A STAND DENSITY MANAGEMENT DIAGRAM FOR NORWAY SPRUCE PLANTATIONS IN CENTRAL NEW YORK

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Abstract—Norway spruce (*Picea abies* (L.) Karst.) is an economically important species in the State of New York. It has been widely planted, especially in the 1930's, and currently occupies about 100,000 acres of forest land in New York (46 percent sawtimber, 36 percent poletimber, and 18 percent sapling). Many of these plantations have already received thinning treatments over years. However, there is little information or few management tools available to guide forest managers in deciding when to start thinning and in selecting appropriate thinning intensities. The objective of this study was to construct a stand density management diagram for the Norway spruce stands in central New York.

A total of sixty-five plots (size 0.01 - 0.25 acre) were sampled from the Norway spruce plantations in six counties in central New York. Tree diameters at breast height were recorded and summarized to stand attributes such as the number of trees per acre (TPA), stand total basal area (BA) in square feet per acre and quadratic mean tree diameter (QMD) in inches. Only fully-stocked or most crowded stands undergoing self-thinning were selected and utilized to formulate the self-thinning line. Major axis regression was applied to estimate the slope and intercept coefficients of the self-thinning equation, resulting in:

Ln(QMD) = 6.18 - 0.63 * Ln(TPA)

A stand density management diagram was then constructed. To illustrate the applications of the diagram, a forest growth and yield model, NE-TWIGS, was used to simulate long-term stand developments of Norway spruce for a range of initial stand densities and different thinning regimes. Figure 1 shows the time trajectories of three hypothesized Norway spruce plantation stands: (1) a stand with a density of 2722 TPA (4x4 ft spacing) at age 10 and no thinning; (2) a stand with a density of 1210 TPA (6x6 ft spacing) at age 10 and three commercial thinnings to 700 TPA at age 40, to 400 TPA at age 70 and to 200 TPA at age 100; and (3) a stand with a density of 1210 TPA at age 10 and one pre-commercial thinning to 200 TPA at age 10.

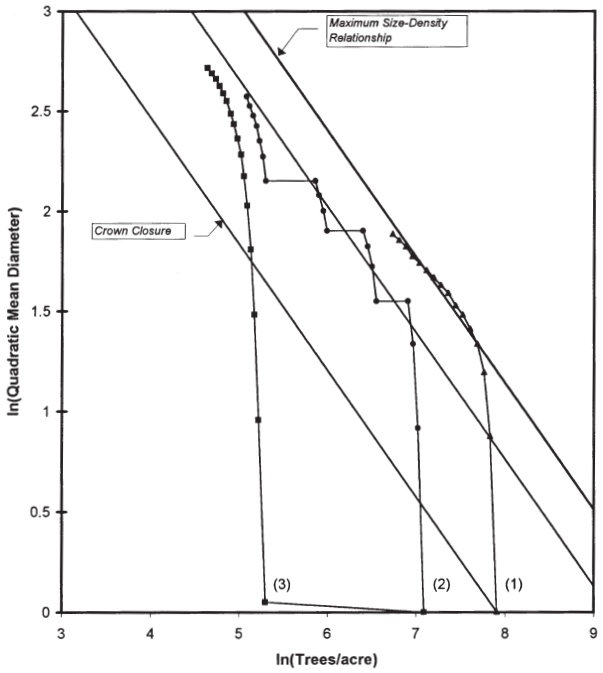

Figure 1—A stand density management diagram for the Norway spruce plantations in central New York. Simulations using NE-TWIGS for three hypothesized stands (from the right to the left): (1) a stand with a density of 2722 trees/acre (4x4 ft spacing) at age 10 and no thinning; (2) a stand with a density of 1210 trees/acre (6x6 ft spacing) at age 10 and three commercial thinnings; and (3) a stand with a density of 1210 trees/acre at age 10 and one pre-commercial thinning.

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