

Technical Bulletin M1441

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Guide to the Tree and Log Scale Stick

No. 59750

Doyle Tree & Log Scale Stick

No. 59760

Scribner Tree & Log Scale Stick

No. 59770

Int'l. 1/4" Tree & Log Scale Stick

TREE SCALE STICK DOYLE RULE (FC-78)	DIAMETER OF TREE (INCHES)	
1 16' FOOT LOGS	14	22
2 14' FOOT LOGS	20	32
3 12' FOOT LOGS	22	38
4 10' FOOT LOGS	24	40
5 14' FOOT LOGS	24	80

Guide to the Tree and Log Scale Stick

Tree and Log Scale Sticks have many uses including diameter measurements for dbh, determining merchantable tree height, finding volumes for standing trees (FC 78), and finding volumes for bucked logs. Knowing how to properly perform these measurements is imperative for accurate readings. The following pages offer in-depth instructions and informative descriptions concerning how to use the Doyle, Scribner, and International 1/4" Tree and Log Scale Sticks.

Comparison of Doyle, Scribner & International 1/4" Tree & Log Scales Sticks

Basics of the Tree and Log Scale Stick

This straight hardwood stick is graduated for direct readings of diameter. Tree diameter is taken at 4-1/2' above the ground, which is more commonly known as diameter breast height or dbh. Since the stick was derived from the principle of similar triangles, it is necessary to hold it horizontally against the tree at breast height, usually at a distance of 25" from the eye. To account for the perspective view, the diameter graduations become increasingly smaller as the tree diameters increase. Because of these smaller graduations, the accuracy of the diameter reading for larger trees decreases. However, the diameter of small trees can be read to the nearest full inch.

The Tree and Log Scale Stick also features a Merritt Hypsometer scale placed at 16' log intervals for determining merchantable tree height. This measurement must be made with the stick 25" from the eye and 66' from the tree. Tree volume scales in board feet for standing trees and bucked logs are also found on the stick. The volumes for standing and bucked are determined by first finding the diameter and volume measurements and cross-referencing them on the appropriate scale.

The stick should not be used for highly accurate measurements, since it is difficult

to keep the correct distance from eye to tree. While it is useful for cruising work, a more accurate and reliable measurement of individual trees can be obtained with tree calipers or diameter tapes. Refer to the Forestry Suppliers catalog for a complete listing.

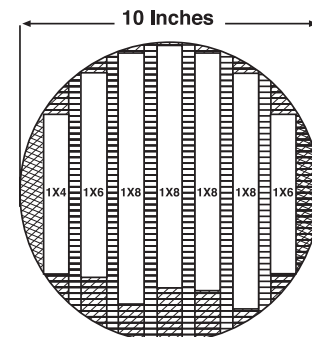
Tree and Log Scale Sticks are available in three scales: Doyle, Scribner and International 1/4" scales. It is recommended that you use a scale common to your area, especially if you are using the measurements as a basis for selling timber. To determine which is commonly used in your area, contact your local county Forester or a saw mill.

Doyle Tree & Log Scale Stick

Based on the algebraic equation:

$$bd\ ft = \left(\frac{D-4}{4}\right)^2 L$$

D represents the log diameter in inches and **L** represents the log length in feet. The Doyle Scale has a slab allowance of 4" and a saw kerf of 5/16", or 25%.



SLAB KERF EDGINGS
Figure 1

Scribner Tree & Log Scale Stick

The Scribner Scale is based on diagrams of 1" boards drawn to scale within different sized cylinders (Figure 1). The saw kerf is

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assumed to be 1/4". However, the minimum board width allowed is not clear but may have been 4" for some log diameters. All volume outside scaling cylinders projected from small ends of logs is ignored, since no taper allowance was included.

International 1/4" Tree & Log Scale Stick

The International Scale is derived from the mathematical formula:

$$0.905 (0.22 D^2 - 0.71 D)$$

Volumes for 16' log lengths require an easier formula:

$$0.8 (D - 1)^2$$

This is the only commonly used scale that allows for log taper. The fixed taper allowance is 1/2" per 4' log length. Scale values for a 16' log are obtained by adding board-foot volumes of four 4' cylinders, each 1/2" larger in diameter than the previous log. Rational deductions for slabbing saw kerf are also included.

The International 1/4" Log and Tree Scale Stick has a 1/4" saw kerf plus a 1/16" allowance for board shrinkage, providing a total deduction of 5/16". Slabs are deducted in the form of a hypothetical plank 2.12" thick with a width equal to the log diameter. All logs are considered to have been cut into boards 1" thick.

