



## Mitigating Wind Storm Damage to Trees:

### Selection, Training, Damage Assessment, and Corrective Pruning

**Eric Stormer**, Agriculture & Natural Resources Extension Agent – Horticulture, Virginia Tech

#### Introduction

Seasonal hurricane and tropical storm force winds represent dangerous and often unpredictable weather systems that frequently damage trees. But planning for inclement weather can diminish the destructive effects of high winds. A comprehensive approach to windstorm damage mitigation will include appropriate tree selection, training, post-storm damage assessment, and corrective actions.

#### The Formative Years

Deciduous trees in particular, benefit from training throughout their youth. Often, this will take place during the first 15 – 20 years after a tree has been planted. The objectives of training include development of a balanced structure and form, with well attached, evenly distributed limbs. This will improve the aesthetic value of the tree, and also minimize the likelihood of wind damage. When planting a new tree, initial training will only involve light pruning to correct critical structural problems. Subsequent pruning should be designed to encourage development of a strong main (vertical) stem, as well as to remove or suppress vigorous lateral growth (branches). During this time, pruning should also be performed, bearing in mind the desired long-term scaffold development

development of the tree. A scaffold is simply a branch that contributes significantly to the structure of the crown, either permanently or for a period of time during the early life of the tree. Additional pruning should be undertaken to ensure uniformity of the trees perimeter, ensuring a uniform canopy edge.

Development of a balanced crown results in even distribution of weight, and reduces the likelihood of wind damage. As trees mature, permanent scaffolds should be selected based on their arrangement, and vigor of growth. Weak, broken, dead and damaged growth should be removed. Pruning of a mature tree, whose permanent structure is largely defined, is limited to light thinning. This practice invigorates remaining branches and lateral growth, while increasing light penetration and air circulation.

#### Assessment and Evaluation

Despite our best efforts, trees will often sustain damage when subjected to wind storms. Not surprisingly, these occurrences are more common in trees which exhibit susceptibility long before strong winds cause harm. Periodic assessment of a tree's vulnerabilities, as well as for post-

storm damage, will help determine what actions might be taken.

Different tree species grow differently and respond differently to environmental stress. Therefore, it may be wise to consult an arborist. Should an arborist be retained, ask if he or she is certified by the International Society of Arboriculture. ISA certified arborists are experienced, knowledgeable, and current on latest research. Before any work is performed, verify that the individual or company has insurance for personal and property damage and workers' compensation. Otherwise, you may be held responsible for medical bills and lost wages for injured workers. Also, be sure to get more than one written estimate. Bear in mind that specialized equipment, insurance, training, and experience will cost more. Good quality tree work is worth some additional investment, while poor quality work may cost more in the long run. Assessing tree damage will involve a thorough inspection of the tree and its surroundings. Trees may pose a hazard for many reasons, including:

***A tree whose lower trunk is cracked or broken.*** Trees exhibiting large wounds, such as cracks extending deep into the trunk, are at risk and should be removed.

***Large limbs are broken.*** When branches greater than 8" in diameter are severed, and most of the canopy is damaged, restoration is difficult, and removal of the tree should be considered.

***Remaining tree structure is susceptible to further damage.*** Trees that have not been well trained may exhibit multiple trunks, codominant stems and bark inclusions, making restoration extremely difficult. Removal should be considered.



***Large wounds in trunk are unable to heal, leaving the tree vulnerable to decay. In addition, canopy weight is unevenly distributed, making this tree even more vulnerable to future damage. (Photo: E. Stormer)***

***A tree with multiple leaders or trunks.***

Trees exhibiting a decurrent or round spreading growth habit often produce multiple leads (vertical stems). The union of these limbs may include bark. This occurs more frequently when the union forms a narrow branch crotch, or "V" shape. With the passage of time, these vertical stems will be burdened with extra weight of branches and foliage. As a result, they often fail in wind storms. Limb unions

which form a “U” are preferable. These unions allow layers of extra tissue to develop each year, strengthening the tree and contributing to its stability. For instance, some cultivars of Flowering Pear, *Pyrus calleryana*, typically produce multiple leads, resulting in included lead unions that are especially vulnerable to wind damage.



