# PRUNING: A KEY TO INTEGRATED PLANT MANAGEMENT

## CONCENTRATE ON YOUNG TREES AND AVOID OVERPRUNING

by DOUGLAS J. CHAPMAN

Over the next twelve months we shall take a close look at INTEGRATED PLANT MANAGEMENT, that is, matching the plant's physiology with ground management goals. One factor certainly is *species selection*. Another overall major management strategy is *pruning*. This is composed of when, what, how, and frequency of pruning. To more knowledgeably make these pruning decisions, one should understand how a tree grows, its gross anatomy, and the tree's response.

Trees have essentially two growth centers or meristems. They are the terminal meristem and the lateral meristem (cambium), located just beneath the bark. These two growth centers are involved with increasing the plant's height (terminal growth) and stem diameter (lateral growth). The center (heartwood) of branches and/or the trunk are non-living with the main function being support.

The stem's meristematic region, the cambium, is part of a thick band of living tissue which sheets the entire tree. The cambium's normal function is to produce xylem tissue inward for upward conduction of water and phloem tissue outward for the downward translocation of carbohydrates, etc. The cambium is also important in callusing over or closure of the wound. Outside the region of living tissue is the protective bark. Plant bark is somewhat analogous to the skin covering the human body from the standpoint of offering protection from the elements—water loss, mechanical damage, disease infection, and decay. Located inside the band of living tissue toward the trunk is a non-living heartwood which provides the plant with a structural framework necessary to support a heavy canopy of branches, twigs, leaves, and fruit capable of withstanding the rigors of the elements.

**Pruning** *provides neat appearance and tree health.*

The plant's response to wounding is important for it dictates how best to prune. It is important to remember that pruning results in the removal of undesirable plant parts but also inflicts a wound. Wounds to trees and shrubs are defined here as any break in the continuity of the outer protective bark which penetrates into the living tissue or deeper. The tree's response to pruning wounds is first compartmentalization or isolation of the wound and then callus closure, as carefully described by Shigo. Normally, small wounds are potentially less harmful than larger wounds. For this reason, the removal of limbs over one and one-half to two inches in diameter or cutting of the main trunk should be avoided whenever and wherever possible. This outer living area is critical in minimizing the effects of the wound and insuring rapid wound closure. This phenomenon is dramatically different from the response of animal injury, which we are familiar with. Wounds in trees do not heal, but the damaged area is isolated or walled off.

Compartmentalization is the chemical and physical response of the tree to wounds. Initially after pruning, the tree forms tyloses. This tylose response is essentially plugging the vascular tissue with chemicals, e.g. phenol compounds, which slow or stop the decay organism. Normally the sidewalls are more resistant to decay or invasion of fungi than are the endwalls of vessels. A wound's compartment appears as a discolored-vertically oriented, often irregularly-shaped

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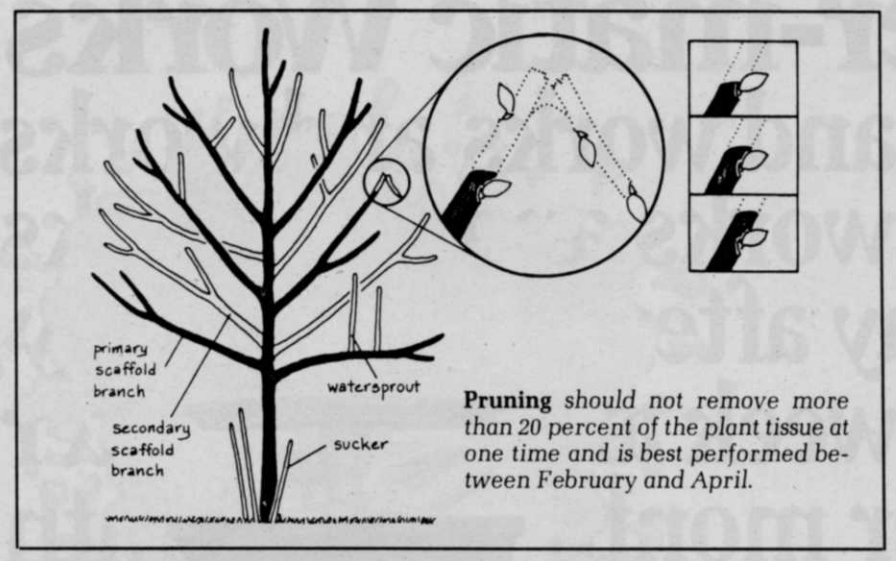
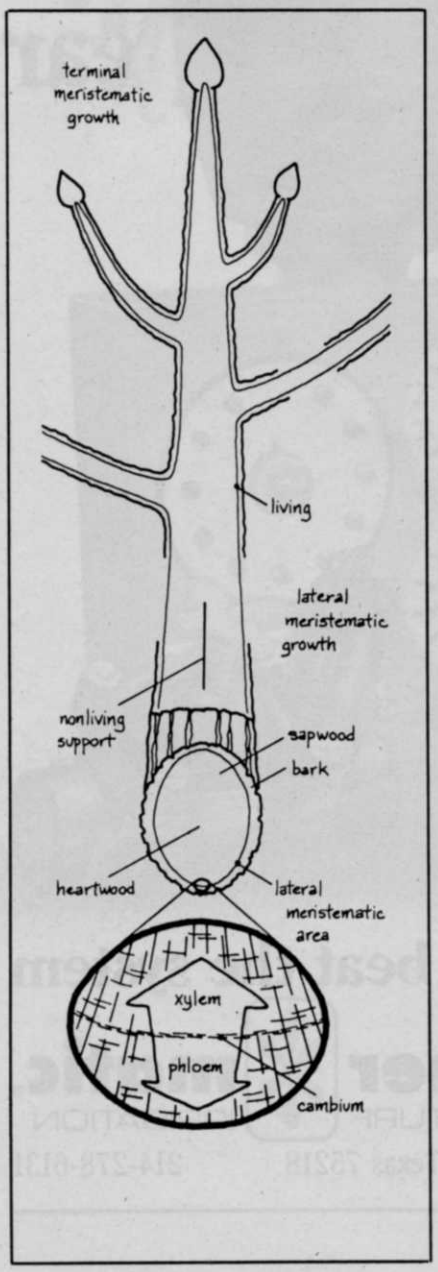



