

HOW PRUNING IMPACTS TREE HEALTH

Most of us live in residential areas with well-developed landscapes that require on-going maintenance. How best to manage and maintain our trees for maximum health, longevity and safety is an ever-present concern. What is proper tree maintenance and how do we find someone competent to perform the work?

A tree is not a piece of lumber that we can cut and carve into our own design. Trees are dynamic, living organisms that are negatively impacted by the cuts and wounds that we impose on them. Tree pruning generally does not improve tree health. It can improve tree structure and safety.

For every green branch that we remove, there is a reduction in photosynthetic capacity. Trees sustain themselves through the production of carbohydrates in the leaves (photosynthesis). Carbohydrates are converted to glucose, sugars, hormones and many other substances that contribute to tree health. Fertilizers do not sustain the tree - carbohydrates do. Thus, the removal of any foliage reduces this capacity and represents a loss to the tree. There needs to be an important reason for the removal of any foliage. The growth rate of trees is a direct function of the tree's total leaf area. Generally, the more foliage, the better for the tree.

The growing tips of branches (apical meristems) produce auxin and other hormones that stimulate root growth, suppress dormant buds, and assign resources to where the plant needs them. The loss of these terminal buds through pruning results in altered branch growth patterns and loss of growth control. Buds that were suppressed by auxin are now free to grow, resulting in excess sprouting as the tree attempts to restore lost foliage. The decline in root production can leave a tree vulnerable to drought stress as it struggles to take up sufficient water. Pruning stresses the tree.

Twigs, branches and woody stems store considerable carbohydrate reserves in the outer two to three growth rings in the ray cells. Secondary metabolites used for plant maintenance, storage, flowering and defense depend on these reserves. Pruning removes this storage space and diminishes this source of energy. This leads to stunting and slower growth.

REASONS TO PRUNE

With this understanding of some negative effects of pruning, let's consider the potential benefits of moderate, reasonable pruning. A quick note on terminology for you lexicon purists. We "trim" the grass or we "trim" the Christmas tree but we "prune" our landscape trees and shrubs.

Trees with the potential to grow taller than approximately twenty-five feet need to develop a single central leader. Remove (or reduce in length) any competing leaders. Remove crossing, crowded or dead branches.

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CONSULTING ARBORIST & TREE EXPERT

Resist the temptation to “thin” the tree or to remove excessive amounts of interior foliage. Some **minimal** removal of interior limbs is warranted on occasion. However, retaining interior foliage reduces sun scald by shading sensitive bark tissue. Foliage should be distributed along the entire length of branches. Smaller twigs that are allowed to remain contribute to branch taper, making for a stronger tree. The removal of these small interior twigs and branches (“lions-tailing”) makes the parent limb, to which they are attached, heavy with end weight and prone to breakage. Branch diameter increase (stronger limbs) comes from resources provided by these small interior twigs and branches. As noted earlier, over-thinning leads to excessive sprout production and stresses the tree. The need to retain this interior foliage is one of the most important principles of correct pruning and the one most often violated.

As a general rule, branches that are larger than one-half the diameter of the limb to which they are attached, should be removed if they are still small (no more than approximately four inches in diameter). If they are too large to be removed, then some reduction of end weight should be considered. These limbs are prone to failure at the point of attachment.

Likewise, long, heavy branches that extend some considerable distance from the trunk in a horizontal fashion can be subject to wind or ice loading and fail. Some reduction in end-weight may be justified. This is where the experience and judgment of your arborist is needed.

End-weight reduction is often best accomplished by the removal of random smaller branches rather than one large limb. Try to limit the removal of limbs to those no more than four inches in diameter at the base. Most trees can deal with these smaller wounds and initiate wound closure before cavity formation begins. Larger pruning wounds often lead to decay and set the tree up for failure.

Another area where homeowners and arborists are often over-zealous is in the removal of large lower limbs at the bottom of the tree. Reasons given are many. “I want people to see the front of my house”; “it’s too shady and I can’t grow grass”; “I don’t want any limbs growing near my roof or over my house”. It’s not that these are unreasonable concerns; it’s the manner in which they are implemented. Consider the shady lawn issue. While some minimal raising of lower limbs can be helpful, cutting off a twenty inch diameter limb at the trunk is not.

