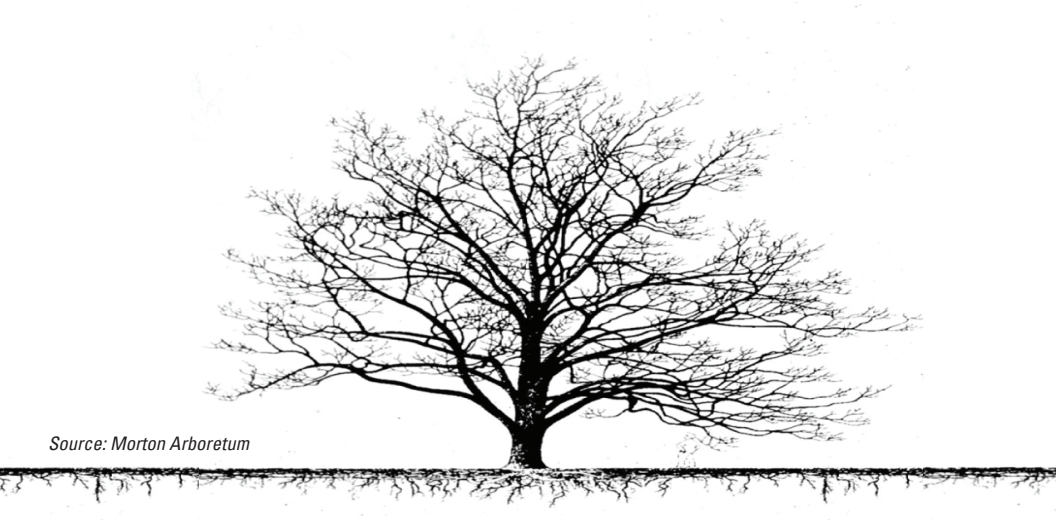
SUSTAINABLE
COMMUNITY FORESTRY
PROGRAM

GEORGIA FORESTRY
COMMISSION

Community Tree Planting and Establishment Guidelines

This Document is intended to aid homeowners and local government staff in planting and directing the establishment and maintenance of community trees. The landscape design details provided in this document have been endorsed by the American Society of Landscape Architects. The planting details were written and tested by certified arborists, foresters and landscape architects and were determined to be minimum requirements to facilitate the establishment and growth of community forests. In addition to the incorporation of these standards, communities should adopt an active tree conservation, protection and management program. Sources for more detailed information regarding these and other community forest issues are listed in the back of this document.



Source: Morton Arboretum

Roots of mature trees extend far beyond the extent of branch tips and drip lines. With adequate soil volumes, tree roots may extend as far as two and a half times the diameter of the drip line. The majority of a tree's nutrient-absorbing roots lie in the upper 12 to 16 inches of the soil. To provide landscape trees the opportunity to grow to maturity, it is critical to understand tree root growth requirements.

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Tree Growth Requirements

Trees require sunlight, sufficient water, moderate temperatures, well drained soils and adequate nutrients to become established.

Sunlight – Some tree species grow naturally in full sun, while others prefer shade. This characteristic is known as a tree's shade tolerance. Trying to establish a shade-loving tree in full sunlight is stressful to the tree, increases the need for maintenance and may predispose the tree to pests and disease. Measure the total number of hours of direct summer sunlight the tree will receive during the day. Then select a species suited to light conditions and published shade tolerance standards.

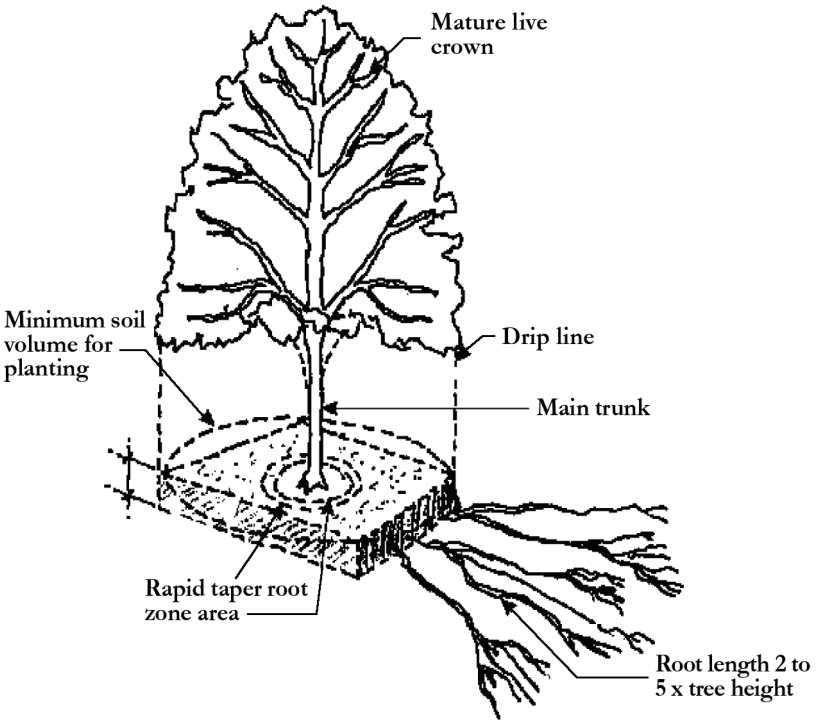
Water – All plants need water to survive but the amount of water needed varies by site, species and size. Without sufficient water, trees can't take up enough nutrients to produce the food they need to support life. Likewise, too much water can also be detrimental. In general, mature trees require about one inch of rainfall over their entire root zone every seven to ten days through the growing season (March through October). Trees in the establishment phase may require more (see page 19). Determine how much water a planting site receives during one week from irrigation, flooding or other sources, and determine if supplemental watering will be required. Adjust watering regimes accordingly. Remember, tree roots under turf get very little water from normal turf irrigation.

