

LOG SCALING IN IDAHO

by **Russ Hogan
and Vern Cooper**

**Scaling
&
Marketing
Private Timber**



An Idaho Forest
Stewardship program

Co-sponsored by:

- University of Idaho
Cooperative Extension System
- Idaho Department of Lands
- Idaho State Board of Scaling
Practices
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INTRODUCTION

The material contained in this booklet is intended for use as an aid to participants attending the Idaho Forest Stewardship Program, “Scaling & Marketing Private Timber.” It supplements the presentation “Log Scaling in Idaho”, delivered by the speakers Russ Hogan and Vern Cooper. This material provides a general background for anyone interested in log scaling practices in the state of Idaho.

Any reader having particular questions regarding technical aspects of scaling, or provisions of the Idaho Log Scaling Law, should feel free to contact the office of the Idaho Board of Scaling Practices for further information. The address and phone number, along with additional sources of information, are included at the end of this booklet.

WHY WE SCALE

From an historical perspective, log scaling probably began around two hundred years ago – about the time of the Industrial Revolution. As sawmills arrived on the scene, it became necessary to have some means of log measurement. Log scaling was born.

In its simplest terms, scaling provides the means for establishing log value. Scaling gives an objective, quantifiable value for a log. The primary reason for scaling is to provide a basis for payment. Other reasons for scaling include:

- prediction of the quantity of end products
- check on the accuracy of cruise volumes
- basis for inventory measure
- basis for tax assessments
- written record of identification
- measure of work accomplished.

Scaling is defined as an *arbitrary* system of measurement, by means of a *log rule*, that reflects certain *units of measure* in a log. Predominantly, log scaling in Idaho is based on the *Coconino Scribner decimal “C”* log rule.

SCALE vs. LUMBER YIELD (“OVERRUN”)

The original *Scribner* log rule was based on diagramming the number of boards (one-inch thick, with allowance for slabs, edgings and saw kerf) that could be recovered from a log of a given diameter and length. The board foot volume was then determined by totaling the volumes of all the boards. The original Scribner log rule has seen modifications over the years, but its “diagram formula” of one-inch boards forms the basis of log scale volumes used today.

Scribner decimal "C" is a modification of the Scribner log rule that uses tens of board feet as its basic unit of measure. It rounds off board foot volumes to the nearest 10 board feet and drops the remaining cipher. For example, if a log scaled 96 board feet by the original Scribner rule, Scribner decimal "C" would round this to 100 board feet, drop the remaining cipher, and express the volume as "10 boards." Ten logs (each with a scale of "10 boards") would total "100 boards", which is the scaling expression for 1,000 board feet.

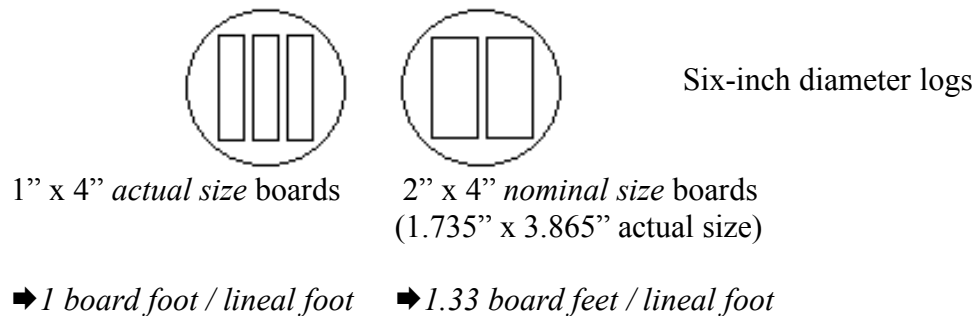
Throughout the United States, lumber volume is expressed in board feet. A *board foot* measures 1" x 12" x 1' (or its equivalent – for example: three boards, each with dimensions of 1" x 4" x 1', would equal one board foot). The formula for determining lumber volume in board feet is:

$$\text{Board Feet} = \frac{\text{Width (in inches)} \times \text{Thickness (in inches)} \times \text{Length (in feet)}}{12}$$

In many instances, the board foot volume of lumber that is produced from a log does not equal the board foot volume expressed by the log scale. When the amount of lumber actually recovered is more than the amount predicted by the log scale, it is referred to as *overrun*; if it is less than the amount predicted by the log scale, it is referred to as *underrun*. A formula to calculate the percentage of overrun (or underrun) is expressed as:

$$\text{"Overrun" (underrun) in \%} = \frac{(\text{lumber tally} - \text{net log scale})}{(\text{net log scale})} \times 100$$

Differences in scale versus lumber yield are due mainly to the design of the Scribner decimal "C" log rule versus the type(s) of end product(s) being manufactured. Scribner decimal "C" is based on boards that are one-inch thick, *actual size*. Lumber production is based on various *nominal size* board measurements. This difference may be illustrated by comparing the Scribner diagram with a sawing diagram that reflects production of "two-by-fours" on six-inch diameter logs:



Since lumber products are manufactured in a variety of sizes, the lumber tally in board feet will seldom be the same as determined by the log scale. Veneer, chips, and sawdust are additional products that may be recovered from a log, and require the use of conversion factors to predict yields. Other factors affecting "overrun" (or underrun) include log sizes, taper of the logs, efficiency of milling machinery, and accuracy of the scaler. To account for all the variables would require a different scale rule for each end-product. In the final analysis, scale is simply a standard for measuring log volume whose application is independent of lumber yield.

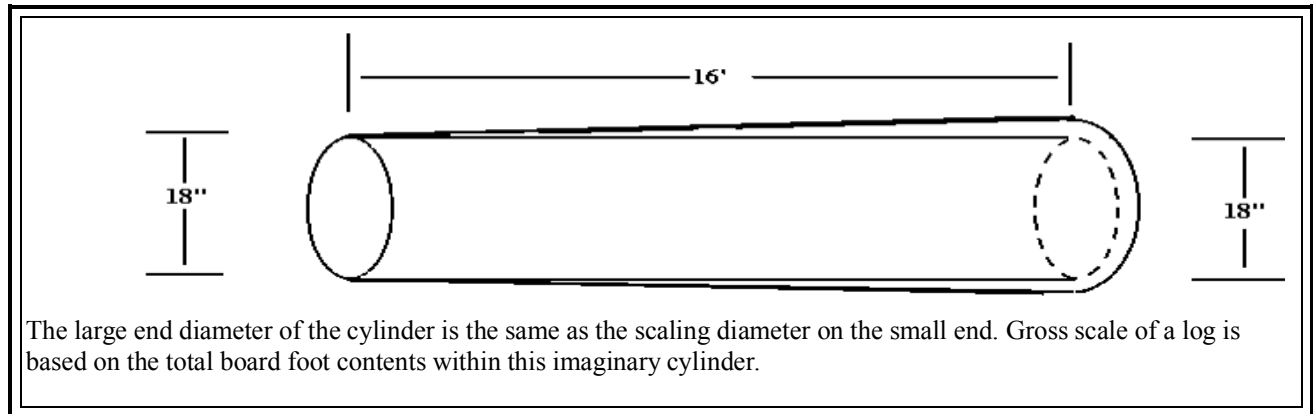
Coconino Scribner decimal "C" Volume Table