**Pruning** *should not remove more than 20 percent of the plant tissue at one time and is best performed between February and April.*




area in the heartwood of the tree. Some trees are relatively quick compartmentalizers and effectively isolate the wound, e.g. Sugar Maple, pine, and Scarlet or White Oak. Others are poor compartmentalizers, e.g. birch and Silver Maple. The next step in the tree's response to minimizing wounds is closure. Closure is simply the plant producing callus tissue which covers the wound or injury, reducing the climatic conditions that favor the activity of decay or saprophytic fungi. Callus tissue originates in the meristematic area at the periphery of the wound and expands across its face toward the center. Wound closure occurs when callus tissue completely covers the wound's surface. When pruning, it is important to encourage rapid closure of wounds. Conditions favoring rapid callus formation include a healthy-vigorous tree, minimizing wound size (cuts under two inches), flush cuts (not penetrating the collar of the branch attachment), and trimming back the edge of the bark to where it is still tightly attached.

Obviously, small wounds close most rapidly, thereby, minimizing exposure of sap and heartwood to weather. Wounds which close in one season are most desirable from the standpoint of preventing serious decay. Branches should be cut at crotches or point of attachment. Correct placing of the cut is important to rapid callus formation and reducing effects of weathering, i.e. checking. The best pruning cuts result in the smallest wound while eliminating branch stubs. This type of cut is usually referred to as flush cut. Drying out and die-back of living tissue may occur to some degree if care is not taken to limit tearing or separation of the bark.

In addition to this two-fold wound response, pruning can affect flowering and fruiting. The carbohydrate-nitrogen ratio in woody plants determines whether the tree will promote vegetative growth or flowering for the particular year. Pruning tends to reduce carbohydrates and may, in situations involving severe pruning, cause the plant to put on excessive vegetative growth and, thus, not flower. Conversely, a periodic controlled pruning program can be used to sustain annual levels of flowering and fruiting. Further, in the case of deciduous trees, severe pruning can cause development of weak branches, known as suckers or watersprouts. These branches commonly develop from latent adventitious or axillary buds located under the bark near branch axils and/or at the periphery of large pruning wounds. They are usually considered undesirable but one must realize suckering is commonly a response to excess pruning or removal of over 20 percent of the plant's leaf and woody tissue at one time. Several plants have a natural tendency to sucker excessively, e.g. crab apple, linden, and Silver Maple, and, therefore, these are high maintenance plants or trees requiring pruning every two to three years. Normally, pruning young trees and developing a structure for the future is a key to pruning and *not pruning throughout the life of the plant.*

Timing for the pruning of deciduous trees is critical. The period from late February through mid-April or late dormancy until bud swell is best. On a scale of one to ten, early spring is ten, whereas, the rest of the year, except mid-August, is one.

