Tree Protection BMPs
for
Contractors and Builders

A Community Forestry and Development Guide

Written by the Chattanooga Tree Commission
Approved by the Chattanooga Association of General Contractors

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Introduction

Best Management Practices for Community Trees is a Technical Guide to selecting, conserving, protecting, maintaining, removing, and replacing trees on development sites in Chattanooga and surrounding areas.

This guide is aimed at helping all people who work around trees during the development and construction phases of both new and existing projects to utilize accepted tree care standards that will give preferred trees the maximum chance for survival.

The Best Management Practices (referred to throughout the Guide as "BMPs") are technically correct and widely accepted *practices* and *standards* used by construction professionals as recommended by professional arborists, urban and community foresters, landscape architects and other tree care and landscape professionals. The goal of the Guide is to provide you with basic and practical information on how to best accomplish the most important tree management activities that will give trees on development sites the best chance for surviving and thriving during and after the construction process. It should be noted that while these BMPs are good standards they don't guarantee 100% success nor should it be implied that by not following them dooms one's efforts to failure and, finally, **THESE GUIDELINES ARE STRICTLY VOLUNTARY!**

Who Should Use This Guide

If you are a—

- **Construction Contractor or Employee**
- **Engineer**
- **Builder or Land Developer**
- **Heavy Equipment Operator**
- **Landscape Architect**
- **Landscape Maintenance Contractor or Employee**
- **Planner**
- **Tree Care Service Contractor or Employee**
- **Chattanooga/Hamilton County Resident**
- **Chattanooga/Hamilton County Government Official or Staff Member**
- **Utility Employee**

--then this Guide is for you! *Your* implementation of the appropriate BMPs is an important component of our overall community tree program. This Guide is primarily intended to support the building, development and construction industry and should be used as a project planning and implementation tool, as well as a community education tool, and statement of standards for community tree care.

Saving Trees in Existing Woodlands

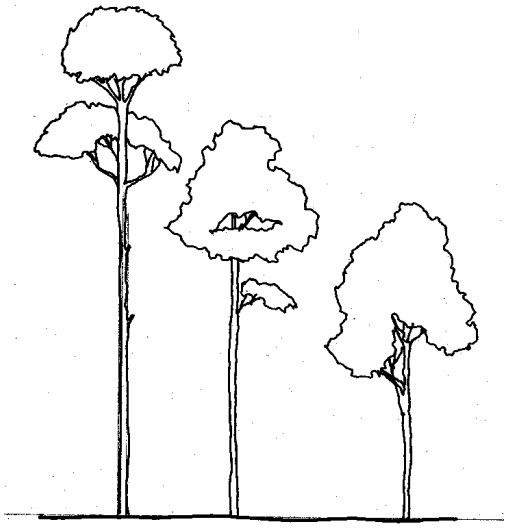
<u>GOOD TREE SAVE AREA</u> – High Tree Density with an Undisturbed Understory

- ☆ **trees structurally support one another**
- ☆ **soil remains undisturbed**
- ☆ **shady microclimate encourages natural woodland plants**
- ☆ **natural forest succession continues and forest regeneration is ongoing**
- ☆ **visually attractive**

<u>POOR TREE SAVE AREA</u> – Scattered Trees with an Understory Removed

Developers are urged to avoid the development scenario in which isolated single, tall and spindly trees remain on-site. Such trees are more likely to become structurally unstable and either bend over or blow over in storms.

- 8 **trees blow over easily**
- 8 **soil dries out**
- 8 **soil erosion occurs**
- 8 **forest microclimate is disturbed and sunlight and temperature increases**
- 8 **weeds take over**
- 8 **forest succession is interrupted and regeneration stops**
- 8 **visually unattractive**



The Critical Root Zone

One of the most critical and most successful steps in preserving trees that will remain on-site during and after construction and development is to protect the trees roots from disturbance. For existing trees, there is a minimum amount of area, above (for the trunk and crown) and below ground (for soil health and the root system vitality) that is required to protect trees and preserve tree health. This area has been identified as the **Critical Root Zone (CRZ)** and is generally agreed to be equivalent to the *soil area below ground and the space above ground defined by the tree's dripline*, or the greatest extent of the branches. This is depicted in Figure 1. and is a simple way to determine the **CRZ.**

However, **for some small trees, newly planted trees, and trees with narrow crowns,** the dripline concept defines an area that is too small for proper protection. So it is best to define the critical root zone for all trees as the circular area above and below ground with a radius equivalent to the greater of 6 feet or 1.5 feet for every inch in trunk diameter at 4.5 feet above the ground. For example, a tree with a trunk diameter (dbh) of 10 inches has a CRZ of 15 feet (10 inches x 1.5) around the tree. While the *radius* of the CRZ is 15 feet, the *diameter* of the entire CRZ is 30 feet.

The concept of a Critical Root Zone or CRZ is used throughout this guide. When a CRZ has been identified and the decision has been to provide protection to the area within the CRZ this area becomes the **Tree Protection Zone or TPZ.**

BMPs for Establishing CRZs:

1. Establish a CRZ for both large and small trees using the information above.
2. Install a strong fence around the CRZ for the life of the development project. An orange, plastic, 4' high, barricade fence well-staked is ideal for this purpose.
3. Post appropriate signage.

Avoid the following activities within the CRZ:

1. Storage of construction materials.
2. Concrete wash-out operations.
3. Stockpiling of demolition debris.
4. Parking of any vehicles.
5. Stockpiling of soil and/or mulch.
6. Trenching.

Figure 1. Location of a typical Critical Root Zone.

