

Pruning – Not a Mysterious Art

Introduction (*Maintaining the Past for the Future.*)

Good design, combined with quality plant installation and proper maintenance are the essential parameters for a garden to reach its full potential. Having that said, there are few maintenance practices that can be more beneficial or more harmful to a residential, commercial, public garden or park landscape than pruning. Proper pruning helps preserve the vigor, health and beauty of shrubs and trees, allowing them to live to their full life expectancy. In fact, you could consider proper pruning to be one of the best methods of preserving the past while ‘shaping’ the future of a landscape! Like all aspects of horticulture, pruning is part art and part science. Although there are numerous reasons for pruning, one element is always important to remember – shrubs are pruned to retain beauty for their flowers, form and foliage, while trees are pruned principally for safety. Pruning is also a fun and very satisfying part of horticulture and, aside from pruning large and mature shade trees, it should never be considered as something too difficult or too mysterious for the home gardener to pursue.

Reading (*Going beyond these Notes.*)

An Illustrated Guide to Pruning (third edition) – Edward Gilman

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Why we Prune (*Reasons for Pruning.*)

The reasons for pruning are many, although the most common reason is undoubtedly trying to maintain the size of a plant that simply wishes to grow too large for the site. The old adage of placing the right plant in the right place is never to be disputed and often the best choice may be a new plant selection! However, there are numerous additional reasons to prune, which include:

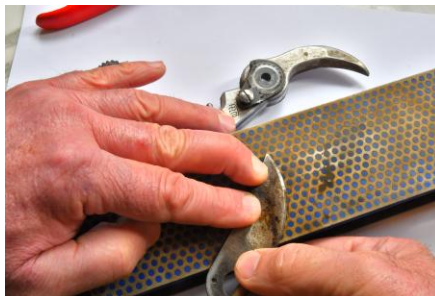
1. **Sanitation.** Removal of dead, diseased or insect infected wood. If the disease is transmissible via hand saws and pruners, the tools should be dipped in a 10% bleach or alcohol solution to prevent further contamination. Sanitation also includes the removal of crossing and rubbing branches. The constant abrasion from rubbing will create or maintain an open wound and allows a port of entry for insect and disease.
2. **Beauty.** Many plants will produce water sprouts (vigorous growth from the branches) or suckers (vigorous growth from the roots) that detract from the overall form of the plant. Many plants also have attractive branch patterns come winter that can be enhanced through the judicious thinning of branches. Removal of spent flower heads may also fall into this category based on one’s definition of what is ugly or attractive.
3. **Renewal and rejuvenation.** Best recommended for multistemmed shrubs and overgrown hedges. For shrubs, it is the removal of old branches, stems or canes that are losing vigor due to age and decline of the vascular system. Plants such as Forsythia, Lilac (*Syringa* spp.) and Slender Deutzia (*Deutzia gracilis*) benefit from a periodic thinning of the oldest stems every 2-3 years. Other plants such as Rhododendrons, Mountain Laurel (*Kalmia* sp.) and Andromeda (*Pieris* sp.) benefit from a removal of the oldest wood every 20-30 years when they become too leggy and the foliage grows sparse at the base. The new shoots that are produced will yield larger and often more numerous flowers as the result of the young and more efficient vascular system. Boxwood (*Buxus* spp.), Yew (*Taxus* spp.) and other hedging plants can also be treated in a similar manner when the hedges have become too large or perhaps misshapen when grown as a specimen.

4. Height Control. Selective shortening of upright branches primarily on shrubs. Can also refer to the removal of lower limbs over time of a shade tree, typically to a height of 8-20' that will allow people or vehicles to pass or see beneath.
5. Balance. Either the shaping of a plant to maintain a uniform appearance unto itself, or to maintain a proper appearance with neighboring plants within the garden.
6. Reduce Transplant Shock. Originally, it was considered beneficial to remove or thin approximately 1/3 of the 'head' of a Balled and Burlapped Tree (B&B) tree or shrub in order to reduce the amount of water loss through transpiration. This in turn would compensate for the reduced uptake of water due to the loss of roots during the digging. It has since been proven that plants benefit from not being pruned, since the carbohydrates produced from the unpruned foliage helps to redevelop a strong root system more quickly. In addition, the hormone called Auxin is produced in the apical buds of branches and transferred to the roots via the phloem to initiate root production. If the apical buds are removed, Auxin production is lowered and less root growth results. An exception are trees with very dense foliage, such as a Linden (*Tilia* sp.); thinning the canopy will allow the wind to pass through the plant and reduce the likelihood of the newly installed plant from being blown and no longer standing straight.
7. Special Effects. Includes hedges, pleaching, espalier, and topiary.
8. Safety. Shade and street trees pruning should be completed primarily for reasons of safety – removing dead material or branches with a poor structure or attachment that are subject to breakage in storms. At one time on college campuses, safety would also refer to the removal of the lower branches from shrubs so that people hiding or lurking in the shrubs would be noticed. In some University circles, this was called pervert pruning!

Tools (*With What do I Prune?*)

Although it should go without saying, always pick the right tool for the job and make certain that the tools are sharp. Not only does it provide a smoother cut and less damage to the plant, it makes it much easier and safer for the operator to make the cut. Chain saws can also be part of your tool arsenal, but for safety and completing nearly all the pruning chores in a home garden, the tools listed below should prove adequate.

1. Bypass pruners.
Probably the best all around tool. Operating much like a pair of scissors, the cutting blade actually passes by the anvil



(hence the term bypass) ensuring a clean, smooth cut. By reducing the impact on the living tissues within a stem, namely the phloem and the delicate cambium cells (see definitions below), cell damage is reduced to a minimum and the wound can heal quickly. Typically, a stem upwards of $\frac{3}{8}$ " to $\frac{1}{2}$ " in diameter is an appropriate size for hand pruners. Once you feel the need to 'wiggle' the pruners in order to make the cut or use two hands, the stem is too large and it is best to use a saw. The action of 'wiggling' the pruners can not only harm the stem, but increase the wear to the central bolt of the pruners.



Sharpening the pruner is a task that should be completed at least once a year or more frequently if the tool is used on a regular basis. The blade of bypass pruners is much like a chisel, being flat on one side and beveled (angled) on the other. To keep the blade sharp, dismantle the pruner and place the blade flat on a sharpening stone, moving it about in a circular motion, as pictured above. The best 'stone' to use on the flat side of the blade is a plastic 'stone' coated with diamond dust called a Diamond Whetstone that is lubricated with water. It will remain flat and not form a 'saddle' over time as will the Arkansas Stones. Once the flat side has developed a nice polish, give the beveled side a few passes on an Arkansas Stone, much as you would when sharpening a conventional knife. You may need to repeat the process several times. When the blade is sharp, add lithium grease (not oil) to the central pin and surrounding contact points and reassemble.

2. Anvil pruners. The cutting blade comes down upon the anvil (as pictured at right), and does not sweep past as with the bypass pruners. These pruners are not as ideal, since they actually crush and damage the cambium in the process of making the cut. Their advantage is they require slightly less effort to make a cut.



3. Loppers. Can either be a bypass or anvil design cutting head with longer handles, allowing you to reach further into a shrub without coming in contact with the shrub. They are ideal for plants with thorns or for thinning multistemmed shrubs. Dependent upon the density or resistance of the stem to being cut, they are typically appropriate for stems of $\frac{3}{4}$ " or less in diameter. The mistake made by many is thinking long handled loppers are a replacement for a handsaw. Once again, trying to cut a branch too large for the loppers will often produce both a dissatisfying cut and harm to the tool.

4. Hedge Shears. Manual, electric or gas powered, they are not the ideal tool to use unless a very formal topiary or dense hedge is the designed and desired intent. Using hand pruners to create a more natural and softer appearance will actually produce a healthier plant.

5. Handsaws. The saws producing the cleanest cut have tri-edge saw teeth. Unlike customary wood saws, the teeth are not set or splayed to either side and they cut on both the push and pull stroke of the cut. The clean cut reduces the amount of cell damage which in turn aides in the healing of the wound. The small size of the blade does allow for easier access into multi-stemmed shrubs than larger saws with conventional teeth. They are useful on stems or branches from $\frac{1}{2}$ - 2+" in diameter.



They are useful on stems or branches from $\frac{1}{2}$ - 2+" in diameter. The saws come in either a folding blade or a fixed blade style. The folding blade is handy for most homeowners, since it can be kept in a pocket when not in use. The fixed blades are best kept in scabbards that are hung from a belt when not in use. The blades of tri-edge saws are very tricky to sharpen and are also brittle, making them susceptible to breakage if they become pinched while making a cut. It is wise to purchase several additional spare blades when buying the saw.

6. Pole pruners. Typically having a telescoping pole or handle with the head of the tool complete with bypass pruners, saw blade, or both. These tools allow you to cut material that is up to 10+' off the ground without the need for ladders or climbing the tree. The

drawback, depending upon the design, is the shape of the pruner which may not allow you to make the cut close to the branch collar or a side shoot, leaving a stub in the process.

