

DO YOU HAVE APICAL CONTROL?

By Christopher Luley, Ph.D.

No, this is not a new self-help technique or corporate leadership approach, but it is an essential component of developing good branch structure on most urban tree species. Pruning to select or maintain a central leader in order to help maintain apical control is arguably the most critical step in small-tree pruning (Photos 1A and 1B). It is important because the process results in the elimination of some of the most critical, life-shortening defects that commonly develop in urban trees (Photo 2).

Apical control is regulation after bud break that functions to maintain crown dominance by a central leader. Apical dominance is the mechanism that determines whether an inhibited bud begins to grow out after bud break. Apical dominance has a role in apical control, particularly in trees with multiple growth flushes during the growing season (definitions and concepts as presented in Cline and Harrington, 2007).

In reality, we cannot prune for apical



Photo 1A. Pruning to select a central leader is arguably one of the most important aspects of small-tree pruning. This Kentucky coffeetree has lost apical control and will require pruning over time to correct its structure. All photos courtesy of the author.



Photo 1B: Pruning for a central leader will eliminate many defects that commonly develop and shorten the life of urban trees. In reality, we can only prune to redirect growth into a central leader and cannot establish apical control per se.

control or dominance, but can only prune so these biological processes have a better chance of being expressed in a tree before poor branch structure develops. Tree species that show weak apical control often require the most pruning to maintain a strong central leader. Species such as oaks, maples and lindens quickly lose apical control, and pruning is almost always necessary to force growth back into a single central stem (Photo 3). However, even species that typically exhibit strong apical control, such as conifers, can lose apical dominance, and this can often be returned with a single pruning cut (Photos 4A and 4B)

A central leader is more likely to develop in some species where apical control and apical dominance are expressed strongly; the result is a single, central leader or stem (as in many conifers and some deciduous species such as black gum, tulip poplar or pin oak) (Photos 4A and 4B). This effect, which appears to be under strong genetic control, is more strongly expressed when trees are young. However, most deciduous species show weak apical control and fail to form a central leader as a result. These

species often are commonly referred to as having decurrent growth form.

Most tree species, even those that natu-



Photo 2: A codominant stem with included bark on this sugar maple failed in a late-season snowstorm. It would have been removed early in the life of the tree if it had been pruned for a single central leader.



Photo 3: Many common urban species require aggressive pruning to maintain a central leader. This Norway maple can still be pruned to a single stem, but it will require several pruning events over time to select a central stem and suppress competing laterals.



Photo 4A: Many conifers and some deciduous species show good apical control. However, even these species may require pruning to maintain a single central leader. Note the codominant leaders developing on this concolor fir.

rally have strong apical control, still may require pruning guidance to form or maintain a strong central leader. Apical dom-



Photo 4B: A sweetgum in fall color showing good apical control. Some deciduous species have better apical control and often require less pruning to maintain a central leader than species that show poor apical control.