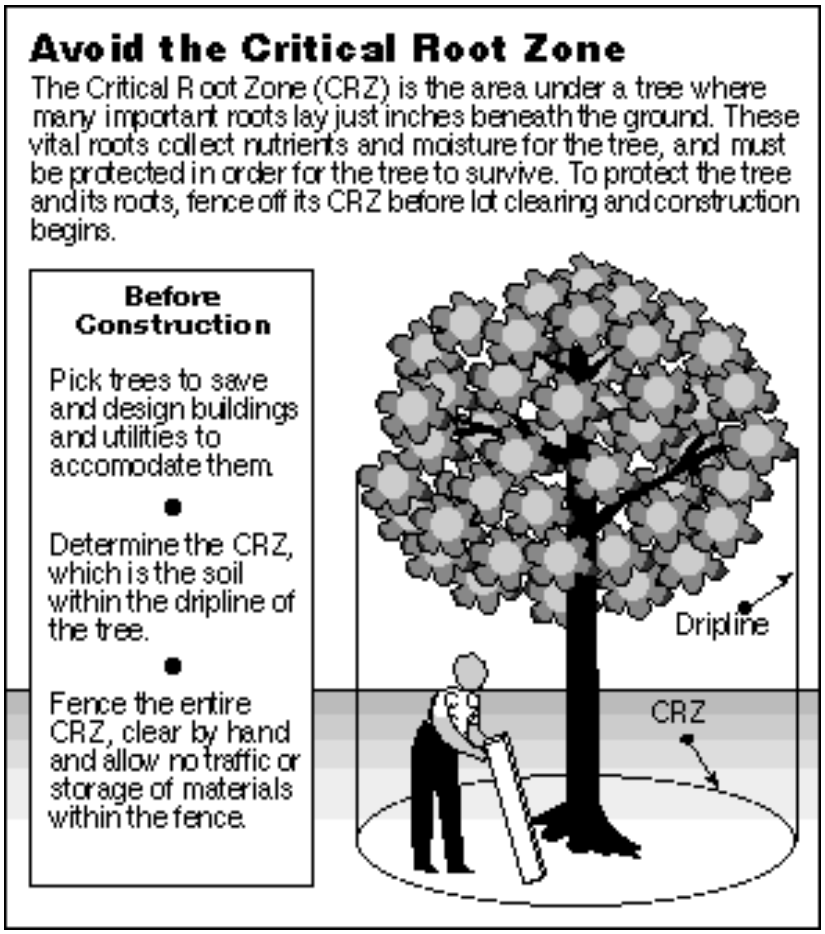


Table 1. Sample Critical Root Zone Radius Distances by Tree Diameter

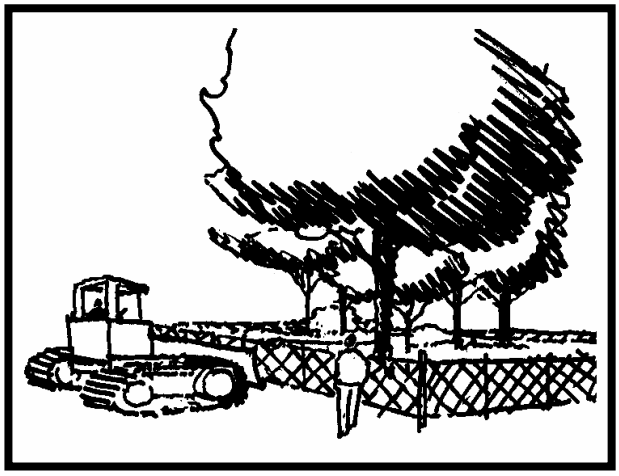
2" diameter	6' radius	16" diameter	24' radius
4" diameter	6' radius	20" diameter	30' radius
6" diameter	9' radius	24" diameter	36' radius
10" diameter	15' radius	30" diameter	45' radius
12" diameter	18' radius	40" diameter	60' radius

Structural Critical Rooting Distance to Minimize Catastrophic Tree Failure

Trees that have been identified for preservation are protected by fencing around the CRZ using those guidelines as stated on page 5. However, sometimes it is necessary to dig trenches and install wires, pipes and other items while working around trees that have not been specifically chosen for CRZ protection. Significant risk of catastrophic failure exists if structural roots within this given radius are destroyed or severely damaged. Limits of disruption are based upon tree diameter (DBH) at 4.5 feet above the ground. **Use this table as a guide for determining how far to stay away from the trunks of trees while trenching past them. This will help prevent cutting support roots which could lead to the tree falling over in a storm. More appropriate distances are given in the section on trenching for "preferred trees" located within a CRZ. See Table 1. on Page___.**

Tree Diameter (inches)	Structural Critical Rooting Distance (feet of radius)	Tree Diameter (inches)	Structural Critical Rooting Distance (feet of radius)
1	1	26	10
2	2	27	10
3	2	28	10
4	3	29	10
5	3	30	10
6	4	31	10
7	4	32	10
8	5	33	10
9	5	34	10
10	6	35	10
11	6	36	10
12	7	37	11
13	7	38	11
14	7	39	11
15	8	40	11
16	8	45	11
17	8	50	12
18	8	55	12
19	9	60	13
20	9	65	13
21	9	70	14
22	9	75	14
23	9	80	15
24	10	85	15
25	10	90	16

Tree Protection



is any activity designed to preserve tree health by avoiding damage to tree roots, trunk, or crown. All trees should be protected throughout their lives from damage to maximize their health, useful life, function, and benefits. Small, newly planted trees need as much protection as large, mature trees. Tree protection can be passive or active.

Passive tree protection involves simply avoiding any disturbance or harmful activity near the tree. Active tree protection is required during land development, building construction and maintenance, infrastructure installation and maintenance, and other landscape changes that will have a major impact upon trees. For successful tree protection to occur, a good understanding of the concepts of the **Critical Root Zone (CRZ)** is required. Generally, the CRZ extends out from the tree trunk 1.5 feet for every 1-inch of trunk diameter and encompasses the area within the dripline of the canopy. Using this standard a 20-inch diameter tree would have a CRZ of 30 feet (radius around the tree).

Some of the ***benefits*** of protecting trees in new and existing developments are:

- ☆ **reduced long-term tree maintenance and replacement costs**
- ☆ **reduced site preparation and grading costs**
- ☆ **larger trees and greater canopy cover providing instantaneous benefits**
- ☆ **positive feedback from neighbors and good public relations**
- ☆ **more diverse native plants and animals; many native trees are unavailable in nurseries and are difficult to re-establish**
- ☆ **healthier trees, forest ecosystem, and environment**

To protect trees, avoid these ***common mistakes***:

- 8 **no one knowledgeable about trees is involved in the planning and protection processes**
- 8 **tree conservation and protection are not considered in development planning**
- 8 **tree protection and "preservation" measures are attempted only after damage has occurred**
- 8 **tree protection zones are not established around trees on construction sites**
- 8 **tree protection zones are not clearly marked**
- 8 **tree protection zones are not large enough**
- 8 **fencing around tree protection zones is not sturdy enough**
- 8 **tree trunk and crown are protected, but soil and roots are not**
- 8 **tree protection is not monitored or enforced**

In addition to avoiding the above mistakes, avoid these ***harmful activities and types of damage*** within the CRZ:

- **removing topsoil during grading without replacing it before planting trees**
- **trenching for utility line installation or repair**
- **trenching for irrigation system installation**
- **grade changes including both soil cuts and soil backfill**
- **root damage by grading or grubbing**
- **compacting soil with equipment, vehicles, material storage, and foot traffic**
- **soil contamination from equipment washouts (especially concrete) and vehicle maintenance**
- **installation and paving of parking lots, driveways, and walkways**
- **placing nails, screws, and spikes in trunks to attach mail boxes, signs, lighting, or other structures**
- **trunk wounds and broken limbs from vehicles and heavy equipment**
- **trunk wounds from string weed trimmers and lawn mowers**
- **fire injury or excessive heat**

Some tree species and some individual trees of the same species are more tolerant than others to these activities and damage. A tree's tolerance depends not only upon the species but also upon the conditions present prior to and at the time of the damage. Tree health, soil aeration and moisture, the time of year the damage occurs, how long the damage lasts, its severity, and the weather conditions prior to, during, and after the damage all contribute to the tree's response. Only a professional arborist with construction project experience can analyze these variables and make specific tree protection recommendations.

