



We Use Trees: A Collection of Tree Care Instruction

Edition 1.0

Preface and Selections by:

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2015

Preface

We use trees in our lives everyday. We plant and maintain trees around our homes for beauty and shade. We park under trees in parking lots. We walk through woodlands to relax. We harvest trees to build ourselves houses and wine barrels, amongst other things. We burn trees for warmth and energy. Trees are a fantastic renewable resource and for some a part of family history.

Trees may be the longest living organisms on earth. Possibly, the largest living masses known on the planet. They photosynthesize and harness the sun's energy to sustain themselves on soil, water, sunlight and atmospheric gases. We breathe the oxygen trees generate.

My experience with trees started largely by collecting physical data in oak woodlands in northern California in the planning process to build residential subdivisions. I became a certified arborist to meet the qualifications to conduct the studies. During these studies I became afflicted with a fondness for trees.

It wasn't long and I started my own arboriculture business. After extensively practicing arboriculture for over a decade, through growing, planting, pruning, removing, appraising, and consulting on homeowner trees in and around Chico, California, I've learned to respect trees and understand what they need to thrive and prosper. Because trees are living, and there are so many different variables associated with growing trees, the long-term success needed to grow or maintain a tree through maturity can be challenging.

With this small book, I've collected some of the best printed material I have found in my tree work to inform average to expert tree enthusiasts. I've tried to keep the page count low and deliver some real "to-the-point" drawings and articles from various professionals and publishers. Presumably these authors and arborists have more material which is obtainable and I'd encourage further study.

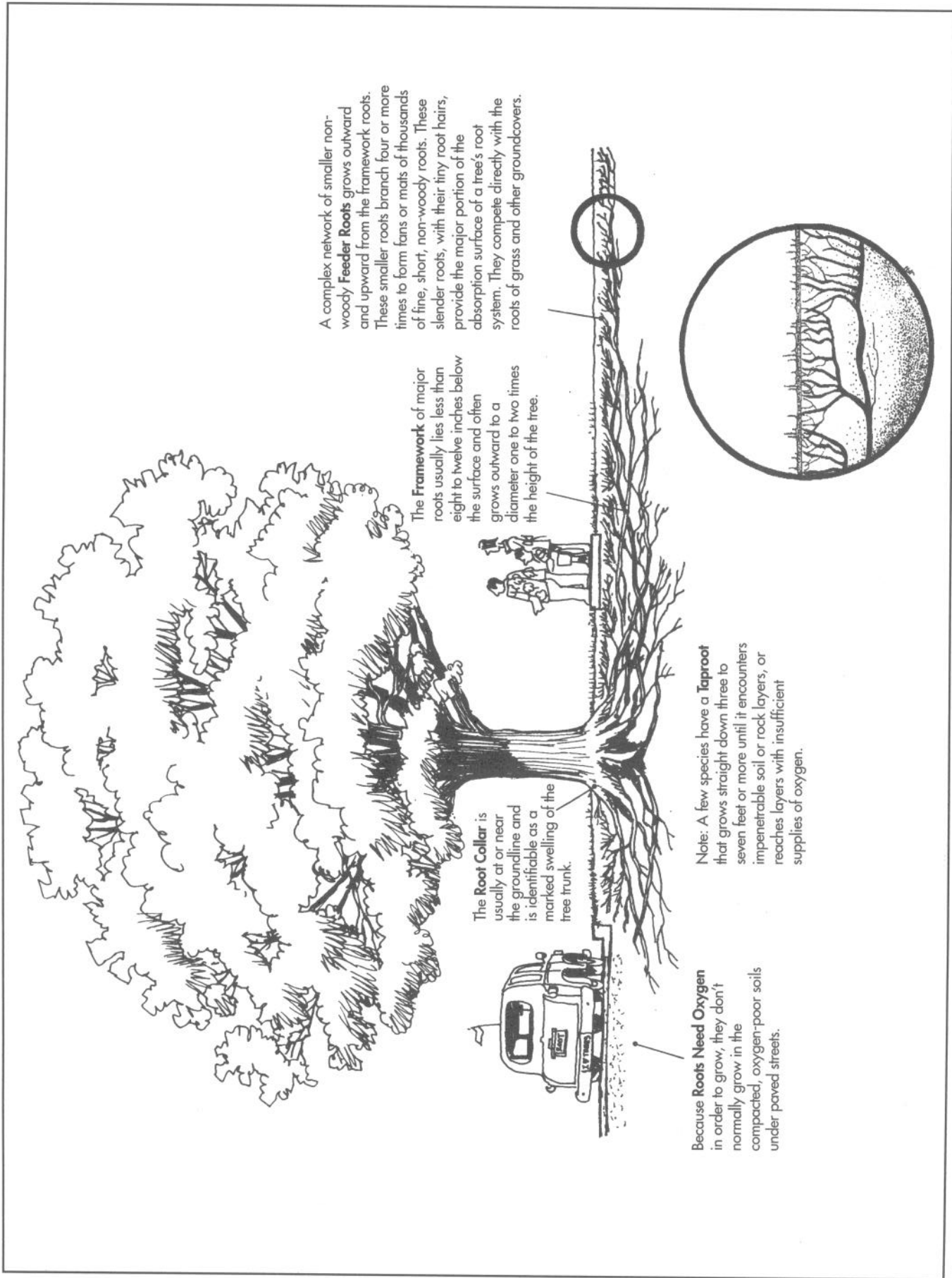
This collection is primarily meant for the residential care of trees and includes materials for proper work in, and care, for our urban forest. Enjoy the material and remember if you are going to, please "plant trees...properly!"

Disclaimer

I want to thank the producers of materials in this collection. They are mighty oaks in the forest of tree literature! I have tried to give accurate credits to authors in the book, but if you are a contributor and desire an edit or the removal of your information, please send me an email with your instruction to: (ryan@blossomlandarborist.com).

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A complex network of smaller non-woody **Feeder Roots** grows outward and upward from the framework roots. These smaller roots branch four or more times to form fans or mats of thousands of fine, short, non-woody roots. These slender roots, with their tiny root hairs, provide the major portion of the absorption surface of a tree's root system. They compete directly with the roots of grass and other groundcovers.

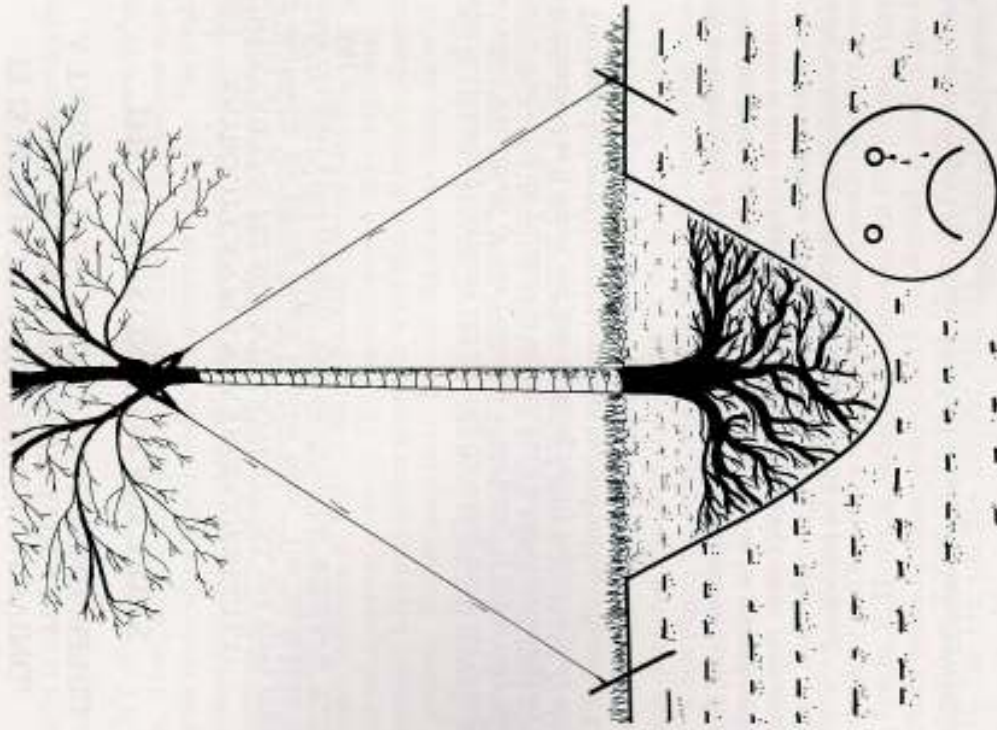
The **Framework** of major roots usually lies less than eight to twelve inches below the surface and often grows outward to a diameter one to two times the height of the tree.

The **Root Collar** is usually at or near the groundline and is identifiable as a marked swelling of the tree trunk.

Because **Roots Need Oxygen** in order to grow, they don't normally grow in the compacted, oxygen-poor soils under paved streets.

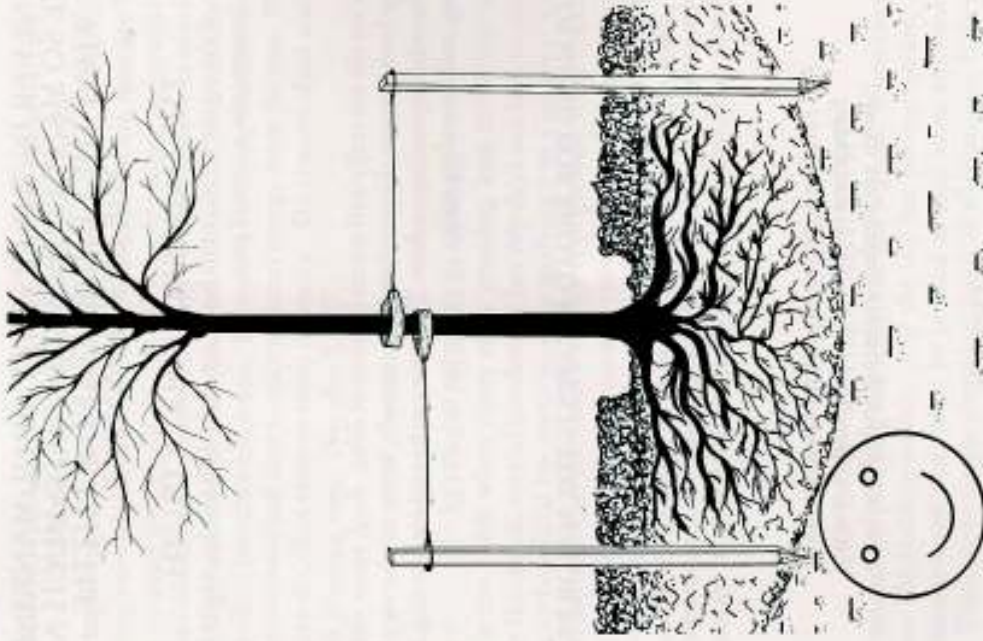
Note: A few species have a **Taproot** that grows straight down three to seven feet or more until it encounters impenetrable soil or rock layers, or reaches layers with insufficient supplies of oxygen.

Figure 1.12 Roots grow where water, oxygen, and space are available.



DO NOT PLANT TOO DEEP

- Money is wasted when trees are planted too deep.
- Do not bury roots in small deep holes.
- Do not wrap trees.
- Do not amend the soil, unless the soil is very poor.
- Do not brace so tightly that the tree cannot sway.
- Do not brace with wire in a hose.
- Do not fertilize at planting time.
- Do not plant grass or flowers near the tree.
- Do not remove branches to balance crown with roots.

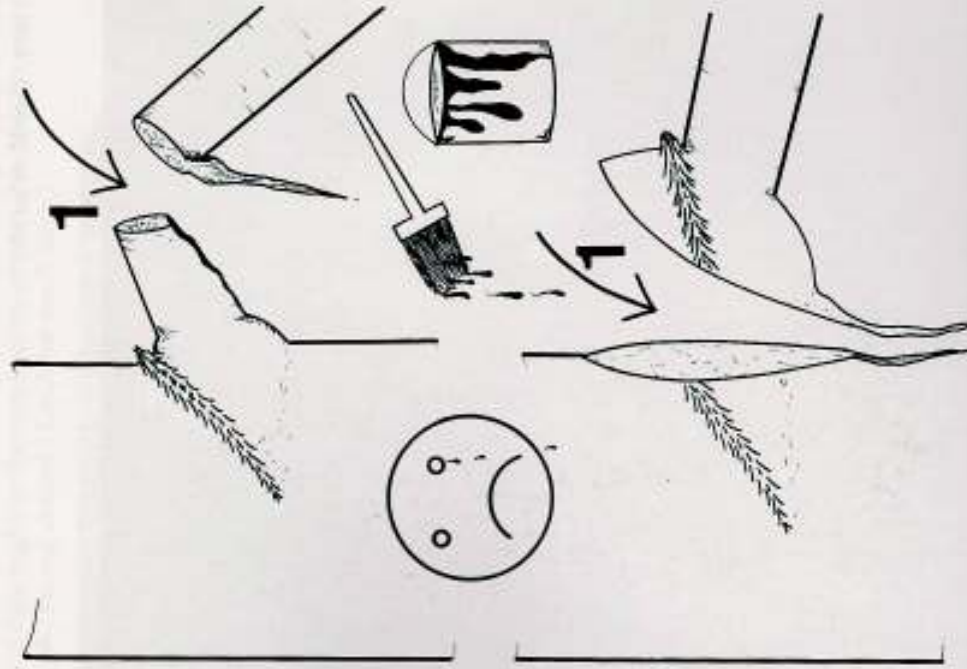


PLANT PROPERLY

- Plant at the depth where roots spread from the trunk.
- Prepare a planting site, not just a hole in the ground.
- Loosen the soil far beyond the dripline of the tree.
- Brace the tree only if it will not remain upright in a moderate wind.
- Brace with broad, belt-like materials that won't injure the bark.
- Mulch away from the trunk with composted material.
- Keep soil moist, not water-logged, to the depth of the roots.
- Remove dead and dying branches.
- Wait until the second growing season to begin training cuts for shaping and to begin fertilizing.

