

## 12. Conifer Spacing, Timing, and Layout

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### Spacing:

Plantation layout is a complex and contentious subject. Maybe it will help to start out with the harvest, 100 years out, and work backwards to planting. Scot Brundage, a Missouri forester with a lifetime of Timber Stand Improvement experience recommended a “Rule of 35 35” for final crop tree density. That means one tree per 35 foot x 35 foot space equals 35 trees per acre. Another rule-of-thumb is that a black walnut tree needs 2 feet of crown diameter space per inch of DBH for unsuppressed growth. So 35 foot crowns are great for 17.5 inch trees, but 30 inch trees need 60 foot crowns, (12 trees per acre) or their growth will be slowed. A partial harvest will solve the problem, but should be conducted before age 60.

To provide a few “insurance trees” we should plan on a 32 x 32 grid of crop trees (space-wise, not a final actual arrangement). Large black walnut trees can reach a long way for canopy space, and it is perfectly okay two have two crop trees side by side. So, the black walnuts should be planted with a 32-foot between-row spacing. Within-row spacing of 8 feet should provide plenty of trees from which to choose crop trees. That would mean eventually choosing the best of 4 planted trees for a crop tree.

Training that kicks in after 10 years of growth is way too late. These young trees thought they were going to be open-grown trees and grew accordingly. All the bad (to us) shade-intolerant tendencies happened, and will not be corrected by any amount of too-late shading

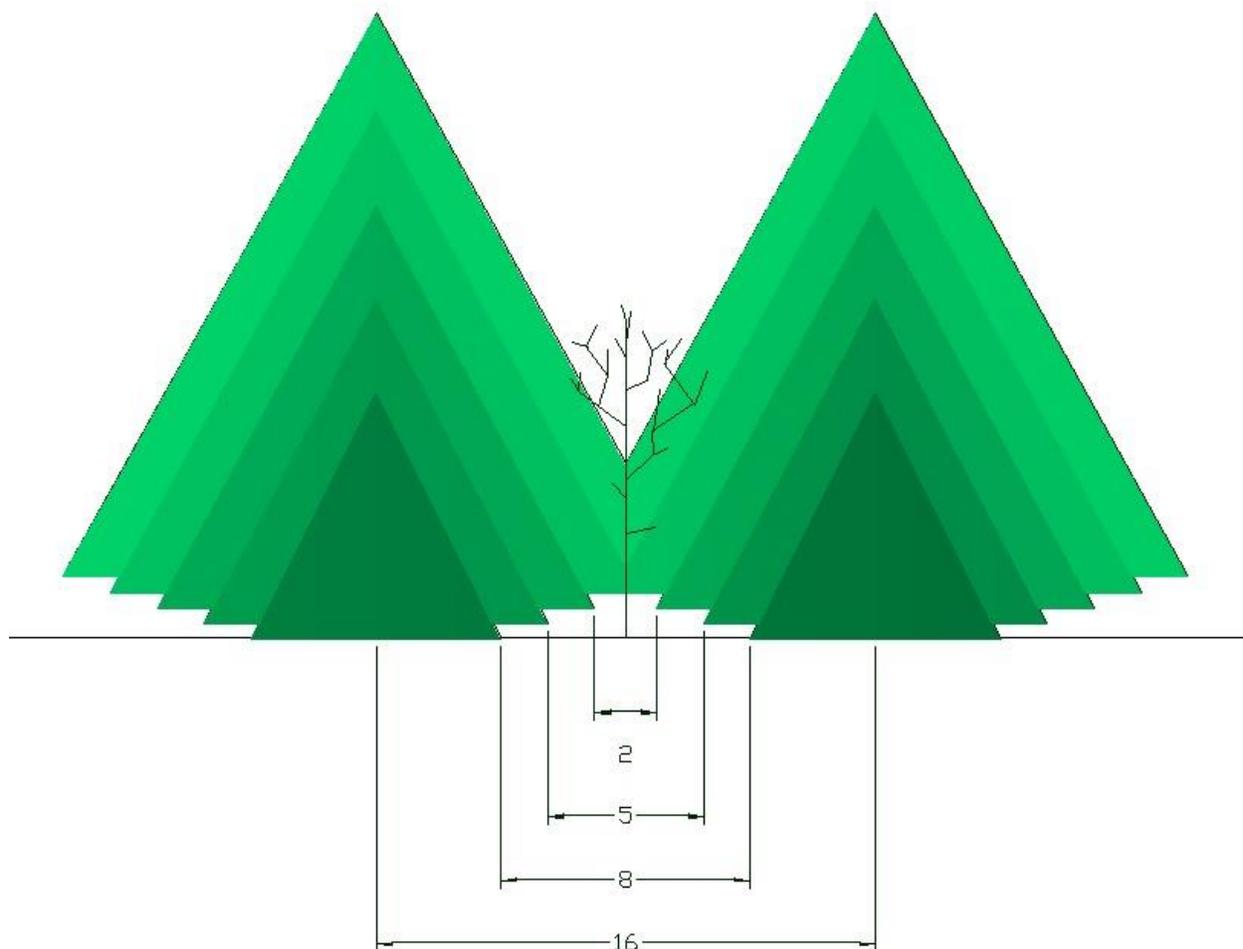
A row of trainers is needed on each side of the black walnut row. That arrangement might look like the layout at the right. These black walnuts were planted for livestock shading, a completely different goal. Both the black walnuts and the pines were planted at the same time and the species of pine used didn't keep up with the black walnut growth. Apart from the relative heights, this layout looks ideal.



