UNIVERSITY OF IDAHO
College of Agriculture

TIMBER

HOW MUCH DO I HAVE?

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Timber-r-rr! How Much Do I Have?

By Vernon H. Burlison

Why Should I Make A Cruise?

Good information about your timber volumes are important to your plan of management. Also, it puts you in a much better position if you are selling some stumpage. When you know what timber you have, you can figure how much it is worth. If you do not know what you have, then you are taking a real risk when you sell. The information you need to manage your woodland well and to sell your timber wisely is worth going after. You can learn to make a cruise that will be reliable enough for these purposes. But if you do not choose to do it, then you will be money ahead to have a cruiser or consulting forester do the job for you.

Well, How Do You Cruise a Woodland?

A cruise of your woodland provides an estimate of the timber volumes on it. Timber cruising, like estimating the yields of other farm crops, requires practice for an accurate job. There is nothing about timber cruising that is especially difficult to learn.

To make your own woodland cruise, you need to know these things:

How to estimate the diameter and height of individual trees.
How to tally the trees that you cruise.
How to lay out your cruise plan.
How to use a tree volume table.
How to compute your total timber volumes.

ESTIMATING THE INDIVIDUAL TREE

The usable volume of a tree depends upon its taper, defect, diameter and height.

Taper is taken into consideration in the construction of volume tables; so we ordinarily do not have to consider it in cruising.

Defect is the volume loss from decay, shake and other factors. We have to make a defect allowance when crusing. To do it accurately is perhaps the most difficult part of a cruise. The best course for a beginner in making defect allowance is to rely upon any experience he has had in handling timber and make a percentage cut on the total cruise volume of each species that seems an adequate deduction for defect.

Diameter is measured (or estimated) outside the bark at 4½ feet above the ground. The diameter at this point is called diameter-breast-high and is commonly referred to as the d.b.h. You can use a tree diameter tape, a caliper, the Biltmore scale on a cruising stick (Fig. 3, p. 17), or an ordinary tape to find d.b.h. The first three tools listed give a direct reading of d.b.h. If you use a regular measuring tape, then refer to Table 8, page 19, to convert your circumference readings to d.b.h.

Because trees often are not round in cross section you should take two readings at right angles to each other and average them when using a caliper or Biltmore scale to obtain d.b.h.

In cruising you take the d.b.h. to the nearest even inch. For example, all trees with diameters 17.1 to 19.0 inches are placed in the 18-inch diameter class.

Height in sawtimber means the number of 16-foot logs a tree will make to a minimum usable top diameter. It means the total tree height in feet when crusing is done for cubic-foot or cord volumes.

You obtain height by estimating, usually with the aid of a hypsometer. The Merritt hypsometer (Fig. 4, p. 18) on a cruising stick is one commonly used.

After you feel you can obtain the d.b.h. and height of trees with reasonable accuracy, you are ready to learn how to tally.

KEEPING YOUR CRUISE TALLY

Taking down the tree measurements while you are cruising is called tallying. Ordinarily some kind of a prepared form is used such as the one on page 12. This completed form shows the trees tallied on 20 plots taken as a sample on a "forty" containing ponderosa pine and Douglas-fir with a small amount of larch. Each of the dots and dashes in the squares represents a tree. The figures in the squares show the total tally for each size of tree.

The standard method for keeping tally of trees as they are cruised is this dot and dash system:

1	2	3	4	5	6	7	8	9	10
·	··	··	··	—	—	⊏	□	◰	⊠
		·	··	··	—				

This first tree of any diameter-height size class is tallied with one dot in the right space on the tally sheet. Succeeding tallies for that class are then added as the above dot-dash arrangements show. The 11th tree of any size class starts the second series of ten tallies.

All plots on a single forty or a small woodland can be tallied on one sheet, unless you want to make some refinements by **typing** your woodland. In many instances you can do this rather easily.

After you have fair knowledge of what your woodland looks like on the ground, consult an aerial photo at the Agricultural Sta-

bilization and Conservation county office or the local office of the Soil Conservation Service. With your knowledge of the woodland and the appearance of the photo, you can usually draw in lines that divide different forest types. A technician can help you obtain type acreages from the map. Then with an overlay copy for a guide, you can make a cruise by types which will give you more accurate species volumes.

HOW TO LAY OUT YOUR CRUISE PLAN

You know how to estimate individual trees and how to tally them to keep a cruise record. The next step is how to lay out your cruise plan, or just how to go about the job of cruising your woodland.