HERE ARE DIAGRAMS THAT SUMMARIZE INCORRECT AND CORRECT PRUNING CUTS.

INCORRECT

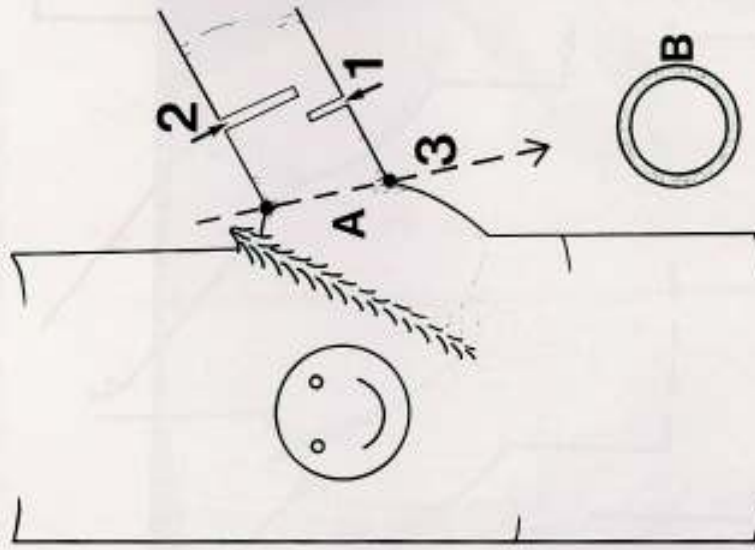


DO NOT REMOVE BRANCH COLLARS, LEAVE STUBS, OR PAINT CUTS.

Painting will not help. Wound dressings do not stop rot. Incorrect pruning starts a long list of costly problems: cankers, sun scald, frost cracks, insect borers.

NATURAL TARGET PRUNING

CORRECT



Cut where the branch meets the branch collar.

First make cuts as shown by arrows 1 and 2. Make final cuts at 3, as close as possible to the outside of the branch collar (A). A "doughnut" or circle of callus will form around correct cuts (B).

CAUTION

Homeowners and others who are not qualified tree care professionals should NEVER prune trees near power lines. NEVER use a chainsaw for pruning, and NEVER get on a ladder to prune. Even if you think you can do the job yourself, it is better, wiser, and safer to discuss your trees with a tree care professional first. Be sure your professional has insurance.

Do not take chances!



TREE CARE INFORMATION



Why Hire an Arborist

Benefits of Trees

Value of Trees

Tree Selection

Buying High Quality Trees

Avoiding Tree and Utility Conflicts

New Tree Planting

Mature Tree Care

Plant Health Care

Palms

Trees and Turf

Proper Mulching Techniques

Pruning Young Trees

Pruning Mature Trees

Why Topping Hurts Trees

Insect and Disease Problems

Recognizing Tree Hazards

Avoiding Tree Damage During Construction

Treatment of Trees Damaged by Construction

Contact Us



[Home](#) > [Tree Care Information](#) > [New Tree Planting](#)

New Tree Planting

Think of the tree you just purchased as a lifetime investment. How well your tree, and investment, grows depends on the type of tree and location you select for planting, the care you provide when the tree is planted, and follow-up care the tree receives after planting.

Planting the Tree

The ideal time to plant trees and shrubs is during the dormant season'Äin the fall after leaf drop or early spring before budbreak. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. However, trees properly cared for in the nursery or garden center, and given the appropriate care during transport to prevent damage, can be planted throughout the growing season. In tropical and subtropical climates where trees grow year round, any time is a good time to plant a tree, provided that sufficient water is available. In either situation, proper handling during planting is essential to ensure a healthy future for new trees and shrubs. Before you begin planting your tree, be sure you have had all underground utilities located prior to digging.

If the tree you are planting is balled or bare root, it is important to understand that its root system has been reduced by 90 to 95 percent of its original size during transplanting. As a result of the trauma caused by the digging process, trees commonly exhibit what is known as transplant shock. Containerized trees may also experience transplant shock, particularly if they have circling roots that must be cut. Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before and during planting coupled with good follow-up care reduces the amount of time the plant experiences transplant shock and allows the tree to quickly establish in its new location. Carefully follow nine simple steps, and you can significantly reduce the stress placed on the plant at the time of planting.

- 1. Dig a shallow, broad planting hole.** Make the hole wide, as much as three times the diameter of the root ball but only as deep as the root ball. It is important to make the hole wide because the roots on the newly establishing tree must push through surrounding soil in order to establish. On most planting sites in new developments, the existing soils have been compacted and are unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides the newly emerging roots room to expand into loose soil to hasten establishment.
- 2. Identify the trunk flare.** The trunk flare is where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). If the trunk flare is not partially visible, you may have to remove some soil from the top of the root ball. Find it so you can determine how deep the hole needs to be for proper planting.
- 3. Remove tree container for containerized trees.** Carefully cutting down the sides of the container may make this easier. Inspect the root ball for circling roots and cut or remove them. Expose the trunk flare, if necessary.
- 4. Place the tree at the proper height.** Before placing the tree in the hole, check to see that the hole has been dug to the proper depth'Äand no more. The majority of the roots on the newly planted tree will develop in the top 12 inches of soil. If the tree is planted too deeply, new roots will have difficulty developing because of a lack of oxygen. It is better to plant the tree a little high, 2 to 3 inches above the base of the trunk flare, than to plant it at or below the original growing level. This planting level will allow for some settling (see diagram). To avoid damage when setting the tree in the hole, always lift the tree by the root ball and never by the trunk.
- 5. Straighten the tree in the hole.** Before you begin backfilling, have someone view the tree from several directions to confirm that the tree is straight. Once you begin backfilling, it is difficult to reposition the tree.

News

Stihl recalls chainsaws

Stihl Inc. has announced the recall of chain saws. The following product safety recall was conducted by the firm in cooperation with the CPSC. Consumers should stop using the product immediately unless otherwise instructed. It is illegal to resell or attempt to resell a recalled consumer product. [MORE >>](#)

EAB Found in Iowa

The Iowa Emerald Ash Borer Team confirmed on May 14, 2010, that the emerald ash borer (EAB), an invasive pest that kills ash trees, has been found in Iowa along the Mississippi River two miles south of the Minnesota border in Allamakee County. The land is owned and managed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service. This is the first confirmed EAB infestation in Iowa. [MORE >>](#)

What is an Arborist and How Can You Find One?

From *Planet Green* a Discovery Company [MORE >>](#)

Rid your lawn of snow mold

Spring is upon us and so is snow mold. Lawn experts provide tips on how to identify and help rid a property of this unsightly lawn fungus. [MORE >>](#)

Green Spaces Improve Health

(BBC News) There is more evidence that living near a 'green space' has health benefits. [MORE >>](#)

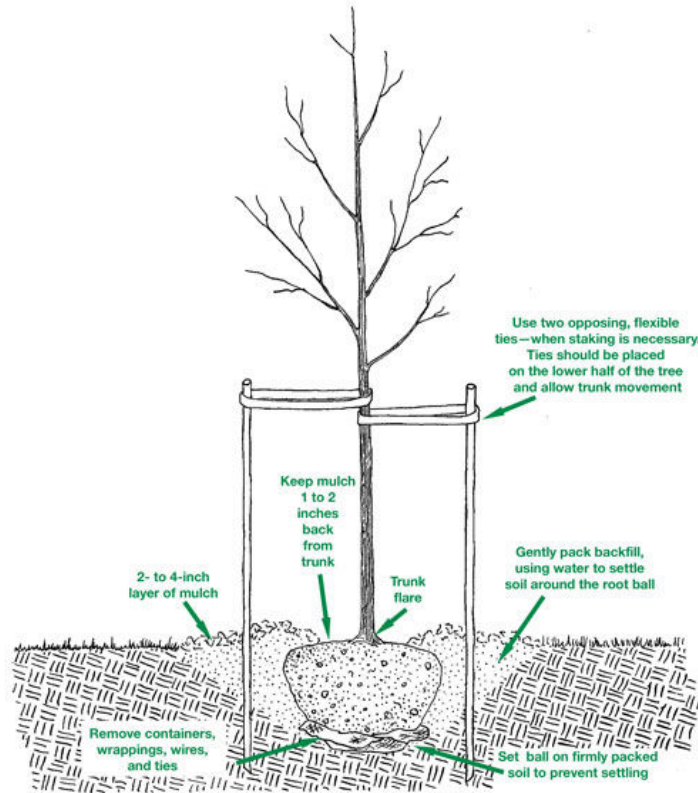
National Register of Big Trees

Big trees are symbols of all the good work trees do for the quality of the environment-and our quality of life. [MORE >>](#)

National Tree Benefits Calculator

The Tree Benefit Calculator allows anyone to make a simple estimation of the benefits individual street-side trees provide. This tool is based on i-Tree's street tree assessment tool called STRATUM. With inputs of location, species and tree size, users will get an understanding of the environmental and economic value trees provide on an annual basis. The Tree Benefit Calculator is intended to be

6. **Fill the hole gently but firmly.** Fill the hole about one-third full and gently but firmly pack the soil around the base of the root ball. Then, if the root ball is wrapped, cut and remove any fabric, plastic, string, and wire from around the trunk and root ball to facilitate growth (see diagram). Be careful not to damage the trunk or roots in the process.



Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. To avoid this problem, add the soil a few inches at a time and settle with water. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.

7. **Stake the tree, if necessary.** If the tree is grown and dug properly at the nursery, staking for support will not be necessary in most home landscape situations. Studies have shown that trees establish more quickly and develop stronger trunk and root systems if they are not staked at the time of planting. However, protective staking may be required on sites where lawn mower damage, vandalism, or windy conditions are concerns. If staking is necessary for support, there are three methods to choose among: staking, guying, and ball stabilizing. One of the most common methods is staking. With this method, two stakes used in conjunction with a wide, flexible tie material on the lower half of the tree will hold the tree upright, provide flexibility, and minimize injury to the trunk (see diagram). Remove support staking and ties after the first year of growth.
8. **Mulch the base of the tree.** Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold moisture, it moderates soil temperature extremes, and it reduces competition from grass and weeds. Some good choices are leaf litter, pine straw, shredded bark, peat moss, or composted wood chips. A 2- to 4-inch layer is ideal. More than 4 inches may cause a problem with oxygen and moisture levels. When placing mulch, be sure that the actual trunk of the tree is not covered. Doing so may cause decay of the living bark at the base of the tree. A mulch-free area, 1 to 2 inches wide at the base of the tree, is sufficient to avoid moist bark conditions and prevent decay.

simple and accessible. As such, this tool should be considered a starting point for understanding trees' value in the community, rather than a scientific accounting of precise values. For more detailed information on urban and community forest assessments, visit the i-Tree website. [MORE >>](#)

When Tree Hugging Goes Too Far

(Wall Street Journal/Real Estate)
Do we love big old trees too much? Many homeowners don't give enough thought to what hazards their biggest and oldest trees may pose to people and property. [MORE >>](#)

USDA Newsroom

USDA's collection of "hot topic" press releases ranging from current pest alerts for specific regions of the United States to new trends in disease prevention and tree and plant care. [MORE >>](#)

Don't Move Firewood!



ISA is pleased to support the efforts of Don't Move Firewood.org. Tree-killing insects and diseases can lurk in firewood. These insects and diseases can't move far on their own, but when people move firewood they can jump hundreds of miles. New infestations destroy our forests, property values, and cost huge sums of money to control. [MORE >>](#)

"Trees are the best monuments that a man can erect to his own memory. They speak his praises without flattery, and they are blessings to children yet unborn."
- Lord Orrery, 1749

Resources

New Tree Planting Brochure



Available through the ISA [Web store](#)

9. **Provide follow-up care.** Keep the soil moist but not soaked; overwatering causes leaves to turn yellow or fall off. Water trees at least once a week, barring rain, and more frequently during hot weather. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less-frequent watering.