Diameter (in inches)	Log Length (in feet)																
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3					1	1	1	1	1	1	1	1	1	1	1	1	1
4					1	1	1	1	1	1	1	1	1	1	1	1	1
5		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
6		1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
7	1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3
8	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3
9	1	1	1	2	2	2	3	3	3	3	3	3	4	4	4	4	4
10	1	1	2	2	3	3	3	3	3	4	4	5	6	6	6	6	7
11	1	2	2	2	3	3	4	4	4	5	5	6	7	7	8	8	8
12	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	10	10
13	2	3	4	4	5	5	6	7	7	8	8	9	10	10	11	12	12
14	3	4	4	5	6	6	7	8	9	9	10	11	11	12	13	14	14
15	4	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18
16	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
17	5	6	7	8	9	10	12	13	14	15	16	17	18	20	21	22	23
18	5	7	8	9	11	12	13	15	16	17	19	20	21	23	24	26	27
19	6	8	9	10	12	13	15	16	18	19	21	22	24	25	27	28	30
20	7	9	11	12	14	16	17	19	21	23	24	26	28	30	31	33	35
21	8	10	12	13	15	17	19	21	23	25	27	28	30	32	34	36	38
22	8	10	13	15	17	19	21	23	25	27	29	31	33	35	38	40	42
23	9	12	14	16	19	21	23	26	28	31	33	35	38	40	42	44	47
24	10	13	15	18	21	23	25	28	30	33	35	38	40	43	45	48	50
25	11	14	17	20	23	26	29	31	34	37	40	43	46	49	52	54	57
26	12	16	19	22	25	28	31	34	37	41	44	47	50	53	56	59	62
27	14	17	21	24	27	31	34	38	41	44	48	51	55	58	62	65	68
28	15	18	22	25	29	33	36	40	44	47	51	54	58	62	65	69	73
29	15	19	23	27	31	35	38	42	46	49	53	57	61	65	68	72	76
30	16	21	25	29	33	37	41	45	49	53	57	62	66	70	74	78	82
31	18	22	27	31	36	40	44	49	53	58	62	67	71	75	80	84	89
32	18	23	28	32	37	41	46	51	55	60	64	69	74	78	83	88	92
33	20	24	29	34	39	44	49	54	59	64	69	73	78	83	88	93	98
34	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
35	22	27	33	38	44	49	55	60	66	71	77	82	88	93	98	104	109
36	23	29	35	40	46	52	58	63	69	75	81	86	92	98	104	110	115
37	26	32	39	45	51	58	64	71	77	84	90	96	103	109	116	122	129
38	27	33	40	47	54	60	67	73	80	87	93	100	107	113	120	126	133
39	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
40	30	38	45	53	60	68	75	83	90	98	105	113	120	128	135	142	150

HOW TO DETERMINE THE SCALE OF A LOG

SCALING CYLINDER:

Two measurements determine the scaling cylinder of a log segment – scaling diameter and scaling length. The scaling cylinder is an imaginary cylinder extending the scaling length of a log segment with identical diameters on both ends.



LOG DIAMETER MEASUREMENTS:

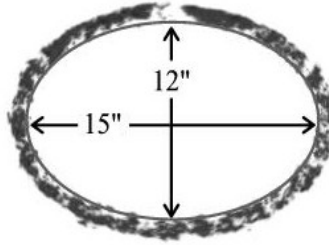
The Coconino Scribner decimal “C” log rule measures diameters on the one-half-inch rather than the full-inch. For example, using a standard tape measure, a scaling diameter of 10” would be any diameter that measures between 9 ½” to just under 10 ½”. The minimum top diameter normally considered in scaling is 6” (5.51 actual inches). When the narrow-way is less than 6” (5.51 actual inches), the log will be scaled back to the next shorter log length that meets the minimum top diameter requirement (this shorter log length is reflected in two-foot multiples with full trim). Log segmenting will then be done using this ‘new’ or ‘cut-back’ length.

When making diameter measurements, always remember the following:

- Diameters are measured on the smallest point on the log.
- Measurements are taken inside the bark.
- Measure through the true center of the log.
- Disregard all abnormal bumps and depressions (such as knot clusters, swells, or broken ends).

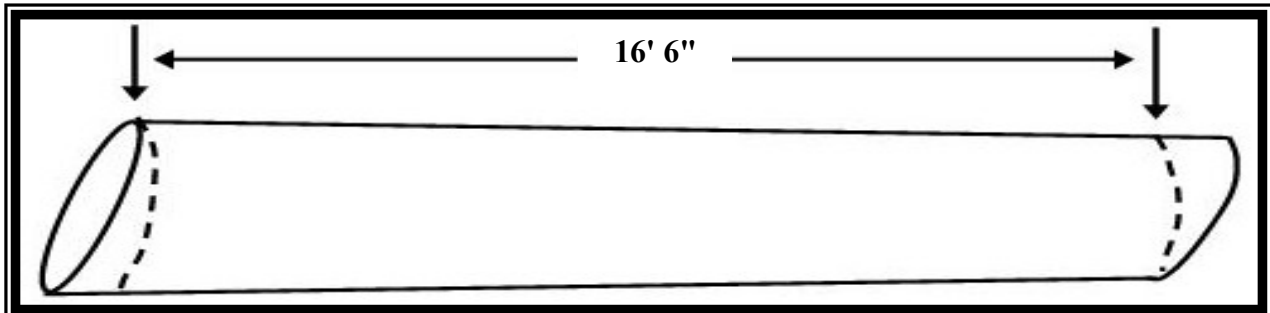
Diameter measurements are taken by finding the *narrowest* way first. If all logs were small and round, one measurement would probably be all that was needed. However, trees grow in a variety of shapes. When logs are delivered that are odd or oblong in shape, a second diameter measurement is needed. The second measurement is taken at a *right-angle* (90 degrees) to the first (narrowest) measurement. If one diameter measurement falls exactly on the half-inch, raise it to the next higher full-inch. If both measurements fall exactly on the half-inch, raise one and lower the other. The two measurements are then added together and divided by two. If the *final* calculation ends in one-half, the one-half is dropped. As an example: a log with a diameter measurement of 12” the narrow-way and 15” at a right angle, has a scaling diameter of 13”.

$12'' + 15'' = 27''$
 $27'' \div 2 = 13 \frac{1}{2}''$
 Drop the final $\frac{1}{2}''$
 Scaling diameter = 13 inches



LOG LENGTH MEASUREMENT:

Acceptable log lengths are generally in two-foot multiples, plus 6" for trim allowance per segment. The maximum scaling length for a single segment log is 20' plus trim. When logs exceed 20' they are scaled as two or more segments, with the length of each segment being as close to the same as possible. On a butt-cut, measure from the shortest side on the small end to the point where the scaling cylinder emerges on the butt. Second cut logs are measured from short side to short side.



