



City of Bellevue

# Pruning Guidelines

November 2009





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# INTRODUCTION

The City of Bellevue is committed to natural resource stewardship and a healthy and sustainable urban forest. Trees and vegetation provide a multitude of benefits, which include clean water, clean air, enhanced quality of life, and improved property values. A study in 2008 conducted by the city to assess the benefits of the city's tree cover found 36 percent tree canopy coverage city-wide. The tree canopy provides 62 million cubic feet in stormwater detention services valued at \$123 million. Bellevue's canopy removes 687,000 pounds of air pollutants annually at a value of \$1.55 million per year. The study also found that Bellevue's tree canopy stores 332,000 tons of carbon in trees' wood and sequesters 2,582 tons of carbon annually. For these and many other reasons, the preservation and care of trees is addressed in the city's *Comprehensive Plan* as well as in its codes and regulations.

This guide is intended to inform residents, business owners, and city staff of tree pruning techniques that reflect industry standards and acceptable best management practices for trees in the city. This guide represents acceptable guidelines for pruning of trees and should be used in conjunction with Section 20.25H.055.C.3.i.vii of the Bellevue Land Use Code. The techniques described here are allowed in geologic hazard critical areas and critical area buffers without requiring a Critical Areas Land Use Permit. A Clearing and Grading Permit (Bellevue City Code Chapter 23.76) is still required. These pruning techniques are not allowed in any other critical area or buffer without a Critical Areas Land Use Permit. Finally, this guide can facilitate effective communication when the expertise of a competent tree care professional is required. For questions regarding permit requirements, call 425-452-4188.

The practices set forth in this guide are consistent with the pruning guidelines and Best Management Practices adopted by the International Society of Arboriculture, the American National Standard for Tree Care Operations – Tree, Shrub, and Other Woody Plant Maintenance-Standard Practices (ANSI A300-1995), the U.S. Forest Service, and the National Arbor Day Foundation. This guide was prepared by the City of Bellevue with technical expertise from Davey Resource Group, a division of The Davey Tree Expert Company.

Throughout this document key terms are in **bold** with their definition found in the Glossary of Terms (Appendix A). In addition, critical information and important rules of thumb are designated by this symbol .

## WHY PRUNE TREES?

Trees, having evolved in forests where they must compete for available light, developed a natural ability to shed limbs. As this natural process occurs, the tissue around the **branch** attachment in the stem develops wound-wood as it heals and protects against **decay**. For trees in an urban or suburban landscape setting, this natural process of branch development and shedding can pose a risk to people and property. These trees may require pruning. Pruning branches can be one of the most beneficial practices **arborists** do to trees, significantly improving their health, structure and beauty. Conversely, improper pruning can hasten the demise of a tree and cause damage, which can continue for the life of the tree.

There are three primary reasons trees should be pruned.



**Figure 1. Reasons to Prune**

Pruning for **health** involves removing diseased or insect-infested wood, thinning the **crowns** to increase airflow and reduce some pest problems, and removing crossing and rubbing branches. Pruning can best be used to encourage trees to develop a strong structure and reduce the likelihood of damage during severe weather. Removing broken or damaged limbs encourages **wound** closure.

Pruning for **safety** involves removing branches that could fail and cause injury or property damage, trimming branches that interfere with lines of sight on streets or driveways, and removing branches that grow into utility lines. Safety pruning can be largely avoided by carefully choosing species that will not grow beyond the space available to them and have strength and form characteristics that are suited to the site.

Pruning for **aesthetics** involves enhancing the natural form and character of trees or stimulating flower and fruit production. Pruning for form can be especially important on open-grown trees that do very little self-pruning. In some cases, tree pruning can be conducted to enhance views beyond the tree itself. This is a reasonable option when the tree's structure and health can be preserved, allowing it to continue to provide benefits that would be lost if the tree were removed altogether.

## **PRUNING GOALS**


As indicated, pruning should only be done with a specific goal in mind. Before any tree pruning project is undertaken, the goal or outcome should be identified. In many cases, different goals require different pruning approaches.

When tree care professionals are hired, it is critical that the arborist and the property owner agree on the desired goal. Extensive communication before any work begins ensures the tree receives the most appropriate pruning.

The following matrix (Table 1) will guide property owners and arborists in choosing the best prescription for the desired goal. If your desired goal or tactic is not listed as an option, it is likely that pruning is not necessary for your situation.

**Table 1. Pruning Goal/Method Matrix**

GOAL	Pruning Techniques						
	Structural	Crown Cleaning	Crown Thinning	Crown Raising	Crown Reduction	Restoration Pruning	Root Pruning
Reduce Risk of Failure (Safety)		X	X	X	X	X	
Provide Clearance				X	X		
Reduce Shade and Wind Resistance			X		X		
Maintain Health	X	X				X	
Influence Flower or Fruit Production	X		X		X	X	
Improve View			X	X	X		
Improve Aesthetics	X	X	X			X	
Tree Planting	X						X
Sidewalk/ Driveway Repair							X

 **WARNING:** Only **Qualified Line Clearance Tree Trimmers** can prune within ten (10) feet of any electrical conductor. Contact your local utility if your trees are growing near the power lines. Assume all overhead wires are energized!