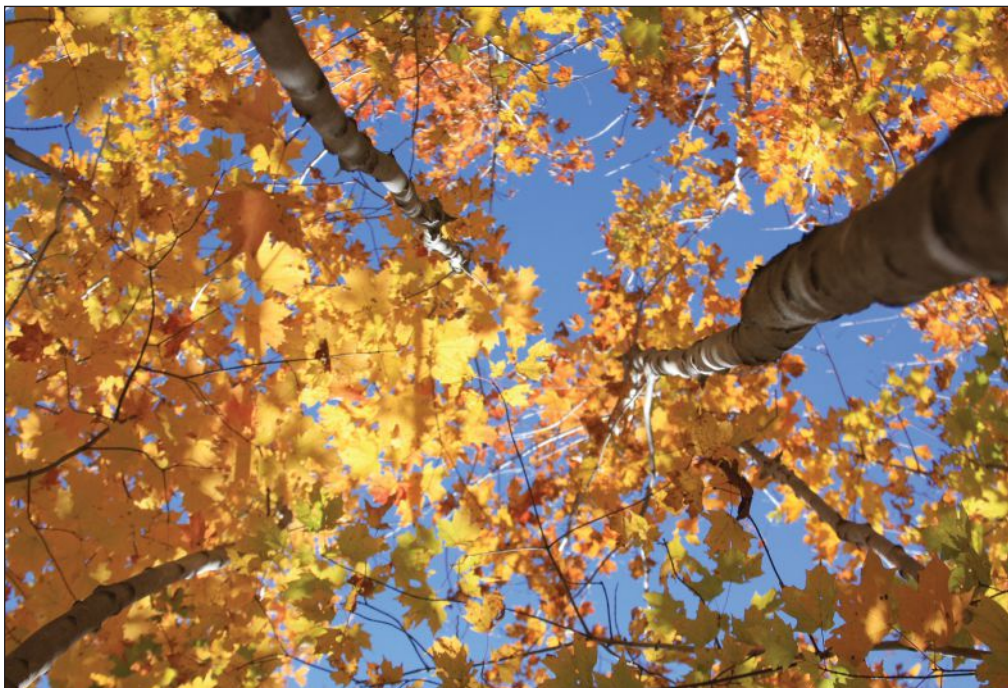


Photo 6: In a forest situation with high tree densities, apical dominance and control are critical in the competition for light.

inance is believed to at least partially be due to the suppression of lateral buds by the shoot apex through the influence of the plant growth hormone auxin. Auxins are produced by actively growing shoots and act as repressors of bud outgrowth (Cline and Harrington, 2007). The loss of apical dominance is thought to be due to changes in auxin-to-cytokinin (a hormone that promotes cell division) ratios, along with influences of nutrition and water (Cline and Harrington, 2007).

Pruning for apical control typically means selecting and pruning for a central leader by suppressing or removing competing laterals or codominant stems. Arborists need to be aware that a tree with a central leader may not have apical dominance. Close scrutiny of the branching pattern at the top of the tree is important in making this distinction (Photo 5).

In forest situations where competition for light is high due to high tree densities or shading from surrounding trees, apical control present in most species normally results in a single leader, at least when the tree is young (Photo 6). In urban plantings, where wide inter-tree spacing is used and light exposure to the entire canopy is common, even young trees quickly lose apical control. Pruning, therefore, becomes critical early in the life of the tree.



Photo 5: Trees with a central leader may not have apical control, such as this cherry, which has lost apical dominance due to competing laterals lower in the tree.

Importance of apical dominance in small-tree pruning

Pruning when trees are young is critical, as it is not uncommon for trees to come from tree nurseries without a central leader (Photo 7A). In the best of all worlds, these trees should be rejected before planting. It is also common for newly planted

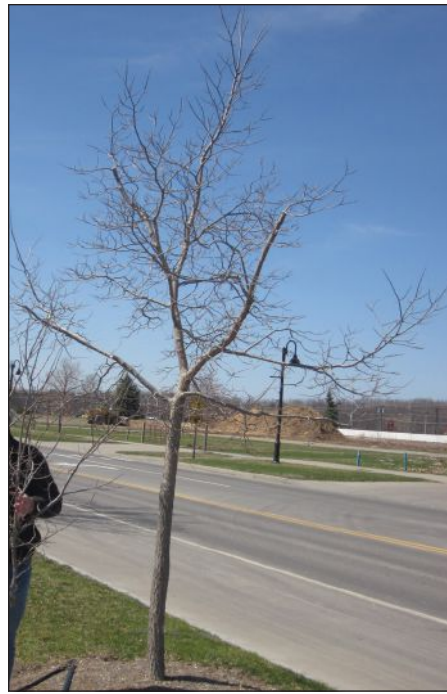


Photo 7A, at left: Trees may come from the nursery without a central leader. **Photo 7B, right:** A central leader can be selected and pruned for when the tree is still young by using one of the stems in the center and suppressing surrounding laterals.

trees to lose apical control directly as a result of the transplanting process, where roots are cut and hormonal balances in the tree are disrupted. Further, the central leader may only weakly resume growth after transplanting, and strong competing laterals may need to be trained for use as the central leader (Photo 7B).

