

## Structural Pruning Shade Trees

By Edward F. Gilman, professor, University of Florida; Brian Kempf, Urban Tree Foundation; Jim Clark and Nelda Matheny, Hortscience, Inc.

### KEY CONCEPTS

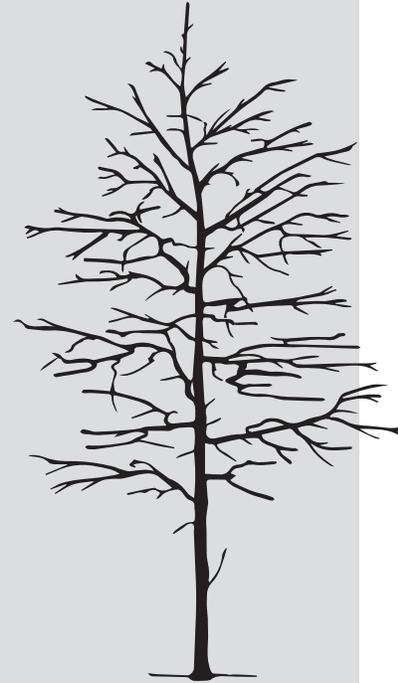
A landscape filled with strong, long-lived trees is most easily achieved when appropriate species selection and placement are combined with high-quality, arborist-friendly nursery stock (Figure 1), good planting techniques, and appropriate follow-up pruning. This article describes key concepts and an approach to pruning that promotes a sound tree structure that resists failure, provides clearance, and improves aesthetics while promoting long life.

From training young trees to managing mature ones, structural pruning to guide and manage tree architecture should be the primary goal each time a tree is pruned. Removing or subordinating defective parts of a tree allows other parts to grow larger, which promotes the formation of a stable structure and attractive form. A well-structured tree is aesthetically pleasing, preserves the crown as it grows larger, is long-lived, and provides benefits at low cost (Figure 2). Poor tree structure

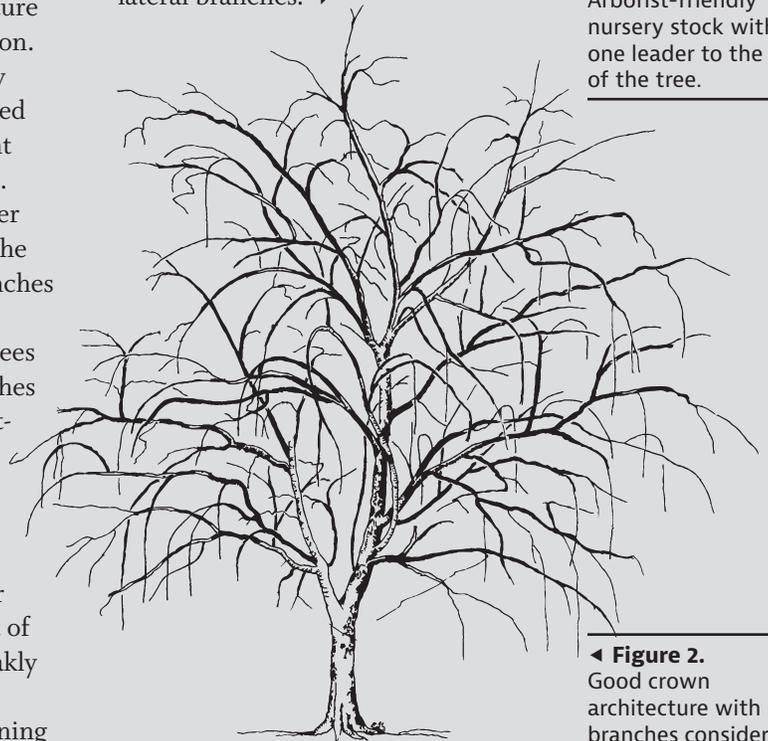
or poor branch structure can be costly, leading to failure and early tree removal.

