

BASIC PRINCIPLES OF Pruning Woody Plants

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Acknowledgment is made to Dr. Stephen C. Myers for developing the original manuscript for this publication.



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Pruning is one of the most important cultural practices for maintaining woody plants, including ornamental trees and shrubs, fruits and nuts. It involves both art and science: art in making the pruning cuts properly, and science in knowing how and when to prune for maximum benefits.

There are numerous reasons for pruning. Sometimes you want to train or direct the growth of plants into a particular form or a specified space, like a formal hedge. Or you may want to prune mature plants to control their size and shape, as in the case of fruit trees that are pruned low to the ground to aid picking or hedge plants pruned at a particular height. For fruiting plants, pruning plays an important role in improving overall fruit quality, primarily by increasing light penetration into the tree.

Unfortunately, many people approach pruning with a great deal of apprehension. Others view pruning as a chore and give little forethought to technique as they hastily do the job. Proper pruning requires a basic understanding of how plants respond to various pruning cuts. The principles and guidelines in this publication will help you master common pruning techniques.

Shoot Growth and Apical Dominance

You can partly determine the characteristic shape and size of a woody plant and its response to pruning by the plant's natural pattern of shoot growth. When a seed germinates and grows, only one growing point exists, the apex or *terminal bud* (Figure 1). When a terminal bud begins growing after being dormant, it leaves a bud scale scar on the branch. You can use the scars to determine the age of a limb or tree by counting the scars. As the new shoot elongates, structures called *nodes* are formed. A *node* is the area on the shoot where a leaf is attached (Figure 1a). One to three *lateral buds* are produced at each of these nodes. Growth of lateral buds is directed by the terminal bud, which produces a hormone called *auxin*. Auxin moves downward in the shoot (toward the Earth's center) from the shoot apex and inhibits the growth and development of lateral buds (Figure 2). This phenomenon is called *apical dominance*.

The intensity of apical dominance varies from one plant species to another. Some plants suppress the growth of their lateral buds until the second growing season; others develop both lateral shoots and terminal buds during the first growing season. Apical dominance influences not only the number of shoot-forming lateral buds and the lengths of lateral shoots formed but also the angle at which the shoots emerge from the main limb.

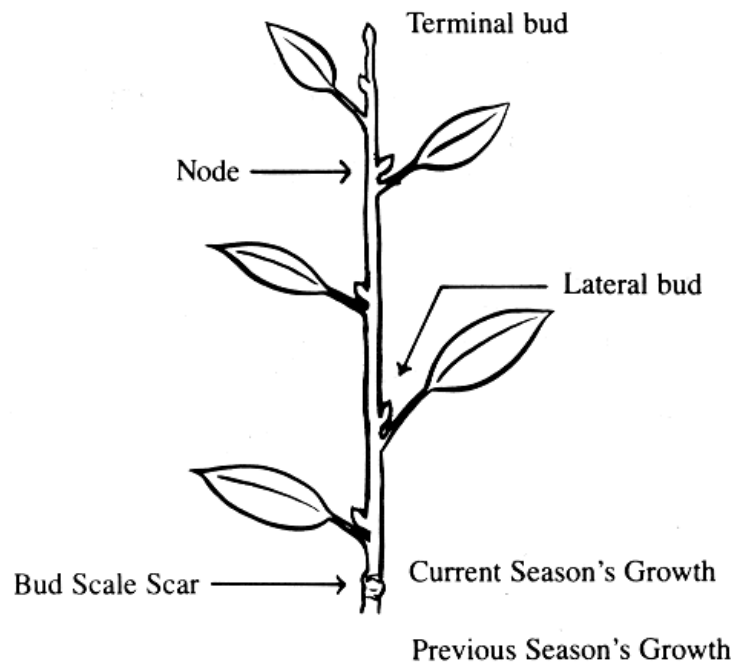


Figure 1. Current season's growth.

