7. How Branches are Abandoned

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A branch's job is to take care of itself plus deliver carbohydrates for the tree's stem and root growth. When light intensity at the branch falls below the critical light ratio, the branch can no longer deliver. Such branches are terminated by being sealed off with pectin in the sapwood within their parent (trunk). We need to make that happen, and at a very early stage. We need to start a chain of events that ends up with no sign on the bark that the branch ever existed. Providing a sufficiently low light ratio will start the interesting natural chain of events.

Decision: A branch's business is to produce energy for the whole tree. As the tree rows upward lower side branches are left below, their shading increases, and energy production decreases. When the energy drops to some low level, a chemical "verdict" is reached to abandon the low producing branch.

Partition: First, the tree partitions off the branch by plugging supply capillaries of the sapwood inside the trunk with pectin. This flow partition is established deep within the branch collar. With the connection blocked, water is withheld from the branch. Also microbe entry into the tree is blocked from the dying branch.

Branch Death: The branch dies, and its microbial defenses are lost. Now the tree must wait for external processes to structurally weaken the dead branch.

Figure 1. An abandoned branch in the process of decay at the branch collar

Invade: With the abandoned branch's defenses kaput, fungi penetrate; start feeding on the cellulose, and structurally weakening the branch.

Snap: For us, it would be nice if the branch broke off just inside the branch collar. Luckily, that is where the mechanical stress is the greatest. The branch collar gives little mechanical support to a branch. The collar surrounds the branch, but is not connected. The tight fit between the branch and the branch collar retains moisture and encourages fungal growth right where we want it to break. How clever is that? Snap -- down she goes, while we are reading a book by the fireplace, and our pruning saw is rusting away in the garage.

Figure 2. The natural branch "no bump" closing progress. Left: the branch breaks of inside the branch collar. Center: The branch collar closes from all sides. Right: The defect is being covered with sound annual tissue and the "catface" bark pattern soon breaks up into black walnut's normal diamond pattern

Close: Here is where the branch collar's specialty begins. The collar has a unique ability to rapidly produce callus tissue to close wounds. In natural branch death the branch collar is not injured. Hopefully the branch broke off just inside the collar and new callus tissue will close in quickly and equally from all directions. The once helpful fungi now become a potential menace to the tree. However, fungi soon find themselves trapped between pectin plugs on the inside and bark tissue on the outside, drowning in antibiotic tree sap.

Erase: The story is not quite finished. As the tree expands, the callus tissue flattens out and becomes a "catface". The catface tells the veneer buyer that there is a defect (knot) just under the bark. As the tree's circumference grows, the outer, bridle part of the bark (cork) cannot expand, so must fracture. Trees do not expand vertically, so the bark develops vertical fracture lines. If enough years go by, the catface must also facture and can vanish as a recognizable feature.

It is easy to understand the importance of "small" branch diameter in the natural branch shedding process. Every step in the chain of events will proceed quicker with smaller diameters.

1. Shading to the critical level will happen sooner.
2. Decay will reach the center of a small branch faster.
3. A small, rotten branch is weaker than a big, rotten branch.
4. A small opening will be closed quicker by the branch collar.
5. Traces of the whole process are sooner covered by sound wood and sooner vanish in bark patterns.

It is clear that early natural pruning is far superior the manual pruning, and much less work. Although manual pruning is tangential to this diatribe, it is non-the-less interesting and often necessary (for more see the Appendix of this chapter). We know that producing the critical low level of shade will trigger the above sequence to remove lower branches. The trick now is to devise the geometry and timing that produces that shade when and where it is needed. That is the focus of the next two chapters.

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"Think of it as nature's cost-benefit analysis. Instead of the landowner or forester choosing which branch to prune and when to prune it, here, the tree makes the call, withholding its investment of food, minerals, and water from any branch that fails to produce at least as much carbohydrate (tree fuel) as it consumes. Any branch that remains a productive contributor, paying its way in the tree's overall energy budget, will persist. Any that don't, get shut off.

Of course, many factors influence this balance between photosynthesis (the food-making) and respiration (the food consuming) within a tree, but access to light is the driver of over-whelming importance. As long as a branch has sufficient light, chances are it will manage to be a net producer, remaining alive and on the tree. This is most readily observed in open-grown trees. With unlimited access to light, they tend to have more live branches, lower down the trunk, for longer durations. In other words, self-pruning is rare in the open.

In the woods, natural pruning is a common occurrence, especially in dense stands where there simply is not enough light for all trees to keep all branches. Accordingly, branches low on the trunk die from shading and competition. They die at varying rates, usually over several growing seasons, and some persist as dead stubs for decades. Immeasurable numbers of shoots and small twigs perish through such self-pruning every day but, surprisingly, it is also a regular occurrence among more sizeable branches on saplings, poles, and sometimes even sawtimber-sized trees.

Events such as storms or pruning may damage the branch collar, thus reducing the naturally occurring defenses of a branch attachment and exposing the trunk tissues adjacent to the wound to disease or decay.

