South Carolina's Urban Tree Care Book

How to Grow Healthy, Beautiful Trees in the Urban Environment

produced by the South Carolina Forestry Commission

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South Carolina's Urban Forestry

Tree Care Book

People NEED trees. They cool our cities on sweltering summer days, give us oxygen to breathe, filter pollutants from the air, hold our soil in place, provide food and homes for birds and other wildlife, and beautify the landscape. But trees need people, too!

Many people think that trees will grow and be healthy without our help, but for trees to thrive we must care for them. Start by selecting the right species of tree to plant on the site, plant the tree properly, then provide timely maintenance throughout its life.

For information on selecting the right species of tree and a listing of species which perform well in South Carolina, refer to the South Carolina Forestry Commission's and Clemson University's "Urban Tree Species Guide: Choosing the Right Tree for the Right Place". The techniques of tree planting and tree care are explained in this guide.

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The Value of Trees

The value that people place on trees and other natural resources in an urban setting is high. Ironically, the stresses on these ecosystems, most of them caused by people, are also very high. As home owners, managers, planners and policy makers whose decisions impact the urban forest, we need to take steps to ensure trees survive and flourish for future generations.

Healthy community forests have a direct impact on economic vitality, job creation, environmental quality, and human physical and mental health. Trees are a perfect tool for addressing a number of needs in our populated places.

Trees...

- Increase property values and enhance economic stability
- Contribute to community pride and feelings of ownership
- Reduce storm water runoff thereby reducing soil erosion and sedimentation in waterways
- Filter out particulate pollutants (dust, ash, pollen, and smoke) in the atmosphere
- Absorb CO₂ and other dangerous gases and, in turn, replenish the atmosphere with Oxygen
- Provide cooling shade, reducing the high energy costs of urban "heat islands"
- Create habitat for wildlife
- Beautify urban areas and give human scale to built environments
- Provide privacy and a sense of security
**Selection**

Trees, like people, are particular. They thrive in some environments and wither in others. Take note of the site conditions before you select a tree. Then select a tree that is best suited to the existing conditions. Site conditions to notice include soil, moisture, light, and space.

**Soil:** Physical soil conditions, especially the degree of compaction, likely have the greatest impact on tree survival, growth and health. If the soil is very compact, select trees that tolerate low soil oxygen levels and be sure to loosen the soil around the planting hole. Soil pH, the degree of acidity or alkalinity in the soil, is also important as it affects the availability of nutrients and the activity of beneficial soil microorganisms. Determine the soil pH through a professional soil test and choose a tree species that grows well in that range. Soil testing service information is available through your local county Clemson University Extension Service office.

**Moisture:** Either too much or too little water will limit tree growth. If the site has a high water table select species that tolerate wet sites (i.e. with low soil oxygen levels). If the planting site has sandy soil, compacted soil, is on a slope, is under the canopy of other trees, or is immediately surrounded by turf or other growing plants, plant roots may endure lengthy dry spells. With these conditions select drought tolerant plants. Do remember however, that all plants even drought tolerant ones need to receive adequate moisture until they are established. Trees generally take from one to three years to establish after planting.

**Light:** Determine the number of hours of direct sun the planting site receives in summer, since different tree species require differing amounts of sunlight. Trees requiring full sun (like most large maturing trees) should receive six or more hours of direct sunlight per day. Trees that prefer part sun or part shade conditions (like flowering dogwood) require between three and six hours of direct sun and usually benefit from afternoon shade.
Space: Be aware of above-ground conflicts such as overhead wires, buildings, signs, other trees, etc., that would restrict tree growth.

Select trees that will have a mature size and form that fits within the space available. Underground space is critical for sufficient root system development and tree health. Root systems can be very extensive, spreading a distance two times the height of the tree or more. Yet, most of the roots will be in the top eight to ten inches of the soil. Once your planting location has been chosen, and before you dig, call your local utility locator company to avoid breaking lines while digging. This is a free service that will identify any underground utility lines at or near your planting site.