**Figure 1. An ideal layout**

The access aisle ways are a great layout plus. These aisles allow access to an otherwise impenetrable tangle. The access is helpful to control invasives, make minor form corrections, culling, and especially a partial harvest that doesn't harm final crop trees.

**Figure 2. A 16 foot access aisle between white pine trainer rows**



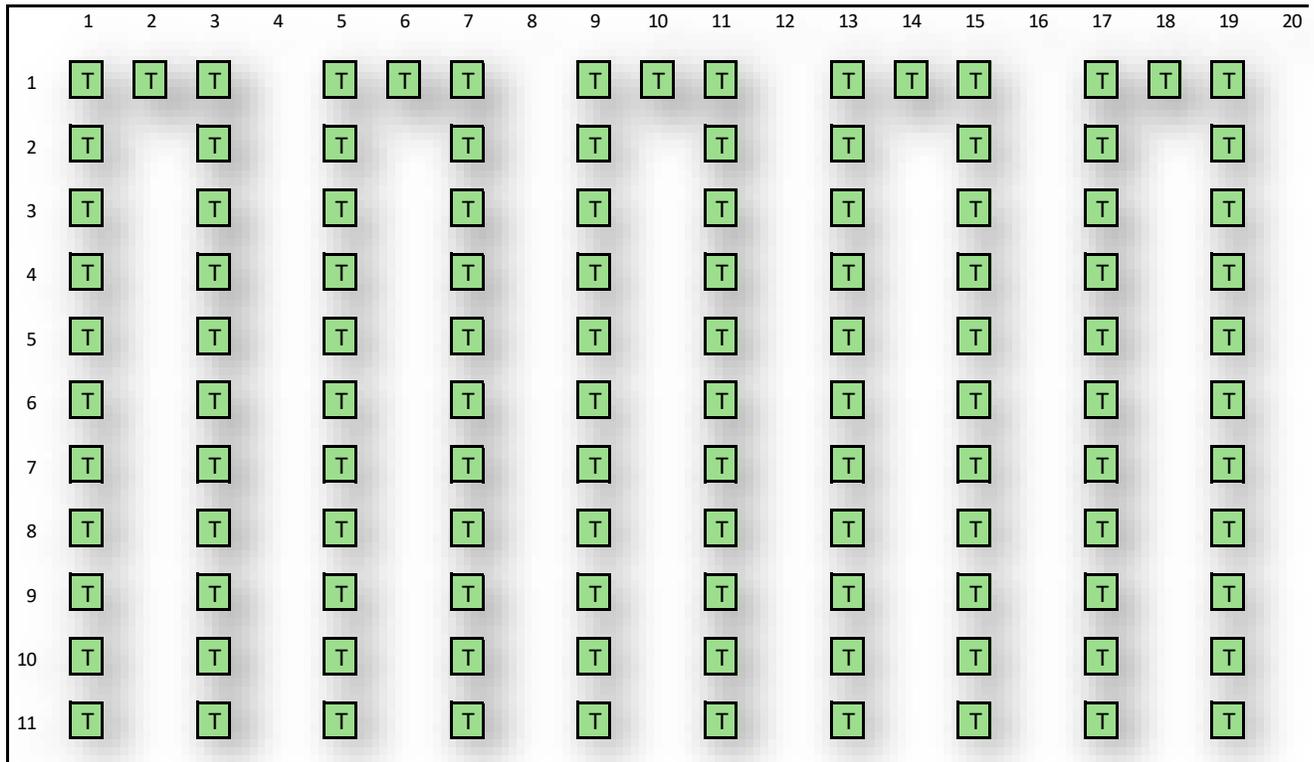
**Figure 3. Conifer growth closing in on a black walnut sapling**