Structural pruning in the landscape has two primary goals: to develop and maintain a single dominant trunk with smaller branches distributed horizontally and vertically around it; and to reduce the likelihood of tree failure caused by defects in structure and poor weight distribution. Large trees are structurally sound when they are trained to grow with one dominant trunk, or leader (Figure 2). Trees with branches smaller than half the diameter of the leader, and trees with branches spaced along the leader or trunk, are stronger than trees with large-diameter branches clustered together originating from one position on the trunk. Vigorous, upright branches that compete with, grow parallel to, or replace the leader often become a major part of the crown and may be weakly attached (Figure 3). These should be the focus of pruning efforts early in the tree's life.

One of the most important applications of pruning is subordinating codominant branches that compete with the central leader to create a single large trunk for 20 to 30 feet or more (see Figure 2). However, it is common for tree crowns to be raised by removing only small interior and low lateral branches. ▶



▲ **Figure 1.** Arborist-friendly nursery stock with one leader to the top of the tree.



◀ **Figure 2.** Good crown architecture with most branches considerably smaller than the dominant leader on 30-year-old tree.

# Cold Damage on Trees and Shrubs

Foliage, twigs, major branches and even the trunk can be damaged or killed on a cold night. This can occur even on shrubs and trees that are considered hardy in the region. A look at the USDA 1990 cold hardiness map shows that the winter of January through March 2012 brought a normal low temperature range to much of Florida and the rest of the country. This appeared to catch some people by surprise. Several situations lead to cold damaged trees and shrubs. First, for about 15 years, we have been planting trees and shrubs perhaps better suited for parts south of us. However, we all like to “push” a plant a bit farther north than recommended based on long term climate data. Trees and shrubs better suited for hardiness zone 10 have been planted, sometimes routinely, well up into zone 9. Some zone 9 plants have been planted in zones 8 or even farther north. Another cause of plant damage in winter 2010 was the extended period of cold weather. Few horticulturists can remember cold temperatures lasting for almost two weeks straight as occurred in winter 2010. This extended cold snap caused much of the damage. Cold damage symptoms include dead, sunken, cracked, or dark patches on the trunk. Bark often flakes off. Damage may be more prevalent on younger and smaller diameter twigs and branches.

Cankers may form on the trunk or branches caused by *Hypoxylon* and other fungi. Root pathogens such as *Armillaria* and others can cause root decline on weakened trees. Borers, beetles and other stress related insects may also cause infestations on weakened trees. Many damaged trees and shrubs display dead tops as shown in the nearby photo. Plants often sprout from internal portions of branches. Some sprouts might grow from branches with cracked bark. Severely damaged plants might also form sprouts along the trunk.

Cold damage treatment includes keeping the root zone moist in the year after the cold snap to promote root growth. No special fertilizer is necessary. Preventive applications for borer control could be indicated for valuable plants. Dead branches can be pruned cleanly back to the most distal sprouts any time following the damage. Allow the tree or shrub to grow on its own so it can rebuild its energy (starch) supply. This is accomplished by retaining all live foliage generated in the growing season following the damage. Restoration pruning can begin the next dormant season.

Proper plant selection and placement are the most important steps toward having a healthy landscape. Cold-sensitive plants should be placed in the warmest sites on your property. Usually a south-facing area protected by walls, fences or evergreen plantings will provide some plant protection. Plant in higher areas since cold air will settle in low areas. Also, poorly-drained sites result in weak, shallow-rooted plants which are more likely to suffer from cold damage. Best choice -- choose plants that will easily tolerate the temperatures you are likely to receive. ■

## Fall / Winter

### THE LANDSCAPE SHOW AND KNOWLEDGE COLLEGE

This annual showcase of the Florida Landscape Industry and the latest industry education features over 400 exhibitors and 7,500 attendees each year in late September and/or early October at the Orange County Convention Center in Orlando. For more information visit [www.fngla.org](http://www.fngla.org) or call 800.375.3642

### ASLA ANNUAL MEETING + EXPO

This annual meeting of Landscape Architects from around the country features the latest and greatest of Landscape Architecture. The event rotates around the county in September or October each year. For more information contact ASLA at [www.asla.org](http://www.asla.org)

