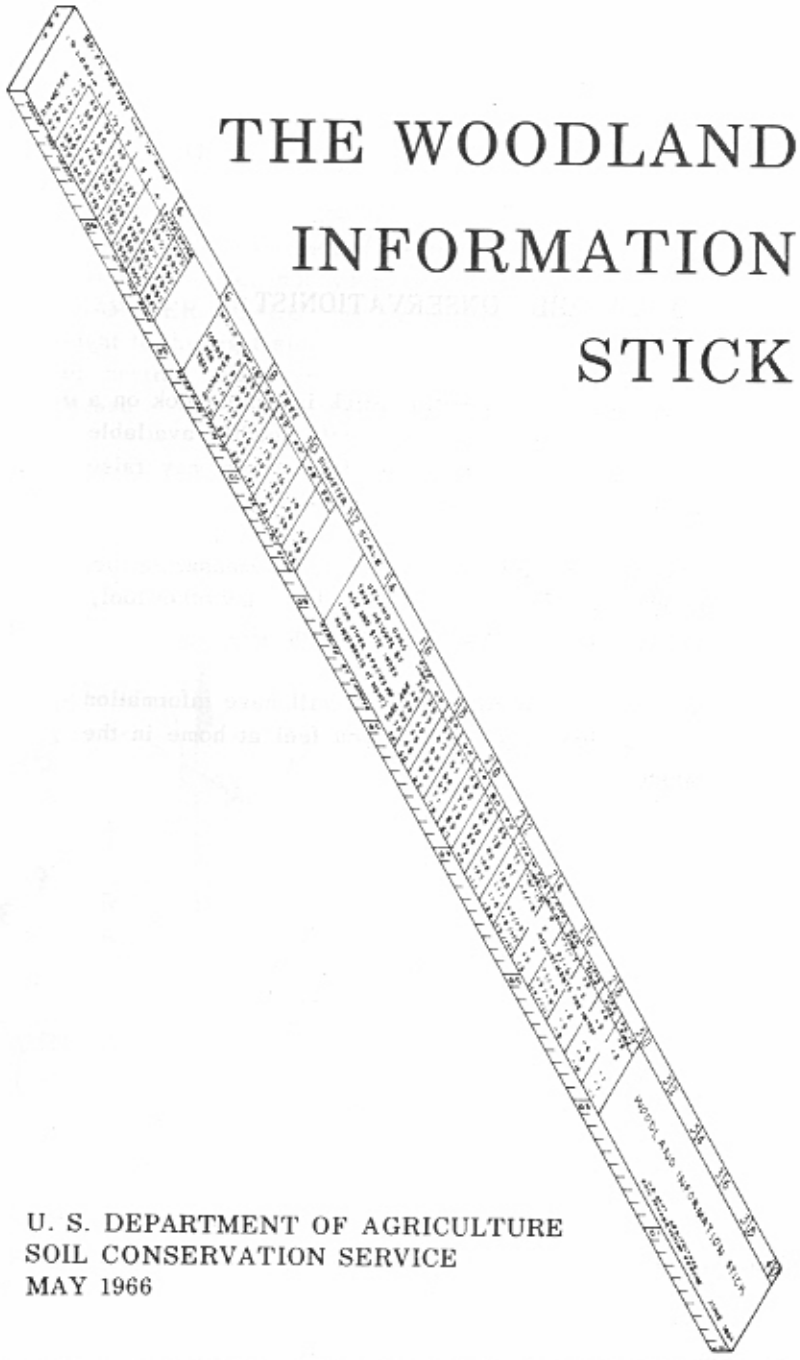
THE WOODLAND INFORMATION STICK



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MAY 1966

TO THE SOIL CONSERVATIONIST:

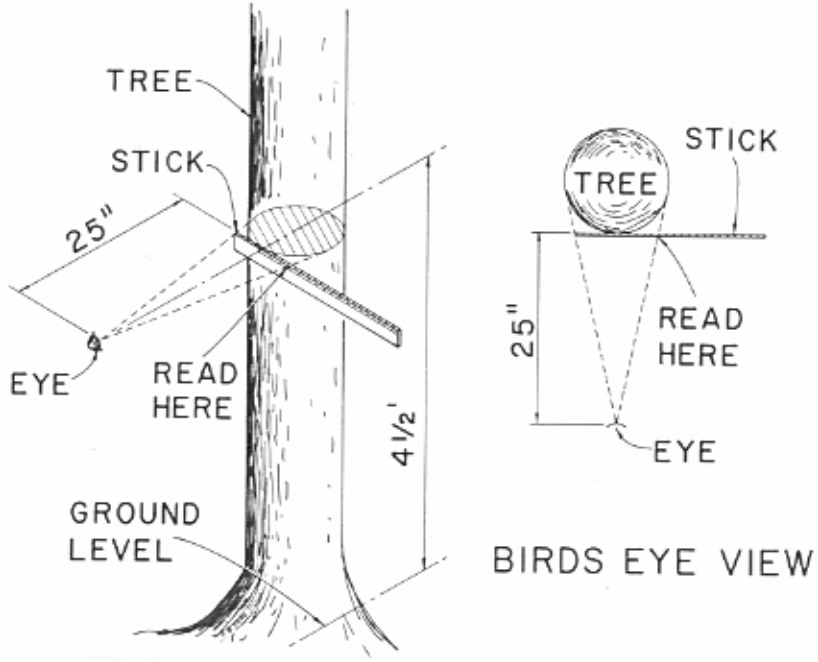
The Woodland Information Stick is a notebook on a stick. It will furnish you with readily available answers to many questions landowners may raise in the course of conservation planning.

The stick is also an instrument for measuring the heights and diameters of trees. Like any other tool, to be effective it must be used properly.

Learn to use it well and you will have information at your fingertips to help you feel at home in the woods.

HOW TO MEASURE TREE DIAMETER

1. Use the "TREE DIAMETER SCALE".
2. Hold the stick horizontally against the tree at 4 1/2' above ground and 25" (stick length) from the eye.
3. Adjust the stick so that the left end is even with your line of sight to the left of the tree.
4. Turn your eye, not your head, and read on TREE DIAMETER SCALE the figure crossed by your line of sight to the right side of the tree. This is the diameter of the tree. Many trees are not round in cross-section. Measure them from two sides and use the average.

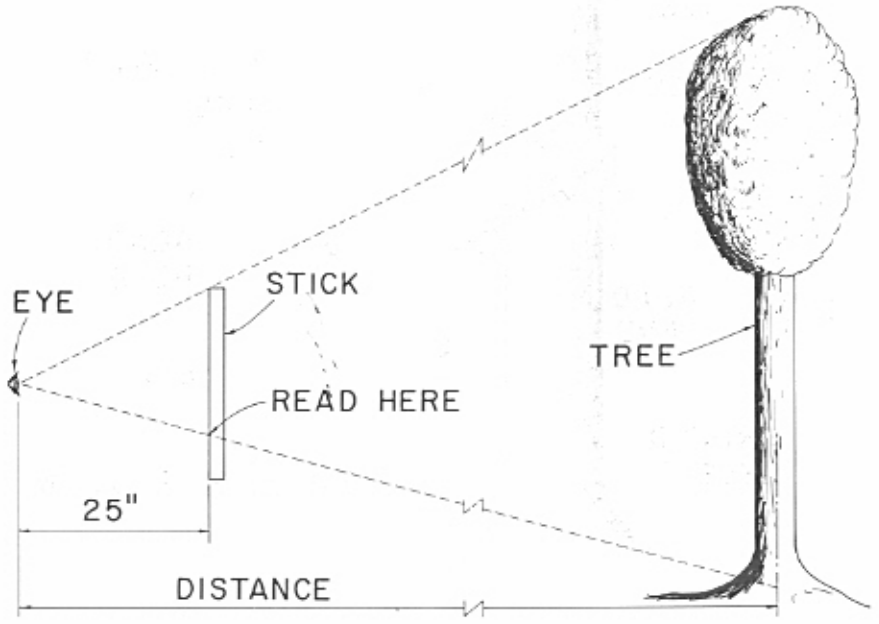


Source: Society of American Foresters
Forestry Handbook Table 1, page 1.2

HOW TO MEASURE TREE HEIGHT

1. Stand where you can see the top and base of the tree.

2. Hold the stick vertically, 25" from eye, the "Top" end even with your line of sight to the top of the tree. Where the line of sight to the tree base crosses, the scale reading will be the height of the tree -- if you are 100 feet from the tree. At any other distance multiply the scale reading by the distance and point off two places.