Soil – While some trees will grow in dry or wet sites, most require well drained soils with some moisture-holding capabilities to minimize stress. To determine if the selected planting site is acceptable, dig a 12 inch diameter hole about 12 inches deep. Fill it with water. If the water remains after eight hours, pick another spot. Do not add sand or organic matter to only the planting hole. This is not a long term solution for improving poor soil quality. Backfill the planting hole with un-compacted native soil. If additional soil amendments are required, they must be incorporated into the entire planting area. Improperly amending the planting area alters the soil hydrology, contributes to root stress and slows tree growth.

Nutrients – With the exception of very poor soils, nutrient additions are seldom required during the early establishment period of a tree. Conduct a soil test after the site is selected to determine the existing balance of nitrogen, potassium, phosphorus and organic matter. Should fertilization

be required, proceed cautiously. Typically, fertilization should take place only after the first year of establishment has passed. Nutrient applications should be made at three intervals during the year - spring, summer and fall. Additionally, in situations where soil quality is very poor, the incorporation of mycorrhizae into the soil can be beneficial during the establishment period.

Tree Root Area Requirements



Site Selection

Selection of a proper planting site depends upon a number of factors:

- Placement of overhead and below ground utilities
- Distance to structures, roads, walks and drives
- Availability and proximity of water for irrigation
- Energy conservation opportunities
- Aesthetic concerns
- Available soil surface area for root colonization

How to calculate minimum soil areas:

Step 1: Estimate the maximum expected mature trunk diameter size, 4.5 feet above ground.

Step 2: Calculate required soil area as:

Expected diameter x 2.0 = each side of planting square in feet.

OR

Expected diameter x 2.25 = diameter of planting circle in feet.

(Calculations based on 60 ft^2 basal area optimum - 750 ft^2 per foot of cross-sectional area. See detail previous page)

Example: *A 10-inch diameter mature tree would need a 20 x 20 foot planting square or a 22.5 foot planting circle.*

Large trees require a minimum of 200 to 400 square feet of rooting area to reach maturity and should not be placed within 25 feet of a structure, 30 feet of an overhead utility, or within 15 feet of an underground utility, road, drive, or walkway.

Small trees, growing to a mature height of under 30 feet, require a minimum of 100 to 200 square feet of rooting area depending on the species, and should not be placed within 15 feet of a structure, 10 feet of an overhead utility, or 10 feet of an underground utility, road, drive or walkway.

Watering is required for all trees through the first two growing seasons. Placement for energy conservation can generate significant savings by shading windows, air conditioners, and south and west facing walls. Aesthetic concerns should not override any of the above recommendations.

Tree Selection

The successful growth of a tree to maturity depends upon a number of factors, particularly the quality of the tree itself. Assuming you have selected the right space (see page 6), use the following guidelines to select a quality specimen:

Don't:

- Pick a tree that has been topped or had the central leader cut back.
- Select a tree with damaged bark or old wounds on the trunk or branches.
- Choose a containerized tree that is pot-bound or has girdling roots. Remove the container and inspect the root system, if possible.
- Pick a tree that has been planted too deeply in its container, (trunk root flare should be obvious).
- Pick a tree that has too small of a root ball for the diameter of its trunk. Root ball diameter should be 10 to 12 inches for every inch of trunk diametern measured at six inches above the soil (tree caliper).
- Choose a tree with broken branches, diseased or discolored leaves or cracked bark.
- Select a tree just because it is a bargain.
- Expect a substandard tree to do well in the landscape simply because it is properly planted and maintained.

Do:

- Select a tree that conforms to the American Standard for Nursery Stock for landscape trees.
- Choose a tree that is the correct species for the selected planting site.
- Plant the tree properly.
- Continue maintenance practices throughout the life of the tree.

Tree Planting - Basic Installation

After following the directions for site selection and soil area determination, proceed as follows:

1. The planting area should be tilled to a depth of six to eight inches (deeper if the soil is compacted) for an area of 10 times the diameter of the root ball.

2. Excavate a hole three times the diameter of the root ball and no deeper than the ball or container. Leave the soil at the base of the hole compacted.