Other follow-up care may include minor pruning of branches damaged during the planting process. Prune sparingly immediately after planting and wait to begin necessary corrective pruning until after a full season of growth in the new location.

After you've completed these nine simple steps, further routine care and favorable weather conditions will ensure that your new tree or shrub will grow and thrive. A valuable asset to any landscape, trees provide a long-lasting source of beauty and enjoyment for people of all ages. When questions arise about the care of your tree, be sure to consult your local ISA Certified Arborist or a tree care or garden center professional for assistance.

The PHC Alternative

Maintaining mature landscapes is a complicated undertaking. You may wish to consider a professional Plant Health Care (PHC) maintenance program, which is now available from many landscape care companies. A PHC program is designed to maintain plant vigor and should initially include inspections to detect and treat any existing problems that could be damaging or fatal. Thereafter, regular inspections and preventive maintenance will ensure plant health and beauty.

E-mail inquiries: isa@isa-arbor.com

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UPDATED JULY 2005

Developed by the International Society of Arboriculture (ISA), a non-profit organization supporting tree care research around the world and is dedicated to the care and preservation of shade and ornamental trees. For further information, contact: ISA, P.O. Box 3129, Champaign, IL 61826-3129, USA.
E-mail inquires: isa@isa-arbor.com

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P.O. Box 3129, Champaign, IL 61826
Email comments & questions to isa@isa-arbor.com

Planting and Pruning Education

An educational DVD for homeowner associations, government entities, libraries, or realtors with demonstrations on proper planting and pruning. Available for purchase online at [Rocky Mountain ISA](http://www.rockymountainisa.com)

Planting With a Purpose

Knowing when, what, where, and how to plant is essential to a tree's life span. And if you want trees in your yard to be assets that continually appreciate in value, keep these important tips from the International Society of Arboriculture in mind before, during, and after planting a tree. [MORE >>](#)



Correcting YOUNG TREE Issues

(...while the trees are young)

for

LONG-TERM SUCCESS

By: Ken Menzer, Loomis Town Arborist

Reasons to Correct Young Tree Issues

- Move or eliminate trees if the right tree is not growing in the right location – some problems start from the inception. Make sure that is enough space for the bole (upper above-ground portion of the tree) and the tree's root system. Determine if the plant zone is right, watering that will occur naturally or by an artificial system, sun/shade, soil, wind, speed of growth, and resilience to: vandalism, pests, insects, and/or disease. Too many of the same tree genus, species, or cultivar should not be planned to be located in one area. Planting trees too close to infrastructure (i.e.: sidewalks, curbs, paving, underground & overhead utilities, transformers, pools, retaining walls, sound walls, etc.) or structures can cause the demise of the tree if the roots or bole cause unacceptable damage. Usually the tree(s) loose if the damage or the potential of damage will be (or could be) too costly.
- Eliminate trees that will not likely survive and thrive to maturity – If the defects are too great, so that no amount of pruning, staking, or tree care is likely make the tree into one that is in reasonable condition to grow to maturity, then it should be removed and replaced with a similar species tree or a more appropriate selection for that location (may need approval to make change).
- Improve structural strength – Recognize and eliminate defects such as narrow branch angle of attachment and co-dominant leaders, trained trees are structurally stronger than untrained trees. Structurally stronger trees have a lower potential for failure.
- Reduce maintenance costs – Trained trees require less maintenance when they are mature. Typically, trained trees have fewer branches than untrained trees, which means less pruning. In addition, well-spaced branches provide easier access for arborists, and pruning can be accomplished in a shorter period of time. Finally, trained trees might not have structural defects that require correcting by cabling, bracing, canopy thinning, and co-dominant stem removal, which avoids substantial costs. **It is cheaper, easier, simpler, and better long-term results will result from early tree care while the trees are smaller and worked on every year for the first 5-years.**
- Increase tree longevity – Simply by remaining intact longer, trained trees serve as functional components of the urban forest for more time than untrained trees. Trained trees have a lower potential for failure than untrained trees. Failed trees and hazardous trees need to be removed. Trees that have sustained partial failure often need to be removed because they are a potential hazard, eminent hazard, or unsightly. **No tree can**

ever be made to be safe, but we can certainly reduce the hazard potential and make them safer.

- Monitor and improve the cultural condition where the tree is growing and should be growing into – Pruning, staking (or un-staking), or guying a tree might help if the tree is going to live and can grow fast enough to survive natural and man induced stress and other hardships. Rain, drought, sun, heat, animals, lawnmowers, chemicals, soil compaction, can be difficult for a tree, but also soil temperature, fertility, aeration, soil pH, lack of available organic material, and competition from other plants.

Steps for Correcting Young Trees Issues

1. **Identify the tree's species & cultivar (if possible), plus general plan for this tree at this location** --- Is this the right tree (the right cultivar too) for this location? Identification is very important. Different trees will have a certain shape, special health issues, insects that are beneficial and harmful, a carrier of larvae and/or disease at certain times of the year. Flowers and fruit at specific times of the year will appear in alignment and/or need of insects or birds to pollinate or protect them. Certain bacteria will only grow on certain cultivars. Powdery mildew grows easily on *Platanus x acerifolia* 'Bloodgood', but not on *A. x a.* 'Yarwood' or 'Columbia'. Think about "islanding" a group of trees to make mowing easier, plus to keep off a larger section of the root system (less soil compaction), and to promote a larger colony of *mycorrhiza* fungus that will benefit and support trees, shrubs, and perennials.

Do not plan to plant more than 15% of one tree genus in a project, no more than 10% of the same species, and no more than 5% of the same cultivar. This will drastically reduce problems with disease, insects, and the potential for huge trees losses from any one problem to a large group of trees.

2. **Removal of dead and/or poor condition trees** --- If the tree is in too poor of structural shape, planted too low, scared trunk from lawnmowers or weed-eaters, has been broken, topped, girdled roots, sun scalded bark (on the south to west side of the trunk), or is simply dead...this is the time to remove it. Maybe it is still under warranty (by the developer, landscaper, or by a mitigation bond) and if possible, have the tree replaced by the responsible party. Maybe the best time to replace will be in the late-fall or early-winter.
3. **Review the location** --- If a tree is dead or on a downhill slide, look at all the symptoms and possible reasons for its demise. Is the location too wet or dry? Change the irrigation or drainage. Is it continually being hit by mowers? Change the position of the tree or "island" the tree into a group of other trees, bushes, and/or other plants. What other symptoms explain the condition of the tree? **Health + Structure = Condition**
4. **Remove broken, dead, dying (if you can tell), diseased (if you can tell), infested (if you can tell), or damaged branches** --- Inspect the canopy from all sides and remove or cut back these branches with proper (correct & sharp) tools and cuts. **WARNING: If the tree is infected with a disease, it could be spread to other locations on the same tree or to other trees via the pruners, loppers, handsaw, or chainsaw.**
5. **Select and establish a central leader** --- There should be only one leader for most tree species (not on all species, i.e.: Crape Myrtle, Saucer Magnolia, Chaste Tree, etc.). Select the strongest and most vertical stem as the leader and remove or suppress competing stems. Watch for opposite bud species of trees (mostly trees in the maple and ash family) for co-dominant leaders. Select one leader to retain and cut of the other... Do this as soon as possible, when the tree is young and the leaders are small. **If the**

competing leaders are over 3-4" then look at bolting, bracing, cabling, or removal of the tree and starting over.

6. **Select and establish the lowest permanent branch** --- Look for a well attached branch at the desired height (determined by location and use, generally 7-8' above grade), and removed closely spaced and competing branches as they are larger than 1" in diameter. The diameter of the lowest permanent branch should be no more than one-half that of the central leader or trunk at the point of attachment. Smaller temporary branches should be left close to the lowest permanent branch. Larger temporary branches should be pruned back (suppressed) to 2-5 buds. Leaves on branches are very valuable to the tree to: shade the trunk (preventing sun scald), providing energy to the whole tree (for growth and protection), and specifically adding growth to the immediate area where the branch is attached (increasing trunk caliper). **Think of leaves like solar panels, if you want more power, you will want more leaves retained.**
7. **Select and establish the scaffold branches** --- Look to retain well attached branches above the lowest permanent branch that are no more than one-half the diameter of the central leader. Scaffold branches should be well spaced both vertically and radially. Vertical spacing should be 18 inches or more for large trees and 12 inches for smaller trees. Radial spacing should allow for balanced branch distribution around the central leader. Leave small branches close to scaffolds as temporary branches and cut back or remove larger branches. **Normal pruning, unless there is a serious reason to do something else, only remove a maximum of 25% of the foliage per year.**
8. **Select temporary branches below the lowest permanent branch** --- Some or all the branches below the lowest permanent branch can & should be retained as temporaries. If possible, leave the smallest branches and cut back or remove the largest branches. **RULE OF THUMB: Do no cut off unwanted branches until they are equal or slightly larger than your thumb in diameter (about 1").**

How Much to Prune?

Generally, no more than 25% of the canopy of a young tree should be removed in any one year. In some cases, removing only 5% to 10% will be sufficient to develop good structure and form. Particularly fast-growing trees or trees with significant defects, more than 25% may need to be removed. Minimal pruning as needed is best, so a tree can grow into its natural shape with the least amount of intrusion by cutting open the protective bark. **Don't just prune to prune, to keep busy.**

How Large of Pruning Cuts?

Some trees cover pruning wounds quickly (London Plane) and others more slowly (Purple Leaf Plum). Some wood is resistant to decay (Coast Redwood), while other wood is soft and pithy, so it decays quickly (Box elder). It is best to keep pruning cuts as small as possible, so that is why training should be done early in the tree live. Purchase well shaped trees. Reject poorly shaped trees (above & below ground). All trees must adhere to ANSI Z60.1 American Standard for Nursery Stock.

Our native oaks are slow to grow, slow to die, and slow to callous over a wound. Especially for our native oaks, cuts are to be kept small. The un-written rule for oak pruning in the world of arboriculture is called the 3" rule: **"A cut over 3" in diameter will generally start to decay and/or become infested with insects before it will completely callous over the wound"**

When to Prune?

Both deciduous and broadleaf evergreens should be pruned in the winter months. Conifers can be pruned at this time as well. Do not prune deciduous species until leaves have dropped in the fall. At the latest, prune well before buds swell and new leaves begin to develop. Pruning during the growing season may be needed to direct growth, remove diseased or infected parts, or to remove watersprouts or suckers. This pruning should be kept to a minimum, however. **The worst time to prune any size tree is in the spring just after bud-break.**

Some exceptional pruning problems:

- ◆ *Prunus* --- Flowering Cherry, Flowering Peach - prune after flowering
- ◆ *Pyrus* --- Flowering Pears - do not spread Black Spot or Fire Blight, clean pruners after each cut if infected
- ◆ *Pinus* --- Pines - do not prune when sap is flowing, late-spring to early-summer, due to borer attraction)
- ◆ *Betula* --- Birch - do not prune late-spring to early-summer, due to borer attraction

Staking and (just as important) Un-staking

Stakes should be placed far enough away from the tree, so the stakes will not be driven through the root ball and provide space for the tree to move with the wind. The support should not be needed for the top of the tree, but the real need for stakes is to keep the lowest part of the trunk and root ball still as the roots connect. The best type of ties are loose, so the tree can move with the wind and not hit the a second wooden stake, like the principal of low-impact aerobic exercise will allow lots of movement, but not to the extreme to cause injury

Staking, like a cast for a broken leg on a person, it meant to be there only short-term to provide temporary immobility while the new roots anchor into the soil. Also, like the cast on your broken leg, if you leave the cast too long, the bone will heal, but the muscles will atrophy and can cause other structural problems. If the stakes are left too long... the roots will not need to grow to anchor the tree, as the stakes provide the needed attachment to the ground. The trunk will not grow equally in diameter as compared to the bole (the canopy of the tree), making the trunk physically less able to whole top weighted tree.

❖ Two un-treated wood stakes with soft ties placed 36" minimally apart (or outside the rootball) and cut off just above the lowest ties.

