A Closer Look at Stem Quality of Old-Field Planted Longleaf Pines

The Georgia Forestry Commission has been working in conjunction with the University of Georgia on a longleaf pine stem quality study funded by a grant from the US Forest Service. This study was performed with the primary objective of quantifying the sawtimber and pole potential of longleaf pine trees planted in old-fields/pastures/hay fields. More than 200 landowner sites were inventoried for stocking, condition and form quality.

Many landowners and managers are concerned about the long-term economic value of longleaf pine stands planted on these sites. While longleaf has typically been known for its sawtimber and pole potential, these observations have mostly come from natural stands with high initial stocking and slower growth patterns. Planting densities of 400-600 trees per acre on highly fertile soils can produce a much different stand.

As objectives vary from landowner to landowner, so does the acceptable or desired stocking in the stand. For a wildlife emphasis, a basal area (BA) of 40-50 square feet per acre might be acceptable, while those with a timber focus may want a basal area of 65-90 square feet per acre. The quality of the stocking also comes into play. For the purposes of this study, stem quality was evaluated in the first and second log (lower 33 feet) of the tree.

Data Summary

Table 1 summarizes the averages for 20% of the landowners sampled or 2,000 trees of the total sampled plots. As can be seen, average planting densities were low and survival was moderate through the first 14 years. The surviving trees displayed significant defects on more than 50% of stems within the first two logs. The main longleaf stem defects were forking and ramicorn branching, accounting for 89% of all stem defects (Figure 1). Keep in mind that these are averages, with individual stands performing better or worse than these numbers indicate.

Table 1: Old-field planted longleaf pine stand averages prior to thinning (age range 10 – 17 years old).

Initial Planting Density	Survival at Time of Site Visit	Defect in 1st log (0-16 feet)	Defect in 1st+2nd log (0-33 feet)	No Defect in 1st+2nd log (0-33 feet)
500 trees per acre	355 trees per acre (71%)	109 trees per acre (30.7%)	190 trees per acre (53.5%)	165 trees per acre (46.5%)

Figure 1: 12-year old longleaf pine trees planted on old-field sites displaying common defects of ramicorn branching (first two pictures) and stem forking (last picture). These defects accounted for 89% of all stem defects in sampled stands. Trees with defects in the first 17 feet will be pulpwood while those with a defect in the 17-33 feet section of stems may have one to one-and-a-half logs of potential sawtimber.

Implications for First Thinning Scenario- Fifthth Row Plus Selection Thinning

Allowing for the longleaf stem quality data collected and the averages presented in the previous section, one can begin considering the factors associated with the first thinning and future management of the stand. Most planted longleaf stands are first thinned between 15 and 22 years old, when the basal area reaches 120 square feet per acre. In current thinning practices, entire rows of trees are taken and defective trees are removed from the rows left in between. In the scenarios detailed in Table 1 and Table 2, the stands are thinned removing all trees in every fifth row and removing defective trees from the four rows in between. In Table 2, only the trees with a defect in the first log (0-17 feet) are removed from the four rows in between. In Table 3, the trees with a defect in the first or second log (0-33 feet) are removed from the four leave rows.

Table 2: Figures for fifth row removal plus selection thin scenario using plot data averages – thinning only trees with a first log (0-17 feet height) defect in the selection portion of the thinning.

Average Survival	Trees Harvested in 5th Row Removal/Acre	Defective Trees Selectively Removed/Acre	Total Trees Removed/Acre	Remaining Trees/Acre
355	71	87	158	197

Table 3: Figures for fifth row removal plus selection thin scenario using plot data averages – thinning only trees with a first or second log (0-33 feet height) defect in the selection portion of the thinning.

Average Survival	Trees Harvested in 5th Row Removal/Acre	Defective Trees Selectively Removed/Acre	Total Trees Removed/Acre	Remaining Trees/Acre
355	71	152	223	132

Because these numbers are averages, each individual stand will need to be evaluated by a professional forester to determine the exact management prescription. Figure 2 shows the variability in the number of stems without defect in the first and second log (lower 33 feet) by stand when applying the fifth row removal plus selection thin scenario described above.

