

# **APPENDIX A –STANDARDS AND SPECIFICATIONS FOR PURCHASING, PLANTING, AND MAINTAINING TREES**

This Appendix is a compilation of the *Guideline Specification for Nursery Tree Quality: Strategies for Growing a High- Quality Root System, Trunk, and Crown in a Container Nursery, and the Tree Care Cue Cards*. It has been prepared to instruct awardees on how to select, plant, and care for young trees.

Illustrations by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida; adaptations from *Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines*, 4th ed., by R. W. Harris, J. R. Clark, and N. P. Matheny (Prentice Hall, 2003). *Copyright © 2011 Brian Kempf and Ed Gilman.*

# Nursery Tree Quality

## I. GENERAL SPECIFICATIONS

Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by species and cultivar (as appropriate).

Compliance: All trees shall comply with federal and state laws and regulations requiring inspection for plant disease, pests, and weeds. Inspection certificates required by law shall accompany each shipment of plants.

Inspection: The buyer reserves the right to reject trees that do not meet specifications as set forth in these guidelines. If a defect or substandard element can be corrected easily, appropriate remedies shall be applied. If inspection of a root ball is to be done, the buyer and seller shall have a prior agreement as to the time and place of inspection, number of trees to be inspected, and financial responsibility for the inspected trees.

Delivery: The buyer shall stipulate how many days prior to delivery that delivery notification is needed. Buyer shall stipulate any special considerations to the nursery prior to shipment.

## II. HEALTH AND STRUCTURE SPECIFICATIONS

These specifications apply to deciduous, broadleaf evergreen, and coniferous species. They do not apply to palms. Note that leaf characteristics will not be evident on deciduous trees during the dormant season.

Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar. The leader shall be intact to the very top of the tree.

Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of moisture stress as indicated by wilted, shriveled, or dead leaves.

Branches: Shoot growth (length and diameter) throughout the crown shall be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.

Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds (except properly made pruning cuts), sunscald areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, cankers, girdling ties, or lesions (mechanical injury). The terminal bud on the leader shall be intact to the very top of the tree, and it shall be the highest point on the tree.

Roots: The root system shall be substantially free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Root distribution shall be uniform throughout the container substrate and shall be appropriate for the species or cultivar. At time of inspection and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots. (see Figure 7)

See Texas A&M Forest Service's "[Selecting a Tree](#)" video for further clarification.



Figure 1.

Trees shall have one relatively straight central leader or be structurally pruned to only leave one central leader (Figure 1).



Figure 2.

Desirable

Not desirable

Main branches (Figure 2) shall be well distributed along the central leader, not clustered together. They shall form a balanced crown appropriate for the cultivar or species.

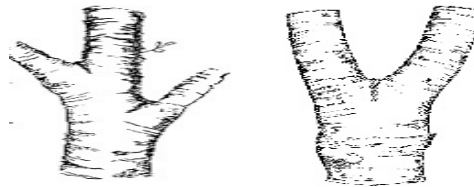


Figure 3.

Desirable

Not desirable

The diameter of branches (Figure 3) that grow from the central leader, or trunk, shall be no larger than two-thirds (one-half is preferred) the diameter of the trunk measured just above the branch.

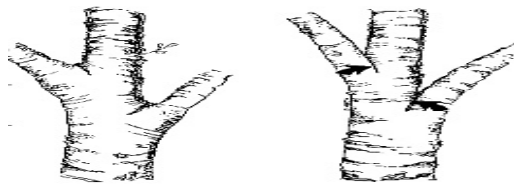


Figure 4.

Desirable

Not desirable

The largest branches shall be free of bark inclusions that extend into the branch union (Figure 4).



Figure 5.

Desirable

Not desirable

Small-diameter branches (Figure 5), particularly on trees less than 1-inch caliper, should be present along the lower trunk below the lowest main branch. The trunk shall be free of wounds, sunscald areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, cankers, or lesions. Properly made recent or closed pruning cuts are acceptable.