Because loss of apical control occurs quickly, and because many newly planted trees are not pruned in the first years after planting, lateral branches can be-



Photo 8: Young trees quickly lose apical control, often as a result of fast-growing laterals overgrowing the central leader from lower in the crown.

come problematic in a very short time. First, laterals near the top of the tree often rapidly start to outgrow the central leader (Photo 8).

Second, laterals attached to the main stem increase in diameter or become so large that they cannot reasonably be removed without first suppressing or slowing their growth. In general, if the lateral-branch diameter is 50 percent or more of the trunk diameter at the lateral's point of attachment, the lateral should not be removed all at once because of the large size of the resulting wound. Thus, removal over time is necessary to avoid making large pruning cuts on the main stem of the tree (Photo 9).

Third, laterals in the lower crown that are increasing in diameter quickly start overtaking the central leader from the outside of the crown. This results in the formation of multi-stemmed, rounded crowns that are very difficult to correct as the tree starts rapidly growing once it is established (Photo 3). Most inexperienced pruners are afraid to try and re-establish apical control on trees that have reached this level of lateral overgrowth. Laterals that start overtaking the central leader present one of the most common pruning needs of young and older urban trees (Photo 8).

ABCs

In the ABCs pruning method, pruning to establish a central leader is the first step. The "A" in "ABC" identifies the importance of apical control and dominance and is the first step in identifying a central leader in the tree. This is usually accomplished by suppressing any competing laterals at the top of the tree. The "B" is for "bad" branches such as diseased, decayed or rubbing branches. The "C" is pruning for clearance and to remove or suppress competing laterals and codominant stems.

Using the ABCs approach, even the trees that have completely lost apical control can have their growth redirected into a central leader (Photos 1 and 7A and 7B). However, this may require multiple pruning events over years. At a minimum, the ABC method will eliminate or suppress codominant stems and slow the growth of competing laterals, even if the tree is not pruned again in the future.

Pruning reality

Except for individual tree species that have strong apical control, single-stemmed trees with a strong central leader as a result of good pruning over time are seldom seen in urban tree populations. One common reason, besides a lack of consistent pruning



Photo 9: Lateral branches in the lower crown often become too large where they attach to the main stem (arrows). These branches usually have to be suppressed and removed at a later pruning event.



Photo 10: Professional arborists are seldom involved in pruning the majority of young trees. Proper training of municipal or grounds crews is essential to train young trees. The ABCs small-tree pruning guide is easy to teach and easy for crews to learn and remember.

over time, is that professional arborists are seldom hired to prune young trees (Photo 10). Young trees are commonly pruned by grounds or landscape crews or by municipal workers who have been provided min-

imal training in proper pruning. Clearance pruning takes precedence, and pruning an overgrown young tree that no longer has apical control is beyond the abilities of many untrained crews (Photo 11). However, even with minimal training, these crews can confidently use the ABCs method to suppress codominant stems or strongly competing laterals and greatly improve the effectiveness of pruning, and in the process increase tree longevity in the landscape.

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References

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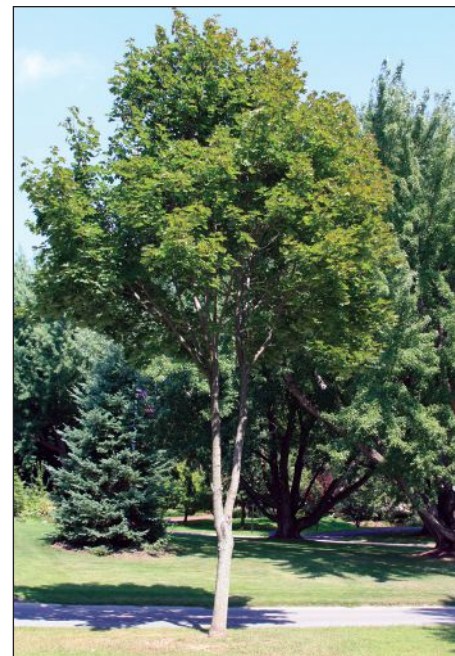


Photo 11: Training is essential for pruning young trees. This maple was pruned for clearance only, leaving a long-term, potentially life-shortening defect to develop as the tree matures.

in multiple flushes of temperate woody species. *Can. J. For. Res.* 37: 74-83. 🌲



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