### GREAT SOUTHERN TREE CONFERENCE + LANDSCAPE FIELD DAY

This annual meeting features a unique combination of indoor education with outdoor workshops featuring education for the landscape industry. This event is held in Gainesville, Florida each year in late November or early December. Visit [www.fngla.org](http://www.fngla.org) for more information or call 800.375.3642

### GULF STATES HORTICULTURAL EXPO

This annual showcase of the Landscape industry from around the Southeastern US brings hundreds of exhibitors to Mobile, Alabama each year in January. Visit [www.gshe.org](http://www.gshe.org) for more information.

## Spring / Summer

### ROOTS PLUS GROWERS

#### FIELD DAY

Annual workshop held in April or May showcasing the latest tree planting, installation & maintenance techniques for the Green Industry. For more information contact RPG at [www.rootsplusgrowers.org](http://www.rootsplusgrowers.org) or call 352.528.3880

### TREES FLORIDA

#### CONFERENCE + TRADE SHOW

Held annually in June The Florida Chapter ISA Conference features the latest in Arboriculture and speakers from around the country. For more information: [www.treesflorida.com](http://www.treesflorida.com)

### FL CHAPTER ASLA ANNUAL CONFERENCE + EXPO

Held each year in June or July, Landscape Architects from around the state gather to learn and network with the best in the business. For more information contact FC/ASLA at [www.flasla.org](http://www.flasla.org)

### ISA ANNUAL CONFERENCE AND TRADE SHOW

This worldwide gathering of Arborists features the latest in arboriculture and urban forestry in July or August of each year. For more information visit [www.isa-arbor.com](http://www.isa-arbor.com)

### NURSERY + LANDSCAPE EXPO

The biggest and the best landscape show in Texas rotates between Dallas, Houston and San Antonio each August. For more information visit [www.txnla.org](http://www.txnla.org)

# Cold Damage on Palms

Because palms can give any landscape a more tropical look, people attempt to grow them in climates that are decidedly less than tropical. While palms may survive, or even thrive, for years in climates cooler than those to which they are native, eventually they will experience temperatures cold enough to cause injury. This article describes how cold temperatures affect palms and how to treat them following cold weather.

#### TYPES OF COLD DAMAGE

There are essentially three types of cold weather events that can injure palms. Chilling injury occurs in tropical species at temperatures above freezing and occasionally as high as 50°F. For instance, a tropical palm acclimated to night temperatures of 70°F, but suddenly subjected to a single night of 45°F, may experience some foliar necrosis (dead tissue) as a result. However, if that same palm had experienced gradually decreasing temperatures over a period of weeks, it may not show any cold injury symptoms until exposed to temperatures in the low to middle 30s°F. Chilling injury symptoms include leaflet discoloration and/or necrosis, which occurs within days of the cold weather. Since newly expanded leaves are usually more cold hardy than mature leaves, the youngest leaves may be unaffected or show only mild symptoms.

Frost (radiational freeze) damage is similar to chilling injury in its symptoms, but occurs on clear nights when radiational cooling (heat loss) of the leaf surface can cause leaf temperatures to drop to 32°F or less, while air

temperatures may be several degrees warmer. The lack of air movement and protection of some parts of the crown from radiational heat loss mean that frost damage is often spotty in distribution, both among trees within a landscape and among leaves within a single palm crown.

The third type of cold weather damage is caused by an advective (hard) freeze, during which air and plant surface temperatures drop below 32°F due to the presence of winds that cause uniform cooling of all plants and plant parts within the landscape. One of the most common problems associated with advective freezes is that the freeze-killed lower portion of the spear leaf is degraded by secondary fungi and bacteria that were naturally present prior to the freeze. Several weeks after the freeze, the spear leaf can often be pulled out of the palm with little effort, and its base will be mushy and have an offensive odor. Meristem death in severe freezes may be caused by the cold temperatures themselves.