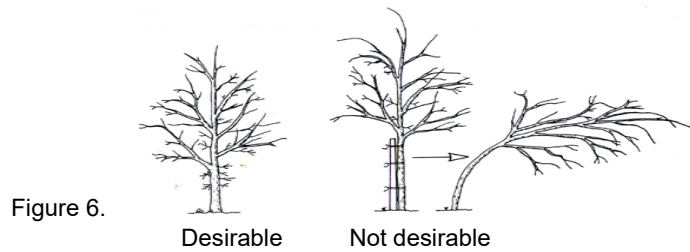


Figure 6.

The trunk caliper (diameter) and taper (Figure 6) shall be sufficient so that the tree remains vertical without a stake.

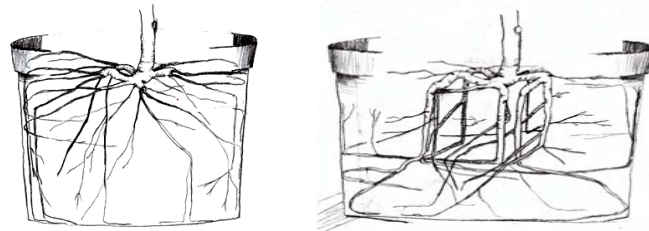


Figure 7.

The root collar (the uppermost roots) (Figure 7) shall be within the upper 2 inches of the soil media (substrate). The root collar and the inside portion of the root ball shall be free of defects, including circling, kinked, and stem-girdling roots. Roots at the surface should grow mostly straight to the side of the container. You may need to remove soil near the root collar to inspect for root defects.

The tree shall be well rooted in the soil media. Roots shall be uniformly distributed throughout the container, meaning that roots should not be concentrated at the bottom of the root ball. Some roots should contact the container wall in the top half of the root ball (Figure 7). When the container is removed, the root ball shall remain intact. When the trunk is lifted, both the trunk and root system shall move as one. The imprint of the liner or smaller container shall not be visible (Figure 7).

The root ball shall be moist throughout at the time of inspection and delivery. The roots shall show no signs of excess soil moisture as indicated by poor root growth, root discoloration, distortion, death, or foul odor. The crown shall show no signs of moisture stress as indicated by wilted, shriveled, or dead leaves or branch dieback.

# Tree Planting

**Selecting quality trees:** Planting quality trees begins by selecting the right tree for the right location and choosing vigorous, structurally sound trees from the nursery.

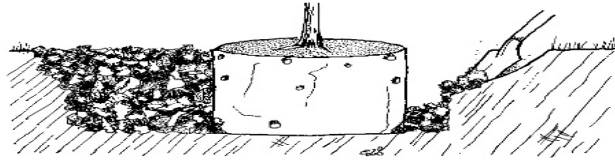


Figure 8. Loosening soil in a large area around the root ball allows for rapid root growth and quick establishment.

**Digging the hole:** A firm, flat-bottomed hole will prevent trees from sinking. Dig the hole only deep enough to position the root collar 1 to 2 inches above the landscape soil surface (Figure 8). Dig the hole 2 to 3 times the width of the root ball. This loose soil promotes rapid root growth and quick establishment.

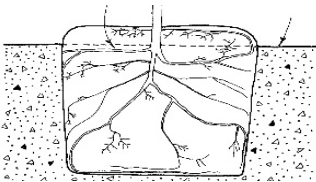


Figure 9. Remove soil and roots growing over the root collar and place collar 1 to 2 inches above soil surface.

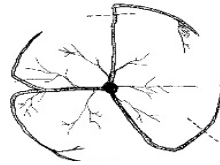


Figure 10. Cut roots at to form new roots that grow away from the trunk. Do not cut roots at since the root defects will regrow.

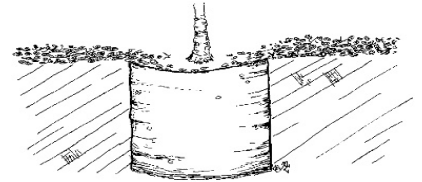


Figure 11. Mulch shall taper to a slightly thinner layer on top of the root-ball.