When to Prune or Not to Prune (*I Have the Tools, When Should I Prune?*)

The following are four rules that apply. As is always the case there are exceptions and personal judgment, better known as common sense, should always prevail.

1. Prune when the shears are sharp. Not a bad rule, since breakage and small problems can and should be quickly corrected at any time of the year.
2. Late July through October are **not** the months for major pruning. The removal of large amounts of growth, especially via renewal pruning will result in a flush of new growth as the plant attempts to resurrect its photosynthetic and sugar making capacity. This vigorous growth will continue well into autumn and be subject to tip dieback or all out death of the stems following the first hard frost. For plants which are marginally hardy in NJ, such as Wintersweet (*Chimonanthus praecox*), the act of the frost damaging the actively growing stems may result in the death of the plant, as I have witnessed.
3. Immediately after flowering. It is important to distinguish which plants bloom on old wood (flower buds are set the previous fall for spring bloom) or on new wood (flower buds develop on growth produced from April through late June). Plants with flower buds produced on previous year's wood should not be pruned heavily during winter dormancy due to the loss of flower buds. Pruning immediately after bloom in May will allow new buds to form during summer and fall. The rule applies best to broadleaf evergreens, such as Rhododendrons, Azaleas and Mountain Laurels (*Kalmia latifolia*) that have a course, upright branch structure that is not easily thinned without producing large 'holes' in the plant. This rule can also apply to plants having a densely multistemmed habit like Bridal Wreath Spirea (*Spirea prunifolium*) and Japanese Kerria (*Kerria japonica*). The dense mass of stems is far easier to cut back heavily, called renewal pruning following flowering versus attempting to thin the older stems in winter.
4. During winter dormancy. Shrubs blooming in June through fall can be pruned back heavily in late February through March and still bloom that summer since they produce flower buds on current seasons wood. Examples include Chaste Tree (*Vitex agnus-castus*), Butterfly Bush (*Buddleia* selections) and Panicle Hydrangea (*Hydrangea paniculata*). For multi-stemmed, spring blooming shrubs like *Forsythia* the plants are best thinned in winter. If the plants are severely overgrown, it is best to cut plants back severely through a 'Renewal' pruning in late winter. For large shrubs and small trees, it is much easier to see the structure of a plant in winter and remove rubbing stems. Late winter is also the ideal time for coppicing or stooling (see below) of red and yellow twig dogwoods (*Cornus* spp.) and Willows (*Salix* spp.). Waiting until late March provides the opportunity to enjoy the last 'bit' of stem color before the spring flush begins.

How to Prune (*I have the tools and plants, now what do I do?*)

A Thought on Thinking

It is easy to read about what pruning practices are best for a given tree or shrub, but where and exactly how to begin is often confusing to someone who has not pruned extensively in the past. When considering how to prune a plant, I have always found it helpful to walk about the plant and – as odd as this may sound – 'become one' with the plant. In other words, what pruning would help the plant to look or 'feel' it's best? If it was possible to be the plant, what would you

be feeling? What weight would you want lifted or what pruning would make you feel better? In essence, think of pruning as removal of a poor fitting piece of clothing or that dead branch that is creating an irritating itch that cannot be reached! Applying human qualities to plants is obviously a stretch. However, we all need to determine how best to approach pruning, and maybe this will help arrange your thoughts and evaluate a plant as it has for me!

Below is the order of thinking in which I approach a plant. This is certainly not a science, just a thought process that works for me:

- How much of the plant has dead wood, and where is the dead wood located? For example, on Cutleaf Japanese Maples (*Acer palmatum* var. *dissectum*), the inner branches die from lack of light. This is normal. If there are major limbs that are dead along the outside of the plant, there are other problems that need to be addressed.
- What is the natural branching habit and shape of the plant? For example, is it vase shaped, globose, fastigiate or pyramidal? This natural form is obviously something you should enhance. If there is a branch that is distorting or altering an otherwise attractive natural habit, it should be removed or reduced in size.
- What portion of the plant is putting excess stress upon the plant? Perhaps there is a cluster of branches adding physical or visual stress, co-dominant leaders (see below) or a poor branch angle that is compromising the health of the plant.
- How does the plant fit into the garden? What pruning would make this individual plant, or a group of plants fit the scale and context of the garden. If the plant was selected for a narrow habit to fit a small space, that habit should be preserved. As previously noted, if the plant genetically wishes to grow far beyond the scale of the garden, a different plant might be the preferred choice, rather than pruning.

Pruning of Shade Trees and Large Ornamental Trees (*Let's think Big!*)

Although the pruning of mature shade trees is dangerous and best left to professionals, there are a number of items gardeners can accomplish from the ground, especially when planting and during the early formative years of a shade tree. By definition, a shade tree grows from 40-100'+ in height and can have a spread of up to 80' in diameter while an ornamental or small tree can range from 18-40' tall and wide, often producing attractive flowers, form, bark, or fruit. In some cases, large shrubs such as Cornelian Cherry Dogwood (*Cornus mas*) or Seven Son Flower (*Heptacodium miconioides*) can also have the lower limbs removed and be shaped into very attractive small trees. Shade trees can live for 150 to beyond 500 years of age while ornamental trees have a shorter life expectancy of up to 100 years. Some ornamental trees like Redbud (*Cercis canadensis*) have a far shorter life span and begin to decline after 20-30 years.

A Look at Plant Physiology and Pruning

Although there is a great difference in the size and age potential of these trees, the physiology is very similar. Some important physiology to understand when pruning includes:

- Xylem – Nonliving tissue that forms the central core of stems, branches and trunks of woody trees and shrubs. When a trunk or branch is cut perpendicular to its length, the xylem appears 'banded' with light and dark concentric 'growth rings'. The light rings illustrate the period of time from late winter through late spring when the tree is growing fastest and the darker areas occur later that same season when the trunk/branch growth is the slowest. Its function is for support and is the medium through which water and nutrients in the form of a

very ‘watery’ sap moves up the stem from the roots to the leaves, fruit and other growing points. Xylem only allows the watery sap to travel upwards, not downwards in a plant.

- **Phloem** – Located just under the bark, it consists of living tissues. Phloem transports a thicker, less watery sap than the xylem, which is rich in sugars produced during photosynthesis. The phloem moves the sap from the leaves to the roots, fruits or other regions of the plant that are in need of the energy rich compounds. During spring, the primary flow is upwards as it transports the sap, along with the sugars stored in the roots throughout the winter to the expanding buds and shoots. Different portions of the Phloem can transfer sap both upwards and downwards simultaneously.
- **Vascular Cambium** – Undifferentiated cells, meaning that they have yet to specialize into a particular function. This is an area of radial growth and is located between the xylem and phloem. It is responsible for the production of xylem on the inside and phloem on the outside.
- **Cork or Bark Cambium** – In its simplest terms, it is a layer of undifferentiated cells on the outside of the phloem and beneath the ‘bark’ that creates the layers of cells we commonly call ‘bark’.
- **Callus** – Undifferentiated cells that develop for the healing of wounds.
- **Branch collar** – It is the swelling at the base of a branch, usually with a strongly defined endpoint as the green arrows indicate at right. The appearance of a collar varies from species to species and is also influenced by the angle from which the branch grows from the trunk. It consists of a co-mingling of the stem and branch tissue. Early in the year, tissue from the branch will grow down the trunk, followed later in the season by the tissues of the trunk growing over those of the branch. The tissues become interlocked and a strong branch union results. In branches that are slower growing and appear at an angle roughly 45-90° to the trunk, the trunk tissue will more dramatically grow over that of the branch tissue, creating a larger collar and a very strong union. Branches that grow rapidly, are close in size to that of the trunk and have a branch angle less than 45° may not have any visible collar.
- **Branch Bark Ridge** – Resembling an eyebrow above the union of a branch and trunk (the orange arrow above), it is the line of raised bark created by the convergence of bark from the branch and the trunk.
- **Codominant Leaders** – The main trunk and one or more upward growing stems/branches with approximately the same diameter. Unlike a properly developed branch with a collar, there is no overlapping or comingling of growth from the trunk and the branch, allowing both to behave as the primary trunk and allowing them to grow independently. A very weak branch structure develops as a result.
- **Adventitious Buds** – A bud originating in a location other than a leaf axil. It lacks a vascular trace or direct connection to the phloem and xylem of the stem. The development of these buds on roots creates suckers and if they appear on stems, they are called water sprouts. For some species, such as Aspen (*Populus tremuloides*), they result in huge colonies.



