MINNESOTA FORESTRY NOTES
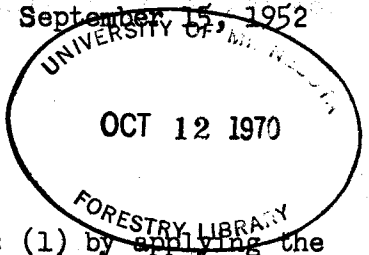
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COMPUTING TREE VOLUME GRAPHICALLY

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The volume of a tree is normally computed either: (1) by applying the Smalian, Huber, or Newton formulae to short sections of the bole, or (2) by planimetering the tree profile as plotted on Reineke's Form 558a. A simple graphical method is available, however, that requires no special form, planimeter, or other equipment.

1. With this method, $8\frac{1}{2}$- by 11-inch graph paper ruled in tenths of an inch with the inch lines emphasized (10 x 10 to the inch) is used.

2. Let the long axis represent height at a scale of 10 feet to the inch (100 feet for the 10 inches). Let the short axis represent the square of the diameter at a scale of 100 square inches to the inch (700 square inches for the 7 inches).

3. Plot the stem profile on this graph. If at 20 feet from the ground, the diameter outside bark is 12 inches and the diameter inside bark is 11 inches, these points are plotted at 144 and 121 respectively for diameter squared over 20 feet in height. All diameter measurements are thus plotted at proper height and smooth curves (the stem profile) are drawn connecting the outside bark and also the inside bark measurements.

4. Count the number of squares (by whole square inches and 0.01 square inches) inside the profile curves.

5. Multiply the number of square inches inside the curves by 4.454 to give the number of cubic feet tree volume. Thus, if the area within the profile curve is 20.41 square inches, the total peeled tree volume is 111.3 cubic feet.

The same principle can be used for merchantable cubic foot or board foot volume. The method described will apply without change for trees up to

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100 feet in height and up to 26.4 inches in basal diameter. Any other convenient scales may be used if the data require them. The general formula for the converting factor is:

$$\text{Cubic feet per sq. inch of graph} = \frac{\text{Feet in height per inch of scale} \times \text{Sq. inches in diameter per inch of scale}}{183.3465}$$

The method described is as accurate or more accurate than any other in common use and is much faster than the planimeter method.[2]

[2]Spurr, Stephen H., 1952. The Ronald Press Company, New York.