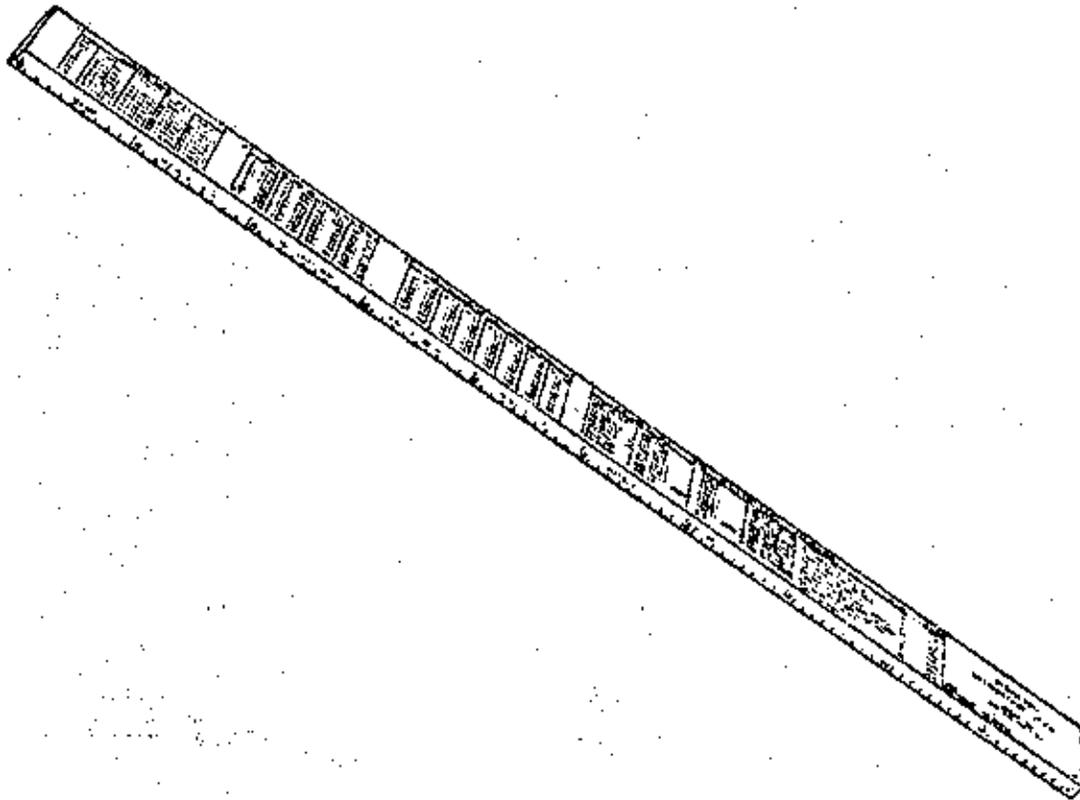


TECHNICAL REFERENCE FILE
Retain - Area and Field Offices
WOODLAND

THE WOODLAND INFORMATION STICK and WOODLAND INVENTORY PROCEDURES



**U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DECEMBER 1977**

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.

The planning procedures and the Information Stick that are discussed in this booklet were developed by Soil Conservation Service foresters. Both are designed to be used in the examination of wooded areas in the regular course of conservation planning work. Most of the information on the Information Stick is necessary for use in stand examination using the zig-zag transect procedure.

Each table on the Information Stick is assigned a number. Following are the numbers and the table it designates.

<u>Number</u>	<u>Table</u>
1	Thinning Guide
2	Spacing and Number Trees Per Acre
3	Tree Spacing to Basal Area Per Acre
4	U.S. Equivalent
5	Metric Equivalent
6	Green Wood Weights
7&8	Board Feet Per Tree
9	Cords Per Tree
10&11	Cubic Feet Per Tree

The information presented in this booklet is based on the publication "The Woodland Information Stick," USDA, SCS, 1966 and an unpublished paper "Woodland Conservation Planning Procedures Using The Woodland Information Stick," 1963. Both were written by William J. Lloyd, Soil Conservation Service.