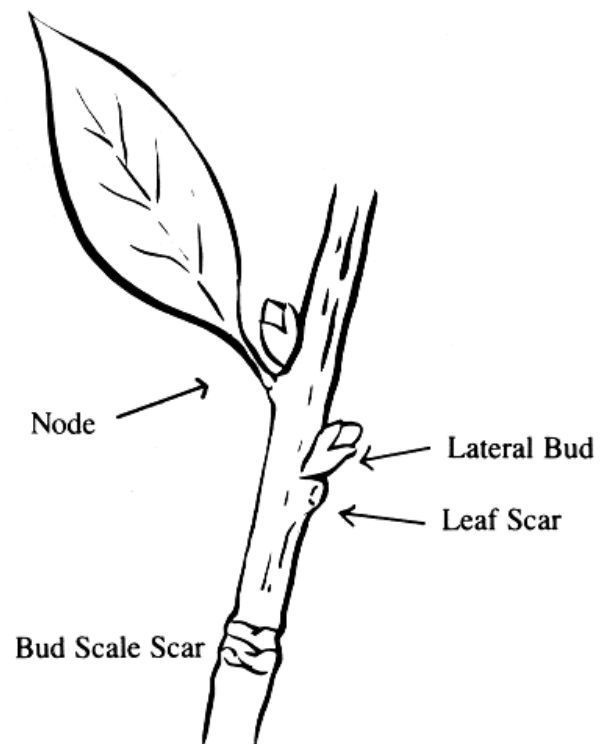


Figure 1a. Close-up of a node.

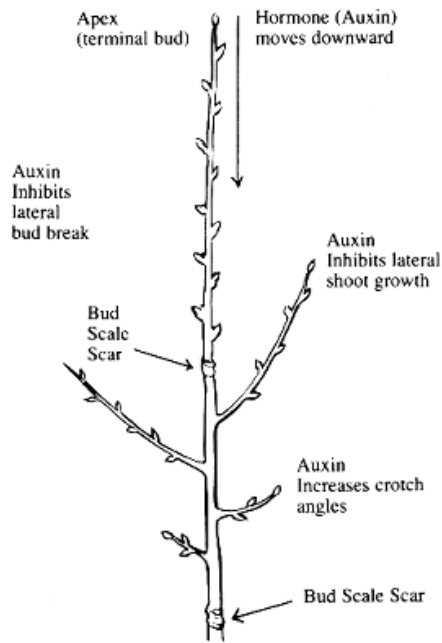


Figure 2. Apical dominance and its effects.

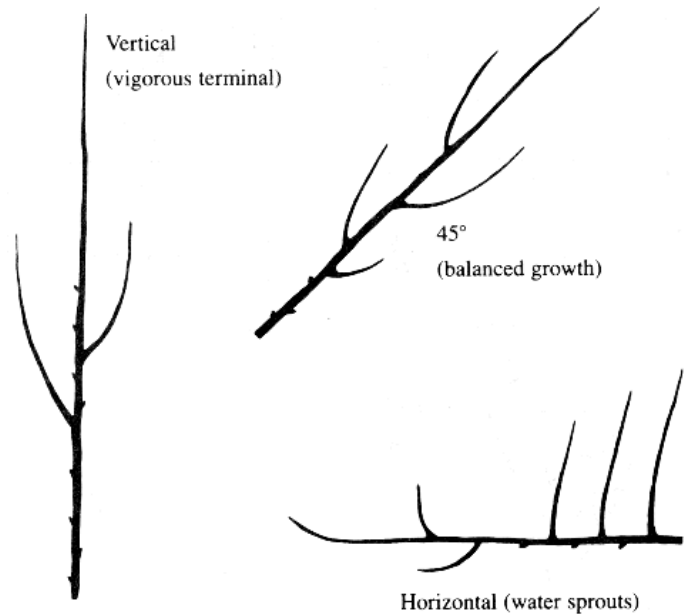


Figure 3. Limb orientation affects apical dominance.

The orientation of a limb or shoot along the main branch has a major influence on growth by its effect on apical dominance (Figure 3). Because auxin moves downward in the shoot toward the Earth’s center, apical dominance is strongest in vertical or upright shoots or limbs. In vertical limbs, vigorous shoot growth occurs near the terminal bud with lateral shoots becoming more sparse with increasing distance from the apex. On the other hand, orientation of lateral branches at 45° to 60° angles from the vertical or main shoot reduces the vigor of shoot growth near the apex and increases the number and length of laterals along the limb further from the apex. On horizontal limbs, apical dominance is totally lost. Without apical dominance to control their growth, lateral buds on the upper side of horizontal limbs develop into vigorous, upright shoots, called *water sprouts*. As they develop, water sprouts show very strong apical dominance. Water sprouts are a common problem on the upper surface of flat limbs in fruit trees and are removed by pruning.

General Responses to Pruning

Pruning is an invigorating process (Figure 4). By removing the apex, pruning temporarily destroys apical dominance and stimulates the growth of lateral buds into shoots.

