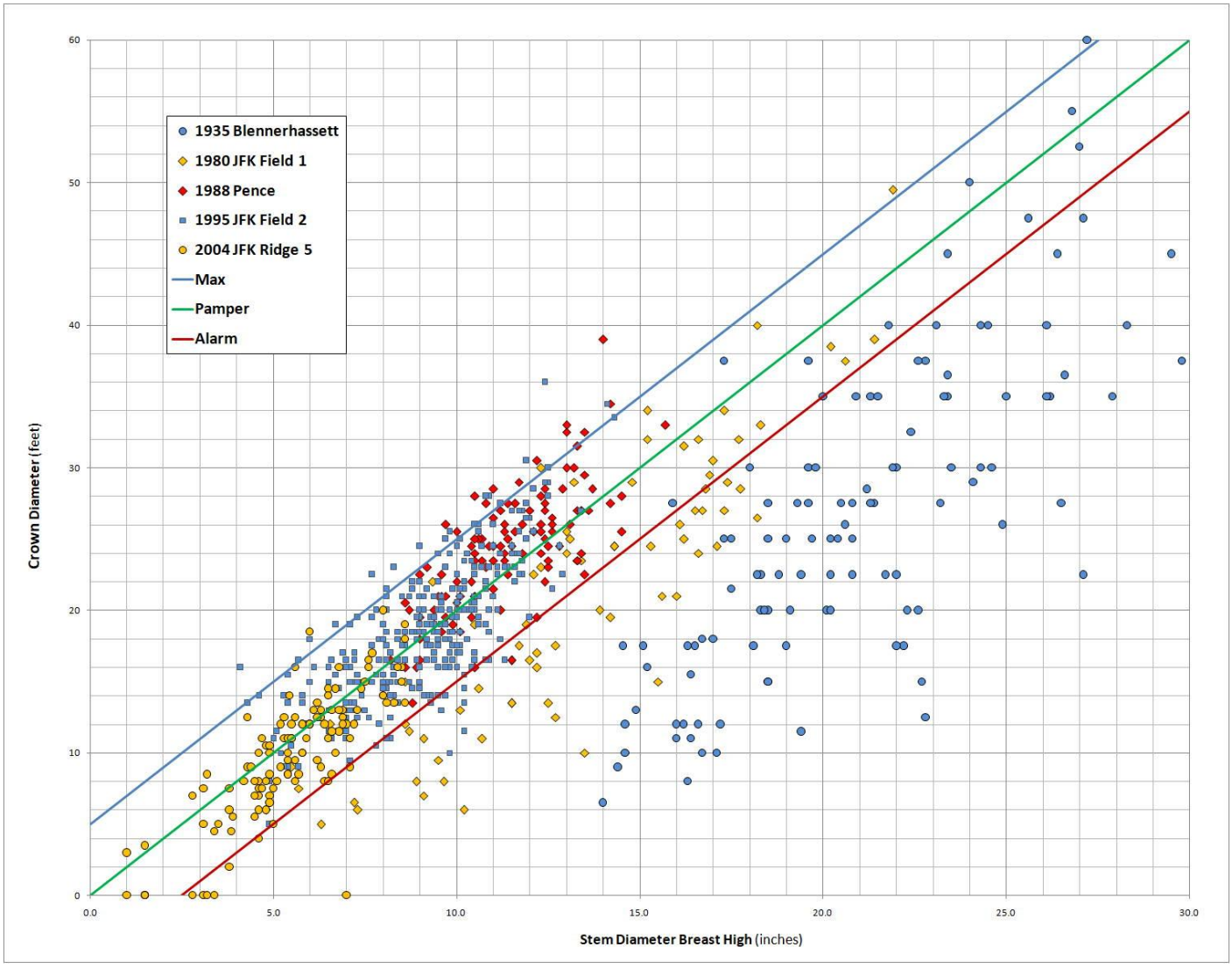
Tree by Tree Plantation Management - - - (Crop Tree Pampering) John Kelsey 2020 Feb 10

Most commercial forests are huge and composed of relatively low value tees. In contrast, black walnut plantings are usually small and contain trees of high value (at least in the eyes of us growers). It is reasonable that forest management methods might change from a focus of "acres" to a focus of individual "trees". With these thoughts in mind, we have been measuring black walnut tree character and growth for several years. We wanted data from a variety of tree ages, sizes, and treatments. We were not sure which measurements were important or where this was going. We are mining the data for significant relationships. One decent relationship shown below is crown size vs. stem diameter. The measurements are from five different black walnut plantings ranging from small to large diameter and intense to no management.



In addition to the tree data points, a Max Crown Diameter blue-line is shown. The blue line represents maximum crown size that stems and root balls can safely support. If crowns were much bigger than the blue line, trees would break off or uproot. Open grown trees without any crown competition typically grow up with big crowns close to the Max blue line. All the trees shown here are <u>not</u> open grown, but are in plantations. None the less, the few biggest crowned plantation trees have crowns near the blue line, as big as open grown trees.