Best Management Practices for Tree Protection

Planning

1. **Plan and budget for tree conservation and protection as part of the development process.**
2. **Plan for tree protection at least one growing season prior to the beginning of construction activities, where possible.**
3. **If possible, employ the services of a professional arborist, urban forester, or other tree care professional to assist in tree protection planning, implementation, monitoring, and follow-up maintenance.**
4. **Plan for and protect trees located on adjacent property, protecting that portion of the roots, trunk, and crown growing into or over your property.**
5. **Evaluate soil health and past site damage and incorporate into tree protection measures.**
6. **Evaluate existing trees and select trees that will be conserved and protected based upon their location, species quality, health, and benefits.**
7. **Remove trees within 30 feet of the proposed building or structure.**
8. **Remove trees that cannot be protected, those having less than 15%-25% of their total height composed of tree crown, or those with more than one-third of the trunk wounded.**

9. **Do not remove the best trees and conserve the poorest quality trees during thinning.**
10. **Do not save trees that will not be protected.**
11. **Conserve and protect trees in groupings where possible to facilitate their protection and maintenance and to keep the forest structure intact.**
12. **Establish substantial penalties for tree damage and non-compliance with tree protection requirements.**
13. **Complete pre-construction tree maintenance, which should include mulching of the CRZ, fertilization, supplemental irrigation as necessary, and pruning to remove dead, structurally weak, and low hanging branches.**

Best Management Practices for Tree Protection (cont'd.)

Implementation and Monitoring

14. **Educate all workers on site about tree protection techniques and requirements.**
15. **Establish a Tree Protection Zone (TPZ) equal to a tree's CRZ.**
16. **Establish TPZs early, prior to construction, using barriers or sturdy fencing around individual trees or groups of trees.**
17. **Protect high value trees not only with barriers, but also with stem, branch, and root padding or wraps.**
18. **Clearly identify the perimeter of TPZs with high visibility signs.**
19. **Establish one access route into the site and one exit route out of the site.**
20. **Confine construction offices, vehicular parking, worker break sites, and material storage to places outside of TPZs.**
21. **Alter the route of underground and overhead utility lines that would require trenching or severe pruning of protected trees.**
22. **Do not trench or excavate the soil within CRZs. Tunnel or bore at least 18 inches beneath CRZs to install utility lines.**
23. **Where tree roots must be cut, make only sharp, clean cuts to promote root regeneration.**
24. **Remove badly damaged trees that can attract insect and disease pests.**
25. **Monitor compliance with tree protection requirements and tree health regularly during construction.**

Follow-up Maintenance

26. **Complete post-construction tree maintenance, including pruning, mulching, fertilization, irrigation, and soil aeration where necessary.**
27. **Apply at least 1 inch of water per week by deep watering in the absence of adequate rainfall.**
28. **Fertilize trees with phosphorus, potassium, calcium, magnesium, and other macro- and micro-nutrients as indicated by a soil test, but wait at least one year to apply any nitrogen.**

29. **Fertilize lightly with nitrogen after 1 year, and then make annual light nitrogen applications for the next 3 to 5 years.**
30. **Inspect trees annually for at least 3 and up to 5 years after construction to look for changes in condition and signs of insects or disease, and to determine maintenance needs.**
31. **Remove trees that are badly damaged or are in irreversible decline.**
32. **Continue to protect not only the large, established trees on the site but also those newly planted in the landscape.**

Best Management Practices for Tree Protection ***(cont'd.)***

Ongoing Protection Strategies for Property Owners

33. **Maintain an "invisible" passive TPZ around all important "keeper" trees throughout their lives.**
34. **Avoid damage to tree trunks and bark from mowers and string weed trimmers.**
35. **Avoid trenching in the CRZ for utility line and irrigation system installation.**
36. **Avoid damage to tree limbs and trunks during home maintenance and repair projects.**
37. **Avoid soil contamination from oil, gasoline, paint, paint thinner, or other chemical washouts.**
38. **Avoid attaching wires, cables, conduit, mailboxes, or other objects to trees.**
39. **Do not park or drive cars, trucks, or heavy equipment within the CRZ.**
40. **Avoid placing paved walkways and driveways within the CRZ of valuable, large, and mature trees.**
41. **Increase a tree's CRZ and TPZ as the tree gets older and grows larger.**

Don't Top Trees!

Topping violates all methods of accepted pruning practices. It is an assault on the health, beauty, and dignity of your tree. It may inhibit the value and sale of your property.

Never cut main branches back to create stubs. Many people mistakenly "top" trees because they grow into utility wires, interfere with views or sunlight, or simply grow so large that they worry the landowner.

Unfortunately, the topping process is often self-defeating. Ugly, bushy, weakly attached limbs usually grow back higher than the original branches and can break or fall with little or no pressure .

Proper pruning can remove excessive growth without the problems topping creates. In addition, many arborists say that topping is the worst thing you can do for the health of a tree. It starves the tree by drastically reducing its food-making ability and makes the tree more susceptible to insects and disease.

There are five important factors to remember about tree topping:

1. Topping will not make trees safe; it makes them more hazardous in the long run.
2. Topping makes a tree more susceptible to storm damage.
3. Topping makes a tree more prone to insects and disease problems, especially decay.
4. Topping is abuse, vandalism, mutilation, expensive, and ugly.
5. Topping is a waste of YOUR money!

Cuts and Fills

The addition or removal of soil around the base of a tree may seriously disturb the delicate and vital relationship between roots and soil and may considerably damage or kill the tree.

In our hilly area with many steep slopes, fill is often added to a building site or grading cuts are made and no precautions are taken to minimize the shock of placing the roots in a new environment.

When fill is added over existing soils, air and water, which are essential for normal functioning of the roots, are partially excluded. As a result, the roots are smothered and die and the symptoms soon become visible in the above ground parts. Symptoms may appear within a month, or may not appear for several years. The visual symptoms are small yellow leaves, presence of numerous suckers alone the main trunk and branches, many dead twigs and in some instances, large dead branches.

The extent of injury from filling over the top of a tree's roots varies with the kind, age and condition of the tree; the depth and type of fill; drainage and several other factors. Even temporary fills in the CRZ of a tree for as little as several days can have severe, long-term negative effects. Maple, oak and evergreens are most seriously injured, while elm, ash, willow, sycamore and locust are least affected.

Obviously, the deeper the fill, the more marked is the disturbance to the roots. Clay soil fills cause most injury because the fineness of the soil shuts out air and water most completely. The application of only an inch or two of clay soil may cause severe injury and death. The placement of several inches of either "Crusher Run" or 33-P Grade D also known as "Pug" over a tree's root zone will usually result in the decline and death of the tree. Sandy fills may be added to a depth of four inches. Gravelly fills cause least damage, because both air and water penetrate them more readily. As a general rule, the application of a layer of several inches deep of gravelly soil, or even of the same type of soil in which the tree has been growing, will do no harm. The roots will eventually become accustomed to the new situation by producing additional roots near the surface.