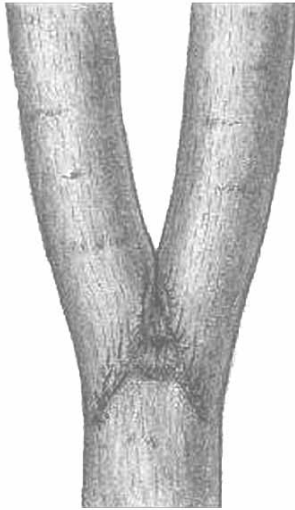
## **PRUNING TECHNIQUE: STRUCTURAL PRUNING OF YOUNG TREES**

Structural pruning principles are primarily used when pruning young or newly planted trees. Properly trained young trees will develop into structurally strong trees that should require little corrective pruning as they mature. One of the best ways to prevent potential tree hazards and increased maintenance costs in the future is to choose quality tree stock for new plantings, perform proper structural pruning at an early age (go to <http://www.ufe.org/Standards&Specs.html#purchase> for choosing quality nursery stock), and be sure the right species is chosen for the right situation.

Trees that will be large at maturity should have a sturdy, tapered trunk with well-spaced branches smaller in diameter than the trunk.



If two branches develop from **apical buds** at the tip of the same stem, they will form **co-dominant** branches (Figure 2). Each **co-dominant** branch is a direct extension of the stem. It is best if one is removed when the tree is young. Remove these co-dominant branches by cutting one branch at the proper angle in relation to the **crotch** (Figure 2).




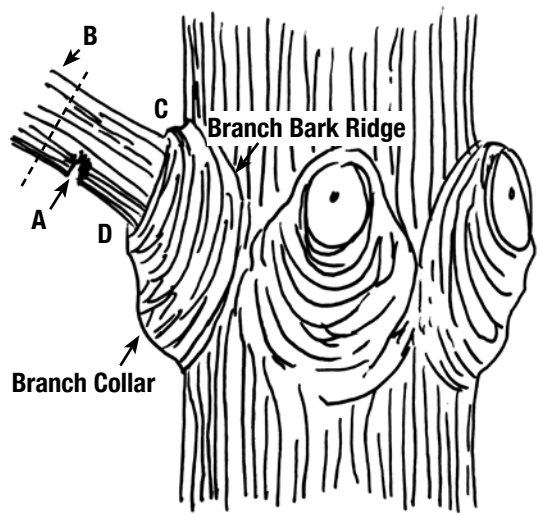
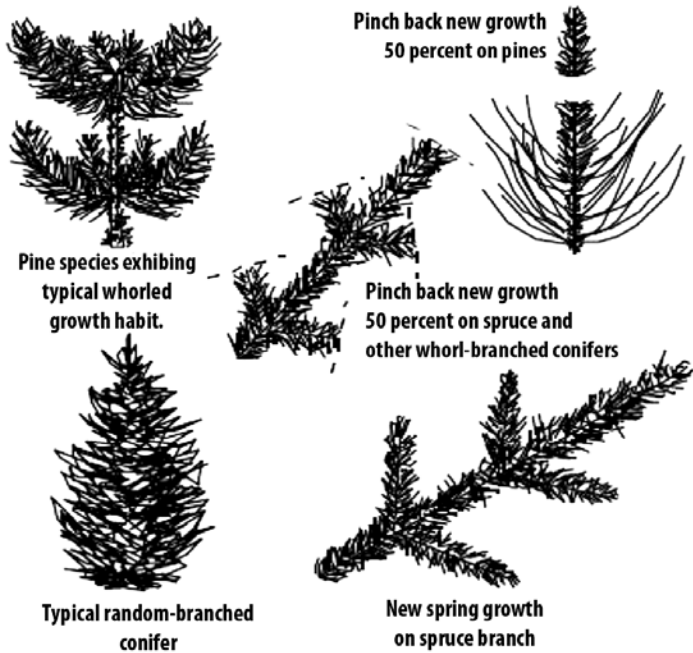
**Figure 2.**  
**Codominant Branches**



**Figure 3.**  
**Included Bark**

Branches with narrow angles of attachment and co-dominant branches tend to break at the point of attachment if there is **included bark** (Figure 3). Included bark is bark that gets enclosed inside the crotch as the two branches develop. It weakens the branch attachment, making the tree more prone to storm damage. Such branches are preferably removed.

 **The relative size of a branch in relation to the trunk is more important for strength of branch attachment than is the angle of attachment. When pruning young trees for structure, the goal should be to have branches that are not greater than one-half the diameter of the trunk or the parent stem.**