Another interesting concept is the “Alarm” red line. Plantation trees, with crowns squeezed smaller than the "Alarm" red line, are being crowded toward a very slow death. The Alarm red line is a tipping point to disaster. Trees failing in the canopy fall further behind, lose resources, fall still further behind, and have no means to recover. It may take many years, but they are on a runaway track to humus. We have measured many trees that were clearly losing the canopy battle. Their DBH growth was pitiful and their crowns averaged 13 feet smaller than the Max blue line. I’m not exactly sure where the Alarm red line is. I have placed it 10 feet below the Max blue line.

So, healthy growing black walnut trees live between the two constraining lines. Their crown cannot get too big (they will tip over) or too small (they will be shaded out). For best growth it would be better to have bigger crowns near the Max blue line, so I placed a “Pamper” green line half way between the two constraint lines. The objective is to “manage” crown size bigger than the Pamper green line. Crop trees with crown size bigger than the green Pamper line (2 x DBH) are in good shape and can be left a while to grow. Crop trees with crowns smaller than the green Pamper line (2 x DBH) could support bigger crowns (hence more growth) and are candidates for a little canopy assistance (pampering).

There are some interesting differences between these five plantings:
1. 2004 JFK Ridge 5: These are unusually tall trees planted with white pine trainers on 8'x8' grid. The black walnuts have been crowded but are now slowly dominating the pines. All the black walnut trees, both good and bad, in the planting are shown.
2. 1995 JFK Field 2: These trees were planted on a 14'x14' grid with 50% tulip poplar trainers. All the trainers were killed 4 years ago and the walnut crowns are expanding. All the black walnut trees are included in the data set.
3. 1988 Pence: These are crop trees only from 2 sample plots. There has been a lot of forest management in the Pence plantation. These crop trees (35 per acre) were selected for stem value, not for crown size (, but their crown size is impressive).
4. 1980 JFK Field 1: This monoculture planting has been pruned, but is unmanaged regarding tree population. It is becoming a mix of large dominant trees and squeezed small crown and DBH failing trees. All the trees are included.
5. 1935 Blennerhassett: This monoculture planting is in a park and is strictly unmanaged by park policy. The plot is very crowded and is at the Crown Competition Factor (CCF) ceiling of 225%. Apart from a few impressive "boss" trees, most trees have low resistance and are slowly succumbing to multiple defects. All the trees below 30 inches DBH are shown.

Trees in the open grow in both stem and crown diameter each year, so on the above chart they move to the right and upward along the Max blue line. For every inch of DBH growth, open trees grow two feet of crown diameter. The crowns of trees in a canopy are hemmed in and cannot expand. On the chart they move straight to the right each year. Their DBH increases, but their crown is fixed by their neighbors, so they don’t move upward on the chart. Unless they somehow get more canopy, they will eventually cross over to the dark side of the Alarm red line and start to decline. It’s like constantly making additions onto your house and never changing the furnace. Without some canopy relief, chart points (trees) move to the right and into suppressed growth.

In the chart it is easy to see the difference between managed (like Pence) vs. unmanaged (like Blennerhassett) plantings. The chart demonstrates a natural progression in an unmanaged plantation. Young plantation trees start out with room

for crown space and they grow like open grown trees. As crowding develops nature slowly sorts the "haves" from the "have-knots" and the separation in crown size vs. stem diameter scatters out and becomes greater and greater – the winners near the blue line, losers dropping off the bottom as their crowns fail.

As growers, our goal should be to convert sunlight into the most expensive wood possible, and that is black walnut veneer. Tree crowns are our energy collectors. Our method should be to select veneer-potential crop trees at a young stage, then manage their crown size to keep them growing expensive volume - - - right up between the blue and green lines like Hugh Pence's crop trees.

Taking a closer look at the Pence crop tree data (red diamonds) shows about 25 crop trees below the Pamper green line. These 25 crop trees could profit from an increase in crown diameter. Only 25 trees deserve any attention out of 175 crop trees and 400 total trees. Looking up in the field reveled that about half of the 25 “challenged” crop trees already had room for crown expansion. The extra canopy space was due to earlier general thinning conducted at the Pence plantation. So, in fact only 12 trees out of 400 needed any pampering. The crowns of these 12 challenged crop trees is examined to determine their most offensive neighbor to be culled.

Applying the tree-by-tree pampering method resulted in culling a total of 12 neighbor trees. By contrast, a general thinning to achieve the usual Crown Competition Factor target of 80% would require culling 94 trees. In the case of the pampering method, the difference, 82 trees, can be left to grow another 5 years – time to check the crop tree crowns again.