**Multiple leads and included bark on this flowering pear tree resulted in extensive canopy loss during a wind storm. (Photo: E. Stormer)**

**A tree whose trunk is leaning.** Heaving soil, gaps and fissures, each indicate a tree that has lost anchorage and is subject to falling. While some gradual soil displacement is natural, as a tree's trunk and roots increase in size with maturity,

rapid changes often indicate problems and removal may be necessary.



**In the wake of a wind storm, this oak leans into the street, pushing against utility lines. Slight soil displacement at the base of the tree has occurred. Anchorage is compromised. (Photo: E. Stormer)**

**Poorly attached branches or limbs.** As with vertical stems, a “U” shaped union of branches or limbs to the boll, or trunk, will be preferable. Even so, storm conditions may result in excessive bending. Compression of tissue due to bending will result in wrinkles of tissue on one side of a limb and stretching or tearing on the opposite side, thereby weakening limbs. Insect larvae activity may also weaken

limbs. On Pine trees, insect boring activity will often result in the presence of sticky sap, or pitch.



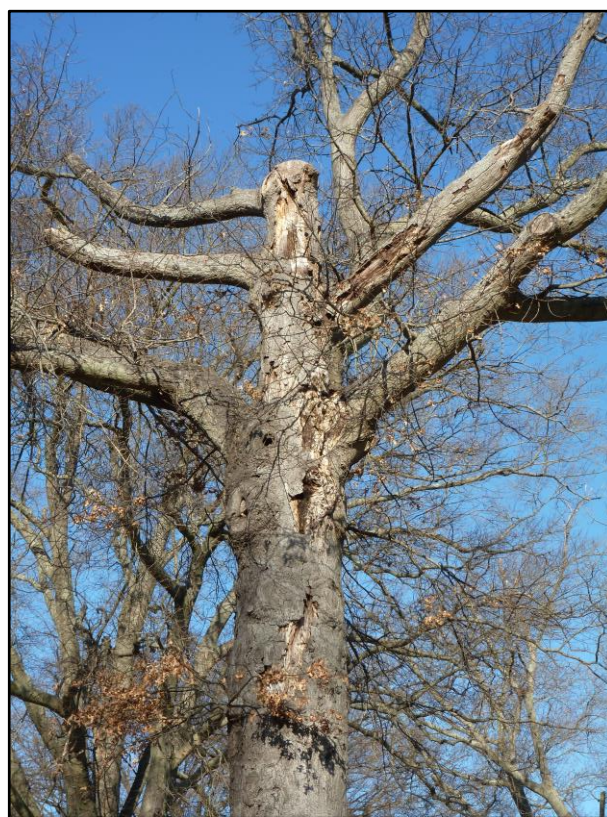
*This crape myrtle boasts strong "U" shaped vertical stem unions. Bark inclusion will not occur, allowing verticals to support the weight of branches as they increase in size and weight with the passing of time. (Photo: E. Stormer)*

#### ***Hollow cavities, pockets, and decay.***

The presence of decaying tissue, development of cavities, and accompaniment of fungal activity – such as conk development – is indicative of weakness. The greater the decay, the greater the weakness of the tree. Trees are incapable of regenerating tissue where damage occurs.

Trees will attempt to seal off damaged tissue as a natural defense barrier. Removal of decay is appropriate. Filling cavities is not recommended, nor is the application of any type of tree "dressing". Neither practice has demonstrated significant long-term positive effects.

***Vertical strips of bark damage.*** Sunburn and lightening can cause linear strips of damage to trunks and limbs. Some trees will continue to grow and thrive for many years, in spite of these injuries. However, underlying tissue is subject to decay and should be monitored regularly.



*This laurel oak exhibits extensive bark loss and decay of tissue. It is susceptible to additional damage from wind storms. (Photo: E. Stormer)*

***Fine particles, similar to wood dust, on or by trunk.*** Frequently, fine wood dust

particles are indicative of insects chewing or boring into tree trunks, and diminishing their structural integrity. This dust, or frass, is very fine.

Of course, many other factors can contribute to a trees weakened or compromised position. If in doubt, consult a trained ISA certified arborist. Should an assessment reveal that major limbs, trunk and roots remain intact, restoration may be considered. To determine whether restoration is viable, additional scrutiny should be undertaken to ascertain the presence of cracks in the trunk and major limbs, presence of decayed wood, and bark inclusions. Roots should not be exposed, or lifted from surrounding soil.