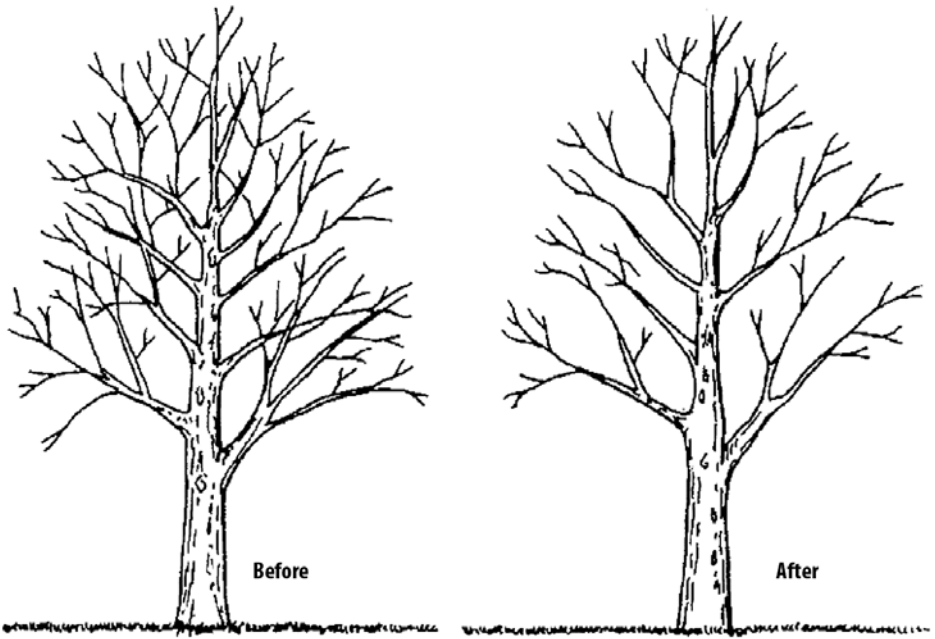


**Figure 4. Conifer Pruning**

**Conifers** may require minor pruning to remove crossing branches or some shaping during the first few years after planting. Figure 4 illustrates some conifer pruning tips.

## PRUNING TECHNIQUE: CROWN CLEANING

Crown cleaning is a series of pruning cuts that remove hazardous, declining, and/or dead branches. Excessive **epicormic branches** (“watersprouts”, “suckers”) throughout the tree canopy are also selectively removed, leaving more dominant ones intact that show good development in desired directions (Figure 5).



**Figure 5. Crown Cleaning**

Crown cleaning can help reduce conditions in the tree that could place people or property at risk. It can be performed on trees of any age but is most common on medium-aged and mature trees that have had minimal maintenance. Crown cleaning could also include some restructuring such as removing branches with included bark to reduce likelihood of breakage.

Since crown cleaning involves the removal of limbs that may have diseases, it is important to follow good sanitation practices. Some diseases, such as canker stain of plane tree and fire blight in crabapple and mountain ash, can be spread by pruning tools.

 **When removing branches in trees infected by these or other diseases, cut 12 to 18 inches below the unhealthy area.**

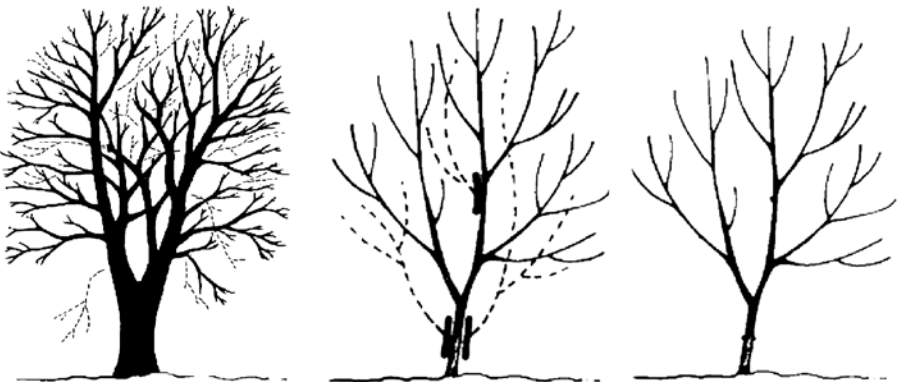
As a precaution, pruning tools should be disinfected between each pruning cut. Rubbing alcohol, disinfectant spray, or a 1:10 mixture of bleach and water are the recommended disinfectants. This precaution can take extra time and is not always followed by every tree company, but can go a long way in keeping trees healthy and should be insisted upon.

## **PRUNING TECHNIQUE: CROWN THINNING**

Crown thinning is the selective removal of branches and epicormic growth to increase light penetration and air movement and to reduce end weight on tree branches (Figure 6). Proper thinning involves removing branches at their point of origin or back to appropriate **lateral** branches. Crown thinning may reduce risk of storm damage among intact tree canopies, allowing wind to pass through canopies of “balanced” foliage and stems.

Thinning does not normally influence the size or shape of the tree and should result in an even distribution of branches along individual limbs, not a grouping toward the ends. Removal of only interior branches can create an effect known as **lion-tailing**. This displaces foliar weight to the ends of the branches and may result in sunburned bark tissue, watersprouts, reduced branch taper, weakened branch structure, and breakage.

 **A properly thinned tree should look natural, balanced, and healthy. Almost like no work has been done at all.**



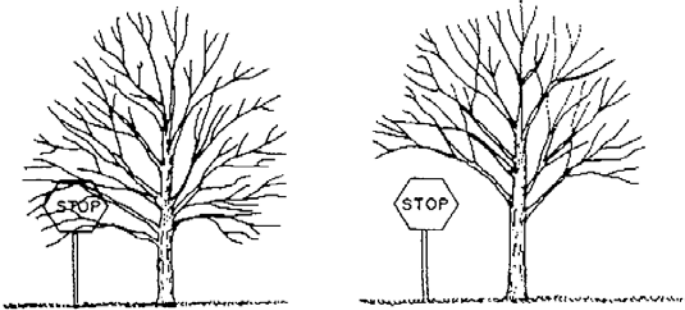
**Figure 6. Examples of Crown Thinning**

