Diameter Distributions of Juvenile Stands of Loblolly Pine (*Pinus taeda* L.) with Different Planting Densities

by

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ABSTRACT

Diameter distributions of juvenile loblolly pine (*Pinus taeda* L.) with different planting densities were characterized utilizing a two-parameter Weibull distribution. Trend analysis was employed to describe the effects of planting density, age, relative spacing, and rectangularity on the estimated diameter distributions for juvenile loblolly pine. A reparameterization of the two-parameter Weibull distribution was sought to reduce the dispersion of the estimated shape parameter.

Methods that quantify the amount of inter-tree spatial dependency in a particular stand were applied. Empirical semivariograms were derived for each plot over all ages to enable spatial trend recognition. Moran's I and Geary's C coefficients were estimated for ground-line diameters from ages 2 to 5, and for breast height diameters from ages 5 to 11. Though there was no discernable trend in the presence of significant spatial autocorrelation with planting density, an initial negative trend with age was present, but leveled off by age 5. A conditional autoregressive model was utilized to evaluate the amount of spatial influence stems in a stand have on one another. The occurrence of

significant spatial influences was positively associated with age through age 8, the trend then leveled off; no recognizable trend was detected with planting density.

These indices help to describe stand dynamics that are influenced by the spatial distribution of stems. Models to predict the parameters of the two-parameter Weibull distribution were developed to aid in forecasting and simulation of juvenile loblolly pine. Simulations were conducted where a spatial dependency was imposed on the diameters within a stand. The spatial structure simulation enables accurate representations of stem characteristics when simulating forest stands that include spatially-explicit information.

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