Pruning is a horticultural practice involving science and art in the removal of branches or portions of a plant to control plant growth, to improve plant health, vigor and structure, and enhance fruit and/or flower development. Young plants are pruned to encourage proper development and natural form.

Older plants are pruned to maintain appearance, size, function, and vigor. It is important to understand the anatomical and physiological terms, as well as the principles of proper pruning in the nursery and in the landscape (Figure 1). If extensive pruning is required to maintain or change size and form, then the proper plant was not planted in the proper location.

Figure 1. Anatomical and physiological terms important in the proper pruning of trees and shrubs.
Pruning Trees

Young trees should be pruned to encourage a sound branching structure with branches evenly spaced and with wide crotch angles. It is critical to remove narrow angled v-crotches when the tree is young. These narrow angled v-crotches often occur toward the top of the tree, therefore, their removal is also essential to maintain a central leader. Narrow v-crotches grow weaker as the age and size of the tree increases because the two stems push each other apart as the tree grows (Figure 2).

Figure 2. A strong (left) and a weak (right) crotch formation. Note the continuous wood layers in the wide angled crotch and the bark inclusion in the narrow one. (After MacDaniels – Cornell University Experiment Station.) From: Christopher, E.P. 1976. The Pruning Manual.

A wide crotch angle is especially important in fruit trees where a heavy load of fruit may be borne when the trees mature. In addition to providing strong branch crotches in shade trees, developmental pruning should include the establishment of a central leader and the elimination of water sprouts, rubbing branches, broken branches, and epicormic and basal sprouts.

Older trees are pruned to maintain their natural appearance and vigor. Dead, dying, and broken branches should always be removed. As with younger trees, rubbing or crossing branches, water sprouts, suckers, and any other undesirable growth should be removed. Thinning a tree may also be advantageous in cases where root injury proposes a threat to the tree. Pruning to remove diseased or insect infested wood is also required.

Trees that have been wounded or are otherwise stressed, often produce suckers and shoots known as epicormic shoots (Figure 3), from dormant and adventitious buds on the trunk or main branches.

Figure 3. Epicormic shoots (upper) from dormant or adventitious buds on the trunk and main stems of trees. Suckers (lower) develop from roots or the basal crown of the tree. From: Joyce, D. and C. Brickell. 1992. Pruning and Training Plants.

It is very common to find clusters of shoots around large flush cuts or growing from the stubs of trees that have been topped. They are less likely to develop on a tree that has been given good formative pruning and is in a good state of health, wherein major pruning has not been imposed on the tree.

Epicormic growth is unsightly and it draws on food supplies that should go to other parts of the tree. These shoots can be cut off at any time, but, because they grow again year after year, it is necessary to prune them annually. Epicormic shoots are weakly attached
and if allowed to develop into large branches, for example on a linden (Tilia) or poplar (Populus), they are potentially hazardous.

In order to insure the best results from pruning, it is important to understand some key principles and proper methods for removing a branch. Dr. Alex Shigo, formally a Chief Scientist with the U.S. Forest Service has spent a lifetime gaining an understanding of how a tree grows and develops as well as how it responds to natural or pruning injury. Dr. Shigo has developed a model for these tree reactions called CODIT: “Compartmentalization of Decay in Trees”. Understanding this model facilitates the proper removal of branches with minimal damage to the tree.

According to Dr. Shigo, flush cuts and cuts that leave stubs are major starting points for many tree health problems including diseases and insects, discolored wood, decayed wood, cavities, cracks, wetwood, cankers and others. A flush cut is made so close to the trunk or main stem that it removes all or part of the branch collar. The branch collar is the enlarged section of meristematic tissue at the base of a branch and on the trunk or main stem surface that serves to provide rapid cell division to compartmentalize wounds upon branch removal. This tissue will grow over the wound unless a stub is left protruding out beyond the branch collar. Although the branch collar is more visible in some species than others, it is important to cut at the outer edge of the branch collar so that it removes all or part of the branch collar. The branch collar is the enlarged section of meristematic tissue at the base of a branch and on the trunk or main stem surface that serves to provide rapid cell division to compartmentalize wounds upon branch removal. This tissue will grow over the wound unless a stub is left protruding out beyond the branch collar. Although the branch collar is more visible in some species than others, it is important to cut at the outer edge of the branch collar so that it removes all or part of the branch collar.

