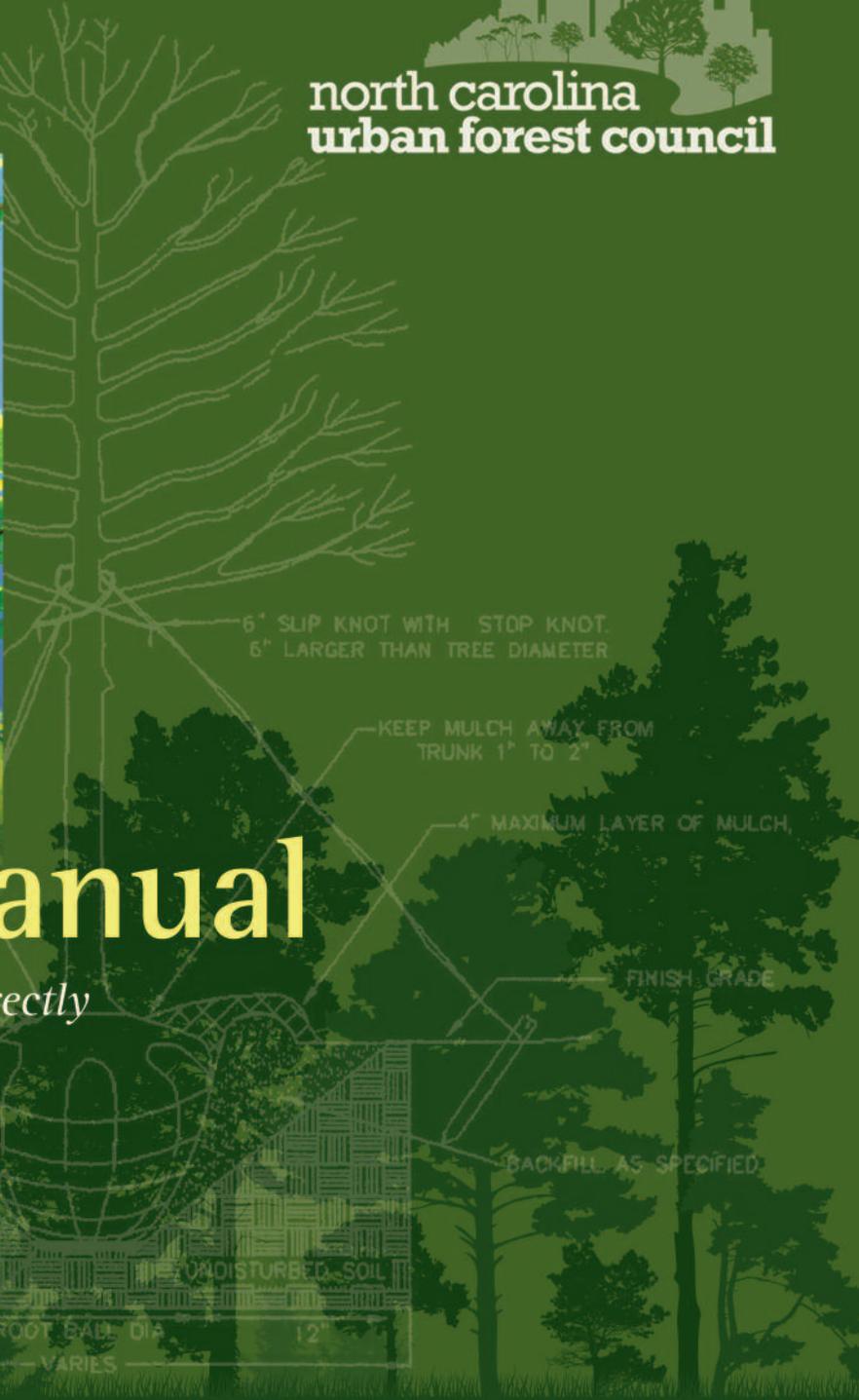




Tree Owner's Manual

From Planting to Maintenance—Learn How to Do it Correctly



WOOD STAKES WITH 1/2" DIA. HOLES DRIVEN IN LINE WITH STRAP EQUALLY SPACED AROUND TREE

REMOVE TYPICAL EXCESS SOIL FROM ROOT CROWN

REMOVE TOP 1/3 BURLAP AND ANY NAILS/PINS, ETC.

REMOVE TOP 1/3 OF WIRE BASKET WHERE PRESENT

SCM, OUTSIDE OF FOOTBALL

Which Tree is Right for my Yard?

Be sure to select the Right Tree for the Right Spot!

