

Deciduous Competition: Impact on Growth of Plantation Spruce

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In British Columbia (BC), forest companies are required to meet administratively set free-to-grow standards within a specified timeframe before responsibility for the plantation can be transferred back to the Crown. In recent years, it has become apparent to industry and government forest professionals that a disconnect exists between administrative and biological free-to-grow. Stands that are obviously biologically free-to-grow (harvest in 50 to 70 years without further intervention) are not administratively free-to-grow because of a deciduous component. Considerable sums have been spent on chemical and mechanical brushing treatments to meet administrative free-to-grow requirements. The total free-to-grow liability in central and northern BC exceeds 100 million dollars. Financial and ecological benefits would accrue if administrative brushing was reduced.

We have studied the relationship between birch (*Betula papyrifera* Marsh.) or trembling aspen (*Populus tremuloides* Michx.) competition and interior spruce (naturally occurring hybrids of *Picea glauca* (Moench) Voss and *P. engelmannii* Parry ex Engelm.) growth since 2001 in sub boreal and boreal forests of BC. In the sub boreal east of Prince George, BC, significant levels of paper birch appear to have little or no impact on spruce growth (Table 1) in a 16-year-old plantation. In addition, percent white pine weevil (*Pissodes strobi* Peck) attack of spruce is significantly reduced when growing with birch. Surveys of understory vegetation demonstrated no significant variation in species diversity (richness,

α , or β measures) between brushed and non-brushed treatments. Species composition varied between treatments with a greater occurrence and abundance of 'weedy' and pioneer species in brushed areas.

West of Mackenzie, BC in the sub boreal, we observed that aspen densities up to 4000 stems per hectare (sph) had no impact on radial growth of spruce: diameter at breast height (dbh) was 1.7 cm with no aspen and 1.6 cm with 4000 sph of aspen in plantations up to 13 years of age. We sampled 8 stands, ranging in age from 10 to 19 years, in the boreal forest near Fort Nelson, BC and observed similar spruce responses to birch competition (Table 2). The results from this wide range of sites suggest that spruce can thrive with considerably more deciduous competition than is outlined in the administrative free-to-grow regulations. As a result for these stand types, less brushing is required and stands with more structural and species diversity will develop.

Table 2. Mean spruce growth response by birch density class in Fort Nelson.

Variable	Stems per hectare					
	0	1000	2000	3000	4000	5000
DBH, cm	8.0	7.1	7.2	6.8	7.1	6.7
DBH inc, mm	6.5	8.2	5.2	5.1	7.6	5.9
HDR	71	77	79	81	79	84

Table 1. Sixteen-year measurements for a spruce–birch complex in the sub-boreal BC forest.

Treatment	Stems per hectare		DBH, cm		Height, m		Volume, m3		WPW attack ¹
	Birch	Spruce	Birch	Spruce	Birch	Spruce	Birch	Spruce	
Herbicide	368	1055	6.9	10.9	7.1	5.8	.018	.036	13.5
Low	991	1268	7.4	10.7	7.6	6.3	.022	.040	8.6
Medium	2305	1067	7.1	10.4	8.1	6.6	.021	.037	5.7
High	3768	1105	6.6	9.9	7.8	6.4	.018	.033	4.7

¹WPW, white pine weevil