To Measure Tree Diameter

With the side of the tree and log scale stick marked *Tree Scale Stick* facing you, hold the stick perpendicular to the tree 25" from your eye and 4-1/2' from the ground. Place the left edge of the stick on the left edge of the tree and without moving your head (turn your eyes only) read the number from the *Diameter of Tree in Inches* section which corresponds with the right edge of the tree. This number is the diameter of the tree. Diameter may be measured from 10" to 40" in 1" increments (Figure 2).

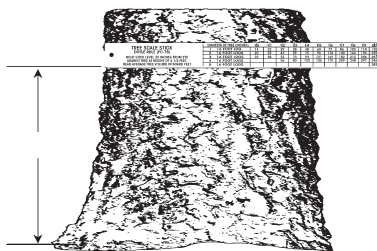


Figure 2

Stick is 25" from eye and 4-1/2' above ground. This tree is 14" in diameter.

To Measure Tree Height

With the side of stick marked *Merritt Hypsometer* facing you, stand 66' from the tree, holding the stick parallel to the tree trunk with the stick 25" from your eye and the bottom of the stick corresponding to the point where the tree trunk would be severed when harvested. Read the stick upward to the top where the tree would be topped. This number represents the height of the tree (Figure 3).

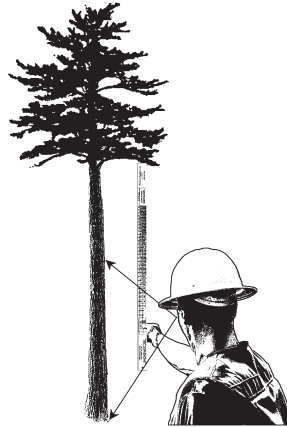


Figure 3

Stick is 25" from eye and 66' from tree. Top measurement is point tree is topped; bottom is point tree is severed at stump. This tree contains three 16' logs.

To Determine the Volume of the Tree*

After the tree diameter and tree heights have been determined, the volume of the tree in board feet can be obtained. Using the *Tree Scale Stick* side of the stick, find the diameter of the tree in the row marked *Diameter of the Tree*. Then find the number of 16' logs in the tree in the column marked *One 16 foot log, Two 16 foot logs, etc.* The point of intersection between the row marked *Tree Diameter* and the column marked *16 foot logs* is the volume of the tree. For example, a tree 14" in diameter with 3 logs would have a volume of 93 board feet (Figure 4).

	DIAMETER OF TREE (INCHES)	10	11	12	13	14	15	16	17
1	16 FOOT LOG	14	22	29	38	48	60	74	91
2	16 FOOT LOGS	28	44	58	76	96	120	148	182
3	16 FOOT LOGS	42	66	87	114	144	180	222	271
4	16 FOOT LOGS	56	88	116	150	192	240	294	355
5	16 FOOT LOGS	70	110	144	192	246	306	372	445

Figure 4

To Determine Volume Once a Tree is Felled & Cut*

To determine the board foot volume of the log after the tree has been felled and cut into log segments, first determine the length of the log. The stick can be used with 8', 10', 12', 14', 16', or 18' logs. These are clearly identified in a column on the *Log Scale Stick* side of the stick. Next the diameter of the log must be determined. Align the left edge of the stick with the left edge of the log at the desired starting point of measurement inside the bark. Since not all logs are perfectly round, a log may be measured at a narrow point and averaged from measuring a narrow point and a wide point.

Read the number which corresponds to the right edge of the log from the row marked *Diameter of Log at Small End*. Once the log length and diameter have been obtained, the intersection between the row marked *Diameter of Log at Small End* and the column marked for appropriate length of the log is the volume of this log. For example, a log 19" in diameter which is 16' long has a volume of 225 board feet (Figure 5).

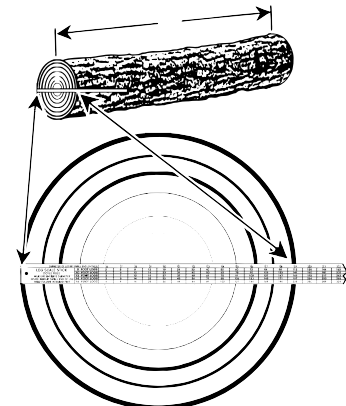


Figure 5

* Examples use measurements based on the Doyle Tree & Log Scale Stick. Scribner and International work the same but yield different volumes.