Tree Selection Checklist:

- Did you ask a professional?
 - Check with local public works or parks department for preferred tree species information. Your county extension agent can also help with selecting the right tree.
- Did you look up?
 - Do not plant directly beneath overhead wires. Trees planted beneath wires tend to be pruned irregularly (Photo 1).
 - Large trees should be planted at least 25 feet from utility lines.
- Do you know your plant hardiness zone?
 - The USDA plant hardiness zones are based on average minimum temperatures.
 - NC is made up of three hardiness zones: 6, 7 and 8. Select a tree suitable for your zone.
- Have you checked your soil?
 - Have your soil tested for pH and nutrient content.
 - Is the soil compacted? Tree roots don't grow well in compacted soils; you may need to break it up and add organic matter.
- Do you know how much sun your yard gets?
 - Select full sun, partial sun, or shade species.
- Are there known insects or diseases in your area?
 - Select plants with low insect and disease susceptibility.
- Did you look around for nearby structures and pavement?
 - Plant a minimum of 3 feet from driveways and sidewalks and minimum of 15 feet from buildings. You need to provide enough room for the tree to grow to its mature size.
- Have you thought about what size or shape tree you want?
 - Different species grow to different height and spread at maturity (broad, narrow, columnar, v-shaped).
- Do you want your tree to provide a certain benefit or function?
 - Trees can slow stormwater runoff, provide shade to reduce cooling and heating costs, increase property value, provide visual screen or wind break, attract wildlife.
- Do you prefer specific types of flowers, fruit, or fall color? (Photo 2)



Photo 1: This picture perfectly shows the wrong tree being planted in the wrong place. There is not enough growing space to accommodate the tree and it has to be heavily pruned to removed utility conflicts. A small maturing tree should have been planted instead.



Photo 2: Like this Eastern redbud, which is native to NC, colorful flowers, interesting leaves and bark, and fruit for wildlife are all good things to consider during tree selection.

Planting Stock: *there are 3 main types of planting stock you can buy from the nursery: container-grown, ball & burlap (B&B), and bare root. Choose the type that works best for you.*



Container grown plant

Ball and burlap plant

Bare root

Containerized	Ball & Burlap (B&B)	Bare Root
Complete root system – but must look for girdling roots	Partial root system (field grown)	Complete root system, no soil but should look for kinked roots
Can be planted any time of year (avoid hot/dry periods)	Best planted during dormant season (late fall to early spring)	Must be dormant - plant immediately after receipt
Small to medium caliper trees	Larger caliper trees	Small trees or seedlings
More sensitive to drought or limited water after planting	Heavy material; takes more equipment to handle and plant	Good for reforestation and reclamation projects

Selecting High Quality Nursery Stock

When picking out your tree, look for a plant that has **one central stem or leader** (Photo 3); if there are three or more leaders choose another tree, if there are only two be sure you can remove the weaker one without leaving a large hole in the crown.

Crown height should be at least 60% of total tree height for deciduous trees and 75% for evergreens.

Be sure the **trunk is not damaged**, is centered in root ball and is not loose. Look for trunk flare, if you cannot see it, you may not want this tree.

There should be no more than 2-3" inches of soil on the top of roots; you may have to scrape soil away to find them. If you cannot find top most roots within 6" of the top of root ball, select another tree.

Look for these qualities whether you are buying a ball & burlap tree or one grown in a container.

It is always a good idea to record the following information about your tree: where and when you purchased it, warranty period, species and any other key information about its care or features.

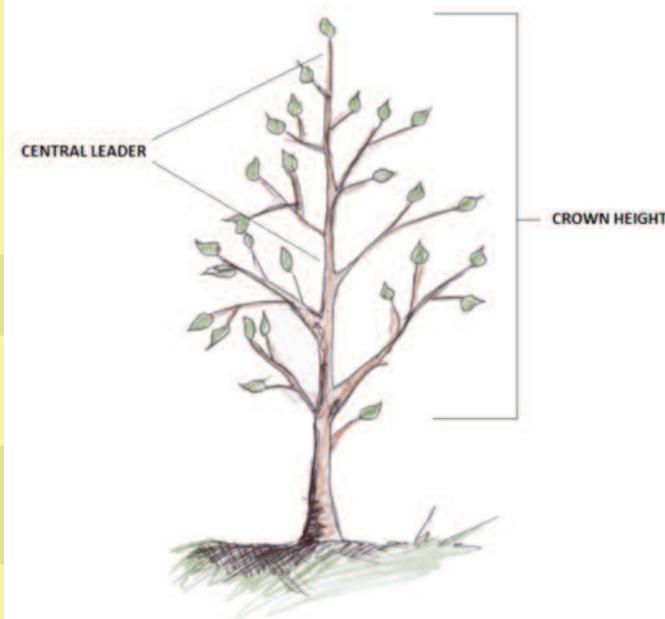


Photo 3: This sketch shows a young tree with one main stem (leader) and well-spaced branches. The crown height of this tree is over 60% the total tree height.

Transporting Your Tree

- Ask the nursery to tie up the branches of your tree; it makes it easier for you to transport.
- Do not lift tree by the trunk, always lift by the root ball or container. **Make sure not to damage the trunk** while transporting your tree, as any wound can cause permanent damage and potentially reduce life span!
- Never transport any plants in full leaf in an open truck bed or car trunk without first wrapping them with a tarp, burlap or a sheet. If this is not done, the plants will suffer windburn and likely lose all its leaves once you get it home. The tree may produce new leaves or it may die.
- If you cannot plant your tree right away, follow these guidelines:
 - Keep the plants in a shady spot and well-watered.
 - Bare root trees need extra protection: pack wet newspaper, sawdust or mulch around the roots and wrap in a plastic bag. It is best to plant bare root trees within two days of receiving them so the roots do not dry out. Bare root trees are typically transplanted when dormant.
 - B&B trees should be stored with mulch or a tarp around the root ball to prevent drying.