**Timing:**

The diagram above shows a cross section of conifer growth as they close in on the black walnut row. On a good site, white pines typically grow 3 feet a year in both height and diameter. So after a slow start, the access to plant the black walnuts will be closing at 3 feet per year. Rather than specifying a delay time in years for planting the black walnut, we should specify an approach distance. I think at 5 foot aisle ways are about the right time to plant the black walnuts. We are testing this number as a variable in the Blennerhassett experimental planting (see chapter 23.).

Aisle ways of 5 feet are about the last time to get through with a lawnmower and cart full of plants and tools. Both black walnut seed and seedling plants grow very little the first growing season. One can still get through the 2 foot aisle way to do replants the following year. After the second year replants are hopelessly behind and it will be nearly impossible to get in – even crawling.

Since the black walnut planting is to be delayed, the first planting will be “trainers only” with 16 foot between-row spacing, and 8 foot within-row spacing. Give some careful thought to the margins of the planting. These trees will be here for a few lifetimes and cannot be moved. Please read Appendix A before doing any real work. Leave room for equipment turning and logging access.



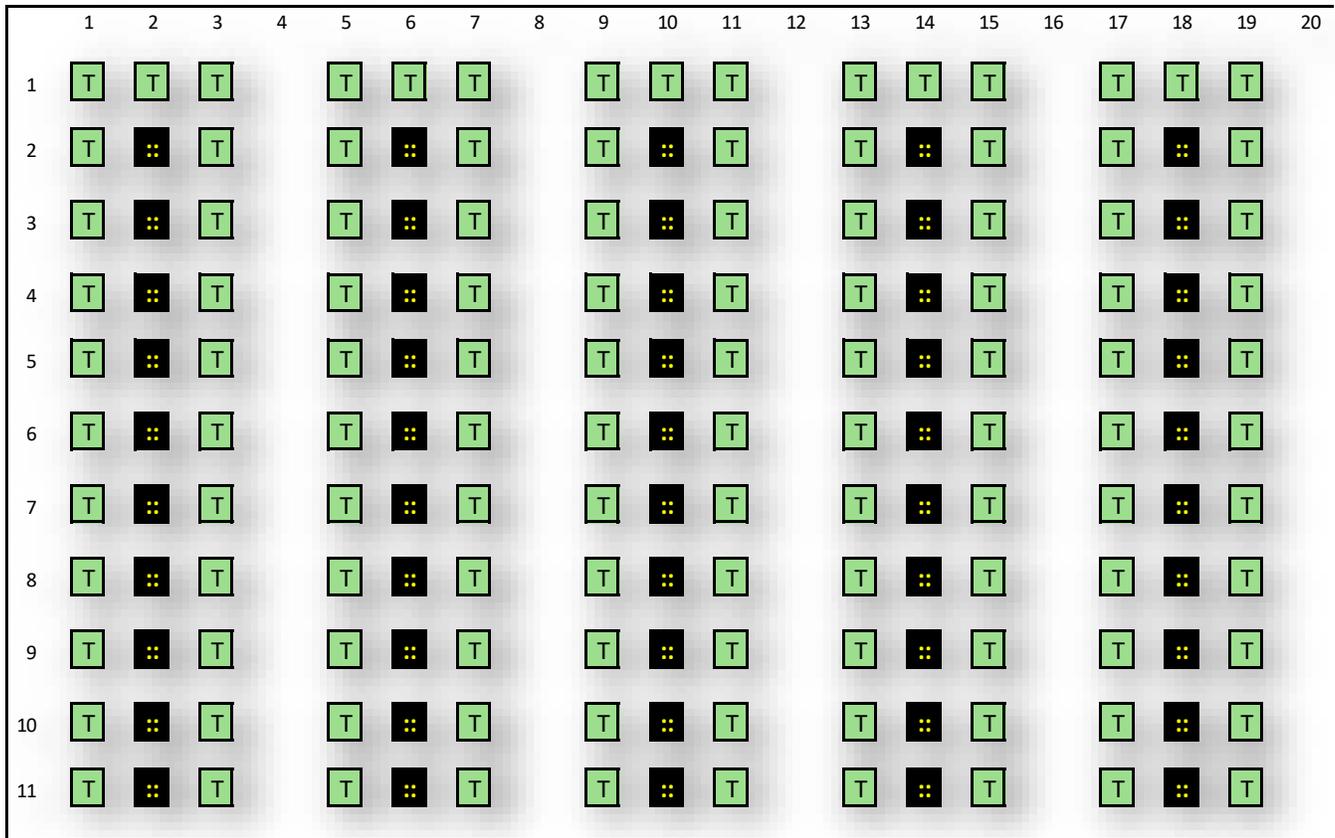
**Figure 4. Year zero, the trainer planting**