Staking season:

There is a best time to place and remove stakes. It becomes obvious that the best time to stake trees is when they are planted, but better is to buy nursery trees that were grown with the least amount of staking and should hopefully support themselves without stakes. When the stakes are initially removed the tree should not fall over. The stakes are to direct and encourage the trees to grow straight and protect the tree during transporting. Stakes can protect trees that are newly exposed to more extreme winds (from nature or from vehicular traffic). Stakes can also protect trees from some forms of vandalism. Un-staking should occur as soon as a tree is well enough anchored, but not just prior to or during the highest wind season, which in our area is winter through spring. Removing stakes in winter or spring would be like a downhill ski racer that had a broken leg; to remove the leg cast the day of an Olympic ski race. The best time to un-stake is mid-June, which is usually at the beginning of the summer doldrums (as far as most winds) and corrective staking would start the end-of-October. **Staking season starts on Halloween and un-staking is best around Father's Day.**

Crape "Murder"

This is an easily cured problem. Either leave the tree alone or just prune off the seed heads as soon as the flowering is completed. There are non-murdered cultivars of Crape Myrtle,

Lagerstroemia hybrids that will mature at 8' tall x 6' wide ('Pecos' & 'Hopi') to 25'+ tall x 12'+ wide ('Natchez' & Muskogee') and *L. indica* cultivars that can be as small as 2' tall ('Pink Blush') when fully grown, then up to 3' tall ('Centennial', 'Chica red or Pink', 'Louisa', or 'Dwarf Purple'). It is also presumed that if the landscape architect wanted a smaller tree, then a specific sized tree would have been selected and approved by the Town Arborist for the Town of Loomis. Many of the median and entry trees were selected to provide summer colored flowers, fall colored leaves, winter bark interest, and shade. Shade may even be a requirement for parking lots (40% within 15-years). Heading cuts also called "topping" and round-over (see "round-over" in glossary) is not acceptable pruning technique for these trees. The bad practice is also called "poodle cut", "lolly-pop", or "lion's tail" and should not be utilized in Loomis.

Conifers

The same **Correctly Training Young Tree** steps can be applied to conifers with some modifications. Damaged branches and (most important) competing leaders need to be removed. The normal shape for most conifers is excurrent when young. Some trees like the Italian Stone Pine, *Pinus pinea* will have a decurrent large multi-stemmed top "head". When side clearance is needed for vehicles, equipment, or people, then plan to slowly remove the lower branches, as the crown is raised.

Planting Trees

New trees that are to be installed must be placed correctly. They need to have the right shape hole, root barrier of the correct material and installed in the right place, grass and other plants kept away, fertilized, mulched, staked, and watered to settle the soil around the roots. See the attached diagrams for tree planting.

Watering

This is a huge problem in Loomis and especially in new subdivisions. Roots need air as much as they need water, but all new trees need more frequent watering than most established trees. When the pores in the soil are filled with water then there is no room for air in the soil. If the pores are completely filled with air, the roots will dry out. Either way the new tree will die. Most commonly most people kill trees by over-watering. A general watering schedule I am recommending is (depending on the soil type and porosity in each location of a property, the daily evapotranspiration rate, ectomycorrhizae colony that has been established, mulch depth and type, plus lots of other contributing factors):

If the temperature is in the 60's ° F or less in Loomis, no watering is needed

If the temperature is in the 70's ° F in Loomis, water 1 time / week

If the temperature is in the 80's ° F in Loomis, water 2 times / week

If the temperature is in the 90's ° F in Loomis, water 3 times / week

If the temperature is in the 100's ° F in Loomis, water 4 times / week

Never water every day or you will kill most trees with root rot diseases or other decay problems. If you believe your trees, lawn, or other plants need more water, ...increase the duration time, **not** the frequency of watering.

Wood Mulch

This organic layer of chipped wood is not to be confused with compost. Compost is mixed with the soil and is composed of fairly well decomposed organic material (usually leaves, sawdust, vegetable waste, etc.); whereas wood mulch is usually not very decomposed and rough chipped wood, leaf, bark, and twig material that is laid on top of the soil to act as an artificial duff layer. This mulch layer will support a beneficial colony of *mycorrhiza* fungus, cool the soil, promote root

growth ...all summer (without heat-dormancy), trap water, reduce run-off, prevent soil erosion, and increase the likelihood of "live soil" (see Glossary below), which will aid soil aeration, and porosity.

Glossary of Commonly Used Terms

Apical dominance – condition in which the terminal bud inhibits the growth and development of the lateral buds on the same stem formed during the same season

Callous tissue – special tissue formed by the cambium, usually as the result of wounding or pruning

Central leader – dominant upright stem that forms the main trunk

Codominant leader – stems or trunks of approximately equal size, growing at about the same rate and attached to one another; typically, the attachment is structurally weak

Crown – foliated portion of the tree from the lowest branch to the tree top, *synonymous with canopy*

Decurrent – spreading or round-headed tree form; scaffold branches codominant with central leader at maturity

Double leader – two codominant stems more or less in the center of the tree and jointly assuming the role of the leader

Excurrent – conical tree form; strong central leader is present to the top of the tree when mature, leader development is dominant over scaffold development

Flush cut – pruning cut through an/or removing the branch collar, causing unnecessary injury to the trunk or parent stem (also see *stub cut*)

Included bark – pattern of development at branch junctions where bark is turned inward rather than pushed out; contrast with branch bark ridge and synonymous with embedded bark

Lateral – secondary branch arising from scaffold limbs

Live Soil - soil that contains vast quantities of living microflora (algae, bacteria, fungi, and actinomycetes) and macrofauna (vertebrates, arthropods, annelida, mollusca, protozoa, and nematodes), which continue to live due to favorable temperature, air, moisture, and organic nutrient conditions. This is a major contributing factor to really make a tree grow, thrive, and be healthy.

Lowest permanent branch – lowest scaffold on the tree, height is determined by tree use and location

Major Pruning - the removal of any live branch and/or root tissues greater than 2" (two inches) in diameter from a protected tree. Pruning shall conform to the most current ANSI A300 standards for Tree Care and the companion ISA Best Management Practices (BMPs). Major pruning must be done by an arborist (see: Arborist) or under the direct supervision of the on-site arborist during the pruning.

Minor Trimming - the cutting from protected trees of any size dead wood and live limbs and/or root tissues less than 2" in diameter; and not to exceed 25% removal of live tissue over a one-year period. Pruning must conform to the most current ANSI A300 standards for Tree Care and the companion ISA Best Management Practices (BMPs): (1) dead or diseased limbs or twigs; (2) parts which may result in damage to a dwelling; (3) parts which must be removed for safety or public utilities; or the pruning of protected trees to promote health and growth. Trimming which substantially reduces the overall size or density of the tree or destroys the existing symmetry or natural shape of the tree is not considered minor trimming.

Protected Tree (in Loomis) - native oak trees 6" in diameter or greater measured at 54" above grade, heritage trees or landmark trees, significant groves or stands of trees (identified by council resolution), trees over 19" DBH, trees within 100' of a perennial stream or 50' of a seasonal stream, mitigation trees, and Condition of Approval trees.

Round-over – to reduce tree size by heading back all stems on the periphery of the canopy by an equal amount, not a recommended pruning practice, also see topping

Scaffold branch – a branch that is part of the main structure of the crown; scaffolds arise from the central leader or main trunk

Stub cut – pruning cuts made too far outside the branch ridge or branch collar that leave branch tissue attached to the stem

Sucker – a vigorous, upright epicormic shoot that arises from latent buds below the graft union or soil level

Suppression – to restrain a natural flow of energy to a part of a plant, to check or hold back a branch, limb, stem or tree by removing a portion of its twigs and leaves

Temporary branch – a branch that remains in the tree for a limited period of time and is not a part of the main structure of the crown; temporaries can occur on the central leader, trunk, or scaffold branches

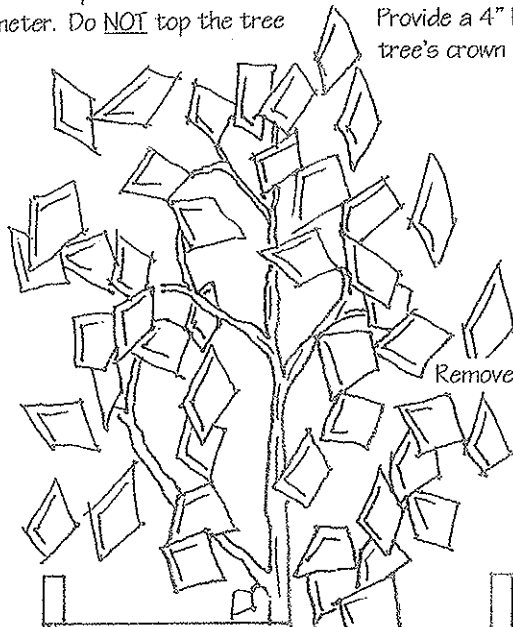
Topping – inappropriate pruning technique to reduce tree size; cutting back a tree to buds, stubs, internodes, or laterals not large enough to assume apical dominance

Tree Protection Zone (TPZ) in Loomis - means the zone around a protected tree's root system to adequately protect the root system from damage. This is delineated as an irregular full circle around a protected tree, with a radius equal to the protected tree's longest horizontal dripline measurement, plus 1 foot.

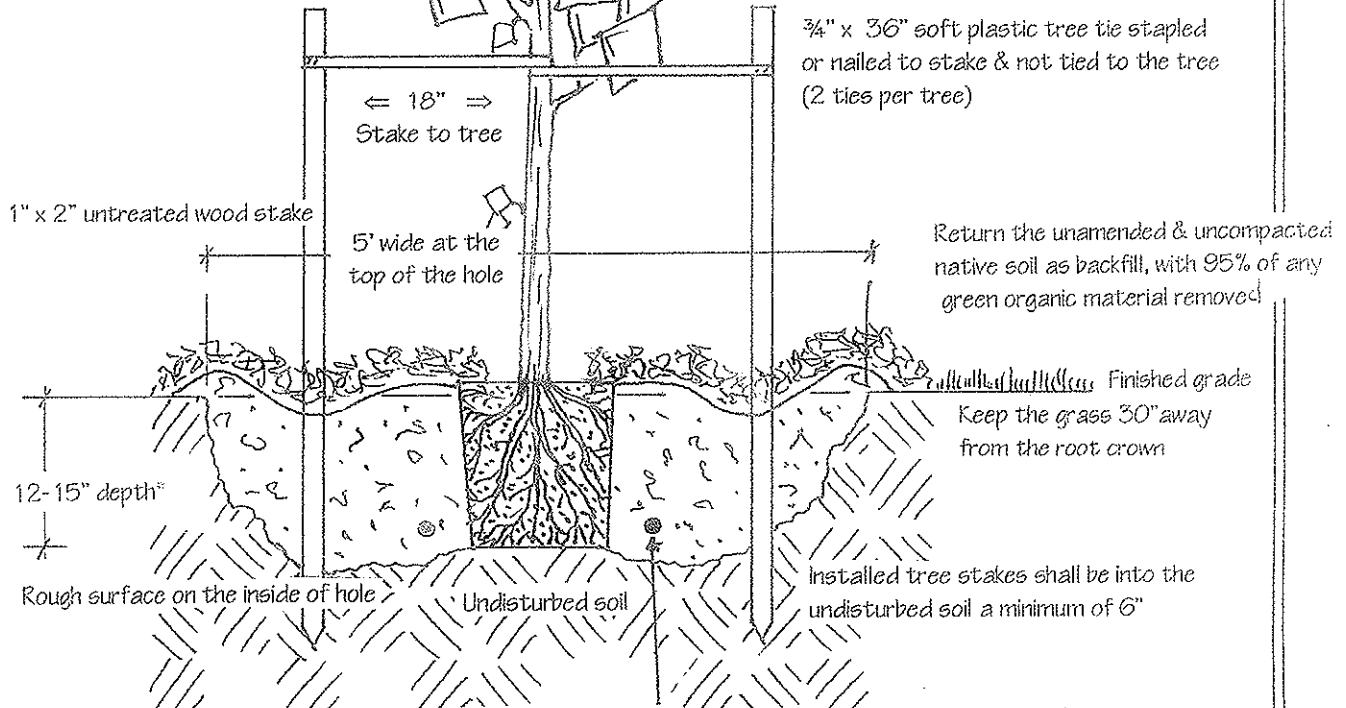
Watersprout – a vigorous upright shoot that arises from latent or adventitious buds above the graft union on older wood

Leave the small branches on the tree. Remove them if the branch location is not suitable as a permanent branch when they become 1" in diameter. Do NOT top the tree

Provide a 4" layer of wood mulch extending 30" from the tree's crown and a 3" clear space at the crown (40 gallons)



Remove any nursery stake tied close to the trunk of the tree




4 slow time release fertilizer tablets (20-10-5) placed about 12" below finished grade and ~4-6" from the rootball

3" high soil water basin for summer use (there shall be a break in the basin during the rainy season, as not to hold water at the crown for more than 4 hours)

*The hole depth should be 1 to 1-1/2" less than the depth of the soil in the container, so the planted tree's rootball shall be 1" to 1-1/2" above the finished grade. Provide positive drainage away from the root crown

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#15 Container Tree Planting

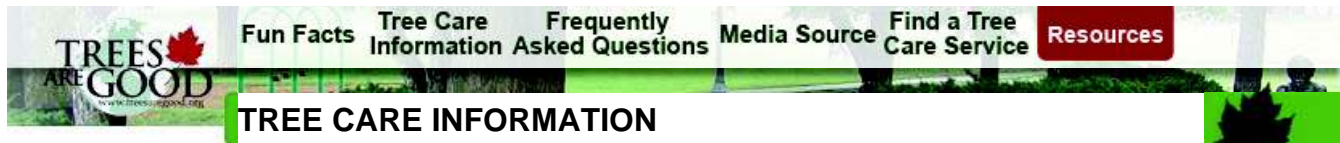
Scale:
3/4" = 1'

Drawing:
#15TP

K. Mauzer 1999

U.C. Davis Five Step Pruning Guide for Young Trees

1. Remove broken, injured, dead, diseased, or dying branches.
2. Select leader stem. Cut back and remove competing leaders.
3. Select and establish lowest permanent branch. A permanent branch should be $\frac{1}{2}$ the diameter of the main stem and well attached.
4. Select scaffold branches, cut back or remove competing branches. Vertical spacing for short growth trees is 12 inches. Vertical spacing for tall growth trees is 18 inches. Scaffold branches should be spaced radially up the central leader.
5. Select temporary branches below the permanent branch. Cut back so that two to three buds remain.



