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PARENT SESSION

Contributed Oral Session 100: Modeling: Forest Systems

Wednesday, August 10, 1:30 PM - 5:00 PM, Meeting Room 519 B, Level 5, Palais des congrès de Montréal

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Determinants of foliage clumping in two-year-old short rotation coppice poplar canopies: assessment from 3-D plant mock-ups.

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ABSTRACT- Light interception by tree vegetation depends on canopy structure, including the extent of leaf area, leaf orientation and foliage clumping. Presently, little is known about the geometrical and botanical attributes of the tree canopies which define foliage clumping. In this study, we used three-dimensional plant mock-ups of two-year-old coppiced poplar (*Populus* spp.) canopies for clones Ghoy (*P. deltoides* Torr. & Gray x *P. nigra* L.) and Trichobel (*P. trichocarpa* Torr. & Gray x *P. trichocarpa*) in combination with light interception computations to investigate foliage clumping. Plant models were constructed from biometric measurements and allometric relationships at five dates during a growing season. The sensitivity of the canopy transmittance and the clumping parameter were studied by numerically varying botanical attributes, namely leaf shape, phyllotaxy, petiole length, internode length and shoot inclination. The clumping parameter was strongly correlated to the relative variance of leaf area density (r^2 = 0.7-0.8), computed by dividing the canopy space into 3-D boxes of 10 or 20 cm. The overall effect of changing botanical parameters was relatively low and made canopy transmittance change from -0.1 to +0.05. Petiole length, shoot inclination angle and leaf shape had the most significant effect on light interception and foliage clumpiness, while internode length and phyllotaxy were less sensitive parameters. However, biomass cost analysis showed that actual petiole length optimised the efficiency of biomass investment in light capture. Similar studies could be further undertaken to identify management options, which could allow increasing light capture efficiency, especially planting pattern.

Key words: light interception, geometrical attributes, botanical attributes, 3-D CPCA model