

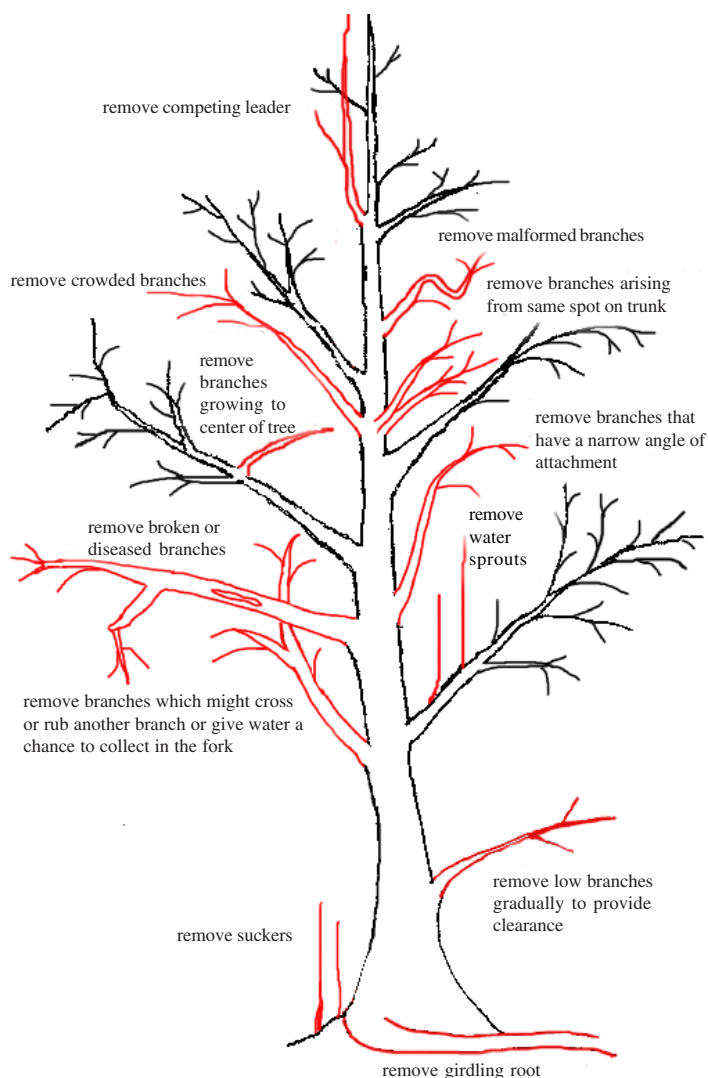
## Pruning Ornamental Plants

### What is Pruning?

Pruning is the removal of undesirable portions of a plant. Each pruning cut should be well planned, because each has the potential to affect the growth of the plant. After pruning, a plant must heal every cut. To do so, it will *compartmentalize*, or seal over, the wound by forming callus or scar tissue. Small cuts do less damage than big ones, requiring that the plant expend less resources to make less repair. Cuts should leave smooth surfaces, without ragged edges or torn bark. Gardeners can avoid extra work by careful pruning and training of young plants and by choosing plants with an ultimate size appropriate to their location.

Pruning does not stop plant growth. In fact, *pruning stimulates growth*. It uses the biological principle that new growth will come at the buds. The terminal bud (the bud at the end of a branch) exerts a strong chemical control over the lateral (side) buds lower on the stem. Hormones located in the terminal bud keep lateral buds dormant. Effective pruning manipulates bud growth to the gardener's advantage, when removal of terminal buds releases lower buds from growth inhibition and permits them to begin branching. The buds closest below the cut are the ones most likely to grow. Cuts made near the base of a plant can create "bushiness" there, but this is dependent upon a plant having viable lower buds.

Regrowth after pruning also depends upon the amount of material removed. If a small percentage of a young, vigorously growing branch is cut off, there will be regrowth up and down the remaining branch. When a large portion of that same branch is removed, the one or two buds closest to the cut will grow at a very rapid rate. Thus, in general, removing just the growing tips causes more branching than the removal of a larger portion of the branch.



**Reasons for Pruning**

## Why Prune?

### To train newly planted trees and shrubs for better establishment

- Pruning can make young shrubs denser. Cutting some shrubs to the ground after the first or second year encourages new shoots to develop from the base of the plant. Small trees frequently need to be pruned to establish a strong and attractive shape.

### To maintain plant health

- Removing all dead, diseased, or damaged branches helps prevent insects and decay organisms from entering the plant. When removing diseased wood, it is important that the cut be made into healthy wood below the point of infection.
- Branches that cross can injure each other by rubbing to create a wound, and they need to be removed.
- Pruning can also rejuvenate declining shrubs or perennials. Severe pruning will often produce vigorous new growth in many species that appear to be dying.
- Pruning overly-dense plants promotes air circulation and reduces disease incidence.

