Factsheet 2

Seedlot Genetic Worth Values Verified for Coastal Douglas-fir at Age 12

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INTRODUCTION

This study evaluates whether genetically selected orchard seed meets expectations for stem-volume-per-hectare growth gains, and whether these gains hold up across a range of plantation densities and site indices. A more detailed report is provided by Stoehr et al. in Ministry of Forests and Range Extension Note 104 and in Stoehr et al., 2010[3]. This bulletin summarizes key operational information.

Seedlings from wild-stand seedlots with a genetic worth for growth of 0 (GWg=0) were compared with two select seedlots representing a moderate genetic gain for growth rate (mid-gain GWg = 10) and high genetic gain (GWg =18). Seedlings were planted in replicated 144-tree blocks (12 x 12) on five field sites with various site indices. All sites are located in the south-coastal area of British Columbia, under 700 meters elevation. Four plantation spacings were used (1.6 m, 2.3 m, 2.9 m and 4.0 m; 3906, 1890, 1189 and 625 stems/ha, respectively). Stand density levels purposely bracketed operational densities to provide information for modelling purposes. Each of the five sites has a total of 2 replications x 3 genetic levels x 4 spacings x 144 trees/plot = 3456 trees.

RESULTS

Mortality

Plantation initial survival was high on all sites (>95%). By age 12, the most-dense spacing (1.6m) was beginning to show competition-induced mortality. No significant differences were observed in early mortality or in competition-induced mortality among the seedlot genetic-gain levels.

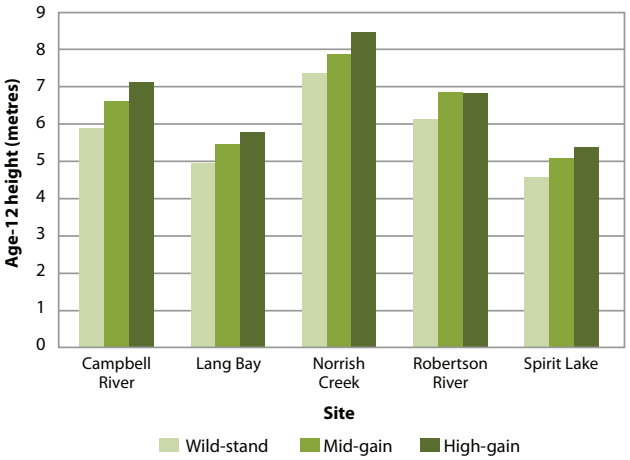

Figure 1. Comparison of age-12 heights averaged by seedlot genetic worth (GWg) across five coastal Douglas-fir realized genetic-gain trials. Wild-stand seed has a GWg of 0, mid-gain GWg = 10, and high-gain GWg = 18.

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RESULTS (continued)

Growth

Tree height and stem volume per hectare varied widely among the five sites, reflecting the range of site indices. Height differences among seedlot GWg levels were statistically significant, with the mid-gain and high-gain seedlots averaging 10% and 15% taller, respectively, over wild-stand seedlots (Figure 1). Based on seedlot GW levels, expected gains for height at age 12 are 10% and 18%.

Seedlot differences in stem-volume per hectare were statistically significant, with mid-gain and high-gain seedlots averaging 29% and 48% greater volume, respectively, than wild-stand seedlots (Figure 2). Expected gains at age 12 for these seedlots are 20% and 36%, respectively. Both height and stem volume gains from the use of high GWg seedlots held up across the range of site qualities used in the study.

Stand density effects

Both volume per hectare and diameter at breast height (DBH) varied significantly among the stand densities used. However, no significant differences in height were detected across the stand densities. There were also no significant interactions between stand density and seedlot GWg for height, DBH, or volume, suggesting that faster growing seedlots maintain their growth advantage across a range of stand densities.

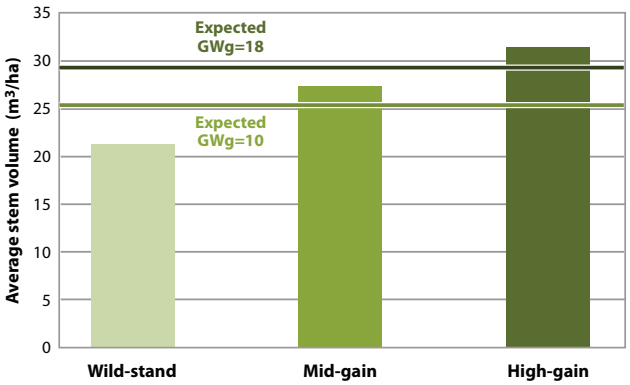

Figure 2. Average stem volume per hectare at age 12 for wild-stand, mid-gain (GWg = 10), and high-gain (GWg = 18) seedlots. Data are averaged over 5 sites and 4 stand densities.

APPLICATION OF RESULTS

Results from this study add confidence to seedlot genetic worth estimates and the application of these values in timber supply analyses. These, and future data from the study will help refine growth models, such as TASS and its interpolation program, TIPSY[4], (Ministry of Forests Lands and Natural Resource Operations), and support the ongoing development of genetic selection procedures for tree breeding and seed orchards.

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[3] Stoehr, M., K. Bird, G. Nigh, J. Woods, and A. Yanchuk. 2010. Realized genetic gains in coastal Douglas-fir in British Columbia: implications for growth and yield projections. Silvae Genet. 59(5):223-233.

[4] Mitchell, Kenneth J., Stone, Michael, Grout, Shelley E., Di Lucca, Carlos Mario, Nigh, Gordon D., Goudie, James W., Stone, Jeff N., Nussbaum, Albert J., Yanchuk, Alvin, Stearns-Smith, Stephen, and Brockley, Robert. 2004. TIPSY V4.2. http://www.for.gov.bc.ca/hre/software/