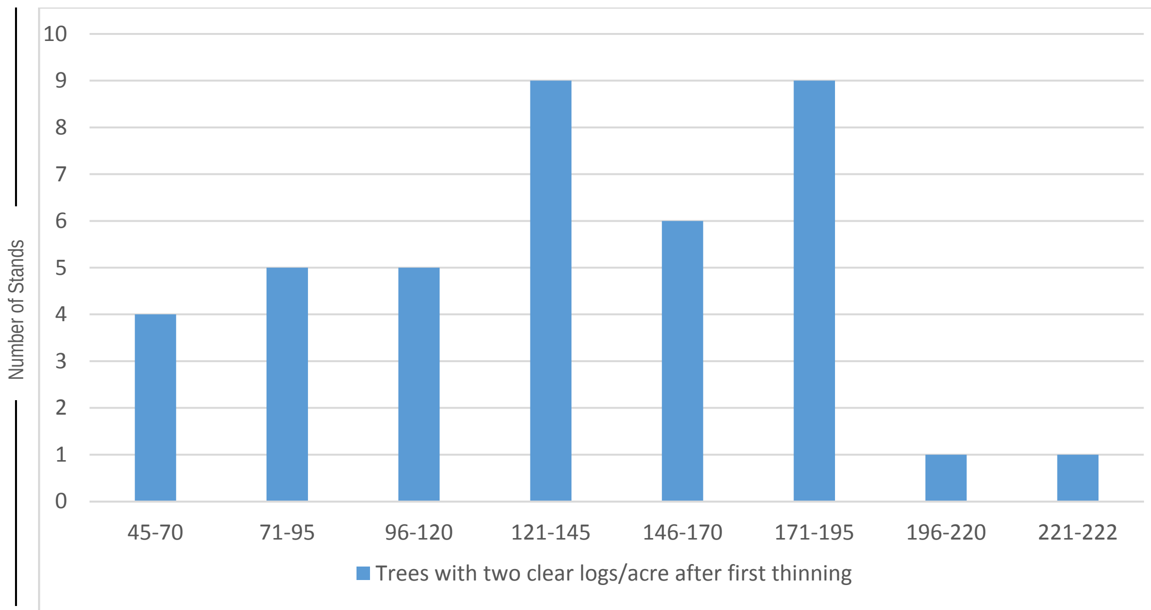

Figure 2: The number of stands (Y-axis) that have a given range of stems with two clear logs (X-axis) after a fifth row plus selection first thinning in old-field planted longleaf sites.

The ultimate goal of the thinning process is to end up with 60-80 well spaced trees per acre, with at least two clear logs to carry to the end of the rotation. This final number is usually achieved through at least two commercial thinnings, with the first thinning reducing stocking to 150-200 trees per acre and the final thinning leaving 60-80 of the best trees per acre. However, the low original stocking found in some (25%) of the stands may result in those receiving only one thinning, as there may not be enough stems per acre to support multiple commercial thinnings.

Summary

The study validated the concern over stem quality within many of these old-field longleaf pine stands. The average survival rate of the stands was 71% resulting in 355 living trees per acre. On average, these living stems were 30.7% pulpwood, 22.8% one clear log and 46.5 % two or more clear logs. By far, the main longleaf stem defects were forking and ramicorn branching. Removing all of the pulpwood and one log trees during the first thinning will likely result in the removal of too many stems; based on this study over 50% of the time. While the averages show numbers slightly above the marginal threshold for acceptable stocking, the numbers are highly variable and show a need for detailed, individual stand assessments.

Recommendations

Each landowner has a unique set of near- and long-term objectives for his or her longleaf pine stands. These objectives set the acceptable levels of trees per acre and/or basal area for each stand. The following recommendations should assist the forest landowner managing existing longleaf pine stands planted on old-fields, as well as those seeking to establish quality stands of longleaf pine on similar sites.

- Existing stands should be inventoried by a registered forester to estimate the number of "quality" longleaf stems per acre. Use this data to carefully evaluate the stands to determine future harvest types and intensities.
- Existing stands should be marked by a registered forester before the first thinning. The study showed high levels of stem defects and marking will result in the retention of the very best trees on the site. It will also ensure that basal area targets are met and will better control the level of defect left on the site.
- When establishing new stands, plant from 600 to 900+ longleaf seedlings per acre. More initial trees per acre provides additional trees to select from in the first thinning. Higher density establishment rates more closely mimics natural stands known for their high-quality stems.
- When establishing new stands, plant at more of a square spacing, such as a 7x9 feet (691 TPA) or 6x10 feet (726 TPA) versus a more rectangular spacing of 6x12 feet (605 TPA). This spacing should help with the pruning process and possibly aid in reducing wind speed in the stand, which may contribute to terminal breakage and forking.
- Although not proven in longleaf, consider broadcast applying elemental-boron at one pound per acre. Boron is known for improving terminal growth dominance, potentially reducing forking. (C.Montes pers. comm. Warnell School of Forestry and Natural Resources).

The entire paper and data used to formulate this document can be found at:
https://bugwoodcloud.org/bugwood/productivity/pdfs/Longleaf_stem_quality_paper_March_2018.pdf.

Authors: Laura Bosworth and Scott Griffin, GFC
Dr. David Dickens and Dr. Dave Moorhead UGA – WSF&NR
2018