**Installing the tree:** Remove soil and roots from the top of the root ball to expose the root collar; cut away any roots that grow over the collar (Figure 9). Cut any roots that circle or mat along the sides and bottom of the root ball (Figure 10). The root collar shall be 1 to 2 inches above the landscape ground level to allow for settling after planting (see Figure 9). Backfill with soil removed from the hole. Minimize air pockets by packing gently and applying water. Build a berm around the root ball to help force water through the root ball.

**Mulching:** A layer of organic mulch, such as leaf litter, shredded bark, or wood chips, helps protect tree roots from temperature extremes and conserves soil moisture. Mulch also helps prevent grass from competing with the tree for water and nutrients. The mulched area makes it easier to operate mowers and weed eaters without hitting the trunk and compacting soil. Apply mulch to a depth of 2 to 3 inches (Figure 11). Mulch should be kept away from contact with the trunk.

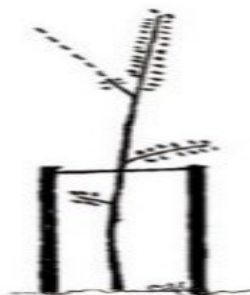


Figure 12. Double

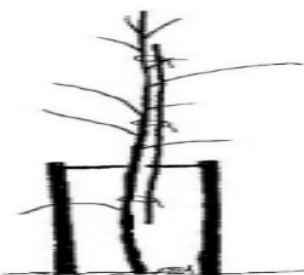


Figure 13. Double staked with splint stake.



Figure 14. Single staked with splint stake.

**Staking:** The method of staking is dependent on a tree's ability to stand on its own and the location of the planting site. If the tree can stand on its own, it does not need to be staked. Staking is used to hold trees erect, allow the root ball to anchor, and protect the trunk from damage by equipment. The ties around the trunk and to the stakes should not be tight – the tree should be able to move slightly in the wind. Stakes should be removed when the tree can stand on its own and the root ball is anchored. Stakes should be positioned away from the tree and secured to the trunk at the point where the tree stands straight. Do not use wire or any strap that will

girdle the tree or damage the bark. Acceptable staking examples may be seen in Figures 12, 13, and 14. Another acceptable method of staking is the use of tree anchor stakes which are driven completely through the root ball into the firm soil below.

See Texas A&M Forest Service's "[How to Plant a Tree in your Yard](#)" video for further clarification.

# Tree Training in the Early Years

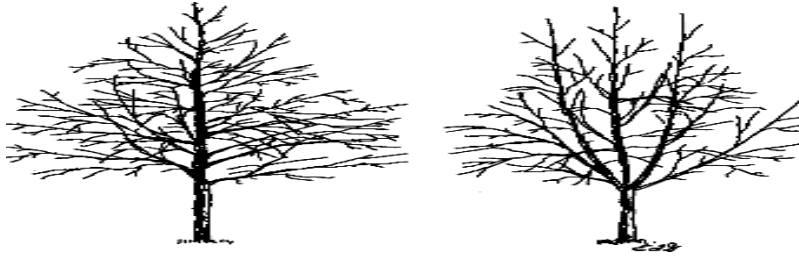


Figure 15. Good tree structure (left); poor structure (right).

Trees with branches spaced along the central leader, or trunk (Figure 15) are stronger than trees with branches clustered together (Figure 15). Prune trees at planting to one central leader by removing or shortening (shown) competing stems (Figure 16). All branches and stems shall be considerably shorter than the central leader after pruning is completed (Figure 16).

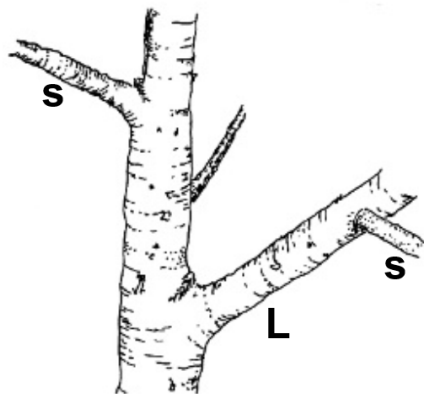


Figure 17. Only large branches need pruning (L). Small branches (S) do not need to be pruned.