The Physiology of How the Plant Responds to Pruning

The action of cutting a branch or reducing the length of a stem is in essence a wound to the plant – with a wound being defined as a penetration or disturbance to the outer protective layer(s). It is also important to note that trees and shrubs do not heal like people, a misconception probably held by many. In plants, damaged tissues and decay will never vanish. Rather the damage is compartmentalized in an effort to reduce the spread of the decay through a regimented response sequence. Once the cut or wound has been made, the xylem closest to the cut will become plugged with clotting materials called tyloses and various gums to slow any decay from moving up or down the stem. The denser and darker growth rings of the xylem help to slow or stop the progression of decay inwards, towards the center of the trunk while a material called suberin is exuded near the wound. Suberin is a waxy material and helps to prevent water loss to the atmosphere as well as any infection from microorganisms, bacteria and fungi from penetrating deeper into the heart of the plant. This process was first described by Dr. Alex Shigo in 1991 who gave it the name of CODIT or Compartmentalization of Decay in Trees. It is a complex response and to this day it remains not thoroughly understood.

All of these CODIT responses work to slow the onset and movement of discoloration and decay and to contain the damage. In concert with these responses, the collar starts to produce callus material, ‘growing’ over the wound and eventually sealing off the wounded surface to air and oxygen. Once sealed and without oxygen, the decay will no longer spread and the amount of decay that has occurred is essentially contained. Unfortunately, it will be present in the plant for the remainder of the plant's life and if the wound was open for a significant period of time, it could potentially serve to be a future point of weakness during a strong storm. This highlights why it is important to correct a problem as early in the growth of the tree as possible when the trunk or branches are still relatively small.

If the intent of the pruning is to make a plant appear fuller, much as would be done through trimming a Hornbeam (*Carpinus*) or Yew (*Taxus* spp.) hedge, the new growth (branches) would be partially cut back, removing the apical bud in the process. As previously mentioned, the plant hormone called auxin is produced in the apical buds. Another impact auxin has on plants is to suppress the growth of the lateral buds along the stem located immediately below the apical bud. This suppressing effect prevents them from breaking dormancy and producing shoots. The apical bud also has a direct connection to the phloem and xylem, while the lateral buds do not have this direct connection. Cytokinins are a group of hormones produced in the roots and responsible for cell elongation. They are transported via the xylem to the apical bud, but not to the lateral buds since there is not a direct connection. Thus, when the apical bud is removed:

1. The source of auxin production and resulting apical dominance is removed.
2. The lateral buds develop connectivity to the vascular tissues.
3. The lateral buds begin to both receive Cytokinins and start the production of auxins.
4. The lateral buds break dormancy and stem growth begins!

Interestingly, this same process happens with herbaceous plants, such as Coleus (*Coleus* clvs.), when the apical buds are pinched to make the plant fuller!



Branch Attachment to the Trunk – Angles Matter!

For small ornamental and large shade trees, broadly speaking there are two types of branch attachments to the main trunk that impacts pruning, as has been mentioned above.

Type 1. These branches appear at a 45–90-degree angle from the main trunk. This angle of attachment is often accompanied by the development of a swollen area or ‘collar’ at the point of attachment and a branch bark ridge just above the collar as seen in the image above of a Persimmon (*Diospyros virginiana*). When removing branches from Type 1 trees, the branch should be pruned to the point just beyond or above the branch collar. This point is indicated by the arrow in the image above before the cut and as seen in the image at right following the cut. Notice that no stub was left and the cut was made smooth with the outer edge of the collar. Following the cut, the cambium layer in the branch collar and in the adjacent branch bark ridge (where present) expands and is responsible for the callus growth that will ultimately extend over the wound. The image at right shows the same branch four months later and the callus growth is certainly noticeable. This ensures that the living tissue will cover the exposed wood of a cut as rapidly as possible and prevent long-term decay. Although the tree has been actively growing during the 4 months since the initial cut, the exposed wood at the site of the wound has dried considerably, as seen by the checking and contraction lines, indicating that the vascular connectivity to the region has been blocked, in part by suberin to reduce water loss.



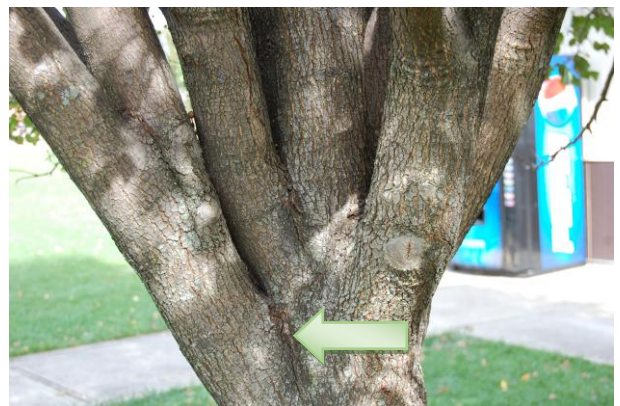
If the branch is cut back to a point too far beyond or above the collar, whether just an inch or six inches as seen at right, the result will be a stub. The stub will also lose connectivity to the phloem and xylem, and begin to decay. Although the tree will still develop waxy suberin zones and try to compartmentalize the decay, the presence of the stub prevents the wound from healing over and increased internal decay results (as seen at right). If, on the other hand, the cut is made too close to the trunk or major branch and penetrates into the branch collar, the ability of the cambium and resulting callus within the collar to grow is compromised and the healing process is dramatically slowed.



To minimize the amount of a wound exposed to the elements, always try to remove the branch before it grows too large. As previously mentioned, winter is a great time to for pruning since the lack of foliage enables you to see the structure of deciduous trees. If the tree was established as a seedling or a 2-6' tall whip, as was the tree at right, it will most likely have branches that are 3-4 feet from the ground. It is important to leave those branches intact until the plant has reached 8-12' in height as the carbohydrates produced through these branches will help develop a stouter, stronger trunk. Slowly elevate or remove the lower branches to a 6-8' height by removing one to two sets of branches each year, as indicated by the arrow in the image above right. Ideally, the branches should be 1-2" in diameter when removed. This will keep the exposed surface area of the cut to a minimum, allowing for a quick healing response and less potential for decay.



Type 2. These branches have a branch angle less than a 45° to the main trunk. Very often this gives the appearance of two or more leaders (trunks), which are termed codominant leaders. There is typically no branch collar present at the point of attachment, although there may be a branch bark ridge located in between the stems, as the arrow points out in the image above right. This is a far weaker attachment and branch structure than Type 1. Without a collar and perhaps the absence of a bark ridge, these branches do not heal rapidly and decay penetrates further into the trunk, potentially compromising the integrity of the trunk. This type of branch arrangement is also poor since the branches literally push against each other as the diameter of each branch increases, ultimately resulting in one of the branches breaking away during heavy winds, rain or ice storms. The cluster of branches in the image above right is prone for damage since bark splitting is already evident at the tip of the arrow. The dark brown bark in the image at right is called included or ingrown bark. It is the bark in-between the stem and the trunk and



illustrates the pressure exerted on the stems. Ideally, codominant leaders should be removed as early in the life of a plant as possible, preferably before the branch reaches 2" in diameter, as seen in the first image above of codominant stems. Although there is not a branch collar evident in this image, there is a bark branch ridge and a cut made just above the ridge (above the arrow) will result in a healing cut. The other main branch is oriented in an upward direction and will assume the role of the main leader.

Of course, the codominant leaders may not always be oriented straight up. In the case of the Yellowwood (*Cladrastis kentukea* 'Sweetshade') pictured below, the two leaders produced a 'Y' configuration. In the image below left, the second codominant leader at the tip of the arrow was removed and the remaining leader was straightened as much as possible with the use of a bamboo pole and twine. It is a temporary 'splint', so the material used for attaching the pole can be anything that does not cut into the bark, such as wire. Although there is a distinctive dog leg appearance to the remaining leader 2 years later (center image below), successive years slowly corrected the physical abnormality. The tree was 5-6' tall when the initial cut was made in 2011 and after the course of 10 years, the dogleg is barely evident as seen in the image below, far right (photo taken on the opposite side of the tree).



Three Cut technique

When pruning a relatively large branch, or at least one that is difficult to prevent from dropping by holding it with one hand while making the saw cut with the other, it is beneficial for both the tree and the person to proceed with a 3-cut technique. First make a cut under the branch, approximately 8"-12" distant from the collar. Then, finish cutting through the branch at a point 1-3 inches further out from the initial cut. The undercut will prevent the bark from tearing backward as the branch drops and potentially harming the collar and the bark of the trunk. A third cut can then be completed next to the collar, removing the remaining branch stub without fear of any damage.

Reduction Cut

If a branch of a young tree is not truly codominant, but is still growing upwards with a crotch angle near or less than 45° and a diameter close to that of the main stem, its rate of growth can be reduced through shortening the branch. Cut the branch back to an outwardly pointed bud or secondary branch. This is called a reduction cut. By reducing the stem or branch length, it

removes the Auxin producing apical bud along with foliage that aids in the vigorous growth of this branch. Auxin results in apical dominance and suppresses side branch development. By cutting this branch and removing the apical bud, it will slow the upward growth of the branch and enhance the production of a collar where it connects to the trunk. The branch needs to be cut back to an outwardly directed bud or branch, rather than inwards such that it does not lead to future rubbing issues. Branches that rub will compromise the health of those stems in the future. As a rule of thumb, make the cut roughly as far above the outwardly oriented branch or bud as is the diameter of the branch you are cutting. In other words, if the branch is a ½” in diameter, make the cut slightly above ½” from this side branch or bud. This ratio changes with larger stems, but for these formative training cuts while the tree is small, this ratio works well.