Pruning also reduces the size of the above-ground portion of the plant in relation to the root system (Figure 5). As a result, the undisturbed root system services a smaller number of shoots and buds. The relative uptake of water and nutrients by the remaining shoots and buds increases, and a flush of growth (regrowth) occurs.

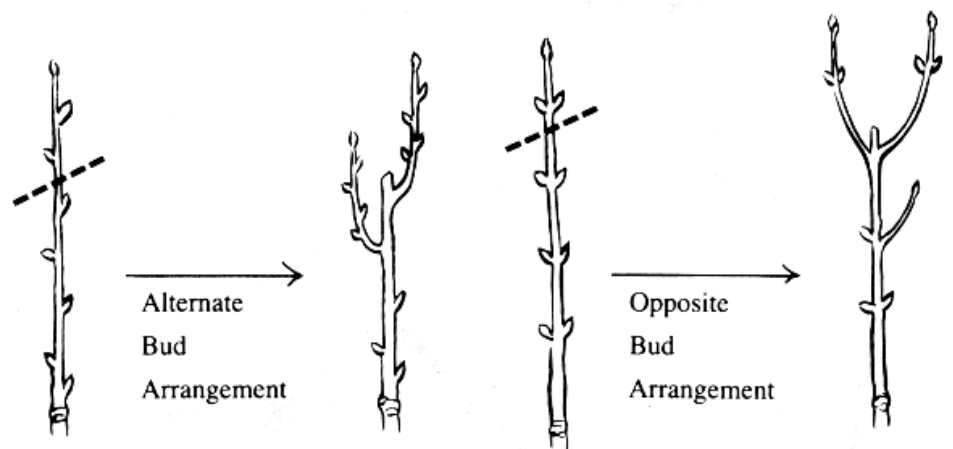


Figure 4. Pruning stimulates lateral shoot growth close to the cut.

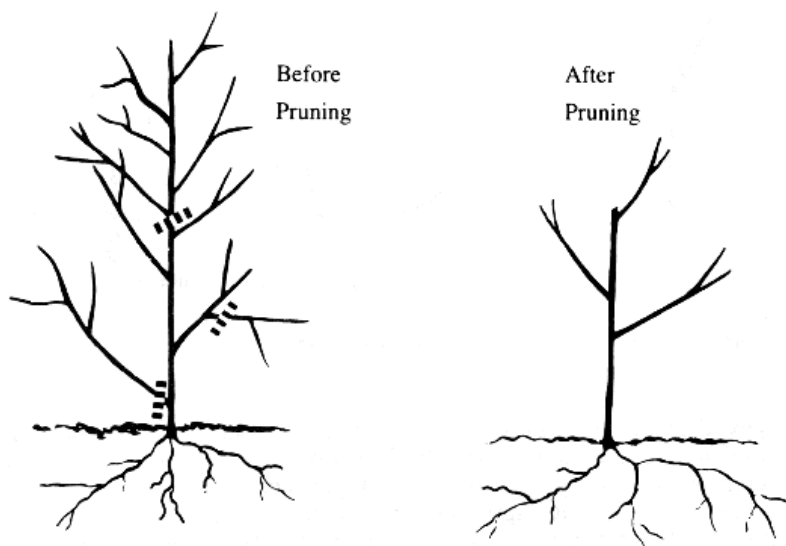


Figure 5. Pruning reduces the top in relation to the root system.

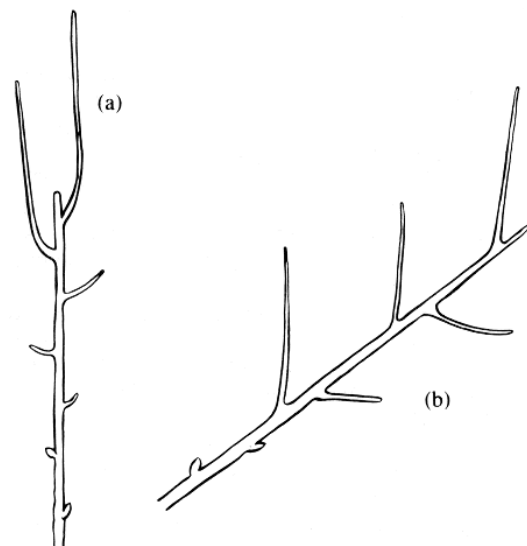


Figure 6. Pruning stimulates growth closest to the cut in vertical shoots; farther away from cuts in limbs 45° to 60° from vertical.

Generally, the more severe the pruning (greater size or number of limbs removed), the greater the resulting regrowth. In essence, the plant is regrowing in an attempt to restore a balance between the top and the root system.