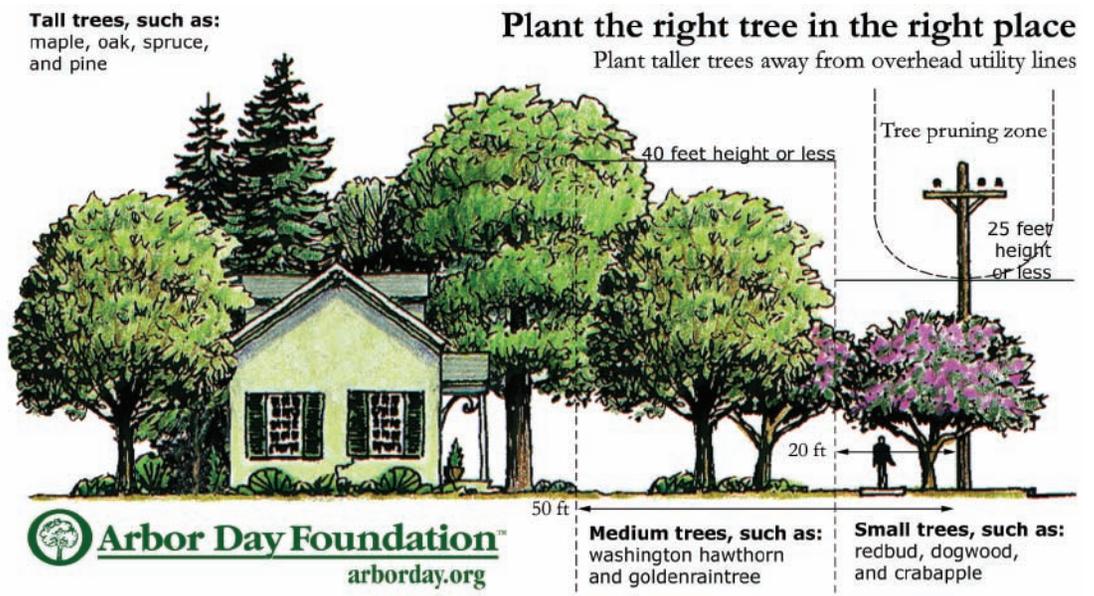


Notice these trees are not wrapped for transport, which will lead to leaf and wind burn. Trees should be wrapped and protected during transport.

Pre-Installation Steps and Site Preparation

Step #1: Check for any Aboveground Obstacles

- Do not plant your tree where it will interfere with buildings, overhead utility lines, pavement, or street intersection sight-lines. Think about the mature size.
- **Plant your tree:**
 - A minimum of 3-feet from pavement or fencing
 - At least 15-feet from home or buildings
 - At least 25-feet from utility wires (for trees that will grow greater than 30-feet tall)
 - Avoid underground utilities



Step #2: Call Before You Dig!

- By law, you must contact 811 at least 72 hours before digging. The underground utility locating service will come to your home and locate all underground utilities.



**Know what's below.
Call before you dig.**

Step #3: Make sure you have the tools you will need to plant your tree properly.

- Gather the following:
 - Shovel, sharp knife (scissors), by-pass pruning shears and a soil knife (optional)
 - Water
 - Mulch (about 3-4 cubic feet, one or two bags)
 - Large-gauge wire cutters if planting a ball and burlap tree
- If you are planting your tree in a large bed area, be sure to till the soil and incorporate about 2" of compost. This will make it easier to plant not only your tree, but any additional plants you want to install.

Soil requirements for trees based on their size at maturity

Tree Size at Maturity	Total Soil Area	Minimum Distance from Paved Surface
SMALL Height: shorter than 30 ft	10 ft x 10 ft	3 ft
MEDIUM Height or spread: less than 50 ft	20 ft x 20 ft	6 ft
LARGE Height or spread: greater than 50 ft	30 ft x 30 ft	10 ft

* Measurements are for when rootable soil depth is 3 feet or greater. For soil less than 3 feet deep, smaller maturing trees are recommended. These are minimum requirements, the more growing space and soil area allowed will lead to bigger and healthier maturing trees.



Planting Procedure

Step #1: Prepare tree for planting

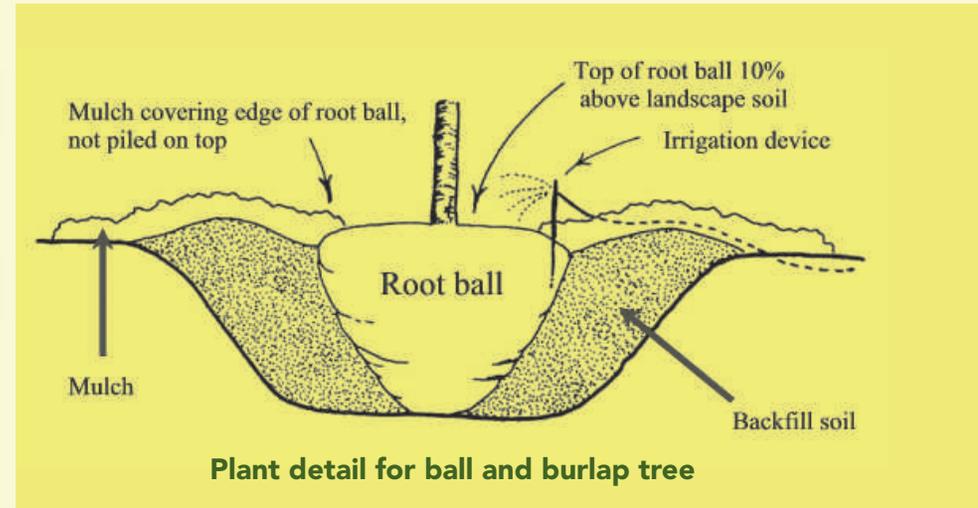
- Move tree to the planting location and remove anything attached to the trunk. Remove twine from crown and any labels.