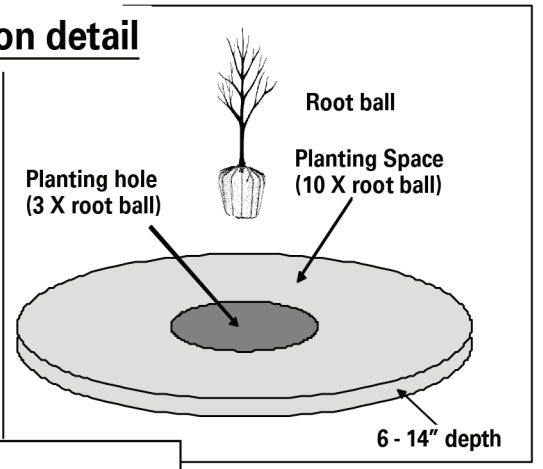
3. Remove the container, cut girdling roots and place the tree in the hole. For Ball and Burlap trees (B&B), remove all ties, strapping, wire basket and burlap. The top of the root ball should rest no more than one inch above existing soil line for every 10 inches of root ball depth and never lower than the existing soil line (example: a 15 inch deep root ball should rest 1.5 inches above existing soil line).

4. Backfill the hole with the uncompacted native soil that was previously removed to make the hole. Lightly pack the soil and water as you go to eliminate any air pockets. Construct mulch ring at outer edge of planting hole and mulch planting area to a depth of two to three inches with composted wood chips. Do not mulch within six inches of the trunk. This will allow air to circulate around the trunk root flares and top of the root ball.

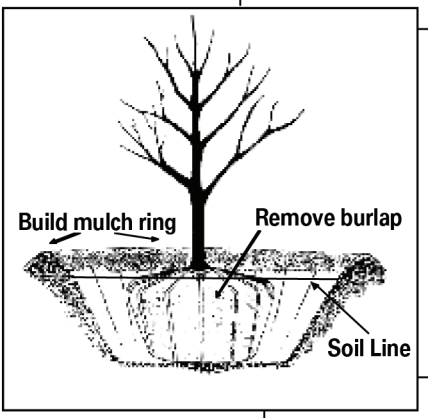
5. Stake the tree only if wind throw is a significant issue and allow for at least three inches “slack” in tie wires. Never allow bare wires to contact bark. Remove all stakes, wires, hoses and ties after first growing season.

Bald and Burlap Material

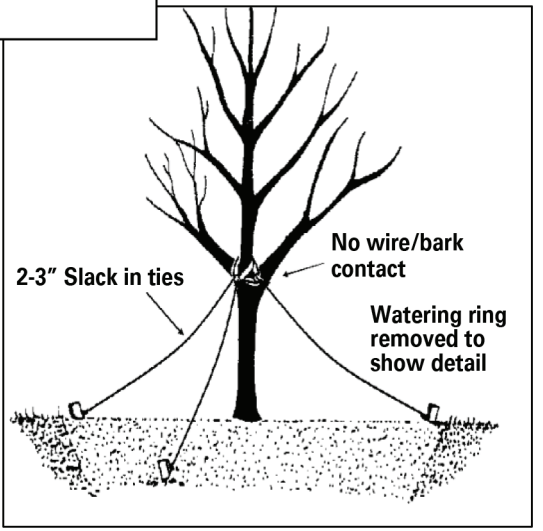
Site preparation detail



Planting detail

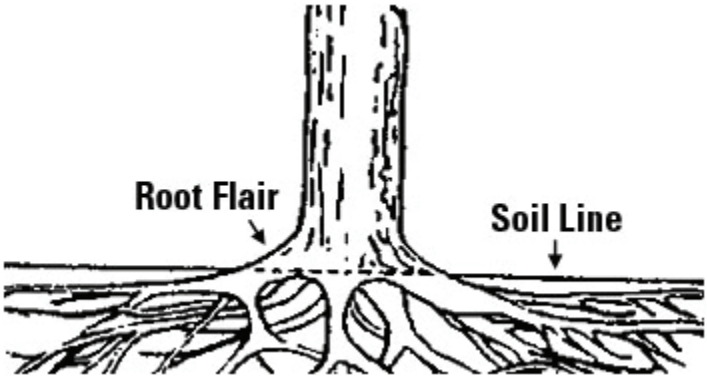


Staking detail



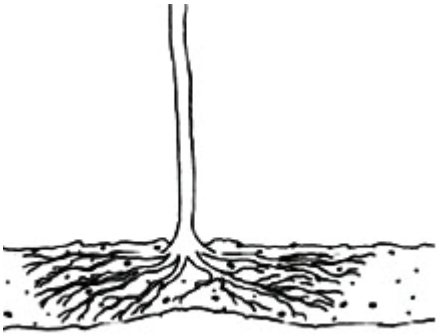
Containerized Trees

Containerized trees may come in 1", 2" or 3" caliper sizes and are usually available in 1,3,5,7 10 or 15-gallon containers. Ideally, the size diameter of the container should be 8-10 inches for every inch of trunk diameter measured at 6" above the ground. A 2" caliper tree should be in a container that has a 16" to 20" opening and should be at least a 15 gallon size. When removing the tree from the container, inspect the soil level in the root ball and make sure the first root flair is at the top of the soil. If not, gently remove the soil until the first root flair is evident. Inspect the root ball for girdling roots (roots that circle around the root ball inside the pot) and cut all girdling roots with a sharp knife or pruning shears at both the top and bottom of the root ball. Also make four vertical cuts, 1" deep, evenly spaced around the root ball from top to bottom. This should cut many of the girdling roots that may not be obvious. Plant the tree as you would a B & B tree, remembering that containerized trees often require more water than B&B and need to be monitored more closely.