### To improve the quality of flowers and fruit

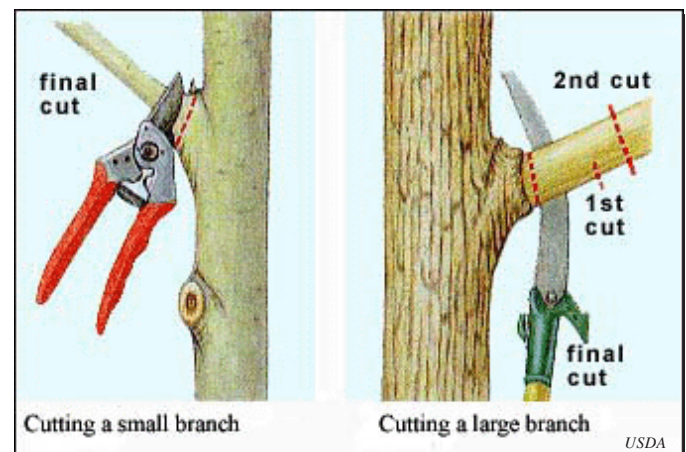
- Flowers and fruit may become smaller in size as their production increases. Pruning woody parts diverts energy to the production of larger, though fewer, flowers or fruit.
- Thinning lets light into the canopy's interior, which is necessary for good fruiting.
- Removing dead flowers and seedpods increases bloom for the following year. On rhododendrons, lilacs and similar plants, the production of seed pods drains energy from the production of new shoots and flower buds, therefore seed pods should be clipped off.
- In some perennials and annual flowers, removal of spent blossoms encourages the production of additional blooms in the current season. When flowers have old leggy foliage and lush new growth at the base, the old foliage should be removed to allow newer leaves and stems to develop. Biennials or short-lived perennials can sometimes be tricked into another year of flowering if seed heads are removed immediately after flowering.

### To promote desired appearance

- Thinning out trees and shrubs lets light into the interior of plants to reveal interesting patterns of bark, trunk, or branch structure.
- Pruning or shearing can be used to develop a special form, as in hedges, espalier, or topiary work. When green shoots develop on a variegated plant, they should be removed to maintain the variegated coloration.
- If a portion of a plant reverts to the wild type, such as strong vertical growth in weeping plants, those portions should be removed.

### To restrict growth

- Branches that are hazardous or interfere with power lines should be removed. Homeowners should obtain professional assistance when pruning near power lines.
- Overgrown shrubs should be restrained.
- Densely branched shade trees can be thinned to help reduce the potential for storm damage.
- Multiple shoots growing from a wounded area should be eliminated.
- Shoots from the rootstock of grafted plants should be removed.
- Water sprouts, which are soft, rapidly growing vertical growths, should be removed at the trunk or limb from which they grow.
- Suckers, similar to water sprouts but grow from the base of the plant or from the roots, should be removed if they are not wanted.



## Pruning Techniques and Terms

**Deadheading** is the removal of spent flowers. Flowers that go to seed consume large amounts of a plant's energy, diverting it from vegetative growth. When practical, plants can be deadheaded to a lateral leaf, flower or bud. In the case of a single flower stem nearly bare of leaves, the stem should be cut off close to the base after flowering.

**Disbudding** is the removal of small, young flower buds. Removal of the top or terminal bud causes the plant to produce more, but smaller, flowers. Removal of the side or lateral buds will produce a larger flower on a longer stem. Dahlias, carnations, chrysanthemums, and peonies are commonly disbudded.

lateral bud



terminal bud



opposite buds:  
cut incorrectly - cut too far from bud



opposite buds:  
cut correctly - flat cut



alternate buds:  
cut correctly diagonally



alternate buds:  
cut too close to bud



alternate buds:  
cut too far from bud

### Twig Pruning

**Heading back** is the removal of the terminal portion of a shrub or tree branch by cutting back to a bud or another branch. Gardeners can control the shape of plants by pruning back to a bud or branch pointing in the direction they wish future growth to go. Generally this is an outward pointing bud. Heading back stimulates the growth of shoots and increases density.

A good heading cut does not leave a stub and is made about one-fourth inch above an active lateral bud or branch.

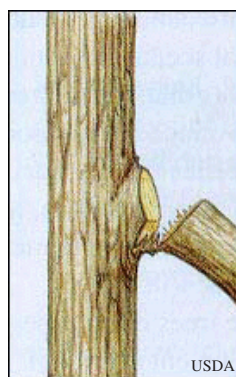
- To prune stems with *opposite* buds or stems (directly across from each other on a stem), make a clean *straight* cut just above a strong pair of buds or shoots.
- To prune stems that have *alternate* buds or stems (not directly across from one another on a stem) make a clean, *angled* cut just above a shoot. The lowest point of the angled cut should be opposite the bud, and the top of the cut located just above the bud.