Little can be done to save trees that have been suffering from grade fills over an extended period. However, much can be done to prevent damage to trees by excessive fills.

RAISING THE EXISTING GRADE - FILLING

Grade changes are often necessary during construction of a new building. When the grade around an established tree is being raised, consider methods of preventing injury to the tree before the fill is made rather than attempting to take corrective measures after the damage has been done. While the initial cost may be high, prevention is always cheaper and more effective than attempting to correct the situation after damage has been done.

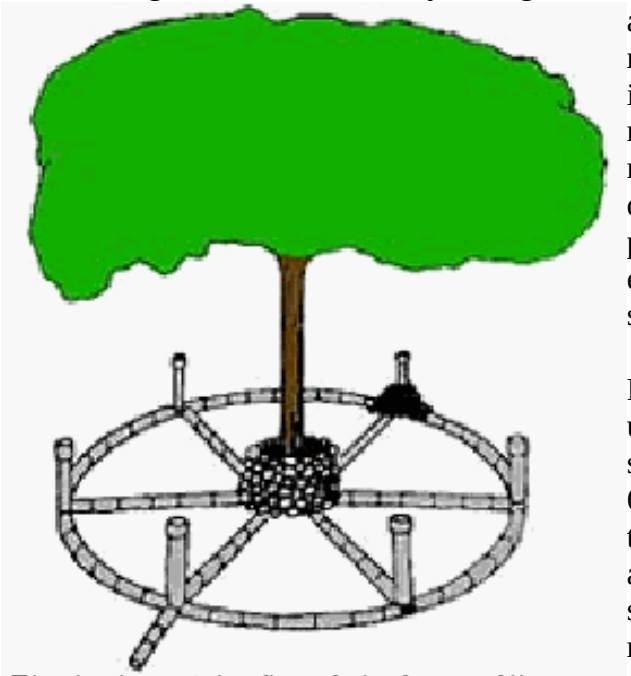


Fig 1. An agricultural drainage tile installation is shown with a dry well and vertical bell tile to provide aeration for tree roots beneath deep soil fill.

Remove all vegetation, including underbrush and sod, beneath the branch spread of the tree. Break up the top 3 to 6 inches of soil carefully so as to disturb the least possible amount of roots. This allows better contact between the fill and soil surface. Apply fertilizer at recommended rates.

Construct an open-joint wall of shell, brick, rock or masonry in a circle around the tree trunk, with at least 2 feet between the wall and trunk. This wall should be as high as the top of the new grade. This opening is commonly referred to as a tree well.

Construct an aeration system using 4-inch agricultural clay tile or 4-inch perforated plastic pipe arranged in five to six horizontal lines radiating from the tree well like spokes in a wheel to a point beyond the branch spread. Allow excess moisture to drain away by installing the radial lines so they slope away from the trunk. Connect the outer ends of the radiating system with a circle of tile or perforated plastic pipe. (See Figures 1 and 2.)

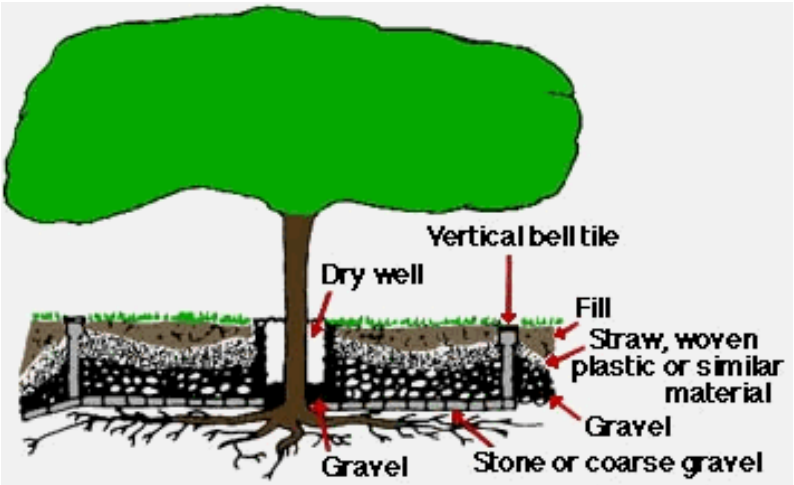


Fig 2. A cross section of a completed fill is shown around an established tree. Soil fill is placed over the ventilating tile system.

To provide vents, place 4- or 6-inch plastic pipe or bell tile upright over the junction of the radial lines with the circle. They should extend to the surface of the planned grade level. Extend the

lower end of the aeration system to a curb or storm drain to carry excess moisture away from the root system.

Cover the exposed soil and tile system with rock or coarse gravel to a depth of 6 to18 inches, depending on the amount of fill. Follow this with a covering layer of gravel. Place a thin layer of straw, woven plastic or other porous material over the gravel to prevent soil from filtering into the gravel and stone. Fill with good topsoil to the desired grade.

To discourage rodents, fill the tree well with enough coarse gravel to cover the ends of the lines opening into the well. Also fill the upright bell tile and cover with a screen or grill.

The tree well can be left open, covered with a metal grill or wooden deck, or filled with a mixture of coarse sand and charcoal (50 percent each, by volume) to within several inches of the top. If filled with the sand/charcoal mixture, cover with pea gravel, decorative bark or other attractive material to allow air circulation through the tile system.

An alternate method can be used if 30 inches or less fill will be used. No tile or pipe is used – only gravel. Again, remove all sod and underbrush, break up the soil surface above the roots and apply fertilizer at recommended rates.

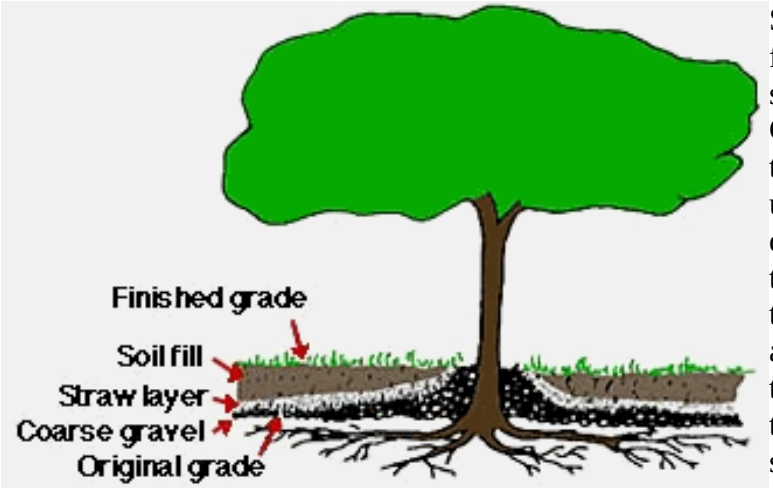


Fig 3. Coarse gravel placed over the original grade will provide aeration for tree roots beneath shallow soil fill.