LOG TAPER RULES:

To improve productivity, handling, and storage capabilities, logs are frequently manufactured in lengths longer than 20' 6". Since log segments are scaled with a maximum scaling length of 20', it becomes necessary to obtain a small-end scaling diameter for any other segment(s) within the log.

Determining Midpoint Diameter on Second-cut Logs	
Measure the small end diameter and the large end diameter; add both measurements together and divide by two. If the <i>final</i> calculation ends in one-half (1/2), <i>raise</i> it to the next higher whole number.	
This log has small end diameter of 13" and a large end diameter of 18". $13'' + 18'' = 31''$ divided by $2 = 15 \frac{1}{2}''$; raising the final $\frac{1}{2}$ to the next higher whole number = 16" midpoint diameter.	

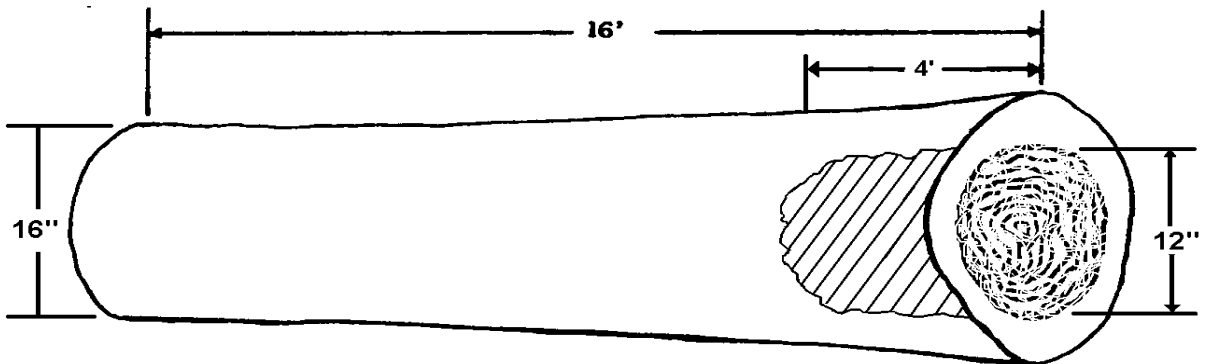
To determine the rate of taper in butt logs, extensive studies were conducted on logs from different areas. Results of these studies were used to develop “*standard taper rules*” for butt logs. Because of distinct differences in the rate of taper from various areas, different taper rules will apply to various regions.

Midpoint Taper Determination for Multi-segment Butt Logs		
<p>1. NORTH IDAHO AREA (north of the Salmon River, and including the northeastern Washington area bounded by the Snake River on the south, to the Columbia River, north to the Okanogan River, north to Canada) -- midpoint taper shall be a standard taper as follows:</p>		
Larch & Lodgepole Pine	21’- 48’	Shall be 1-inch per segment.
Larch & Lodgepole Pine	49’- 60’	Shall be 2-inch top segment, 1-inch remaining segment.
Cedar	21’- 40’	Shall be 2-inches per segment.
All Other Species	21’- 40’	Allow 1-inch taper on pieces with an odd top diameter; allow 2-inch taper on pieces with an even top diameter (Odd-Even Rule).
All Species (except Larch & Lodgepole Pine)	41’- 60’	Take two measurements, small end and 16’ up from the butt. The diameter at the 16’ measurement point shall be determined by actual measure. Apply calculated taper distribution to determine scaling diameter of the second segment.
All Species	61’ and longer	Take two measurements, small end and top of the second segment up from the butt. The top diameter of the second segment shall be determined by actual measure. Apply calculated taper distribution to top segment(s) and standard taper rule for the appropriate species to bottom segment.
<p>2. SOUTHWEST IDAHO AREA --- midpoint taper shall be a standard taper as follows:</p>		
Larch	21’- 40’	Shall be 1-inch taper.
All Other Species	21’- 40’	Shall be 2-inch taper.
Multiple-segment butt logs not addressed shall be determined with actual taper applied.		
<p>3. SOUTHEAST IDAHO AREA ---</p>		
<p>a. TARGHEE NATIONAL FOREST AREA – midpoint taper shall be a standard taper as follows:</p>		
Douglas Fir, Alpine Fir, & Engelmann Spruce	21’- 40’	Shall be 2-inch taper.
Lodgepole Pine	21’- 31’	shall be 1-inch taper.
Lodgepole Pine	32’- 40’	shall be 2-inch taper.
<p>b. OTHER SOUTHEAST AREAS—midpoint taper(s) shall be determined with actual taper applied.</p>		
<p>c. Multiple-segment butt logs not addressed shall be determined with actual taper applied.</p>		
<p>4. Except as previously addressed, the butt-log taper tables developed by the USFS at the point of origin of the forest products shall be utilized on all forest products scaled within the state of Idaho. Multiple-segment butt logs not addressed shall be determined with actual taper applied.</p>		

DEFECT DEDUCTION METHODS:

There are four types of defect deduction methods used in scaling logs. These methods are used to arrive at the *net scale* volume of a log by applying a given set of rules and procedures.

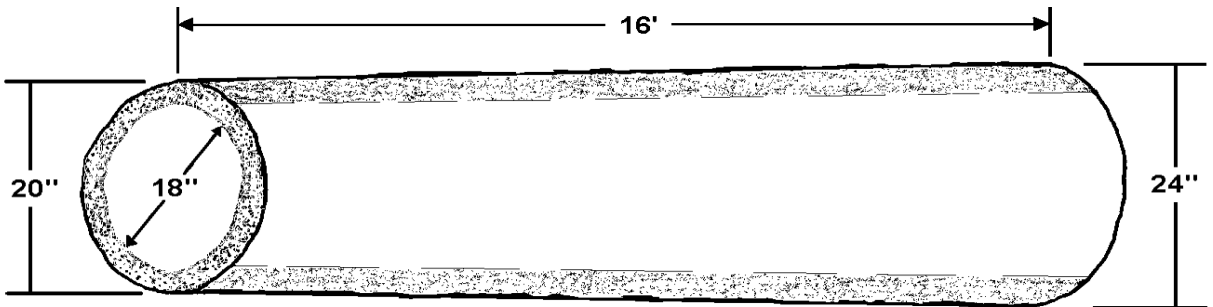
(1) **Length cut** is used to reduce the gross scaling length to a usable net scaling length. This method is used for larger interior rots (such as butt rots or conk rots) and also for undertrim or overtrim log lengths.