Making a Total Cruise

A total cruise is the simplest way. It is also the most accurate on small woodlands, but it requires more time than making a partial cruise. To make a total cruise, work back and forth in strips across your woodland and include in your estimate every merchantable tree that you believe should be taken in the next

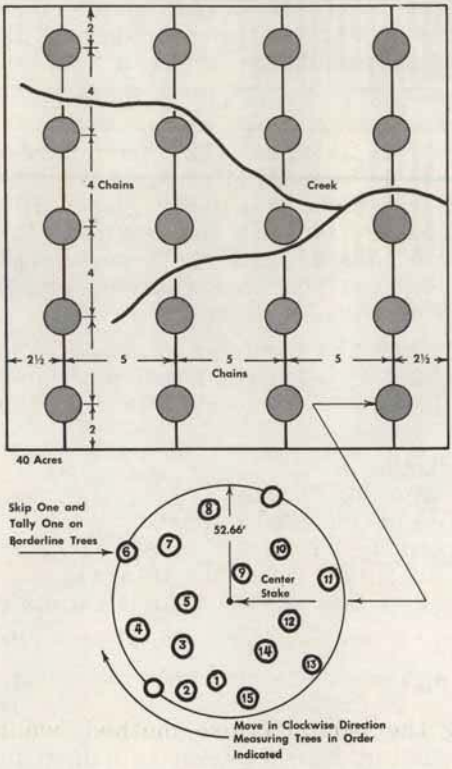

Fig. 1. Suggested plot arrangement for cruising a forty.

cutting. Mark each tree plainly with a daub of paint or a light bark blaze as you cruise it.

If you have a large woodland with a lot of merchantable timber, making a total cruise will be a big job. But you can do it by cruising a "forty" at a time. When you are through you should have a much more reliable estimate than you would get by making a partial cruise.

Making a Partial Cruise

If the job of including all the merchantable trees in your cruise seems too great, or time does not permit you to make a total cruise, then use the **partial** or **sample** cruise. Cruise the merchantable trees on selected plots that make up a representative sample of your woodland. There is a variety of methods for making a sample cruise. A good one for you to use is a mechanical arrangement of circular plots.

Use fifth-acre plots for sawtimber and cedar poles. Drop down to tenth-acre plots for pulpwood, short-logs, posts, or other small tree products. The radius of a fifth-acre plot is 52.66 feet; of a tenth-acre, 37.24 feet.

Figure 1 shows a suggested plot arrangement for a forty. Make your plot lines cut across the drainages. This helps you get a sample that best represents the types in your woodland.

First plot line is 2½ chains (165') in from border.
Plot lines are 5 chains (330') apart.
First plot center is 2 chains (132') from border.
Plot centers are 4 chains (264') apart.

Twenty fifth-acre plots on a forty give a 10 percent cruise. In most stands 10 percent makes a good sample. But when a woodland is very uneven (lots of open spots and irregularities in the size and density of trees) you need a larger sample to make your cruise reliable—15 or even 20 percent.

Your woodland may be irregular in shape. This will not prevent you from making a systematic location of your plots. Figure 2 shows how the plots could be located on a woodland with irregular boundaries.

53 acres woodland.
Plot lines 5 chains (330') apart.
Plot centers 3⅓ chains (220') apart.

24 one-fifth acre lots total 4.8 acres. 53/4.8=11.04, the **correction factor.** This figure times the total volume of any species on the plots would give that species volume estimate for the woodland.

Cruising a Single Plot

In discussing the partial cruise method, we have talked of cruising by plots, but it has not been explained how to cruise a plot.

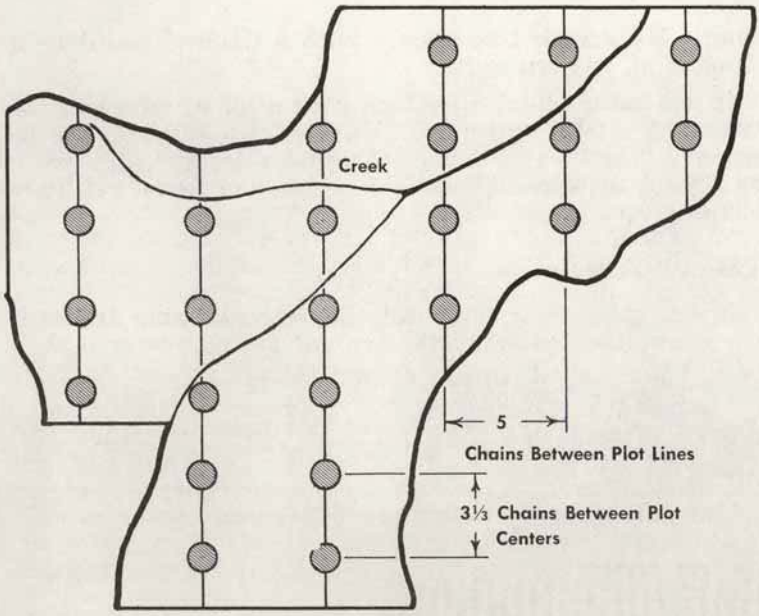

Fig. 2. A plot arrangement that can be used for a woodland with irregular boundaries.

