

**Forest Service Handbook
National Headquarters - Washington Office
Washington, DC**

**Forest Service Handbook 2409.11 – National Forest Log Scaling Handbook
Chapter 40 - Special Scaling Problems**

Amendment: 2409.11-2006-1

Effective date: October 30, 2006

Duration: This amendment is effective until superseded or removed.

Approved by: Gregory Smith, For Joel Holtrop, Deputy Chief

Date approved: April 20, 2006

Responsible Staff:

Last Change: Amendment No. 7

Superseded Document(s): Entire Handbook, Title Page thru 247

Digest: Following is an explanation of the changes throughout the directive by section.

10: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

13: Clarifies in paragraph 1 that the standard unit for saw timber scaling will be in cubic foot log scale, although board foot log scale is used under certain circumstances.

17.12: Changes the caption in exhibit 02 to clarify direction to allow full trim in the length measurement and record in 2 foot multiples.

17.18: Adds new direction and an exhibit for length measurements on forked logs.

17.2: Clarifies scalers will notify the contracting officer when improper trim allowance is detected.

17.3: Adds direction on how to record logs that are further reduced to the lower 2 foot multiple, but the diameter increases to the next diameter class, the increased diameter will be recorded as the proper scaling diameter.

17.33: Adds a list of butt characteristics to assist in identifying butt cut logs.

20: Corrects minor typographical and technical errors throughout the chapter. There are no changes to the substantive direction in this chapter.

30: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

33: Establishes defect types and new deduction procedures for: Burls, Foreign Material, Pecky Rot, Pistol Butt Defect, Pitch Pockets, and Spiral Grain.

Slope of Grain, and Twist have been included in the Spiral Grain definition.

Barber Chair and Pull, Stump or Sliver has been included in the Breaks and Splits definition.

Bark Seam has been included in the Pitch Seam, Heart Check, Frost Crack definition.

Adds new direction and exhibits for crook defect deduction process.

Combines Knots, large and Knots, clusters into a single new defect type, Knots. Establishes new knot size limits and knot deduction guide.

Adds definition of massed pitch and clarification of when a deduction is necessary.

Adds clarification of scaling cylinder position when deducting for sweep.

Reformats and rennumbers entire section to conform to FSH 2409.11a - Cubic Scaling Handbook, chapter 20.

40: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

44: Changes caption from Stump Scaling to Timber Trespass. Provides direction for measurements to be performed by certified scalers and cruisers and requires coordination with Law Enforcement staff prior to beginning field work.

44.1: Changes caption from Timber Trespass to Stump Scaling.

44.2: Changes caption from Scaling when Stump and other Direct Evidence is lacking to Stump Cruising.

44.3: Established this code and recodes direction formerly at section 44.2 to this section.

51: Changes caption to selection of scaling locations. Changes responsibility for selection of scaling locations from District Ranger to Contracting Officer. Also removes direction on selecting truck-scaling locations.

52: Removes requirement for Forest Supervisor to develop additional safety specifications for scaling.

53: Removes the direction which discusses the need for the purchaser to keep government logs separate from private logs up to the point of scaling and for the use of distinctive marking between various sales.

54.1: Changes the direction for team scaling from "discouraged" to "must not be used." Also removes direction Regional Forester to authorize team scaling in limited situations. Changes the responsibility for taking corrective action when scalers to not perform to standard from District Ranger to Contracting Officer.

54.2: Removes direction on the benefits of mill visits and specific direction concerning various items to be observed while conducting a mill visit.

55.2 - 55.4: Removes obsolete direction, which referenced out of date equipment, processes and procedures.

55.5: Revises and recodes to section 55.2. Changes the responsibility for completing the Scaler Information Form from the Forest Service Representative to the Contracting Officer.

55.61: Removes section on standard scaling forms.

55.62: Recodes to section 553.

55.63: Recodes to section 55.4. Removes significant amount of instruction, including exhibit's 01 and 02, on how to fill in scaling sheets. Stresses the use of field data recorders to record scaling information.

55.64 - 55.65: Removes obsolete direction from handbook.

56.1: Removes obsolete from handbook.

56.21: Removes obsolete direction from handbook.

56.22: Recodes to section 56.1.

56.3: Removes obsolete direction from handbook.

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60: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

64: Increases situations where Regional Foresters may deviate from established check scale standards.