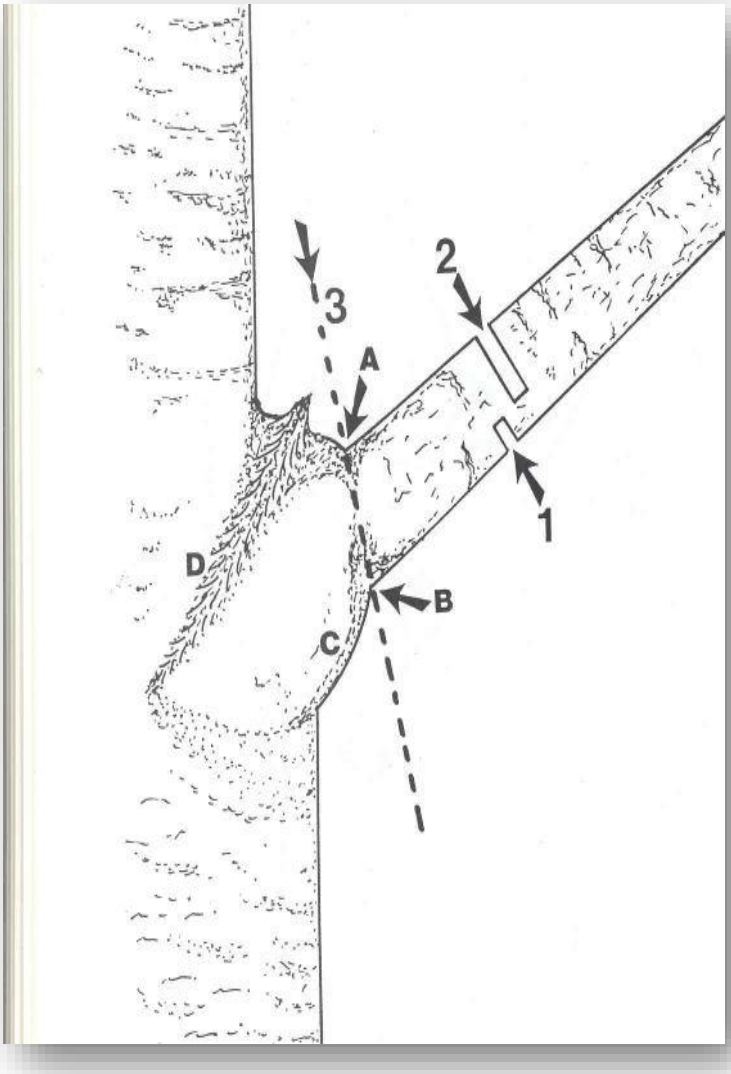
Understanding the external appearance and anatomical importance of a branch collar is key to correct tree pruning. Pruning practices that mimic natural branch shedding avoid unnecessary damage to the plant's defensive anatomy."

Appendix . Manual Pruning:

In a monoculture black walnut trees have insufficient shading for early natural pruning, so must be manual pruning to produce reasonable quality timber trees. The skeleton of the mature tree is formed during the first few years of growth. Growing a top quality black walnut veneer woodlot may be a hundred year project, but as far as the "Top Quality" goes, you'll know the answer in 15 years.

How:

Arborists have long understood this special healing ability of branch collars, {C} and try to duplicate the natural process. Cutting branches just outside and not harming the branch collar is called "Natural Target Pruning".



Natural Target Pruning

When:

Every book on growing black walnut has a chapter on pruning. Black walnut growers know that in a generously spaced monoculture, natural branch removal is too late. The branches get too big before they naturally are abandoned. Big branch scars make a knobby, crooked bole skeleton. The only hope for good form is devoted hand pruning of branches before they grow to one inch in diameter. That means revisiting the trees every year or two. There is an old adage: "The best time to prune is when your knife is sharp, (which means any old time). Based on that, I did some pruning in mid-summer and was sorry for it. About half the trees got some canker. Half of those died and the other half were crippled. It was 90+ degF days and high humidity beside a river. I have discussed this with northern growers who have done summer pruning and don't know what I'm whining about.

Where:

The worst defect is codominant leaders, so job one is to create a single central stem as straight and as soon as possible. A sharp angled pair of codominant leaders is a veneer no-no and structural time bomb due to weak entrapped bark. My observation is that branches that reach the canopy survive, and all understory branches eventually die. Codominant leaders are canopy branches and will both survive. Veneer logs are always butt logs. Their length is from the stump up to a veneer showstopper. A codominant crotch is a guaranteed veneer showstopper plus a structural risk. One of the pair should be removed well before they contain heartwood – the sooner the better.

Once a single reasonably straight leader is established, go after side branches from the bottom up. Some advisers say to remove side branches up to 40% of the tree's height. I would rather measure down from the top, and leave 15 feet of crown. If you are only cutting off dead branches you are working below the critical light level, and the work is already done.

With light above the critical level at the manual branch removal site, epicormic sprouts often erupt and thrive. They are an additional aggravation.

The higher the pruning, the more expensive, and the less return. At some point we give up on pruning and start thinking about thinning.

Figure 10. West Virginia champion epicormic sprouts. Epicormic sprouts often erupt just below a pruned branch removal (the armpit effect). The more light, the more vigorous the epicormic growth. In a well shaded planting they soon die. This photo was on the outside face of an edge tree – lots of light.