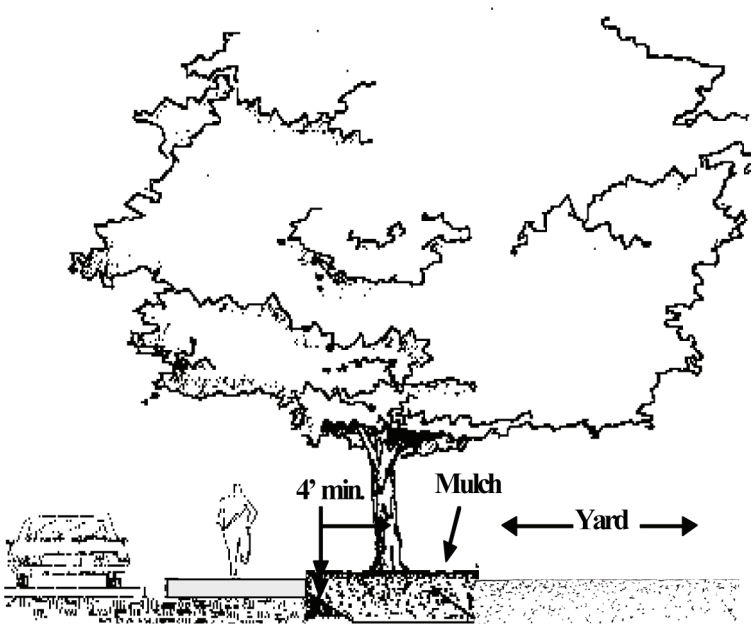
Bare Root Trees

Bare root trees have become more widely used in the South in recent years. Bare root trees have no soil attached to the root system and are generally sold as 1 – 1.5" caliper trees. Because they have no soil, the full extent and quality of the entire root system is known. Bare root trees are only available during winter when the trees are dormant, and must be planted as soon as they are received. They are also easier to plant because they only require that the planting area be tilled so that the tree can be placed in loose soil about four inches deep. Place the tree roots so that they are three to four feet deep, uniformly arranged, and the top of the first major root flare is even with the surrounding soil level. Cover the roots with native soil and stake the tree with a single stake and biodegradable twine. Proceed with mulching and watering as you would with other trees.

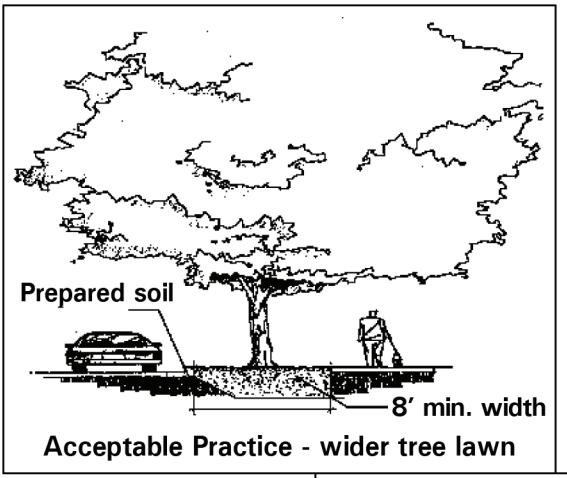


Tree Planting - Street Trees

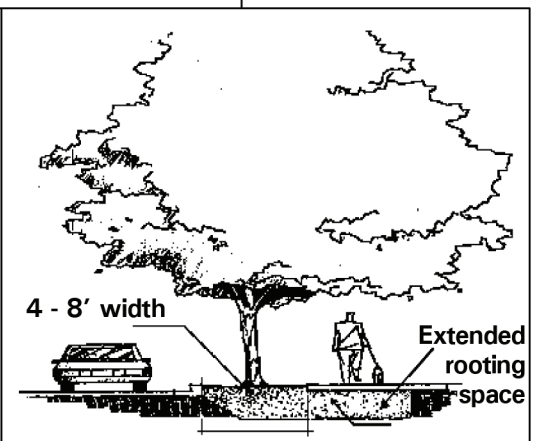
The installation of street trees may follow the same guidelines as found in the "Basic Installation" section of this booklet (page 8). However, tree planting along streets, sidewalks, driveways and medians usually requires special consideration of soil volume minimums and infrastructure conflicts. Tree spacing widths within the planting area and soil preparation at depths of two to three feet requires a significant amount of planning and investment if trees are expected to grow to maturity. Descriptive details regarding tree placement for typical street tree planting situations follow:



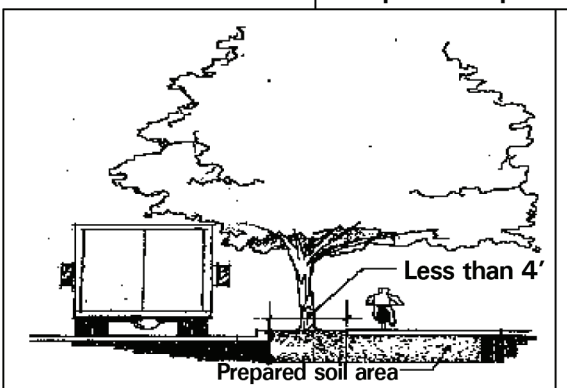
Best Practice - Tree on property side of sidewalk.