Go about the cruising of a single plot as follows: Mark the center of the plot. If you are cruising in a dense stand, it is a good idea to measure out the radius and mark the circumference on each quarter of the plot. The cruising goes faster if two can work together. One can stand at the center of the plot and tally while the other covers the plot, estimating the d.b.h. and heights of all merchantable trees it contains and calling out these values to be tallied (see Fig. 1).

If you are working alone, you will have to do your own tallying. Cruising alone necessitates more care to be sure that no mistakes are made. Where trees are thick it will help to mark each one as you cruise it to prevent the danger of overlooking some and cruising others twice.

Be sure to get all the merchantable trees that are on the plot, but be just as sure not to include any trees that are outside the plot boundary. For all trees that are on plot boundary lines, follow the practice of tallying one and skipping one. Remember, the radius of a fifth-acre circular plot is 52.66 feet, that of a tenth-acre 37.24 feet.

HOW TO USE A TREE VOLUME TABLE

Table 4, page 14, gives tree volumes for the northern Rocky Mountain region. It lists board-foot volumes by d.b.h. and number of logs for our commercial species. The volumes are deter-

mined by the Scribner Decimal C log rule, the official log rule for Idaho.

To illustrate how to use the volume table, let us refer again to the sample tally sheet on page 12. Our first tally for ponderosa pine was 18 inches d.b.h. with three logs. Now, in the volume table we go down the left-hand d.b.h. column to 18, then select 3 in the number of logs column, and move right across the page to ponderosa pine. There we find the figure 25, which means an 18-inch, 3-log ponderosa pine tree contains 250 board feet on the average. To all values given in the volume table we have to add a cipher because these volumes are by the Scribner Decimal C log rule and are rounded off to the nearest ten board feet.

We have also tallied two 26-inch, 5-log ponderosa pine. From the volume table we read a value of 98 or 980 board feet, for a ponderosa pine of this size. Similarly we have tallied eight 18-inch, 4-log Douglas-fir. By following the 18-inch, 4-log class over to the "L & F" column, we find a value 30. The average 18-inch, 4-log Douglas-fir has a volume of 300 board feet.

HOW TO COMPUTE YOUR TOTAL TIMBER VOLUME

These are the steps in figuring your woodland volumes from the cruise tally sheets:

1. For each species, multiply the number of trees tallied in each diameter-height class by the corresponding volume from the volume table.
2. Add these products for the volume cruised by species. If you make a total cruise, the figure you get in this step for each species is its volume estimate for the woodland.
3. If you made a partial cruise, multiply the cruised volume of each species by the correction factor. The correction factor is obtained by dividing the acres in your cruise unit (a forty, a forest type, or the entire woodland) by total plot area in acres for the unit. Example: On our sample tally sheet, p. 12, the acreage in the unit is 38.6 acres. Twenty one-fifth-acre plots were used in making the cruise. They have a combined area of 4 acres. Therefore, our correction factor is 38.6/4 or 9.65.
4. In either a total or sample cruise, add species volumes to get total cruise unit volume. Add up the volumes of the separate units you may have for total woodland volume.

It is good practice to use an accounting sheet or a special form in computing cruise volumes. That makes it easy to check errors. Table 1 illustrates a good form to use. On it we have computed the cruise volumes from the sample tally sheet, p. 12.

The total value of 2150 for ponderosa pine by the Scribner Decimal C rule becomes 21,500 board feet when we add the cipher. This is commonly written 21.5MBM, or just 21.5M. Similarly, the Douglas-fir total becomes 9860, or 9.86M.

Table 1. Sample form for computing cruise volumes

Tree size, Class d.b.h.	No. Logs	Vol. of one tree	No. trees tallied	Total volume of trees in this class
PP				
18	3	25	2	50
18	4	33	3	99
20	4	42	2	84
20	5	53	5	265
22	4	55	1	55
22	5	66	7	462
24	4	70	3	210
24	5	81	9	729
26	5	98	2	196
Total PP			34	2150
DF				
14	3	13	4	52
16	3	19	5	95
16	4	24	6	144
18	4	30	8	240
18	5	38	2	76
20	5	46	4	184
24	5	65	3	195
Total DF			32	986

Now, these volumes are the totals for the trees cruised on the 20 plots or 4 acres. The whole area, 38.6 acres, is 9.65 times larger than the acreage of the plots. Therefore, to get the total estimate for the "forty," we multiply the plot totals by the correction factor 9.65.

9.65 x 21.5M = 207.5M of ponderosa pine
9.65 x 9.86M = 95.1M of Douglas fir

Grand total all species = 300.9M, the total volume estimate for the "forty."

Selecting Trees to Cut

You have been learning to make a woodland cruise. You have likely been asking yourself: How should I go about cutting my woodland? What trees should I cut? What trees would be best to leave? These are important questions. You may be able to make a profitable cutting in your woodland now.

A fair price for your standing timber depends upon the: species, size and quality of trees to be cut; per acre volume and the total volume to be harvested; location and topography of your woodland; products to be made from your trees; market conditions; and efficiency of the buyer's operation.