Pruning Small Ornamental Trees

Although small trees and shade trees share similar physiology, there are some differences in pruning based on the trees’ response from age and the associated time to prune!

Late Winter Pruning (February and March)

1. Removal of Sucker Shoots. Sucker Shoots are stems resulting from the activation of dormant or adventitious buds located at or near the soil line. These shoots normally grow straight up through the plant, compromising both the appearance and ultimately the physical structure of the plant. Suckers often appear on grafted or budded trees and shrubs. With a grafted plant the crown or above ground portion is genetically different from the roots. When shoots originate from the root system or understock, it is often an indication of graft incompatibility, whereby the plant may not be able to deliver adequate carbohydrates through the graft union for use or storage by the root system. In response, the understock produces stems and foliage to generate the needed carbohydrates. For shoots that originate from beneath the ground, it is best to excavate around these shoots and prune them as close to the root or the trunk as possible in order to reduce the chance of reoccurrence. Any short stubs that are left will develop adventitious buds (buds lacking a vascular connection) and yield new shoots. Since these sucker shoots have an unobstructed connection to the roots (assuming a poor graft union is the cause), they have tremendous vigor, resulting in their ability to outgrow and overwhelm the desired cultivar, especially if it is a shrub.



Always check for graft incompatibility when purchasing plants in an attempt to avoid such issues. Obviously, that is not always possible, especially if the plant is already on site. With multistemmed small trees or large shrubs, such as Witch Hazels (*Hamamelis* selections), the suckers may go unnoticed. For Witch Hazels this results in the miracle in the garden whereby the winter blooming cultivar suddenly blooms in autumn. In most cases the selections of winter blooming Witch Hazels are budded onto the Eastern North American fall blooming species (*Hamamelis virginiana*), explaining the ‘miracle’.

It should also be noted that some trees, such as Persian Ironwood (*Parrotia persica*), Sassafras (*Sassafras albidum*), Black Locust (*Robinia pseudoacacia*), Aspen (*Populus tremuloides*) and American Beech (*Fagus grandiflora*) will naturally produce suckers

from the root system. In some cases, these suckers may be a considerable distance from the main plant. This is normal and it is up to the gardener/homeowner to decide whether a grove is appropriate or if it is best to remove these suckers.

2. **Thinning of Water Sprouts.** Watersprouts are similar to sucker shoots, except they arise from adventitious buds in the canopy of the shrub or tree. Similar to suckers, they detract from the overall shape and beauty of the plant, growing straight up through the canopy. As they grow in diameter and length, many will ultimately begin to rub against and damage existing stems. The plant generates these sprouts because there is a need to produce more carbohydrates via the production of additional foliage. Watersprout formation can be stimulated by excessive pruning during the past year or when the plant is simply growing older and the existing branches are in decline. Despite their lack of attractiveness, it is important not to remove all the watersprouts, since the plant needs the additional carbohydrates produced through their growth and will only respond by regenerating new sprouts. It has also been shown that watersprouts enhance the strength of the branches from which they originate since the sugars will enhance the radial growth or diameter of the branch, thereby increasing its strength. This is especially beneficial for long wispy branches with only a few stems near the tip, giving the branch a resemblance of a 'Lion's Tail'. The key is to thin the sprouts. Leave those that have a clear path into the canopy while removing those that will grow into and impact the existing branches above. In addition, the length of some sprouts can be reduced in length and ultimately removed when the optimally located shoots have reached a size where they are sustaining the branch. Always try to remove those sprouts that are generated on the underside of a branch and need to curl around the branch in order to grow upwards. Not only is this a weak attachment but will become problematic in the future as the diameter increases and it grows into the original branch.



3. **Eliminate crossing and rubbing branches.** Rubbing branches, as seen at right abrade the bark, exposing the inner phloem and/or xylem. This allows decay to enter into the branch while the continued rubbing prevents any potential for healing. Usually, this problem develops on multistemmed plants whereby a branch is oriented into the center of the plant. This inwardly directed branch is destined to grow within close proximity to another branch and ultimately start rubbing as both stems increase in diameter. It is best for all the stems to be oriented towards the outside of the plant, as illustrated by the



Chinese Dogwood (*Cornus kousa*) pictured at right. This plant was actually a single stemmed tree that was accidentally cut close to the base nearly 60 years prior. The resulting shoots were trained into this attractive outward configuration by removing all inwardly oriented stems while they were young. Training for this type of branch structure begins when the plant is young, so as to give prominence to those shoots oriented properly and to minimize the size of the wound when branches are removed.



4. Shorten disproportionately strong growth. Strong upright or outward growth is often distracting to the overall shape of the plant. Prune back to a lateral bud or branch. This is termed a reduction cut and was discussed prior.
5. Remove branches distracting to the winter outline or having weak points of attachment. Plants grown for winter outlines often include selections that are contorted or pendulous. Lightly thinning the plant can make the remaining branches more distinct and attractive. Removing codominant stems or stems otherwise producing weak crotches is always paramount and should be done as early as possible.

Spring/Summer Pruning (late May into early July)

1. Remove any reappearing sucker shoots and evaluate water sprouts to see if any additional shoots need to be reduced or removed after the spring growth flush.
2. Remove growth that has sagged over walks, drives, patios or plantings below. This pruning is very appropriate for shade trees as with Ornamental Trees. Often, this does not entail removing an entire branch, but merely removing some of the heavier new growth at the tip, which in turn will allow the branch to return to a more attractive level. In the before and after sequence at right, only one large branch was removed. The remaining branches sprang upward once smaller stems and foliage was removed from the ends of the branches.



3. If the branches remain too low following removal of the smaller outer branch stems, it is time to remove the next tier of branches. It will give the plant a more attractive appearance and allow for more light to penetrate to plantings beneath the tree. It will also make the space feel less confined. As with shade trees, initially leave the lower branches of small trees for several years since research has shown how the carbohydrates produced by the lower branches, creates a stronger and stouter trunk. Once these lower branches become 1-2" in diameter, they can be removed if it will benefit the garden. Clearly, removal of the lower branches is not necessary if the design intent is for the small tree to be branched to the ground to create screening.
4. For plants that 'bleed' excessively from winter cuts like Cutleaf Japanese Maples (*Acer palmatum* var. *dissectum*), major cuts, including the removal of all dead wood is best completed during the summer months when the sap is not rising in the stems. For the Cutleaf Japanese Maple this may entail having to actually crawl beneath the tree in order to make the appropriate cuts, but it will improve the winter outline and appearance of the plant.

Pruning Conifers and Broadleaf Evergreens

Conifers

1. Strong central leader evergreens such as Spruce (*Picea*), Pine (*Pinus*), Cedar (*Cedrus*), Eastern Red Cedar (*Juniperus virginiana*) or Leyland Cypress ($\times$ *Cuprocyparis leylandii*) can be thinned, have their lower branches removed (elevated), or even pruned into a hedge if training begins at an early age. However, severe pruning, including the cutting back or reduction of branches or stems beyond existing foliage is to be avoided. In general, conifers will not sprout new growth from dormant buds beyond the point where the foliage ends and it will remain a lifeless branch.
2. Bald Cypress (*Taxodium distichum*) is a deciduous conifer that is an exception to the rule and will break dormant buds should a cut be made beyond the existing needles. I became aware of this ability after a person randomly cut back stems that were overgrowing and blocking a sidewalk, as seen at right. This allows Bald Cypress to be an ideal candidate for hedging, since the plant can be periodically reduced in size (see below under hedges).
3. Removal of the leader or top of conifers will destroy the form since a new leader will generally not form, with Bald Cypress once again the exception! Typically, removal of a leader is due to a conifer being planted in the wrong place or storm damage. For mature Pines and Cedars, it is normal for the plants to lose their leaders as they mature into majestic flat topped and broad spreading plants. However, the appearance is far less becoming when the plant is 10-30' tall and it is best to simply remove the plant.
4. As mentioned above, very often conifers are planted in inappropriate locations where they obscure views from windows or the lower branches grow out over walks and drives. Removal of too many lower branches will leave a cone of upper branches on a stick that is equally unattractive! In addition, the remaining lower branches will often droop down



- to fill in for where the lower branches once existed, further reducing the appearance of the plant. The best option is to simply remove the plant.
5. In order to keep the plants appearing natural and more compact, it is helpful to use the technique called Candle Pruning. A candle is the new growth before the needles have begun to elongate. Candle pruning is the concept of breaking this candle to the desired length, as seen at the tip of the arrow at right. New buds will subsequently form for the growth the following year. Providing the whole plant has received this treatment, it will not appear misshapen, but merely much more compact. The trick to candle pruning is to start when the plant is young and still small and this technique works great on Dwarf Pine trees. A ‘Dwarf’ can easily reach heights of 16-20’ with time, a size that may be too large for the site. Candle pruning is a method for slowing that growth and allowing the plant to remain a more compact dwarf form for a much longer period of time.
 6. The height of multi-stemmed coniferous shrubs, such as Yew (*Taxus*), Chinese Juniper (*Juniperus chinensis*) and Plum Yew (*Cephalotaxus* spp.) can be controlled with annual pruning in March with a follow up pruning in June. In fact, with the exception of the Juniper, all the plants can be cut back into older, foliage bare wood for a renewal pruning (see below).