Planting

Whenever possible schedule your planting during the dormant season when trees are not actively growing. Dormancy is from the time trees shed their leaves in fall until new growth appears in spring. Fall planting is best since the roots have more time to become established before leaves emerge. Planting may be extended through spring if trees are watered regularly.

Current techniques for tree planting require preparation of a large planting bed with favorable conditions for root growth. Successful planting will involve locating the root flare of the tree; digging a shallow, wide hole; backfilling with existing soil; watering and mulching.

Locating the root flare is easy. Before digging, find the topmost root growing from the trunk of the tree. This is called the root flare area. Remove any soil above that point across the entire root ball. Measure from the topmost root to the base of the root ball to determine the height of the root ball.

Dig the planting hole roughly three times wider than the diameter of the root ball. Dig no deeper or slightly less deep than the height of the root ball. The hole should be bowl-shaped with sloped sides. Set the soil you remove from the hole aside. You will need it later.
Place the tree in the hole so that the top of the ball (root flare) is even with the soil level. Do not cultivate the soil in the bottom of the hole as loose soil may then settle and the tree will be planted too deep. Remove any burlap, wire, twine, or strapping. For container grown trees, if there are any visible circling roots, make four or five vertical slits along the sides of the root ball. This will encourage new root growth for faster establishment as well as stop the roots from circling.

Back fill with the soil that was removed from the hole. Don't amend the soil with peat moss, other soil, or fertilizer. Tamp the soil lightly but do not compact.

Form a one to two-inch berm or ridge of soil around the edge of the planting hole to hold water. Fill the "saucer" with water once or twice.

Mulch the root ball surface and planting area. Use three to four inches of organic material such as shredded wood, bark chips or pine straw. Keep the mulch one or two inches away from the trunk.

Keep the tree well watered until it is established. This usually takes from one to three years. Unless there is sufficient rainfall to moisten the entire planting area (depth as well as width), water every day for two weeks and every other day for two months, and then weekly until the tree is established. Remember that watering frequency depends on many factors: rainfall, temperature, and soil type. When watering, use two gallons of water per inch of trunk diameter. Do not water if the soil is already wet.
Prune only broken or dead branches at planting time. Structural pruning and fertilizing may begin after one full year of growth.

Staking is only necessary in extremely windy areas. Anchor the tree with two stakes (2x2") on either side of the root ball. Make sure the stakes are long enough to drive into the soil. A cross piece is attached with screws or nails. Untreated wood should be used. On smaller trees, a single anchor is sufficient. The wooden anchor can be hidden with mulch. This system eliminates the need for guy wires.

Mulching is one of the most beneficial things that can be done for the health and growth of a tree. The benefits of vegetative mulch include, but are not limited to: increasing soil organic matter content; retaining soil moisture; reducing weed seed germination; and reducing soil temperature fluctuations. In addition, mulch may deter mowing and string trimmer operators away from tree trunks and result in fewer injuries to the tree.

The root system of a tree is limited by space, oxygen, water and nutrients. Depending on these factors, roots can extend out a significant distance from the trunk. Most of the fine, absorbing roots are located within inches of the soil surface and extend out past the drip line (the outermost extension of the canopy). These roots are essential for taking up water and minerals and require oxygen to survive. A thin layer of vegetative mulch applied as broadly as practical, can improve the soil structure, oxygen levels, temperature, and moisture availability where these roots grow.

Mulch is available commercially in many forms. The two major types of mulch are vegetative, also referred to as organic and inorganic.
Vegetative or organic mulch includes wood chips, pine needles, hardwood and softwood bark. Organic mulches decompose in the landscape at different rates depending on the application and thickness. Those that decompose faster must be replenished more often. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider decomposition a positive characteristic, despite the added maintenance.

Inorganic mulches include various types of stone, lava rock, shredded rubber, geotextile fabrics and other materials. Inorganic mulches do not provide any significant benefits to the tree. Most horticulturists and arborists prefer organic or vegetative mulch.