This log has a 16" scaling diameter and a 16' scaling length, giving a gross volume of 16. The log has butt rot which is estimated to extend 4' up the log. A log with a 12' scaling length and a 16" diameter would have a gross volume of 12, this would be the net volume for this log.

$$16 \text{ (gross volume)} - 12 \text{ (net volume)} = 4 \text{ (defect)}$$

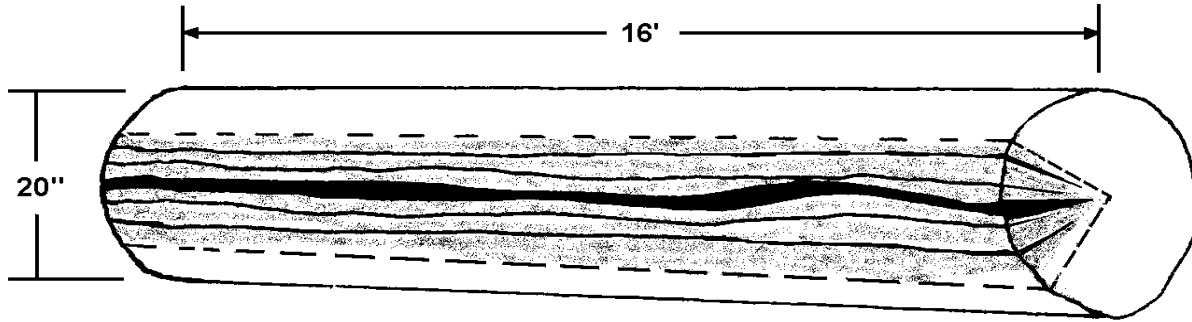
(2) **Diameter cut** is used to reduce the original gross scaling diameter to a smaller net scaling diameter. This method is used for defects such as sap rots and surface checks.



This log has a scaling diameter of 20" and a scaling length of 16'; the gross volume would be 28. The log has a collar of sap rot (one-inch thick) extending all the way around, leaving a firm 18" core. The gross scale of a 16' log with an 18" diameter would be 21; this would be the net scale for this log.

$$28 \text{ (gross volume)} - 21 \text{ (net volume)} = 7 \text{ (defect)}$$

(3) **Pie cut** is used to reduce the gross scale for a portion that is missing or not merchantable. This method can be used for defects such as lightning scars or cat-faces that do not affect the entire scaling cylinder.



This log has a scaling diameter of 20", and a scaling length of 16' with a lightning scar that is estimated to affect ¼ of the scaling cylinder. The gross scale of the log would be 28, divide this by 4 (one quarter of the cylinder) to determine the defect deduction.

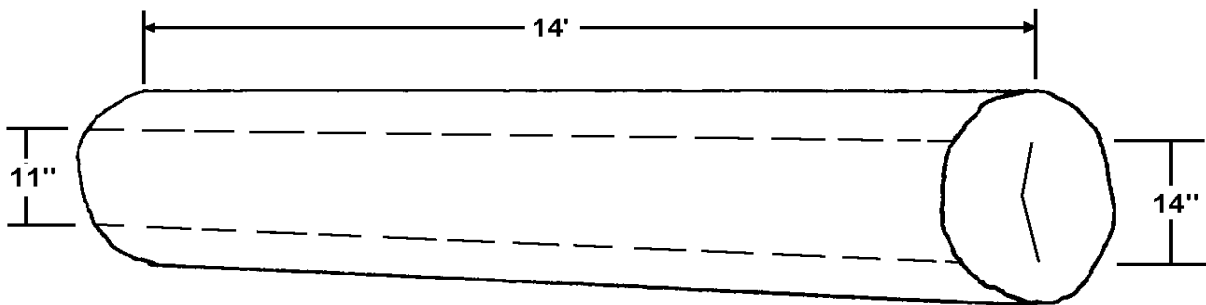
$$\frac{28}{4} \text{ (gross volume)} = 7 \text{ (defect)}$$

(4) **Squared defect cut** is used to make deductions in the form of squares or rectangles from the interior of a scaling cylinder. This mathematical method is used for pitch seams, heart checks, and smaller interior rots. The formula for this is:

$$\frac{\text{Width (inches)} \times \text{Height (inches)} \times \text{Length (feet)}}{15} = \text{Defect volume in board feet (round this to the nearest "ten" and drop the final zero)}$$

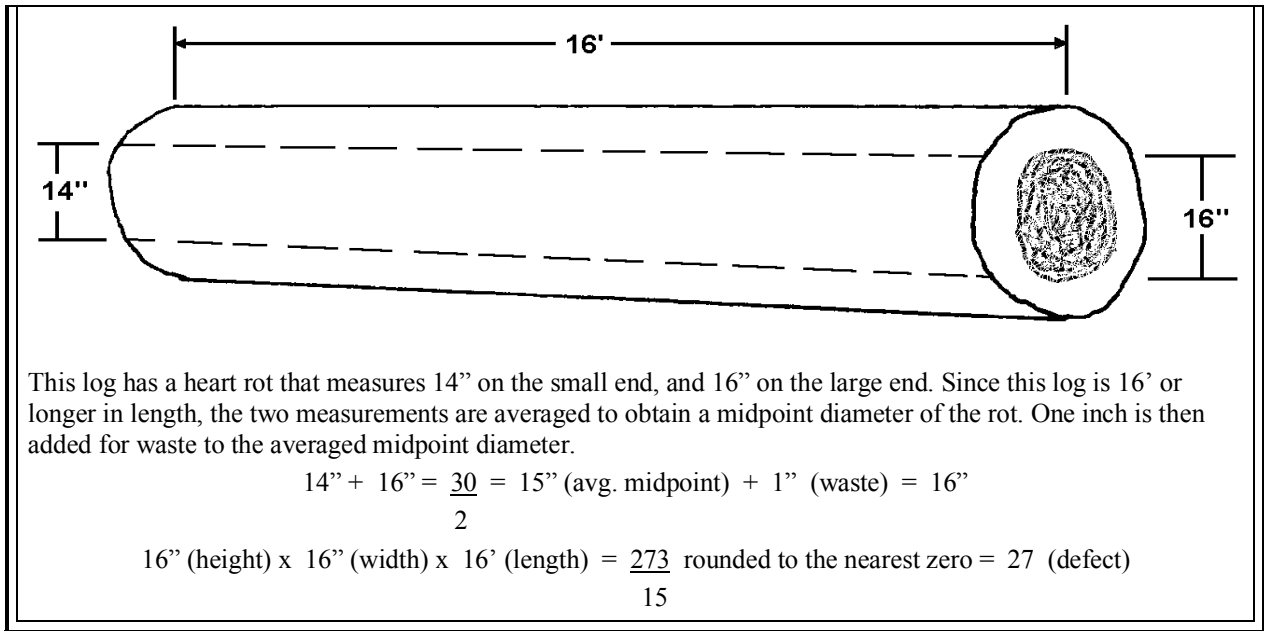
Numerous rules apply when using squared defect:

- one inch is added to allow for waste on both width and height dimensions
- logs 15' and shorter – measurements are taken from the large end of the defect
- logs 16' through 20' – measurements are taken from the large and small ends of the defect, then averaged to get the mid-point dimensions for the width and height
- if the squared defect equals or exceeds the gross volume of a segment, the scaler must use a different method of deduction.