Step #2: Pruning tree

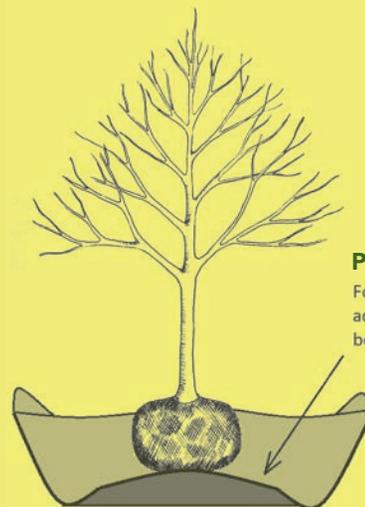
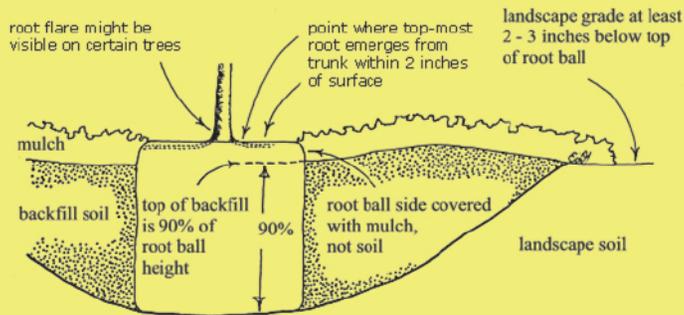
- At time of planting, prune only broken or dead branches, or those that are rubbing. If there is more than one central leader, select the healthiest one and remove the other, using the proper pruning cut. Now is the time to do any pruning for shape as well as the health and vigor of the tree. You can access the tree crown while standing on the ground.

Step #3: Measuring and digging planting hole

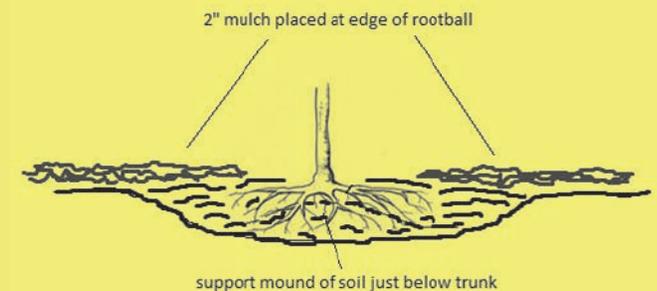
- Determine how big the hole should be by measuring the root ball. You can use a measuring tape, yardstick or the shovel handle for a good approximation. Dig the hole **only as deep** as the root ball and at least 2-3 times wider. Place tree in hole; for B&B trees gently roll them into the hole. Make sure the tree's "best side" faces out, where most people will get to see it. **Make sure to plant at or slightly above grade.**
- **If your soil is very poorly drained**, create a small mound (about 6" or so in height) in the middle of your hole. Set the root ball on this mound. This will allow water to collect beneath the roots. (Photo 4)



Plant detail for container-grown tree



Plant detail for bare root tree



Step #4: Properly handling the root ball

- For B&B trees, remove any twine wrapped around trunk; remove the top 1/3 to 1/2 of the wire basket using wire cutters and pull the burlap down away from top of ball and cut off.
- For container-grown trees, use your shovel to shave off roots around edge and bottom of root ball, and then slice down into root ball in a radial manner. (Photo 5)
- For each of these planting stock types, fill planting hole about halfway, and then water-in. Finish adding soil to site grade. Chop soil in hole with the end of your shovel to minimize air pockets. **DO NOT TAMP THE SOIL TOO FIRMLY**, as this will compact the soil making it harder for growing roots to penetrate.
- For bare root trees, once soil is placed in hole, lightly firm soil to increase good root-soil contact. Be careful not to over compact.

Step #5: Add a soil berm to hold water

- Make a small berm around the outside edge of the hole to help direct water toward roots.

Step #6: Adding mulch

- Put a 3 - 4" layer of mulch around the tree, from edge of root ball out (Photo 6). Never mound mulch up around the trunk, which is often referred to as "volcano mulching" (Photo 7). This may lead to animal or disease problems. There are many types of mulches available. The best mulch is organic, rather than stone or lava rock because it adds organic matter to the soil.

Mulch breaks down slowly, adding organic matter to the soil. There should never be more than 4" of mulch at any one time on the top of the root ball. If you want/like the look of fresh mulch every year, you should remove old mulch first.