Broadleaf Evergreen – Hollies

1. Renewal pruning. Overgrown holly shrubs, such as Japanese Holly (*Ilex crenata*) and Inkberry Holly (*Ilex glabra*) can be ‘renewed’ by cutting the plant close to the ground in March. The new growth will be vigorous and will require several additional cuts through mid-summer to develop a more attractive and denser branching habit. This treatment is especially appropriate for Inkberry Holly, which has a habit of shading out the lower foliage and often requiring a rigorous renewal pruning every 10-15 years.
2. Overgrown American Holly (*Ilex opaca*), English Holly (*Ilex aquifolium*), large specimens of Longstalk Holly (*Ilex pedunculosa*) and interspecific hybrids can successfully undergo a technique called ‘Hat Racking’ in March (pictured at right). This is a process whereby the branches are cut back far beyond where the foliage ends to within several inches or several feet of the central trunk to restore the plant back to more narrow proportions. The plant will literally look like an immense Victorian hat rack once the process is complete. As much as 8-10’ of the branches may be removed in the process. Dormant and adventitious buds located along the cut-back branches will break growth by late May or early June, although they will not push huge amounts of new growth the first year. It will take upwards of 3-4 years for the plant to once again assume a more normal, yet smaller appearance. The plant will be full and shapely, but much narrower. Not all the branches will respond and some may require removal while others may



need to have some ends removed if dormant buds failed to break near the end of the branch. In addition, corrective pruning will need to be done during the regrowth period, since many of the shoots will initially try to grow straight upwards and not outwards. It is also very stressful on the plant and additional water and a light fertilizing is beneficial. Just as a reminder, this process does not work on conifers like Pines, Spruce and Firs.

Broadleaf Evergreens – The Rest!

1. Rhododendron, Mountain Laurel (*Kalmia latifolia*), Camellia (*Camellia japonica*), Anise Tree (*Illicium* spp.), Daphniphyllum (*Daphniphyllum macropodum*), Cherry Laurel (*Prunus laurocerasus*), Boxwood (*Buxus* spp.), Andromeda (*Pieris japonica* and *Pieris floribunda*) and other broadleaf evergreens can be pruned back lightly to a leaf or a branch, or pruned back harshly to within 12-18” above the ground. For a light pruning, plants can be pruned in winter or as the flowers are fading in April or May. May is often a busy time and pruning tasks may get overlooked making March a more ideal time for pruning. Plus, the amount of flower buds removed will really not be missed during the blooming season. For the heavier and more drastic renewal cuts to 12-15” above ground, the pruning is best performed in late March or early April. The plant will respond by breaking adventitious or dormant buds along the stem and reflush, usually within 4-6 weeks. It will take two to three years for the plant to regain a more normal appearance, conceal the large cuts and begin to bloom. Large plants can be reduced in size gradually by removing the central portion of the plant the first year and the remainder the second. By reducing the size in this manner, the initial cuts are not as obvious and new growth will emerge from the base, allowing the plant to not look as forlorn when the remainder of the foliage is removed the second year.
2. Azaleas – Late winter is a great time to observe the plant structure, even among the semi-evergreen Azaleas, since most drop a good percentage of their foliage during the fall. Understanding the plant structure and where to make the cut readily aids in



reducing the size of the plant. It is easy to hide the cuts on Azaleas, since most have an arcuate growth habit, whereby the stem grows in a series of upwardly arching waves. Pruning the branch back to the start of an arch or wave allows the plant to keep its natural habit and appear virtually untouched as seen in the upper 3 images of a Kurume Azalea (*Rhododendron obtusum*). Trying to find natural locations for a cut on any of the Broadleaf Evergreens will provide an attractive, naturally appearing shrub that is merely smaller in size. The Kurume Azaleas above were clearly growing out into the path. Cutting back to a branching point not only provides for a natural appearance and leaves few stubs, it is also relatively quick. The time between the lower two images was only 15 minutes.

Pruning Deciduous Flowering and Ornamental Fruiting Shrubs

Know the shrub! As previously mentioned, it is important to know what time of the year the plant blooms – during late winter, spring, summer or fall. In other words, does the shrub bloom primarily on last year's wood or current wood? Plants that bloom in January through May bloom on the previous year's wood while those blooming from July to December bloom on current season's wood. June is always the month that is questionable and the plant will require some research. If it blooms on last year's wood, such as the Japanese Hydrangea (*Hydrangea macrophylla*) pictured at right or Japanese Kerria (*Kerria japonica*), shearing in fall or cutting back all the stems during winter will also remove the flower buds for the year to come. Therefore, it is imperative that only the oldest and least vigorous canes be removed by thinning the shrub. This is best performed in the winter, while it is easy to see the relative size and vigor of the stem. Plants that bloom on current year's wood, such as Butterfly Bush (*Buddleia*), Beautyberry (*Callicarpa sp.*) and Smooth Hydrangea (*Hydrangea arborescens*), can be cut back severely in late winter without any impact upon flowering or fruiting the following summer.



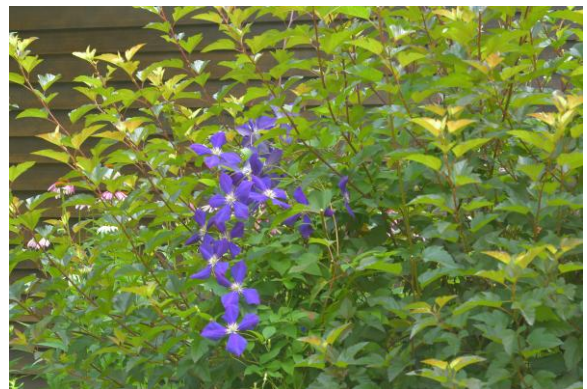
Specific types of Shrub Pruning

1. **Rejuvenation Pruning** – For many multi-stemmed shrubs, rejuvenation pruning is the selective removal of the oldest stems. This is particularly effective for multi-stemmed shrubs that bloom on previous year's wood. By removing the oldest and least vigorous stems, it not only initiates the growth of new stems, but preserves older stems for blooms

that season. Good subjects for this type of pruning include Lilac (*Syringa vulgaris*), Slender Deutzia (*Deutzia gracilis*), Forsythia (*Forsythia x intermedia*), Old Fashioned Weigela (*Weigela florida*), Japanese Hydrangea (*Hydrangea macrophylla*) and Mock Orange (*Philadelphus coronarius*).

In the before and after images of the Japanese Hydrangea above, the stems older than two years of age have gray bark while the one-year-old stems are cinnamon brown. In the lower finished image, notice that the plants have been thinned, but not all of the older, gray stemmed wood has been removed. Simply because a stem is older than 2 years does not justify its removal, since many of these stems still have an efficient vascular system and the buds will yield large flowers. The key is to remove the oldest and less vigorous stems that are producing smaller or no flowers whatsoever. The process of thinning the canes is tedious and best broken up between several days if the planting is substantial. However, the time required to prune a plant is not very substantial, as the time between the before and after images for these two Hydrangeas was 6 minutes. For Smooth Hydrangea (*Hydrangea arborescens*) and Panicle Hydrangea (*Hydrangea paniculata*), which bloom on new wood, see below under Coppicing.

For plants like Pearl Bush (*Exochorda racemosa*), Oak Leaf Hydrangea (*Hydrangea quercifolia*) and Ninebark (*Physocarpus opulifolius*) that have attractive exfoliating bark and bloom on last year's wood, there is really no need to prune if space is adequate. All of these plants will continue to produce ample flowers for 20-30+ years without substantial pruning. So long as the plants are located where the 10' height and 15' width can be accommodated, they only need the occasional shaping. They simply need room to grow. For the purple, golden and wine-red foliated forms of Ninebark, such as 'Diablo', Summer Wine® and Tiny Wine®, the foliage often becomes less vibrantly colored during the summer. Thus, for these plants it is preferable to grow them as foliage plants and coppice the plant annually (see below). If flowers are desired along with the colorful foliage, consider growing a flowering vine such as Clematis through the plant for summer interest. The image of *Physocarpus* Summer Wine® above with a Clematis were taken during March and July of the same year. In order to accommodate and support the vigorous early growth of the Clematis, random stems of the *Physocarpus* were left longer and not cut back to a uniform length.