Pruning Shrubs
There are a variety of reasons for, and methods of, pruning shrubs. Heading back is used to produce a more compact, denser shrub and is normally used on plants such as burning bush that have a single central stem. Severe cutting back of young plants is a common practice in the nursery to develop full multi-stemmed plants. With multi-stemmed shrubs such as red-twig dogwood, however, the primary principle in pruning is to encourage renewal growth from the base of the shrub. This requires removal of the oldest canes, which opens up the center to light and air and encourages development of new canes.

For species that are mound-like in habit, such as snowhill hydrangea or spirea, a combination of the two methods is used. Several of the canes may be thinned out, and the remaining stems headed-back at various heights so the flowers will not all be on the same level. Commonly, from 1/3 to 2/3 of each cane is removed.

In certain cases, rejuvenation of a plant in the landscape is necessary. Species such as forsythia, mockorange, spirea, potentilla, and dogwood respond well to cutting all stems down to four to eight inches from the ground, however it is better to remove the largest stems at ground level. Never shear just the new growth off the top of shrubs as this causes dense growth to form at the top of the sheared branches. This creates an unnatural form and shades out lower branches, making a very top-heavy plant.

Roses usually require a considerable amount of spring pruning. Hybrid tea roses require pruning back to live wood each spring. Shrub roses require pruning back to live wood or perhaps to ground level. Refer to the chapter on Roses for information on pruning of roses.

Pruning Narrow Leaf Evergreens
Pruning of pine, spruce, fir and other narrow leaf evergreens is done primarily on individual branches to improve the conformation and density of young plants. Shearing of species such as yew, arborvitae, and juniper will also enhance the conformation and density of young and older plants.

When pruning spruce, fir, and pines, removing 1/2 to 1/3 of new “candle” growth in the spring will promote a denser, more compact plant. A single central leader must be maintained. If spruce are pruned during the dormant season, individual twigs should be cut back to where side buds have formed. The best method to prune pine, spruce and fir is to pinch back new candles in June when they are about half formed. As little pruning as possible should be done on spruce, pine, and fir so that the growth is not reduced and the natural form is maintained.
Figure 4. The Branch Bark Ridge and Branch Collar are very visible on some species, and not so visible on other species. There are also differences between hardwood and softwood trees. The final pruning cut is made between Points C and D. If D is hard to locate, cut straight downward from Point C. From: Shigo, A.L. 1989. A Worldwide Photo Guide.

Figure 5. Pruning to reduce size involves removal of larger branches back to a line (E-F) where a smaller branch joins the stem. Locate the Branch Bark Ridge and make the cut, without disturbing the Ridge, from Point E to Point F at approximately the same angle as the Branch Bark Ridge. From: Shigo, A.L. 1989. A Worldwide Photo Guide.
Figure 6. Two samples from the same red oak tree that had branches of the same size and age cut off six years before the tree was dissected. The improper cut at left had large ribs of wound wood and a large column of decay. No decay developed following the proper cut because a ring of wound wood formed and the wood-inhabiting organisms were compartmentalized. From: Shigo, A.L. 1989. A Worldwide Photo Guide.

Figure 7. When pruning any branch over one inch in diameter, first remove most of the branch's weight with three cuts: 1. Undercut branch about one foot from main stem. 2. Make second cut one to two inches beyond and above the first cut; the second cut must always be farther from the main stem than the first cut. 3. Make the third cut at the branch collar, being careful not to make a flush cut and not to leave a stub. From: Rakow, D.A. and R. Weir III. 1989. Pruning – An Illustrated Guide to Pruning Ornamental Trees and Shrubs.
Pruning Broadleaf Evergreens
It is seldom necessary to prune the broadleaf evergreens such as azaleas, rhododendrons, mountain laurel and others, except to remove dead or diseased stems. Most broad-leaf evergreens do not regenerate new shoots upon pruning, particularly on older wood. If it is a good practice to remove the flowers as soon as they fade. The old flowering parts can be snapped out readily with the fingers at that time. Avoid breaking off leaf buds or new shoots that may have started just below them. Setting of seeds causes a heavy drain of nutrients from the plant and frequently is the cause of a plant's failure to set flowers annually.

If plants become tall and spindly with few leaves on the lower part of the stems, they may need to be cut back severely. Some species will respond to this, but with others, the plant may need to be replaced. If they respond to a cut back it still may be a year or two before the plant comes into bloom again. A fertilizer application would be beneficial following a severe pruning.

Pruning Perennials
Many perennials can benefit or in fact, require some specific types of pruning throughout the growing season in the nursery and in the landscape. The types of pruning involved are describe below.