**Not Too Much!**

As beneficial as mulch is, too much can be harmful. The generally recommended mulching depth is 2 to 4 inches. Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark or it may lead to insect and disease problems. Thick blankets of fine mulch can become matted and prevent the penetration of water and air.

**Watering**

The most limiting factor for newly planted tree growth and survival is lack of adequate water. Newly planted trees should be regularly watered for the first three growing seasons or until established. Water newly planted trees every day initially, then every other day, then once a week depending on soil conditions and rainfall. Weekly watering should continue until the tree is established in the landscape.

A good slow soaking over several hours is best, and may be done with an oscillating sprinkler, a soaker hose, a Treegator watering bag, or a slow-drip bucket. Watering should be focused on the root ball, the planting area, or in mature trees, under the canopy. Don't overwater. Too much water can kill a tree by eliminating the oxygen from the soil. The soil should not stay saturated, but have time to dry out between waterings.

As a general rule: 2 gallons of water should be applied for every 1" of tree diameter.
Fertilization

First, determine why you wish to fertilize. Is it to push growth or increase vitality of the plant? Or are you fertilizing to correct an observable problem? Mature trees growing in favorable soil conditions may not require any supplemental fertilization.

If your intent is to encourage growth, flowering, fruiting, or simply enhance vitality remember to wait until at least one year after planting to apply fertilizer. Also, be sure to utilize other cultural practices such as selecting the right tree for the right place, proper planting, sufficient watering, and mulching.

The ideal time to fertilize is after bud break in the spring and before color change in the fall. Fertilizer **should always** be applied to moist soil and watered in afterward to improve uptake and to reduce the chance of root injury.

Fertilizer is *not* plant food, but a mix of essential elements necessary for plant growth. The most common nutrients found in fertilizers are nitrogen, phosphorus, and potassium, abbreviated as N, P, and K.

If you are trying to correct a problem, then it is important to determine what the cause of the problem is prior to responding with fertilizer. A professional soil test and/or foliar nutrient test can help identify or rule out soil nutrient deficiencies or imbalances. The soil test will not tell you if your problem is due to physical, rather than chemical problems. Many plant health problems are physical, such as soil compaction, tree root mechanical damage (perhaps due to trenching or construction work) or improper placement. A site visit from a professional arborist may be the best way to properly identify the type of plant health care problem you are experiencing.

Soil test and foliar analysis reports are available from the Clemson University Extension Service for a fee. Your local county office can supply you with information on how to take a soil and/or leaf sample. The soil test report will identify if your soil pH (relative acidity) is correct for your species of tree and identify the soil nutrient levels and salt content of the soil. The report will also tell you what to add to the soil in order to correct identified problems. The foliar nutrient report will identify nutrient deficiencies but will not tell you why they occur.
Fertilizer is not a cure-all for declining trees, but may be used to complement other tree activities, such as watering and mulching.

**Application rate:**

In the absence of a soil analysis, a fertilizer ration of 3:1:1 or 3:1:2 should be used. For palms, the ratio should be 3:1:3. These numbers refer to the percent content of nitrogen, phosphorus, and potassium respectively. Slow-release nitrogen fertilizer and a salt index of less than 50 are preferred.

- **Slow-release fertilizer** should be applied at rates between 2-4 lbs. of actual N/1000ft².
- **Quick-release fertilizers** should be applied at rates between 1-3 lbs. of actual N/1000ft².

A soil test is the best method for determining what is lacking in the soil. For most areas the following guidelines based on the distance from the trunk to the edge of the branches may be used for fertilizing established trees:

**STEP 1** Measure the distance from the trunk to the edge of the branch spread; this is the dripline radius.

**Dripline Radius = distance from edge of branch spread to trunk.**

**STEP 2** Use the table on the following page to determine the amount of fertilizer to apply. Find the dripline radius in the left column, then look in the appropriate column for the type of fertilizer that you are using to determine how many pounds of the fertilizer to apply.