#### FACTORS AFFECTING PALM COLD HARDINESS

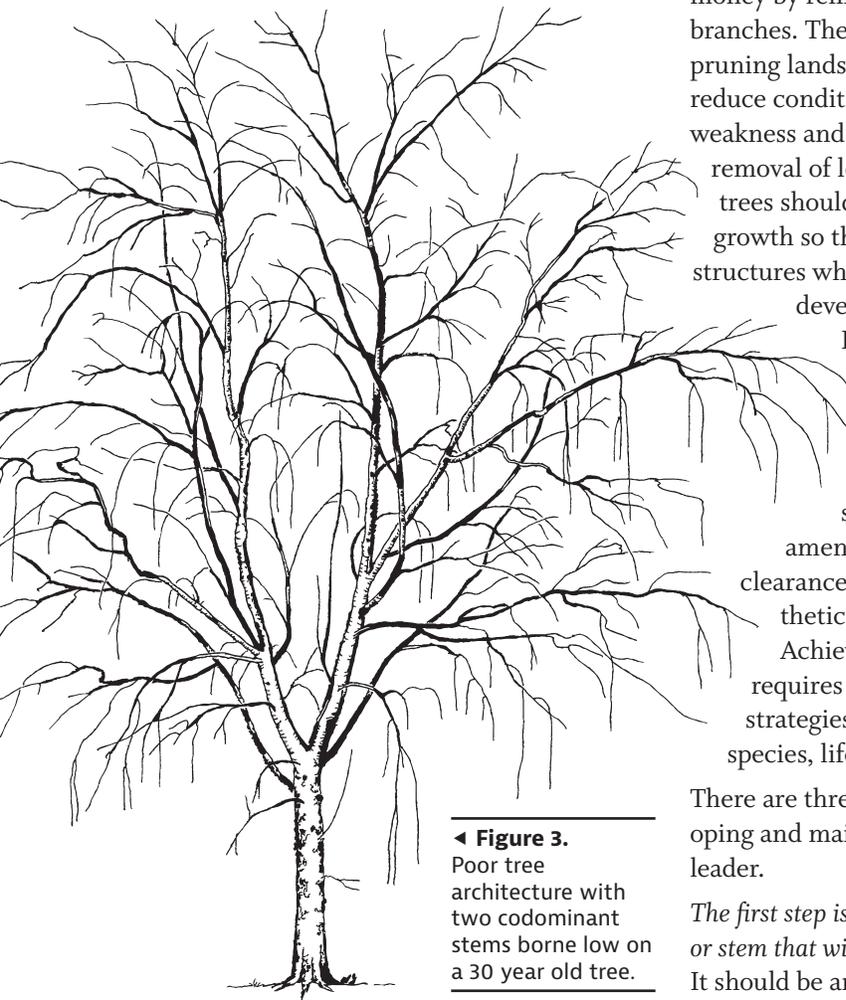
It is well known that palm species differ greatly in their cold hardiness. For any palm, planting them in areas protected by buildings or tree canopies can increase their chances of survival during cold weather. Recent studies have also demonstrated that proper fertilization can improve cold hardiness of palms. Although not documented experimentally, there is anecdotal evidence that overtrimming can also reduce palm survival rates following cold weather events.

#### TREATMENT OF COLD-DAMAGED PALMS

Since foliar necrosis is one of the first and most conspicuous symptoms associated with cold damage, palm owners are often anxious to trim off these affected leaves following a cold weather event. Avoid the temptation to remove these leaves until the danger of additional cold weather has passed. Even dead leaves provide some insulative value to the palm meristem. If the cold weather was sufficient to kill the spear leaf base and the spear leaf can easily be pulled out, it may be helpful to remove the spear leaf to allow for air movement and drying of the tissue. Drenching the bud area with a copper fungicide (not a copper nutrient spray or drench) to reduce the chances of secondary microbes killing the meristem may also be helpful. If the spear leaf does not pull out easily, it is likely that the spear leaf base has survived, and since the meristem is much hardier than the spear leaf base, it, too, should be alive. Fungicide treatment of such palms is probably unnecessary. ■