Starting at the dripline, apply from 3 to 6 inches of crushed stone or coarse gravel. Gradually increase the depth towards the trunk of the tree until it is 8 to 12 inches or deeper within 2 feet of the trunk. The gravel can reach the surface of the fill in the area extending 2 feet around the trunk of the tree. Cover the gravel with a thin layer of straw, woven plastic or other porous material to prevent soil from filtering into the gravel and sealing the air spaces. Spread good topsoil over the area to the desired depth. Use good, well-drained topsoil in making the fill in order to provide adequate aeration for normal root activity and tree growth. (See Figure 3.)

Best Management Practices for Fill Operations

1. **Never place any fill or organic materials directly against the tree.**
2. **If no more than 2 to 4 inches of fill is used around existing trees, no significant damage should occur if the fill has a coarser texture than the existing soil.**
3. **If 4 to 12 inches of fill is required for the project near an existing tree, then the drainless technique will be appropriate if the final grade falls away from the tree.**
4. **If greater than 12 inches of fill is required, then existing trees must have a drain system and retaining wall constructed.**
    a. **If no more than 18-inches of fill is required, then it can be 100% soil.**
    b. **If more than 18 inches of fill is required, then gravel should be used as the intermediate fill capped with 8-inches of soil.**

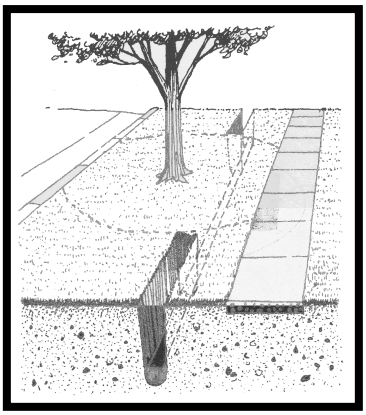
LOWERING THE EXISTING GRADE - CUTTING

There will likely be less damage to a tree when the grade is lowered, unless a great amount of the root zone is exposed or removed. Removing 1 to 2 inches of soil normally will not affect the growth of a tree, especially if steps are taken to ensure that drought damage does not result from loss of roots. Use retaining walls or terraces to avoid excessive soil loss in the area of greatest root growth. When possible, spread mulch over the exposed area to help prevent soil erosion, reduce moisture loss and keep soil temperatures lower. Provide adequate water in the event of a prolonged drought.

Best Management Practices for Making Cuts

1. **Because the initial cost of proper precautionary measures is high replacement of the tree may be more economical, particularly if the tree is young, in poor condition, an undesirable species, or very susceptible to insect and disease pests consider removal and replacement of existing trees.**
2. **Consider and plan grade changes in advance of construction the appropriate method of preventing injury to desirable trees.**
3. **Spread mulch over exposed roots after cuts are made.**
4. **Provide adequate water to desirable trees in the event of a prolonged drought.**
5. **Root Prune - Root pruning is a preventative technique that can prepare the tree for root loss due to grade lowering. Exposed tree roots can be properly clipped with the use of shears and/or pruning saws after the soil has been removed and the affected roots are visible.**
6. **Save the topsoil removed by grade lowering for use elsewhere on the site where landscaping is planned.**

Trenching

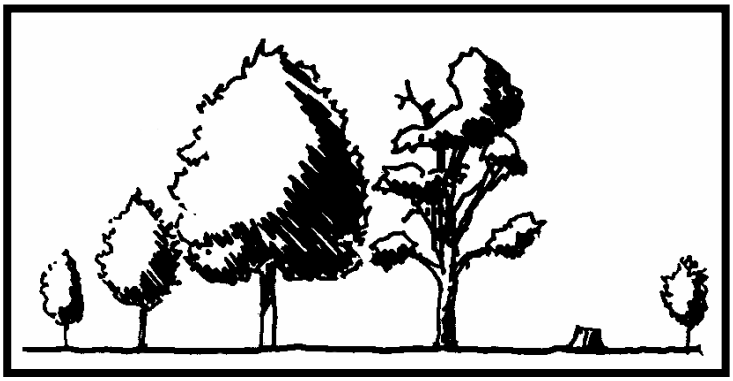


Trenching is a standard way in which utilities are delivered to a building. However it is important that those performing such operations understand that 85% of the mass of the trees root system is located within the **CRZ** and that most roots are within the top 18 inches of soil. A decision must be made as to where best to locate the utility trenches. **Certainly it is best to entirely avoid trenching through the CRZ**. If that is not possible use Table 2. on page ___ to minimize the risk of root failure and a possible blowover.

Best Management Practices for Making Trenches

1. **Protect the trunks of high value trees from scraping and gouging by placing a band of 2 x 4s on the trunks of protected trees to a height of 8 feet.**
2. **Keep equipment and excavated backfill on the side furthest from the tree.**
3. **Place excavated backfill on a plastic or canvas tarp.**
4. **Prune away jagged roots back to the trench wall closest to the tree. Use a hand-held pruner or pruning saw to make sharp, clean cuts.**
5. **Replace the backfill on the same day. If this is not possible cover the exposed roots with wet burlap to prevent them for drying out.**
6. **Do not allow chemicals or foreign debris to become mixed with the backfill.**
7. **Pack the backfill to the same firmness as the surrounding soil.**
8. **Water the backfill if the operation occurs during hot, dry weather.**

Tree Removal and Replacement



are activities that will have to occur for every tree at some point. All parties must understand that some tree removal MUST occur and that it is not a bad thing! The overall goals of tree removal and replacement are to prepare a site for development, maintain public safety, maintain community forest health while also preserving as much tree canopy cover as is reasonably possible.

There are many reasons why trees must be removed. They may be growing in the wrong location, without adequate growing space, and are in conflict with hardscape (driveways, walkways, etc.) or other infrastructure (buildings, roadways, swimming pools, overhead utility lines). They may be old trees that are at the end of their normal life span. They may be dead or in poor or hazardous condition and require removal to protect the safety of the owner or the public in general. Whatever the reason for removal, the site should be evaluated to determine if another tree can be planted in the same or a nearby location to maintain tree canopy cover in the area.