To take everything that is merchantable would likely defeat your goal in management. You want to keep a stand of trees that makes full use of the site. Therefore, it is best never to cut more than ¼ to ⅓ of the total stand volume at one time. This is particularly true in immature stands.

Here are some factors to consider in selecting the trees you will cut if you want to make your woodland as productive as possible:

Vigor—Take out the trees that show poor health by short crown length, low crown density and by short needle length or poor foliage color.

Form and Quality—Weed out the defectives and cripples. Trees with forked or broken tops or that are infected with heart rot are poor producers. Take them out.

Age—Select old trees for cutting and give their room to younger, thriftier trees.

Species—Select trees from your less valuable species as long as their space can be used by higher value trees. For example, hold western red cedar or western white pine in preference to grand fir.

Size—Small trees are more expensive to handle per unit volume harvested than larger ones. Cut small trees only when their growing space is needed or when they are in poor condition.

Growing Space—Trees need adequate space to make their best growth. Use the factors mentioned above to select trees from crowded clumps so those remaining will make better growth.

This brief discussion of tree selection in cutting over-simplifies the problem of what to cut. You will do well to get the advice of a forester before making a cutting.

Scaling a Deck or Load of Logs

The board foot volume of a log depends upon its **average top end diameter inside the bark** (d.i.b) and its **length.** The diameter is taken to the nearest inch, the length in even feet. That is, logs are usually scaled in 8-, 10-, 12-, 14-, and 16-foot lengths, rather than allowing odd lengths. All lengths must have a reasonable trimming allowance. The minimum acceptable trim allowance on 8-foot logs is 2 inches. The minimum trim on 16-foot logs is 4 inches. In other words, to scale as a 16-foot length a log would have to be 16 feet 4 inches long. If it is shorter than 16'4", then it must be scaled as a 14-foot log. When a log is too long to be a sixteen the common practice is to scale it as two logs. Always plainly mark the end of each log as soon as you have scaled it.

A scale stick simplifies scaling because the gross log volumes can be read directly from the stick as the small end diameter is measured. If you do not have a scale stick, then measure the small end diameters with tape or yardstick. Remember, you want the **average** diameter to the nearest inch inside the bark at the small

end of the log. Refer to a log rule table for volumes. See Table 2 this page. Find the log diameter in the left hand column. Go across the page to the appropriate column for length and read the volume. For example: a log with a 10-inch d.i.b. and 16-foot length contains 60 board feet; a log with 20-inch d.i.b. and 14-foot length contains 240 board feet.

In either case, using scale stick or log rule table, you get gross scale. No allowance is made for defect. There are established rules to follow in making deductions for defects. It takes some time to learn them and be able to apply them with any degree of skill. In most instances gross scale will be sufficient information for your use, because you will be familiar with any defects that occur in your logs and will understand that reasonable deductions must be made for them.

Table 2. Log Volumes by Scribner Decimal C Log Rule

DIB[1]	8	10	12	14	16	[2]
(inches)			(Board-foot volume in tens)			
6	0.5	1	1	1	2	
7	1	1	2	2	3	
8	1	2	2	2	3	
9	2	3	3	3	4	
10	3	3	3	4	6	
11	3	4	4	5	7	
12	4	5	6	7	8	
13	5	6	7	8	10	
14	6	7	9	10	11	
15	7	9	11	12	14	
16	8	10	12	14	16	
17	9	12	14	16	18	
18	11	13	16	19	21	
19	12	15	18	21	24	
20	14	17	21	24	28	
21	15	19	23	27	30	
22	17	21	25	29	33	
23	19	23	28	33	38	
24	21	25	30	35	40	
25	23	29	34	40	46	
26	25	31	37	44	50	
27	27	34	41	48	55	
28	29	36	44	51	58	
29	31	38	46	53	61	
30	33	41	49	57	66	
31	36	44	53	62	71	
32	37	46	55	64	74	
33	39	49	59	69	78	
34	40	50	60	70	80	
35	44	55	66	77	88	
36	46	58	69	81	92	
37	51	64	77	90	103	
38	54	67	80	93	107	
39	56	70	84	98	112	
40	60	75	90	105	120	

[1]Average diameter inside bark at the small end of the log.
[2]Scale lengths over 16 feet as two logs.

Sample Woodland Cruise Tally Sheet

Name John Doe Date 7/2/63

Location ½ mi. N., 1 mi. E. Pleasant Valley Store

No. of plots twenty Acreage in unit 38.6

Correction Factor: $\frac{\text{Acreage in unit}}{\text{Acreage in plots}} = \frac{38.6}{4} = 9.65$

D B H	Species: Ponderosa pine — Number of logs or total height 2	3	4	5	6	Fir and larch — Number of logs or total height 2	3	4	5	6	Dead All Species
14							..4				
16							..5	6			
18		2	. 3					8	2		
20			2	..5					..4		
22			1	7							
24			. 3	9					. 3		
26				2							
28											
30											
Plot Vol.	21.5M					9.86M					
Unit Vol.	21.5 x 9.65 = 207.5M					9.86 x 9.65 = 95.1M					

Woodland Cruise Tally Sheet

Name ..... Date .....