**Pruning** continued from page 1

This practice fails to address the poor structure in the largest branches. As a result, large branches grow up at a steep angle into the permanent crown in a manner not seen in most trees growing in their native habitat. These trees take on a low-branched codominant form in which aggressive upright-sweeping branches become susceptible to cracking or breaking as they grow long and heavy. In some species, these branches may grow quite large, sag, and interfere with people and structures, requiring removal. Trees pruned as those in Figure 3 can ultimately lose large sections of their crowns, which leads to reduced aesthetic value, increased cost of management, trunk decay, and shortened life.



◀ **Figure 3.**  
Poor tree architecture with two codominant stems borne low on a 30 year old tree.

This article introduces a standard approach that begins with structural pruning and may include other pruning methods as needed. Structural pruning trains young- and medium-aged trees by guiding future growth, and it also reduces defects in mature trees by shortening and thinning selected branches to subordinate and direct growth. In addition to pruning for clearance and aesthetics, structural pruning should be applied each time a tree is pruned, keeping in mind the tree's response or reaction to pruning.

#### THE STRUCTURAL APPROACH TO PRUNING

Other than for clearance of obstructed views, much of the pruning that is performed today accomplishes little or nothing of merit to the property owner or the tree. Unfortunately, this approach wastes money by removing the wrong branches. The primary focus when pruning landscape trees should be to reduce conditions that contribute to weakness and to prepare the tree for removal of low branches. Young trees should be pruned to guide growth so their crowns clear urban structures while ensuring that they develop strong structure.

Established older trees in urban landscapes should be pruned primarily to reduce risk, preserve a tree structure that boosts amenity values, provide clearance, and improve the aesthetic value of the property. Achieving these objectives requires different pruning strategies for trees of different species, life stages, and sizes.

There are three basic steps to developing and maintaining a dominant leader.

*The first step is to identify the branch or stem that will make the best trunk. It should be among the largest in*

diameter and in the center of the crown (but it does not have to be straight), and free of cracks, openings, mechanical damage, large pruning wounds, inclusions, cankers, or other defects that could compromise its strength.

*The second step is to identify the branches that are competing with this branch (i.e., those with a large aspect ratio, i.e. those that are large relative to the trunk).*

*The final step is to remove competing branches back to the trunk or subordinate them with a reduction cut, or a combination of both. Remove and/or reduce some branches that are clustered together and growing from the same point on the trunk.*

#### ESTABLISHING THE CENTRAL LEADER

In structural pruning, only the parts of the crown that contribute to weakness are pruned, in order to direct future growth into one leader. Structural pruning redistributes mass within the crown by subordinating or removing branches that compete with the leader or have inclusions, reducing aggressive or long branches, and thinning uncharacteristically dense clumps of branches high in the tree. Rather than a one-time event, structural pruning should be thought of as a process that trains and improves tree structure over a period of time. In this sense, it is like raising a child.

Other pruning methods on established trees, including crown cleaning (removing dead, touching, infested branches), thinning, reducing, and raising, can be applied according to desired objectives, while considering current structure, health, size, location in the landscape, species, presence of stress conditions, and other factors. A single pruning method need not be applied uniformly to the entire tree. For example, one side of a crown can be reduced to relieve a structural



► **Figure 4.** Structural pruning, before and after, on Yellow Tabebuia.

weakness, and the other side can be raised for clearance or thinned to balance the crown.

#### PRUNING DOSE

The pruning dose is the estimated amount of foliage or buds removed during pruning compared with the total amount on the tree prior to pruning. The ANSI A300 Standard recommends a pruning dose of less than 25% at any one pruning treatment; however, this represents an average of trees across all ages and health. Healthier and younger trees tolerate greater amounts of live branch removal than do mature or unhealthy trees. Larger doses can be applied to certain branches or sections of the crown to improve structure or for other reasons. For example, about 60% of the foliage and buds on a medium-aged tree may be removed from a large codominant branch to subordinate it; other portions of the tree may be lightly thinned in order to mechanically or visually balance the tree to improve aesthetics. Pruning a branch

slows growth on that branch in proportion to the pruning dose and can direct future growth by invigorating parts of the tree that were not pruned.