**Large branch pruning** of branches over 1½ inches in diameter requires a special three-cut pruning process. This avoids the unfortunate event when, before the pruning cut is even complete, the weight of the branch breaks it off, leaving a ragged wound and ripping bark from the trunk. First, saw an upward cut halfway through the branch about a foot beyond where it intersects the trunk. Second, saw a cut downward all the way through the branch somewhat farther out from the first undercut. This removes the excess weight of the branch. Now make the third and finishing cut perpendicular to the trunk on the branch side of the *collar* which is the thickened area at the intersection of the branches. (If there is no visible collar, make the final cut where the top of the branch makes

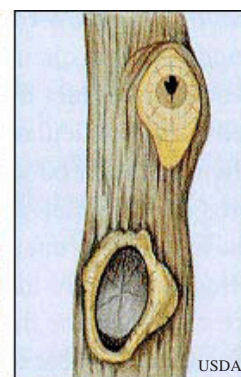
an abrupt turn from the trunk.) See diagram, page 2.

Never cut the branch flush with the trunk, thus removing the collar. The collar is an area of natural shedding that contains chemically protective tissue that encourages rapid healing. Contrary to what was once recommended, tree wound dressing, paint, or shellac should not be applied over the cut surfaces. Research shows that dressings can shelter disease organisms and slow the wound-healing process.

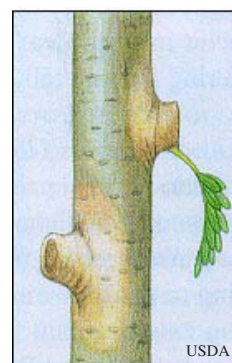
### Harmful Practices



Avoid bark ripping



Avoid flush cuts



Avoid stub cutting

**Pinching** is the manual removal of the growing tips of plants and the first set of leaves as a way to control plant size, to promote bushiness, and to increase density. This technique is most frequently used on annuals and perennials.

**Pollarding** is a pruning technique in which the top of the tree or shrub is headed back severely when less than three years old, followed by annual removal of sprouts that arise from the cut area. This achieves a formal appearance and keeps the tree or shrub small. After a number of years pollard heads, also known as knuckles or knobs, develop where the sprouts are removed. Care must be taken not to cut into these knobs. Not all trees or shrubs can withstand pollarding, although it is commonly done on crepe myrtles.

**Renewal pruning** keeps shrubs, such as nandina, lilac and forsythia, compact and vigorous and prevents lanky, untidy growth. Remove the weakest and unhealthiest stems first. Then remove the oldest branches just above ground level,



leaving only the younger, more vigorous branches. Also, remove stems less than a pencil thickness in diameter. Old, poorly developed plants may need to be cut flush to the ground to encourage new branches to develop. For some overgrown plants it may be advisable to stagger renewal pruning over several years to lessen plant shock by cutting out one stem in three each year. Remove other stems to open up the center of the bush or improve its general shape. The bush will appear somewhat sparse just after pruning, but new growth will soon fill in the empty spaces.

**Root pruning** is used to reduce a plant's excessive shoot growth, promote flowering, or facilitate transplanting. To force flowering, for example, of wisteria or fruit trees not on dwarfing rootstocks, root prune in July or early August for flowers the next year. To reduce excessive shoot growth, root prune in the spring just before growth begins.

Facilitate transplanting of established plants by root pruning in early spring or as soon as the first flush of growth stops in late spring or early summer. This improves transplanting success, because it increases the number of feeder roots close to the trunk, where few normally exist. When using this technique, prune the roots about one year before the move or stagger pruning cuts over the prior two years to lessen the shock to the plant.

To root prune, force a sharp spade into the soil in a circle around the plant. This circle should be about a half foot smaller than the root ball to be moved. New roots will be stimulated to develop at the cut surfaces, so subsequent digging to lift the plant will be done outside the root-pruned area. When it is possible to stagger the root pruning over the course of two years, insert the spade, skip a spade width, and insert again, alternating thus in a circle around the plant. It is important to keep root-pruned plants well watered.

Occasionally roots grow across the base of a tree rather than growing out and away from the tree. As these *girdling roots* grow, they can act as a tourniquet, slowly killing the tree. They must be removed when spotted at a young age. Large roots cannot be removed. Potbound container-grown trees are more prone to root girdling.

**Thinning** is removal of a branch or water sprout to its point of origin, where it joins a branch or trunk. This is the least conspicuous method of pruning stimulates the least growth. When pruning this way, cut back to the collar. Do not remove the collar, as it helps the cut heal. If the collar is at the base of a dead branch, remove only the dead wood.