Acceptable Practice - wider tree lawn



Compromised practice - narrow tree lawn



Not recommended for large trees - too narrow

Tree Planting - Medians

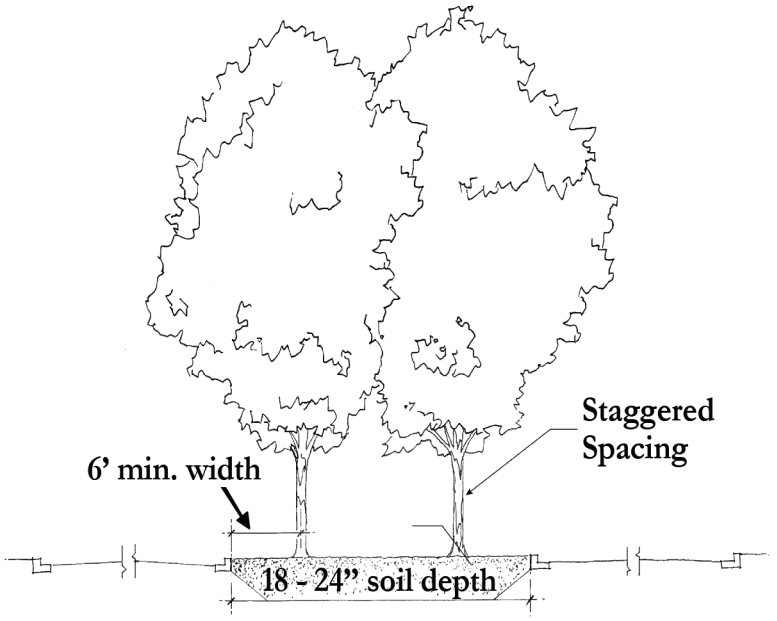
Median plantings differ from street tree plantings in that there are not as many confrontations between tree roots and infrastructure. However, some challenges exist to successful tree establishment in medians.

The width of a planting area determines how many, what size and what species of tree is acceptable for successful growth in medians. Many medians are too narrow to support more than one row of trees. Soils are usually very poor in these narrow medians, often composed of spoil left over from road construction. The narrower the median the more likely that extensive soil preparation will be necessary. Sometimes soil replacement is a more effective use of available resources. Where soil quality is acceptable, follow the guidelines for tree planting and soil preparation discussed earlier (page 8). Irrigation and watering, whether temporary or permanent, must be planned and implemented as soon as the trees are installed. Maintenance (mulching, watering, insect control, and pruning) needs to continue throughout the life of the tree.

Wider medians have more available soil area for root colonization and can support larger growing trees with fewer maintenance problems. Medians measuring more than 25 feet in width can support two rows of trees spaced 20 to 40 feet apart. Medians less than 25 feet wide have difficulty supporting more than one row of trees. The actual number of trees a planting area can support depends upon species, soil type and water availability. As with any tree planting, matching species to site is critical for successful establishment and maturity.

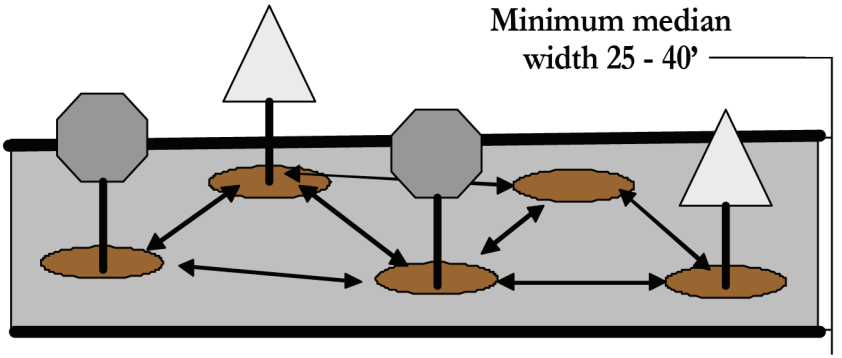
Also, remember to consult with transportation auithorities to ensure median and rights-of- way plantings meet local regulations.