Pruning generally stimulates regrowth near the cut (Figure 6). Vigorous shoot growth will usually occur within 6 to 8 inches of the pruning cut. This is particularly true for vertical limbs that have been pruned (Figure 6a). However, regrowth on limbs having a 45° to 60° angle from the vertical will develop farther away from the cut (Figure 6b).

Pruning also may indirectly stimulate growth of lateral shoots by allowing more light to penetrate the canopy of the plant.

Pruning a young plant will stimulate vigorous shoot growth and will delay the development of flowers and fruit. The length of the delay, of course, will depend on the species pruned and the severity of the pruning.

Types of Pruning Cuts

There are two basic types of pruning cuts, *heading* and *thinning* (Figure 7). Each results in a different growth response and has specific uses.

Heading removes the terminal portion of shoots or limbs (Figure 7). By removing apical dominance, heading stimulates regrowth near the cut. It also is the most invigorating type of pruning cut, resulting in thick compact growth and a loss of natural form, as in the case of a formally pruned hedge. Sometimes ornamental shrubs along a foundation overgrow their planting space and are rejuvenated by heading to within 12 inches of ground level. Many broadleaf shrubs such as burford holly, ligustrum, abelia and crape myrtle tolerate this type of pruning. Other types of heading are topping, dehorning, hedging and clipping.

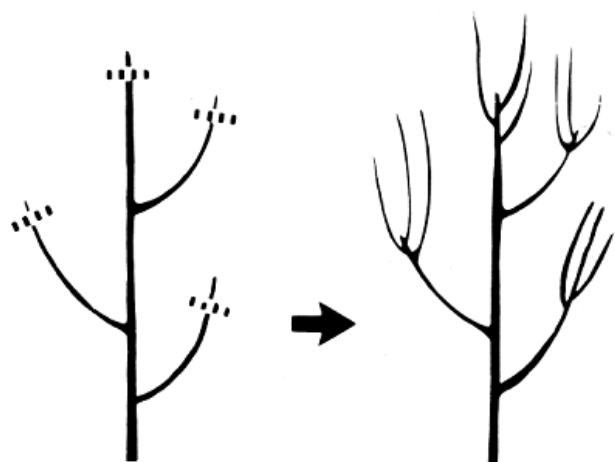


Figure 7. Heading removes a part of a shoot or limb.

Thinning, on the other hand, removes an entire shoot or limb to its point of origin from the main branch or lateral (Figure 7a). Some shoot tips are left undistributed, so apical dominance is maintained. As a result, new growth occurs at the undisturbed shoot tips while lateral bud development and regrowth is suppressed.

Thinning is generally the least invigorating type of pruning cut and provides a more natural growth form of plants. Important in maintenance pruning, thinning cuts are used to shorten limbs, to improve light penetration into plants and to direct the growth of shoots or limbs.

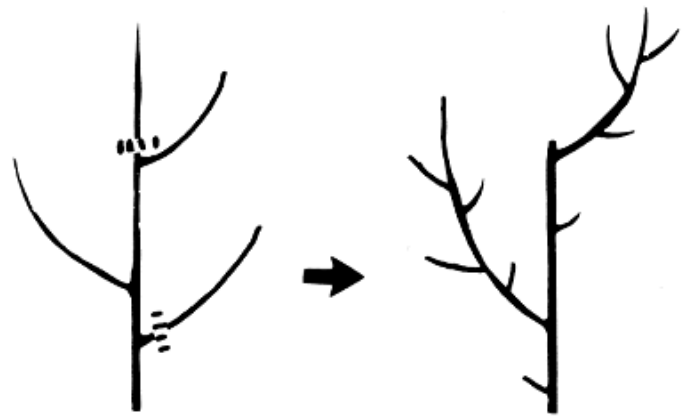


Figure 7a. Thinning removes the entire shoot or limb.

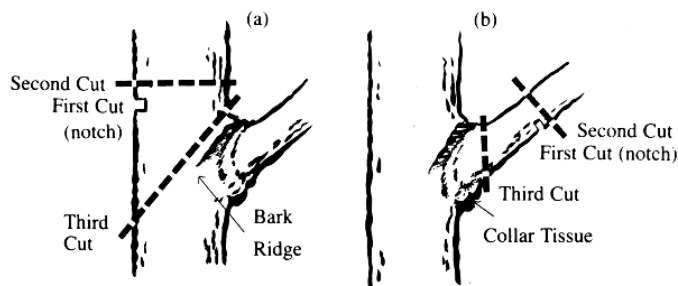


Figure 8. Types of thinning cuts: (a) dropcrotching and (b) limb removal.