Even worse is when several of these large cuts are made at the same plane on the trunk, as in the case of two large limbs opposite each other. These large wounds will continue to decay and over time will coalesce and combine to compromise the structural support of the trunk, leaving the stability of the tree in doubt.

Just raising branch tips can increase light to turf. It is not always necessary to remove entire branches. This means that maintenance may be on-going, requiring periodic pruning back as the branches continue to re-grow - not unlike regular visits to the hair dresser or barber. The pruning and cleaning out of the upper canopy can also increase the amount of light reaching the turf. The removal of crowded branches, dead limbs and excess end-weight from various limbs can make a difference in light penetration that can improve turf health. If you live in a neighborhood surrounded by mature trees - essentially in a forest - just know that no matter how much you prune your own tree, you’re still trying to grow grass in the shade of other trees. Don’t punish your tree with excessive and harmful over-pruning. Create mulch beds around the trees and just understand that you can’t always have it both ways. Besides, grass is so over-rated.

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The removal of large diameter low limbs on tall trees makes them more subject to high wind damage. The more of the live crown that you remove from the bottom of the tree, the more prone it becomes to excessive side to side sway. Strong gusts of wind can cause wind shear and stem failure. Trees with a full crown and a full complement of branches to near the bottom of the trunk benefit from the damping of movement that all these limbs provide.

As for roof clearance, understand that it is ok for limbs to hang over the house as long as they are healthy. The concern is for the amount of roof clearance. While you don't want limbs to rub on the shingles, you don't need excessive amounts of clearance. Allowing strong branches to grow in reasonable proximity to the roof affords a degree of protection in the event of ice or snow loading. As the branch over the roof becomes heavy with ice, it slowly sags and gently settles on the roof. The roof supports the branch so that it doesn't break and the branch protects the roof against falling limbs from higher above. I generally recommend no more than eight to ten feet of clearance where appropriate. With smaller species such as Japanese Maple or Dogwood, two feet may be sufficient.

HIRING AN ARBORIST

The term "arborist" confers no special status. It's a generic term that merely distinguishes the person from a plumber or electrician. It means that you prune trees for a living and says nothing about competency. "Certified arborist" means that one has achieved at least a minimal level of knowledge and has meet the requirements of the certifying organization. In the Kansas City area there are two organizations providing certification: the Kansas Arborist Association (KAA) and the International Society of Arboriculture (ISA). Both have a web site and it is possible to verify the credentials of one claiming to be certified. It is possible to achieve certification after acquiring a certain level of arboricultural knowledge but often with limited practical experience. The attainment of certification is a useful indicator that the arborist is at least familiar with horticultural concepts and is striving to improve his/her knowledge of their craft.

Problems sometimes arise in that the owner or a person on his staff may be certified but that says nothing about the crew that shows up to care for your trees. The best protection you can have is a well-written set of pruning specifications that describe in detail how your trees are to be pruned. ANSI A300 Standards *Trees, Shrubs, and Other Woody Plant Maintenance - Standard Practices* and the ISA's *Best Management Practices: tree pruning* are available for purchase at a nominal cost. These documents present performance standards and general pruning specifications. You will need to develop pertinent specifications that apply to your individual needs.

A reminder of a few key concepts mentioned earlier: 1) there should be minimal removal of live, healthy foliage; 2) specify the level of detail for dead limb removal such as "remove all dead limbs 2" diameter and larger from the lower 2/3 of tree canopy"; 3) specify height of roof clearance such as "prune branches to provide @ 6' roof clearance at branch ends"; 4) specify height that bottom branches are to be raised such as "raise lower limbs to @ 10' high at branch ends"; 4) all pruning cuts shall be made outside the branch collar; 5) live interior branches distributed along the length of the scaffold limbs shall not be removed; 6) no live limbs larger than 4" diameter shall be removed without the specific consent of owner.

Remember, when it comes to tree pruning, less is more.