Median width detail



25' Minimum/40' Optimum

Staggered spacing detail



Note: 20 to 40' tree spacing

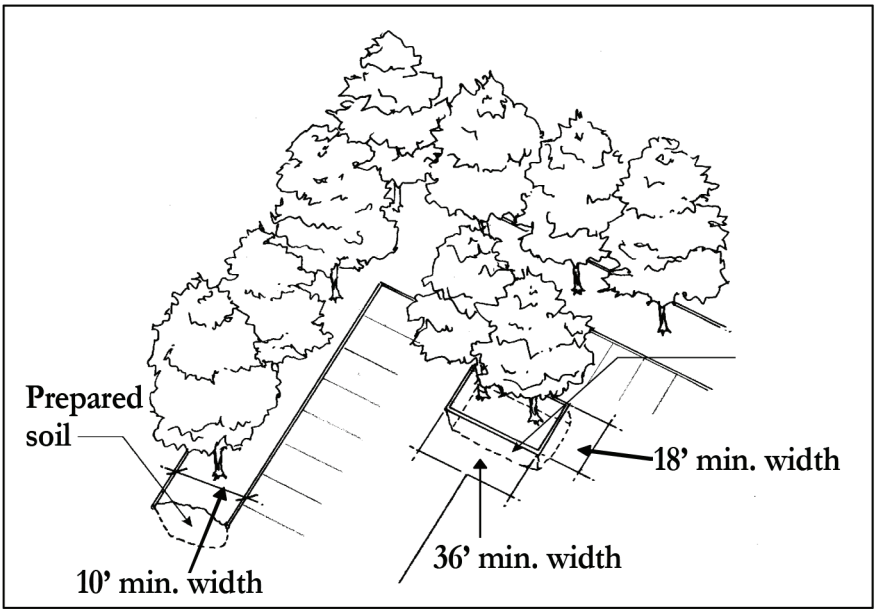
Tree Planting - Parking Lots

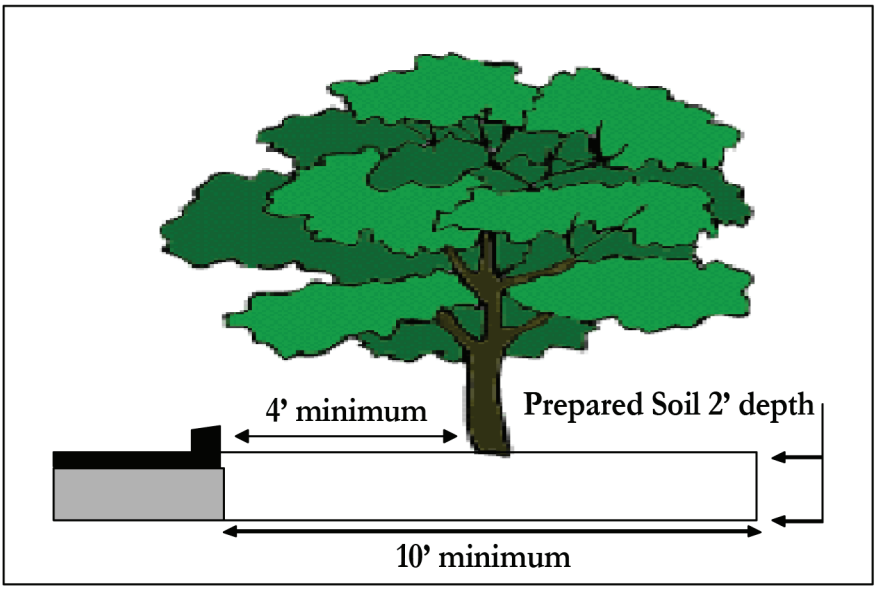
Planting trees in parking lots is a quick way to reduce the environmental impacts associated with auto emissions, heat island effects and storm water runoff. Successful tree growth in parking areas is a function of quality soil volume and water availability. Water may be made available through irrigation from in-ground systems or hand watering. The required soil volumes needed for trees to reach maturity must be engineered into the parking lot design prior to construction. Soil types must be specified in construction plans. Constructing planting islands of proper width will reduce plant stress and ensure long tree life. There is a limited selection of tree species that can survive the environmental stresses of parking lots and reach maturity. This list expands as planting soil areas and volumes increase.

Continuous landscape beds on the perimeter of the parking area should be at least 10 feet in width. Interior parking islands should be at least 18 feet wide and 36 feet long. Tree planting islands should have no less than 100 square feet of soil surface area. Small growing trees (which reach a mature height of under 30 feet) require from 100 to 200 square feet of surface rooting area and a soil depth of 18 inches. Small growing trees should not be placed within three feet of a parking stop or curb. Large trees require from 200 to 400 square feet of surface rooting area and a soil depth of 18 to 24 inches to reach maturity. Large growing trees should not be placed within four feet of a parking stop or curb. Always make sure soil type is continuous throughout the islands, soil pH is acceptable (5.5 to 7.0) and the installation of underground irrigation lines take place prior to tree planting.

Finally, develop a long term maintenance and management plan for the planting spaces.