For Forsythia (*Forsythia x intermedia*), Winter Jasmine (*Jasminum nudiflorum*) and Old Fashioned Weigela (*Weigela florida*), the plant will root where the tip of a stem touches

the ground, allowing a new plant to take form. For this reason, it is important to look about the plant and remove any rooted stem tips while pruning. If not, that small initial planting will greedily and ‘secretly’ start to consume large portions of the garden!

For plants with red or gold winter stems, including Dogwoods (such as *Cornus sericea* and *Cornus sericea* ‘Flaviramea’) are planted in deer country, the removal of 1/3-1/2 of the stems at the end of each winter will encourage new, brightly colored stems to appear. The act of leaving existing stems will reduce the ability of deer to reach and eat the young shoots emerging from the base. If deer are not present, the plants are best stooled or coppiced every 3 years (see below). The worst treatment for plants with winter stem color is to shear them with hedge trimmers. This treatment will allow the older canes to develop gray, non-ornamental bark with only a thin layer of colorful stems remaining around the periphery of the plant.

2. Coppicing or Stooling – Cutting of the plant back annually to within 12” of the ground or



Cercis canadensis ‘Hearts of Gold’

Paulownia tomentosa foliage

to roughly the height of a stool leg as seen with the before and after images of *Cercis canadensis* ‘Hearts of Gold’ above and the Coral Bark Willow (*Salix alba* subsp. *vitellina* ‘Britzensis’) pictured below. The image above left shows the *Cercis* following pruning in the spring while the top images are of the plant the following August as a beautiful golden shrub and in winter before pruning. For the Willow, pictured below, it is a very

effective treatment for plants with colorful stems, since by the third year the bark turns a less attractive brown.

Just as with the Hearts of Gold Redbud, stooling is a great treatment for plants with purple and golden foliage, often resulting in dense masses of attractive tall and upright whips – upwards of 10’ tall – of colorful foliage. Such plants include purple and golden selections of Smoke Bush (*Cotinus coggygria*), Southern Catalpa (*Catalpa bignonioides*), and Ninebark (*Physocarpus opulifolius*). For other plants, coppicing the plant will produce leaves the size of dinner plates such as for Empress Tree of China (*Paulownia tomentosa*) on stems up to 15’ tall in one season! A leaf of a coppiced *Paulownia* is pictured above.



It is also an effective way to keep large willows like Rosemary Willow (*Salix eleagnos*) in scale for the smaller garden. For the Coral Willow, stooling the plant annually keeps it to a smaller annual height of 6-8’ vs. the 25-30’ if left unpruned. The potential drawback to stooling is the added avenues of decay from the severed stems. Interestingly, this does not seem to have a negative impact on the plants since the *Cercis*



canadensis ‘Hearts of Gold’ photographed above is 14 years old in the images without any signs of a loss in vigor or substantial decay. It is possible the dramatic pruning may actually enhance the plants longevity!

Hydrangeas such as the Panicle Hydrangea (*Hydrangea paniculata*) and Smooth Hydrangea (*Hydrangea arborescens*) bloom on new wood, potentially allowing the entire plant to be pruned back vigorously. In fact, regardless of the cultivar for Smooth Hydrangea it is best to cut the plant back to the ground each spring since the stems break under snow load. For Panicle



Hydrangea, those selections featuring dense floral heads such as ‘Limelight’ are best cut back to a 3-5’ tall framework each spring, as seen in the image above. This will yield a

more conservative 2' flush of new growth that can support the dense flower heads. The selections featuring more open flowers with less sterile florets like 'Unique', along with the more compact versions like 'Bobo' can be cut back further to 18" tall and the longer stems resulting from the more aggressive pruning will still be able to support the flowers.

For other plants, such as *Buddleia davidii* (Butterfly Bush) or *Callicarpa* species (Beautyberry) that flower and fruit on new wood, coppicing in late winter allows the plant to develop new stems from the base, providing a clean and attractive habit throughout the season to come. The image at right is of *Callicarpa* 'Duet', a plant grown mostly for the white variegated foliage, although it also blooms and yields white fruit on new wood. Cutting it back to 6-12" annually preserves an attractive arching habit and good variegation.



3. Renewal Pruning – Unlike the selective removal of specific branches in rejuvenation pruning, renewal pruning involves the cutting back of an entire overgrown plant or hedge that has exceeded the desired size. The difference between Renewal Pruning and Coppicing is the year or years between pruning. Coppicing is typically an annual procedure while Renewal Pruning is limited to every 10 to 40 years or perhaps more. Although not possible with coniferous plants such as *Pinus* (Pine) and *Picea* (Spruce), it is very effective for many shrubs like Spice Bush (*Lindera* spp.), Rhododendron, Andromeda (*Pieris*), Yew (*Taxus*), and shrub forms of Holly (*Ilex*). Renewal pruning should be completed in late March through mid-May in order for the plant to break dormant buds, reshoot and harden off before the autumn frosts.
4. Specialty pruning – Some types of pruning do not fit any particular definition and are simply based upon the plant itself. This would include contorted or weeping plants, such as Cutleaf Japanese Maple (*Acer palmatum* var. *dissectum*) and Flying Dragon Hardy Orange (*Poncirus trifoliata* 'Flying Dragon'). In these cases, the pruning is specific to the type of plant. For example, the Cutleaf Japanese Maple grows upward by new



branches arching up and over lower branches. In time, the lower branches die due to lack of light and will need removal. Removing the dead stems in winter will result in the main trunk bleeding for several days after the cut, weakening the plant. The best time for removal is during the summer or fall when the trunk will not bleed. In late fall, it is also helpful to remove accumulations of dead leaves while pruning, since they both distract from the plants beautiful habit and allow snow to accumulate and potentially break branches. For contorted plants, such as Flying Dragon Hardy Orange (pictured above) or Contorted Filbert (*Corylus avellana* 'Contorta'), the network of branches can often become so dense as to reduce the beauty of the interlacing stems. In these cases, the plants should be periodically receive a light thinning during winter, allowing the beauty of the stems to be more apparent. Above left is before and at right is after pruning. The effects are not dramatic, but allow a better appreciation of the architecture of the plant.

Girdling Roots

Of late I have noticed more and more shrubs, small trees and shade trees with a girdling root system. In most of these cases, this is the result of the plant having been grown for too long in a container. When the root hits the side of the container, it follows the curvature of the pot and develops an encircling form. Following planting, the root continues to encircle the trunk and effectively inhibits the flow of carbohydrates to the roots during the growing season and to the canopy in spring as the trunk continues to expand outward in diameter. Ultimately, the tree declines in vigor and dies. Aside from a noticeable loss in vigor, girdling roots that are hidden below grade are noticeable when a root flare is not visible on one side of a tree or large shrub. The encircling root prevents the flair from developing and that side of the tree resembles a telephone pole going straight into the ground.



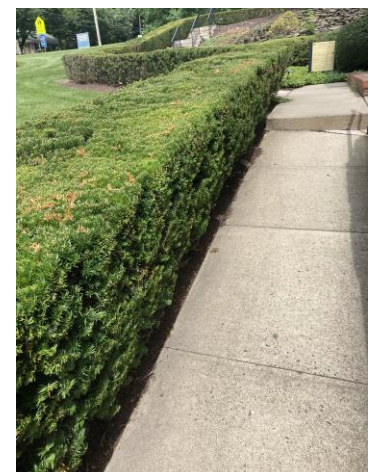
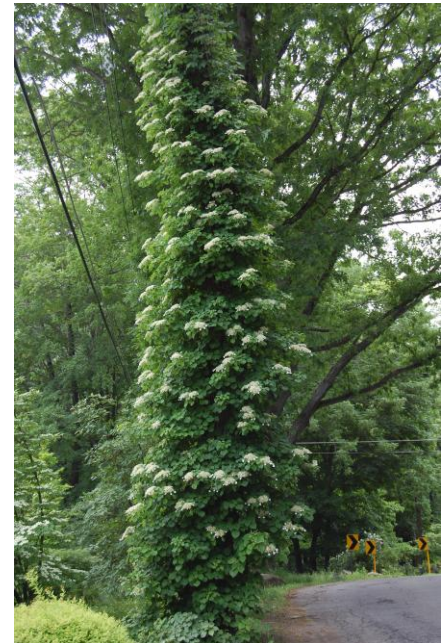
Girdling roots are most prevalent in large container grown materials or container stock that was not advanced to a larger pot size at the appropriate time. During planting, the problem can be remedied by cutting down the sides of the ball or pulling outward any roots that are encircling the root ball. It may appear as if you are destroying the root system, but it will quickly redevelop with proper care and watering with little or no impact on the plants health.

If the plant is established, the girdling root can be removed by clearly exposing the root and severing it at either end using the tip of the chainsaw. Remove the root after it is cut, since it will continue to harm the expanding trunk for years to come if left in place.