## When to Prune

The time to prune is based on a plant's flowering, fruiting, or growth habit. When in doubt, prune in early spring. This may mean loss of flowers for one year, but the tree or shrub will not be damaged. Do not prune in the fall (generally from August to October), since new growth will not have a chance to harden off before winter.

### Spring Flowering Trees and Shrubs

For plants that flower before the end of June, prune immediately after flowering. Because these flower buds develop during the prior growing season, pruning in fall, winter, or spring would remove buds and subsequently reduce the following spring's flower display.

### Summer Flowering Trees and Shrubs

For plants that flower in summer or autumn, prune in the winter or spring before new growth begins. These plants develop flowers on growth produced during spring. A notable exception to this are most mophead hydrangeas which bloom on old wood. Pruning them in spring reduces bloom.

### Evergreens

Prune evergreens, such as pines, in late spring or early summer. [See *Conifers*, page 8.] Hollies may be pruned during the winter when their branches are desired for holiday decorations. Save severe pruning of evergreens for early spring. New growth at this time soon overgrows any disfigurement caused by pruning. Be aware that many evergreens will not tolerate severe pruning. It is important to identify the evergreen and learn its tolerance to pruning.

### Weeping wounds

Some trees, including birch, maple, dogwood, elm, walnut and yellowwood, exude an excessive amount of sap from pruning wounds made in late winter or early spring. This is not harmful to the tree, however it can be avoided by pruning such trees in late fall/early winter (November-December) or after new spring growth is finished in May or June.

### General tips

- Prune and repair any plants that are damaged by storms as soon as possible, no matter what the season.
- Minor corrective pruning, as well as the removal of dead or diseased wood, can be done any time.
- Delay pruning plants that are grown for their ornamental fruits, such as cotoneasters, pyracanthas, and viburnums, until after the fruit drops.
- If maximum growth is desired, avoid pruning during or immediately after the initial spring growth spurt.
- Stressed trees should be pruned as little as possible, since all their foliage makes an important contribution to recovery.

## Pruning Tools

Tools must be sharp to give a good clean cut. This leaves a smooth surface on the wound with no stubs, split branches, or torn bark to harbor decay organisms. When there is danger of spreading infection from one diseased plant to another, pruning tools should be cleaned between pruning cuts with 70 percent alcohol, or bleach diluted one to nine with water. Be sure to rinse bleach from tools, because it is corrosive to metal.

**Hand pruners** cut branches up to one inch (2.5cm) in diameter and come in two types: anvil and by-pass. **Anvil pruners** have a straight blade that closes against a small anvil or block as the handles are squeezed. **By-pass pruners** have a curved blade that slides past a broader blade. By-pass pruners are superior to anvil pruners, because they reduce tearing or crushing of tissues. Cut by moving the blade side of the pruner *up* and through or across the branch. Moving the blade *down* through the branch can cause tearing. Cutting branches that are too big for the pruners results in damage to the plant as well as dulling and ruining the pruners.

**Pruning shears** should be handled in such a way that they make a straight cut. Twisting the handgrips places excessive strain on the joint and creates excessive wear on the shears. Pruning shears should be used to prune hedges only.

**Lopping shears** have long handles that offer better leverage for cutting large branches up to three inches (seven cm) in diameter. If a stem is too wide for the blades, the stem cannot be cut cleanly with one cut. Avoid over-straining shears.

**Pruning saws** have narrow blades, and their teeth are coarser than carpenter saws. The teeth are usually designed to cut on the pull stroke. A small curved pruning saw is useful for working on compact trees or large shrubs and on plants with narrow crotches.

**Pole pruners** have a hooked blade with a straight blade beneath that is moved by a rope pulled downwards. Fiberglass or plastic poles are lighter than wooden ones and do not conduct electricity as aluminum poles do. Pole pruners sometimes are combined with saws. It is important to use great care when using pole pruners to avoid being hit by falling branches.

## Pruning Trees

Young trees frequently need pruning to establish beneficial branch structure. At first, however, newly planted trees should be pruned only when there are broken or damaged branches. It is a myth that trees should be pruned when planted to compensate for root loss, because leaves and shoot tips provide food and growth substances that stimulate root production.

Young trees need their low temporary branches to provide sustenance, though they should be kept short enough not to compete with permanent branches. Low temporary branches also protect the trunk. As the tree grows taller, the lower branches may be removed, keeping desirable branches. As a tree grows, branches do not move farther off the ground. Prune off the low temporary branches gradually, over a course of several years, and before they reach one inch in diameter.

Never remove more than one fourth of a tree's canopy at one time. Remember: it is better to make several small pruning cuts than one big cut. Avoid cutting large branches when possible.

