When to Prune Trees or A Short Course in Tree Phenology

by Marcel Beauchamp

Looking out my kitchen window as the winter days get longer and the sun brighter and warmer, I'm reminded of my early days in the Arboretum when we would prepare for the annual ritual of pruning the crabapples at this time of year. As newly appointed foreman of the Dominion Arboretum at the Central Experimental Farm, I was expected to carry out this time-honoured tradition, as my countless predecessors had done in the past. Unfortunately (or perhaps fortunately?), I was destined to be the one to break this rite, among others. I always had a healthy curiosity about what makes things tick and why we do the things we do the way we do them.

One of the greatest opportunities with this position was the relatively generous amount of time I had during the winter months to plan my work for the coming season, and, more importantly, to read and research articles on arboriculture. Day after day, I would pour over periodicals and books at the Agriculture Canada Library in the basement of the Sir John Carling Building. I relished those days. Great strides were being made by notable arborists, among them a Dr. Alex Shigo, who turned the world of trees around with his work on the growth of trees and, in particular, their reaction to pruning. His research brought us important realizations about the processes and principles of tree growth that take place during a tree's lifetime. This revolution would set the stage for many changes in tree care practices based on solid scientific knowledge known as tree phenology.

Phenology is the study of a plant's growth processes throughout a one year cycle. This gives us valuable insight as to when is the best time to prune trees. Pruning is a stressor. Therefore, trees should be pruned at a time when they can best minimize the effects of this stress. This is usually accomplished when a tree's energy reserves

are high. Throughout the year, a tree accumulates and stores energy through photosynthesis. As growth progresses, these energy reserves are used up, only to be produced once more and stored for next year's growth cycle.

Tree phenology can be broken into five major periods based on the accumulation and depletion of energy reserves. There is no clear delineation of these periods as their timing varies from species to species and with environmental conditions such as temperature and the availability of water. There may also be an overlap from one period to the other as one ends and another begins.

Let's first take a look at dormancy in trees. We understand dormancy as that time after leaf fall when trees cease growing, up until early spring when we notice buds swelling in preparation for growth. At this time, deciduous trees are completely devoid of leaves. Evergreens experience this much the same way as deciduous trees by shedding a year's growth of needles in preparation for winter. After leaf fall, we think of trees as being totally inactive. And to a certain point they are; at least during the dead of winter when temperatures are at their coldest and the ground is frozen. However, there is still some activity going on beneath the surface of the soil for some time after leaf drop and before new leaves begin growing in spring.

The first phenological period is the onset of growth of new feeder roots. This occurs in late winter when the tree still looks dormant. With the growth of new feeder roots, the tree begins taking up valuable moisture and nutrients in preparation for growth. Remember the sugar maple as the sap begins to run during the maple syrup season? It has no leaves yet the sap flows. This occurs when the tree starts to "wake up" from its winter slumber. At this time, the growth of new feeder roots may occur even with snow still on the ground and is driven by reserve energy produced and stored the previous year. During this period, energy reserves start to dwindle slightly.

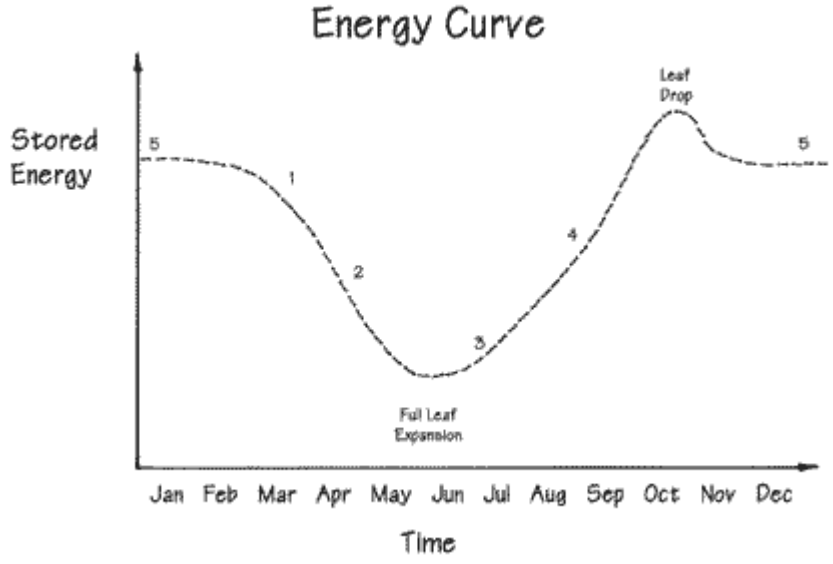
The second period is marked by budbreak and the formation of new leaves. Growth is beginning but photosynthesis is minimal as the growth of leaves is still being fueled by energy reserves. A tree begins to enter its lowest energy level during the growing season.