Drop-crotching, a form of thinning used to reduce the size of large trees, involves the removal of a main branch (or leader) by cutting it back to a large, lateral branch (Figure 8a). The cut through the main branch is made parallel to the angle of the remaining lateral. When removing large tree limbs, a series of three cuts are recommended in order to avoid tearing the bark along the main trunk and severely wounding the tree (Figure 8b). One undesirable form of thinning is the *bench cut*, where a vigorous upright limb is thinned to horizontal limb (Figure 9).

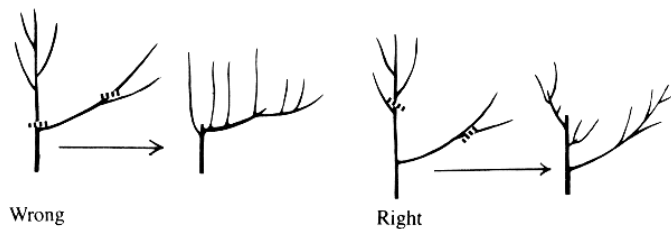


Figure 9. Compare branch cut (left) with correct method (right).

Vigorous, upright shoot growth, called water sprouts, often result from the “bench” area because of the absence of apical dominance in the horizontal limb. Such regrowth is weak and often results in an undesirable umbrella-shaped plant. The correct method is to make the thinning cuts to limbs that are similar in angle to the limb being removed but not greater than 45° to 60° from vertical.

Shoots or limbs having narrow-angled crotches are weaker than those having wide crotch angles (Figure 10). The bark of the adjoining branches becomes tightly compressed or “included,” preventing normal wood development. Winter ice, trapped down in crotches, often causes narrow-angled branches to split.

Healing Response to Pruning

Healing naturally follows pruning or wounding. It starts in the cambium, a thin layer of cells between the wood and bark. Two areas of the cambium, the *bark ridge* at the junction of two limbs, and the *branch collar*, a ring of slightly raised tissue where the lateral branch joins the main limb, function to close off the wound between the plant and the pruning cut. For fastest healing, prune close to the main branch without injuring the bark ridge or branch collar areas (Figure 11). Leaving a stub will slow healing and invite decay. Wound dressings or pruning paint are cosmetic and do little to promote healing of the pruned area.

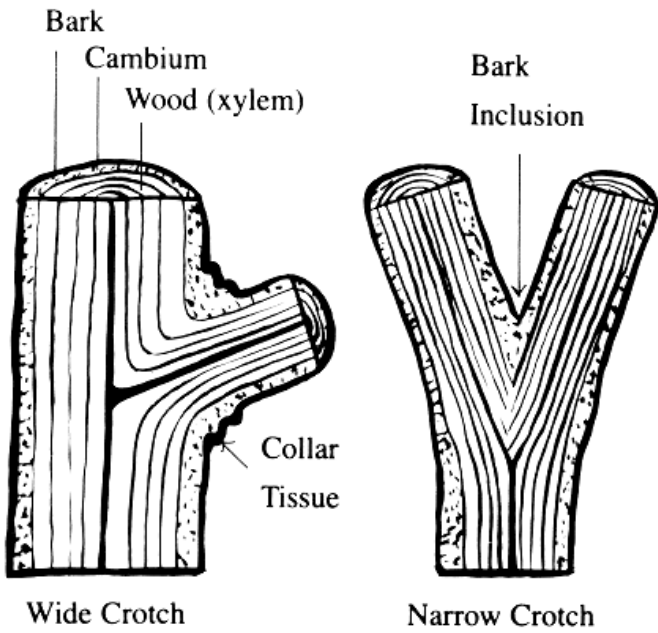


Figure 10. Wide crotches (left) are stronger than weak, narrow crotches (right).