Deadheading – Deadheading is the removal of spent flower heads on blooming perennials. It is done to keep the plants looking clean and it may stimulate or force buds lower on the plant to form branches, and therefore, provide a fuller plant. These new branches may produce another set of flowers later in the season. Removal of spent flowers from the plant and surrounding soil also eliminates potential habitat for insects and diseases. Deadheading also prevents the formation of seed heads, which can deprive the vegetative part of the plant of nutrients. Also, removing spent flowers can cut back on seed dispersal of heavy self-seeding varieties.

Disbudding – Some perennials produce flower clusters at the end of the stem. Removing the majority of individual side flower buds as they appear results in one main flower bud at the end of the stem. This will produce one large flower, rather than a multiple of smaller flowers. In contrast, the terminal bud can be removed to force an abundance of flowers along the stems or on side branches.

Cutting Back – Most perennials will benefit from being pinched or cut back early in the growing season to produce fuller and more compact plants with more flowers. Examples of plants that benefit from early pinching include Salvia (Perennial Sage) and Veronica (Speedwell). Some perennials will tolerate a flat cut back by 1/3 to 2/3; however, others need more specific attention to individual stems.

Pruning Hedges
Hedges are widely used in the landscape. Because individual plants are growing very close together, they compete for moisture, nutrients, and light. Proper pruning will ensure that hedges remain full from the top of the plant to the ground line. Pruning is done to achieve a shape that intercepts a maximum amount of light over the outside of the plants. Hedges should be pruned so that they are wider at the bottom than at the top. This will ensure maximum sun exposure to the bottom portions as well as the top, as the top will not shade out the bottom of the plant. To obtain and maintain a properly shaped hedge, prune yearly starting at the time of planting.

Frequency of Pruning
No general rule exists as to how often to prune plants. Each of many different species and varieties of plants has different requirements. Younger plants may need pruning more often to establish a proper structure. Plants that require substantial size control will require more frequent pruning, however, such plants should be removed and replaced with a species appropriate to the size of the site. Plants should be pruned only when there is an obvious reason, such as the removal of dead, broken or diseased branches, and only when it’s understood what needs to be achieved.

Proper Timing of Pruning
Choosing the proper time of year to prune is also important to achieve acceptable results. Some plants are susceptible to disease invasion if pruned at the wrong time. These plants should be pruned when they are least likely to become infected. Oaks should be pruned in the winter to minimize the chance of oak wilt infection. Do not prune oaks between April 15 and July 15. Apples, flowering crabapples, pears, Mt. ash, hawthorns and cotoneasters should be pruned when dormant to minimize the chance of fireblight infection.

Some trees have free flowing sap and will “bleed” if pruned in late winter or early spring. While unsightly, this causes little harm to the plant. The “bleeding” trees include maple, honeylocust, butternut, walnut, birch, ironwood, and elm.
The following trees and shrubs bloom early in the growing season on old wood and should be pruned immediately after they finish blooming. Winter injured stems should be pruned as soon as it is apparent what is injured or dead and what is healthy.

**Apricot**  
**Juneberry**

**Azalea**  
**Lilac**

**Chokeberry**  
**Magnolia**

**Chokecherry**  
**Mayday Tree**

**Clove Currant**  
**Flowering Plum and Cherry**

**Deutzia**  
**Early Blooming Spirea**

**Forsythia**  
**Rhododendron**

The following shrubs bloom in late spring and most of the summer. They should be pruned either early in the spring before growth starts or immediately after bloom.

**Mockorange**  
**Shrub Roses**

**Potentilla**  
**Weigela**

Shrubs grown primarily for their foliage, fruit, or other non-flowering reasons should be pruned in the spring before growth starts. Any wood injured by the winter should be removed as soon as such injury is apparent.

**Barberry**  
**Alpine Currant**

**Winterberry**  
**Honeysuckle**

**Buffaloberry**  
**Sumac**

**Caragana**  
**Sandcherry**

**Cranberry**  
**Smokebush**

**Dogwood**  
**Euonymus**

**Viburnum**  
**Ninebark**

Shrubs that bloom on the current season’s growth or sustain consistent winter die back should be pruned in the spring before growth starts. Those severely winter injured should be pruned to the first pair of buds from the ground. Others such as the following should be renewed or rejuvenated as necessary.