TREE CARE INFORMATION



Why Hire an Arborist

Benefits of Trees

Value of Trees

Tree Selection

Buying High Quality Trees

Avoiding Tree and Utility Conflicts

New Tree Planting

Mature Tree Care

Plant Health Care

Palms

Trees and Turf

Proper Mulching Techniques

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Proper Mulching Techniques

Mulches are materials placed over the soil surface to maintain moisture and improve soil conditions. Mulching is one of the most beneficial things a home owner can do for the health of a tree. Mulch can reduce water loss from the soil, minimize weed competition, and improve soil structure. Properly applied, mulch can give landscapes a handsome, well-groomed appearance. Mulch must be applied properly; if it is too deep or if the wrong material is used, it can actually cause significant harm to trees and other landscape plants.

Benefits of Proper Mulching

- Helps maintain soil moisture. Evaporation is reduced, and the need for watering can be minimized.
- Helps control weeds. A 2- to 4-inch layer of mulch will reduce the germination and growth of weeds.
- Mulch serves as nature's insulating blanket. Mulch keeps soils warmer in the winter and cooler in the summer.
- Many types of mulch can improve soil aeration, structure (aggregation of soil particles), and drainage over time.
- Some mulches can improve soil fertility.
- A layer of mulch can inhibit certain plant diseases.
- Mulching around trees helps facilitate maintenance and can reduce the likelihood of damage from "weed whackers" or the dreaded "lawn mower blight."
- Mulch can give planting beds a uniform, well-cared-for look.

Trees growing in a natural forest environment have their roots anchored in a rich, well-aerated soil full of essential nutrients. The soil is blanketed by leaves and organic materials that replenish nutrients and provide an optimal environment for root growth and mineral uptake. Urban landscapes, however, are typically a much harsher environment with poor soils, little organic matter, and large fluctuations in temperature and moisture. Applying a 2- to 4-inch layer of organic mulch can mimic a more natural environment and improve plant health.

The root system of a tree is not a mirror image of the top. The roots of most trees can extend out a significant distance from the tree trunk. Although the guideline for many maintenance practices is the drip line—the outermost extension of the canopy—the roots can grow many times that distance. In addition, most of the fine, absorbing roots are located within inches of the soil surface. These roots, which are essential for taking up water and minerals, require oxygen to survive. A thin layer of mulch, applied as broadly as practical, can improve the soil structure, oxygen levels, temperature, and moisture availability where these roots grow.

Types of Mulch

Mulches are available commercially in many forms. The two major types of mulch are inorganic and organic. Inorganic mulches include various types of stone, lava rock, pulverized rubber, geotextile fabrics, and other materials. Inorganic mulches do not decompose and do not need to be replenished often. On the other hand, they do not improve soil structure, add organic materials, or provide nutrients. For these reasons, most horticulturists and arborists prefer organic mulches.

Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually

News

Stihl recalls chainsaws

Stihl Inc. has announced the recall of chain saws. The following product safety recall was conducted by the firm in cooperation with the CPSC. Consumers should stop using the product immediately unless otherwise instructed. It is illegal to resell or attempt to resell a recalled consumer product. [MORE >>](#)

EAB Found in Iowa

The Iowa Emerald Ash Borer Team confirmed on May 14, 2010, that the emerald ash borer (EAB), an invasive pest that kills ash trees, has been found in Iowa along the Mississippi River two miles south of the Minnesota border in Allamakee County. The land is owned and managed by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service. This is the first confirmed EAB infestation in Iowa. [MORE >>](#)

What is an Arborist and How Can You Find One?

From Planet Green a Discovery Company [MORE >>](#)

Rid your lawn of snow mold

Spring is upon us and so is snow mold. Lawn experts provide tips on how to identify and help rid a property of this unsightly lawn fungus. [MORE >>](#)

Green Spaces Improve Health

(BBC News) There is more evidence that living near a 'green space' has health benefits. [MORE >>](#)

National Register of Big Trees

Big trees are symbols of all the good work trees do for the quality of the environment-and our quality of life. [MORE >>](#)

National Tree Benefits Calculator

The Tree Benefit Calculator allows anyone to make a simple estimation of the benefits individual street-side trees provide. This tool is based on i-Tree's street tree assessment tool called STRATUM. With inputs of location, species and tree size,

derived from plants. Organic mulches decompose in the landscape at different rates depending on the material and climate. Those that decompose faster must be replenished more often. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider that characteristic a positive one, despite the added maintenance.

Not Too Much!

As beneficial as mulch is, too much can be harmful. The generally recommended mulching depth is 2 to 4 inches. Unfortunately, many landscapes are falling victim to a plague of overmulching. A new term, "mulch volcanoes," has emerged to describe mulch that has been piled up around the base of trees. Most organic mulches must be replenished, but the rate of decomposition varies. Some mulches, such as cypress mulch, remain intact for many years. Top dressing with new mulch annually (often for the sake of refreshing the color) creates a buildup to depths that can be unhealthy. Deep mulch can be effective in suppressing weeds and reducing maintenance, but it often causes additional problems.



"Mulch volcanoes" cause many problems for trees.

Problems Associated with Improper Mulching

- Deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Piling mulch against the trunk or stems of plants can stress stem tissues and may lead to insect and disease problems.
- Some mulches, especially those containing cut grass, can affect soil pH. Continued use of certain mulches over long periods can lead to micronutrient deficiencies or toxicities.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and can girdle the trees.
- Thick blankets of fine mulch can become matted and may prevent the penetration of water and air. In addition, a thick layer of fine mulch can become like potting soil and may support weed growth.
- Anaerobic "sour" mulch may give off pungent odors, and the alcohols and organic acids that build up may be toxic to young plants.

users will get an understanding of the environmental and economic value trees provide on an annual basis. The Tree Benefit Calculator is intended to be simple and accessible. As such, this tool should be considered a starting point for understanding trees' value in the community, rather than a scientific accounting of precise values. For more detailed information on urban and community forest assessments, visit the i-Tree website. [MORE >>](#)

When Tree Hugging Goes Too Far

(Wall Street Journal/Real Estate) Do we love big old trees too much? Many homeowners don't give enough thought to what hazards their biggest and oldest trees may pose to people and property. [MORE >>](#)

USDA Newsroom

USDA's collection of "hot topic" press releases ranging from current pest alerts for specific regions of the United States to new trends in disease prevention and tree and plant care. [MORE >>](#)

Don't Move Firewood!



ISA is pleased to support the efforts of Don't Move Firewood.org. Tree-killing insects and diseases can lurk in firewood. These insects and diseases can't move far on their own, but when people move firewood they can jump hundreds of miles. New infestations destroy our forests, property values, and cost huge sums of money to control. [MORE >>](#)

*"I think that I shall
never see / A poem
lovely as a tree." -
Joyce Kilmer,
"Trees," 1914*

Resources

Proper Mulching Techniques Brochure



Available through the ISA [Web](#)

Proper Mulching

It is clear that the choice of mulch and the method of application can be important to the health of landscape plants. The following are some guidelines to use when applying mulch.

- Inspect plants and soil in the area to be mulched. Determine whether drainage is adequate. Determine whether there are plants that may be affected by the choice of mulch. Most commonly available mulches work well in most landscapes. Some plants may benefit from the use of a slightly acidifying mulch such as pine bark.
- If mulch is already present, check the depth. Do not add mulch if there is a sufficient layer in place. Rake the old mulch to break up any matted layers and to refresh the appearance. Some landscape maintenance companies spray mulch with a water-soluble, vegetable-based dye to improve the appearance.
- If mulch is piled against the stems or tree trunks, pull it back several inches so that the base of the trunk and the root crown are exposed.
- Organic mulches usually are preferred to inorganic materials due to their soil-enhancing properties. If organic mulch is used, it should be well aerated and, preferably, composted. Avoid sour-smelling mulch.
- Composted wood chips can make good mulch, especially when they contain a blend of leaves, bark, and wood. Fresh wood chips also may be used around established trees and shrubs. Avoid using noncomposted wood chips that have been piled deeply without exposure to oxygen.
- For well-drained sites, apply a 2- to 4-inch layer of mulch. If there are drainage problems, a thinner layer should be used. Avoid placing mulch against the tree trunks. Place mulch out to the tree's drip line or beyond.

Remember: If the tree had a say in the matter, its entire root system (which usually extends well beyond the drip line) would be mulched.



Mulch wide—not deep.

E-mail inquiries: isa@isa-arbor.com

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UPDATED JULY 2005

Developed by the International Society of Arboriculture (ISA), a non-profit organization supporting tree care research around the world and is dedicated to the care and preservation of shade and ornamental trees. For further

[store](#)

Proper Mulching Techniques Key to Healthy Trees

Mulching is one of the most beneficial things a homeowner can do to keep trees healthy - it makes growing situations more "friendly" for trees in general. But over-mulching can be one of the worst landscaping mistakes you can make, MORE >>

PRUNING STANDARDS

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CHAPTER

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WESTERN CHAPTER
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PRUNING STANDARDS

Purpose:

Trees and other woody plants respond in specific and predictable ways to pruning and other maintenance practices. Careful study of these responses has led to pruning practices which best preserve and enhance the beauty, structural integrity, and functional value of trees.

In an effort to promote practices which encourage the preservation of tree structure and health, the W.C. ISA Certification Committee has established the following Standards of Pruning for Certified Arborists. The Standards are presented as working guidelines, recognizing that trees are individually unique in form and structure, and that their pruning needs may not always fit strict rules. The Certified Arborist must take responsibility for special pruning practices that vary greatly from these Standards.

I. Pruning Techniques

- A. A thinning cut removes a branch at its point of attachment or shortens it to a lateral large enough to assume the terminal role. Thinning opens up a tree, reduces weight on heavy limbs, can reduce a tree's height, distributes ensuing invigoration throughout a tree and helps retain the tree's natural shape. Thinning cuts are therefore preferred in tree pruning.

When shortening a branch or leader, the lateral to which it is cut should be at least one-half the diameter of the cut being made. Removal of a branch or leader back to a sufficiently large lateral is often called "drop crotching."

- B. A heading cut removes a branch to a stub, a bud or a lateral branch not large enough to assume the terminal role. Heading cuts should seldom be used because vigorous, weakly attached upright sprouts are forced just below such cuts, and the tree's natural form is altered. In some situations, branch stubs die or produce only weak sprouts.

- C. When removing a live branch, pruning cuts should be made in branch tissue just outside the branch bark ridge and collar, which are trunk tissue. *(Figure 1)* If no collar is visible, the angle of the cut should approximate the angle formed by the branch bark ridge and the trunk. *(Figure 2)*.
- D. When removing a dead branch, the final cut should be made outside the collar of live callus tissue. If the collar has grown out along the branch stub, only the dead stub should be removed, the live collar should remain intact, and uninjured. *(Figure 3)*
- E. When reducing the length of a branch or the height of a leader, the final cut should be made just beyond (without violating) the branch bark ridge of the branch being cut to. The cut should approximately bisect the angle formed by the branch bark ridge and an imaginary line perpendicular to the trunk or branch cut. *(Figure 4)*
- F. A goal of structural pruning is to maintain the size of lateral branches to less than three-fourths the diameter of the parent branch or trunk. If the branch is codominant or close to the size of the parent branch, thin the branch's foliage by 15% to 25%, particularly near the terminal. Thin the parent branch less, if at all. This will allow the parent branch to grow at a faster rate, will reduce the weight of the lateral branch, slow its total growth, and develop a stronger branch attachment. If this does not appear appropriate, the branch should be completely removed or shortened to a large lateral. *(Figure 5)*
- G. On large-growing trees, except whorl-branching conifers, branches that are more than one-third the diameter of the trunk should be spaced along the trunk at least 18 inches apart, on center. If this is not possible because of the present size of the tree, such branches should have their foliage thinned 15% to 25%, particularly near their terminals. *(Figure 6)*
- H. Pruning cuts should be clean and smooth with the bark at the edge of the cut firmly attached to the wood.
- I. Large or heavy branches that cannot be thrown clear, should be lowered on ropes to prevent injury to the tree or other property.
- J. Wound dressings and tree paints have not been shown to be effective in preventing or reducing decay. They are therefore not recommended for routine use when pruning.