Location .....

No. of plots ..... Acreage in unit .....

Correction Factor: $\frac{\text{Acreage in unit}}{\text{Acreage in plots}} =$

DBH	Species — Number of logs or total height										Dead All Species
(in)											
Plot Vol.											
Unit Vol.											

Use this one for practice.

Table 3. Second-growth tree volumes[1] (Scribner Decimal C)

DBH	No. logs	WWP[2]	PP	WL	DF	GF	WRC	WH	ES
(in.)				(Board foot volume in tens)					
12	2	5	6	6	6	7	7	7	5
	3	9	9	10	9	11	10	12	9
14	2	7	9	9	9	10	10	11	8
	3	13	14	15	15	17	16	19	12
	4	19		20	22	25	22	26	18
16	2	9	12	10	10	12	11	12	10
	3	16	19	17	18	20	18	22	15
	4	23	25	24	26	29	25	31	22
	5	30		30	33	38	32	41	30
18	2	12	14	12	12	13	12	14	12
	3	19	24	20	21	24	21	25	18
	4	28	32	28	30	34	30	37	26
	5	36	42	35	39	45	38	48	34
20	3	22	29	22	24	28	24	29	22
	4	33	41	32	35	40	34	43	31
	5	44	54	41	45	53	44	56	40
22	3	26	34	26	28	32	28	34	26
	4	39	48	37	40	47	40	50	36
	5	52	62	48	53	62	51	66	47
24	3	31	38	29	32	36	32	39	30
	4	46	56	42	46	54	45	58	42
	5	61	74	55	61	72	59	76	54
	6	76	92	68	75	90	73	95	68
26	3	36	42	34	36	40	36	44	35
	4	54	64	48	52	61	51	66	48
	5	71	86	62	69	83	67	88	62
	6	89	108	77	86	105	83	110	78
28	3	41	46	37	40	44	40	49	49
	4	62	72	54	59	68	58	74	55
	5	82	98	71	78	94	76	100	71
	6	105	124	88	98	120	93	125	89
30	3	47	50	41	45	49	45	54	45
	4	70	80	60	66	77	64	84	62
	5	94	110	79	88	105	85	115	80
	6	115	140	99	110	135	105	145	100

[1]Compiled from U S. D. A. Tech. Bul. 323 and U. of I. Bul. No. 20.

[2] WWP=western white pine
PP=ponderosa pine
WL=western larch
DF=Douglas fir
GF=grand fir
WRC=western red cedar
WH=western hemlock
ES=Engelmann spruce

Table 4. Old-growth tree volumes[1] (Scribner Decimal C)

DBH	No. logs	WWP[2]	PP	L&F	GF	WRC	WH	ES	NBC
(in.)				(Board-foot volume in tens)					
12	2	8	9	7	8	8	9	7	10
	3	12	12		13	12	14	11	13
14	2	9	11	9	11	11	12	9	13
	3	15	15	13	17	15	17	13	16
	4	21	22	18	23		23	19	18
16	2	12	14	13	13	14	15	11	17
	3	19	20	19	21	19	21	16	21
	4	26	26	24	28	24	29	24	24
	5	33		30	37		37	31	

Table 4. Old growth tree volumes (continued)

DBH	No. logs	WWP[2]	PP	L&F	GF	WRC	WH	ES	NBC
(in.)					(Board-foot volume in tens)				
18	2	16	19	16	14	17	17	14	21
	3	24	25	24	25	23	27	20	28
	4	33	33	30	35	30	36	29	32
	5	41	40	38	46	37	46	38	
20	2	20	27	22	16	19	20	19	27
	3	30	34	28	29	27	33	27	35
	4	40	42	37	41	35	43	36	41
	5	50	53	46	54	43	55	45	
	6	60		55	67		68	55	
22	3	35	46	35	35	31	37	35	48
	4	47	55	45	50	41	52	44	56
	5	60	66	55	63	51	66	54	62
	6	72	76	65	78		81	65	
24	3	44	60	46	40	36	43	47	61
	4	58	70	52	57	46	61	56	72
	5	72	81	65	72	58	77	66	80
	6	86	92	77	90	70	94	77	
26	3	52	75	55	47	42	52	61	72
	4	69	86	65	66	53	72	69	86
	5	85	98	75	82	70	90	80	96
	6	102	110	90	102	86	110	92	
28	3	65	90	60	54	48	58	76	87
	4	83	104	72	76	60	81	85	105
	5	102	116	87	97	78	105	96	119
	6	120	132	105	116	99	126	108	
30	3	69	108	67	59		66	95	101
	4	90	125	84	81	76	93	104	122
	5	113	139	100	103	90	120	114	138
	6	136	154	121	130	112	145	125	
32	3	73	125	75	61		77	116	123
	4	100	148	95	86	84	107	125	151
	5	127	164	115	112	98	137	135	172
	6	154	182	138	144	124	164	147	
34	3	88	146	95	63		80	142	145
	4	118	172	102	97	96	113	153	178
	5	148	191	132	120	110	145	161	206
	6	178	210	156	158	138	183	171	
	7	205	229	182	197	167	220	181	
36	4	132	200	120	108		118	177	200
	5	166	221	148	148	122	159	183	230
	6	199	243	175	189	155	202	191	
	7	230	264	207	230	185	244	200	
38	4	139	225	140	132		130	201	228
	5	179	254	165	175	150	177	207	266
	6	219	279	195	218	170	225	214	
	7	258	301	230	260	204	268	223	
40	4	164	260	163	160		140	225	254
	5	206	288	185	205	175	193	234	302
	6	249	316	208	249	190	245	241	
	7	288	340	251	293	223	291	250	