# PRUNING TECHNIQUE: CROWN RAISING

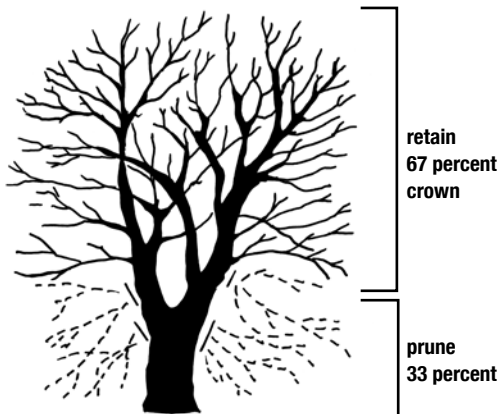
Crown raising is the removal of the lower branches of a tree in order to provide clearance on trees that obstruct vision and/or may interfere with pedestrian and vehicular traffic (Figure 7). Lifting or raising should be performed on young and medium-aged trees to prevent low branches from growing to a large diameter. Lower limbs on young trees should remain as long as possible to create and maintain trunk taper and develop a stronger trunk. Young or medium-aged trees also tend to heal better than older trees. Removal of large diameter limbs low on the tree can create large wounds that may not heal and promote decay on the main trunk.

A common practice on young trees to avoid large low branches is to shorten low branches regularly and suppress their growth to force more growth in the upper branches. The shortened branches are later removed to raise the crown as needed.

**To promote tree health and stability do not remove more than 30-33 percent of the lower canopy (Figure 8).**



**Figure 7. Crown Raising for Sign Clearance**



**Figure 8. Crown Raising for Urban Landscapes**

Conifers may require crown raising to provide clearance (Figure 9).



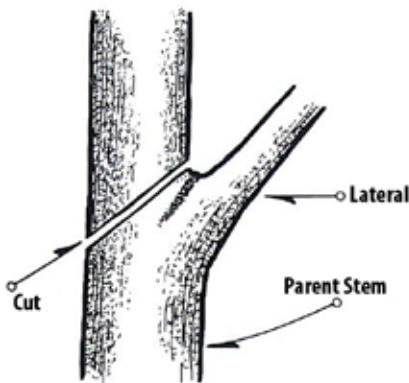
**Figure 9. Crown Raising of Conifers**

🍃 **A good rule of thumb is to never remove lower limbs that would result in less than 50 percent of the trees height being covered in live limbs.**

## **PRUNING TECHNIQUE: CROWN REDUCTION**

Crown reduction (drop-crotch pruning) is the cutting of limbs back to their point of origin or back to a lateral branch capable of sustaining the remaining limb and assuming **apical dominance** of the limb (Figure 10).

Reduction is used to reduce the size of a tree by decreasing the length of one or many stems and branches (Figure 11).



**Figure 10.**

### **Drop-Crotch Pruning**

Crown reduction is not the same as topping. The City of Bellevue and the tree care industry do not condone topping or **heading** cuts back to stubs or weak lateral branches because this creates large wounds and can increase risk and potential liability for the tree owner.

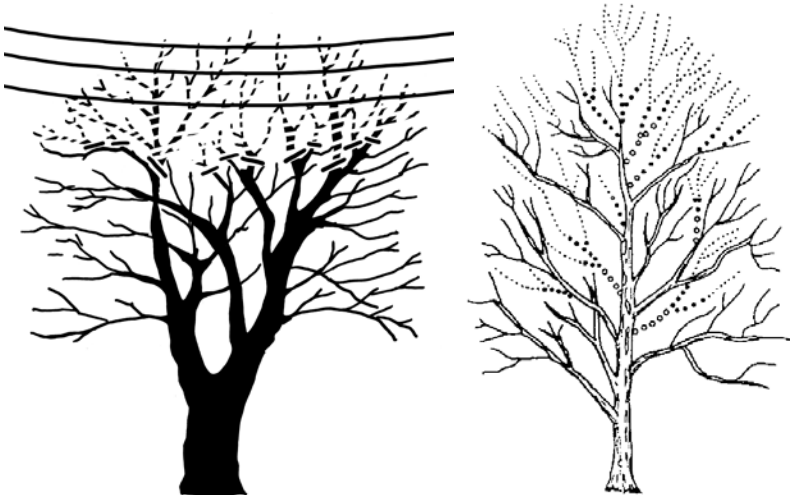
Crown reduction must consider the ability of the species to sustain this type of pruning. Reduction cuts at smaller laterals require knowledge of plant anatomy and pruning

methodology. Properly executed, this technique ensures subsequent wound closure and reduces the risk of long-term damage from decay.

🌿 **When a branch is cut back to a lateral, no more than one-fourth of its foliage should be removed.**

🌿 **The remaining lateral branch must be at least one-third the diameter of the removed portion. This rule can vary with species, age, climate, and the condition of the tree.**

Although crown reduction pruning can control tree size to a certain degree, it is no substitute for matching the correct tree species with the site when planting, “Right-Tree – Right Place.”