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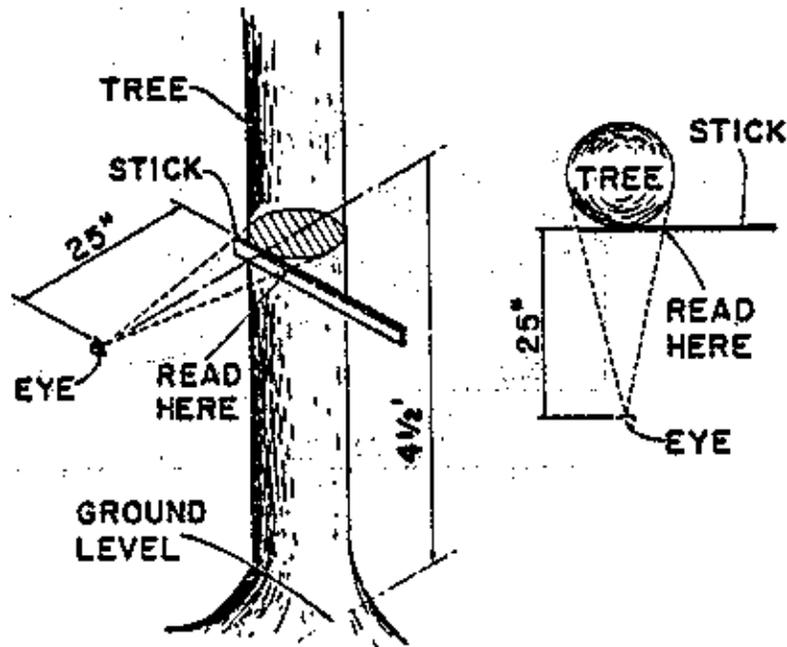
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SECTION I

THE WOODLAND INFORMATION STICK

HOW TO MEASURE TREE DIAMETER

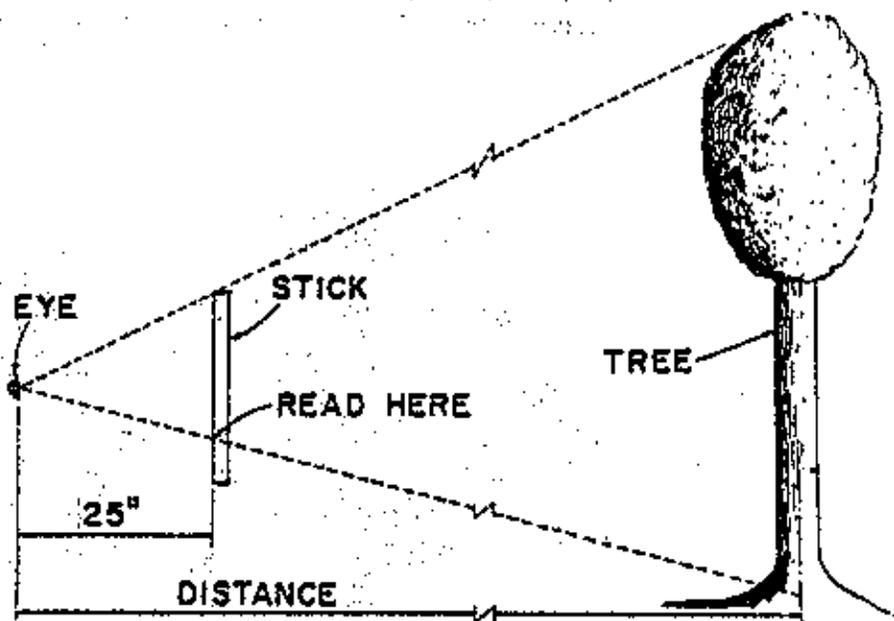
1. Use the "TREE DIAMETER SCALE."
2. Hold the stick horizontally against the tree at $4\frac{1}{2}'$ above ground and 25" (stick length) from the eye.
3. Adjust the stick so that the left end is even with your line of sight to the left of the tree.
4. Turn your eye, not your head, and read on TREE DIAMETER 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