### Dominant Leader

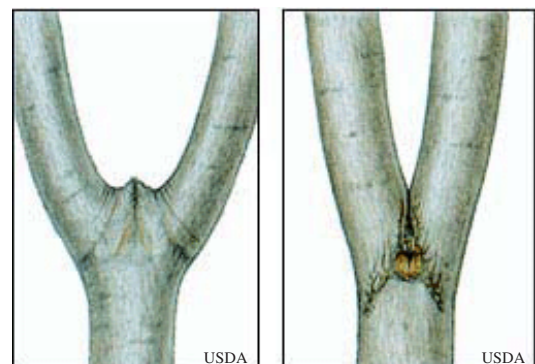
Maintain a single dominant leader stem, which is the tallest, strongest, main branch of the tree. Do not prune back this leader or allow secondary branches to outgrow the leader. If a tree has co-dominant stems (known as double leaders), remove one to avoid structural weakness. Save the straightest and strongest stem. Prevent competing branches from growing larger than half the trunk diameter by removing them or bending them downward to slow their growth.

### Branch Structure

A couple of years after planting, while the tree is still young, establish a strong structure of *scaffold* branches to form the framework of the mature tree. Scaffold branches are the primary boughs radiating from the trunk of a tree. *Secondary* branches grow off the scaffold branches. Scaffold branches should not arise from the same point on a trunk. Through pruning, carefully space permanent scaffold branches along the trunk, staggering them both vertically and radially. In other words, scaffold branches should not arise directly above each other, nor should they grow at exactly the same height. The distance between permanent branches should be three percent of the tree's eventual height. For example, a tree that will be 50 feet tall should have scaffold branches that are no closer than 18 inches apart along the trunk. These are ideal guidelines and homeowners should not attempt to climb tall trees to prune branches to exact specifications.

Proper pruning leaves secondary branches all along the larger branches. It is better to remove branches from the edges of the tree.

### Branch Union



U-shaped strong union

V-shaped weak union

## Branch Attachment

The angle formed between two branches is called the *crotch*. Sometimes branches develop with narrow angles of attachment, that is, with tight crotches. As the tree grows, bark becomes enclosed within the crotch, which leads to weakness and branch failure or dieback. Branches with narrow crotches should be removed or stretched into a wider angle when the tree is young. To widen crotches, use spacers, sometimes called spreaders, or simply bend the branch to a wider angle while it is still young and supple. Spacers can be made of wire or wood and are positioned in a crotch, pushing it wider. Weights, also, can be tied to branches to widen the crotch angle. The spreaders or weights should be removed after a season. The spreading and spacing of branches is an old established practice for fruit trees that can be applied to any tree.

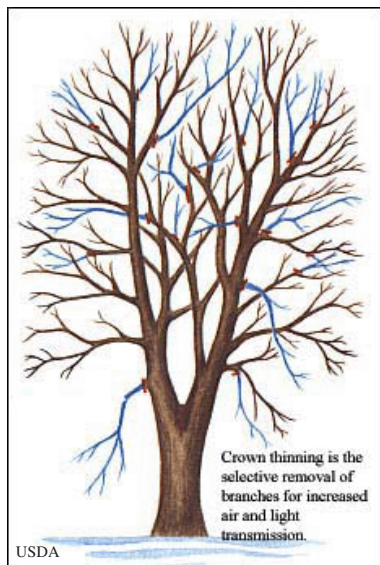
## Pruning Techniques for Mature Trees

If properly pruned when young, mature trees seldom need major pruning, but three techniques may be used when necessary.

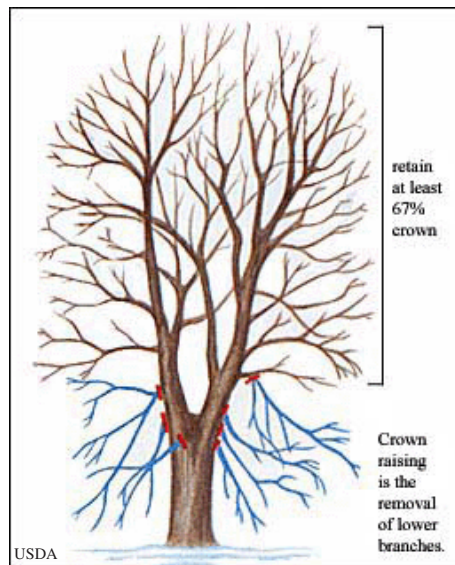
- **Crown Thinning** is the selective removal of branches to increase light penetration and air movement in the crown, or canopy, of a tree. Thinning reduces wind damage by diminishing the degree of wind block. No more than one fourth of the living crown should be removed at any one time.

