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Diameter Distribution Models: Loblolly Pine Plantations

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DIAMETER DISTRIBUTION MODELS

Loblolly Pine Plantations

A parameter recovery procedure for the Weibull distribution function based on four percentile equations was used to develop a diameter distribution yield prediction model for unmanaged loblolly pine (Pinus taeda L.) plantations in east Texas. This model was compared to the diameter distribution models of Lenhart (1988) and Knowe (1992), which have been used in east Texas. All three models were evaluated with independent observed data. The model developed in this study performed better than the other two models in prediction of trees per acre and cubic-foot volume per acre (wood and bark, excluding stump) across diameter classes. Lenhart□s model consistently under-estimated the larger diameter classes because it was originally developed with data mostly collected in young plantations. Knowe□s model over-estimated volume in sawtimber sized trees, which could lead to over-estimations of volume in older loblolly pine plantations found in east Texas. An example cubic-foot volume per acre wood and bark yield curve is provided below (Figure 1) for an initial planting density of 600 trees per acre for a range of site index values. These results support the recommendation that forest managers should use growth and yield models designed and/or calibrated for the region in which they are implemented.
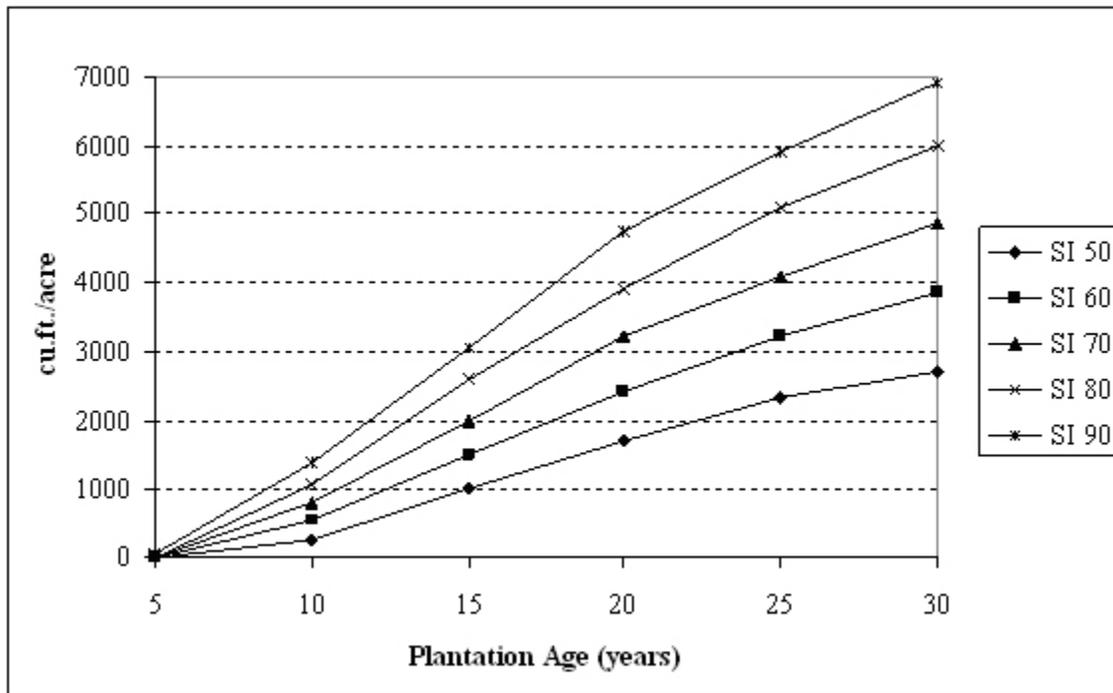

Figure 1. Predictions of cubic-foot volume wood and bark excluding stump per acre (volume) over time from the new east Texas loblolly pine growth and yield model with 600 initial trees per acre for different levels of site index (SI in feet, base age = 25 years).