65: Revises to require minimum check scale record and summary information. Removes outdated policy, procedures, and forms.

70: Reformats chapter.

71: Updates CFR reference.

80: Corrects minor typographical and technical errors throughout the chapter. Substantive changes are as follows:

82: Deletes previous documentation which was incomplete and adds reference to National Forest Cubic Scaling Handbook (FSH 2409.11a) for handbook direction.

85: Adds a cross reference on sample scaling to Forest Service Handbook 2409.11a, National Forest Cubic Scaling Handbook, chapter 50.

85.5: Recodes to section 86.1.

85.6: Recodes to section 86.2.

87.42: Establishes new direction for Fiber Scaling.

Appendix: Renames exhibits from "Table" to "Appendix." Removes Table 1A, Table VIII, Table IX - Exhibit A, Table XIV. Adds Appendix 15 - Factors for Computing Scribner decimal C Volumes and Appendix 16 - Scribner Decimal C Recorded Length and Segment Lengths.

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41 - Logs Not Meeting Utilization Specifications

41.1 - Because of Defect

Cull logs are logs which do not meet utilization standards for net scale as a percent of gross scale under the terms of the contract. Such logs may or may not contain some merchantable material. Usually the removal of cull logs from the sale area is by the option of the purchaser. If cull logs are removed as a product specified in the contract, record the log as a cull and show the gross scale in the defect column (sec. 55.63). If cull logs are being removed from the sale area as a product not specified in the contract, inform the Contracting Officer. In such cases, the product shall be appraised, rates established, and instructions to the scaler (ex. 1, sec. 55.5) revised.

41.2 - Chunks, Slabs, and Small Logs

1. A chunk is a piece of wood in log form which measures less than the contract minimum length. Chunks may originate from long butting, bucking out defects, failure to vary log length, or breakage. When chunks result from purchasers' carelessness or waste of what would have been standard material, as determined by the Forest Service representative for the sale, chunks may be scaled. Some timber sale contracts provide that products removed which do not meet the utilization standards because of size or net scale will be paid for at the same rates as standard timber. Therefore, under this type of contract if a chunk is not cull because of defect, it will be scaled if it is removed from the sale area. Also see section 42.

2. Slabs are portions of logs created when a log splits lengthwise. The statements in paragraph 1 about chunks also apply to the treatment of slabs.

3. Scale slabs and chunks in the same manner as other logs. When slabs approximate one-half the original log, determine the gross volume as one-half the volume of a full log with the same dimensions. If pieces are not round, take square or rectangular measurements and determine the volume in the same manner as defect volumes are obtained by use of Coconino-scale stick or shortcut procedure (sec. 22). Deduct for any remaining defect.

4. Logs with top diameters smaller than the contract mini-mum must be measured at the top diameter specified in the contract when there would be a volume loss if scaled as presented. Also see section 17.5. An exception to this would be when a timber sale contract provided for the scaling of material with a diameter smaller than the contract minimum and needs to be converted to board feet measure. In such cases, the Regional Forester must issue special instructions and approved volume tables.

5. Except for utilization scaling in the woods (sec. 42), the minimum volume that can be recorded for any piece is 10 board feet, or 1 decimal C, unless otherwise specified by the timber sale contract.

42 - Utilization Inspections

Timber sale contracts provide for the greatest practicable utilization of the included timber. Product specifications normally include minimum length, diameter, and net scale in percent of gross scale. Conduct utilization checks in cut over areas during or as soon after logging as practical. When more than incidental amounts of material meeting the product specifications have been left in the woods, the Timber Sale Administrator should promptly notify the purchaser in writing to remove the material.

Some examples of improper log manufacturing include:

1. A cull log under the terms of the contract, which would have met contract specifications if the end containing the major portion of the defect had been cut off.
2. A log left in the woods because its top diameter is smaller than the contract minimum, but it would meet minimum specifications if cut shorter.
3. Top material with a diameter larger than the contract minimum, which when properly bucked, would have been included with the log removed.
4. Excessive sound material showing on one end of a defective log or long butt which, if properly bucked, would have been included on a log that was removed.
5. Sound material wasted in bucking-out defects, breaks, or crooks which could have been utilized if bucking had been done correctly.
6. Tree not bucked so as to avoid excessive sweep deduction.
7. Long-butts that are excessive due to attempts to eliminate all the stump rot.
8. A log meeting contract specifications with less than the defect percent of the net percent of gross stated in the contract and capable of producing 6 foot lumber.
9. Stumps exceeding the contract height specification.