Removing a portion of a branch causes the terminal portion of the remaining branch to become dominant. This remaining dominant branch should be strongly attached. Therefore, when thinning it is best to cut to a side branch that is at least one-third the size of the one being cut. Branches smaller than that will not be joined as strongly and be more susceptible to breakage. When cutting back a branch to one of its lateral branches, remove no more than one-fourth of its foliage.

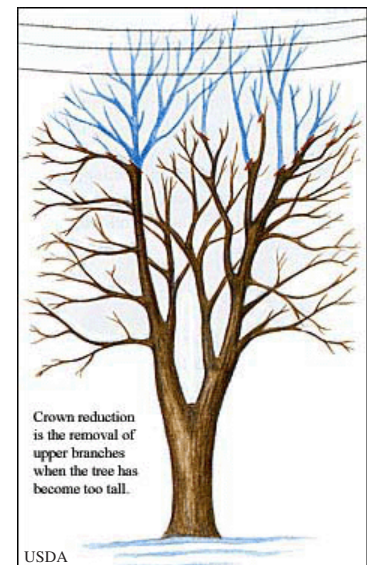
- **Crown Raising** is the removal of lower branches. Afterwards, at least two-thirds of the total height of the tree must still have living branches. Crown raising is frequently done to allow foot or vehicle traffic under the tree. Street trees require at least 16 feet of clearance for trucks. Lawn trees need eight feet of clearance for foot traffic. (Trees used for screening or windbreak can be allowed to have branches near the ground.)
- **Crown Reduction** is the removal of upper branches when the tree has become too tall. Branches that are too tall are removed back to the next larger branch out of which they grew. This procedure should only be used if absolutely necessary. When it is necessary to remove half the foliage from a branch, it is better to remove the whole branch.



Crown thinning



Crown raising

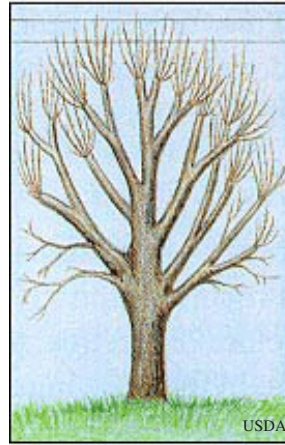


Crown reduction

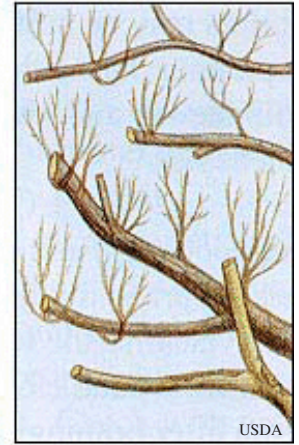


## Tree Pruning Tips

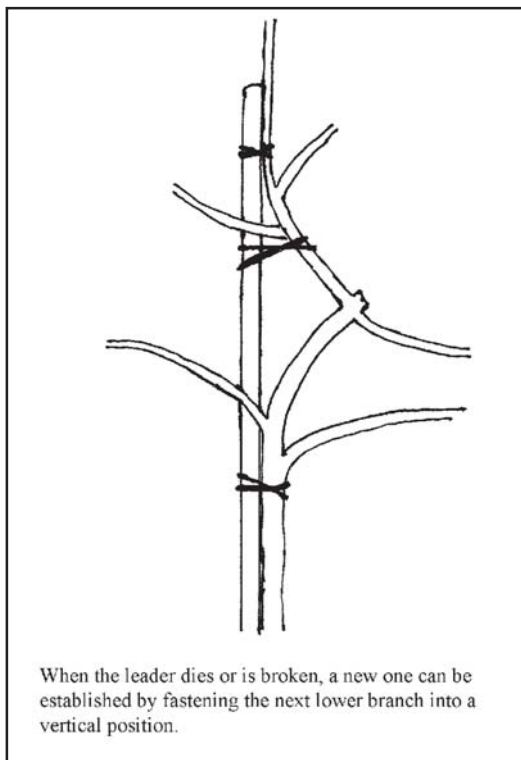
- Physical damage to tree trunks requires special attention. All loose bark from the edges of a wound should be trimmed back to bark firmly attached to the sapwood (the layer of wood under the bark). Carefully remove all shredded sapwood, too, and leave a smooth surface.
- Leave old wounds undisturbed, especially when callus or healing tissue has developed along the outside edge of the wound. Trees protect themselves from decay organisms through a process called compartmentalization, and callus tissue is part of that defense mechanism.
- Broken terminal leaders can be replaced by tying a lateral branch into a vertical position braced with a wooden stick, making it the new leader. When the new leader is growing vertically on its own, remove the tie.