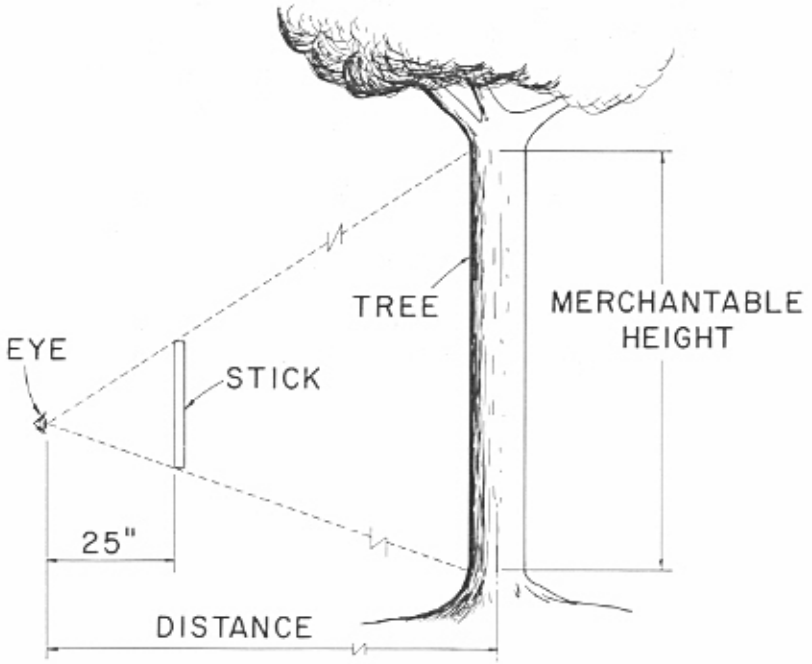


HOW TO ESTIMATE THE MERCHANTABLE HEIGHT OF A TREE

1. Pick the highest point on the tree which is usable for the product in mind. For sawlogs this will usually be at the point where the tree is 8" in diameter -- for cordwood it is at a 4" diameter.

2. Walk to or away from the tree until the stick, held vertically 25" from the eye, intercepts the stump on one end and at the top limit of merchantability on the other.

3. The distance to the tree will be the same as the merchantable height. For sawlogs estimate merchantable height in units of 8' or 1/2 log -- for cordwood estimate in four foot units.



HOW TO ESTIMATE TREE VOLUME

For Board Foot Volume: Use the table labeled "Bd. Ft. Per Tree". Measure the diameter (page 1) and estimate the merchantable length (page 3). From the table read the volume. Example: A 16" tree with 2 logs (32' of merchantable length) shows 180 board feet. This table is based on the International 1/4" log rule. To convert to Doyle or Scribner multiply by the appropriate percentage listed at the right. For example: for Scribner, 180 x 90% = 160 board feet: for Doyle, 180 x 65%= 120 board feet. Round all figures to the nearest ten feet. Interpolate for tree diameters not shown.

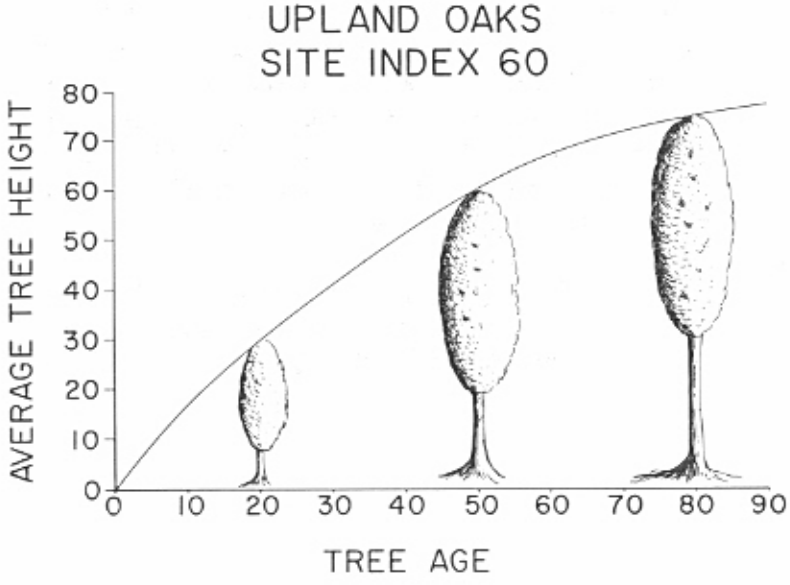
For Cordwood Volume: Use the "Cords Per Tree" table to the right of the "Bd. Ft. Per Tree" table. Knowing the diameter and merchantable length, read the volume from the table. Example: A 10" tree with 24' of merchantable length contains 0.11 cords of wood.