Woody Vines

Once again, just as with woody shrubs, it is important to know the vine and whether it blooms on current season's growth or on last year's growth. Some of the major vines that benefit from pruning:

1. *Clematis*. There are three general types of *Clematis* and techniques for pruning, which are divided into Type A, B and C. For type A, the flowers bloom in spring on the previous year's wood, and vines should be pruned just after flowering before new flower buds begin to form. An example would be Himalayan Clematis (*Clematis montana*). Type B blooms on both last year's wood as well as that of the current year. At the end of winter, these plants should be pruned back to just above the first or second pair of large and vigorous appearing buds, roughly 3-5' high on the vine. Most of the large flowered *Clematis* 'Jackmanii' selections are in this category, such as *Clematis* 'Nelly Moser'. Lastly, Type C blooms entirely on new wood, such as *Clematis terniflora* or Sweet Autumn Clematis. These vines can be cut back hard or simply pruned lightly to remove any wood that died during winter, depending upon the size vine that is desired. I have seen it trained up a post to a second story deck where it was effectively trained along the railing. As an aside, Sweet Autumn Clematis is also invasive and care should be taken when planting.
2. Climbing Hydrangea (*Hydrangea anomala* subsp. *petiolaris*) as seen at right, Japanese Hydrangea Vine (*Schizophragma hydrangeoides*) and Woodvamp (*Decumaria barbara*) are vigorous growing plants after the 3 to 5-year establishment period. They produce flowers year after year on the same stems that project 12-24" out from the supporting wall or tree on which the vines are growing. Although these stems may appear unruly or unattractive in winter, they should not be pruned to ensure bloom. Any vertical growth that is tight against the supporting structure can be pruned without impacting the flowering. Plants grow well on the trunks of trees or on stone or brick masonry, but not on parged (plastered) concrete block walls or cultured stone walls (veneer 'stone' made from concrete), since the high lime content negatively impacts the anchoring roots.
3. *Wisteria*. Wisteria produces flowers from short 1-2" long spurs on wood that is two years old or older. The same spur will continue to produce flowers for years to come. All too often Wisteria vines fail to bloom because they are pruned too heavily throughout the growing season. This pruning initiates the production of vigorous vegetative growth with ample foliage, but no flowering spurs. Wisteria should not be fed heavily, as that will also encourage vigorous growth and few flowers. A light pruning and shaping during the summer is fine. Once the plant has bloomed, take note of the flower spurs (they will develop a bean-like fruit pod that remains attached into winter). During the late winter, remove all or part of the stem above the spur as this will retain the flowering buds for the coming year.



Pruning for Special Effects (Look, see what else I can do!)

Hedges

Each year that we prune a hedge, it is inevitable that some of the growth from the previous year remains, allowing the hedge to

slowly ‘expand’ over time. A good hedging plant is one that can be pruned a bit more drastically every few years to bring the plant back to the desired size without impacting the integrity of the plant. Good hedging plants can also tolerate the removal of nearly all of the new foliage and still show good vigor. Oddly enough, many more plants than most people may suspect can successfully tolerate this consistent shearing without a loss of vigor.

Hedges should preferably be shaped such that they are wider at the base than at the top. The Hornbeam hedge (*Carpinus betulus*), pictured at right at Wave Hill gardens in NYC displays a nice batter to the sides of the hedge. This prevents the upper portion of the hedge from ‘shading out’ the lower portion, a typical problem that is pictured above right. Vertical sides can prove to be successful as well, providing light is able to reach the sides of the hedge from the top to the base, preventing any dieback near the base. The



image above right shows a Yew (*Taxus*) hedge that is wider at the top than the base, allowing the lower portions of the hedge to become ‘shaded out’. Although hedge shears are typically used and are appropriate for where the hard lines of architecture wish to be brought into the garden, using hand pruners has several advantages, both to the plants and to the gardener.

- Hand pruners are a bit slower for making the cuts, but the clean-up is much faster, since the gardener is discarding the cuttings into a barrel as they proceed. Hand pruners also eliminate the small and unattractive fragments of cut foliage left from hedge trimmers on top of the hedge or the mulch below that defy the effort of every rake for total removal!
- The hedge is much looser and more flexible, allowing it to bend rather than break under heavy snow loads.
- A loosely pruned hedge allows more light to penetrate into the hedge. As a result, it develops more foliage within the hedge that ensures the production of more sugars, which in turn creates healthier plants.
- Hedge shears cut foliage as well as stems. The cut leaf edge turns brown, creating an unattractive brown discoloring to the hedge that is especially evident on Boxwood (*Buxus*) and Yew (*Taxus*) hedges.
- Depending upon the desired effect, a sheared hedge lends more visual weight to a garden while the loose cut from hand pruners creates less visual weight.
- A tightly pruned hedge is near impossible to reduce in size and still retain a sheared appearance, while loosely pruned hedges lend themselves to making selective reduction cuts without losing the impact of a hedge.
- Perhaps most importantly, when making individual cuts with a hand pruner, the gardener is thinking of the garden’s design and how to appropriately shape the plants to best fit that design. Conversely,



hedge shears tend to mentally remove the gardener from the design process and allows a person's mind to easily drift. This is often seen with hedges, since instead of allowing the individual plants to grow together into a hedge, the plants are often sheared individually resulting in what often resembles really bad dental work. As seen in the image above right, using pruners allows for the cuts to be made at the proper length above the flower buds, ensuring an attractive spring presentation.

For deciduous hedges, I have found it far easier and quicker to prune the hedge during the winter



without the foliage than during the growing season. The lack of foliage allows you to see the structure of the plant and to quickly access where a cut is best made. In the Japanese Cornel Dogwood (*Cornus officinalis*) hedge at left, it took 5 people 1½ hours to prune the hedge in July but 1 person 45 minutes to prune the hedge in January! It is also easier to navigate around perennials or other plants on the ground during January. Of course, the drawback is the somewhat unkempt look of the hedge in the summer as the

new growth appears.

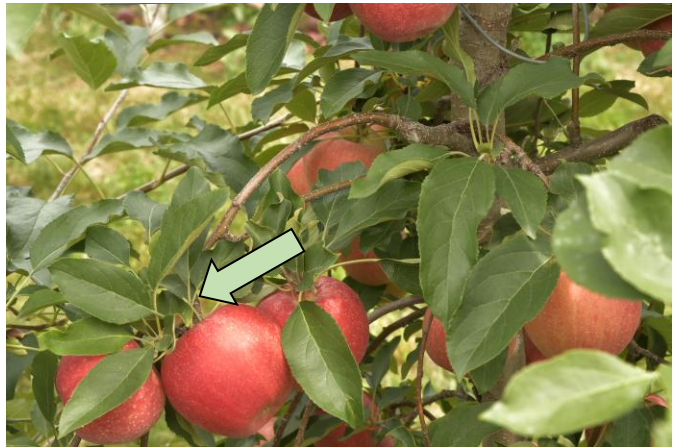
Plants appropriate for hedging is far larger than you may think, depending upon the attentiveness of the person maintaining the hedge. Some of the tried-and-true selections include:

- Abelia x grandiflora* – Glossy Abelia and cultivars
- Acer campestre* – Hedge Maple
- Berberis* species – Barberry
- Buxus* species – Boxwood
- Calycanthus floridus* – Sweetshrub (pictured at right)
- Carpinus* species – Hornbeam
- Cornus mas* – Cornelian Cherry Dogwood
- Cornus officinalis* – Japanese Cornel Dogwood
- Fagus sylvatica* – European Beech
- Ilex crenata* – Japanese Holly
- Ilex glabra* – Inkberry Holly
- Ilex opaca* ‘Hedge Holly’ –American Holly
- Ligustrum ovalifolium* – Privet
- Osmanthus heterophyllus* – Tea Holly and its cultivars
- Poncirus trifoliata* – Hardy Orange
- Prunus laurocerasus* – Cherry Laurel
- Taxodium distichum* – Bald Cypress
- Taxus* species – Yew
- Thuja occidentalis* – Arborvitae
- Tilia cordata* – Littleleaf Linden



Fruit Trees

There are several ways in which fruit trees can be pruned for optimal production. In general, the concept is to thin the central portion of the tree in order for the fruit to be exposed to sunlight and promote horizontal stems. Remove most of the upright shoots in favor of horizontal branches. If the tree is newly planted, encourage a central leader and work the branches out in a horizontal or slightly downward direction with weights or cables to bring the stem into a horizontal orientation. This will increase the creation of fruiting spurs. Each season the tree will produce vigorous new growth that will require removal or reduction in length in order to encourage the less vigorous side branches that in turn will flower and fruit (as seen above). Fruit trees also make fantastic candidates for espaliers, as discussed below. I have noticed that Pawpaw (*Asimina triloba*) trees fruit far more heavily when pruned into a more planar or espaliered form.



