come through a storm with only minor damage, particularly if you have inspected them regularly and addressed any issues.

We prepared these lists based on municipal arborists' observations and research studies investigating tree response and survival after hurricane events in the past several decades. Other tree species not listed here may perform similarly as it is hard to predict how any tree will perform during a storm, and the severity of the event certainly plays a key role. That is why it is so important to get your trees ready before the storms, as this is the best way to avoid any issues.

Remember, no matter the species if you have trees that made it through a storm intact, these are keepers!

**Table 1:**  
**Trees species for North Carolina with**  
**Moderate to High Wind Resistance**  
*(listed alphabetically by botanical name)*

Common name	Botanical name
hedge maple	<i>Acer campestre</i>
sugar maple	<i>Acer saccharum</i>
Japanese maple	<i>Acer palmatum</i>
river birch	<i>Betula nigra</i>
musclewood (blue beech)	<i>Carpinus caroliniana</i>
pignut hickory	<i>Carya glabra</i>
mockernut hickory	<i>Carya tomentosa</i>
redbud	<i>Cercis canadensis</i>
common fringetree	<i>Chionanthus virginicus</i>
flowering dogwood	<i>Cornus florida</i>
common persimmon	<i>Diospyrus virginiana</i>
Kentucky coffeetree	<i>Gymnocladus dioicus</i>
Dahoon holly	<i>Ilex cassine</i>
American holly	<i>Ilex opaca</i>
Yaupon holly	<i>Ilex vomitoria</i>
junipers	<i>Juniperus spp.</i>
crape myrtle	<i>Lagerstroemia indica</i>
sweet gum	<i>Liquidambar styraciflua</i>
southern magnolia	<i>Magnolia grandiflora</i>
saucer magnolia	<i>Magnolia x soulangiana</i>
sweetbay magnolia	<i>Magnolia virginiana</i>
swamp white oak	<i>Quercus bicolor</i>
live oak	<i>Quercus virginiana</i>
needle palm	<i>Rhapidophyllum hystrix</i>
Sabal palm	<i>Sabal palmetto</i>
pond cypress	<i>Taxodium ascendens</i>
bald cypress	<i>Taxodium distichum</i>

We know that we cannot safeguard every tree in the landscape when a severe storm moves through our community. Additionally, we know that more mature (older) trees, those in poor health, or those that were pruned improperly are less likely to survive a storm. However, by choosing species with the best wind resistance and proactively managing your trees over their lifespan dramatically reduces potential damage and losses. For more information on what tree species you can plant in your area visit **NC Extension Gardener Plant Toolbox**.

**Table 2:**  
**Trees species for North Carolina with**  
**Low to Medium Wind Resistance**  
*(listed alphabetically by botanical name)*

Common name	Botanical name
red maple	<i>Acer rubrum</i>
silver maple	<i>Acer saccharinum</i>
sugar hackberry	<i>Celtis laevigata</i>
common hackberry	<i>Celtis occidentalis</i>
Foster's holly	<i>Ilex x attenuata</i>
red mulberry	<i>Morus rubra</i>
wax myrtle	<i>Morella cerifera</i>
pinus	<i>Pinus spp.</i>
sycamore	<i>Platanus occidentalis</i>
black cherry	<i>Prunus serotina</i>
white oak	<i>Quercus alba</i>
willow oak	<i>Quercus phellos</i>
Shumard oak	<i>Quercus shumardii</i>
post oak	<i>Quercus stellata</i>
weeping willow	<i>Salix babylonica</i>
American elm	<i>Ulmus americana</i>

**Table 3:**  
**Trees species with the Lowest Wind Resistance**  
*(listed alphabetically by botanical name)*

Common name	Botanical name
pecan	<i>Carya illinoensis</i>
tulip poplar (tuliptree)	<i>Liriodendron tulipifera</i>
Carolina cherry laurel	<i>Prunus caroliniana</i>
Callery pear	<i>Pyrus calleryana*</i>
southern red oak	<i>Quercus falcata</i>
laurel oak	<i>Quercus laurifolia</i>
water oak	<i>Quercus nigra</i>
Shumard oak	<i>Quercus shumardii</i>
post oak	<i>Quercus stellata</i>
arborvitae	<i>Thuja occidentalis</i>
lacebark elm (Chinese elm)	<i>Ulmus parvifolia</i>
Leyland cypress	<i>Cupressocyparis leylandii</i>

\* This species is extremely invasive and we recommend that you do not plant it in North Carolina. We include it on the list due to its abundance in landscapes and as street trees. Although the species has high stress tolerance, attractive flowers, and red fall color it is highly susceptible to breaking apart during storms.