[1]Arranged from multiple volume tables for the northern Rocky Mountain region published by Forest Service, Missoula, Montana.

[2] WWP—Western White Pine
PP—Pondersoa Pine
L&F—Western Larch & Doug-fir
WH—Western Hemlock
ES—Engelmann Spruce
NBC—Northern Black Cottonwood
WRC—Western Redcedar

Table 5. Average second-growth coniferous tree volumes in cubic feet[1].

DBH	Volume in cubic feet by total height of trees in feet												
(in).	30	40	50	60	70	80	90	100	110	120	130	140	150
6	2.5	3.3	4.0	4.8	5.6	6.5	7.3	8.1					
8	4.8	5.6	7.2	8.4	9.7	11.3	12.8	14.2	15.8	18.0	20.0		
10	7	9	11	13	15	17	19	22	24	26	28	30	
12		13	15	19	21	23	27	30	33	35	38	42	45
14		16	20	24	28	32	36	41	45	49	53	58	62
16			27	31	36	41	47	52	57	62	68	74	80
18			33	39	46	52	58	64	71	78	84	91	98
20			39	46	54	62	70	78	86	94	102	111	120
22				60	68	76	85	94	103	112	121	130	140
24					80	90	100	110	121	132	142	152	161
26					89	102	115	127	139	151	162	173	184
28						118	132	145	159	172	185	198	211
30							150	165	180	195	209	223	238

[1] Adapted from U. S. D. A. Tech. Bul. No. 323, U. of I. Bul. No. 20 and U. S. D. A. Ag. Handbook No. 92. This table gives average volumes for our commercial coniferous species. It is accurate for a woodland containing several species. If used for only 1 or 2 species, the results may be high or low, depending upon the species cruised. The following corrections will make cruise results more accurate: WWP, add 6%; GF, add 9%; PP, deduct 5%; DF, deduct 7%; WH, add 6%; WL, deduct 10%; WRC, deduct 9%. To convert cubic-foot cruise volume to an estimate in cords, divide by 85.

Table 6. Average second-growth coniferous tree volumes in cords[1].

DBH	Cords per tree	Trees per cord	DBH	Cords per tree	Trees per cord
(in.)	(number)		(in.)	(number)	
4	0.015	67.0	18	0.78	1.30
6	0.045	23.0	20	1.00	1.00
8	0.095	10.5	22	1.25	0.80
10	0.170	5.9	24	1.51	0.66
12	0.275	3.6	26	1.78	0.56
14	0.410	2.4	28	2.05	0.49
16	0.580	1.7	30	2.32	0.43

[1] Based on cubic-foot volumes of our important coniferous species from U. S. D. A. Technical Bulletin No. 323 and U. of I. Bulletin No. 20. The volumes given are average values, based on a solid wood content of 85 cubic feet per cord.

Table 7. Cord volume of 8-foot sticks[1].

DIB[2]	Vol. per stick	Sticks per cord	DBH	Vol. per stick	Sticks per cord
(in.)	(cords)	(no.)	(in.)	(cords)	(no.)
3	.0082	122	12	.0802	12.5
4	.0128	78	13	.0935	10.7
5	.0184	54	14	.1079	9.3
6	.0237	42	15	.1233	8.1
7	.0289	35	16	.1398	7.2
8	.0371	27	17	.1572	6.4
9	.0463	22	18	.1757	5.7
10	.0566	18	19	.1952	5.1
11	.0678	15	20	.2157	4.6

[1] Based on average solid wood content of 85 cubic feet per cord.
[2] Diameter inside bark at the small end of the stick.