The ***benefits*** of timely tree removal and replacement include:

- ☆ **reduced risk of failure with the prudent removal of trees**
- ☆ **reduced risk of pest infestations and damage to other trees**
- ☆ **additional space for new, vigorously growing trees**
- ☆ **dynamic, diverse community forest**
- ☆ **maintenance of tree stocking levels**

Common mistakes made in tree management that cause tree removals include:

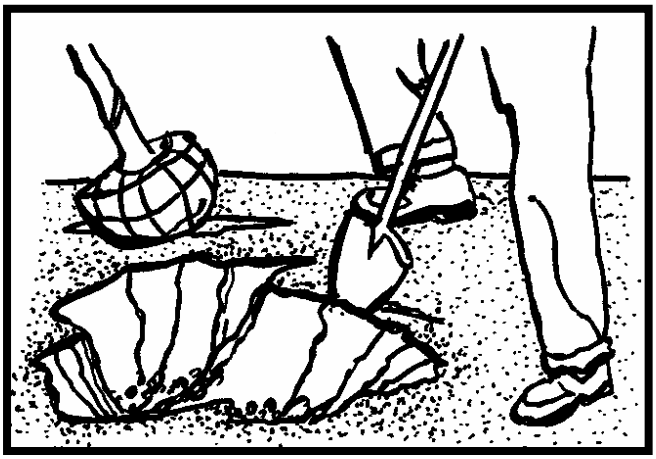
- 8 **trees are not provided with adequate space to grow to maturity**
- 8 **large maturing trees are planted beneath utility lines**
- 8 **trees are neglected and not routinely maintained**

- **tree preservation activities are undertaken only when a tree is in poor condition**
- **trees in poor condition without reasonable chances for improvement or repair are left to fall apart instead of being removed**
- **trees are planted that have a characteristic unsuitable for their location**

Best Management Practices for Tree Removal and Replacement

1. **Have an experienced arborist evaluate tree health and risk for failure before removing old, large, landmark, or historic trees, or trees damaged in a storm.**
2. **Hire only experienced professionals to remove trees.**
3. **Reduce the number and frequency of necessary tree removals through proper tree selection, placement, protection, and maintenance.**
4. **Evaluate trees at risk for failure using standard methods which include the assessment of the probability of failure, size of part that may fail, and the targets that may be affected should the tree fail.**
5. **Remove trees in irreversible health decline and poor condition.**
6. **Removes trees creating a hazardous situation that cannot be remedied with pruning, cabling and bracing, or removal of the target**
7. **Remove trees with characteristics in conflict with the site (oak with large acorns planted in a parking lot).**
8. **Remove trees located where growing space is inadequate.**
9. **Remove trees with unattractive form, or messy, hazardous, or noxious flowers or fruit.**
10. **Replace trees wherever and whenever possible, planting large canopy trees if space permits.**
11. **Request the local power company to remove trees located near or beneath utility lines; do not attempt to remove these trees yourself.**
12. **To preserve any desired trees which have an increased risk of partial or whole tree failure, consider removing the target by restricting public access or moving valuable structures.**
13. **Positively identify ownership before authorizing tree removal.**

New Tree Establishment



consists of a series of steps that begins with the development of a planting plan designed to meet the objectives of the property owner or the requirements of local development regulations. Once a plan is developed, the establishment process continues with the selection of planting sites and appropriate species. The sites are prepared, trees are purchased and planted, new tree maintenance begins, and regular maintenance continues for at least 3 years, completing the establishment process.

New trees should be planted on a regular basis--to replace trees that are removed, to add to an existing group of trees, and to insure that our community forest remains diverse, dynamic, and stable.

The ***benefits*** of regular and successful tree establishment are:

- ☆ **stable tree population with a diversity of ages, sizes, and species**
- ☆ **maintenance of tree canopy cover for future generations**
- ☆ **opportunities for community involvement in tree planting and maintenance activities**
- ☆ **better survival and lower tree establishment costs**

Common mistakes made in tree establishment include:

- 8 **not enough growing space provided and the tree grows too large for the available space**
- 8 **inadequate soil volume provided with restricted root growth and decreased tree stability**
- 8 **species planted does not meets the site conditions of available growing space, soil moisture and pH, sunlight, temperature, or general climate**
- 8 **poor quality planting stock is selected, most often with co-dominant leaders (forked stems) or inadequate root systems**
- 8 **tree is planted in a hole that is too small**
- 8 **tree is planted too deep, below ground level**
- 8 **regular after-planting care is not provided during the 3-year establishment period**
- 8 **trees are staked unnecessarily**
- 8 **tree watering rings remain in place longer than 1 year**
- 8 **stakes and guy wires are incorrectly placed or left on longer than 1 year**

Best Management Practices for Tree Establishment

Tree Selection

1. **Select a tree of appropriate size (at maturity) for the site.**
2. **Select native tree species for planting if they are available and where they match the site conditions, instead of non-native species.**
3. **Use proven, non-native species for special purposes or difficult situations.**
4. **Select only good quality planting stock, trees with a good quality root system, a straight trunk without wounds, a single, central leader (no "forked" stems), and a full, well-balanced crown.**
5. **Select trees that meet the minimum standards for root ball size and quality as defined in the American Standards for Nursery Stock.**
6. **Protect trees from wind damage during transport by covering with a tarp or landscape fabric.**

Site Selection

7. **Place trees where they have plenty of room to grow to maturity without their health or form being compromised by conflicts with infrastructure.**
8. **Provide trees with an adequate amount of soil volume for tree growth and stability.**
9. **Make sure there is now and will be at tree maturity adequate clearance from overhead utility lines, pedestrian and vehicular traffic, buildings, signs, and street lights.**
10. **Plant at least 10 feet from an underground utility line.**
11. **Plant only small maturing trees within 10 feet of an overhead utility line.**

Site Preparation

12. **ALWAYS call the Tennessee One-Call System at 1(800)351-1111 for utility locations before you dig to install trees.**
13. **Till, harrow, or break up overly compacted soils in an area 5 to 10 times the width of the new tree's root ball or container.**
14. **Dig a planting hole that is at least 2 times and as much as 5 times the width of the new tree's root ball or container.**
15. **Dig the planting hole no deeper than the height of the new tree's root ball.**
16. **Do not add soil amendments such as peat moss or fertilizer to the planting hole.**

Best Management Practices for Tree Establishment (cont'd.)