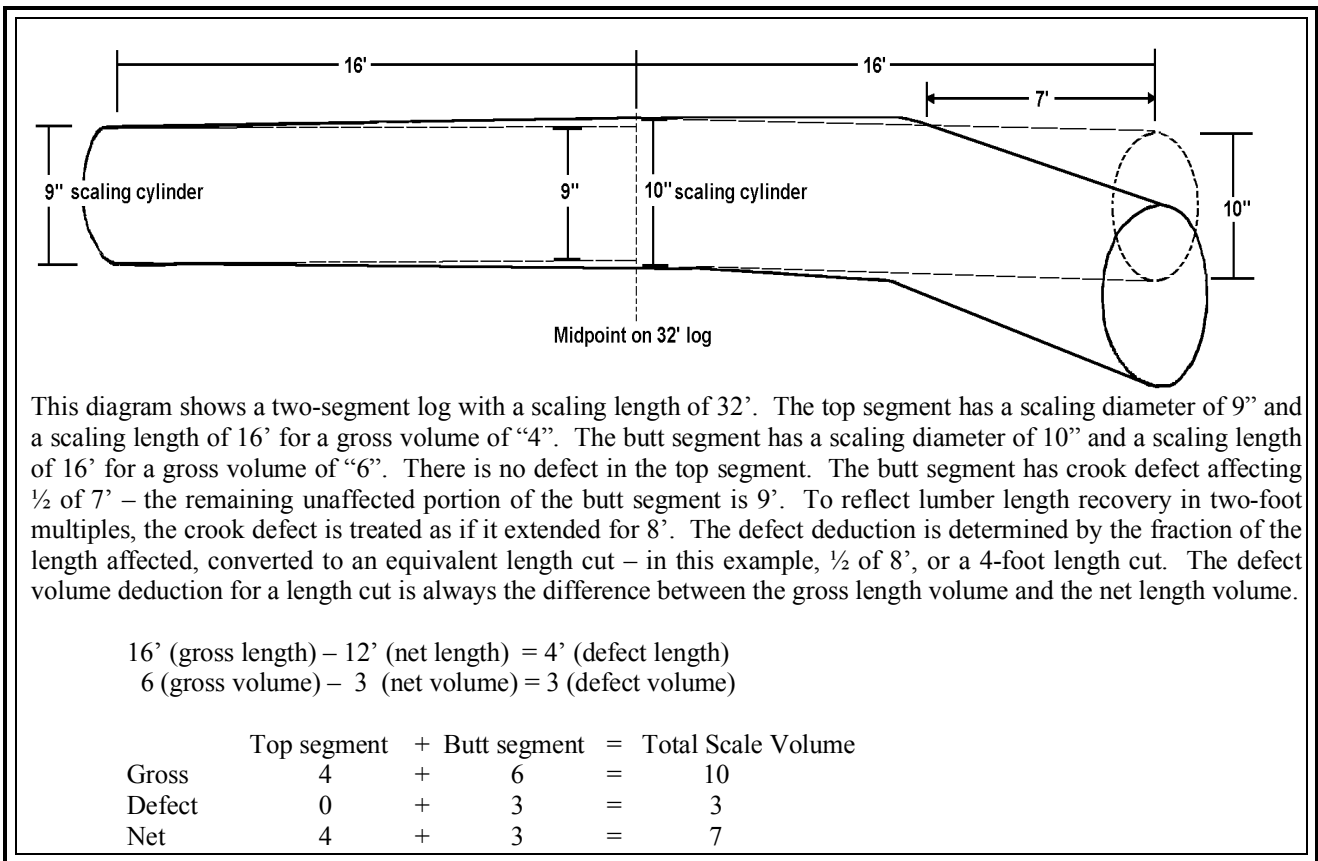


This log has a pitch seam that measures 1" x 11" on the small end and 2" x 14" on the large end. Since the log is shorter than 16', the largest end of the defect is used and one inch for waste is added to both the height and width measurements.

$$15'' \text{ (height)} \times 3'' \text{ (width)} = 45 \times 14' \text{ (length)} = \frac{630}{15} = 42 \text{ rounded to the nearest zero} = 4 \text{ (defect)}$$



Since lumber is usually sold in two-foot multiples, the net scale of a log is also determined in two-foot multiples. Any defects that would result in lumber length recovery shorter than six feet are treated as if they affect the entire length. Each log segment is always scaled on its own individual merits.



IDAHO SCALING LAWS & INSPECTIONS

During the late 1960's, the Idaho legislature created the Log Scaling Law, and the State Board of Scaling Practices to administer it. The Idaho State Board of Scaling Practices is a seven-member board, consisting of the Director of the Department of Lands, and six members appointed by the governor representing the following segments of the timber industry of Idaho: manufacturing, logging and transportation, nonindustrial private forest landowners and industrial forest landowners (two members representing manufacturing, one (1) member from companies consuming less than one hundred million (100,000,000) board feet of logs annually, and one (1) member from companies consuming more than one hundred million (100,000,000) board feet of logs annually. The board also includes two members from the Associated Logging Contractors of Idaho, Inc., one member from the Idaho Forest Owners Association representing owners with not more than fifty thousand (50,000) acres of private forest land and shall not own or control a forest products manufacturing facility within the state, and one member representing timber growing landowners holding more than fifty thousand (50,000) acres of forest land within the state of Idaho).

Provisions of the Log Scaling Law govern log scaling for commercial purposes within the state of Idaho. One of the primary aspects of the law requires scalers to be *licensed* before they can legally scale for commercial purposes. In order to be licensed, a person must pay a registration fee of twenty-five dollars (\$25.00), and pass both written and practical examinations on fundamental scaling subjects. Log scalers must renew their licenses every two years. Conditions for license renewal require scalers to pass an examination and pay a renewal fee of twenty-five dollars (\$25.00).

Funding for the Board's operations comes mainly from an assessment that is levied on the scale of all forest products harvested within the state. The assessment is levied against both the landowner and the purchaser with the purchaser being responsible for making payment to the Board. Money received is deposited in a dedicated fund known as the state scaling account, to be used solely by the Board. Annually, the Board submits a budget for legislative approval.

Scaling methods used within the state of Idaho are mandated by the Log Scaling Law:

- [Idaho Code] 38-1220. SCALING METHODS USED. (a) The method of scaling the various forest products for commercial purposes shall be in accordance with the board's administrative rules.
- (b) For the purpose of payment for logging or hauling logged forest products only, forest products shall be measured by gross weight, or by gross volume converted to gross decimal "C" or gross cubic volume.
- (c) Forest products scaled or otherwise measured by or for any agency of the United States government shall not be affected by this act. The licensing and bonding provisions of this act do not apply to any person measuring logs for any agency of the United States government, unless such agency so elects.
- (d) Measurement may be determined by a sampling process.

The law makes provision for the Board to appoint check scalers. Check scales help to ensure that scaling standards are maintained. The Board may also perform a *requested* check scale in response to disputes involving scaling, and there is a fee for this type of check scale.

Not contained within the Log Scaling Law, but assigned by the Floating Timber Law are two other responsibilities of the Board – the disposition of *prize logs* and the registration of *log brands*. Prize logs are logs that have been abandoned for a year or more, after having been placed in transit. Prize logs are sold by the Board at public auction. Log brands must be registered with the Board prior to their use within the state of Idaho. There is a fee of twenty-five dollars (\$25.00) for each log brand registered. Proceeds from these activities are deposited in the state scaling account.