Photo 5: Detail of radial slicing to help remove any potential trunk girdling roots. Prior to this, the outer edge and bottom of root ball was shaved to eliminate any circling roots. (Gilman and Weise 2012)

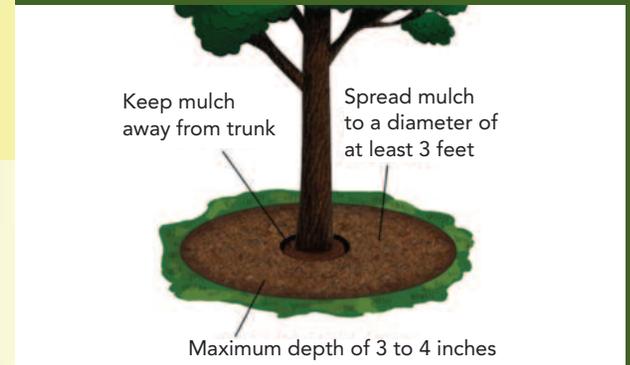
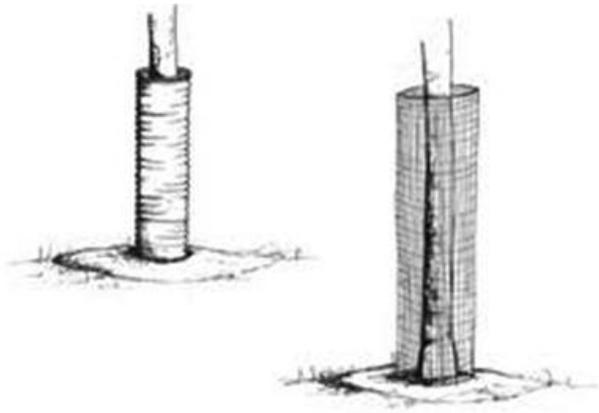


Photo 6: This shows properly placed mulch, at the correct depth. (Photo borrowed from <https://forestcitytree.wordpress.com/>)



Photo 7: Above, this tree was mulched incorrectly. Too much mulch was added causing this "volcano". This can lead to tree health issues.



Young trees often have thin bark that is easily damaged by animals and equipment, such as mowers and string trimmers. To prevent wounding that can lead to long-term damage, install a plastic tube or wrap around the lower 1 - 3' of the trunk. The wrap should be loose enough to allow the tree to grow. Push the tube or wire into the ground about 1 or 2". You can use trunk protection year round, but you should definitely use it during the winter months. Check wrap to ensure it is not girdling or growing in to the tree trunk. Problems with sun scald have been shown when trees are kept wrapped. They should be removed after 2-years.

Watering

Proper watering is the single most important thing you can do to ensure a long life for your tree. The first three years of the tree's life is critical, as this is when the tree is establishing in its new location and may be more susceptible to stressors, such as drought, insects and diseases.

How Often?

How often depends on soil drainage. Soils that drain quickly, such as sands, will require more frequent watering with less water than soils that drain more slowly, such as clays.

Apply about 5 gallons of water per caliper inch (diameter of trunk at 6" above the root ball), watering where the roots are primarily beneath the canopy of the tree (**dripline**). Photo 8

When?

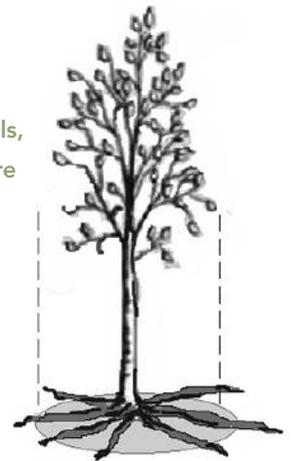
Start checking soil moisture in spring, then throughout the growing season.

Even mature trees can use some water during a prolonged drought. Apply water within the **dripline** with a soaker hose, allowing the water to infiltrate slowly over night.

You can also use a water bag for newly planted and younger trees. Water or gator bags should be removed when not in use to avoid sun scald issues or damaging bark.

First 3 years after planting:

Check soil every couple of days to see if tree needs to be watered. For sandier soils, you may need to check more often.



After 3 years:

Check weekly during the growing season; apply water within the dripline as needed.

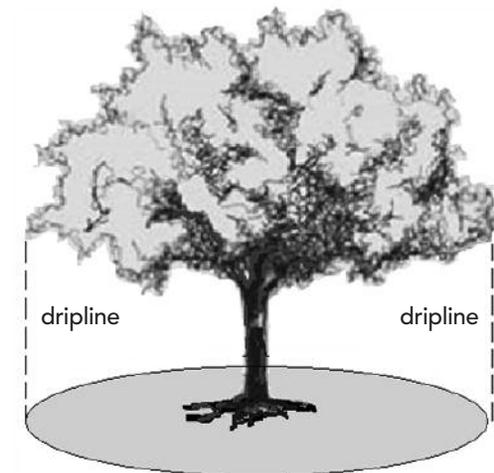


Photo 8

Staking

In many cases, it is unnecessary to stake trees, particularly in home landscapes. You will need to stake a tree when it is loose in the root ball or seems unstable. Most likely you will need to stake bare root plant material, and some container-grown plants as their root balls are light in comparison to the top of the tree (especially when in leaf). To stake your tree, use three nylon straps looped around three main branches (not too tightly). Attach the straps to stakes (at least 1' in length) in the ground outside the planting hole. Try to place stakes so they will not interfere with mowing equipment. **The staking system should be removed after 1 year,** otherwise you run the risk of girdling the stem or injuring the tree. An alternate method of staking requires four, 4' grounding stakes, and two cross beams (Photo 9).