42.1 - Material to be Removed

All logs and pieces which meet the minimum contract specification are required to be removed. When determining the proper utilization in the woods, each piece must be considered on its own merits. Depending on the characteristics of the log or piece, one or more of the following criteria should be used to determine if the required merchantability is met.

Use these criteria to estimate proper log manufacturing in the woods and to assess merchantable material remaining after yarding:

1. The log end diameter and the diameter dimension of the defect.
2. The net scale of a log and the percent of gross scale stated in the contract (Normally 33 1/3 percent).
3. Merchantable material meets the net scale in percent of gross scale at the point it is severed.
4. The capability of the piece to produce lumber at least 6 feet in length.

42.1a - Procedure for Determining Diameters

1. Long Butts.
 - a. If the butt end is defective, estimate the diameter at 4 feet above the butt end to compare to the defect diameter (large end) to determine if a long butt was warranted.
 - b. When checking long butts for proper utilization use the small end diameter where the piece is or should have been long butted for proper utilization. When long butts are less than 4 feet in length, measure at the small end, ignoring flare.
2. Other Logs.
 - a. Assess defect at the large end of the defect.
 - b. Use the small end diameter of the piece for log or segment diameter.
 - c. Check each end of the piece for merchantability requirements, such as the merchantability specifications of 33 1/3 percent where the log has been severed, and check the minimum top diameter as stated in the contract.

42.1b - Proper Utilization

When determining proper utilization in the woods, the piece left must be considered on its own merits. When determining the merchantability of a piece and the correct bucking points, 2 foot multiples must be considered when determining piece length. Determine all log lengths in even lengths in 2 foot multiples plus the specified trim allowance. For example, use lengths of 10, 12, and 14 feet, and so forth.

Refer to an appropriate utilization table for interior defect (ex. 01 and 02). The major types of defects are explained in the following sections. Examples shown are for a net of 33-1/3 percent sound volume.

42.1b - Exhibit 01

**Utilization Table for Internal Defect
and 33-1/3 Percent Merchantability**

Small End Diameter (Inches)	Maximum Interior Defect Diameter (Inches)
8	3
9	3
10	5
11	5
12	6
13	6
14	7
15	8
16	8
17	9
18	10
19	11
20	12
21	12
22	13
23	14
24	14
25	15
26	16
27	17
28	17
29	18
30	19
31	20
32	20
33	21
34	21
35	22
36	23
37	24
38	24
39	25
40	26

42.1b - Exhibit 02

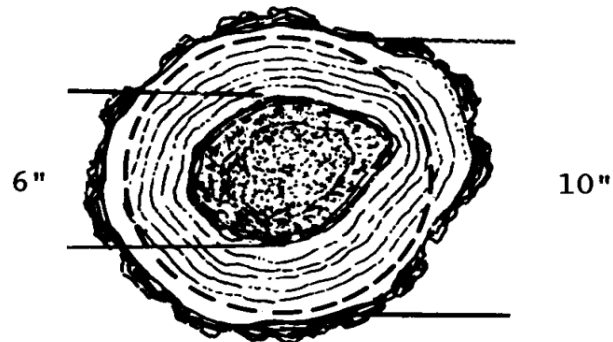
**Utilization Table for Perimeter Defect
and 33-1/3 Percent Merchantability**

Small End Diameter (Inches)	Maximum Interior Defect Diameter (Inches)
7	1
8	2
9	3
10	4
11	4
12	5
13	4
14	5
15	5
16	6
17	7
18	7
19	7
20	7
21	8
22	8
23	8
24	9
25	9
26	9
27	9
28	10
29	11
30	11
31	12
32	12
33	13
34	14
35	14
36	14
37	14
38	15
39	16
40	16

42.2 - Massed Interior Defects

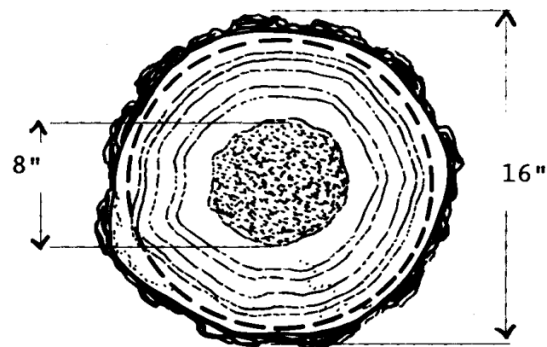
Assess a log or piece which contains interior defect for meeting the contract utilization specifications by using a utilization table for interior defect (sec. 42.1b, ex. 01).