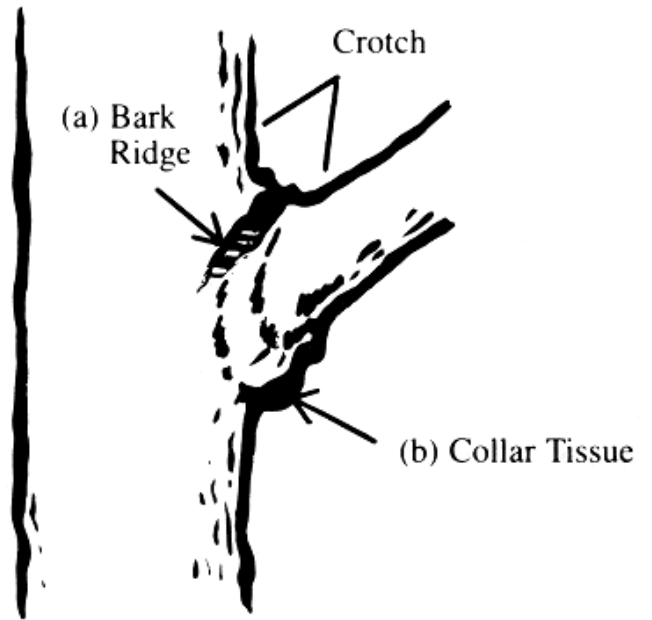


Figure 11. Areas of cambium important for healing: (a) bark ridge and (b) collar tissue.

Time for Pruning

Time of pruning varies with plant species. Prune at times that best complement the growth characteristics, flowering, and other objectives you desire. Many woody ornamentals are pruned according to their date of flowering (Table 1). For example, spring-flowering plants, such as dogwood or forsythia, normally are pruned after they bloom. Pruning spring-flowering shrubs during the dormant season will remove flower buds formed the previous fall. Summer-flowering plants generally are pruned during the dormant winter season. If plants are not grown for their flowers, the best time for pruning is during the dormant winter season before new growth begins in the spring. Avoid heavy pruning during the late summer and fall because regrowth may occur and make the plants more susceptible to cold injury. Peach trees, for example, should not be pruned from October through January.

Some plants bleed heavily after pruning. Bleeding is unsightly but not usually harmful. Trees subject to bleeding should be pruned in the late spring or early summer when leaves are on the tree. Actively growing leaves tend to reduce the amount of bleeding from pruning cuts and allow the cuts to heal more quickly. Plants that bleed readily include willows, birches, maples, beeches and dogwoods.

Table 1. Time of pruning based on time of flowering.

Prune Before Spring Growth Begins		Prune After Flowering	
Beautyberry	Goldenrain Tree	Azalea	Japanese Pieris
Camellia	Japanese Barberry	Beautybush	Lilac
Chaste Tree (Vitex)	Japanese Spirea	Bigleaf Hydrangea	Mockorange
Cranberrybush Viburnum	Mimosa	Bradford Pear	Oakleaf Hydrangea
Crapemyrtle	Nandina	Bridalwreath Spirea	Pearlbush
Floribunda Roses	Rose-of-Sharon (Althea)	Clematis	Pyracantha
Fragrant Tea Olive	Sourwood	Climbing Roses	Redbud
Grandiflora Roses	Anthony Waterer Spirea	Crabapple	Saucer Magnolia
Gloss Abelia	Sweetshrub	Deutzia	Star Magnolia
		Dogwood	Shrub Honeysuckle
		Doublefile Viburnum	Thunberg Spirea
		Flowering Almond	Vanhoutte Spirea
		Flowering Cherry	Weigelia
		Flowering Quince	Winter Daphne
		Forsythia	Wisteria
		Japanese Kerria	Witchhazel

Summary

Pruning is an invaluable tool for developing and maintaining woody plants. Developing clear pruning objectives is important. By combining these objectives with a basic understanding of pruning and how plants respond, you can derive maximum benefit from the effort.

Several key points concerning the use of pruning in woody plants are summarized below.

- Pruning is an invigorating process, stimulating regrowth in proportion to pruning severity. Light annual pruning is better than periodical severe pruning.
- The two basic types of pruning cuts are *heading* and *thinning*. Thinning cuts are the least invigorating type of cut and are the most effective pruning cut for maintaining woody plants in their natural form.
- Pruning, particularly heading cuts, stimulates regrowth very close to the pruning cut. Heading cuts, such as topping, dehorning and hedging, often are misused and destroy the natural shape of plants because they stimulate regrowth near pruning cuts.
- Bench cuts, pruning upright limbs back to flat limbs, result in vigorous regrowth and weak limbs. Instead, thin out limbs leaving those oriented at a 45° to 60° angle from vertical.
- Pruning time should be dictated by specific requirements or characteristics of the plant such as flowering date, susceptibility to cold weather, etc.
- Wounds heal fastest when pruning does not disturb important areas of cambium such as the bark ridge and branch collar. Wound dressing is cosmetic and does not promote healing.
- All too often, improper pruning techniques seriously damage or kill woody plants. If you wish to have woody plants properly maintained, personally supervise or conduct the pruning operation.

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