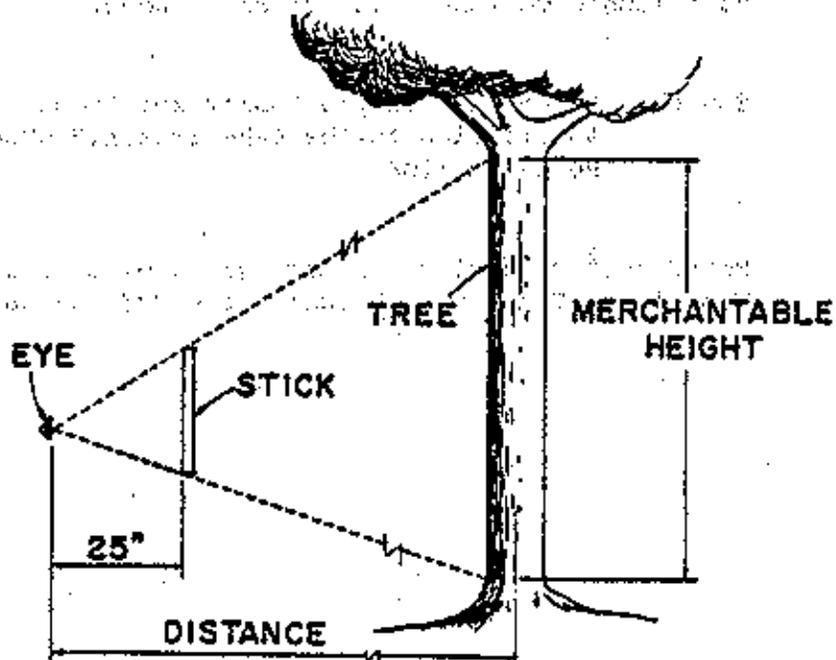
HOW TO MEASURE TREE HEIGHT

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. The method described on the previous page can also be used. For sawlogs estimate merchantable height in units of 8' or $\frac{1}{2}$ log—for cordwood estimate in four foot units. Interpolate for heights not shown on tables.



HOW TO ESTIMATE TREE VOLUME

For Board Foot Volume: Use the table labeled "Board Feet Per Tree." Measure the diameter and estimate the merchantable length. 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 1/2" log rule. To convert to Doyle or Scribner multiply by the appropriate percentage listed at the right. For example: for Scribner, $180 \times 90\% = 160$ board feet; for Doyle, $180 \times 65\% = 120$ 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. 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

THINNING GUIDE

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. Stocking may be described by spacing, by numbers of trees per acre, or by basal area per acre. This guide lists the desired spacing for species by diameters. The spacing serves as a guide for thinning. Listed is D+X spacing which relates the size of the tree to the space available to it. In this formula D=tree diameter and the X is an added quantity in feet. Stands of oak and yellow-poplar averaging 6" in diameter should be thinned to D+7 or 13 feet apart for optimum growth. Note that the guides show closer spacing for conifers than hardwoods.

(For a better understanding of D+X read "A Guide to Stocking Scourthern 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 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 OF 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.

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 the 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

This is an optional method of expressing stocking and is not necessary in using the Woodland Information Stick or in stand examination.

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

Tables for U. S. Equivalents and Metric Equivalents are presented for general use.

Green wood weights of several species are listed in the event that wood is sold by units of weight rather than volume. The table is used to convert volume to weight.

A 90° arc is located in the center of the stick for use in measuring a transect angle.

SECTION II

WOODLAND CONSERVATION PLANNING PROCEDURES USING THE WOODLAND INFORMATION STICK

The procedures described in the following material were designed to help in the examination of wooded areas in the regular course of conservation planning work with a landowner. Planning decisions—decisions of land use and conservation treatment—can be made only by the landowner. By helping him to become aware of the potential productivity of his land and of some facts about his trees—species composition, average diameter and diameter range, relative stocking, and tree condition—you help him to reach these decisions.

Do not prejudge the land use or the treatment to be applied. These decisions are not yours to make.

The landowner should participate in the examination. Show him how to use the Woodland Information Stick. He should take the tree measurements and make the other determinations which are needed.

Do These Things Before Going To the Field:

1. Study the soils map. Check the technical guide for woodland interpretive information related to the soils shown for the ownership. The guide will give the potential productivity of land in growing a wood crop, and it will alert you about any serious limitations or hazards which will need to be considered. The guide should tell you what kinds of trees are likely to be found, which are most desirable for wood production, or which have particular wildlife or aesthetic values.
2. Study the aerial photo which is to be used as the base for the conservation plan map. Use a stereoscope if one is available. Locate drainageways, streams, ridges, and other features which might affect the use of the land. Watch for variation in the cover.

Locate logging roads and other disturbed areas on the photo as these should be visited for planning erosion control measures if needed.

3. Outline with soft pencil, on the map, those areas which you think should have individual on-site examination. Apparent differences in cover, changes in aspect or soil, natural barriers such as streams or ridges—these are reasons for making tentative field separations. Woodland fields are not "fenced in" areas as is usually the case for cropland and pasture.