Parking lot detail

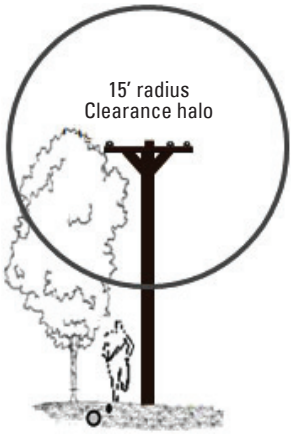




Tree Planting - Near Utilities

One of the first rules of tree planting is “Look up!” Many of our urban trees would have much fuller canopies and longer lives if planters had done that prior to turning over that first shovel of soil. Overhead utility lines may be as low as 20 feet overhead and need at least 15 feet of clearance in all directions (the “clearance halo”) to insure free and unhindered power lines. Planting anything but the smallest growing trees under low hanging utility lines insures at best, a misshapen crown and at worst, tree removal. Planting above underground utilities can also result in tree damage when utility lines need to be repaired.

With all tree planting, whether on public or private property, it is critical to avoid current and future utility conflicts. Determine half the average mature crown spread of the tree to be planted. Add 15 feet to the measurement. That distance is the closest to an overhead power line that the chosen species of tree may be safely planted. Below-ground utilities present a different problem. Never plant closer than six feet to below-ground utilities. A good rule of thumb is to plant outside the mature tree's expected root plate, or half a foot radius for every inch of mature trunk diameter at 4.5 feet above the ground.



Basic Tree Maintenance

Trees growing in parking lots, along streets, and in front yards have more stress placed upon them than trees growing in natural environments. Each site has different watering, pruning, mulching and fertilization requirements. Therefore, it is critical to the long term survivability of these trees that a proper maintenance plan can be established.

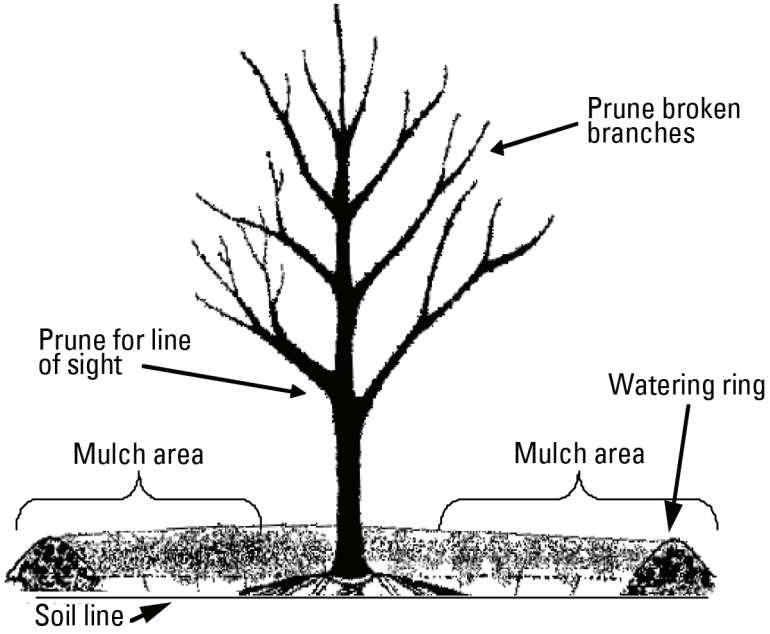
Water - All plants need supplemental watering to survive the first and second years of establishment. Watering requirements are driven by evaporation rates on the site, moisture holding capability of the soil and species type. Newly planted two inch caliper trees require approximately four to five gallons of water over their entire root zone, one to two times a week through the summer months, depending upon local conditions and soil types. This may be supplied by hand watering or in-ground irrigation systems. Determine how much water a planting site currently receives per week from irrigation, flooding and other sources. Determine if supplemental watering will be required. Check existing soil moisture prior to watering and do not water if soils are saturated.

Pruning - Limit pruning in the first two years to the removal of damaged and hazardous branches. Hazardous branches are those that would cause personal injury or line of sight issues (most often related to pedestrian or vehicular traffic). All pruning should follow the International Society of Arboriculture standards for landscape trees.

Fertilization - Conduct a soil test to determine the balance of existing nutrients and soil ph. Nutrient additions to planting areas are seldom required in yard plantings. However, fertilization may be needed in street and parking lot plantings where soil quality is very poor. Amend poor soils throughout the entire island or root zone. Soil of poor quality or improper ph may have to be replaced. Additional fertilization of the site should not take place during the first year of establishment. When additional fertilization is required, nutrient applications should take place at three intervals during the year - spring, summer and fall.

Mulching - Placing mulch around newly planted and established trees reduces watering requirements, weed competition and reflected heat stress. Mulch should be spread over the tree's entire expected root system to a depth of two to three inches. Keep mulch six inches away from the

trunk to allow for air exchange between the root collar, root ball and above ground environment. Mulching to a deeper depth or against the tree's trunk may cause pest and disease problems and increase tree stress. Mulch with composted wood chips (composted for four months minimum), maintain the two to three inch depth and keep root flares uncovered.



Tree Conservation

Tree root systems extend far beyond the drip line and vary in length from two to five times the height of the tree (page 5) depending upon the species, size, soil type, and location of the tree. Successful tree conservation efforts require that a large portion of the tree's root system, the critical root zone (CRZ), be protected for all trees to remain in the landscape.