RULES OF THE BOARD:

Administrative rules describe how a state agency applies and interprets the law. The Board has one chapter of administrative rules and the Idaho Log Scaling Manual. Chapter One rules addresses procedural rules for contested cases, rulemaking promulgation, general rules of the Board including licensing, and check scaling requirements. The Idaho Log Scaling Manual (2008 edition) contains measurement rules for scaling in the state of Idaho.

Chapter One, rule #100 (Payment For Logging Or Hauling), provides that gross scale must be determined according to the Board’s measurement rules. The rules relating to decimal “C” *gross scale* determination are mandatory and specific. These rules address all criteria for diameter and length measurements. Licensed scalers are required to determine a gross scale volume accordingly.

Decimal “C” *net scale* rules describe the *what*, and *how much*, in determining defect volumes for various product classifications (sawlogs, pulp, and cedar products). However, these rules relating to net scale determination also provide that a contractual scaling agreement may modify *how* net scale is determined. As a result, net scale volume *may vary*, and most often does. Written scaling specifications provide information from a contractual scaling agreement – to the scaler – for determining net scale volume. In the absence of written scaling specifications to the contrary, all licensed scalers are required to determine the net scale volume as described in these rules.

CHECK SCALING:

Once a scaler is licensed, routine and random check scales are performed by Board-appointed check scalers. Check scaling is performed to verify scaler proficiency, and confirm that the scale determination is made in accordance with the Board’s rules.

A *valid check scale* requires checking a minimum of 50 pieces (logs) with a volume of at least 10,000 board feet (BF). Most of the time, however, check scales will involve 100 or more logs with volumes around 12,000 BF or more. When possible, check scaling is done without the scaler’s knowledge. Valid check scales also require that the logs being checked are in the same position as presented to the scaler.

Check scale comparisons are tabulated and listed in a Check Scale Report. This report is distributed to persons *directly affected*, in accordance with the law and rules of the Board.

A scaler must be within allowable limits of variation in four areas – gross scale, net scale, species identification, product classification – for the check scale to be considered acceptable.

A *requested check scale* may be performed upon request of any individual, company, or corporation. The request must be in writing, made by a party directly affected, and involve disputes on scaling. The fee charged for a requested check scale is \$200 for each day, or part of a day, that the check scaler is scaling the logs. The fee is payable by the person requesting the check scale, or by the party in error when check scale results are outside allowable limits of variation. The check scale report is distributed to all persons directly affected, as defined in the Board’s rules.

DOES SCALE VARY AMONG MILLS?

Since net scale is not mandatory, the scale sometimes does vary among mills. The same load of logs may have greater (or lesser) scale at one mill versus another. This apparent anomaly is often due to variations in the *contract scaling specifications*. The following table compares some of the items that may vary by contractual agreement with the Board’s rules - that would otherwise apply in the absence of an agreement.

Some Common Sources of Net Scale Variation Among Mills	
Contract Scaling Specifications	Current Board of Scaling Practices Standards (Default Scaling Specifications)
Minimum Trim Allowances	None
Scaling in 1-foot or 2-foot Multiples	Scaling in 1-foot Multiples
Log Lengths Acceptable or Special Lengths	All Log Lengths from Eight Feet and Longer
Minimum Top Diameter	6-inch Scribner Class
Sawlog, Pulp, Cedar Products Scaling	Sawlog Scaling Only
Combination Logs are Scaled	No Combination Logs are Scaled
Special Defect Deduction Provisions	According to the Idaho Log Scaling Manual
Volume Tables	Idaho Log Scaling Manual
Multi-segment Butt-log Taper	Idaho Log Scaling Manual - (Generally USFS Taper Tables)
Minimum Merchantability Percentages	Sawlog - 33 1/3 % Pulp - 50 % Cedar Products - 10 %

The majority of check scale results show licensed scalers within allowable limits of variation.

Category		Allowable Variation	
Gross Volume	For logs in round form	+/- 2.0 percent	
	For logs in fractional or slab form	+/- 5.0 percent	
Net Volume	Sawlogs	Check scale percent of defect on logs checked	
		Up to 10	+/- 2.0 percent
		10.1 to 15	+/- 3.0 percent
		15.1 to 20	+/- 0.2 percent for each percent of defect
	Over 20	+/- 5.0 percent	
	Pulp Logs	+/- 5.0 percent	
	Cedar Product Logs	+/- 8.0 percent	
Species Identification Errors		3.0 percent	
Product Classification Errors		3.0 percent	

MEETING MILL SPECIFICATIONS

All mills expect good workmanship in log quality. This is an important issue because poor bucking, limbing, or excessive defect in log manufacturing practices results in reduced product recovery. To maximize productivity, mills also require that logs be manufactured according to their specifications. Mill specifications ultimately determine how much will be paid for any given log.

Depending on the type(s) of end-products a mill may produce, some species, sizes, lengths, or defects in a log may be unacceptable. But even among mills producing the same type(s) of end-products, there are often differences in what constitutes a properly manufactured log. Before a logging job begins, anyone involved in the manufacture of logs should become familiar with purchaser mill specifications.

Type of Mill Product	General Log Type Preferences		
	Species Used	Scaling Lengths	Scaling Diameters
Boards	WP, PP, LP, S, C	2-foot multiples	6-inch plus
Dimension & Boards	All species	2-foot multiples	6-inch plus
Studs	LP, DF, L, GF, H	8-foot multiples	5-inch/6-inch plus
Plywood	DF, L, GF, H	8.5-foot multiples	9-10" to 20-22"
Pulp	All species except C	1-foot multiples	3-inch plus
Utility Pole	C	35+ (5-foot multiples)	12-14" dbh trees
Cedar Products	C	Various	15-inch plus

QUALITY CONTROL: PREFERRED LOG LENGTHS AND PROPER TRIM

One of the more common mill specifications contained within a timber purchase agreement addresses preferred log lengths and proper trim. The log lengths preferred by a particular mill will depend on the type of product(s) that they produce. The proper trim allowance on a log ensures both that effective utilization of the tree has been made, and that the mill can produce a finished product of a given length.

In general, most mills want and accept logs manufactured in 2-foot multiples – with proper trim allowance. This allows a logger the ability to vary the log lengths and realize maximum utilization on harvested trees. Preferred log lengths allow a mill to more efficiently produce their finished product. The price paid for purchased logs will be predicated to some degree on the number of “preferred length” logs. Never assume that a log length which was acceptable at one mill will necessarily be acceptable at a different mill. While most mills accept a variety of similar log lengths, there is no universal standard – always refer to mill specifications. One common example of this occurs with 8-foot (plus trim) log lengths – at some mills, a log of this length is unacceptable and will be culled for net scale.