**Clematis** (most varieties)

**Annabelle Hydrangea**

**PeeGee Hydrangea**

**Hills of Snow Hydrangea**

**Hybrid Tea Roses**

**Spirea**

The natural form of an evergreen is usually most desirable, and pruning should be limited to correcting growth defects. The following evergreens grow continuously through the growing season and can be pruned at any time, but early in the growing season is usually best:

**Juniper**  
**Yew**

**Arborvitae**  
**Hemlock**

Spruce, fir, Douglas fir, and pines put on a single flush of growth each year. They must be pruned at the candle stage of growth before the candles become woody. Pruning at other times may cause dead stubs. To promote dense, compact specimens, prune when candles are elongated to about three-fourths their length. Up to two-thirds of this new growth can be removed, but pruning should not extend into the previous year’s growth.

**Pruning Equipment**

Using the right pruning equipment (Figure 8) reduces the effort in pruning and makes it possible to make professional, proper, and healthy cuts.

Pruning equipment can be a source of disease transfer from tree to tree or within each tree. Pruning shears and saw blades should be disinfected by dipping them in a 5% bleach solution between each cut if a disease such as fireblight is present or suspected. Prepare a 5% chlorox solution or a 10% sodium hypochlorite solution as a disinfectant. These products can be caustic to the equipment so at the end of the day wash and oil the equipment or soak the equipment in oil to prevent severe degradation of the equipment.

**Pruning Shears** – A good hand pruning shears is an important pruning tool required by all green industry professionals. The two types of pruning shears include the shear type and the anvil type. The shear type makes a cleaner and closer cut with less effort than the anvil type. It is impossible to make a proper cut with the anvil type and it injures or crushes one side of the branch being cut. Anvil type pruners should not be used if proper pruning cuts are to be achieved. A good pruning shears has one flat side to the cutting head. This flat side must be placed toward the branch collar or bud when making each cut. Therefore, the pruning shears must be rotated in the hand to ensure the flat side always faces the branch collar. If this is not done, it is impossible not to leave a stub. Most pole pruners have the cutting blade passing through a metal groove with a ridge on each side. This does not allow for a proper cut at the branch collar.

**Lopping Shears** – Lopping shears are similar to pruning shears, but with long handles to provide greater leverage needed to cut branches up to 1.5 inches in diameter. Lopping shears can be used to cut large stems to ground level when renewing large, overgrown shrubs, as well as removing larger branches from small trees. Lopping shears should not be of the anvil type.
Hedge Shears – Hedge shears should be used to prune hedges and some evergreens such as arborvitae. In addition to the hand-held shears, excellent time-saving electric and gas powered hedge shears are available. Hedge shears should not be used in shrub renewal. To keep hedge shears clean, soak the blade portion in a mixture of water and diesel fuel overnight.

Saws – Many types of saws can be used for pruning. Probably more important than the type of saw is how the saw is used. Saws with teeth on both sides of the blade should be avoided because it is easy to cause unintentional damage. Small handsaws and chain saws, as well as the many saws made specifically for pruning, can be used. Because of the distance from the handler, it is difficult to make clean cuts with pole pruning saws. If used, exercise care to make clean cuts.

Specialized Pruning
Lopping and Topping – Lopping of side branches and the topping of the main trunk are crude methods of reducing the height of trees that have become too large for the positions in which they were planted. Typically, this type of pruning is used by unqualified people claiming to be experienced tree surgeons.

Lopping and topping cannot be recommended as methods of pruning: they destroy the natural shape of trees and are frequently the source of major problems. The large wounds that they create often lead to serious decay, which is not always easily detected. Furthermore, the epicormic growth which results from using these methods is normally weakly attached and is, therefore, vulnerable to wind damage. If the size of a large tree must be reduced, some of the taller branches should be selectively thinned to a logical branch angle. In most cases, it is better to remove the tree than create an unsightly, unhealthy, hazardous tree.

Pollarding and Coppicing – These are traditional Old World methods of management for lumber. Cutting back trees regularly at or near ground level is called coppicing. Cutting back trees to a suitable height, normally above the browsing level of cattle, is called pollarding. Pollarding is often used in Europe as a method of holding city trees at a fixed height, with new growth cut back to a stump or stumps at two to three year intervals. The result of pollarding is swollen and distorted branch stubs. Pollarding or coppicing is not a recommended or acceptable method of pruning in the landscape or in the nursery. This system may, however, be used in a scion block or when cutting stems for use in floral arrangements.

Topiary – This type of pruning or art form involves the training and shearing of plants to grow in unnatural shapes such as animals, squares, spirals, cylinders, or “poodles”. These forms may function effectively in formal settings or park-like areas where they can be featured accents. Topiary pruning procedures require sincere practice, patience and skill to keep topiary shapes maintained. It takes time to achieve good specimens: four to five years for simpler shapes, ten to 20 years for the elaborate specimens. Initial training requires controlled tying of branches and twigs to a temporary form until they remain in the desired position. Shearing continues during the development process and throughout the life of the plant. This type of pruning requires extremely high maintenance at all times.