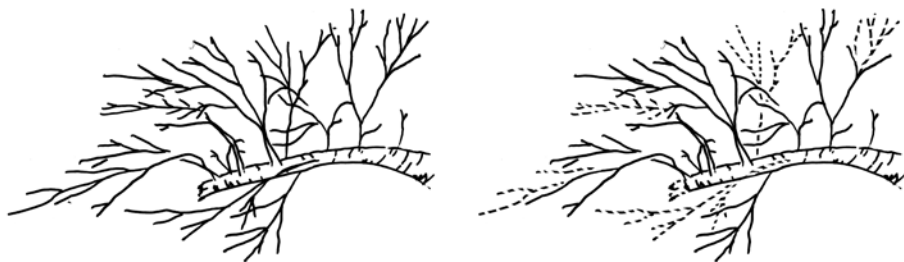
**Figure 11.**  
**Crown Reduction Pruning**

## **PRUNING TECHNIQUE: CROWN RESTORATION**

Crown restoration pruning is performed to improve the structure, form, and appearance of trees that have been topped, vandalized, or storm damaged. The success of restoration pruning depends on the ability of the tree to **compartmentalize** decay, extent and location of damage and the skill of the arborist attempting restoration. Restoring a tree to a sustainable structure usually requires a number of prunings over a period of years as new dominant branches will take time to form. Not all trees that have been damaged are candidates for crown restoration and a professional tree care specialist should be consulted to evaluate the tree. It may not be possible to restructure the tree and removal and replacement may be a more viable option.

Before restoration

Remove some sprouts and shorten others

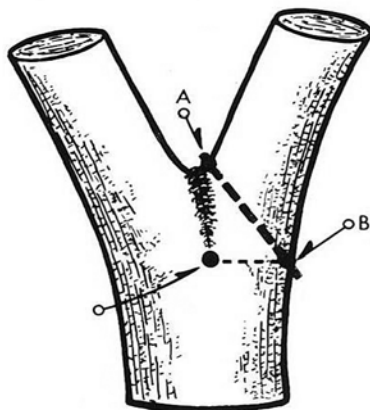


**Figure 12. Thinning of Epicormic Growth**

The process of crown restoration can be a combination of crown cleaning, crown thinning, and crown reduction, depending on the severity of the damage. Removal of dead or broken limbs and stubs should be completed first. If the tree had been topped or broken limbs are present, there will most likely be epicormic growth that will need thinning to allow more dominant limbs to grow (Figure 12). Sometimes these limbs will need to be reduced to a proper lateral (drop-crotch pruning) to completely remove the stub and sucker growth. When selecting branches to remain on the tree consideration to how the limbs are attached must be given.

 **Choose limbs that are more U-shaped to remain rather than limbs with a sharper angle of attachment; V-shaped (Figure 13).**

Remove these co-dominant branches by cutting one branch at the proper angle in relation to the crotch (Figure 13).



**Figure 13. Correcting Co-Dominant Branches**




# PRUNING TECHNIQUE: ROOT PRUNING

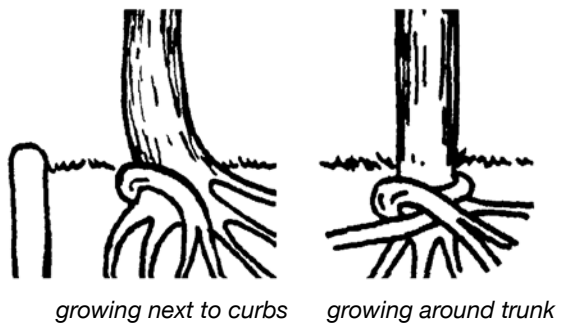
Root pruning is the selective removal of tree roots. It is done when conflicts between tree roots and existing infrastructure (such as sidewalks and driveways) or underground utilities (such as water or sewer lines) have been identified. Root pruning may be necessary to repair damaged hardscape, reduce the potential hazards, or correct girdling roots.

When trees are root pruned, there is always a risk of tree failure. Tree species, age, size, site conditions, existing problems, vigor, and extent of pruning are just some of the factors. Mature trees can be less tolerant of root pruning than young trees. Trees with defects or poor general health are not good candidates for root pruning.


Excavate the root zone using an **air-spade** and/or by hand digging prior to root pruning. This allows for exposure of the roots for easy identification and clean cuts. Make all cuts with a clean, sharp saw. In some cases, a stump grinder may be used to cleanly cut roots. Root pruning cuts should not be made with an axe, a back-hoe bucket, or ditch excavating machine. These tools tend to shatter and splinter roots, promoting decay and decline. After removing the offending roots, add coarse gravel as a base for a new sidewalk or pavers.

Determine the presence of **girdling roots** and remove if necessary. Girdling roots can be caused by the unfavorable growing conditions or restricted space (Figure 14).

 **Ideally, all root pruning cuts should be at least a distance of five times the trunk diameter from the outside of the trunk.** For example, if the tree is 24 inches in diameter at breast height, then the closest root pruning cut should be a minimum of 120 inches from the trunk. The closer to the trunk the roots are pruned the greater the effect on the tree.



**Figure 14. Girdling Roots**

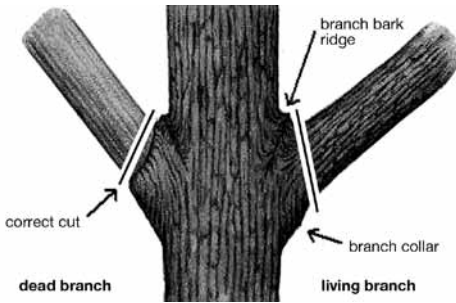
 **Cutting more than 25 percent of a tree's root zone can cause fatal injury to a tree and should be avoided.**

# PROPER PRUNING PRACTICES

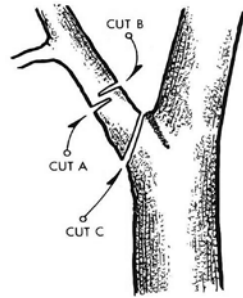
Most people can easily acquire tools for proper pruning at most local hardware stores or home improvement centers. Unfortunately, it is much more difficult to obtain the skills necessary to safely carry out the pruning technique appropriate for the desired objective. Professional tree trimmers, or arborists, undertake hours of training and practical experience on various pruning techniques, tree identification, tree climbing practices, and safety before they are qualified to perform these specialized techniques.