## Restoration and Healing

Restoration pruning should involve cleaning the tree canopy by removing hazards including large dead branches and broken limbs. Because trees will have been stressed, very little live wood should be removed. The tree will need to use stored energy reserves to recover.

Good pruning of limbs is a *three-step process*.

**The first step.** Undercut the limb to be removed, about 12 inches from the trunk. This undercut will prevent bark from tearing.

**The second step.** Make a topcut beyond the undercut in order to remove the limb and its excessive weight.

**The third step.** Make a cut to remove the stub at the branch collar. The branch collar is the swollen area at the base of a branch where it joins the trunk. Tissue in the vicinity of the branch collar is rich in energy reserves and chemicals that hinder the spread of decay.



*Properly removed limbs are more likely to heal. Bark will seal the wound and protect the tree from insects, moisture, fungi, etc.  
(Photo: E. Stormer)*

## Types of Pruning Cuts

Several types of pruning cuts exist, including:

**Flush cuts.** Limb is removed by cutting flush against the tree trunk. Should be avoided.

**Removal cuts.** Used to remove a branch or limb at its point of origin, are made to remove broken, cracked and hanging limbs.

**Reduction cuts.** Used to make clean cuts behind jagged tears of broken branches. Reduction cuts are made at a point where a lateral stem, or branch, originates. The lateral stem should be at least 1/3 the diameter of the pruned branch. Reduction cuts are preferable to heading cuts.

**Heading cuts.** Not usually recommended for routine pruning, but may be appropriate for damaged trees, if removing an entire limb would be too detrimental. Limbs store food reserves.

Subsequent pruning will be required over several years. This pruning will seek to build structure back into the tree, and typically will involve removal of 1/3 new sprouts and reduction of length of 1/3 new sprouts. The remaining 1/3 will be allowed to develop into new branches. Restoration of a tree's canopy will take time, and depend on several factors, including: tree age, tree size, tree species, tree health, and amount of damage incurred.

“Topping”, also referred to as heading, stubbing, rounding, hat-racking or dehorning, is the drastic removal, or cutting back, of large branches on mature trees, with little regard for the location of the pruning cut. By removing a major portion of the tree canopy, topping causes severe stress to the tree, requiring the tree to use large energy reserves to produce new growth. The large wounds which result from topping often do not heal properly, leaving the tree susceptible to insects and fungal activity. Bark suddenly exposed to extreme sunlight is often damaged by

sunscald and may also become diseased. Once decay enters a branch stub, it may progress to the main trunk, eventually killing the tree. Water sprouts, vigorous new vertical growth often produced immediately beneath cut limbs, are poorly attached, and make the tree highly vulnerable to wind damage. Conversely, some species of oak, maple and beech are likely to simply decline and die when topped.



*This tree has been “topped” making it more vulnerable to wind storm damage, disease, and insect infestation. Large wounds seldom heal properly, inviting rain water to decay tissue, leading to diminished structural stability. (Photo: E. Stormer)*

Where possible, reduction cuts should be employed to remove damaged limbs as well as reduce tree crowns, as they result in a more natural appearance and significantly delay the period of time that will elapse, before additional pruning is required.

## Some Suggested Trees

In areas prone to seasonal high winds, it is wise to plant tree species that are time tested, and recognized for their resistance to wind damage.

### Large growing wind resistant trees:

Saucer Magnolia, *Magnolia grandiflora*

Sugar Maple, *Acer saccharum*

American Sycamore, *Platanis occidentalis*

Ginkgo, *Ginkgo biloba*

American Sweetgum, *Liquidambar styraciflua*

White Oak, *Quercus alba*

Bald Cypress, *Taxodium distichum*

Kentucky Coffeetree, *Gymnocladus dioicus*

### Smaller (ornamental) trees:

Serviceberry, *Amelanchier canadensis*, *A. arborea*

Redbud, *Cercis Canadensis*

Crapemyrtle, *Lagerstroemia indica* hybrids

Yaupon Holly, *Ilex vomitoria*

Sweetbay Magnolia, *Magnolia virginiana*

Saucer Magnolia, *Magnolia x soulangiana*

Fringe tree, *Chionanthus virginicus*