Do NOT top trees



Do NOT tip trees



When the leader dies or is broken, a new one can be established by fastening the next lower branch into a vertical position.

## Pruning Shrubs

The same principles of pruning trees apply generally to pruning shrubs. The bottom of shrubs should be wider than the top so that light can reach the lower branches, except for naturally vase-shaped shrubs.

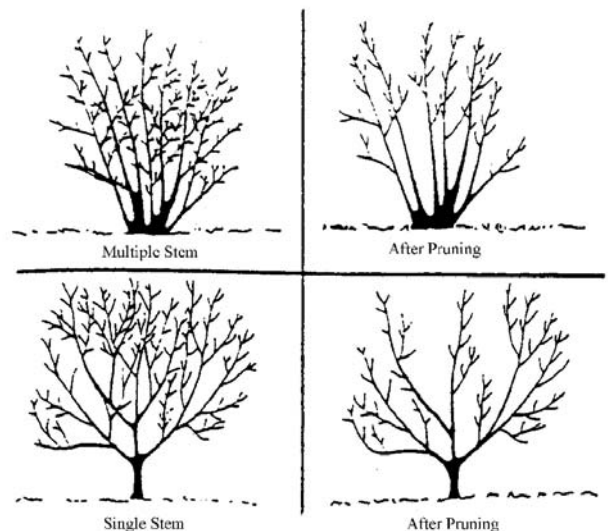
Small-leaved plants, such as boxwood, can be clipped with shears or a hedge trimmer. Shears can damage large leaves, however, causing them to turn brown and die, so on large-leaved plants such as rhododendron use pruners, not shears.

Maintaining a shrub in a specific shape or size may require pruning at least once a year. Repeated heading-back pruning can eventually make the plant too dense, reducing air circulation and increasing disease, such as *volutella* blight in boxwoods. This can be avoided by the use of thinning cuts.

Hard pruning results in vigorous regrowth. When a shrub is lopsided, hard pruning on the weak side should help that side to fill in.

Sometimes overgrown shrubs can be “elevated” by pruning them up to resemble small specimen trees.

- Pruning very large trees can be dangerous and is best performed by a licensed and certified arborist. <http://www.goodtreecare.com/search/index.cfm>
- When a tree is too tall, it is better to remove it. **Never top a shade tree.** Topping causes the growth of many weak suckers that may break off when they become heavy branches. Wood rots are more likely to be a problem in topped trees. If a tree must be reduced in size, use the crown reduction technique [See page 6], pruning entire branches at their point of origin.
- Tipping is the procedure of cutting lateral branches between nodes or buds to reduce crown width rather than cutting back to a node or crotch. Tipping is another procedure that *should not* be used.

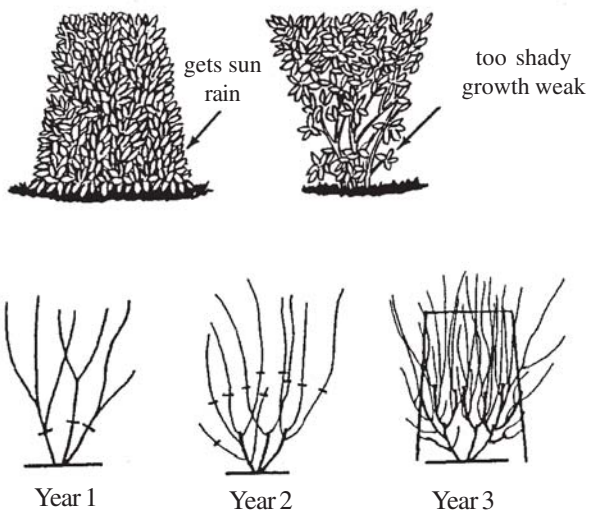


## Pruning Hedges

Hedges can be formal or informal. The formal hedge is pruned with hedge shears to a definite size and shape one or more times a year. The informal hedge, often a row of shrubs planted close together but allowed to grow naturally, may be pruned annually to thin out the oldest wood or to maintain a desired height and width, if it is pruned at all.

To establish a formal hedge, small shrubs one to three years old should be cut back to about three to five inches above the ground. This will force new shoots at the base of the plant to develop into a thick, bushy shrub. No additional pruning is needed on newly planted hedges until the next spring. When older shrubs are used to start a hedge, about one third can be cut from the top and sides to develop a thick, bushy hedge of many twiggy stems.

### Hedge Pruning



The recommended shape for hedges is a narrow pyramid or inverted V. For example, a hedge five feet high could be three and a half to four feet wide at the base and about a foot wide at the top. This is crucial for a healthy hedge, because when a top is as wide as, or wider than, the base, the lower hedge is too shaded and produces thin, weak growth. The top of a formal hedge may be slightly rounded or pointed. This helps the plant to shed snow, which could otherwise break branches.