Espalier – This atypical technique involves the training of certain trees and shrubs so that the branches lie in one plane. Branches are supported on taut wires or a trellis, fence, or pipe that is usually installed against a wall, or the structure may be freestanding. For centuries, fruit trees were the principal plants used for espalier work. This technique requires little space, and blooming and fruit maturity are hastened by heat reflected from walls facing the sun.

Growing espaliered plants is time-consuming and requires considerable skill. Training young plants is a slow process. Care must be exercised in placing plants against south-facing walls because of reflected heat. Spacing the horizontal, vertical, and/or diagonal supports about four to six inches from the face of the wall or building is generally suggested to allow for good air circulation, branch development, and easier maintenance. Be aware that espaliers will not maintain themselves or retain their artificial stature without diligent, continued training and pruning.

Chemical Pruning – Although not a pruning technique per se, the application of growth-inhibiting chemicals is another way in which trees and shrubs can be kept in a desired height range. Growth inhibitors are currently used most widely by utility companies for restricting tree growth under power lines. Materials used include dikegulac and paclobutrazol (Clipper®). These products should be used only by certified commercial arborists or nursery and landscape professionals. Chemicals are not a long-term solution to planting an inappropriate specimen in a particular site.
Pruning Trees in the Nursery

Of the many desirable characteristics found in a quality tree, the shape of its “Crown” or head, and its branching structure is of utmost importance. Pruning trees at an early age is the most effective method of obtaining a quality specimen. It is critical to know the growth habit of the specific species being pruned, as it is impossible to improve the structure if the natural form is unknown. A maple or ash may be handled quite differently than a hawthorn or crabapple. Do not try to make the tree into something it is not by nature. Pruning when young, two to four years of age, will eliminate many problems in the future and will reduce future maintenance substantially. The larger the branch to be pruned, the bigger the scar and thus, a greater chance for disease introduction, a longer healing time, and a possibility for structural weakness. Also, by removing a large branch, the tree’s food manufacturing ability is reduced and, therefore, that year’s growth is reduced.

Pruning is best accomplished when the tree is dormant in early spring. The structure is more easily seen at this time and the first flush of new growth will go in the directions desired. Dormant pruning generally stimulates more growth in the remaining branches, while summer pruning takes away leaf surface during a growth stage and thus, retards growth. However, pruning reduces the total size of a tree, so indiscriminate cutting back of branches is to be avoided.

It is always preferable to train a single dominant leader until a shade tree reaches 12-15 feet in height, or until a flowering crab or smaller tree, reaches five to eight feet tall. With the exception of an occasional pruning of a narrow-angled crotch, the main branches will now have been determined and the tree will generally form a nice crown characteristic to its species. Trees such as tree lilacs and flowering crabs that grow outward can have multi-stem leaders as long as the branch structure is sound and narrow v-crotches are removed. Eight criteria for pruning branched trees in the nursery are described below.

1. Remove all double leaders and prune to one dominant leader. If one leader is straight, cut off the angled branch at its origin on the trunk. If neither leader is straight, keep the straightest leader and cut the other one back by one half. Tie them together to hold the new leader upright (Figure 9). Cut off the short one at the end of the growing season.

2. Prune out crossing or inward growing branches to maximize leaf light surface and increase aeration. Remove any rubbing branches or downward growing branches. If branches must be shortened, cut back to a healthy, outward facing bud.

3. Remove diseased, weakened, or damaged branches. Branches that are smaller than the one above it should also, most often be removed.

4. Acutely angled branches or narrow v-crotches are weaker than horizontally growing branches and

Figure 8. Proper pruning tools are required for proper pruning. Anvil type pruners do not provide proper cuts.
should be eliminated by removing the entire branch next to the trunk (Figure 10). If it is removed when the tree is young, other branches will grow to fill in the opened area.

5. Very large branches should be cut off completely, as they will dominate the tree if left in place. When completely pruning off a branch, cut just beyond the branch collar, perpendicular to the branch being pruned rather than as close to the trunk as possible (Figures 4 and 5). This minimizes the wound and therefore, the decay and disease problems. If the branch is not too much larger, it can be cut back to match other branches. If a tree has only one or two major branches, these should be pruned off or back as soon as possible. This will usually force more branches of a smaller size as illustrated in Figure 11. If branching is extremely limited, the few existing branches should be cut back and if a long terminal leader exists, the leader may need to be cut back to a strong bud. This will better proportion the tree, but it will also force greater growth of the side branches.