This 16 x 8 trainer spacing will take:  $42,560 / (16 * 8) = 333$  trainers per acre. State tree nurseries are a good source for bare root trainer seedlings. Order in October for delivery after mid March.

Chapter 16 deals with planting and caring for the young plants. Deer and weeds will need to be controlled for any hope of success. Plan on replanting trainers the second year. There is no such thing as walk-away forestry, but this will be close once underway.

Now wait for the aisles to close.

In about 5 years when the trainer aisle ways close to 5 feet, it is time to plant black walnuts. The next Chapter discusses possible superior genetic black walnut plant sources. Again young plants may need some pampering during their first growing season.



**Figure 5. Plot layout after delayed black walnut planting. This 32 x 8 foot spacing takes:  $43,560 / (32 * 8) = 170$  black walnut plants per acre.**



***Figure 6. A two year old black walnut being “touched” and over-topped by older white pines. This is ideal spacing and timing. The bottom of the black walnut will soon be in the shading death zone, but the top sees daylight above. The walnut will speed up, and is in no danger (the weeds are in danger)***

It is hard to get a good picture, but in a couple of years the young black walnuts might look like Figure 6. The white pine candles are reaching out like snakes. Experienced hand pruners couldn't resist cutting off the little crotch branch on the right, but it has no hope of causing problems in this setting. The white pines will soon remove it without a trace. What's more in the next year or so this black walnut will take off on a vertical growth spurt and become equal in height with the white pines. Starting about this time the grower's work is over. You have conceded 5 years of black walnut growth time to hire white pines to do the work. Now kick back and let the white pines do their job. Plantation Layout may seem like a trivial issue, but that is far from being true. If you are really going to make a planting, you need to first read a great paper on the subject: *Designing and Establishing a Fine Hardwood Timber Plantation* by James McKenna and Lenny Farlee:

[https://htirc.org/wp-content/themes/child\\_theme/assets/newsletters/nov-2013/07mckenna-p-115.pdf](https://htirc.org/wp-content/themes/child_theme/assets/newsletters/nov-2013/07mckenna-p-115.pdf)



***Figure 7. The tip of a 14 year old black walnut trained by white pine. Once the tree tops are about even, the trainers and black walnuts race up together.***



The tree on the left is what the old veneer buyer meant when he said he never bought a top quality veneer log that didn't come from deep in a forest. You won't find anything like this in a monoculture planting

That is about it. It is not exactly plant-and-walk-away, but almost. There are several important issues addressed elsewhere in this document. The white pine trainers will need deer and weed control for a few years. Black walnut side branches near horizontal will soon run into pine shadow and be removed, but sharp angle co-dominant leaders are a problem and can persist if not removed by hand.

On the positive side, we have no epicormic sprouts, no frost cracks, and no bird pecks. This is not a natural forest, but it is a step closer than a monoculture. We are trying to recreate the unusual forest situation where the rare top quality veneer black walnut trees arise. In general, we can kick back and let the white pines do the work

The black walnut tree at left is 14 years old, 6 inches DBH, and 48 feet tall. It forms the skeleton of a future veneer log, or two, or three. There is no trace on the bark that it ever had lower branches, no cat-faces, no bumps. It still depends on its white pine neighbors for support. It would be dangerous to remove the trainers at this time. The black walnut is very slowly defeating the white pines both in the canopy and below ground. To continue doing nothing here is a good plan. I can manage that.