Source: "Composite Volume Tables for Timber and Their Application to the Lake States." USDA Tech. Bulletin 1104

Board foot converting factors are from Lake States Forest Experiment Station Technical Notes 283 and 287

HOW TO USE THE UPLAND OAK SITE INDEX TABLE

The Work Unit Technical Guide should show the approximate site index for each particular kind of soil. Site index is an expression of forest site quality based on the height of the dominant trees of a particular species at an arbitrarily chosen age -- generally 50 years. The taller the trees at a given age, the greater is the productivity. The site index table helps us to predict the height trees may attain at any given age. The chart below shows the development of Upland Oak on Site Index 60 land. Note that the tree is 60' tall at 50 years. The table on the Stick gives expected heights of dominant and codominant trees for ages 30 to 80 years and for a full range of site index. Also, if you know the age of the trees and their average height, you can use the site index table to determine site index.



HOW TO ADJUST THE SITE INDEX TABLE FOR SPECIES OF TREES OTHER THAN OAKS

To the right of the oak site index table are shown adjustments which makes it possible to use this table with species other than oaks. Example: On land that is Site Index 70 for aspen, you wish to know how tall dominant aspen trees might be at age 30. First check the oak table for height at that age and site index -- the answer, 48' ; apply the correction shown for aspen, +3'; the answer 51'. Where two correction figures are shown, as for red pine at 30 years (-1/-7), the -1 correction applies to site index 40 and the -7 correction applies to site index 100. Obtain corrections for an intermediate site index by interpolation.

The height figures, when adjusted, agree with the source tables within a foot (±) for shortleaf pine and red pine. They are correct within two feet for northern white pine, jack pine, and aspen. They are generally correct within two feet for southern white pine, tulip, and Virginia pine, but at extremes of age and site index errors to five feet could be present.

Warning: This table cannot be used to predict site index for one species on the basis of a known site index for another species.

SOURCE OF SITE INDEX TABLES

upland oak - U. S. D. A. Tech. Bulletin 560

red pine - Lake States Forest Experiment Station Tech. Note No. 484

jack pine - Lake States Forest Experiment Station Tech. Note No. 463

aspen - Lake States Forest Experiment Station Tech. Note No. 464

white pine (northern) - Lake States Forest Experiment Station Tech. Note No. 483

white pine (southern) - Southern Forest Experiment Station Research Note 141

Virginia pine - Southeastern Forest Experiment Station Research Note 135

tulip tree (yellow poplar) - Doolittle curves, USFS, October 1957

shortleaf pine - Coile and Schumacher, Journal of Forestry, June 1953

THE STOCKING GUIDES

Stocking is a term used to indicate the number of trees in a stand as compared to the desirable number for best growth and management. In these tables standards are given for three levels of stocking.

"High" stocking is that degree of stocking at which there is essentially full production of wood. The upper limit of "high" stocking is the limit imposed by nature. The lower limit is that stocking where trees have ample room to grow with none to waste. When a stand is at the widest spacing possible for good development of crop trees but with negligible loss of wood producing capacity, that is the lower limit of "high" stocking.

"Medium" stocking begins where "high" leaves off. The lower limit of medium stocking is where normally growing trees will have grown about enough in 10 years to increase the stocking to "high".

"Low" stocking extends from "medium" down to where there are only scattered trees. An area with less than 10% of crown canopy would be called "open".

Stocking may be described by spacing, by numbers of trees per acre, or by basal area per acre. These tables use D+X spacing which relates the size of the tree to the space available to it. In this formula D = tree diameter, and X is an added quantity in feet. If trees average 8" in diameter and are spaced 19' apart, we say they are spaced at D + 11 (8+11=19).

Note that the guides show closer spacing for conifers than for hardwoods. Hardwood trees 12" in diameter growing at D+11 would be "medium" stocking. Conifers of the same size and spacing would be shown as "low" stocking.

(For a better understanding of D + X read "A Guide to Stocking Southern Pine Stands", H. C. Mitchell, Soil Conservation Service, An In-Service Report, September 1962).