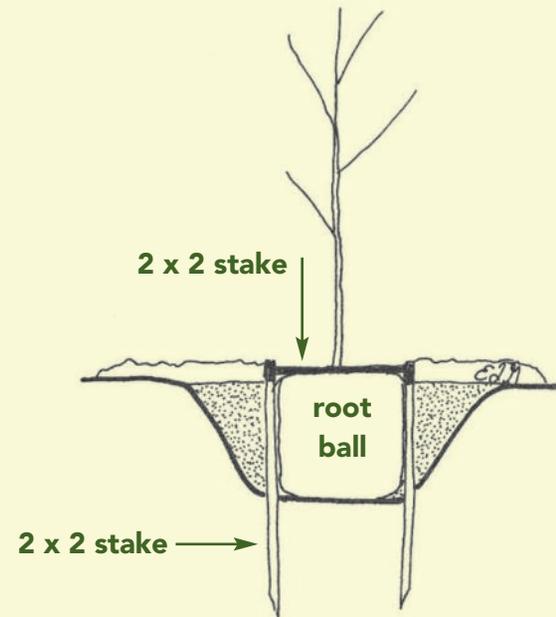


Photo 9: One horizontal 2-inch x 2-inch stake screwed to two vertical 2 x 2s against the side of the root ball. A second set is used on the other side for larger trees if needed.

Be sure to remove the staking materials after one year.

Tree Health and Structure

Check your tree annually to assess its health.

Look at the color, size and distribution of leaves. Are they appropriate for this species? Are they the right color for the season? Are leaves falling off at the wrong time of year?

Are there dead twigs/branches or areas of dieback? Is there

trunk damage? If anything seems amiss, contact a certified arborist to provide you with expert guidance.

These experts can perform yearly inspections, professionally and thoroughly. They know what to look for regarding symptoms of stress, insects, or diseases. Such

health-care programs help maintain your landscape's safety (particularly for trees), vitality, and aesthetics. These programs will provide you sufficient information about your landscape plants to help you make management decisions that address your goals.



How to Hire a Certified Arborist

Hiring a certified arborist is key to maintaining the health of your trees, but not always an easy task. While unskilled persons may see tree work as a dangerous job that can provide a good income, trained professionals understand the risks and the science behind the work. Here are some tips to help you find the most qualified tree care company for your job:

KNOWLEDGE: Crews from highly qualified outfits should, at minimum, be staffed with Certified Arborists (CA) whom are certified through the International Society of Arboriculture, or arborist trainees under a CA's direct supervision. This ensures that each worker has some advanced knowledge. CA's must participate in yearly training to keep their certification.

QUALITY: The quality of any work is a reflection of one's devotion to it. When a contractor under bids a project, costs must be recouped elsewhere. This often means staff are underpaid, untrained, and under insured; the job is hurried and poorly coordinated; and safety is compromised.

SAFETY: Most reputable tree care service outfits are safety obsessed. They also are properly insured, bonded, and licensed (where required). Check with neighbors and always ask the company for references to ensure they have met all legal requirements and follow all proper safety protocols. It is a fact that you can be sued if an uninsured tree worker gets hurt on your property, even if they claim to be insured.

VALUE: Going with unskilled operators may cost you less when the bill is due, but will cost you much more due to the lost value caused by damage to your trees. In addition, it can cost you more money and hassle for house and lawn repair, damaged infrastructure like fences or pavement, or damage to surviving landscape and trees.

When hiring an arborist ask for certification credentials, references, safety history, and type of training the crews receive.



Pruning

Pruning is the most common tree maintenance practice, and is often the most improperly applied technique. Improper pruning can cause damage that will affect the health of the tree throughout its life. Therefore, before removing any branch, ask yourself why you are doing so. The most common reasons for pruning are to remove dead or rubbing branches, and to reduce the height of the tree.

Respect older trees. These should require little or no pruning. Pruning should start when trees are young. By developing good structure as the tree matures, you can help reduce future maintenance costs. In addition, removing small branches is much better for the tree. A tree can recover from several small wounds, but may not be able to readily deal with a large wound.

Remove dead or broken branches at any time. You can begin major pruning two years after the tree has established in its new home. Prune any time of year, but early spring is best, as the tree will soon begin growing and wound closure will occur quickly. Some species, such as maples, do exude a lot of sap when pruned at this time, so you may want to wait until mid-spring. Although unattractive this has little effect on tree health.

Make each cut at the correct location on the branch. To remove a branch, cut just outside the branch collar and at a 45° angle to the branch bark ridge (Photo 10). Use the three-cut method as shown in Photo 11. This allows you to remove the weight of the branch without stripping the bark below the cut. Making a cut from "c" to "x" in the diagram is considered a flush cut. This cut removes the branch protection zone. This zone produces chemicals, such as resins, that resist the spread of fungal organisms into the tree. As a branch increases in size as compared to the trunk diameter, this protection zone is no longer produced. This reinforces the need to remove branches when small in diameter.