<table>
<thead>
<tr>
<th>BEST Ratio</th>
<th>Good Ratio</th>
</tr>
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<tbody>
<tr>
<td>3:1:1</td>
<td>3:1:2</td>
</tr>
<tr>
<td>N:P:K</td>
<td>N:P:K</td>
</tr>
</tbody>
</table>
## Fertilizer Application Rate

<table>
<thead>
<tr>
<th>Dripline Radius (feet)</th>
<th>Pounds 10-10-10 to apply</th>
<th>Pounds 16-4-8 to apply</th>
<th>Pounds 30-10-10 to apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'</td>
<td>.8</td>
<td>.5</td>
<td>.3</td>
</tr>
<tr>
<td>4'</td>
<td>1.5</td>
<td>1.0</td>
<td>.5</td>
</tr>
<tr>
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<td>7'</td>
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</tr>
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<tr>
<td>30'</td>
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<td>53.0</td>
<td>28.0</td>
</tr>
</tbody>
</table>

One pound of fertilizer is approximately two 8 oz. clips.

If the area under the branches is restricted by sidewalks or driveways, or the root system has been damaged by construction, this area should be subtracted from the fertilization application area and the rate should be reduced by an equal percentage to avoid damage to the tree.

### Application Method: for mature trees

A broadcast method may be applied to the soil surface, starting near the tree trunk and extending several feet beyond the furthest branch tip. If the soil is compacted or grass is present, you may want to consider the drill hole method of fertilizer application instead.

The drill hole method requires that holes be dug in a grid pattern starting near the trunk and extending slightly beyond the...
edge of the branches. Holes should be 4"-8" deep and 2"-3" in diameter, and may be made with a drill auger, pipe, or broom handle. Fill holes with specified amount of fertilizer leaving a space 2" from the top of the fertilizer to fill with soil. The total amount of fertilizer should be divided evenly among the holes. The increased amount of air available to the roots is often as beneficial as the fertilizer.

**WARNING**

*Do not use herbicide-type fertilizers or soil sterilants in the area beneath the branches of trees which may cause tree damage or mortality.*

Arborists frequently apply liquid fertilizer through a probe into the soil which results in faster uptake by the trees, and a more visible response. Injecting or implanting fertilizer into the trunk is useful for specific nutrient deficiencies or where root area is limited. But since trunk injection and implants wound the tree, their use should be limited and performed by professional certified arborists.

**Pruning**

Pruning is a tree maintenance practice that when performed properly, can help remove weakly attached limbs, improve the safety and appearance of a tree, and correct structural problems. Pruning live wood removes the trees food factories (leaves) and creates wounds.

Pruning is probably the most misused and misunderstood tree maintenance practice. Incorrect pruning may even kill a tree.

Avoid the need for excessive pruning by planting the right species in the right place. Refer to the Urban Tree Species Guide: Choosing the Right Tree for the Right Place for a list of small trees suitable for planting under utility lines. This guide is available from the SC Forestry Commission and Clemson University. Begin to prune while the tree is young, removing problems while they are small. Pruning mature or large trees should be left to professional arborists.

**What to prune:**

- Dead, diseased, or broken branches are hosts for decay fungi and should be removed promptly. When pruning diseased branches, dip the pruners in household bleach or rubbing alcohol before storing or making the next cut.
• Double leaders or branches that fork at a narrow angle are more likely to split. Ideally, the branch angle should be at 10 or 2 o'clock. When pruning, leave branches with wide angles.

• Remove nuisance growth. Prune to remove low limbs over sidewalks and roads which limit their use or present a safety hazard. Remove branches that may interfere with utility lines in the future.

• Remove sprouts and suckers at the base of the tree or inside the crown that are upright and grow rapidly.

When to prune:

The best time to prune live limbs is during late winter or early spring before leaves emerge. Avoid pruning when leaves are expanding since this is more likely to cause heavy sap flow. Prune dead, diseased and broken limbs as soon as you notice them; prompt pruning prevents the spread of decay and cavity development within the tree.