Remove or shorten branches that are larger than half the trunk diameter at planting. (Figure 17). The central leader shall be more visible in the crown center after pruning. Only large-diameter branches need to be pruned because they compete with the leader and could be weakly attached (Figure 17, L). Small branches (Figure 17, S) do not need pruning because they will not compete with the leader.

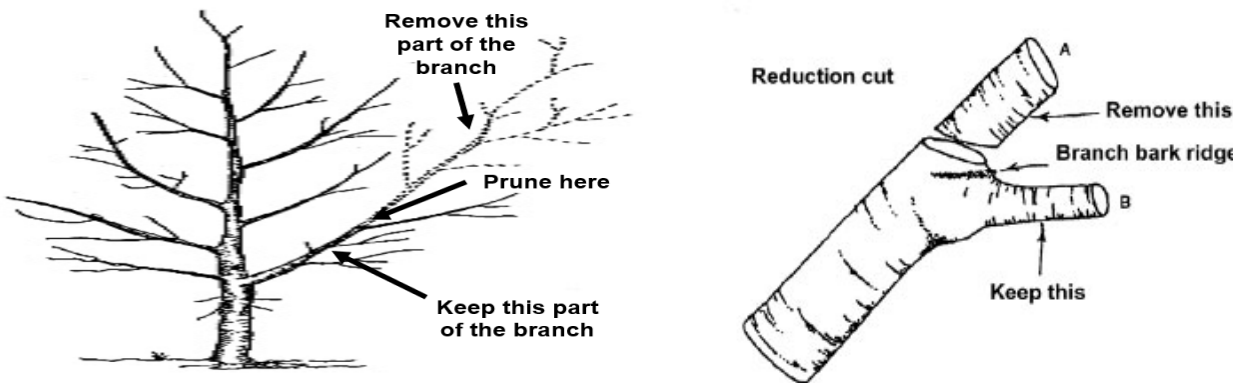


Figure 18. Shortening larger low branches concentrates growth in the leader and improves tree structure.

The best way to shorten large or long stems and branches is to cut them back using a reduction cut to a live lateral branch (Figure 18). This slows growth on the pruned parts and encourages growth in the dominant leader creating sound structure. Reduction cuts can be used on trees at planting to subordinate branches that are codominant (Figure 18). Some upright stems and branches can be removed entirely back to the trunk.

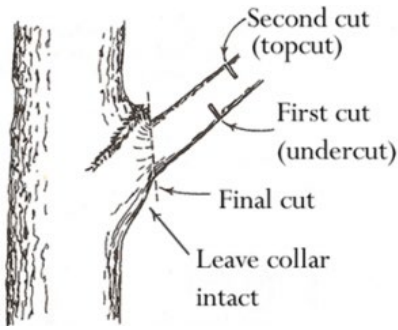


Figure 19. The 3-Cut Method

Remove larger branches by making three cuts (Figure 19). This prevents the bark from peeling or splitting off the trunk below the cut. Make the final cut back to the branch collar (enlarged area around union of branch where it joins the trunk).