Scaling Length Determination			
Typical Manufactured Log Lengths (with full trim allowance ... these often may vary by plus or minus 2")	Scaling Length	Log Segmenting	
		Butt Segment	Top Segment
* 8' 6"	8'	8'	
10' 6"	10'	10'	
12' 6"	12'	12'	
14' 6"	14'	14'	
16' 6"	16'	16'	
* 17' 6"	17'	17'	
18' 6"	18'	18'	
20' 6"	20'	20'	
* 21' 0"	21'	11'	10'
23' 0"	22'	12'	10'
25' 0"	24'	12'	12'
27' 0"	26'	14'	12'
29' 0"	28'	14'	14'
31' 0"	30'	16'	14'
33' 0"	32'	16'	16'
35' 0"	34'	18'	16'
37' 0"	36'	18'	18'
39' 0"	38'	20'	18'
41' 0"	40'	20'	20'

<p>* 8' 6" and 17' 6" and 21' 0" log lengths should be cut <i>only</i> when requested by the mill buying the timber.</p>	<p>When segmenting scaling lengths in excess of twenty feet (20'), the longer segment always goes on the butt (or large) end of the log.</p>
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Occasionally logs are bucked without proper trim allowance. There are several reasons for this happening, all of which can and should be quickly corrected. The overall length of a log determines the gross scaling length, and incorrect trim allowance may result in a defect deduction to arrive at the net scaling length.

Proper trim allowance is neither too much nor too little. A log having too much trim allowance does not effectively utilize all of the tree. Overtrim may result in additional gross scale volume, but there is no benefit realized in finished product length. Quite often, a scaling deduction is made to reflect the finished product length that will be realized. A log having too little trim allowance is a costly mistake. Undertrim logs result in a finished product length that is shorter than what was intended. Depending on log size, length, and mill specifications, a scaling deduction for this type of "avoidable defect" can be substantial. A mismanufactured log length can easily result in a log being culled that would otherwise be an acceptable log.

* Examples of Some Acceptable and Mismanufactured Log Lengths				
Manufactured Log Length	"Short" Log Length	"Long" Log Length	Gross Scaling Length	Net Scaling Length
8' 4"			8'	8'
8' 3"	Yes		8'	CULL
16' 4" through 16' 8"			16'	16'
16' 3"	Yes		16'	14'
16' 9"		Yes	17'	16'
32' 10" through 33' 2"			32'	32'
32' 9"	Yes		32'	30'
33' 3"		Yes	33'	32'
<p>* Assumes <i>contract scaling specifications</i> requiring net scale determination in two-foot multiples, with minimum trim allowance of 4" on single-segment logs and 10" on double-segment logs.</p>				

GETTING THE MOST SCALE FROM YOUR LOGS

Increasing the scale of your logs involves understanding all the aspects involved in converting a standing tree to the finished products. Knowledge of how scale is determined, what reduces scale, and what does the mill need, all come into play in deciding a log manufacturing strategy. Avoiding the mistakes in log manufacturing is one of the best ways to realize greater scale.

Maximizing scale begins with felling of the tree. Errors to avoid include high stumps, stump shots, stump pull, and falling breaks. The higher the stump, the smaller the scaling diameter will be as you work your way up the tree making log lengths. Stump shots are undesirable log quality defects. Stump pull and falling breaks may reduce scale.

Bucking a felled tree into log lengths results in the real measure of log value. Logs are scaled as presented, and its length will determine many of the rules applied in scaling that log. Pitfalls to avoid include non-preferred lengths, short (or long) trim, small tops, bucking breaks, bias-cuts, protruding limbs, and excessive defect left in logs.

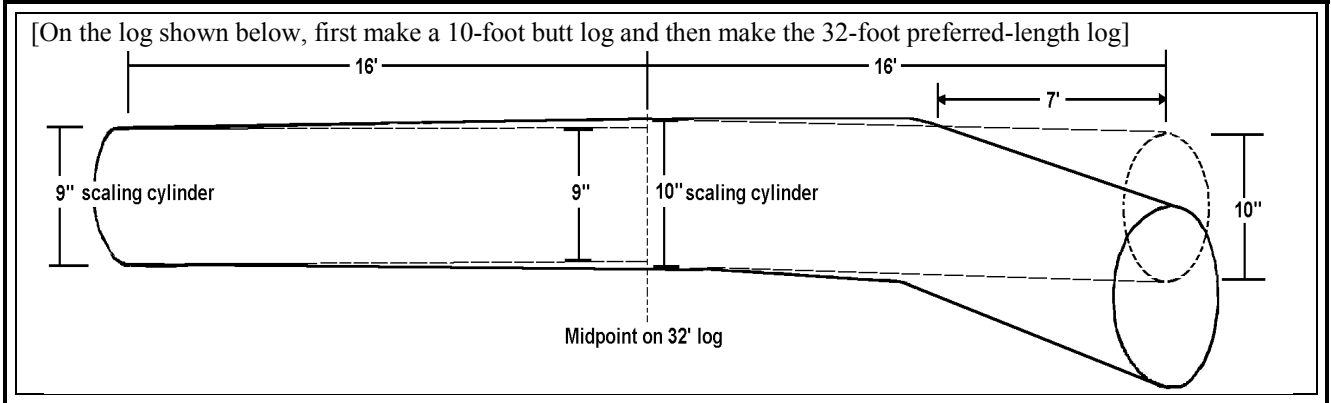
Being able to identify and understand how certain defects will affect the scale of a log is a great help in deciding how to buck a log. Various types of natural defects occur in any stand of trees. In manufacturing logs to get the most scale, the strategy is to reduce or eliminate the defect and, at the same time, make the best use of the resource available. While a logger may have little control over natural defects, most man-made defects can be reduced or eliminated.

Two special types of defects should always receive a log manufacturer's scrutiny. Most mills will not purchase logs that have "char" defect, and always, always, totally eliminate any "foreign object" defect (most commonly, iron) from a manufactured log.

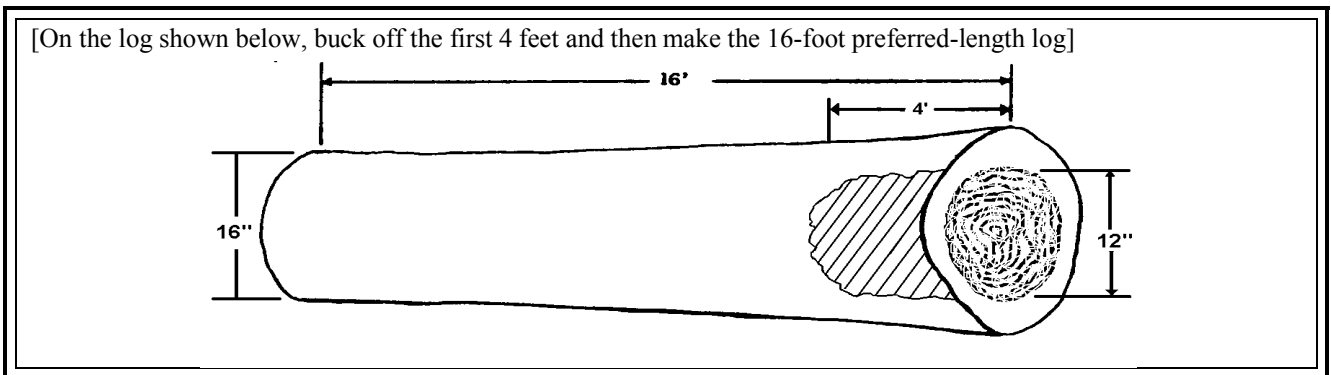
Examples of Some Scaling Defects & Causes			
Natural Defects		Man-made Defects	
Disease	Trunk, heart, butt, & sap rots	Falling	Stump pull, barber-chair, shattered logs
Insects	Bark beetles, carpenter ants, borers	Skidding	Track gouges, limbing gouges, breakage
Stress	Heart checks, shake rings, massed pitch	Bucking	Improper lengths, slabbed ends, splits
Perils	Lightning scars, fire, porcupines	Loading / unloading	Broken logs, gouges, slabbed logs

Ways to reduce or eliminate natural defects depend on the type, and severity, of the defect identified. Some defects must be tolerated because they cannot be reduced. Pitch seams, small to medium size frost cracks, and minor cat-faces should not be bucked out.