42.2 - Exhibit 01
Cull Log End Due to Interior Defect



The log end in exhibit 02 exceeds the maximum interior defect. The tree may be long butted to a point where the interior defect is not more than the maximum shown on the interior utilization table.

42.2 - Exhibit 02
Merchantable Log End With Interior Defect

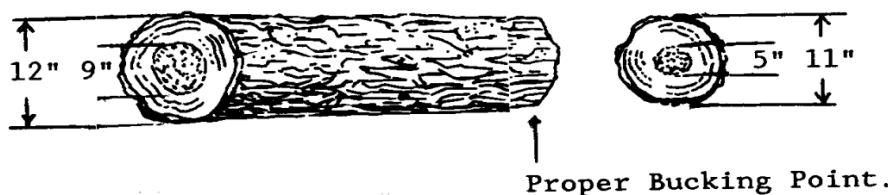


The maximum allowable interior defect for a 16" log is 8". Long butting of this log is not necessary.

42.2a - Proper Bucking Point for Logs With Massed Interior Defect

Examine logs to determine the extent of defect, make test cuts. Check to see that the piece was bucked at the point on the log that meets minimum contract requirements such as 33-1/3 net percent of gross which is used in this example.

42.2a - Exhibit 01
Proper Bucking Point for Log With Interior Defect



Large end diameter = 12"
Defect diameter = 9"
6" is the maximum
allowed interior defect
for a 12" log end division
(refer to exhibit 01)

Small Diameter = 11"
Defect diameter = 5"
5" is the maximum
allowed defect for
an 11" diameter

42.3 - Massed Defect With Sound Sector

On log ends containing defect which can be confined to a portion of the log, use the percentage of end area method.

42.3 - Exhibit 01
Sound Sector - Unmerchantable



Less than 33 1/3 percent

The defective portion is not merchantable as the log end does not meet contract specifications.

42.3 - Exhibit 02
Sound Sector - Merchantable



More than 33 1/3 percent

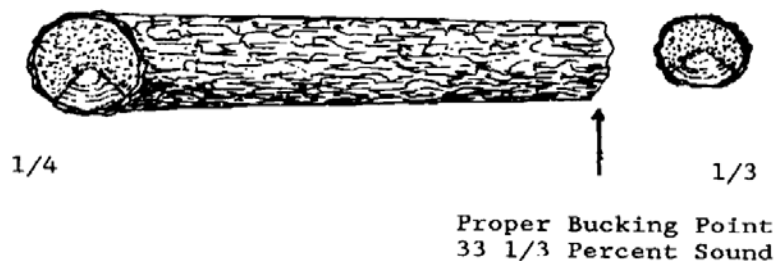
Bucking out the defect is not justified.

Logs with diameters of 6", 7", and 8" that do not contain a product (4" in width) are culls.

42.3a - Proper Bucking Point for Logs With Sound Sector

Examine logs to determine the extent of defect, test cuts should be made. Buck the piece at the point on the log that meets minimum contract requirements such as 33-1/3 percent of end area sound.

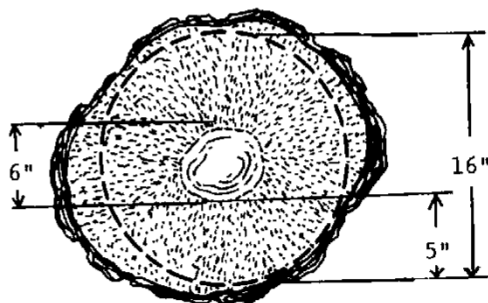
42.3a - Exhibit 01
Sound End Area



42.4 - Perimeter Defects

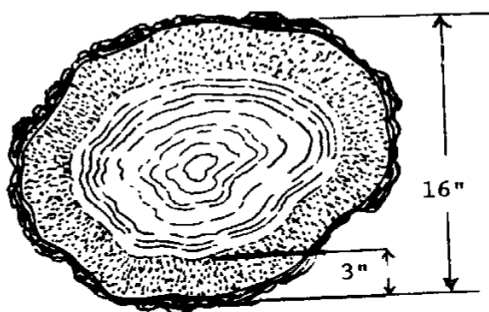
A log or piece which contains perimeter defect can be assessed for meeting the contract utilization specifications by using the utilization table for perimeter defect (sec. 42.1b, ex. 02).