A large pruning dose is sometimes necessary to accomplish structural pruning objectives when poor structure exists. This can cause many hardwoods to generate sprouts from latent buds and adventitious points throughout the crown, but many grow from points near pruning cuts. Sugars and other growth substances generated by sprouts help the tree resist decay behind pruning wounds. These substances also help replace the stored energy removed with the live wood, thus sprouting is an acceptable condition when structural pruning. The growth rate of the most vigorous sprouts can be subsequently suppressed by reducing and removing them where necessary to prevent them from interfering with other branches and with each other.

Less-vigorous sprouts should be retained to help the tree slow the development of decay behind the pruning cut. Resist the temptation to remove sprouts entirely because they are an asset to a structurally pruned tree.

Trees can become a more sustainable resource when they are trained with structural pruning. Long-lived trees appropriately placed in the landscape provide appreciable benefits to urban and suburban landscapes. Training young and medium-aged trees to a dominant leader with smaller-diameter branches is the most reliable method of developing a sustainable tree structure. Maintaining this basic structure throughout the life of the tree minimizes risk of failure and provides for large, structurally sound trees. Although methods other than structural pruning can be used on trees, none help train and guide the tree into an improved branch structure. ■

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#### READ MORE

*An Illustrated Guide to Pruning*, Third edition (2012) by E. F. Gilman, Delmar Cengage Learning, Inc., 476 pgs.

# The Real Value of Trees

## WHAT TREES DO:

PRODUCE OXYGEN

CLEAN THE SOIL

CONTROL NOISE

SLOW STORM WATER

STORE CO<sub>2</sub>

CLEAN THE AIR

SHADE AND COOL

ACT AS WINDBREAKERS

FIGHT SOIL EROSION

ADD PROPERTY VALUE

The ISA Annual Conference in early August was hosted by the Pacific Northwest Chapter ISA in Portland, Oregon. This year's conference was a huge success drawing over 2,000 people with great educational programs, networking opportunities and the beautiful backdrop of northwest Oregon. One of the best ideas I saw during the conference is these tree price/benefit tags. These are not price tags in terms of the cost of the tree and installation but price tags in terms of the value the trees give back to the community. These tags show the value of the environmental and aesthetic benefits the tree provides. They were placed on trees throughout the event and really helped illustrate the important message that we all need to deliver to our customers and communities.

One method of determining the values that trees provide for our communities is through a program called i-Tree. i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban and community forestry analysis and benefits assessment tools. The i-Tree tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the environmental services that trees provide and the structure of the urban forest. i-Tree has been used by communities, non-profit organizations, consultants, volunteers, and students to report on the urban forest at all scales from individual trees, parcels, neighborhoods, cities, to entire states. By understanding the local, tangible ecosystem services that trees provide, i-Tree users can link urban forest management activities with environmental quality and community livability. Whether your interest is a single tree or an entire forest, i-Tree provides baseline data that you can use to demonstrate value and set priorities for more effective decision-making.

A recent analysis of street trees and canopy cover completed by the Wisconsin Department of Natural Resources showed that public trees in the Green Bay metro area provide \$6.14 million in annual benefits. In addition, the canopy analysis revealed that the Green Bay metro area is currently covered by 24% tree canopy with the potential of an additional 56% of canopy cover. The study highlights the significant benefits that community trees provide Green Bay area residents including the following: \$1.81 million per year in summer cooling and winter heating energy savings, \$1.78 million per year in storm water management savings by intercepting approximately 65 million gallons of storm water annually, \$2.02 million per year increase in local property values, \$296,206 per year in air quality improvement by mitigating harmful air pollutants, \$233,998 per year in atmospheric carbon dioxide reduction.