## Pruning Cuts


Correctly removing a branch from a tree involves having a basic understanding of plant physiology and how a tree heals. Each cut should be made carefully, at the correct location, leaving a smooth surface with no jagged edges or torn bark.



**Figure 15. Proper Pruning Cuts**



**Figure 16. Three-Step Pruning Cut**

 **The correct anatomical location is just beyond the branch collar or shoulder (Figure 15). This method is also known as natural target pruning.**

Large or heavy limbs should be removed using three cuts. The first cut undercuts the limb one or two feet out from the parent branch or trunk. A properly made undercut will eliminate the chance of the branch “peeling” or tearing bark as it is removed. The second cut is the top cut which is usually made slightly further out on the limb than the undercut. This allows the limb to drop smoothly when the weight is released. The third cut is to remove the stub, while preserving the branch collar and **branch bark ridge** (Figure 16). This method can be used for most pruning cuts including drop crotch pruning.

🍃 Use the following guide for size of branches to be removed:

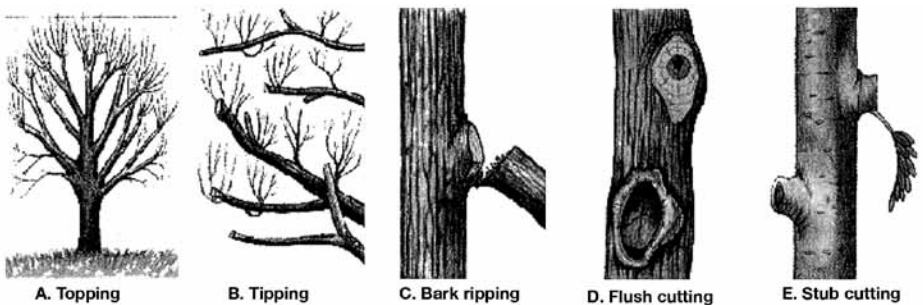
1. Under two inches in diameter – go ahead,
2. Between two and four inches in diameter – think twice, and
3. Greater than four inches in diameter – have a good reason.

## Practices That Harm Trees

**Topping** and tipping (Figures 17A and 17B) are pruning practices that harm trees and should not be used. Topping is the pruning of large upright branches between **nodes** and is often done to reduce the height of a tree. Tipping is a practice of cutting lateral branches between nodes to reduce crown width or branch length. These practices result in the development of epicormic sprouts or in the death of the cut branch back to the next lateral branch below. These epicormic sprouts are weakly attached to the stem and eventually will be supported by a decaying branch.

Improper pruning cuts cause unnecessary injury and bark ripping (Figure 17C). Flush cuts can injure stem tissues and can result in decay (Figure 17D). Stub cuts delay wound closure and can provide entry to canker fungi that kill the **cambium**, delaying or preventing wound-wood formation (Figure 17E).

It is important that the safety of the tree be evaluated by a professional arborist before any pruning is attempted on a tree. There may be structural defects that will endanger property and the people who use the area as well as the worker who attempts to prune the tree.



**Figure 17. Improper Pruning Cuts**

## WHEN TO PRUNE

The best time to prune trees depends on your goal and pruning technique employed.

 **Growth after pruning is maximized if pruning is done just before the period of rapid growth, which is in early spring.**

Plant growth can be reduced if pruning takes place soon after growth is complete for the season. Most routine removal of weak, diseased, undesirable, or dead limbs can be accomplished at any time with little effect on the tree.

Flowering can be enhanced or prevented by pruning at the appropriate time of the year. Trees that bloom on the current season's growth, such as crepe myrtle or linden, are best pruned in winter, prior to leaf emergence, or in late summer after bloom has occurred. Plants that bloom on last season's wood, such as fruit trees, should be pruned just after bloom or after leaf fall.

Conifers may be pruned any time of year, but pruning during the dormant season may minimize sap and resin flow from cut branches. However, some species of pine are more susceptible to pest infestation when pruned during the growing season. Recent wounds and the chemical scents they emit can actually attract insects that spread tree disease.

Table 3 demonstrates some suggested pruning times of certain tree types.

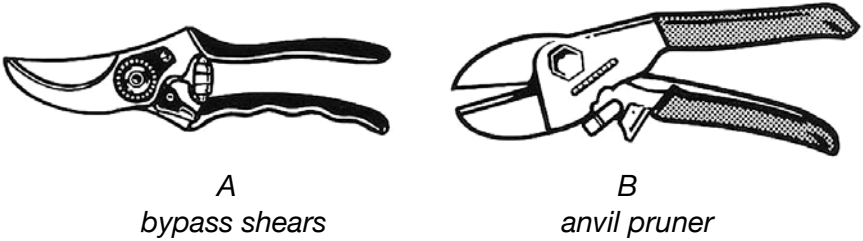
**Table 3. Suggested Pruning Periods by Tree Types\***

<b>WINTER</b>		
<b>December</b>	<b>January</b>	<b>February</b>
conifers		
summer/fall flowering trees		
elms, oaks, ash, maple		
fruit trees		
<b>SPRING</b>		
<b>March</b>	<b>April</b>	<b>May</b>
broadleaf evergreens		
<b>SUMMER</b>		
<b>June</b>	<b>July</b>	<b>August</b>
broadleaf evergreens		
spring flowering trees		summer/fall flowering trees
<b>FALL</b>		
<b>September</b>	<b>October</b>	<b>November</b>
	elms, oaks, ash, maple	
		conifers
summer/fall flowering trees		
		fruit trees

\*Check with your county extension agent or a horticulturist for additional information.