42.4 - Exhibit 01
Cull Log End - Perimeter Defect



The log exceeds the maximum log perimeter defect. The tree may be long butted to a point where the perimeter defect is not more than the maximum shown on the perimeter utilization table.

42.4 - Exhibit 02
Merchantable Log End - Perimeter Defect

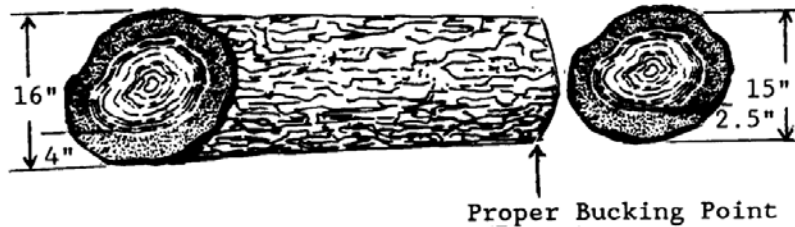


The maximum allowable perimeter defect for a 16" log is 6". Long butting of this log would not be appropriate.

42.4a - Proper Bucking Point for Logs With Perimeter Defect

Examine logs to determine the extent of defect, test cuts should be made. Buck the piece at the point on the log that meets minimum contract requirements.

42.4a - Exhibit 01
Proper Bucking Point for Log With Perimeter Defect



Large end diameter = 16"
Perimeter defect = 8"
6" is the maximum
allowed interior defect
a 16" log end diameter

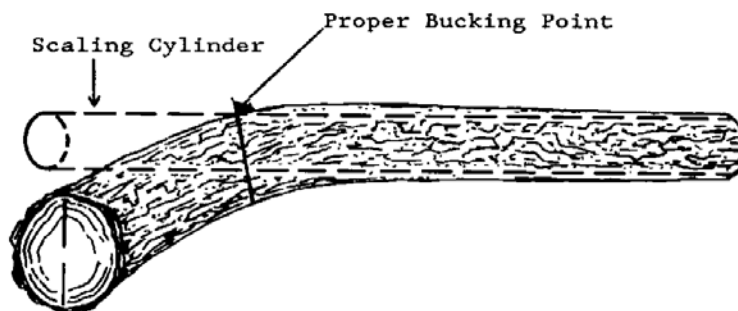
Small diameter = 15"
Perimeter defect = 5"
5" is the maximum
allowed defect for
15" log end diameter

42.5 - Exterior Defects

These include crooks, sweep, forks and breaks.

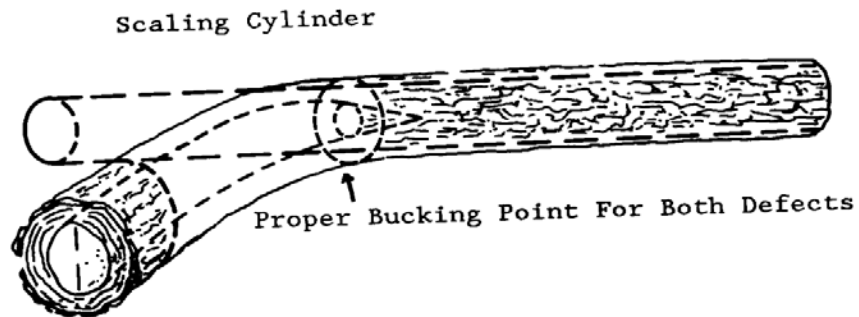
1. Determine if long butting is necessary when crook is present. If no other internal defect affects the log, determine the bucking point by extending the log through the crook. The proper bucking point is located where the extended log side emerges.