## Step Two: Plant trees in groups and in the right location



We know it is not only important to pick the right tree species, but to place it in the right location in your landscape to maximize its benefits.

Research has shown that trees planted in groups of five or more are about 70 to 90 percent more likely to withstand a storm. Plant trees about ten feet apart.

Trees planted as groups also typically have more rooting space. More space means a broader spreading root system and greater support for the tree. It is best to use a variety of species (including some shrubs) that provide vegetative layers and mature at different ages. These practices not only reduce potential losses during a storm, but also enhance wildlife habitat and increase biodiversity. Trees planted in groups can also provide protection to your home by creating a screen or “living wall” that moderates damaging winds and blowing snow. In addition, when either you plant trees in groups or individually they can significantly minimize storm water runoff. How? Trees take up a lot of water through the process of transpiration, moving it through their roots, trunk, and branches and out of the leaves. In fact, the canopies of large, healthy trees capture and slow down precipitation before it hits the soil. So, trees play an important role in protecting soil from erosion, which in turn helps keep our waterways much cleaner!

Planting trees in the right place increases their chances to provide protection to your home and maximize their inherent benefits. Before planting any tree, think about the mature height and spread of your selection. It is best to plant shorter maturing trees under utility lines and save the larger growing trees for other places in your landscape. Is the tree evergreen or deciduous (loses leaves every year)? Plant deciduous trees on the southeast, southwest, and west sides of your house to help keep things cooler in the summer. Use evergreens as a screen on the north side to block cold winter winds and snow. Of course, we know you must also consider the form, growth rate, hardiness, and cultural requirements (soil, sun, and moisture needs) of the plants to ensure we get the effect we want and long-lived trees.

To help you pick the right tree and place it in the best location, the North Carolina Urban Forest Council (NCUFC) has developed two brochures to guide you. These are the “Tree Owner’s Manual” and “Trees and Utilities Guide”. They are available online and in print as well, simply contact NCUFC to get more information. Remember, properly planted trees are not only more tolerant of stresses such as insects/diseases, drought or flooding and improper maintenance, but may also be less likely to blow-over or break apart in a storm. Plus, they can live a longer, healthier life!



**Large trees planted adjacent to utility lines can lead to serious issues for communities after the storm passes.**

## Step Three: Minimize Root Disturbance of Trees During Construction

Construction activities compact the soil, damage root systems, and can severely stress trees and will make them much more susceptible to storms. A strong, supportive root system with adequate space to grow is a critical factor when assessing a tree's ability to withstand hurricane-force winds. Trees sited in open lawn areas with healthy soils are less likely to fail during a storm. So, what can you do to protect your trees? When performing any construction activities carefully site buildings, driveways, utilities or even sidewalks to prevent cutting roots, compacting soil, or changing the grade level around a tree. Minimize root zone disturbance by staying out of the tree's dripline, erect brightly colored temporary fencing or flagging to alert construction workers to "keep out", and avoid parking vehicles on tree roots. After construction is complete, keep your trees healthy by providing adequate water, fertilize if a soil report indicates it is warranted, and seek advice from a Certified Arborist.

Throughout the year, protect the roots and trunk of your trees from mowers and weed trimmers by applying a large area of mulch, no more than 3 inches deep. Too much mulch can lead to root and trunk damage, which can weaken your tree, making it more susceptible to heavy winds.

For more information on protecting your trees during construction, visit the Trees are Good website [www.treesaregood.org](http://www.treesaregood.org).



Compaction can seriously stress trees, and lead to blow-over in a storm. This tree had a shallow root system and severely compacted soils that led to its failure in a storm.