## PRUNING TOOLS

The proper pruning equipment is almost as important as knowing and practicing correct pruning. Pruning operations progress more smoothly and safely if the right tools are selected for the job and if the equipment is well maintained.



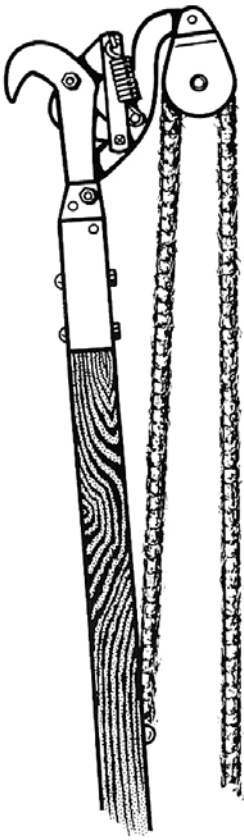
**Figure 18. Hand Pruning Shears**

Hand pruning shears—the smallest shears—are made for cutting branches up to about a one-half-inch in diameter. Bypass shears (Figure 18A) are the recommended type. They should make a shearing cut—the cutting blade passes the anvil as it cuts through the branch. A close cut can be made with less effort by placing the cutting blade against the branch or trunk from which the limb is to be removed. Bypass shears are especially useful to give shrubs a natural appearance. The anvil pruner (Figure 18B), where the cutting blade presses against the anvil as the cut is completed, is not recommended for pruning trees because they tend to crush branches instead of slicing.



**Figure 19. Lopping Shears**

Lopping shears (Figure 19) have long handles to exert great cutting power when pruning branches up to two inches in diameter. As with hand



**Figure 20. Pole Pruner**

pruning shears, the bypass type is preferred over the anvil type.

A pole pruner (Figure 20) is a specially designed pruning shear adapted for use on the end of a pole. The anvil is more strongly “hooked” than in hand pruners or lopping shears to grasp the branch more securely as the cut is made. Because tree experts often work close to energized lines, the only metal in professional pole pruners is in the cutting parts.

**🌿 To avoid serious electrical shock, never use aluminum poles.**

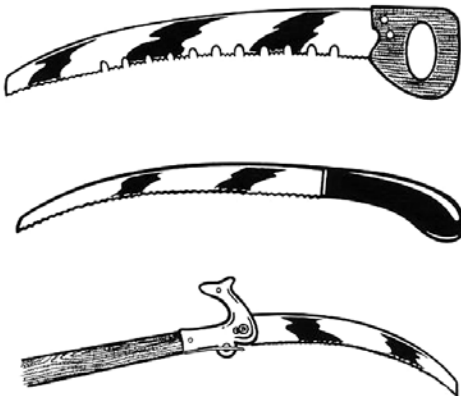
The operator exerts cutting power through a rope from the end of the handle to a compound lever arrangement at the cutting head. Pruning poles vary in length and some have a connecting sleeve and an additional 10-foot pole so that the operator’s reach is extended to 20 feet.

when pulled rather than when pushed. This saw can cut branches with diameters ranging from too large for the hand pruner to several inches in

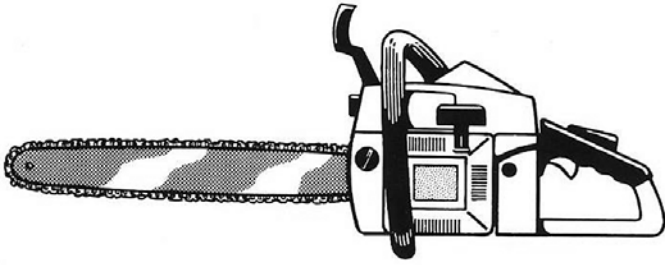
The basic saw available at most arborist supply outlets is the 24-inch curved “speed saw” (Figure 21A). This saw cuts rapidly and, unlike carpenter saws, cuts

diameter. There are smaller, curved pruning saws that cut on the pull and have finer teeth than the large speed saws (Figure 21B). These smaller saws are useful where there are many small cuts to be made that are too large in diameter for hand pruners.

Pole saws (Figure 21C) are smaller versions of the fine-toothed, curved speed



**Figure 21. Types of Saws**



**Figure 22. Chain Saw**

saws. They cut on the pull and are mounted on ten-foot lightweight poles, extending the operator's reach by the length of the pole.

The chain saw (Figure 22) is probably the most often used and most dangerous pruning equipment an arborist handles. The user must respect the power and speed with which they cut. Chain saws are especially useful in removing large limbs or cutting up fallen limbs and trees.

Professional tree care personnel will also have a variety of climbing gear to safely ascend into a tree to perform pruning operations (Figure 23).



**Figure 23. Professional Climber**

Properly trained climbers can easily work in the tree while being securely tied in and can safely move around the branches.


