

# CENTRE FOR ENHANCED FOREST MANAGEMENT

## ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

EFM RESEARCH NOTE 04/2011



### Site preparation increases yield of lodgepole pine and white spruce plantations by 10%

CORTINI, F., COMEAU, P.G., BOATENG, J.O., AND L. BEDFORD

**Introduction:** While site preparation and vegetation management treatments can give large increases in tree size at young ages (e.g., trees up to 8 times the size of untreated trees at age 10), we know that tree sizes or stand level yield at rotation will not be increased by such large amounts. Yield effects of treatments are often described as either Type 1 or Type 2 responses. Type 1 growth responses, also referred to as an age-shift, occur when treatments reduce the time needed for the stand to reach a given stage of maturity (e.g., total volume per hectare). Type 2 responses are obtained when a proportional gain in volume is achieved throughout the rotation and reflect either an increase in site quality or in site utilization (i.e., stocking). This study compared several different methods for estimating effects of site preparation treatments on yield.

**Methods:** We used data from two long term studies (20-year-old) in the boreal and sub-boreal forests of B.C. to determine effects of selected site preparation treatments on conifer growth. We then used the TIPSY model to estimate conifer yields resulting from these treatments at these two sites.

	Site Index (m)	Age Shift	Growth Multiplier
		Volume per ha	
<i>Lodgepole pine</i>	Yr 20	Yr 15	Yr 20
Bedding Plow	22.2	1.9	1.3x
Breaking Plow	21.8	-0.8	0.9x
Burn	22.1	4.3	1.6x
Delta Hinge	21.6	2.5	1.4x
<b>Untreated</b>	<b>21.4</b>	-	-
<i>White spruce</i>	Yr 20	Yr 11	Yr 20
Bedding Plow	24.5	3.7	3.9x*
Burn	24.7	10.9	8.0x
Delta Hinge	19.0	1.1	2.2x
Herbicide	25.5	9.3	7.5x
<b>Untreated</b>	<b>19.0</b>	-	-
*Year 19			

Table 1. Treatment effects on site index (type 2 response), age-shift (type 1 response) and growth multipliers (type 2 response) relative to the untreated for total volume per hectare.

**Results:** As shown in Table 1 several treatments result in increases in site index and stand volume. Age-shifts indicate that treatments can accelerate stand volume growth by up to 4.3 and 10.9 years for lodgepole pine and white spruce, respectively. For lodgepole pine the best treatments had 10% more volume at age 60 than the untreated (average merchantable volume of 323 m<sup>3</sup>ha<sup>-1</sup>). Also for white spruce (Fig. 1) the best treatments at age 80 show 10% higher standing volume than the untreated plots with an average merchantable volume of 621 m<sup>3</sup>ha<sup>-1</sup>.

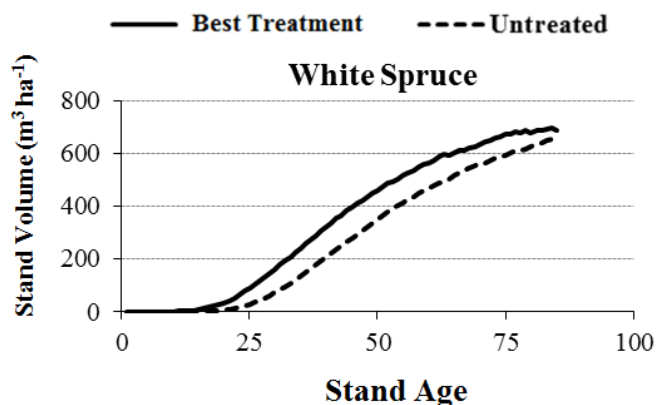


Fig. 1. TIPSY estimates of stand volume for untreated and for the best site preparation treatments for white spruce.

**Implications:** Results indicate that using a Type 1 response provides conservative and realistic estimates of yield increases in these stands. On the other hand, growth multipliers will result in inflated estimates of yield responses.

**Funding** was provided by the Forests for Tomorrow program of the Ministry of Forests of British Columbia.

#### Further Information:

Cortini, F., Comeau, P.G., Boateng, J.O., and Bedford, L. 2010. Yield implications of site preparation treatments for lodgepole pine and white spruce in northern British Columbia. *Forests* 1: 25-48

<http://www.cefm.rr.ualberta.ca/>

Centre for Enhanced Forest Management, Dept. of Renewable Resources, UofA Edmonton, AB T6G 2H1.

[phil.comeau@ualberta.ca](mailto:phil.comeau@ualberta.ca); [fcortini@gmail.com](mailto:fcortini@gmail.com)