The yellow line indicates the dripline of this tree. When possible, keep machinery out of this area and avoid cutting roots. If you must enter this area, try not to affect more than 30% of the root system.



A tree damaged by a car, growing in a challenging site poses a risk to the public.

## Step Four: Regularly Assess Your Trees & Hire a Certified Arborist



Getting your landscape ready for a storm can be overwhelming, particularly if you have numerous larger trees, or trees that may not have received sufficient maintenance over the years. A Certified Arborist can provide guidance on necessary pruning activities and possible removals. They can also provide ideas for where and what type of trees to plant for a long-lived, healthy landscape.

If you do not have a Certified Arborist taking care of your trees, now is the time to remedy that situation! Certified Arborists have gone through specialized training and have years of experience working in the field. The International Society of Arboriculture (ISA) is the organization that certifies these professionals, and it is their mission to promote the professional practice of arboriculture (the study of trees) through research, technological advancements and education. Visit the ISA's website [www.treesaregood.org/findanarborist/findanarborist](http://www.treesaregood.org/findanarborist/findanarborist) to find a Certified Arborist near you. Certified Arborists are qualified to not only assess your trees' health, but also perform any necessary tree removals and any maintenance. This may include removal of trees that are beyond saving, and conducting structural pruning to correct or remove branches damaged during the storm. Building a good relationship with them means your trees will be in the best care prior to the storm. In addition, you will likely be first on their list for any necessary cleanup or removals after the storm passes. So, have an arborist's phone number on hand, as well as those of other key emergency contacts long before the storm winds start to blow.

### Readiness Tips

#### Protect Your Property Before the Storm

- Check out the ISA's website for information to contact a Certified Arborist near you
- Plant wind resistant species in the right location and plant correctly
- Prune young trees for sound structure
- Do not top trees!
- Remove dead or hazardous trees before the wind does
- Inspect your trees regularly looking for any defects or health issues that could cause branches to break off or entire trees to fail
- Remove dead branches and address repairable issues
- Prevent mechanical damage to your trees
- Remove trunk girdling roots when small



## Step Five: Inspect trees for issues that could affect storm readiness

With the help of your Certified Arborist look at overall tree health and any signs of stress and structural problems such as wounds, decay, cracks, dead branches, and so forth. Remember, a tree may look healthy, but there may be structural issues that could affect its storm readiness.

Next, let's cover some common structural tree defects that you and your arborist need to address before the storm.

**Decay** is the most common cause of tree failure, no matter the complicating factors, such as a storm. Wood rotting fungi in branches, stems, cavities, or at the base of trees can lead to failure, even without storm force winds. Check for cavities, fungal conks, or mushrooms growing on trunks and branches, and particularly at the base of your trees or close by. Some of these may be harmless, but others may have been growing inside the tree causing problems long before they produce a conk or fruiting structure.



*Ganoderma spp.* grows on many tree species, and although it spreads slowly, it can contribute to tree failure.



Weeping conk (*Inonotus dryadeus*) on the base of a willow oak. This rot-causing fungus may grow inside the tree for many years prior to producing this white, sticky conk and typically leads to failure of 80+ year old trees.

**Cracks** indicate that a tree is already failing. If decay is associated with the cracking, the failure risk is higher. Often, cracks form where two or more main stems (leaders) grow from the same point on the tree. Bark often grows in the union of these two stems (arborists refer to these as "co-dominant leaders") and can increase the risk of failure. Be sure to have your arborist inspect these unions closely, as pruning may be able to correct the damage, or the injury may be too extensive requiring tree removal. Prune young shade trees to remove all but one main stem (leader) to prevent cracks from forming, and to reduce potential for storm damage.





Crack formed where two main stems (leaders) grew from the same point. Pruning early in the tree's life could have prevented this.



Bark growing between two main stems (leaders) led to this failure during a storm. Proper pruning when the tree was young could have prevented this from happening.



**Topped trees** are also more susceptible to storm damage. Never top trees! A topping cut removes a branch incorrectly, and this can lead to entry of decay-causing organisms at the wound site. Branches will quickly sprout from these cuts and so it would seem like a benign practice, but these sprouts will be attached to decay and will break off easily, with or without a storm. Pick the right tree for your site; understand the tree's size at maturity, and that way you will not need to shorten a tree unnecessarily.