***Figure 8 Young black walnuts stretch up and soon become as tall as their trainers. The white pine trainers are definitely not as healthy as in Figure 6.***

## Laying-Out Method Details

Getting into such fine detail here may seem a bit anal, but I have laid out many plots, and worked in many plots that were poorly laid out. The owners usually had remorse, but alas too late. If you have a GPS controlled tree planter you can skip this section. Also this method might be a waste of time for a small triangular plot.

To use this method requires a prepared string, black and red felt tipped markers, a heavy hammer, lots (2 per row) of short wooden stakes, lots of wire flags, and a long tape measure. This example assumes 8' x 8' spacing, although every intersection need not be planted..

Buy a mason's string longer than the plot size, but 500 feet is about the limit. Iridescent pink or white are good colors. Nylon string breaks when stretched a little over 5%, so I plan on a 4% stretch. I cut a  $\frac{3}{4}$ " x 6" board 90.5 inches long. That is  $(96 - 1.5) * 96\%$ . Make a big loop knot on the end of the string, hook it on one end of the board, then wrap the string around and around in the long direction of the board – snug, but not stretched. Where the string rounds one end of the board, mark the string with a black Sharpie. Mark the string on the other end with a red Sharpie. Be sure to roll the string a little to get the permanent ink more visible. The string should have visible alternating black and red marks 8 feet apart when stretched. Cut another board about 2 feet long to store the string. Print the name of the plot on the storage board. The string and the board belong to the plot and will be useful for many years.

Now to generally layout the plot: I usually do this without a helper because no one can stand how fussy I am. So don't use a friend you want to keep. You need to create a long baseline perpendicular to the row direction. Hopefully this would be the position of the first tree in every row – maybe 20 feet from your fence, ditch, or property line. Stretch the string out on the baseline and drive stakes to mark the beginning end of each row to be planted. To decide which color will be trainer rows, remember that the outside row needs to be an all trainer row. Use permanent stakes for the ends of the baseline. With a felt tip write on the string storage board exactly how the baseline was created. Example: Start 23' 6" from Kirby's fence and 2" from Maldore's property line.

Now another long baseline is needed far away from and parallel to the first baseline. This second line should be some multiple of 8 feet from the first baseline. Again drive stakes at the marks where tree rows will be planted.

When planting time comes, stretch out the string for row #1 and plant the trees 10" from the black and red marks to the side opposite row #2. This will let you move the string to row #2 without the new plants being in the way. Windy conditions can be a problem when stretching a long string. The wind is usually calm here in the early morning and looking at the string toward the sun greatly helps visibility

This may all sound a little picky. Try it your way first, then I think you will understand and come around.



*Too little*



*Just right*



*Too much*

The black walnut plantation on the left was planted on 14' x 14' grid, and hand-pruned about every other year. The poor stem quality shown is typical for this plot – a lot of work and little chance for veneer quality. The plot in the two pictures on the right was started as we are prescribing. The plot never saw mowing, pruning, fertilizer, pesticide, or herbicide. The black walnut in the center picture has a veneer factory in its future. The right picture shows the available power of white pine trainers. This spaghetti noodle black walnut tree has been shaded too high and too long. It fell behind and will continue to fall further behind. It is growing too slow to stay alive. If released it will “candy-cane”. It is now a thinning challenge to even keep this tree alive and upright. We will talk about helping trees like this in *Chapter 12. Pampering Crop Trees*. Some variation of results is expected due to genetics, which

may explain the specimen on the right, but the majority will do well and there are plenty of beauties to choose for crop trees.

The impressive accidental results, like the black walnut in figure 8, prompted a group of us to make an experimental planting. We wanted to explore conifer trainer geometry, suitable conifer species, and various black walnut planting delays. The goal was to develop a solid silvicultural practice to produce clear black walnut stems (on your first try - you only get one try). We obtained an agreement to use a super black walnut site on West Virginia's Blennerhassett Island State Park. More on the Blennerhassett project in chapter 23.