Tree Planting

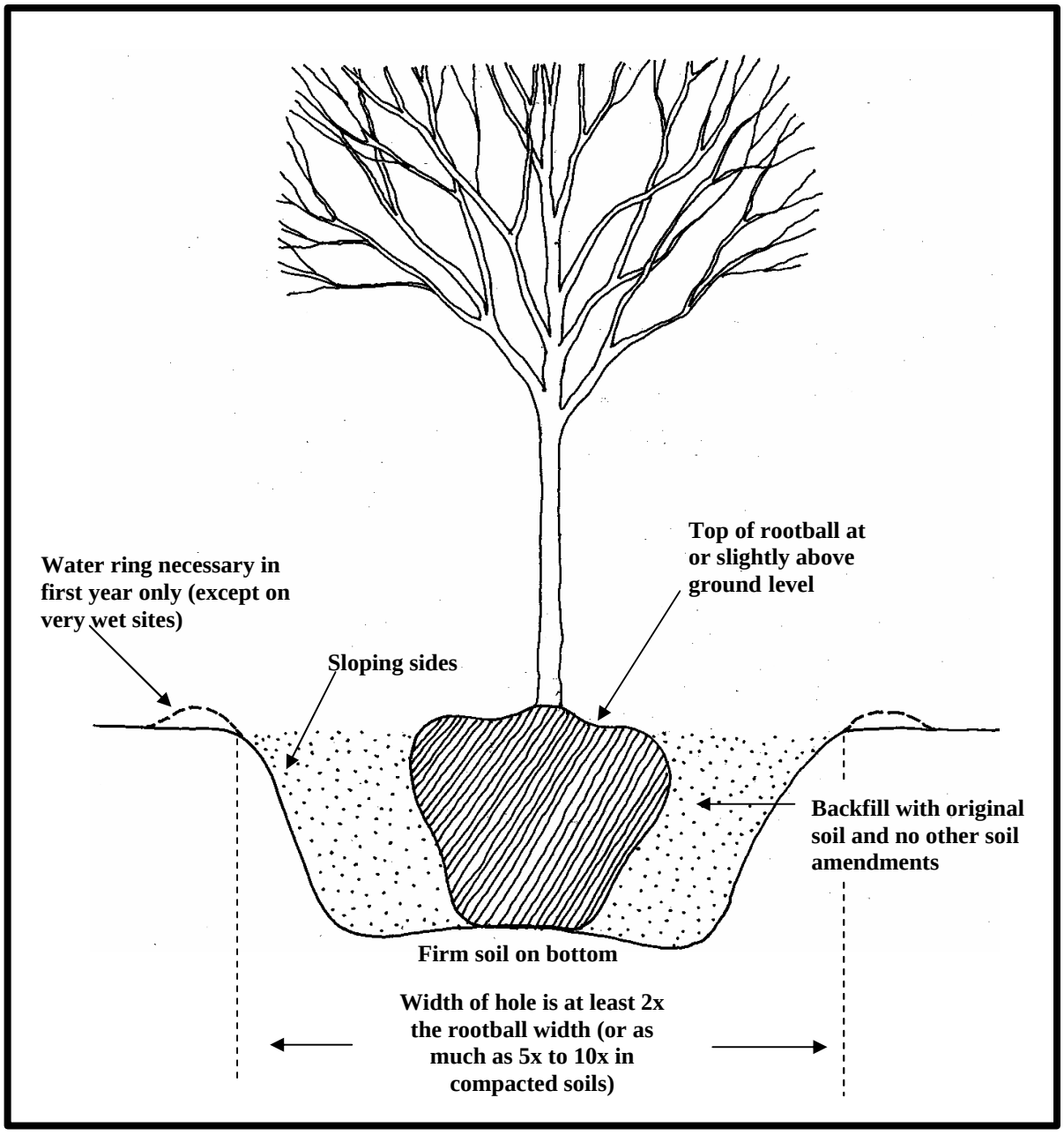
17. **Move the tree using only the root ball or container; avoid using the tree trunk as a "handle" to move trees, which can break tree roots and damage the trunk.**
18. **Plant the root ball at or slightly above ground level, never below.**
19. **Remove all tags, wires, string, straps, burlap, and wire baskets from the root ball.**
20. **Backfill the planting hole with the original soil.**
21. **Do not add fertilizer or other soil amendments to the planting hole.**
22. **Water once when the planting hole is halfway full of soil, and again thoroughly when full to eliminate air pockets.**
23. **Create a watering ring around the tree unless soil conditions are very wet; remove rings after one year.**
24. **Do not stake the tree unless it is unable to stand upright on its own; always remove stakes and guy wires after 1 year.**

New Tree Maintenance

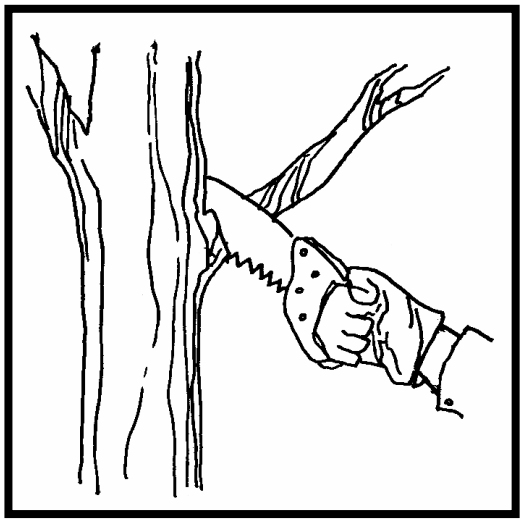
25. **Mulch newly planted trees with leaves, pine straw, or other organic materials to 3-4" in depth and in a 5-foot radius around the tree, or as wide as possible; keep the mulch several inches from the tree trunk.**
26. **Prune only dead, broken, crossed, or rubbing branches; prune annually thereafter.**
27. **Water in the amount of 1" per week in the absence of adequate rainfall.**
28. **Establish tree protection zones (TPZs) around new trees during construction activities.**
29. **Inspect newly planted trees regularly to evaluate their condition and maintenance needs.**
30. **Remove tree watering rings after one year.**
31. **Remove stakes and guy wires after one year.**

Proper tree planting is essential to long-term tree survival and health. Figure 2 shows the recommended method for planting a tree.

Figure 4. Recommended Tree Planting Method



Tree Maintenance



is routine care given to a tree throughout its life to preserve or improve its health, function, and safety. The amount of maintenance a tree requires depends on the species, the tree's location in the landscape, its age, and the care (or abuse) it's been given. Basic tree maintenance begins with regular inspections to determine a tree's needs which may include **pruning**, **mulching**, **fertilization**, **irrigation**, and **pest management**. Only pruning is discussed below.

Tree Pruning

Pruning is the deliberate removal of tree branches and limbs to achieve a specific objective in the alteration of a tree's size, spread, health, and form. Regular inspections to determine a tree's pruning needs should be a part of every tree maintenance program. Always determine your objective before beginning pruning.

The American National Standards Institute (ANSI) and the International Society of Arboriculture publish tree pruning and safety standards, known as ANSI A300 (Part 1) - 2001 Standards Practices (Pruning). The subtitle is: Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Pruning).