Photo 10: This is a good pruning cut, placed at the branch collar and at a 45° angle to the branch bark ridge. Do not use any wound paint or tar as this only traps decay-causing organisms in the wound and slows wound closure process.

Proper Pruning Principles

Dead Branch Living Branch
Branch Bark Ridge
Branch Collar
Branch Collar
First cut part way through the branch at A, then cut it off at B. Make the final cut at C - D.
(Do not cut along line C - X)

Hardwoods Conifers

Photo 11: This diagram illustrates where the branch collar and branch bark ridge are located, and how to remove a branch with the three-cut method.

For more details on proper pruning techniques, you can also visit http://cals.ncsu.edu/hort_sci/extension/documents/ (There are four publications in this series.). You should always refer to a certified professional if you are unsure how to proceed or if the necessary work exceeds 10-12 feet in height.



Photo 12



Photo 13

DO NOT Top Your Tree

Topping a tree as shown in Photos 12-14, should never be done. Topping is the indiscriminate cutting of the entire tree crown or larger branches, leaving stubs that are too small to assume the role of terminal leader. Topping is not an acceptable tree care practice. Topping removes large stores of the tree's energy, upsetting the balance between the crown and roots. Sudden removal of the crown through topping opens the canopy to sunlight causing sun scald. This is much like when we go to the beach after a long winter and are unprepared for the sun.

Topping is usually done to reduce the height of the tree and keep it small, but that doesn't actually happen. In response to the topping, a tree will produce a bunch of new, quick growing shoots and the tree will be back to its original size in no time. In addition, the new growth will be weakly attached and more prone to break in a wind or ice event. The wounds created by a topping cut are also slow to close and will leave the tree open to fungal diseases, organisms, and insect pests.

While it may cost less to top trees now, the true costs will be realized later and include the reduction of property value, the expense of eventual removal and replacement when the tree dies, the loss of understory plants, and the risk of liability from weakly-attached branches.

The best ways to avoid topping trees is to plant the **RIGHT TREE IN THE RIGHT PLACE**, prune properly when young, and reduce the crown with proper pruning cuts.

In general, do not remove more than about 25% of the tree's canopy at any one pruning event.



Photo 14: These birch trees were topped for no particular reason. This was done by an untrained crew to prevent branches from falling onto cars in the parking lot. Now there is no shade in the parking lot and the site looks rather desolate.

Tree Topping Story

Pictures speak louder than words

Pictures taken by Urban Forestry Staff of the City of Charlotte, NC

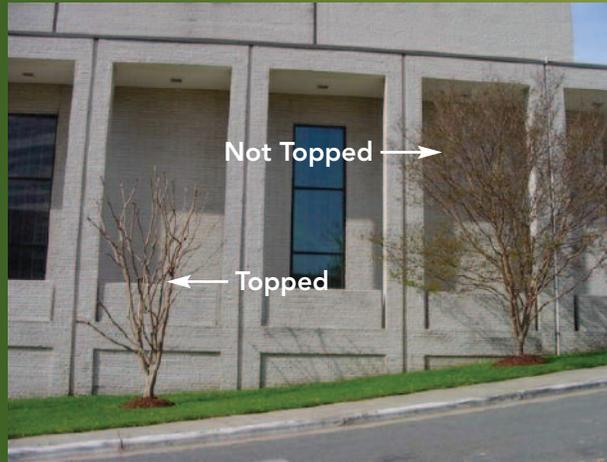
Crape Myrtle Myths

Myth: Crape myrtles need to be topped so they will produce more flowers.

Fact: Producing flowers takes a lot of energy. Trees produce food through their leaves and store that energy in their roots. Topped crape myrtles must use that stored energy to produce new growth, leaving little left for flower production.

Myth: Crape myrtles need to be topped every year to keep them small.

Fact: Topped trees often regain their pre-topped height more rapidly than a properly pruned tree. There are many varieties of crape myrtle on the market, from shrub size (3-5 feet) all the way up to 50 feet, so there is no need to top your crape myrtle to keep it small. Simply choose the appropriate sized variety for your landscape



March 2001, time to top those crape myrtles so they will bloom this year, Right? Wrong! Follow these trees, of identical size before March 2001, as they show what topping really does for a tree.



June 2001, trees should be in full leaf. Ready to bloom. Well, one tree is, the other is still working on those leaves and twigs.



OK, time to bloom. Oh wait, one tree is still trying to replace those missing leaves. Knowing it should bloom it manages to eek out a few flower heads.



OK, it's been a year and a half. What is wrong with this picture? Nothing, it's just the simple truth that topping harms trees. Some trees, like crape myrtles eventually recover. Some don't. Don't abuse your trees. Topping is never an acceptable tree care practice.

