

DIAMETER-HEIGHT AND CROWN RELATIONSHIPS FOR LOBLOLLY PINE FROM NORTH CAROLINA AND OKLAHOMA-ARKANSAS SEED SOURCES NEAR THE WESTERN EDGE OF THE NATURAL RANGE

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Abstract—In southeastern Oklahoma, loblolly pine (*Pinus taeda* L.) has been planted extensively outside the western boundary of its natural range. Furthermore, many plantings have been based on seed sources such as North Carolina Coastal (NCC) rather than Oklahoma-Arkansas (OA). NCC plantings are also frequent in nearby areas of Oklahoma and Arkansas which are within the loblolly pine natural range. A loblolly pine seed source and density trial planted in 1983 on Carter Mountain near Broken Bow, OK, provided the opportunity to compare individual tree characteristics of NCC vs. OA seed sources in a location just beyond the western edge of the natural range. The study site is a rocky, mountain soil. North Carolina and OA seed sources were planted at 4- by 4-feet, 6- by 6-feet, 8- by 8-feet, and 10- by 10-feet spacings. Diameter at breast height (d.b.h.) of sample trees ranged from 4 to 13 inches, with heights ranging from approximately 30 to 70 feet. The study consists of 19 plots for which individual tree measurements were made in 2000, 2001, 2002, 2005 and 2008. D.b.h. was measured on each tree while heights and heights to live crown base were measured on a subset of trees on each plot. Nonlinear regression techniques were used to develop models relating tree heights and crown lengths to d.b.h. Dummy variables representing loblolly pine seed sources (NCC and OA) were included in height, crown, and local volume models where significant to represent seed source effects on total height, crown length, and cubic-foot volume inside bark. Dependent variables for regression analysis included measured height, crown length, and computed inside bark volume on individual trees. Inside bark cubic-foot total volumes were obtained by using the equation of Tasissa and others (1997). Individual tree volumes were then regressed against individual tree basal area with dummy variables to indicate seed source. Regression relationships between individual tree d.b.h. and height indicated a significant difference due to seed source, with the North Carolina source being approximately 7 percent taller across the d.b.h. range in these data. This indicates that the North Carolina seed source is outperforming the OA seed source in height growth even at the extreme western edge of the loblolly natural range. The average d.b.h.-height relationship also was significantly affected by density, but the North Carolina seed source was taller on average per given d.b.h. for all densities. In addition to being taller, for a given d.b.h. the average individual North Carolina trees had a significantly longer live crown (approximately 2 to 3 feet longer at d.b.h. 5 to 10 inches) and significantly more cubic stem content (from 6.6 percent at 12 inches d.b.h. to 8.8 percent at 5 inches d.b.h.) than the average individual tree from the Oklahoma seed source.

LITERATURE CITED

Tasissa, G.; Burkhart, H.E.; Amateis, R.L. 1997. Volume and taper equations for thinned and unthinned loblolly pine trees in cutover, site-prepared plantations. *Southern Journal of Applied Forestry*. 21: 146–152.

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