Source: The hardwood guides are derived from figure 1 of the "Timber Management Guide for Upland Central Hardwoods", USDA Central States Forest Experiment Station, December 1962. The dividing line between "High" and "Medium" stocking (the "thin to" level) is approximately the "B" level of stocking on figure 1 of the Timber Management Guide. A thinning rule was developed which closely followed the "B" level: "At average stand diameter of 8" thin to D+8; increase 'X' one foot for each two inch increase in diameter. For trees less than 8" decrease 'X' one foot for each two inch decrease.

The conifer guides are based on the work by Krajicek, Brinkman, and Gingrich, "Crown Competition" -- a measure of density, Forest Science, Volume 7, No. 1, March 1961.

AVERAGE SPACING AND NUMBER TREES PER ACRE

This table is intended as a cross reference with the stocking guides, to make it possible to interpret D + X spacing in terms of number of trees per acre. Add D to X to get spacing. If 8" trees are spaced at D + 11, spacing is 19'. For a 19' spacing the table shows 121 trees per acre. The table assumes trees to be evenly spaced on squares.

This table is very useful in giving a clue as to the amount of thinning which could be done. Example: You have a conifer stand 8" in diameter now spaced at D + 4. The stocking guide shows it could be thinned to D + 6.

D + 4 = 8 + 4 = 12' spacing, for which the table shows 304 trees per acre.

D + 6 = 8 + 6 = 14' spacing, for which the table shows 222 trees per acre.

Could be removed: 82 trees per acre.

In actual use we must recognize that precise measurements are not made. This is only an indication of the amount of thinning which might be possible.

Use this table for number of trees per acre needed in planting at any given spacing.

TREE SPACING RELATED TO BASAL AREA

Basal area per acre is the sum, in square feet, of the cross sections of the stems at breast height of all the trees of a forest stand. Basal area includes the bark with the wood.

This table makes it possible to convert basal area per acre to D + X spacing or D + X spacing to basal area per acre.

Example: For 10" trees spaced at D + 8 the basal area per acre would be 73 square feet (reading from the table). If the table is not broad enough to give an answer you need, remember that you can reduce D + X to its lowest common denominator and the basal area will remain the same. The basal area for 20" trees spaced at D + 16 is the same as for 10" trees spaced at D + 8 or for 5" trees spaced at D + 4.

By using this table in conjunction with the "Average Spacing and No. Trees Per Acre" table it is possible to convert stocking by basal area to stocking by number of trees. Example: A stand averaging 10" in diameter has 73 square feet of basal area. How many trees are there per acre? Follow the 10" line horizontally to the basal area of 73; go vertically to read a spacing of D + 8; D = 10, so D + 8 = 18, which is the average spacing. For an average spacing of 18 feet the "Average Spacing and No. Trees" table shows 135 trees per acre.

MISCELLANEOUS INFORMATION

Weights per cord are given for green wood of several species. These weights are only approximations as green wood is very variable in weight. Do not attempt to estimate dry wood weights from green wood weights.

Numbers of posts per cord are also approximations and should not be considered as precise.

USDA-SCS-HYATTSVILLE, MD. 1965

4 6 8 TREE 10 DIAMETER 12 SCALE 14

BD. FT. PER TREE (INT. 1/4" RULE)

DIAMETER	16' LOGS → 1	1 1/2	2	3	4	SCRB.	DOYLE
10"	40	50	60			75%	40%
12"	60	80	100	120		80%	50%
16"	110	150	180	250	300	90%	65%
20"	170	240	300	400	590	90%	75%
26"	300	410	510	700	880	93%	85%
32"	470	640	790	1070	1350	95%	93%

CORDS PER TREE — DIAMETER	HT. TO 4" TOP → 16'	24'	32'	40'	48'	56'
6"	.03	.04				
8"	.05	.07	.09	.11		
10"	.08	.11	.13	.16	.19	
12"	.12	.16	.20	.23	.26	.30
14"	.17	.23	.27	.31	.35	.40
16"	.22	.30	.37	.42	.47	.53

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	8	TREE	10	DIAMETER	12

4" TOP → 16'	24'	32'	40'	48'	56'
6"	.03	.04			
8"	.05	.07	.09	.11	
10"	.08	.11	.13	.16	.19
12"	.12	.16	.20	.23	.26	.30
14"	.17	.23	.27	.31	.35	.40

DIAMETER