How and When to Fertilize Trees

Before applying any fertilizer, always obtain soil samples from the area where the tree is growing. This will show what nutrients are lacking. Without a soil sample, in general, applying ½ pound of nitrogen per 1,000 sq. ft. of a slow release fertilizer in the fall, then again in the spring is an acceptable practice, and promotes healthy tree growth. Always make sure to follow the label instructions and avoid getting fertilizer on paved areas. Applying fertilizers and other chemicals properly is critical to ensure they do not enter any water system. Contact a certified arborist or extension professional for more information on the use of landscape chemicals such as herbicides, pesticides, and fertilizers. See Photo 15

Wrap Up

To have beautiful trees in your landscape is easy. Select the right tree for your spot; plant it correctly, maintain and water it well, and watch your investment grow. Having trees in your landscape is one good way to "PLANT IT FORWARD", so generations to come will be able to reap the benefits! Trees are an important part of our home and city landscapes. They provide countless environmental, economic, and social benefits. They collect and slow stormwater runoff. A well-landscaped property can be worth up to 25% more on the retail market. A well-designed landscape can help reduce home energy costs by using deciduous trees to shade in the summer and evergreens to block winter winds. Trees are not only beautiful, but can also provide us a sense of place, calm, and a connection to nature. To find out how much your trees are worth go to <http://www.treebenefits.com/calculator/>

Remember trees are an investment in the future. They are one of the only things that can grow in value over time.

However, you must keep your trees healthy to ensure their values will be realized! If you are unsure how to pick the right tree for your site, how to install a plant correctly, and how to properly maintain your trees contact the North Carolina Urban Forest Council for more information and tree care resources.

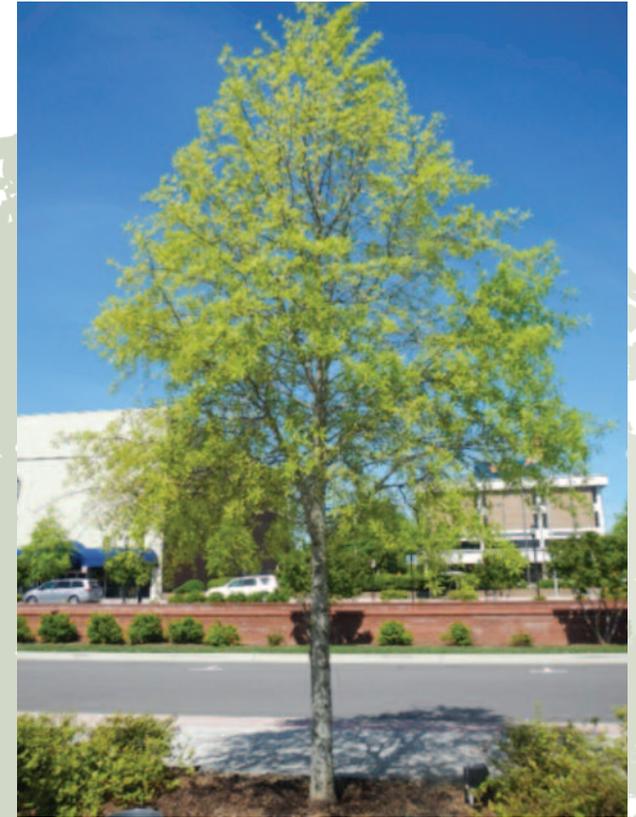


Photo 15: The leaves of this tree are chlorotic (overall yellowing). This may be due to a high, or basic, soil pH or this tree may need nitrogen. Soil testing will indicate the pH and help guide your fertility program.

Rules of Thumb *(Quick Reference Guide)*

Tree Planting

- ✓ Do not plant too close to overhead wires, buildings, or other trees.
- ✓ Check rootball for circling roots and correct/cut at time of planting.
- ✓ Remove any soil at top of root ball down to the first top-most root.
- ✓ Dig the planting hole twice as wide as and slightly less than the depth of the rootball.
- ✓ Water in the backfill as you fill the planting hole, working the soil to ensure that no air pockets remain. DO NOT tamp down soil.
- ✓ Apply a 3 inch layer of mulch to an area 2 feet in diameter per trunk caliper inch. DO NOT pile mulch directly against the tree trunk.
- ✓ Make sure tree gets adequate water during establishment:

Tree Size: 2-4" caliper

Irrigation for vigor – *Daily for 1 month; every other day for 3 months; weekly until established.*

Irrigation for survival – *Twice weekly for 3-4 months.*

Tree Size: >4" caliper

Irrigation for vigor – *Daily for 6 weeks; every other day for 5 months; weekly until established.*

Irrigation for survival – *Twice weekly for 4-5 months.*

Tree Pruning

- ✓ Start pruning while the tree is young (smaller cuts close faster).
- ✓ Locate central leader and reduce any competing limbs.
- ✓ The best time to prune is early spring.
- ✓ Remove dead or broken branches at any time.
- ✓ Never prune more than 25% of the tree crown at any one time.
- ✓ DO NOT top your tree!
- ✓ Always prune a limb back to a point of union on the branch.
- ✓ Make pruning cuts outside the branch collar. Never flush cut your tree branches.
- ✓ Use the three-cut method on limbs larger than 2 inches in diameter.

Looking for the right tree? Check out our Urban Tree Selector: <http://www.ncufc.org/tree-selector-overview.php>

North Carolina Urban Forest Council

To learn more about the North Carolina Urban Forest Council and become a member visit our website at: www.ncufc.org

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