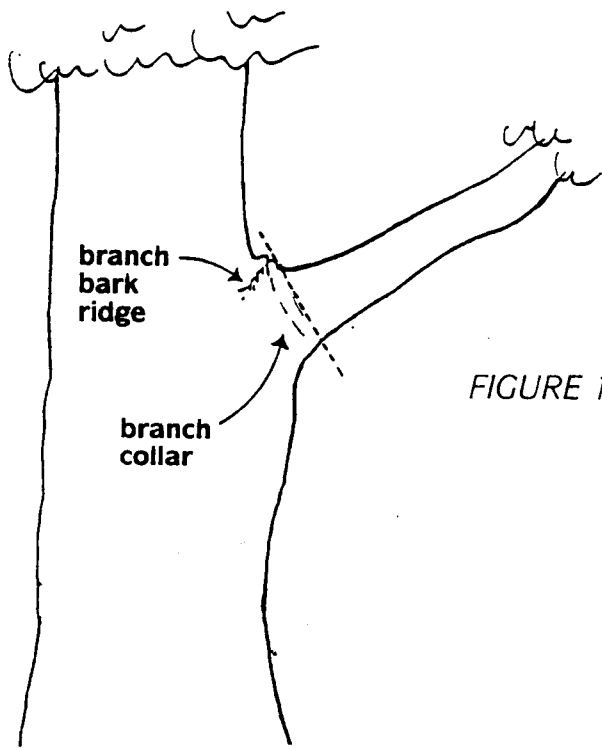


FIGURE 1. When removing a branch, the final cut should be just outside the branch bark ridge and collar.

FIGURE 2. In removing a limb without a branch collar, the angle of the final cut to the branch bark ridge should approximate the angle the branch bark ridge forms with the limb. Angle AB should equal Angle BC.

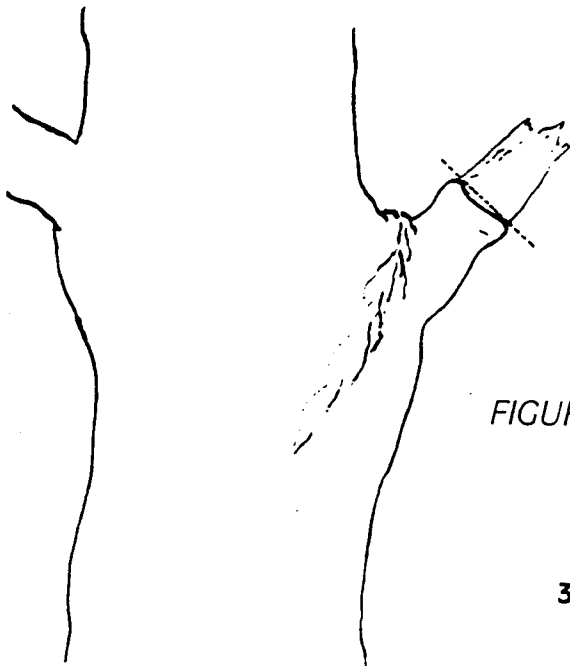
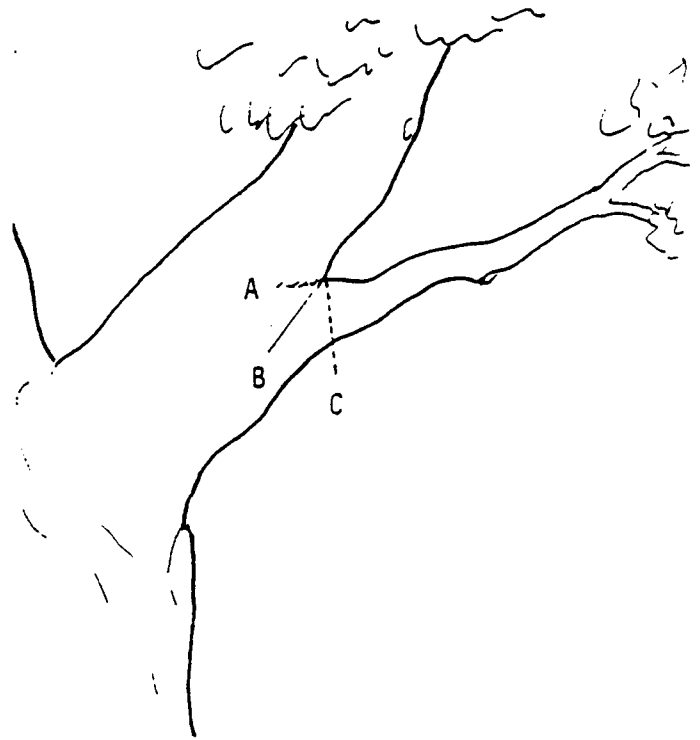


FIGURE 3. When removing a dead branch, cut outside the callus tissue that has begun to form around the branch.

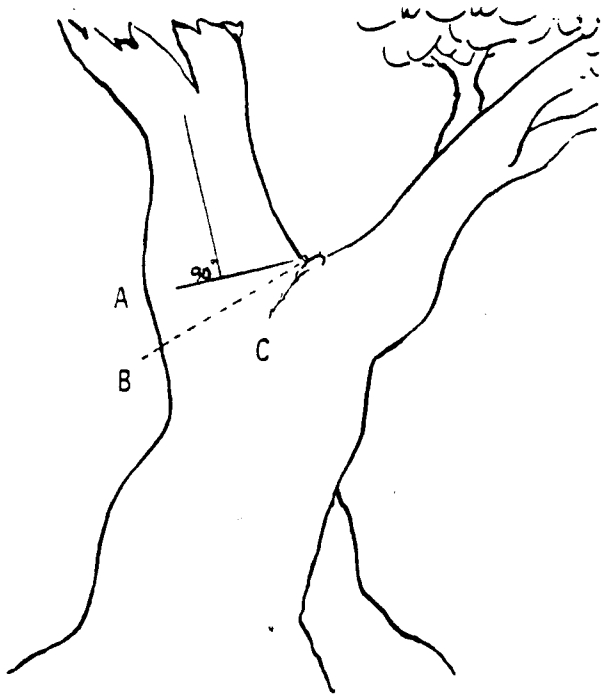
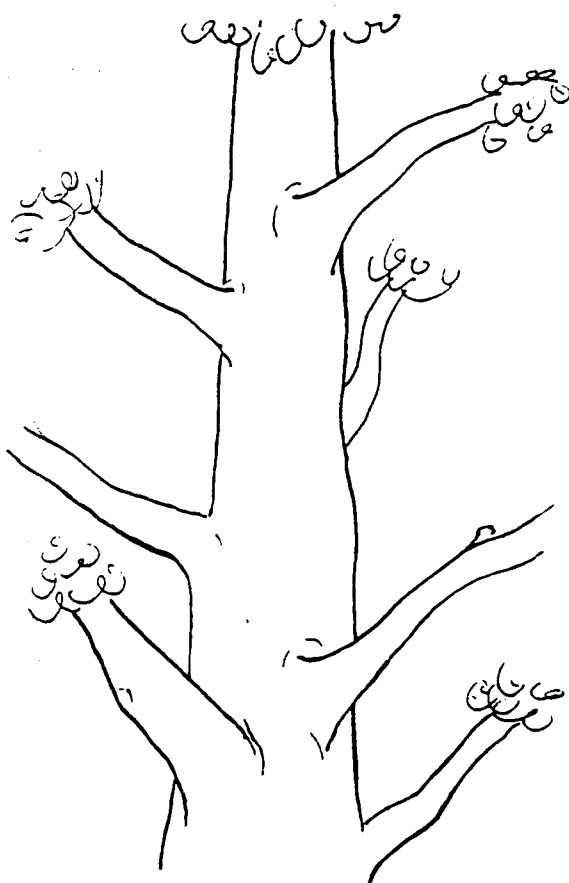


FIGURE 4. In removing the end of a limb to a large lateral branch, the final cut is made along a line that bisects the angle between the branch bark ridge and a line perpendicular to the limb being removed. Angle AB is equal to Angle BC.

FIGURE 5. A tree with limbs tending to be equal-sized, or codominant. Limbs marked B are greater than $\frac{3}{4}$ the size of the parent limb A. Thin the foliage of branch B more than branch A to slow its growth and develop a stronger branch attachment.



FIGURE 6. Major branches should be well spaced both along and around the stem.



II. Types of Pruning — Mature Trees

A. CROWN CLEANING

Crown cleaning or cleaning out is the removal of dead, dying, diseased, crowded, weakly attached, and low-vigor branches and watersprouts from a tree crown.

B. CROWN THINNING

Crown thinning includes crown cleaning and the selective removal of branches to increase light penetration and air movement into the crown. Increased light and air stimulates and maintains interior foliage, which in turn improves branch taper and strength. Thinning reduces the wind-sail effect of the crown and the weight of heavy limbs. Thinning the crown can emphasize the structural beauty of trunk and branches as well as improve the growth of plants beneath the tree by increasing light penetration. When thinning the crown of mature trees, seldom should more than one-third of the live foliage be removed.

At least one-half of the foliage should be on branches that arise in the lower two-thirds of the trees. Likewise, when thinning laterals from a limb, an effort should be made to retain inner lateral branches and leave the same distribution of foliage along the branch. Trees and branches so pruned will have stress more evenly distributed throughout the tree or along a branch.

An effect known as "lion's-tailing" results from pruning out the inside lateral branches. Lion's-tailing, by removing all the inner foliage, displaces the weight to the ends of the branches and may result in sunburned branches, watersprouts, weakened branch structure and limb breakage.

C. CROWN REDUCTION

Crown reduction is used to reduce the height and/or spread of a tree. Thinning cuts are most effective in maintaining the structural integrity and natural form of a tree and in delaying the time when it will need to be pruned again. The lateral to which a branch or trunk is cut should be at least one-half the diameter of the cut being made.

D. CROWN RESTORATION

Crown restoration can improve the structure and appearance of trees that have been topped or severely pruned using heading cuts. One to three sprouts on main branch stubs should be selected to reform a more natural appearing crown. Selected vigorous sprouts may need to be thinned to a lateral, or even headed, to control length growth in order to ensure adequate attachment for the size of the sprout. Restoration may require several prunings over a number of years.

II. Types of Pruning — Mature Trees (*continued*)

E. CROWN RAISING

Crown raising removes the lower branches of a tree in order to provide clearance for buildings, vehicles, pedestrians, and vistas. It is important that a tree have at least one-half of its foliage on branches that originate in the lower two-thirds of its crown to ensure a well-formed, tapered structure and to uniformly distribute stress within a tree.

When pruning for view, it is preferable to develop “windows” through the foliage of the tree, rather than to severely raise or reduce the crown.

III. Size of Pruning Cuts

Each of the Pruning Techniques (Section I) and Types of Pruning (Section II) can be done to different levels of detail or refinement. The removal of many small branches rather than a few large branches will require more time, but will produce a less-pruned appearance, will force fewer watersprouts and will help to maintain the vitality and structure of the tree. Designating the maximum size (base diameter) that any occasional undesirable branch may be left within the tree crown, such as ½", 1" or 2" branch diameter, will establish the degree of pruning desired.

IV. Climbing Techniques

- A. Climbing and pruning practices should not injure the tree except for the pruning cuts.
- B. Climbing spurs or gaffs should not be used when pruning a tree, unless the branches are more than throw-line distance apart. In such cases, the spurs should be removed once the climber is tied in.
- C. Spurs may be used to reach an injured climber and when removing a tree.
- D. Rope injury to thin barked trees from loading out heavy limbs should be avoided by installing a block in the tree to carry the load. This technique may also be used to reduce injury to a crotch from the climber's line.

GENERAL TREE PRESERVATION GUIDELINES

Introduction to Tree Preservation

Great care must be exercised when development is proposed in the vicinity of established trees of any type. The trees present at this proposed construction site will require specialized protection techniques during all construction activities to minimize negative impact on their health and vigor. The area immediately under canopy driplines of these trees is especially critical, and for these reasons the requirements, procedures, and recommendations which follow have been established for short and long term tree protection. The purpose of this preservation guideline is therefore to define the procedures which must be followed during any and all phases of development in the immediate vicinity of these trees.