4. Plan a route of travel with the cooperator which will enable you to see each of the areas delineated. The divisions you make at the office are only tentative. The field examination may show need for fewer or more divisions. In either case, the office study will save you and the cooperator much time in the field and it will insure more profitable use of the time spent

5. Be prepared for a trip into the woods. Have with you your Woodland Information Stick and a clipboard with maps and worksheets.

6. Don't go into the woods with a landowner unless —

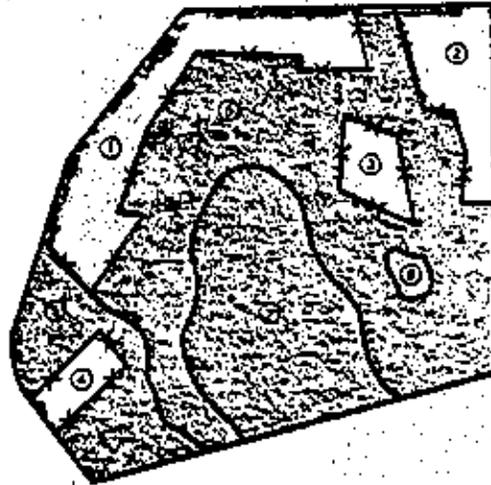
You are sure that you can identify the local trees without embarrassing hesitation.

You have been trained in the use of the Woodland Information Stick and feel confident that you can use each of the scales and tables properly and easily.

You are familiar with and trained in using the woodland field examination procedure.

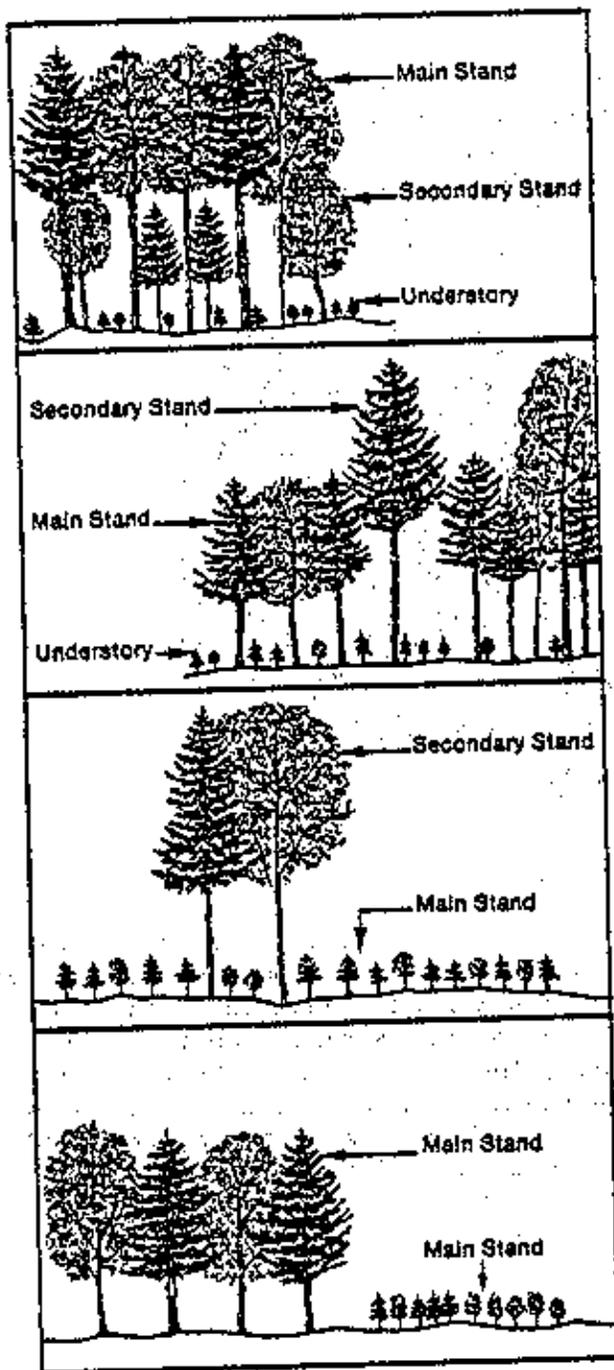
At The Farm:

Explain to the landowner that you wish to visit with him each of the woodland fields tentatively delineated. If he is familiar with his woodland and can understand the aerial photo-map, he will know if your delineations are reasonably correct and he will be able to tell you if an area of significant size, but differing in cover, is being missed.