This is exactly the information we need to show to everyone in our communities so that both citizens and community leaders understand the importance of trees and that the benefits far outweigh the costs of investing in community trees and urban forests. ■

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## Trees Are Cool License Plates

With Florida's unique environment, extra attention must be paid to preserving our natural resources, especially our trees. By purchasing a TreesAreCool.com license plate you help underwrite programs that directly benefit the trees of Florida which help keep our state the uniquely beautiful place we all call home. Healthy trees benefit wildlife, increase property values and help cool and clean the air.

The Florida Chapter of the International Society of Arboriculture, a nonprofit organization, is committed to serving the needs of Florida's professional arborists and tree-care consumers. The TreesAreCool.com license plate revenues benefit our urban environment through tree research, the ongoing education of tree-care practitioners, and by providing public education programs about tree care and preservation.



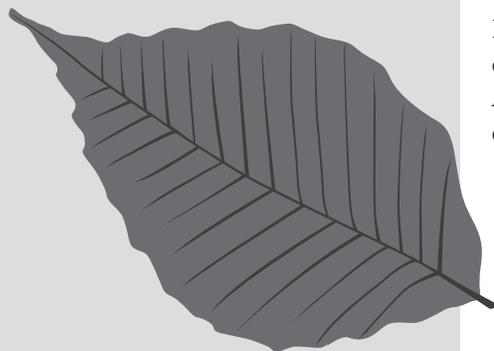
## What Is Hardening-off?

Quality field-grown trees should be hardened-off, or cured, after harvesting. This hardening-off process lasts 3 to 4 weeks and it simply involves providing the tree with optimum irrigation during the few weeks after harvesting. After the tree is hardened off it is ready to ship to the landscape site. New roots that have begun to develop are ready to grow immediately into the landscape. This may sound

like a simple idea but research has shown that hardened-off field grown trees are a superior performer in the landscape. Research conducted continues to confirm that quality field grown trees outperform container grown trees in landscape settings. Research has shown that field grown trees use water more efficiently at planting, establish faster after planting, are more wind resistant than container grown trees, and when planted with container trees in a situation of limited water or irrigation will have dramatically higher survival rates. All of these results are from peer reviewed research that has been published in various trade journals.

## Sleeve ≠ RPG

Regular buyers of field grown trees are most likely familiar with the black sleeve of weed-cloth like material over the root ball of each tree. This sleeve covers the wire basket after harvest and helps to prevent new roots from taking hold in the ground during the hardening-off period. Please note that though many growers ship trees with these sleeves over the root ball, that does not guarantee that the trees have been hardened off. Be sure to look for the RPG tag on the trees you buy as your guarantee of quality hardened off trees. Trees with a black sleeve does not necessarily mean the trees are RPG.



# Great Southern Retools for the Future

*Great Southern Tree Conference (GSTC)* has completed 11 years of a very successful partnership between the industry, FNGLA and the University of Florida. It has become the premier conference for growers and purchasers of landscape trees to exchange ideas and learn from one another. When the program started, the concept of a cutting-edge educational event, centered around an outdoor demonstration area, was a unique combination. The need for a better understanding of strong production techniques was critical to the tree industry. A place to incorporate needed industry research with an educational experience made this conference second to none across the country. As the committee reviewed past success of this program, they questioned; how can we continue to make this unique program and industry partnership successful and provide new and innovative information to the nursery and landscape industry?

The answer is that beginning with the 2013 conference the program will expand to build a strong landscape field day with successful elements taken from the *Great Southern Tree Conference* along with new research and educational opportunities for shrub growers, contractors, and others in the landscape profession. With a more diverse conference format and program content this educational model will continue to give our industry an exceptional educational opportunity.

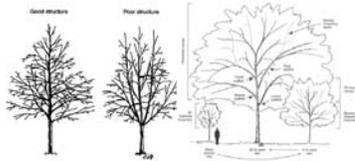
For 2012, there will be a one-day field day, held on Friday, November 30th in Gainesville, FL. As a culmination of 11 years of research and education, the program will demonstrate the key advances made in production and landscape maintenance practices. It will also provide an opportunity to present an expanded conference concept to industry segments other than tree producers.