Established, mature trees respond in a number of different ways to disruption of their natural conditions. Change of grade within the dripline or near the root crown, damage to the bark of the tree, soil compaction above the root system, root system reduction or damage, or alteration of summer soil moisture levels may individually or collectively cause physiological stress leading to tree decline and death. The individual effects of these procedures may cause trees to immediately exhibit symptoms and begin to decline, but more commonly the process may take many years, with symptoms appearing slowly over a period of time. Trees may not begin to show obvious signs of decline until many years after construction is completed. It is not appropriate to wait for symptoms to appear, as this may be too late to correct the conditions at fault and to halt decline.

It is therefore critical to the long term health of all tree species that a well conceived management program be agreed upon before implementation of any construction activities. Once agreed upon at the design level, it is imperative that contractors and construction personnel understand the importance of guidelines and their potential implications. The following guidelines are meant to be utilized by project managers and those supervising any construction in the vicinity of these trees including grading contractors, underground contractors, all equipment operators, construction personnel, and landscape contractors. Guidelines are presented in a brief outline form to be applied to each individual circumstance which occurs during development activities. It is left to the project supervisor to apply and enforce these protection measures. Questions which arise, or interpretation of guidelines as they apply to site activities, should be referred to the office of Horticultural Associates as they occur.

It should be understood by all those involved in this project that by altering natural conditions around any existing, healthy tree, the potential for root damage and eventual tree decline is increased. A well written and implemented protection specification will minimize to an acceptable level but not necessarily eliminate negative impacts on trees. Compromise or deviation from protection specifications will significantly increase the chance of tree decline or failure.

The term *dripline* has different meanings and should be defined for use at this project. Tree dripline is defined as the perimeter of each tree canopy at the widest point from the main

trunk. This traditionally is applied to the actual field condition, however, where a one-sided tree structure exists and the tree is not structurally uniform, the dripline shall be assumed to be the widest distance to the edge of canopy extending equally around tree circumference. The area below ground within the dripline is the location of only approximately 70% of the root system, *primarily in the top two feet of the soil surface*. Tree protection guidelines are focused on minimizing intrusion, soil cut or fill, and all activities causing compaction within this area. Site supervision should be completely familiar with this definition and these guidelines, as well as utilizing common sense when working near this critical area.

The following guidelines will cover most circumstances which might arise during construction and will require application to the particular circumstances at the development site based on the actual conditions present.

Protection Within Dripline of Individual Trees

- 1) Prior to initiating any construction activity in the area, including demolition or grading, temporary protective fencing shall be installed at each site tree in the immediate vicinity of construction. Fencing is to be located a minimum of one foot beyond the canopy dripline. If available space and logistics allow, fence shall be placed at a greater distance or up to twice the diameter of the dripline.
- 2) Fencing shall be minimum four foot height at all locations, and shall form a continuous barrier without entry points around all individual trees, or groups of trees. Barrier type fencing such as chain link or Tensar plastic fencing is suggested, but any fencing system which adequately prevents the entry of equipment and activity will be acceptable. The use of simple post and cable fencing is not recommended as this provides minimal protection and is easily removed or moved by construction personnel. Fencing shall be installed in a professional manner with adequate uprights and appropriate attachments. Concrete footings are not required due to the temporary nature of the fencing. Any encroachment into the dripline for fencing or construction purposes should be discussed and agreed upon in advance.
- 3) This fencing shall serve as a barrier to prevent dripline encroachment of any type by construction activities, equipment, materials storage, and personnel.
- 4) Contractors and subcontractors shall direct all equipment and personnel to remain outside the fenced area at all times until project is complete, and shall instruct personnel and subcontractors as to the purpose and importance of fencing and preservation.
- 5) Fencing should remain in place and not be removed until all construction activities are completed. This shall include grading and compaction activities, installation of underground, all construction activities, and any other construction or activity which is scheduled prior to landscape installation. There may be occasion when access is required, and fencing may temporarily be moved to facilitate the work.
- 6) Roots of single standing trees often extend two to three times the distance of the actual dripline and function primarily in the uptake of nutrients and water. The dripline is arbitrarily established as the minimum root area generally required to preserve tree health. As much area around the circumference of the tree beyond the dripline should have minimum intrusion to further ensure tree survival and health.

Grade Changes

- 1) Grade changes within tree dripline are to be minimized wherever possible. Grade should not change from that which existed prior to grading activities without approval from the project arborist.
- 2) Maximum cut or fill within actual or estimated dripline not to exceed 6 inches. All cut activities should be done in conjunction with the project arborist, even those under 6", to minimize root damage.
- 3) Estimated dripline is defined as the widest distance from main trunk to furthest branch tip applied around the entire circumference of each individual tree. This definition specifically applies to all trees where a one-sided or unbalanced structure exists and the actual dripline is not truly representative of the area of the root zone requiring protection. Cut and fill activities apply to this definition.
- 4) No more than 6 inches of fill soil shall occur without specifically developed mitigation measures. Removal of soil within tree dripline is also limited to 6 inches, or a lesser amount which can be removed without contacting major roots. Detailed mitigation is required to remove a greater amount. The amount of cut and fill is to be determined by actual tree species, rooting characteristics, soil conditions, and purpose of grade change.
- 5) All cut and fill activities within tree dripline increases percentage of short and long term tree decline and loss, and approval of these activities, or compromise in this area, shall be done with full knowledge of the negative potential that is incurred.
- 6) Original grade shall be maintained in immediate area of the root crown, where the soil contacts tree bole, at all times. No increase in grade shall be allowed under any circumstances in this area.
- 7) Physical retaining structures are required where any fill operation is approved and exceeds 6 inches above original grade. Retaining structures function to prevent soil grade from being raised in the root crown area.
- 8) Retaining structures shall be permanent in nature and may be constructed from any material which is appropriate in function to hold raised grade away from root crown on a long term basis. Engineering may be required in some instances.
- 9) Tree retaining structures shall be installed a minimum distance of four feet from any tree trunk and may completely or partially surround the tree depending on location of grade change. If grade is raised on 50% of the dripline, then retaining structures must be installed to prevent that soil from moving to the immediate root crown in that area. If 100% of the grade is raised, structure must surround the tree entirely. It is the responsibility of the project designer to develop an appropriate structure for this purpose.
- 10) If site conditions exist which necessitate installation of retaining structures closer than four feet to tree trunk, the project arborist shall be consulted for details of this installation.

- 11) No part of the dry well structure shall be placed below original grade to minimize impact on root system. If necessary, structural posts may be installed to hold walls in place, providing that care is taken during installation to minimize damage to the root system, and that post hole size is minimized. The excavation and pouring of footings and other structural support is not compatible with tree preservation.
- 12) Grade changes outside the retaining structures shall be such that drainage water of any type or source is not diverted toward or around the root crown in any manner. Grade shall drain away from root crown at a minimum of 2%.
- 13) If grading toward root crown is required, appropriate surface and/or subsurface drain facilities shall be installed so that water is effectively diverted away from root crown area.
- 14) Where fill is approved and/or where paving of any type is planned within the dripline, aeration tubes shall be installed from the dry well or retaining structure to the limit of the dripline and placed at a depth corresponding to slightly below original grade. A description of aeration tube use and construction follows:

In all areas where paving, impermeable or semipermeable surfaces, or fill over 6 inches is to be installed within any tree dripline, aeration tubes shall be required to the limit of the dripline or beyond where possible. Tubes shall radiate horizontally from each dry well or the root crown area to the limit of the dripline, and shall be located on 4 foot centers. Ends of tubes shall be connected to one another. A proportional number of tubes shall be installed when partial paving or filling within dripline is required.

Aeration tubes shall consist of rigid and perforated PVC pipe, minimum class 200, styrene plastic, or molded ABS, minimum 3 inch diameter, 10 perforations per foot. Pipe shall be placed slightly below original grade. Each tube shall be wrapped in suitable filter fabric securely fastened with waterproof tape. Aeration tubes shall daylight within the retaining structure around tree trunk, and a grate shall be attached, but not glued, to the end of each daylighted tube to prevent the entry of debris. Aeration tubes shall also daylight near the outer perimeter of the dripline with a fitted metal grate properly installed slightly above finished grade. Tubes and grate shall not be installed such that water of any type or source backdrains into dry well.

- 15) The installation of aeration tubes is meant to facilitate the normal exchange of atmospheric gasses with the soil and root system. When impermeable or semi-permeable paving is installed, or when soil grade is raised, this normal exchange is limited and commonly becomes a source of root damage and potential disease.
- 16) Tree roots will be expected to grow into areas of soil fill, and quality of imported soil should be considered. Ideally, fill soil should be site soil that closely matches that present within tree dripline. If import soil is utilized it should be the same or slightly coarser texture than existing site soil, should have a pH range comparable to site soils, and generally should have acceptable chemical properties for appropriate plant growth. A soil analysis is recommended prior to importation to evaluate import soil for these criteria
- 17) All approved soil cuts should be made outside the immediate dripline for minimal negative impact on trees. If approved within dripline, crown foliage shall be reduced

accordingly to balance the estimated root loss. Any construction activity which necessitates soil excavation in the vicinity of preserved trees should be avoided where possible, or mitigated under the guidance of the project arborist. Roots are to be hand cut and sealed wherever possible when major structural roots are encountered over one inch in diameter. The tearing of roots by equipment of any type within the dripline shall not be allowed.

Underground Construction

- 1) All underground work within tree driplines shall be avoided wherever possible to reduce negative impact on trees. The location of underground utilities well outside dripline is recommended as part of tree preservation.
- 2) Weakened anchorage, root system integrity, and the ability to acquire moisture from the root soil areas are the most critical issues when considering any type of root impact or removal.
- 3) Underground work in the area of site trees has a potentially serious impact on tree health and tree stability. Underground trenching for a variety of utilities will sever large structural roots reducing nutrient and water uptake and more seriously affecting the ability of each tree to remain appropriately anchored.
- 4) The existing root system within the dripline should not be severed by construction activities of any type. If undergrounding within dripline is required for unavoidable logistical reasons, the project arborist shall be consulted to determine whether the impact on tree health will be significant.

Pruning Requirements

- 1) The removal of dead wood, damaged branches, structurally unsound wood including bark included wood, narrow crotches, and crossing branches shall be the goal of the climbing tree worker. Co-dominant leaders or lateral branches shall be removed, pruned to retard growth, or cabled wherever possible.
- 2) The removal of significant live wood is discouraged at all times. Where removal of significant wood is required to mitigate the loss of roots, careful coordination between project arborist and tree workers is required. Severity of pruning should be restricted wherever possible while still modifying unhealthy or inadequate structure appropriately. The use of drop crotching and thinning techniques to restore balance is preferred when necessary to accomplish pruning goals, over heading type cuts. The use of heading type cuts shall be minimized or eliminated whenever possible.

Pruning shall be as minimal as possible, removing dead or damaged branches, crossing or rubbing branches, or correcting other structural deficiencies which may be present. Removal of lower branches may be required to allow for access and clearance following construction. Minimal pruning is the desired approach to all trees.

- 3) The following general guidelines shall be used during all pruning procedures:

Lateral Branch Removal

All laterals shall be removed immediately beyond the branch bark ridge, always preserving the branch collar.

No stub cuts should be made which leave an inch or more beyond the branch collar.

No flush cuts through the branch collar shall occur

Triple Cuts

All branches too large to be hand held shall be removed by means of the triple cut; undercutting branch 4 to 8 inches beyond base, removing branch beyond undercut, and removing remaining stub utilizing a shoulder cut.

Terminal Pruning

Thinning

Cut back terminal portions of branches by cutting back to laterals with a basal diameter 1/3 the size of the terminal being removed. Removal of many smaller terminals is preferred over removal of a few large ones.

Size Reduction

Remove portions of the crown for reducing height by removing terminals back to laterals. Each lateral remaining should be located to serve as a new terminal. This will establish the crown at a lower level. The diameter at the base of a remaining lateral should be 1/3 the diameter of the terminal being removed.

- 4) Pruning to reduce the amount of top growth in relation to root severance shall occur on all trees where approved trenching or underground work is to occur. Pruning is required to directly compensate for the amount of roots being damaged and removed by this work. This shall be determined after plans and construction techniques are determined.
- 5) Pruning may also be required to create appropriate access for construction equipment where low limb presence may obstruct access. This pruning is to be done by a qualified arborist, and shall by no means be done by construction personnel under any circumstances.
- 6) Pruning shall occur prior to initiation of any/all approved underground trenching. No ground shall be broken within the dripline of street trees without having pruning completed.
- 7) Project arborist shall be consulted prior to initiation of any pruning procedures to coordinate activities with the working arborist.

Additional Recommended Procedures

Continued discussion and coordination between project arborist, owners, designers, and general contractor should occur to further discuss and define these guidelines based on the actual work planned in the vicinity of these trees.

Fertilization

Fertilization is not generally recommended unless a specific nutrient deficiency symptom is visible. Following completion of construction activities, a determination of tree health should be conducted to visually evaluate tree performance and to recommend fertilization or mitigation if it is required based on the appearance of each individual tree. Owners additionally should monitor visible tree appearance and contact the project arborist should any tree exhibit unusual growth or characteristics.

