UNIVERSITY of NEW HAMPSHIRE
COOPERATIVE EXTENSION

ICE RESISTANT TREE POPULATIONS

Adapted from: TREES AND ICE STORMS: THE DEVELOPMENT OF ICE STORM RESISTANT URBAN TREE POPULATIONS by Richard J. Hauer, Mary C. Hruska, and Jeffrey O. Dawson. 1994. University of Illinois

Tree Features Influencing Ice Storm Susceptibility

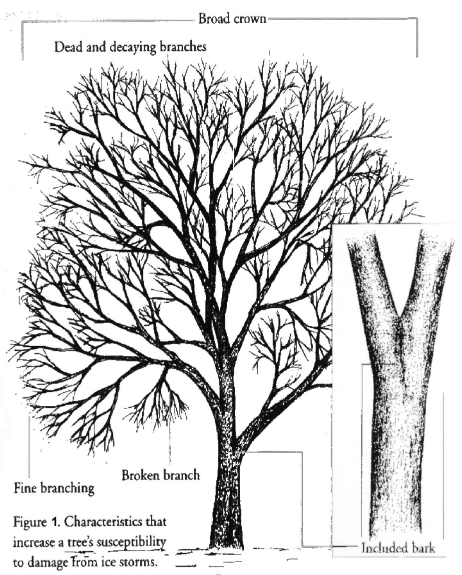

Figure 1. Characteristics that increase a tree's susceptibility to damage from ice storms.

A number of characteristics increase a tree species' susceptibility to ice storms: "included" bark, decaying or dead branches, increased surface area of lateral (side) branches, broad crowns, and imbalanced crowns (Figure 1). Included bark (inset) results from in-grown bark in branch junctures. This is a weak connection and enhances a tree's susceptibility to breakage under ice-loading conditions. For example, "Bradford" pear branches often break during ice storms where there is included bark in branch junctures. In contrast, the "Aristocrat" pear has few branches with included bark and sustains less damage during ice storms. Decaying or dead branches are already weakened and have a high probability of breaking when loaded with ice. The surface area of lateral branches increases as the number of branches and the broadness of the crown increase. With an increased surface area, more ice can accumulate on lateral branches; the greater ice load results in greater branch failure. Contrary to popular belief, the wood strength of sound branches matters less than the ability of a tree to withstand breakage at branch junctures and the presence of fine branching or a broad crown that enhances ice accumulation. Many broad-leafed tree species, when grown in the open, form broad crowns (decurrent branching), increasing their susceptibility to ice storms. Examples include Siberian elm, American elm, hackberry, green ash, and honey locust. Trees with imbalanced crowns are also more susceptible to ice damage.

Tree Features Influencing Ice Storm Resistance

Juvenile and mature trees that have excurrent (conical) branching patterns, strong branch attachments, and low surface area of lateral branches are generally resistant to ice storms (Figure 2). Many conifers have an excurrent branching pattern, and many resist ice storm damage. Some tree species, such as sweet gum, have an excurrent growth habit when young but develop a decurrent growth habit later in life. These species are more resistant to breakage when young than broadleaf trees that do not exhibit a juvenile excurrent branching pattern. Some tree species that typically exhibit a decurrent branching pattern have clones with an excurrent form, which should have greater resistance to ice storm damage. Tree species with strong branch attachments have greater resistance to breakage than those with included bark. Trees with coarse branching patterns (fewer, thicker branches) and, as a consequence, lateral branches with reduced surface area, such as black walnut, and ginkgo, accumulate less ice and typically have little breakage from ice storms. Forest understory tree species such as ironwood and blue beech and trees that mature at small heights, such as Amur maple, are also relatively resistant to ice storm damage.

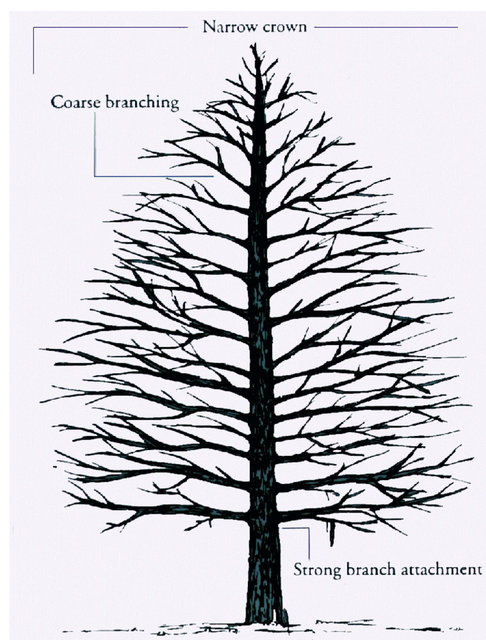

Figure 2. Characteristics that reduce a tree's susceptibility to damage from ice storms.

Ice Storm Damage Management and Prevention

Tree species resistant to ice damage can be planted to reduce tree and property damage from ice storms. Ice storm susceptibility should not be the sole criterion for selecting trees for urban planting, but the numbers of susceptible trees should be limited, particularly in regions with high frequencies of damaging ice storms. Ice storm resistance ratings of commonly planted urban trees are presented in Table 1.

For species not included in Table 1, resistance to ice accumulation can be estimated based on general tree characteristics. Tree species and cultivars genetically prone to forming included bark and those having decurrent branching patterns and large branch surface area will be more susceptible to damage. In contrast, species and cultivars with coarse branching patterns and excurrent branching and those that lack included bark and other structural weaknesses will generally be more tolerant to ice storms. However, ratings based directly on measurements and observations of ice-storm-related tree damage are more reliable when available. Proper tree placement and pruning on a regular cycle will reduce property damage and decrease a tree's susceptibility to ice storms. Property damage from trees broken by ice accumulation can be reduced by locating trees where they can do the least damage. Trees should not be planted in locations where their growth will interfere with above-ground utilities—branches that grow into power lines and fail during ice storms create power outages and safety hazards. Those trees located near homes and other structures should be pruned and monitored for hazards. Trees pruned regularly from a young age should be more resistant to ice storms as a result of removal of structurally weak branches, decreased surface area of lateral branches, and decreased wind resistance. Professional arborists can install cables and braces to increase a tree's tolerance to ice accumulation in situations where individual trees must be stabilized to prevent their failure. After storm damage has occurred, hazardous trees and branches require immediate removal to ensure safety and prevent additional property damage. Trees that can be saved should have broken branches properly pruned to the branch collar; stubs and flush-cut pruning result in weakly attached sprouts and future insect and disease problems. Loose bark should be cut back only to where it is solidly attached to the tree. A split fork can be repaired through cabling and bracing.

Table 1. Ice Storm Susceptibility of Tree Species Commonly Planted in Urban Areas

Susceptible	Intermediate resistance	Resistant
American elm	Bur oak	American sweetgum
American linden	Eastern white pine	Arborvitae
Black cherry	Northern red oak	Black walnut
Black locust	Red maple	Blue beech
Bradford pear	Sugar maple	Catalpa
Common hackberry	Sycamore	Eastern hemlock
Green ash	Tuliptree	Ginkgo
Honey locust	White ash	Ironwood
Pin oak		Kentucky coffee tree
Siberian elm		Littleleaf linden
Silver maple		Norway maple
		Silver linden
		Swamp white oak
		White oak

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