In Each Woodland Field:

Help the landowner to recognize and select the main stand. There is usually more than one general crown level. The forest may be two-storied or three-storied. Walk for a short distance into the field as you discuss the matter. The trees which form the main stand are usually the larger ones, the dominant and codominant trees. Underneath the main stand, there is usually an understory stand made up of suppressed trees, advanced reproduction, and brushy species. Sometimes, there is a secondary stand of trees larger or smaller in size than the main stand. The following diagrams show the most common combinations which occur.



An occasional tree may be borderline between the Main Stand and the Secondary Stand. If in your opinion, the tree offers significant competition to the trees in the Main Stand, consider it as part of the Main Stand.

Don't separate larger trees as a Secondary Stand unless they are considerably larger and clearly of an earlier generation than the trees of the Main Stand.

If the larger trees are fairly numerous, there may be a question as to which is the Main Stand. In case of doubt, consider the larger trees as the Main Stand.

A change in the Main Stand may show need for a field boundary.

Stand Examination by Zig-Zag Transect:

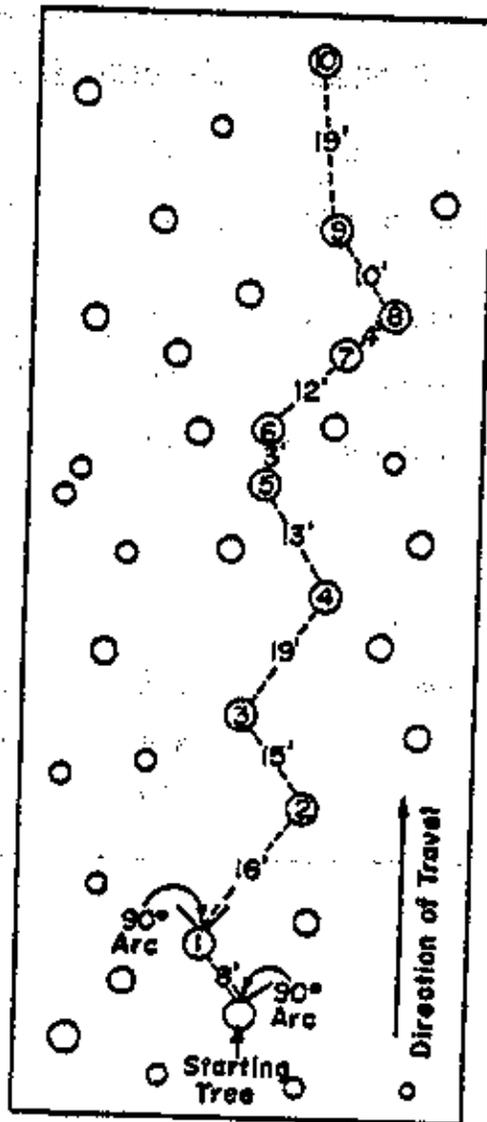
1. Choose a direction of travel which will take you through the field, perpendicular to the drainage pattern, so as to see a good cross section of it. You could elect to go in a cardinal direction or toward a visible landmark. On a sunny day use the sun as a direction marker. Go toward it, away from it, or at some angle to or from it.
2. Select a starter tree. This may be any tree which is a part of the main stand. No measurements are made of the starter tree. It serves only as a point of beginning.
3. At the base of the starter tree, sight in the chosen direction, using the center line of the 90° arc on the Woodland Information Stick.
4. Locate the closest main stand tree, the center of which is within the angle defined by the 90° arc. This tree is #1.
5. Pace the distance from the center of the starter tree to the center of tree #1. Determine the species of the tree and measure its diameter with the Woodland Information Stick. Carefully examine the tree and rate it for condition using the adjectives--good, fair, and poor. A good tree is one that is reasonably straight, not excessively limby, with a sound, full crown and without evidence of scars, wounds, or disease. A poor tree may have a broken top, a bad crotch, excessive limbiness, wounds, scars, or disease, or a combination of defects. Use fair as an intermediate rating. Do not confuse species desirability with the condition rating. Rate each tree on its own merits, without regard to species.

The condition rating and the other facts (distance, species, and diameter) are recorded on the Woodland Planning Worksheet. Show in "notes" the reason for rating a tree as poor if desired.

6. Standing at tree #1, repeat steps 3, 4, and 5 to select, measure, and rate tree #2. Continue in this manner until 20 trees have been examined. The line of travel will proceed in a zig-zag fashion as shown on page 15.