Slash Pine Plantations

A parameter recovery procedure for the Weibull distribution function based on four percentile equations was used to develop a new diameter distribution yield prediction model for unmanaged slash pine (Pinus elliottii Engelm.) plantations in east Texas. This new model was similar in structure to the model of Lee and Coble (2006) in their work with east Texas loblolly pine plantations. The new model was compared to the diameter distribution model of Lenhart (1988), which was developed for slash pine plantations in east Texas, as well as to two other models developed using iterative techniques suggested and inspired by Cao (2004). The model developed in this study was preferred over Lenhart (1988) and the other two models in prediction of total trees per acre, basal area per acre, quadratic mean diameter, and cubic-foot volume per acre (wood and bark, excluding stump). An example cubic-foot volume per acre wood and bark yield curve is provided below (Figure 2) for an initial planting density of 600 trees per acre for a range of site index values. We recommend that the model developed in this study be used to estimate growth and yield of east Texas slash pine plantations.
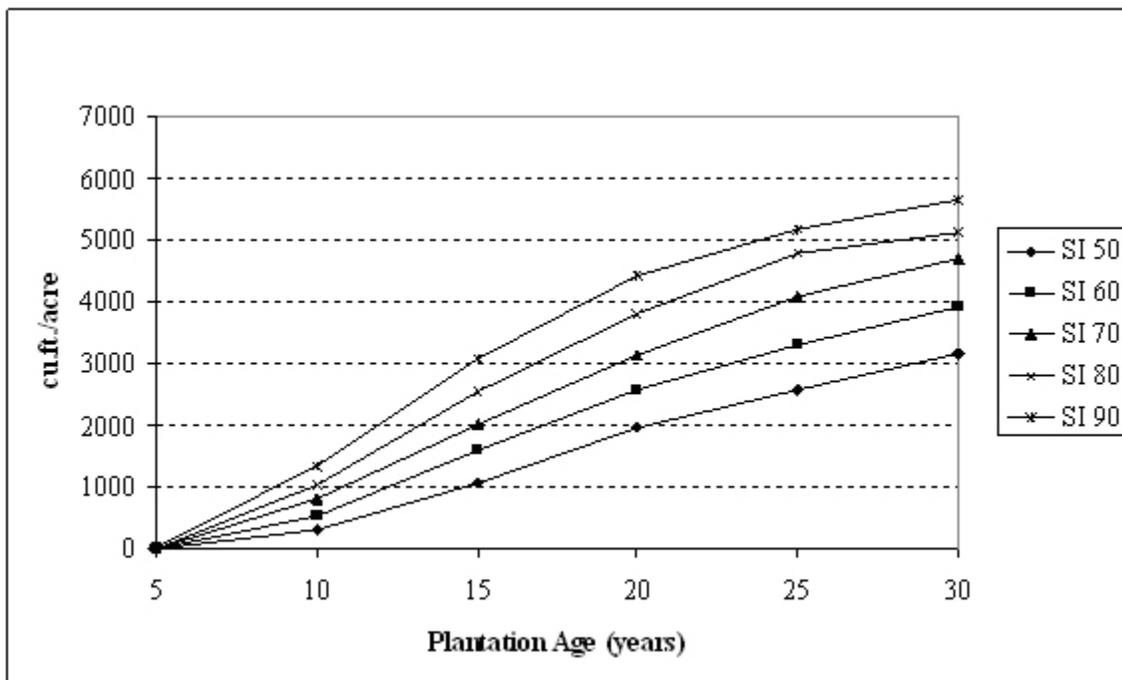

Figure 2. Predictions of cubic-foot volume wood and bark excluding stump per acre (volume) over time from the new east Texas slash pine growth and yield model with 600 initial trees per acre for different levels of site index (SI in feet, base age = 25 years).

References

Lee, Y.J, and D.W. Coble. 2006. A new diameter distribution model for unmanaged loblolly pine plantations in east Texas. South. J. Appl. For. 30(1):13-20.

Coble, D.W., and Y.J. Lee. 2008. A new diameter distribution model for unmanaged slash pine plantations in east Texas. South. J. Appl. For. 32(2):89-94.

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