How to prune:

Step 1 Cut through 1/2 of the branch from underneath about a foot from the trunk. This will prevent stripping or peeling the bark off of the trunk.

Step 2 A few inches further from the first cut, make the cut from the top of the branch downward. This will remove the entire branch.

Step 3 Locate the branch collar, (a layer of wrinkled bark where the branch attaches to the trunk) and the branch bark ridge (a raised area of bark at the branch/trunk union). Make the final cut just outside of the branch collar and the branch bark ridge, at a slight downward angle. Do not cut into the collar or leave a stub.

To cut small twigs, use a set of hand pruners. For small branches use loppers. For large
limbs use a hand-saw. All tools should have sharp blades as clean cut wood closes (forms callus tissue) faster than jagged wood. Hand tools with by-pass blades are preferred. Anvil type blades, where the blades meet, should be avoided as they crush plant tissue.

To shorten a branch, or reduce tree height or tree spread, use the reduction pruning method. This method can redirect tree growth without severely damaging or topping the tree. Begin by removing the portion of the branch or terminal leader back to a side branch that is at least 1/3 to 1/2 the diameter of the removed portion of wood. This will help ensure that there are enough leaves to make food for the tree and prevent stub-cuts which can lead to wood decay.

Avoid making a cut that leaves a wound over 4" in diameter since these take longer to callus over. Do not paint the pruning cut. Research shows that wound dressings are not effective in preventing decay.

Never remove more than 25% of the live crown or branches. This ensures that the tree has enough leaves to manufacture its own food.

**Warning**

Don't top trees! "Topping" is the reduction in size of a tree by severally cutting back the branches. Topping weakens the tree and leaves large wounds. Topping usually occurs when the tree is too large for the available above ground space. This situation is best avoided by selecting the correct size tree for the space initially. If a site placement mistake exists and a tree must be shortened, begin to prune while the tree is young, and make reduction pruning cuts where branches fork.
Wounds, Cavities, Cables & Bracing

Wounds are openings in the bark and/or trunk that expose trees to insect and disease attack. Be careful not to wound young trees with lawn mowers, string-type weed trimmers, vehicles or heavy equipment, over pruning, or any other mechanical or physical injury.

If a tree is wounded, remove all loose bark and jagged wood protruding from the wound. As with pruning, there is no need to paint the wound, since this has not been proven to prevent decay.

Stimulate tree growth with proper watering and mulching - these cultural practices will help maintain tree health as the wound heals.

To help prevent cavities from developing, prune dead, diseased or broken limbs when you see them. Filling cavities will not stop decay from spreading or strengthen a tree. If a cavity has structurally weakened a tree, support from cables or mechanical rods may be needed. Branches with cavities should be removed if they are structurally unsound. Consult an arborist.

Cable and rod bracing can be used to help prevent breakage of branches weakened by decay, narrow forks, large heavy limbs or breakage during high winds. Avoid the need for cable and rod bracing by keeping the tree healthy and pruning as the tree grows. Cable and rod bracing are recommended for high value trees where personal injury or property damage is likely, and should be left to professionals.
Insect Pests & Disease

Insect pests and diseases often attack trees which are already under stress or weakened. Drought, improper planting, and disturbance of the root system through digging, trenching, construction activity, or addition of soil to the root area can make trees more susceptible to attack. First find out why the tree is weak and second treat the primary cause of stress.

Examine your trees regularly, looking for anything out of the ordinary: sap coming out of the bark, leaves smaller and less green than usual, leaf spots, wood die-back in the canopy, or leaves changing color early. Mushrooms at the base of a tree can sometimes indicate root rot and may warrant removal. Consult an arborist.

Always identify the pest or disease before applying "sprays" to control it. Some tree pests do not require control measures and some diseases have no practical control. A good fungicide will never control an insect problem. If you cannot diagnose a problem, get professional assistance from a local nurseryman, professional arborist, the SC Forestry Commission, or Clemson University Cooperative Extension Service.

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