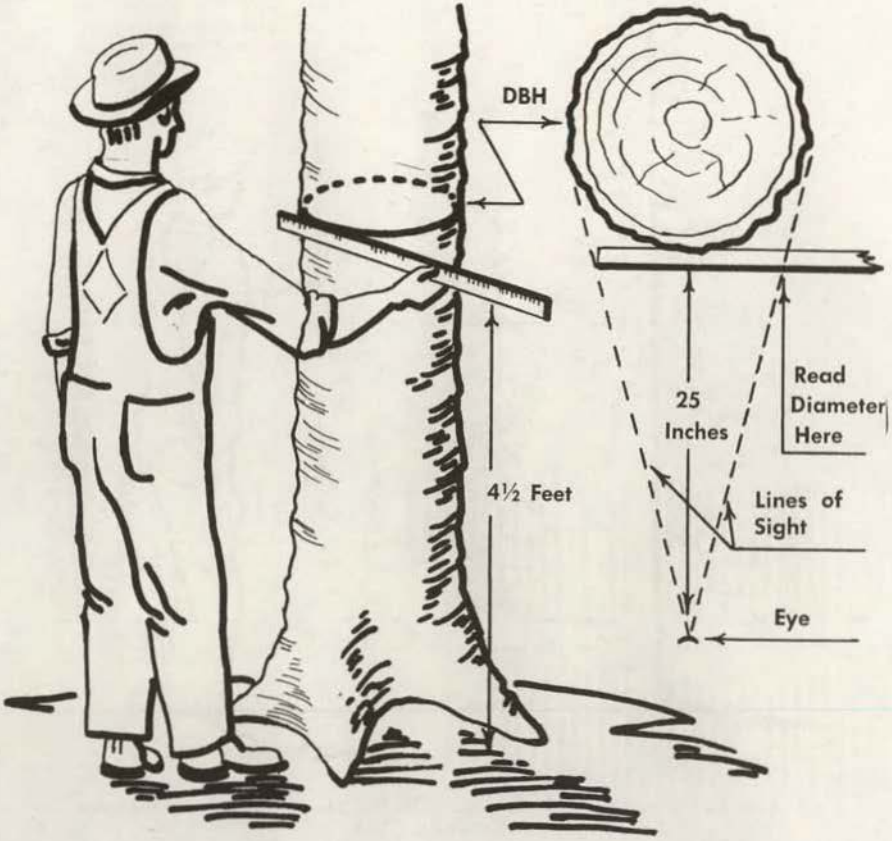

Fig. 3. Estimating Diameter With The Biltmore Scale On A Cruising Stick.

Place the stick against the bark of the tree trunk, 4½ feet above ground level. Hold it perpendicular to the tree trunk and 25 inches from your eye. Now adjust the stick horizontally until the zero end is flush with your line of sight to the edge of the bark on the left side of the tree. Without moving your head shift your line of sight to the edge of the bark on the right side of the tree. Read the figure that is nearest to where your line of sight crosses the scale on the stick. This is your diameter-breast-high (d.b.h.) estimate for the tree.

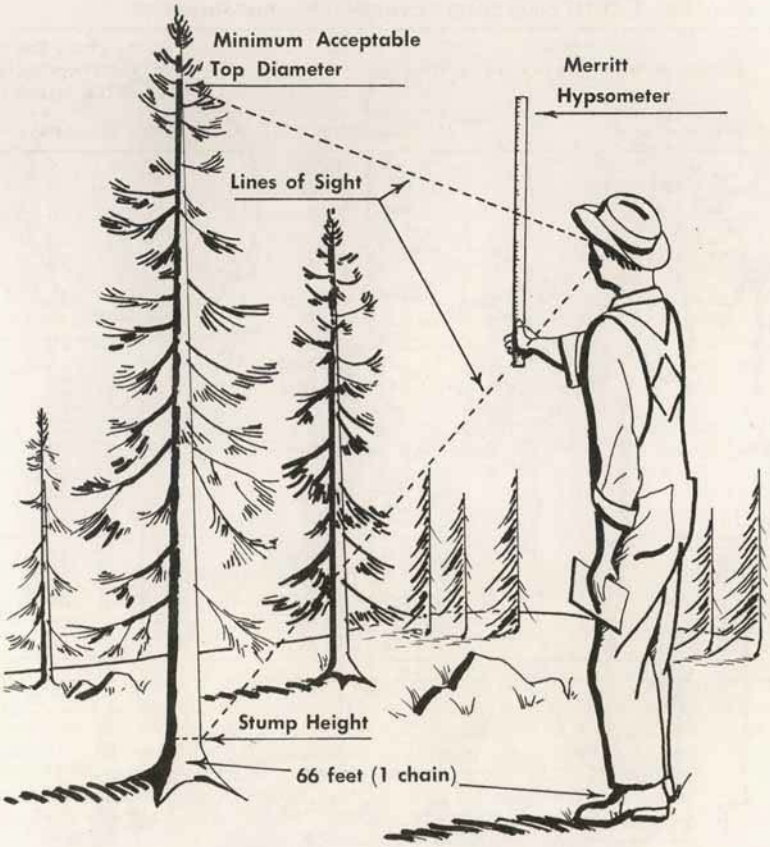

Fig. 4. Estimating Tree Height with the Merritt Hypsometer on a Cruising Stick

Minimum Acceptable Diameter

Stand at a point 66 feet from the base of the tree where you have good vision into the tree crown. Hold the stick plumb with the base 25 inches from your eye. Adjust the stick vertically until the zero end is flush with your line of sight to stump height on the tree. Without shifting your head or the stick, sight to the minimum acceptable top diameter in the tree crown. On the left hand hypsometer scale read the figure nearest where your line of sight crosses the stick. This is your estimate of the number of 16-foot logs in the tree. In case of a tree with more than 6 logs merchantable height, stand 99 feet from its base and read your height estimate on the right hand scale.

