

Form Class Volume Tables Aren't What We Think They Are

Richard G. Oderwald

Many people use Mesavage and Girard (1946) form class volume tables as if there is a fixed top diameter. Some use 10 inch top diameters, others 8 inch, 12 inch, even 6 inch. But, M&G top diameter varies by DBH, merchantable height, and form class. Using them like there is a fixed top will cause inaccurate volume estimates.

Mesavage and Girard (1946) form class volume tables (M&G) are widely used and commonly accepted as standard volumes for sawtimber trees. Many inventory specifications call for M&G volume and measurement in 16 foot logs to a fixed top diameter (ib or ob). Common specified top diameters are 8 and 10 inches, with others such as 6 and 12 inches used depending on the tree species or product.

M&G volumes and fixed top diameter is a contradiction. Nothing about the M&G top diameters is fixed. Top diameter in M&G depends on DBH, form class, and total number of logs. Any match between a M&G top diameter and a fixed top diameter is accidental

The original publication is very clear about taper and top diameters. The diameter inside bark of the first log, regardless of the total number of logs, is the form class, as a decimal, multiplied by tree DBH. Taper in logs above the first log, regardless of form class, is shown in Table 2 (page 7) of the original publication.

For example, a 14 inch DBH, 3 log tree with form class 78 has a dib at the top of the first log of 10.9 inches (14×0.78). From Table 2 the taper in the second log is 1.4 inches, so the second log top dib is 9.5 inches ($10.9 - 1.4$). Again, from the table the taper in the third log is 1.6 inches, so the third log top dib is 7.9 inches.

The table below shows the M&G dib at the top of the last log for some common DBH's for form classes 78. The results are similar for all form classes. There is no consistent top diameter for the ultimate log and the range of top dibs is quite large.

When you call a tree height to a fixed top diameter, you and the M&G are thinking of two different trees. Suppose you call 3 logs to a 10 inch top i.b. for a 14 inch DBH tree with form class 78. According to M&G the 1st log top is 10.9 inches dib, the 2nd log top is 9.5 inches dib, and the 3rd log top is 7.9 inched dib. That's 79 BF in the first log, 58 BF feet in the second log, and 38 BF in the third log, a total of 175 board feet.

Your tree also has a 10.9 inch 1st log top dib since it is FC times DBH. The 3rd log top is 10 inches dib since that's what you said it was. Assuming straight line taper the 2nd log top is 10.45 inches dib.

Your tree has 79 BF in the 1st log, 71 BF in the 2nd log, and 65 BF in the 3rd log, a total of 215 BF.

Between the time you saw the tree and the time you calculated the volume you lost 45 BF, about 9% of the volume you thought you had. It takes only a few trees to make a very big difference.

The error can go the other direction. A 16 inch DBH tree called 2 logs to a 10 inch dib contains 171 BF. The same tree contains 180 BF according to M&G.

You might think the errors will offset in the long run. Perhaps, but do you want to bet on it? I don't. The Oderwald Law of Large Numbers is "*All things being equal, they aren't.*"

More people worry about using the right form class than using the right top diameter. This worry is misplaced. The problem isn't form class, its top diameter. You could get the exactly correct form class for every tree in the woods and still get the wrong volume.

M&G form class volume tables served a purpose when we had no computers or modern volume and taper equations. We can do better now, and we should.

		Form Class 78 Number of 16 foot logs		
		1	2	3
DBH	Dib at top of last log (inches)			
10	7.8	6.4	5.2	
12	9.4	7.8	6.6	
14	10.9	9.2	7.9	
16	12.5	10.6	9.3	
18	14.0	12.0	10.6	
20	15.6	13.5	12.0	
22	17.2	15.0	13.4	
24	18.7	16.4	14.7	