Pest Control

A close visual examination for tree pests shall be conducted by the climbing arborist as he completes pruning procedures. If a serious infestation is present which was not apparent from ground observation then pesticide application should be considered at that time. However, the simple presence of tree pests does not warrant the use of chemical pesticides, and it should clear that a serious infestation capable of causing tree decline must be present to warrant their use. The use of organic sprays or pesticidal soaps is the preferred method for treating any serious pest infestation. If infestations should occur, discussion with the project arborist is recommended.

Weed Control

No specific measures are recommended for weed control, and the presence of weeds should not be considered a problem in relation to continued tree health.

Disease Control

No specific measures are recommended for disease control unless noted in the Individual Tree Evaluations. The tree pruning specialist should note any serious problem during his climbing procedures if they become evident.

Paving Reference

The use of asphalt or concrete as a primary paving surface within the canopy dripline is generally discouraged. Utilization of a permeable substance which does not impede the natural percolation of water or limit the nature of gaseous exchange is recommended. Materials such as decomposed gravel or cobble are ideal for this purpose, however, generally do not function satisfactorily as a parking or driving surface.

Interlocking pavers come in a variety of shapes, colors and sizes and provide a suitable surface for driving, parking and walking. At the same time they will allow some infiltration of water and air to the original soil level. Functionally and aesthetically they are appropriate for consideration at many projects. Utilization of an installation method which excludes fine sand

joints must be used however, to maintain infiltration. A coarse sand leveling bed and coarse sand joints are recommended to increase water infiltration and aeration.

Planting Under Existing Trees

The installation of lawn beneath established native trees is strongly discouraged. The ideal treatment under natives is the use of an organic or inert mulch. Redwood chips, gravel, or stone cobble are all excellent materials. If planting is required for aesthetic or functional purposes, the use of drought tolerant, woody species is most appropriate. Species should be selected for their ability to survive with minimal or no water through the summer months after initial establishment period. Only drip irrigation should be utilized within the canopy dripline to minimize summer water in the root zone.

Nature of Work

All work to date has been intended to be general in nature and comments and recommendations are based on obvious external conditions and symptoms. This inspection and evaluation did not include root crown excavation or inspection, nor did it include the use of instruments to determine unseen cavities or inherent weakness in trunk or branch structure. This inspection and evaluation did not include the climbing of each tree or inspection at that level. Underground portions of the root system cannot be viewed, and roots have not been excavated. Structural stability, root crown health, and root health are all inferred from external growth characteristics only. Many of these trees have cavities present and this is a normal occurrence which may or may not affect tree health and structural stability in the future. It is the recommendation of this firm that regular annual inspections be performed to determine whether any tree on site is in a declining state and may become a hazard. Trees are living, changing organisms which can be affected by any number of environmental conditions and biotic factors beyond our control. Construction activities, even when rigidly supervised, may lead to a quick decline or to unseen hazards within the tree and should be considered potentially damaging to the natural balance present before development began.



Garden Notes

GN 127

GROWING CITRUS IN SACRAMENTO

Growing citrus trees can be very rewarding for home gardeners in Sacramento. Citrus trees are generally easy to grow and can add interest to a landscape with their fragrant flowers, colorful fruit, and evergreen leaves, as well as add an “edible” element with their tasty fruit. Varieties recommended for Sacramento include navel and Valencia oranges, Satsuma mandarin, Meyer lemon, and Bearss lime.

CHOOSING A CITRUS TREE

Consider the space you have for a tree: standard size citrus trees grow to 20 feet or more, dwarf trees to 6-10 feet. Four Winds Growers provides a good source for information on varieties (www.fourwindsgrowers.com). Consider the cold hardiness of varieties when making your selection since light frosts are frequent during Sacramento winters and hard freezes hit the area every few years. Lime trees, for instance, tend to be less cold tolerant than most other citrus, whereas mandarins and kumquats are among the most cold tolerant. By comparing the ripening times in the Central Valley for the various varieties and carefully selecting your citrus trees, you can potentially have ripe fruit almost all year.

PLANTING

Plant citrus trees in full sun and well-drained soil. Do not plant citrus in a lawn or with plants that require frequent irrigation. Space standard trees at least 12 feet apart, and dwarf trees 8-10 feet apart. The best time to plant citrus is early spring after the danger of frost has passed and when nurseries stock the best selection. Early planting also allows the tree to establish itself before the hot weather hits.

If you have heavy clay soil or very sandy soil, spread about 1 to 2 inches of good quality soil planting mix or compost to a 5 ft. x 5 ft. area of soil, and rototill it thoroughly. The tree will be planted in the center of this area, and roots will explore this amended soil. On clay soils, provide for drainage by creating a mound or raised bed before adding the compost.

Dig a hole at least twice as wide as the rootball, but no deeper. Set aside the soil from the hole for backfill. Gently loosen any matted or circling roots at the edges of the rootball. Position the rootball in the hole so the top sits about 1” above the surrounding ground. Do not add soil amendments in with the native soil unless you incorporated compost as described above. Next, fill the hole with the native soil. Tamp gently to eliminate air pockets around the rootball and to ensure good roots-to-soil contact. Keep soil off the top of the rootball. Water thoroughly, and keep the rootball moist until roots grow out into the native soil.

WATERING

Citrus trees need regular and adequate soil moisture for healthy growth and good fruit production. Fluctuating soil moisture can cause the fruit to split. Adequate soil moisture means the soil should be kept moist but not wet. Once the trees are well established, allow the soil to partially dry out between water applications. How much, how often, and how long you need to water depends upon your growing conditions such as your soil type, drainage, weather, age and size of the trees, as well as the type of watering system you use. Keep in mind that more citrus trees die from excess water than from drought!

A drip system with either 2 or 4 emitters per tree, or micro-sprinklers preferably directed away from the tree trunk, provide two water-efficient ways to irrigate your trees. The root zone of citrus is shallow and emitters or sprinklers need to apply water near the trunk of newly planted trees to keep the rootball moist until roots grow into the native soil. With either a drip system or micro sprinklers you may need to water twice a week during the first two years, especially during hot periods. Apply water further from the tree trunk as trees become established (watering mainly near the tree's drip line), increase the amount of water per session, and reduce the frequency (every 7-10 days for mature trees).

Another way to irrigate citrus is to build a water trough around the tree and fill it with water. For a newly planted tree, take a hoe and scrape a shallow ditch about 4-6" wide encircling the tree about a foot from the tree trunk. Use the soil pushed to the side by the hoe to build up the edges of the trough to 6" high. Fill this donut shaped basin with enough water to wet the root area to a depth of 1 foot the first year. The water will travel downward but also outward to moisten the roots. As the tree grows, re-form the ditch each year, make it wider, center it under the outer edge of the tree's canopy, and water deeper (to a depth of 2 to 3 feet for a mature tree). Avoid wetting the soil at the base of the trunk.

FERTILIZING

Citrus trees are heavy feeders, and they may need regular applications of nitrogen, iron, and/or zinc. The easiest way to feed citrus trees is with an organic or synthetic fertilizer formulated specifically for citrus. Read and follow the label directions for how much and when to feed your trees. A good plan is to divide the annual amount of fertilizer into two or three portions and apply the first portion in March before bloom, the second in May, the third in June. Avoid fertilizing after August because it can stimulate new growth that will be frost tender. An annual application of compost is also beneficial to citrus and may provide sufficient fertilization.

PRUNING

Citrus trees usually need little pruning, especially for the first 2 or 3 years. When pruning is needed, it is best done in spring after danger of frost, and in summer. Avoid pruning after August because it can stimulate new growth that is likely to be injured by frost.

Remove dead and rubbing branches, and suckers (shoots) that originate below the graft union. Remove watersprouts (unusually vigorous upright shoots) as they are usually less productive. You may want to prune vigorously-growing older trees to control size, or to fit your growing space. Prune out foliage that touches the ground as this provides easy access for ants and snails to reach upper branches. Remove dead branches that accumulate in the center of older trees to allow better light penetration and reduce pest habitat.

SANITATION

Keep the area under the canopy of the tree free of weeds and debris, which can harbor pests and diseases and compete with trees for water and nutrients. Remove diseased or pest-infested branches as soon as they are discovered.

FRUIT THINNING

The home citrus grower does not usually need to thin fruit. However, an excessively heavy crop may stunt weaker trees so sometimes fruit thinning is justified. Mandarin trees produce especially heavy crops and trees may benefit by fruit thinning. There is a natural drop of pea-sized fruit about a month after bloom. Golf ball-size fruit may drop later if it is hot, the tree is water stressed, or nitrogen levels are too low or too high. On new trees, it is recommended that all fruit be removed during the first two years to encourage root and vegetative growth.

HARVEST

Most citrus varieties ripen from late fall through winter, although Valencia oranges and grapefruit ripen in early summer in Sacramento. Citrus ripen only on the tree and are sour if picked too early. Just because the fruit has turned color doesn't mean it is ripe. Pick one fruit and test the flavor. Generally, citrus fruit store best on the tree without losing quality, except Satsuma mandarins which should be picked as soon as they are ripe. If a hard freeze is forecast, remove ripe fruit from the tree for immediate use, or freeze the juice for later use. Damage to green fruit may not be apparent until harvest when the "ripe" fruit is dry and pithy.

MULCH

Citrus tree roots are generally shallow, concentrated in the upper 2 feet of soil, and extend well past the drip line. Use 4-6" of organic matter such as compost, leaves, straw, or wood chips under the tree to conserve water and discourage weeds, but keep it 4-6" away from the trunk. Mulch also moderates soil temperatures and improves the soil as it decomposes.

PEST CONTROL

Vigorously growing citrus have few pest problems, but even well-grown trees can have aphid, scale, whitefly, or mite problems. Management information for the control of these pests is online at www.ipm.ucdavis.edu. In poorly drained soil, fungal diseases often infect the trunk and roots, so well drained soil is a must!

CONTAINERS

Many citrus varieties can be grown in containers. These trees have different requirements than those planted in the ground. Small, compact types of citrus such as Satsuma mandarin, kumquat, lime, and Meyer lemon do well for years in pots. The pot should be at least a 15 gallon size (about 17" diameter by 16" deep). Half-barrels are a good choice. Holes in the bottom of the container are essential for good water drainage. Use bricks or wood blocks to raise the container off the ground for good drainage and air circulation beneath the container. Use a good commercial potting soil in the container.

Container citrus require watering more frequently than in-ground trees. In hot weather, they may need water every day. Check soil moisture by using a moisture meter, or use the "feel" test. To conduct a "feel" test, carefully dig down 6-8" into the soil with a trowel, place a handful of soil in the palm of your hand, and squeeze the soil. If water drips out, it is too wet; if the soil forms a weak ball, there is sufficient water; if the soil is crumbly and will not form a ball, it is dry and needs water. A drip-irrigation system on a timer is useful. The frequent watering needed to maintain container moisture leaches nutrients out of the soil, so the plants will need regular fertilization. Use a slow-release fertilizer and follow package instructions for amounts to use for container trees.

COLD HARDINESS

Young citrus trees need to have some frost protection in Sacramento for the first 4 or 5 years. Older trees vary in their tenderness depending on the type of citrus. Citrus tree leaves and branches can be damaged below the temperatures shown below (these are not hard and fast figures):

Limes	29 degrees
Lemons and grapefruit	26 degrees
Meyer lemon	22 degrees
Oranges and mandarins	21 degrees
Kumquat	19 degrees

Depending on the state of ripening, citrus fruit can be damaged below 27 degrees. Citrus sensitivity to cold also depends on how long it stays cold, whether the trees are exposed or in a protected area, whether the trees are in a low area where cold air collects, and how old the trees are.

If a hard freeze is expected, make sure citrus trees are well watered, and rake back mulch to encourage the absorption of daytime heat in the soil and its release at night. Covering trees with frost cloths, sheets, or blankets at night helps hold the radiated heat in. Add outdoor Christmas lights (the old type of bulbs that get warm, not modern LED lights) in the tree canopy to add heat. For additional information on frost protection see Frost Protection for Citrus and Other Subtropicals (ANR Publication 8100 available at <http://anrcatalog.ucdavis.edu>).

FOR ADDITIONAL INFORMATION:

- *Citrus, Complete Guide to Selecting and Growing more than 100 Varieties* by Lance Walheim
- *The California Master Gardener Handbook*, 2002, ANR Publication 3382
- *Frost Protection for Citrus and Other Subtropicals*, 2003, ANR Publication 8100

WEBSITES:

- www.ipm.ucdavis.edu (pest information, citrus information)
- www.fourwindsgrowers.com
- <http://cekern.ucdavis.edu> KC9382 *Growing Backyard Citrus in Kern County*, by Craig Kallsen, Farm Advisor, revised July 2007

To simplify information, trade names of products and company names have been used. No endorsement of named products or companies is intended, nor is criticism implied of similar products or companies that are not mentioned.

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