Metric Volumes for Plantation White Spruce

A. B. Berry

Research Scientist
Petawawa National Forestry Institute
Canadian Forestry Service
Chalk River, Ontario

With Canada's adoption of the metric system (SI) many forestry tables, previously prepared in the foot/pound units, will be converted to the new values. This paper presents the metric version of the white spruce (*Picea glauca* (Moench) Voss) volume table prepared by Berry (1969), and describes its derivation.

The data from 455 plantation grown white spruce at the Petawawa National Forestry Institute were available for analysis and conversion. The trees had been taken from unthinned plantations. For each tree the diameter at breast height, total height, and total wood volume (stump and top included) were listed. The total wood volume (in cubic feet) had been computed for each tree from a series of inside bark measurements from the stump to the top of the tree.

These data were converted to SI units using the following conversion factors:

$$1 \text{ inch} = 2.54 \text{ cm}$$

$$1 \text{ ft} = 0.3048 \text{ m}$$

$$1 \text{ ft}^3 = 0.028316846 \text{ m}^3$$

Since metric breast height is at 1.3 m instead of 4.5 ft an adjustment in the tree diameters was made to take this into account by the formula from Berry (1978):

$$Y = -0.049 + 1.01X \quad (R^2 = .999)$$

where $Y = d_{1.3}$ in centimetres

$X = d_{4.5}$ in centimetres.

The data for all trees were combined and the following regression equation was derived:

$$Y = 0.0083 + 0.0327X \quad (R^2 = .992)$$

where $Y =$ volume in cubic metres
(stump and top included)

$$X = \frac{D^2H}{1000}$$

1000

$D =$ diameter in centimetres at 1.3 m

$H =$ total height in metres.

The volumes by 2-cm dbh classes and 2-m height classes are shown in Table 1.

References

Berry, A. B. 1969. Revised volume tables and taper curves for plantation white spruce. Canada, Dept. Fish. Forest., Inform. Rep. PS-X-9.

Berry, A. B. 1978. Metric yield tables based on site class and spacing for white spruce plantations at the Petawawa Forest Experiment Station. Canada, Dept. Fish. Environ., Inform. Rep. PS-X-70.

Table 1. Metric volumes¹ for plantation white spruce.

DBH Class (cm)	Volume (m ³) - stump and top included									
	Total Tree Height (m)									
	4	6	8	10	12	14	16	18	20	22
4	0.010	0.011	0.012							
6	0.013	0.015	0.018	0.020						
8	0.017	0.021	0.025	0.029	0.033					
10		0.028	0.034	0.041	0.048	0.054				
12		0.037	0.046	0.055	0.065	0.074	0.084			
14		0.047	0.060	0.072	0.085	0.098	0.111	0.124		
16		0.058	0.075	0.092	0.109	0.125	0.142	0.159	0.176	
18			0.093	0.114	0.135	0.157	0.178	0.199	0.220	
20			0.113	0.139	0.165	0.191	0.218	0.244	0.270	0.296
22				0.167	0.198	0.230	0.262	0.293	0.325	0.356
24				0.197	0.234	0.272	0.310	0.347	0.385	0.423
26					0.274	0.318	0.362	0.406	0.450	0.495
28					0.316	0.367	0.418	0.470	0.521	0.572
30						0.420	0.479	0.538	0.597	0.656
32						0.477	0.544	0.611	0.678	0.745
34						0.538	0.613	0.689	0.764	0.840
36							0.686	0.771	0.856	0.941
38							0.764	0.858	0.953	1.047
40							0.845	0.950	1.055	1.159

¹Based on equation $Y = 0.0083 + 0.0327X$ ($R^2 = .992$)

$$X = \frac{D^2H}{1000}$$

$$Y = \text{total volume (m}^3\text{)}$$

Block indicates range of basic data from 455 trees measured at the Petawawa National Forestry Institute.