6. Odd angled or misshaped branches including downward growing, double, or very crooked branches should be pruned off completely. If the tree has abundant branches, it is usually better to cut a branch completely off rather than just cutting it back. When a branch is cut back, it will slow that branch down and force other side branches to grow faster. Some of these branches will usually grow in odd directions and will need to be cut off the following year. Avoid very severe pruning as it may result in additional pruning the following season. Prune only those branches that require pruning.

7. Pruning young trees in the nursery requires the development of a proper ratio of top growth to trunk caliper. Since nursery trees are growing in ideal conditions, they tend to grow more top growth than the trunk can support. This is especially true if the bottom branches are cut off too soon. If the bottom branches are raised or cut off too soon, it forces the growth into the top of the tree and then the trunk does not develop enough taper and caliper to support itself. However, if the bottom branches are left on too long, they become large and compete with the top growth of the tree. The lower branches on the trunk help to develop caliper and taper, and the branch scars actually help to stiffen the trunk. It is a balancing act to remove the branches soon enough so they don’t become too large, yet not before the tree has developed strength to support itself. For most trees that are planted out as whips, it is recommended that the bottom branches be left on the trunk right to the ground until sometime in the second year, usually halfway through the season or more. If there is a branch or two that is larger than the others, they should be removed earlier. This proper sequence is illustrated in Figure 12.

8. The actual mechanics of pruning is as important as the theory behind the pruning. When a limb is pruned back to create more branching, it should be cut approximately 1/4” beyond the bud with a slanting cut. It is not so critical to be that close on the smaller branches as these very small stubs will eventually break off. More care must be taken not to leave stubs when pruning back larger branches. If the cut is too far from the bud, a noticeable and unacceptable stump will be left, while if cut too close, there is the risk of destroying the bud, resulting in an even longer stump. Buds left on the end of the pruned branches will create next year’s branches, so their direction can be influenced by choosing carefully where to cut. On trees with opposite buds, prune back to buds facing to the side rather than up and down as shown in Figure 13. The branches will then grow out opposite to each other, rather than one on top of the other. This technique is used if a tree is lightly branched, wherein if all the branches are cut back to side buds fairly close to the trunk, the number of branches on the tree will double when the tree starts to grow. This procedure also works with alternate budded trees, as these buds are almost always in the sides of the branches. When cutting back a leader on opposite budded trees, always cut at a slant to leave only one bud or it will develop a double leader (Figure 13B).
Figure 9. (A) One straight leader with competing branch: remove competing branch. (B-D) Two crooked leaders: cut the worst leader back and use it to strengthen the other one by tying them together.

Figure 10. Completely remove branches with narrow v-crotches at the base of the branch next to the trunk.

Figure 11. (A) Remove or cut back a branch that is considerably larger than others on the same tree. Cut back all larger branches and/or the terminal leader to healthy buds if branching is extremely limited.
Figure 12. (A) Two large branches on the lower trunk need to be removed. (B) The tree enters its second year after the two large branches have been removed. The remaining branches are in balance and can be left on. (C) The tree has grown in the second year, and the trunk has increased in caliper so it can now support the top. (D) The lower branches have been removed up to the finished height. The tree can now support itself and needs one more year to heal over the branch wounds on the lower trunk.

Figure 13. (A) Cutting back stem to horizontal side buds. (B) Remove terminal leader with opposite buds by cutting at an angle to also remove one side bud. This will prevent development of a double leader.
Principles of Pruning Summary

1. Do not leave stubs.

2. Do not cut into the Branch Collar and do not make flush cuts.

3. Remove all narrow angled v-crotches when trees are young, as these crotches grow weaker with size and age of the tree.

4. Painting the cuts with wound dressing serves cosmetic purposes only. With the exception of applying a dressing to oak during the oak wilt infection period, research shows that wound dressings do not stop insect or disease problems. Wound dressings can actually increase tree decay.

5. Use clean, sharp, well-maintained tools to provide clean, neat, and healthy cuts. Do not use anvil type pruners.

6. The best time to prune is late in the dormant season or in early spring before growth begins. Almost all trees will benefit from pruning early in the life of the plant and from careful pruning to maximize the percent of top quality specimen plants.

7. If continuous pruning is required to maintain plant size, the plant is not appropriate for the location.