Table 8. DBH class from circumference measurements[1].

If the circumference of a tree is (inches)	or (feet & inches)	Then the Corresponding d.b.h. class is (inches)
3.4 to 9.4	0 & 3.4 to 0 & 9.4	2
9.5 to 15.7	0 & 9.5 to 1 & 3.7	4
15.8 to 22.0	1 & 10.1 to 1 & 10.0	6
22.1 to 28.3	1 & 10.1 to 2 & 4.3	8
28.4 to 34.6	2 & 4.4 to 2 & 10.6	10
34.7 to 40.8	2 & 10.7 to 3 & 4.8	12
40.9 to 47.1	3 & 4.9 to 3 & 11.1	14
47.2 to 53.4	3 & 1.2 to 4 & 5.4	16
53.5 to 59.7	4 & 5.5 to 4 & 11.7	18
59.8 to 66.0	4 & 11.8 to 5 & 6.0	20
66.1 to 72.3	5 & 6.1 to 6 & 0.3	22
72.4 to 78.5	6 & 0.4 to 6 & 6.5	24
78.6 to 84.8	6 & 6.6 to 7 & 0.8	26
84.9 to 91.1	7 & 0.9 to 7 & 7.1	28
91.2 to 97.4	7 & 7.2 to 8 & 1.4	30
97.5 to 103.7	8 & 1.5 to 8 & 7.7	32
103.8 to 110.0	8 & 7.8 to 9 & 2.0	34
110.1 to 116.2	9 & 2.1 to 9 & 8.2	36
116.3 to 122.5	9 & 8.3 to 10 & 2.5	38
122.6 to 128.8	10 & 2.6 to 10 & 8.8	40

[1] Use this table if you want to find tree diameters with a common tape. The table works this way: Suppose you measure the circumference of a tree and find it to be 69.2 inches at 4½ feet above ground. Come down the left-hand column to the range that includes the measurement, which is 66.1 to 72.3. Follow that level across the page and we see the corresponding DBH class is 22 inches. If your tape were laid off in feet and inches, the measurement would have read 5 feet 9.2 inches, and would fall in the range 5 & 6.1 to 6 & 0.3, found in the second column.

Further information and assistance on woodland management and marketing problems are available to you from these sources:

County Extension Agent
Woodland Forester (State Forestry Dept.)
Soil Conservation Service
Agricultural Stabilization Service

The material in this bulletin was reviewed and approved by the Idaho Interagency Forestry Committee, composed of representatives of the Soil Conservation Service, U. S. Forest Service, Bureau of Land Management, Idaho State Forestry Department, Idaho Fish and Game Department, forest industry and the University of Idaho Forest, Wildlife and Range Experiment Station and Agricultural Extension Service.

Titles of current forestry bulletins available from your County Extension Agent or Woodland Foresters:

Woodland Management and Marketing

Managing the Family Forest, U. S. D. A.
Logging Farm Wood Crops, U. S. D. A.
Measuring and Marketing Farm Timber, U. S. D. A.
Measuring Trees, P. N. W.
How to Make and Use a Cruising Stick, U. of I.
Protect White Pine from Blister Rust, U. S. F. S.
Knots vs. Clear Lumber, U. S. F. S.
Building Woodland Roads, Wash. State Univ.
Marketing Woodland Crops, P. N. W. Bul. 48

Tree Planting

Trees Against the Wind, P. N. W.
Plant Your Trees Right, P. N. W.

Christmas Trees

Raising Christmas Trees for Profit, P. N. W.
United States Standard for Christmas Trees, U. S. D. A.

Wood Utilization

Building with Logs, U. S. D. A.
Selecting Farm Framing Lumber for Strength, U. S. D. A.
Wood Siding, How to Install It, Paint It, Care for It, U. S. D. A.
Fuel Values of Idaho Woods, U. of I.

Wood Preservation

Cold Soak Wood Preservation, U. of I.
Salt Treatment for Green Posts and Poles, Oregon State College
Wood Decay in Houses, How to Prevent and Control It, U. S. D. A.

General

Native Trees of Idaho, U. of I.

Cooperative Extension work in Agriculture and Home Economics, J. E. Kraus, Director, University of Idaho College of Agriculture and United States Department of Agriculture Cooperating.

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