Late dormancy pruning results in rapid compartmentalization, closure, and little drying. Pruning during late spring, after growth starts, or early summer seems to result in limited plant response, e.g. poor callus formation, little compartmentalized response, and drying of

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meristematic areas at the edge of the wound. Fall pruning, after the leaves drop, often results in minimal plant response and some heartwood decay. Mid- to late-August provides a second period for pruning. At this time, the lateral meristem or cambium is still active. It is a time when maximum increase in trunk diameter occurs, thus, allowing for rapid wound response. In many cases, closure can occur before dormancy. This second pruning period is best suited for light pruning or trees that bleed heavily, such as birch, elm, and maple. It must be added that bleeding has not been reported to cause an adverse effect on trees, but if one can prune and eliminate this phenomenon, it is good for public relations with no negative impact on the tree itself.

Generally speaking, pruning objectives for young-vigorous trees include the culture of healthy, disease-free, symmetrical plants. The following rules help achieve these goals:

- start pruning trees when young;
- maintain a central leader;
- eliminate narrow v-crotches;
- remove dead and diseased branches;
- eliminate insect infested branches;
- remove rubbing or deformed branches;
- select well-spaced, broad-angled scaffold branches.

Pruning trees correctly, when they are young, eliminates most of the problems encountered by owners of middle-aged or mature trees and helps decrease or eliminate the need for pruning after the first few years. The less pruning one can do, the better it is for trees.

Establishment and maintenance of a single, centrally-located vertical stem or leader that dominates in height over all the plant is important. This reduces narrow v-crotch branches or double leaders in trees —one of the main causes for storm damage. Wide angle crotches, between 40 and 90 degrees, result in stronger branch attachment, thus scaffold branches. Narrow crotch angles result in weak branch attachments which are subject to storm damage. Further, removal of dead and diseased branches is important. Prompt treatment allows the tree to compartmentalize the injury and, therefore, reducing deterioration of sapwood or heartwood, while encouraging rapid closure.

Limbs that change direction frequently are aesthetically pleasing but tend to grow into each other, resulting in crossing or rubbing branches. Branches that rub on other branches, buildings, or hard objects incur substantial wounds that may become a site for decay. For this reason, one of the two crossing branches or limbs should be removed or shortened while redirecting the remaining branches.

Pruning can also stiffen branches while determining the direction of growth. Buds, pointing parallel with the stem, are most likely to form narrow crotches; therefore, one should prune to the next lower bud to encourage the branch to grow at a 90 degree angle away from the main leader. Cuts should be pointed toward the bud to reduce bud death due to desiccation and encourage callus formation. Since the branches that will be with the tree the longest and will bear the greatest weight of a mature tree are formed when the tree is young, it is critical that structural pruning be completed during the first four years after planting. It is not uncommon for the majority of the tree's crown to be supported by four to seven main scaffolds. Pruning of scaffold branches which are no higher than 12 feet from the ground are easy to prune with minimal equipment. It is quite possible for the average person to mold his well-proportioned shade or ornamental tree without touching a ladder or leaving the ground.

Normally, the volume of leaf surface or branches removed during heavy pruning should never exceed 20 percent. Light pruning constitutes removal of roughly 5 to 10 percent of the tree's leaf surface or branches.

The tendency to over-prune young trees can be partially overcome by maintaining secondary scaffold branches for a few years. Such limbs serve both aesthetic and physiological functions while acting as replacements, in case of main limb loss during early years. Such limbs should be removed at or by the time they are one-inch in diameter.

It should be stressed that pruning trees when young means that a crew of one or two men can prune up to 100 or 200 trees a day using hand shears, versus corrective pruning of middle-aged or mature trees that require bucket trucks, often results in heartwood decay and decreased total productivity (pruning two to three trees in an eight-hour day). When considering the plant's physiology and our budget constraints, it is more efficient and beneficial to prune young trees at the correct time versus pruning middle-aged or older trees. Four- and five-year pruning cycles can often result in large wounds which don't heal with little improvement in the total structure of the tree. Pruning several times when the tree is young results in structurally sound trees that don't have to be pruned at maturity. Pruning of older trees should be kept at an absolute minimum because their wound response is slower while heartwood decay is increased. It is more difficult to prune older trees economically; therefore, the pruning of older trees should be considered to correct storm damage only, not trying to structurally improve trees that weren't pruned when they were young.

Wound dressing—the use of a wound dressing is a time-honored practice which has little or no empirical justification. To date, there is no tree-healing paint which is considered to be a panacea to limit pruning damage or heartwood decay. Tree healing dressings are commonly used for cosmetic purposes—black in color, essentially covering a large, unsightly wound.

One key to maintaining a landscape is correct pruning. Corrective pruning should be actively practiced on younger trees at the right time of year—March or August, to improve structure and remove deformities. If the aforementioned practices are implemented, the grounds manager, golf course superintendent, or horticulturist is truly using the tree's physiology in concert with management strategies—a combination that is hard to beat! **WTT**