# Tree Pruning Cue Card

provided by **Roots Plus Growers™**

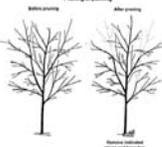
Trees with appropriately pruned crowns and roots become more stable and healthy. Here are some guidelines for executing these practices on young large-maturing shade trees.

- 1 Shade trees that will become large perform best in urban landscapes when grown with one trunk extending 30' or more into the crown. Large limbs should be spaced along this trunk, not clustered together at one point. Newly planted Florida #1 or better nursery trees have one trunk at least half way up the tree (left). Trees with more than one large upright trunk are considered lesser quality and more prone to failure in the landscape (right). (Below left illustration)

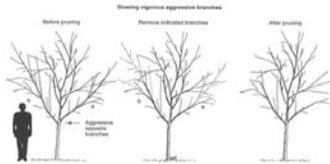


- 2 Trees with competing stems can be pruned so there is one trunk to the top of the crown (left). Pruning in this manner at planting and every few years results in a strong tree with one dominant trunk (center and right). (Above right illustration)

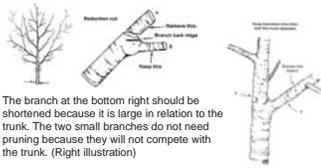
- 3 Removing or shortening competing upright stems back to lateral branches in the top half of the crown will encourage one trunk to dominate. The one trunk in the crown center should be more visible after pruning.



- 4 Shortening all large lower branches when the tree is young also forces more growth into one trunk which makes it strong. Trunk wounds will be small with little resulting decay when these shortened low branches are removed later.

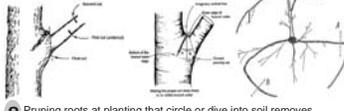


- 5 Reducing large stems and branches back to a live lateral branch slows growth on the pruned stem because foliage was removed. This shifts growth to the leader stem and encourages it to become the dominant trunk. (Below left illustration)



- 6 The branch at the bottom right should be shortened because it is large in relation to the trunk. The two small branches do not need pruning because they will not compete with the trunk. (Right illustration)

- 7 Branches are removed from the trunk and other branches by making 3 cuts to prevent bark tearing. Final cut is back to the branch collar. Cut as shown when the collar is not visible. (Below left and center illustration)



- 8 Pruning roots at planting that circle or dive into soil removes roots that could cause stability and health problems later. Cut at A not B. (Above right illustration)

## Structural Pruning Checklist

- ☞ Develop and maintain a dominant leader
- ☞ Identify the lowest branch in the permanent crown
- ☞ Prevent branches below permanent crown from growing too large
- ☞ Space main branches along the dominant trunk
- ☞ Keep all branches less than 1/2 the trunk diameter by shortening or thinning them
- ☞ Suppress growth on poorly attached branches

### PRUNING SAFETY

- ☞ Prune from the ground with proper tools and safety equipment
- ☞ Do not prune anywhere near powerlines
- ☞ Hire an ISA Certified Arborist for larger trees, if pruning cannot be done from the ground or if anywhere near powerlines
- ☞ Locate an ISA Certified Arborist at [www.TreesAreGood.com](http://www.TreesAreGood.com)



This tree pruning cue card provided to you courtesy of Roots Plus Growers & the Florida Chapter ISA visit them at [rootsplusgrowers.org](http://rootsplusgrowers.org) or [floridaisa.org](http://floridaisa.org)

# RPG Cue Cards

The Roots Plus Growers Association has developed a pocket guide for tree pruning. This 3 x 7" laminated Tree Pruning Cue Card is intended to simplify the tree pruning process by highlighting eight steps for successful and safe pruning.

RPG also provides the Tree Grading and Tree Planting Cue cards in both English and Spanish. Download a copy of each cue card at [rootsplusgrowers.org](http://rootsplusgrowers.org), or call 352-528-3880 to request yours today!

**English and Spanish cards are available right now!**



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