7. Skip over openings and clumps or patches of trees not part of and decidedly different in kind or size from the main stand. Do not include spacing measurements to or diameter measurements of trees on the edges of openings or clumps. Pass through them on the chosen direction of travel. Commence measurements on the opposite side. Record the frequency of openings or clumps-of trees encountered.

TAKING A ZIG-ZAG TRANSECT



Field procedures for running a zig-zag transect.

Your field notes will look like these below. Use a Woodland Planning Worksheet for your notes.

<u>Number</u>	<u>Species</u>	<u>Distance</u>	<u>Diameter</u>	<u>Condition</u>	<u>Notes</u>
1	red oak	17	10	G	
2	white oak	11	12	P	Large scar
3	elm	16	11	G	
4	white oak	18	10	G	
5	hickory	13	8	P	Broken top
.	
.	
20	ash	<u>14</u>	<u>9</u>	G	
TOTAL		315	199		
AVERAGE		16'	10"		

Summarize The Transect

1. To find average diameter of the main stand, divide the sum of diameters by the number of trees measured.
2. The diameter range of the main stand is shown by the smallest and largest trees in the sample.
3. Average spacing is found by dividing the total distance by the number of trees sampled. If desired, convert this to $D+X$, subtract the average diameter from the average spacing. If 10" trees are spaced 16' apart, they are growing at $D+6$ spacing.
4. Relative stocking is found by checking average diameter and the spacing with the stocking tables on the Information Stick.
5. The number of trees present per acre is found by using the spacing and number of trees table on the Information Stick.
6. The number of surplus trees is found by using the Information Stick. Subtract the number of trees which would be present at the desired level from the number of trees now present per acre.
7. The proportions of various species present can be approximated from the proportions found in the sample taken. If 7 of the 20 trees were white oak, it indicates that 35% of the main stand is white oak.
8. The proportions of trees rated as good, fair, and poor condition can be determined in the same manner as were proportions of trees by species.

Rating the Understory Stand:

Although the understory is of less importance than the main stand, it should be given its fair share of attention. Rate the stocking as though the main stand did not exist. List the principal timber species present. If enough trees are present to stock $2/3$ or more of the area, the rating is dense; a medium rating means $1/3$ to $2/3$ of the area would be stocked. Sparse means less than $1/3$ of the area would be stocked. Rate brushy species similarly. Your rating will be more meaningful if you make observations from more than one point. Understory plants may have wildlife values or particular aesthetic values. Discuss these matters with the owner as they are identified.

Observations of A Secondary Stand:

The Woodland Planning Worksheet has a block for making notes about a secondary stand if one is present. Show the principal species, the diameter range, and some remarks as to the extent of the stand.

LAND USE DISCUSSIONS WITH THE OWNER

As you and the owner gather the individual tree and stand facts, the stage is set for discussion. The Woodland Information Stick will provide answers to many questions. Don't hesitate to admit that you do not have all the answers.

Try to determine the nature of his primary interest. Most wooded areas lend themselves to multiple use, but there may be some incompatibilities. Wildlife values may be enhanced by planned systematic cutting. However, if his woodland is not large and his interests are primarily aesthetic in nature, woodcrop production may not be possible. A hollow tree would surely be rated in poor condition and would probably be slated for cutting if woodcrop production were his only interest, but if this tree is a den tree and the owner likes wildlife, he may be quite satisfied that it remain in place.

TREATMENT DISCUSSED WITH COOPERATOR

In this section of the Woodland Planning Worksheet, show the gist of your discussions with the cooperator and his decisions as to land use and conservation treatment. Remember that low intensity management is also good management. As a minimum objective help the owner be knowledgeable of his woodland resource and to seek help whenever tree harvesting is anticipated. Guide him to install erosion control practices when needed. Refer to the planning sheet before you visit him a second time. For many people, decisions do not come quickly. This record will help you to make your follow-up calls most productive. The completed worksheet should be retained in the conservation plan folder at the office. Use it for reference before you visit the cooperator again.

NEED FOR PROFESSIONAL FORESTRY ASSISTANCE

When the State Service Forester makes his next call to your district, review the completed Woodland Planning Worksheet with him. If the landowner needs or desires professional assistance in forestry, this will enable the Forester to concentrate his efforts on those places where he can be most productive. If you have a question about the practicality of the course of action planned by the landowner, engage the help of the Forester. Visit the area with him and benefit from his specialized training and experience. Build a good working relationship.

Robert E. Hartung, Forester
Northeast Technical Service Center
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