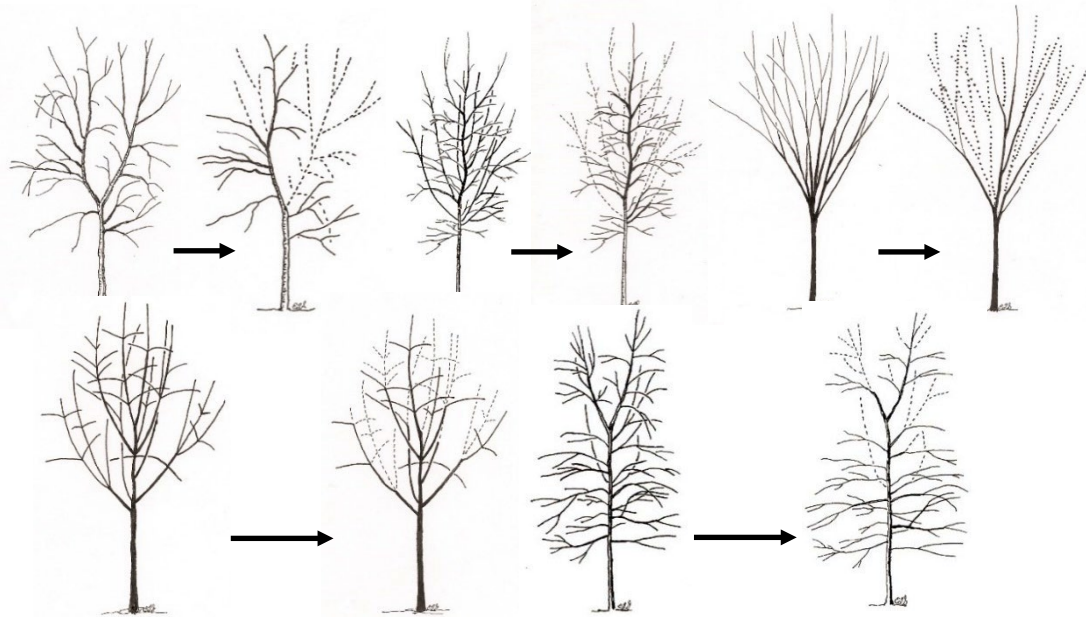


Figure 20. Before and after pruning at planting

Structural Pruning Checklist

1. Develop and maintain a central leader.
2. Prevent branches below the permanent crown from growing larger than half the trunk diameter.
3. Space main branches along the central leader.
4. Reduce vigorous upright stems back to lateral branches or remove entirely (Figure 20).



# Irrigation

Consistent irrigation is critical for tree establishment.

- At planting, water immediately: first apply 25% of the tree's original container volume, let the soil and tree settle for a few minutes, straighten the tree, re-stake if necessary; then apply a second application of 25% of the container volume.
- Apply 5 gallons of water per inch of trunk diameter over the root ball 12 times per month for the first three months. Water quantity may be increased during the summer and decreased during the winter. Adjust as needed to prevent the soil from drying out or staying saturated.
- Increase volume and decrease frequency as the tree becomes established. Weekly irrigation during the second year and bimonthly irrigation during the third year should be sufficient for establishment.
- Once established, irrigation requirements depend on species, planting site, climate, and soil conditions.
- Irrigation devices should be regularly checked for breaks and leaks.
- If recycled water of adequate quality is available, consider its use if the species has been determined capable of tolerating recycled water while complying with all state permitting requirements.

Year	Amount	Frequency
<b>YEAR 1</b>		
First month after planting	Trunks smaller than 2" (5 cm): 3 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 5 gallons per inch of trunk diameter.	Water three (3) times a week over the root ball.
Second month after planting	Trunks smaller than 2" (5 cm): 4 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 6 gallons per inch of trunk diameter.	Water two (2) times a week over the root ball.
Third month after planting	Trunks smaller than 2" (5 cm): 5 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 7 gallons per inch of trunk diameter.	Water once (1) per week over the root ball.
Fourth to ninth month after planting	Trunks smaller than 2" (5 cm): 7 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 10 gallons per inch of trunk diameter.	Water twice per month over the root ball.
<b>YEAR 2</b>		
Hottest months	Trunks smaller than 2" (5 cm): 5 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 7 gallons per inch of trunk diameter.	Water twice per month over the root ball only. During a drought, water once weekly.
Cooler months		Monitor and respond.
<b>YEAR 3</b>		
Hottest months	Trunks smaller than 2" (5 cm): 5 gallons per inch of trunk diameter.  Trunks larger than 2" (5cm): 7 gallons per inch of trunk diameter.	Water twice per month, twice the width of the root ball. During a drought, water once weekly.
Cooler months		Monitor and respond.