The ***benefits*** of regular and correct tree pruning are:

- ☆ **better tree form, health, and structural integrity**
- ☆ **removal of decaying and diseased wood**
- ☆ **decrease in overall risk of limb failure**

Some of the ***common mistakes*** made in tree pruning include:

- 8 **improper techniques such as topping, stub cuts, flush cuts, and stripping the bark beneath the pruning cuts**
- 8 **using spikes to climb trees for pruning**
- 8 **waiting until limbs get large to prune them**
- 8 **pruning trees on a crisis only basis**
- 8 **pruning to reduce tree size as a substitute for proper tree selection and placement**

Best Management Practices for Tree Pruning

1. **Hire only experienced professionals to prune trees; arborists certified by the International Society of Arboriculture are required to pass a written test of basic arboricultural knowledge and to attend continuing education courses to maintain their certification.**
2. **NEVER "top" trees. This is an unacceptable practice and greatly decreases tree health, safety, and longevity.**
3. **NEVER use climbing spikes or spurs while pruning trees, except during an emergency rescue.**
4. **Trees should be inspected before climbing to determine the amount and extent of hazards, and the tree owner should be notified of potentially hazardous or harmful conditions.**
5. **Keep pruning equipment sharp, clean, and in good operating condition.**
6. **When pruning limbs that show evidence of disease, clean pruning equipment between trees.**
7. **Always prune trees back to the parent branch or a lateral that is at least 1/3rd the diameter of the branch being pruned.**
8. **Prune just outside of the branch collar.**
9. **At time of planting, prune only to remove dead, broken, crossed, or rubbing branches.**
10. **Prune trees when young to develop branch structure, strength, and form.**
11. **Prune off one of two leaders on trees with co-dominant (forked) stems.**
12. **Prune trees regularly throughout their life to maintain vehicular, pedestrian, and sight clearance, and to remove deadwood and broken branches.**
13. **Make proper pruning cuts using the 3-cut method, avoiding stub cuts, flush cuts, and wounds to remaining limbs and trunk (see Figure 3).**
14. **Do not remove more than 1/4th of the foliage of a mature tree in any one growing season.**
15. **Do not remove more than 1/3rd of the foliage of a young tree in any one growing season.**
16. **Do not remove more than 1/4th of the foliage from a branch unless you are removing the entire branch.**
17. **Always wear personal protective safety equipment while pruning, including safety glasses.**
18. **NEVER prune (or remove) trees located near energized electrical service or other utility lines; to have a tree growing beneath utility lines pruned or removed, contact your utility service provider.**
19. **Talk to your utility provider about their needs for clearance and their pruning techniques designed to maintain that clearance.**

A recommended method commonly employed to safely remove large tree limbs is illustrated in Figure 3.

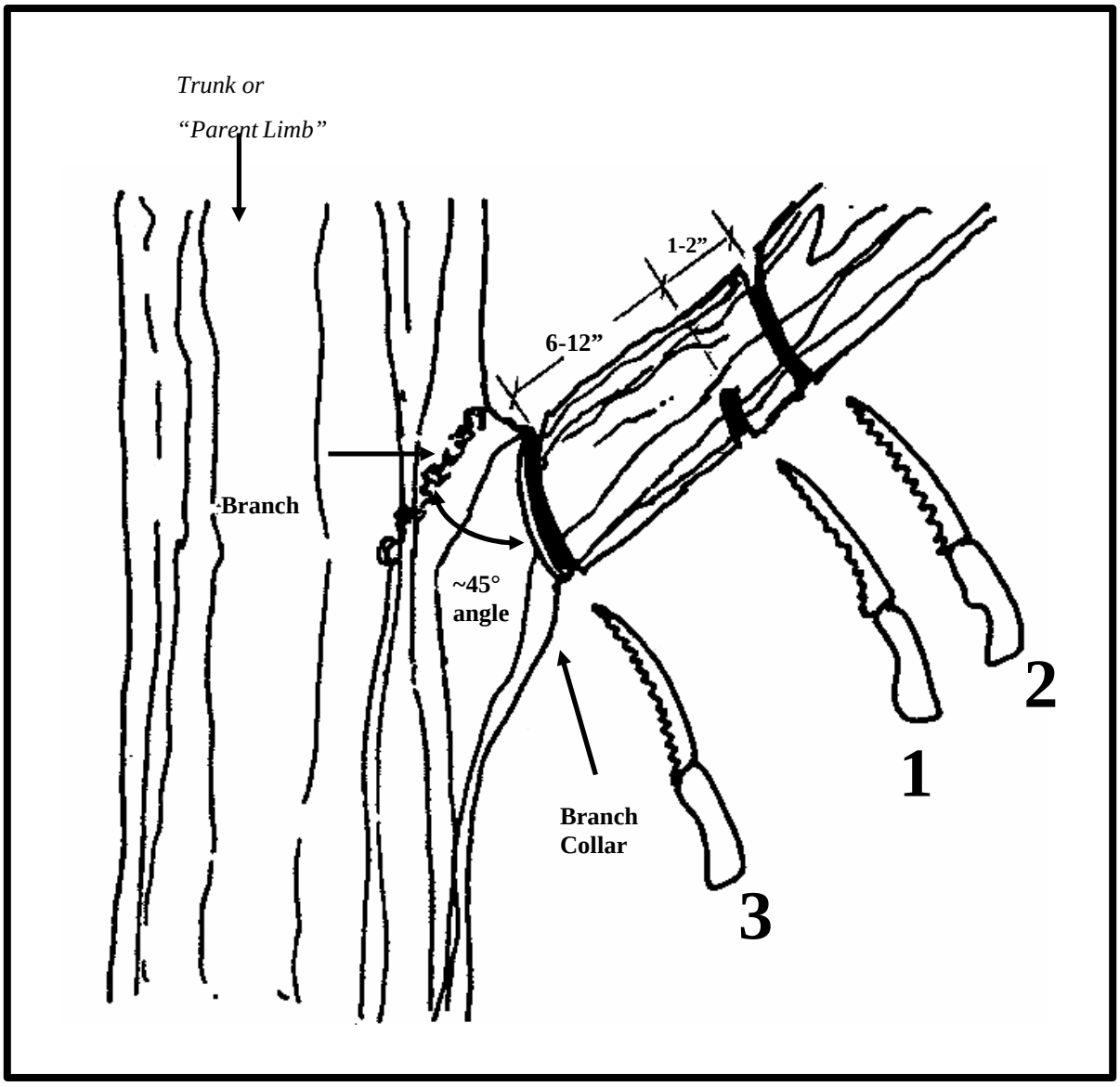


Figure 3. The 3-Cut Pruning Method

When removing a branch, make your cut back to the trunk or parent limb, just outside the branch collar, or at an approximately 45 degree angle to the branch bark ridge if the collar is not visible. In Figure 3, Cut 1 is made first, then Cut 2 is made just outside of Cut 1. At this time the majority of the branch begins to fall, breaks at Cut 1, and is removed without stripping the bark below Cut 1. Cut 3 is then made just outside the branch collar or swelling at the base of the branch and the remainder of the branch or limb is removed.

This is a special project of the The Chattanooga Tree Advisory Commission and was designed to provide information to help guide people through the process of evaluating, preserving, protecting, and removing trees on site that will/are being developed. Also provided are suggestions for maintaining trees after a development project has been completed.

Acknowledgements

Mayor Ron Littlefield

Members of the Tree Advisory Commission:
June Coppinger, Chairwoman
Christine Bock Jack McDonald
Adele Glascock Leroy Parks
Kim McClurkin John Sweet

Gene Hyde, City Forester

Special Thanks to Jenni Gulick who helped edit this edition.

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