Determine the root zone for established trees as follows:

Step 1. Measure trunk diameter at 4.5 feet above soil line.
Step 2. Multiply trunk diameter in inches times 2.5
Example: 20 inch diameter Oak x 2.5 = 50 foot root radius or a 100 foot diameter root zone.

Root systems have a threshold of loss above which long term damage or death can occur. This threshold is that area defined by the limits of the critical root zone (CRZ). Eliminating soil impacts in the CRZ significantly reduces the likelihood of long term damage.

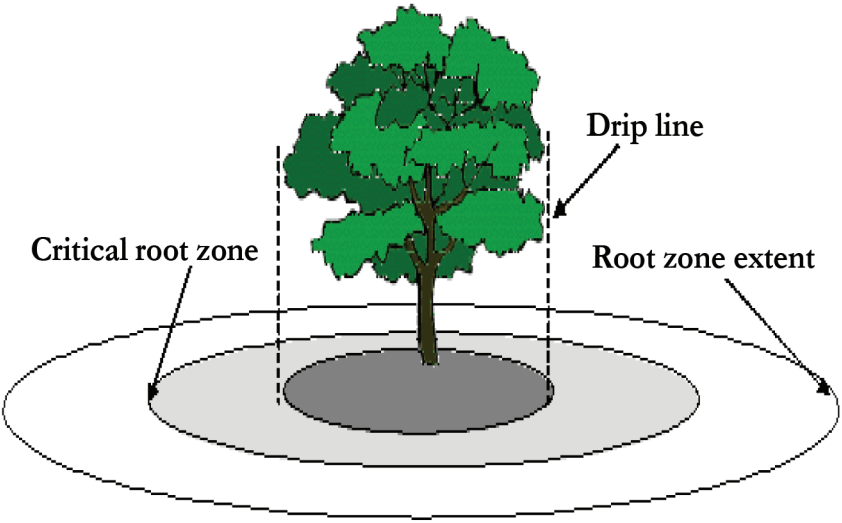
Determine the critical root zone for established trees as follows:

Step 1. Measure trunk diameter at 4.5 feet above soil line.
Step 2. Multiply trunk diameter in inches times 1.5
Example: 20 inch diameter Oak x 1.5 = 30 foot root radius or a 60 foot diameter critical root zone.

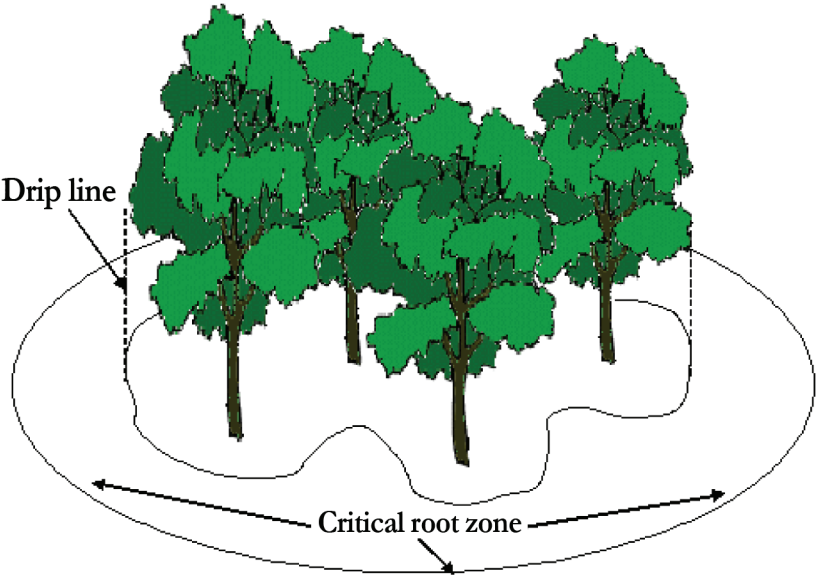
Grade changes, cuts and fills can alter the hydrology of the site and the water and nutrients available to the tree, which impacts root system vitality.

When construction activity is necessary around a group of trees, the trees' cumulative critical root zones should be determined in order to reduce or eliminate impacts on these areas. Consider removing trees that have sustained CRZ loss in excess of 30%. Tree species, health, structural integrity, soil type, vegetation competition, structure proximity, future planned impacts and planned maintenance and management regimes contribute to the determination of which trees should be removed.

Critical Root Zone Detail
for individual trees



Critical Root Zone Detail
for grouped trees



Sources of Document Details:
Georgia Forestry Commission, *Georgia Model Urban Forest Book*
January 2001, GaTrees.org

Coder, K. Various publications available.
University of Georgia Extension, Warnell School of Forestry and Natural Resources

Additional Sources of Information:
Gillman, Ed. Various publications available.
Environmental Horticulture Department, University of Florida, Gainesville

American Society of Landscape Architects

International Society of Arboriculture

Georgia Urban Forest Council

Southern Forestry Extension Service

U.S. Forest Service – UrbanForestrySouth.org

Funds for this project were provided by the Urban and Community Forestry Financial Assistance Program administered through the Georgia Forestry Commission.

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