Remember your Certified Arborist is there to enhance the quality of your landscape and get you and your trees storm ready. If they find problems, they may be able to address them by implementing a pruning program. First, they will remove dead and rubbing branches, as well as those with structural defects. It may be possible for your arborist to restore crowns of topped trees to make them safer. In certain cases, however, some of your trees may be beyond repair and so the arborist may determine removal and replacement are your only options. Removal is never the first preference of a qualified professional! They love trees and want to do whatever they can to keep them alive and healthy!

## Step Six: Implement sound pruning as needed long before a storm hits



**This young tree with good branch spacing and open branch angles will have good structure in the future, as maintenance continues through middle age.**

Although often overlooked, it is very important to plan early for the future structure of your young trees (about 10-20 years old, depending on the species). You can either hire a Certified Arborist to assist you, or you can learn how to properly prune them yourself. There are many written and video resources available through NC State Extension, the NC Urban Forest Council, and the NC Forest Service to guide you through the process. Trees that are properly “trained” when young will be better able to resist storm damage and require less pruning in the future. It is not always easy for an untrained eye to know what to prune, but a Certified Arborist understands tree structure, and can readily do the required pruning. Training trees when they are young also prevents large wounds. Such wounds may never close over and will allow decay-causing organisms to enter the tree, leading to decline and reduced resistance to stressors, such as storms. We recommend yearly inspections and maintenance programs implemented as needed to find and resolve any issues.

An arborist can also help you with trunk girdling roots. These roots can cut off movement of water and sugars throughout the tree, but they can also make trees unstable. Some tree species are more prone to development of girdling roots, like many maples. Poor quality trees, improper planting practices, and compacted soils are other causes of girdling roots. Removing girdling roots when they are small is critical to ensure long-term stability of your tree.

Trees nearing the end of their life, poorly maintained trees, and those in decline may be more likely to fail in storms for a number of reasons. Branches become less flexible with age, becoming more brittle and more likely to break off in high winds. Larger, more mature trees tend to lose more branches than younger trees. Additionally, these trees are less able to fight off insect and disease organisms, as well as environmental stressors such as flooding, drought and extreme



**Someone removed this branch leaving behind a very large wound. This wound will never close over, will dry out, and readily allow decay-causing organisms to enter the tree. Prune when branches are small in diameter.**



Once girdling roots get larger in diameter than your arm, it may be too late to remove them! Your Certified Arborist knows how to remove these without damaging the tree.

temperatures. Always consider the lifespan of the trees you select for your landscape. Having a mix of longer, medium aged, and younger lived trees is a sound plan. Remember trees in urban areas do tend to have a shorter lifespan than forest trees.



**A mature tree in decline due to environmental stressor, as well as old age. Take such trees down before the storm does!**



Live oak, *Quercus virginiana*, planted along the street in Florida are well maintained and perfect for this location.

Along with assessing trees, your Certified Arborist will take a comprehensive view of your landscape looking at soil health and fertility, drainage issues, cut root systems or limited growing space, all of which can negatively affect tree health and the quality of your landscape, and make trees more susceptible to storms.

Healthy trees are an important asset to your property. Not only do they protect your home during storms they also capture and slow precipitation to prevent soil erosion. And, those are just a couple of the many benefits trees provide. By planting the right trees in the right places, pruning young trees for good structure, removing potential hazards, and employing a Certified Arborist to guide you, many of your trees will have weathered this storm and hopefully those in the future. Remember that those trees that made it through the storm are the toughest! So, do not let fear or an unscrupulous salesperson convince you to remove all your trees. That person is simply seeking to profit from the disaster. Contact your certified professional to ensure that your trees will remain healthy for many years and continue to work hard for you and your community.



Healthy, well-maintained trees are more storm ready!

written by **Barbara A. Fair**, PhD, NCSU Landscape Extension Specialist and Certified Arborist

To learn more about what you should do once the storm has moved on, please visit the NC Urban Forest Council, NC Forest Service, and NC Cooperative Extension websites, along with Trees are Good, the National Arbor Day Foundation, and many others for more information and guidance.



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