The use of **climbing spurs** can assist climbers in safely moving about a wet or moss-covered tree, but spurs can cause damage to trees by wounding the wood and should only be used when a tree is to be removed.

The practice of climbing trees with ropes should only be performed by qualified persons and should not be attempted by untrained individuals.

Other personal protective gear should include safety glasses, hard hat, gloves, and appropriate clothing.



If you feel you lack the necessary skills, equipment, or understanding to perform any of the described techniques, you should contact a licensed professional arborist.

 **A good rule of thumb is that if you have to leave the ground, even on a ladder, to prune your tree, you should hire a professional.**

## CONCLUSION

Pruning is one of the most important and visible management actions used on woody vegetation in the urban environment. Proper pruning is a wise investment that can extend the useful life of trees and shrubs, improving their safety and adding significantly to the values they provide. Conversely, improper pruning can irreparably damage a tree or shrub, significantly detracting from its value and possibly making it hazardous. This pruning guide should be used to make informed decisions as to whether pruning is necessary based on your overall objectives and to improve understanding of tree health and maintenance needs.

The pruning practices set forth in this guide represent the current accepted standards in the industry. The City of Bellevue promotes these guidelines as the expected level of care for both city and privately owned trees. Property owners and tree care professionals are strongly encouraged to adhere to these pruning guidelines and seek additional advice from the City of Bellevue if conflicts or questions arise. When higher standards of care are put into practice by all stakeholders, the multiple benefits of the urban forest can be realized.

## APPENDIX A: GLOSSARY OF TERMS

**Air Spade:** A pneumatic soil probe that delivers sudden bursts of air to crack, loosen, or expand the soil to improve the root growing environment or for trench excavation to preserve root tissue.

**Apical buds:** The terminal bud, or tip, of a stem of a main leader that maintains dominance. Removing the apical bud can promote lateral buds to grow.

**Arborist:** A professional who possesses the technical competence through experience and related training to provide for or supervise the management of trees and other woody plants in the residential, commercial, and public landscape.

**Branch:** A secondary shoot or stem arising from one of the main axes (i.e., trunk or leader) of a tree or woody plant.

**Branch collar:** Trunk tissue that forms around the base of a branch between the main stem and the branch or a branch and a lateral. As a branch decreases in vigor or begins to die, the branch collar becomes more pronounced.

**Branch bark ridge:** Raised area of bark in the branch crotch that marks where the branch wood and trunk wood meet.

**Cambium:** Dividing layer of cells that forms sapwood (xylem) to the inside and bark (phloem) to the outside.

**Climbing spurs:** Sharp, pointed devices affixed to the climber's leg used to assist in climbing trees (also known as *gaffs*, *hooks*, *spurs*, *spikes*, *climbers*).

**Co-dominant:** Two main branches that originate at the same point on the main trunk. These create a weak union that is more prone to failure than normal branch development.

**Compartmentalization:** The process within woody plants of building cell walls around decay to prevent the spread.

**Conifers:** Cone bearing trees such as pines, firs, and redwoods.

**Crotch:** The angle formed at the attachment between a branch and another branch, leader, or trunk of a woody plant.

**Crown:** The leaves and branches of a tree or shrub; the upper portion of a tree from the lowest branch on the trunk to the top.

**Decay:** Degradation of woody tissue caused by biological organisms.

**Epicormic branches:** A branch that arises from latent or adventitious buds; also known as water sprouts that occur on stems and branches and suckers that are produced from the base of trees. In older wood, epicormic shoots often result from severe defoliation, excessive pruning, or topping.

**Girdling roots:** Roots located above or below ground whose circular growth around the base of the trunk or over individual roots applies pressure to the bark area, ultimately restricting sap flow and trunk/root growth, frequently resulting in reduced vitality or stability of the plant.

**Heading:** Cutting a currently growing or one-year-old shoot back to a bud, or cutting an older branch or stem back to a stub or lateral branch not sufficiently large enough to assume the terminal role. Heading should rarely be used on mature trees.

**Included bark:** Bark enclosed between branches with narrow angles of attachment, forming a wedge between the branches.

**Lateral:** A branch or twig growing from a parent branch or stem.

**Natural Target Pruning:** Utilizing natural markers on the tree to ensure pruning occurs without injuring the branch bark ridge or collar.

**Nodes:** Point along a branch where leaf or lateral shoot growth originates. Just above a node is also the correct place to make a pruning cut.

**Parent branch or stem:** The tree trunk; or a large limb from which lateral branches grow.

**Qualified line clearance tree trimmer:** A tree worker who, through related training and on-the-job experience, is familiar with the techniques in line clearance and has demonstrated his/her ability in the performance of the special techniques involved. This qualified person may or may not be currently employed by a line clearance contractor.

**Topping:** An inappropriate technique to reduce tree size that cuts through a stem more than two years old at an indiscriminant location.

**Wound:** The opening that is created any time the tree's protective bark covering is penetrated, cut, or removed, injuring or destroying living tissue. Pruning a live branch creates a wound, even when the cut is properly made.

## **APPENDIX B: ADDITIONAL RESOURCES**

ANSI Z133.1. 1994. Safety standards. American national standard for tree care operators. Washington, DC: American National Standards Institute.

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425-452-6800

**International Society of Arboriculture**

[www.isa-arbor.com](http://www.isa-arbor.com)

**National Arbor Day Foundation**

[ww.arborday.org](http://www.arborday.org)