Other kinds of defects can be reduced by varying the length of a log. An example would be making shorter lengths to reduce excessive sweep. Bucking a log completely free of sweep results in poor utilization of the forest product. Properly bucked, the defect is minimized.

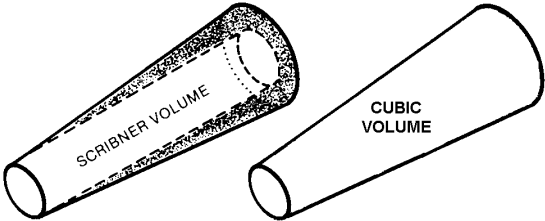


Defects affecting a considerable portion of the scaling cylinder should be eliminated. Examples would include severe butt rots or heart rots. In bucking for this type of defect it is important to remember not to buck off too much or too little. Generally, when the length affected by defects would result in the scale being less than one-third sound, wood should be eliminated.



OTHER LOG MEASUREMENT METHODS
(wt., cubic, etc.)

Throughout the state of Idaho, the most common measurement method used for buying and selling logs is the *Coconino Scribner decimal* "C" log rule. A few other measurement methods are categorized and described below.

Sample Weight Scale	A statistical sampling procedure generally applied to larger volume sales.																																																																											
Weight	<p>Although an objective method of measurement, a number of variations exist, such as seasonal changes in weight and fluctuations in pounds/MBF based on differing diameter classes. Some comparisons (reprinted, in part, from VO.ED. # 38, 1974 edition) are listed in the table below.</p> <table border="1"> <thead> <tr> <th rowspan="2">Species</th> <th colspan="2">Pounds Per Cubic Foot</th> <th colspan="3">16-foot Green Logs Per Thousand</th> <th rowspan="2">Approximate Weights of Wood (Pounds)</th> </tr> <tr> <th>Green</th> <th>12% Moisture</th> <th>12-Inch Logs</th> <th>18-Inch Logs</th> <th>24-Inch Logs</th> </tr> </thead> <tbody> <tr> <td>Western white pine . . .</td> <td>35</td> <td>27</td> <td>7,550</td> <td>5,950</td> <td>5,250</td> <td></td> </tr> <tr> <td>Ponderosa pine</td> <td>45</td> <td>28</td> <td>9,700</td> <td>8,050</td> <td>7,100</td> <td></td> </tr> <tr> <td>Western larch</td> <td>48</td> <td>36</td> <td>10,350</td> <td>8,600</td> <td>7,600</td> <td></td> </tr> <tr> <td>Douglas fir (NW Montana, N. Idaho type)</td> <td>38</td> <td>31</td> <td>8,450</td> <td>6,950</td> <td>6,200</td> <td></td> </tr> <tr> <td>Grand fir</td> <td>45</td> <td>28</td> <td>9,950</td> <td>7,800</td> <td>6,900</td> <td></td> </tr> <tr> <td>Engelmann spruce . . .</td> <td>39</td> <td>23</td> <td>8,450</td> <td>6,600</td> <td>5,850</td> <td></td> </tr> <tr> <td>Western redcedar . . .</td> <td>27</td> <td>23</td> <td>5,850</td> <td>4,600</td> <td>4,050</td> <td></td> </tr> <tr> <td>Western Hemlock</td> <td>41</td> <td>29</td> <td>8,850</td> <td>6,950</td> <td>6,150</td> <td></td> </tr> <tr> <td>Lodgepole pine</td> <td>39</td> <td>29</td> <td>8,450</td> <td>6,600</td> <td>5,850</td> <td></td> </tr> </tbody> </table>	Species	Pounds Per Cubic Foot		16-foot Green Logs Per Thousand			Approximate Weights of Wood (Pounds)	Green	12% Moisture	12-Inch Logs	18-Inch Logs	24-Inch Logs	Western white pine . . .	35	27	7,550	5,950	5,250		Ponderosa pine	45	28	9,700	8,050	7,100		Western larch	48	36	10,350	8,600	7,600		Douglas fir (NW Montana, N. Idaho type)	38	31	8,450	6,950	6,200		Grand fir	45	28	9,950	7,800	6,900		Engelmann spruce . . .	39	23	8,450	6,600	5,850		Western redcedar . . .	27	23	5,850	4,600	4,050		Western Hemlock	41	29	8,850	6,950	6,150		Lodgepole pine	39	29	8,450	6,600	5,850	
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Cubic Scale	 <p>A scaling system based on the cubic foot, 12" x 12" x 12". It offers many advantages over board foot diagram rules. Disadvantages include a reluctance to change measurement units and the costs of implementation.</p>																																																																											
Truckload Volume by Cordwood Measurement	Measures height, width, and length of a load of logs and converts the volume to board feet. It is being used at some locations for pulp logs.																																																																											
Lump-Sum	Sales based on cruise volume data.																																																																											
Westside Scribner Scale	Based on a 40-foot scaling segment with diameters rounded down to the full inch. Has diameter & length-cut deductions only.																																																																											
Pole Measure	Based on length, diameter, and pole grading standards.																																																																											

ADDITIONAL SOURCES OF INFORMATION

National Forest Log Scaling Handbook

This contains a wealth of information regarding technical applications of scaling.

Idaho Code, Title 38, Chapter 12, Log Scaling; Chapter 8, Section 38-808 (Brand Registration); Chapter 8, Section 38-809 (Prize Logs)

The text of Idaho's log scaling law, brand registration law, and prize logs law.

Rules of the Idaho State Board of Scaling Practices

The administrative rules of the Idaho State Board of Scaling Practices.

Any of the references listed above may be viewed at the office of the Idaho State Board of Scaling Practices during normal business hours (please phone ahead for an appointment). Some libraries or consulting foresters may also have copies.

Have a computer with access to the Internet? If so, you may do online viewing at these addresses:

<http://www.ibsp.idaho.gov> Official website for the Idaho Board of Scaling Practices. This contains general information on log scaling, technical log scaling rules, log scaler licensing, log brand registration, and the current roster of Idaho licensed log scalers.

<http://www.legislature.idaho.gov> *Idaho Legislature home page.* Select "Statutes & Rules" to view the statutes on Log Scaling (*Title 38, Chapter 12, Sections 38-1201 through 38-1222*), Log Brand Registration (*Title 38, Chapter 8, Section 38-808*), or Prize Logs (*Title 38, Chapter 8, Section 38-809*).

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