Formal and informal hedges can be kept vigorous for years by annually cutting out one third to one fourth of the oldest branches near or a few inches above the ground. Do so before new growth starts in spring, using hand pruners, loppers, or curved pruning saws. This method encourages new growth at the base of the plant. Along with regular shearing, formal hedges can also be kept vigorous by thinning out upper branches.

Deciduous hedges that are overgrown, bare-bottomed, or misshapen can be renovated by pruning to one foot below the desired height and trimming frequently for the next few years to the shape and fullness desired. Overgrown evergreen hedges, except for yews, hollies and arborvitae, may have to be replaced. Yews and hollies can be cut back severely. Arborvitae should not be pruned back to old wood that has no green growth.

## Pruning Conifers

Plant larger conifers such as fir, spruce, and pine only in areas where heavy pruning will not be necessary, since new shoots will not develop from cuts made in the older wood.

Most conifers used in foundation plantings, unless they are dwarf varieties, must be pruned every year. Once they have become overgrown, it is usually too late to begin corrective pruning. Yews, junipers, hemlocks, false-cypress, and arborvitae may be headed back in spring or summer. These are the only conifers that will rebound after severe pruning, and this should be undertaken only in early spring.

Firs and spruces may be lightly pruned in late summer, fall, or winter after growth is completed. Leave the side buds present along the twigs. Never cut the central leader. To thicken the growth of coniferous trees such as pine, fir or spruce, pinch out half the candle, which is the new spring growth, when it is about two inches long, usually in early June. Use fingers rather than shears. If large cuts are made, new branches will arise only in the area where needles are present along the stem.

## Pruning Perennials

In general, perennials should be deadheaded after blooming unless: self-seeding is desired, the seed heads are attractive, or the seeds are a food source for wildlife. Many people allow foxglove, digitalis, columbine, corydalis and other desirable perennials to go to seed to generate new plants. The seeds of coneflower, joe-pye weed, sunflower, bee balm, hosta, and black-eyed Susan are considered both attractive in winter and a good food source for birds.

Some perennials are thinned to reduce the risk of disease, increase flower size, or improve appearance. Thin by cutting some stems at the base of the plant. This improves air circulation around the plant, thereby reducing the risk of disease. Phlox, asters, *Monarda*, and delphinium benefit from being thinned because they are prone to mildew or rot.

Pinching promotes bushy growth. To avoid staking and to produce more compact plants with stronger stems, pinch back perennials such as chrysanthemums and asters several times before mid-July. Generally the first pinching is done as soon as there are several sets of leaves on each stem. Pinching delays flowering. The trick of pinching only some of the stems extends the blooming season, since the pinched portions



will bloom later. To stagger plant heights or bloom times, perennials such as *Phlox paniculata* and Autumn Joy sedum can be pruned once or twice in the summer before mid-July. Perennials with one leafy stalk, such as a lily, and those with leafless flowering stalks, such as iris, should not be pinched back before bloom.

Sometimes flowers are removed because they are not considered as attractive as the leaves: some hostas are an example. In the fall, cutting plants to the ground tidies up the garden and removes debris that might harbor insects or disease, however it can also remove the winter weather protection that broken, bent stalks provide to tender basal foliage.

### **Pruning Ornamental Grasses**

Grasses that die back in the winter should be cut to the ground in early spring before new growth begins. Dead or diseased foliage on evergreen grasses should be similarly removed. When clumps of grass become large, cutting them back can be difficult. Try wrapping two strips of duct tape, string, or bungee cords around the clump, one at ground level and another a few of inches above it. A chain saw or reciprocating saw can be used to cut the stalks between the two restraints.

**Author:** Virginia Williams, Horticulture Consultant, University of Maryland, Home and Garden Information Center (HGIC).9/2005

Edited by Ellen Nibali and HGIC staff.

Reviewed for content by Raymond Bosmans, Professor Emeritus, University of Maryland College Park.

#### **References:**

Maryland Master Gardener Handbook, Home and Garden Information Center, Cooperative Extension Service, University of Maryland, 1996 (source of several illustrations)

Pruning Ornamental Trees and Shrubs, Bulletin 150, Francis Gouin, updated by Raymond Bosmans

How to Prune Trees, NA-FR-01-95, USDA, Forest Service (source of several illustrations)

Tree Pruning Best Management Practices, Edward F. Gilman, Sharon J. Lilly, International Society of Arboriculture 2002.

Pruning and Training, Christopher Brickell, Dorling Kindersley Limited, 1996.

**Have a pest or gardening question?**

**CALL THE HOME AND GARDEN  
INFORMATION CENTER**

**1-800-342-2507**

**[www.hgic.umd.edu](http://www.hgic.umd.edu)**