Topics For Discussion:

SUCCESSFUL PLANT ESTABLISHMENT

ROOT RESPIRATION: Roots respire or breathe. Roots accomplish this by getting the oxygenated air from the space *between* soil particles via **root hairs**. Soil must not be soggy. Soil with excessive water can block free oxygen availability. Large soil pores, which deliver water for plant growth during a rain, also need to drain rapidly after a rain event and not retain water or obstruct the respiration process.

COMPACTION: Soil particles readily slip and compress, especially when wet. Activities near trees should be undertaken *only when the soil is reasonably dry* to avoid compaction.

ROOT TEMPERATURE: keep roots cool – apply water and mulch to 3” depth. High soil temperature is a killer of roots.

AMENDMENTS: Organic materials are preferred **when planting**: small Pine bark nuggets (such as *Soil Pep* or *Pine Bark Soil Conditioner*) and cotton burr. It is important to hand-dig or till **bed area** to a depth of @ 8” **before** adding *backfill soil mix* and then repeating the tillage process to combine the two growing media with soil.

Roots are not battering rams and cannot easily force their way into compacted soils or soils of a different texture. Planting **areas** (not planting *holes*) need to be composed of sufficiently large diameter soil pores that can accommodate the smaller diameter roots that move into them.

PRESCRIPTION FERTILIZATION THROUGH SOIL ANALYSIS

Not every site requires a soil analysis before planting, depending on circumstances. Where required or desired, an effective analysis should provide the following soil properties:

pH – Percent organic content - Essential element levels to include both macro and micro elements - recommendations for supplements - Cation Exchange Capacity (CEC) - Bulk density

TREE PROTECTION ORDINANCES

Municipalities should develop a detailed and effective ordinance to protect parkway trees during construction. It should include fines and penalties for non-compliance, with a one-year warranty to insure tree survival.

PRUNING SPECIFICATIONS

We remove too many trees based on poor advice. A tree risk assessment protocol should be developed. Street trees designated as “hazardous” should be verified by an independent third party. There may well be other alternatives to removal. We remove too many trees prematurely on advice from people who are unqualified and lack the necessary training and experience to make those decisions. Improper pruning may lead to:

- **Loss of photosynthetic capacity**
- **Loss of apical dominance and growth control** (excurrent trees)
- **Loss of stored reserves**
- **The overall effect of pruning is stunting, reduced growth and wounding.**

1. Since pruning is often unnecessary and undesirable, prune only as needed.
2. There should be minimal removal of live, healthy branches. Keep pruning cuts small and few in number.
3. Don't remove interior foliage from the tree. There should be an even distribution of foliage and small twigs along the entire length of branches. Don't "lion's tail". Most pruning should take place at the ends of branches, not in the interior of the tree.
4. Avoid the removal of large, lower limbs. Such limbs contribute to trunk taper and stability and dampen excessive sway and movement in high winds. Lower limbs make the tree stronger. The loss of any foliage is especially critical for aging trees.

MYCORRHIZAE

There is very little evidence that inoculation with commercially available endomycorrhizal fungi will benefit mature plants or that the plants don't become mycorrhizal on their own - the fungi are everywhere. There is some evidence for increased mycorrhizal colonization of roots following inoculation, but increased colonization does not necessarily mean greater benefit. The *relationship between plant and fungus is very specific*, and one fungus may benefit one species but not another even though it colonizes it. The one-size-fits-all strategy of commercial inoculants may not result in benefit.

PLANT CHOICES

Municipalities should develop **nursery stock specifications** (see *ANSI Z60.1*) to insure quality plant materials. *Planting site preparation* is generally inadequate. *Consistent follow-up watering* for new trees is needed. A decision about **what tree to plant** should consider a number of criteria. We've got to stop planting large diameter trees in the narrow strip between sidewalk and curb. Also, the need to achieve visual uniformity by planting the same identical tree species on every block is often misguided. Think *Emerald Ash Borer*.

Dispute Resolution and Litigation Support

- negligent or criminal trespass
- insurance claims for damages
- eminent domain proceedings
- plant appraisal and valuation