The end of this period is marked by the maturing of the new leaves as they increasingly produce more energy through photosynthesis.

During period three, which occurs largely in mid-summer, leaves are maturing and the growth of new leaves has largely stopped. Photosynthesis increases dramatically. This photosynthetic activity feeds the production of new wood in twigs, branches and trunks. New phloem, xylem and cambium are being produced as the tree increases in girth. Near the end of this period, as photosynthesis continues, energy reserves begin building up once again.

Period four marks the end of growth. This is when a tree begins storing energy in preparation for dormancy and next year's growth. This typically occurs in late summer and early fall. Starches and fats are stored in living cells in sapwood, both above ground and in woody roots. Non-woody roots (feeder roots) begin shedding at the end of this period.

In the fifth and final phenological period, dormancy sets in. Trees begin to lose their leaves. New non-woody roots are formed simultaneously as old ones are shed. Energy reserves are at their highest and with the onset of cold and frost in the ground, dormancy sets in and trees once again await a new awakening. The cycle repeats itself as it as for countless millennia.



So when is the best time to prune? As previously mentioned, pruning is best done when energy reserves are at their highest. In theory, this is during dormancy. However, late dormancy (late winter/early spring) is better than early dormancy (fall). Here's why:

- Wound closure is most rapid when pruning is done just before growth begins; energy reserves are high which fosters the quick production of wound-healing chemicals and processes in the tree;
- Pruning too early in the dormant season, i.e. fall, allows pruning wounds to crack and dry out, delaying wound closure and making them more susceptible to infestation by wood decaying pathogens.

What about trees who are "bleeders" such as elms, maples and birches? Won't pruning in early spring cause excessive bleeding and harm the tree? Research has shown that when pruning cuts are done properly, i.e. respecting the branch collar, these trees eventually stop bleeding by initiating a chemical reaction at the branch collar which effectively seals off the wound from the trunk, thus protecting it from invading organisms. What about wound dressings and pruning paint? Don't these protect the wound from diseases? Not at all! They are strictly cosmetic. As a matter of fact, they may be harmful by creating an environment that is conducive to infections.

This brings us back to our crabapples. When is the best time to prune these? According to phenology, isn't it during late dormancy like other trees? Trees like crabapples, hawthorns and prunus react to early spring pruning by producing an excessive amount of suckers at the base of the tree and watersprouts on the branches. These long adventitious shoots result when overpruning in spring upsets the delicate balance between the amount of energy the tree had stored and the size of the canopy for which it had stored energy. These trees consistently respond by replacing the removed wood with fast growing water sprouts in an attempt to restore the balance. Research has shown that pruning these trees in mid-summer, when energy reserves are at their lowest, will produce fewer suckers and watersprouts, thus improving the appearance of the tree and reducing the amount of work for you.

After discovering this valuable information, I changed the timing of pruning of all the crabapples at the Experimental Farm to mid-summer. I also use this practice for my own crabapples on my property and have greatly reduced the production of suckers and watersprouts.

Sometimes nature plays tricks on us with ice storms and heavy wet snow which breaks branches and upsets the balance all over again. As gardeners, we know that nature isn't always co-operative. Sometimes I think nature does it on purpose just to remind us who's in charge. After all, aren't we just wardens and keepers of "nature" on our properties? Sometimes we need to be reminded that we don't own "nature", nor do we really control it. All we can do is serve it while we inhabit a small patch of this green earth. After we are gone, nature simply returns to its own ways and our footprints disappear.