Espalier

A term that originated from the Italian *spalliera*, meaning ‘stake works shoulder high’. This



refers not to the plant, but to the wooden lattice against which the plants were initially trained. Ultimately, the name came to mean the act of actually training plants onto the lattice in two dimensions. Espaliers can be formal or informal, attached to a wall or freestanding in front of the wall or simply standing on its own. Espaliers can serve as a wall decoration, a freestanding barrier or fruit production for small spaces. In the image on the left, the freestanding espalier of a pear serves as a focal point and terminus to a walk at

Chanticleer Gardens. It is a fun and relatively easy technique that is not adequately employed in modern gardens. The technique became popular in the 16th century, out of the practical necessity for growing fruit in the cooler climates of northern France and southern England. The French and English horticulturists discovered how the warmth absorbed and reflected by stone or brick walls helped to extend the season and allowed fruit to fully ripen during the cooler days of autumn. It also was an effective means for conserving space. Through manipulating the branches, they also discovered how orienting apple-tree branches horizontally helps to direct energy away from vigorous vertical growth and into producing spurs – those stubby lateral branches that flower and produce fruit.

For fruit trees, generally the first year’s growth is foliage, second year’s growth produces flower buds and the third-year fruit production begins. Fruit tree espaliers should have the new growth cut back to approximately ½” above the previous year’s growth in late June or July, allowing light to both reach and enhance the ripening of the fruit, as seen above in the image of the Pear.

To ensure the best success, start with as small of a plant as possible, since it is far easier to



position and form the branches as needed when they are small, vs. more mature specimens. A good example is the Weeping Ginkgo (*Ginkgo biloba* 'Pendula') pictured at left which was started from a small container plant. A 2-3' tall whip is actually an ideal size to use at the start and it will grow to fit the space much quicker than you may imagine. The smaller container size associated with a smaller plant will also allow the plant to be located closer to a wall, as compared to a larger container or the ball of a B&B

plant. Should selecting a smaller plant prove not possible, look for a plant that has been improperly grown too close to another plant in the nursery. The plant will have developed more of a planar or two-dimensional appearance, making it easier to shape.

Among the many plants that are ideal candidates for espalier pruning, aside from fruit trees, the following have proven to be successful:

- *Asimina triloba* – Pawpaw
- *Cornus kousa* – Chinese Dogwood
- *Cornus mas* – Cornelian Cherry Dogwood
- *Cotoneaster* spp. – Cotoneaster
- *Ginkgo biloba* 'Pendula' – Weeping Ginkgo
- *Hamamelis x intermedia* 'Jelena' – Jelena Witch Hazel
- *Ilex crenata* – Japanese Holly
- *Ilex verticillata* – Winterberry Holly
- *Malus hupehensis* – Tea Crabapple
- *Malus floribunda* (and other species) – Crabapple
- *Magnolia grandiflora* – Southern Magnolia
- *Magnolia* 'Ann' (and other compact forms) – Magnolia
- *Poncirus trifoliata* – Hardy Orange
- *Pyracantha coccinea* – Firethorn

Topiary

Pruning plants into a geometric shape, an animal form, or some other form not found in nature. The concept dates back to the period of the Roman Empire. By its very nature, the plants selected for topiary should have a very short internode space, such a *Taxus* (Yew) or *Buxus* (Boxwood) and are tolerant of shearing.

Bonsai

A Chinese art form that was developed further by the Japanese. The concept is to dwarf what would otherwise be a full-sized



shade or ornamental tree, such as the Bald Cypress (*Taxodium distichum*) seen above right. The plant or group of plants are grown in shallow containers and maintained through root and canopy pruning, creating a subject that appears like a miniature form of an adult plant. Truly an art form that – as it was so intended – is great for small spaces. Since many of the subjects are hardy plants, like the Bald Cypress, the plants will need a period of winter chill in order for the plant to thrive. Ideally, plants should be brought into a garage that has temperatures just around freezing, since most root systems of winter hardy plants are not tolerant of temperatures below 20-25° Fahrenheit.

Brambles (Raspberry and Blackberry)

Brambles are best grown in a 12-18” wide row, allowing for ease of pruning and harvest. Much like Forsythia, the canes will root where the tips touch the ground, so it is helpful to run wire supports along the row to keep the canes more upright, as pictured below. Brambles also have a unique manner in which they grow, whereby they produce vigorous upright stems the first year called Primocanes, which become flowering and fruiting stems the second year called Floricanes. At the end of the second year, the stem dies.

Once the Floricanes of the summer bearing Red and Yellow Raspberries have finished bearing fruit, they can be cut to the ground in late summer or at any point throughout the fall into winter.

Remember, they will not live to the next season so cutting them back is doing no harm to the plant. During winter, thin the weakest of the remaining canes, leaving only those that appear the most vigorous



as they will yield the most fruit. The remaining vigorous canes can be shortened to 4-5 feet to make the row more manageable and to induce fruiting branches. Any canes that have spread beyond the 12-18” row should be cut back or dug out in order to keep the row manageable.

For Black Raspberries, the fruits are produced on branches or side shoots that emanate from the cane. To encourage branching, tip the Primocanes back during the summer to develop the first flush of side shoots and during the following winter, tip back the side branches to encourage further branching. Make certain as well to use the wire supports to keep the Primocanes from touching the ground, as they will readily root. Once the Floricanes have fruited, they too should be cut to the ground.

For those plants called ‘Ever Bearing’ or ‘Fall Bearing’, they produce red or yellow fruits on Primocanes during the late summer and fall of the first year and once again in early summer on the two-year-old Floricanes, although the flowering and fruiting is less during the second year. This allows the plants to yield all season or be ‘Ever Bearing’. Typical to brambles, the canes die following the second year. To prune, come winter cut the two-year-old canes to the ground, since their life expectancy is at an end. For the first-year canes, cut them back to just below where they fruited the previous fall to encourage more branching along the lower part of the canes for the early summer crop. You can also take the easy road and simply cut the entire plant

to the ground. Obviously, this will forfeit the early to mid-summer crop, but it makes the process far less complicated for those short on patience!

Review (*Oh my Goodness, is this ever going to end?*)

Proper pruning is a necessity for keeping plants looking and flourishing at their best, as well as keeping shade trees safe from falling limbs. It can also be very therapeutic and beneficial for the gardener! Always remember, pruning is never a strict by the 'recipe' type of activity, so there will always be situations requiring some personal thought, intuition and common sense in order to make the proper corrective cut. It is also a practice that is never completed in one year, but rather is an ongoing and continues for as long as the plant is alive! Far from a mystery, pruning is part art, part horticulture, and most of all, lots of fun!

List of Plants Based on Pruning Needs (as initially prepared by Donald B. Lacy, NJAES)

Flowering Shrubs for Which Annual Pruning is Suggested
(*May be Cut Back Severely*)

<i>Buddleia</i>	<i>Genista tinctoria</i>	<i>Lespedeza</i>
<i>Callicarpa</i>	<i>Hydrangea arborescens</i>	<i>Rosa</i> (Shrub & Hybrid Tea)
<i>Caryopteris</i>	<i>Hydrangea bretschneideri</i>	<i>Salix</i> (red stemmed forms)
<i>Ceanothus</i>	<i>Hydrangea paniculata</i>	<i>Sorbaria</i>
<i>Cornus</i> (red stemmed forms)	<i>Hydrangea radiata</i>	<i>Spiraea</i>
<i>Elsholtzia</i>	<i>Hypericum patulum</i>	<i>Tamarix</i>
	<i>Lavendula</i>	<i>Vitex</i>

Prune by Thinning Older Wood Every 2 or 6 Years or Longer

<i>Deutzia</i>	<i>Lindera benzoin</i>	<i>Weigela</i>
<i>Exochorda</i>	<i>Philadelphus</i>	
<i>Forsythia x intermedia</i>	<i>Symphoricarpos</i>	
<i>Hydrangea macrophylla</i>	<i>Syringa</i>	

Seldom Need Pruning, Perhaps Corrective Thinning

<i>Acanthopanax</i>	<i>Diervilla</i>	<i>Ligustrum</i> (unless a hedge)
<i>Aesculus parviflora</i>	<i>Edgeworthia</i>	<i>Lonicera</i>
<i>Amelanchier</i>	<i>Elaeagnus</i>	<i>Lycium</i>
<i>Amorpha</i>	<i>Euonymus</i>	<i>Myrica</i>
<i>Aronia</i>	<i>Forsythia suspensa</i>	<i>Potentilla fruticosa</i>
<i>Berberis</i>	<i>Hamamelis</i>	<i>Rhus species</i>
<i>Chaenomeles</i>	<i>Hydrangea quercifolia</i>	<i>Ribes</i>
<i>Clethra</i>	<i>Hypericum</i>	<i>Robinia</i>
<i>Corylus</i>	<i>Ilex verticillata, serrata</i>	<i>Rosa species</i>
<i>Cotoneaster</i>	<i>Itea virginica</i>	<i>Stephanandra</i>
<i>Cytisus</i>	<i>Kolkwitzia amabilis</i>	<i>Viburnum</i>



Clethra barbinervis

Bruce Crawford
Manager of Horticulture, Morris County Park Commission