42.5 - Exhibit 01
Proper Bucking Point on a Log With Crook



2. The correct location of the bucking point changes for a log with crook or sweep that also contains an additional defect, such as heart rot. Additional long butting is appropriate in this circumstance. Determine the initial bucking point for the crook. Determine the need for additional long butting due to internal defect. The additional defect is used to determine the additional length of the long butt.

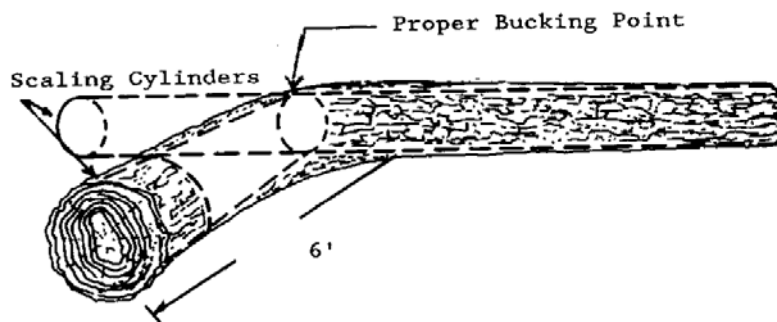
42.5 - Exhibit 02
Proper Bucking Point on a Crooked Log With Interior Defect



3. Permit long butting for sweep when the curvature is sufficiently severe to create an unmerchantable piece less than the contract minimum. These pieces more commonly occur in the top or butt end of a tree, but can occasionally occur in the middle if there is severe sweep. As with crook, it is essential to check for correct bucking prior to skidding.

- a. Long butting is permissible in the following examples because the sweep created an unmerchantable piece less than the contract minimum. This is applicable to both the butt and the top of the tree.

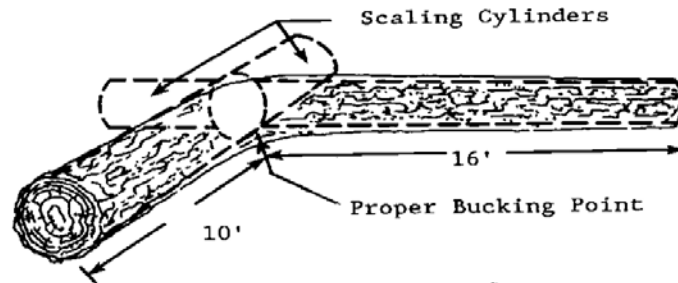
42.5 - Exhibit 03
Long Butting Permissible



- b. Long butting would not be permissible in the following example when proper bucking would create 2 merchantable pieces or logs. This is also applicable to logs in the top of trees.

42.5 - Exhibit 04

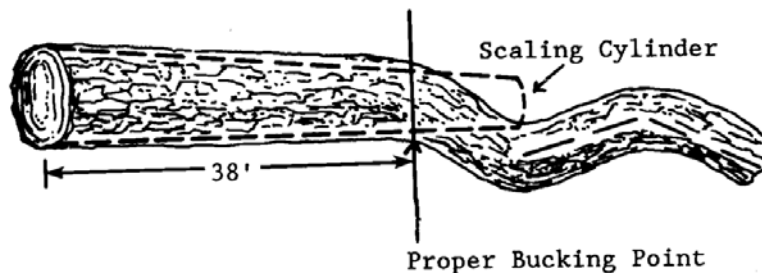
Log With Merchantable Pieces on Each Side of the Crook



4. Consider logs containing multiple crook or sweep to be merchantable if they meet the minimum merchantable specification in the contract and contain the minimum piece length.
 - a. The following is an example of a tree which has an unmerchantable piece in the top due to multiple sweep. The same example could be applicable to the butt end of the tree.

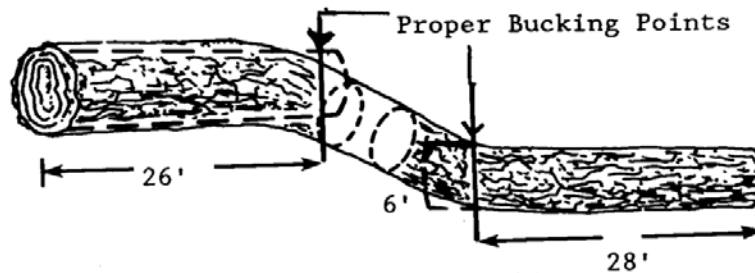
42.5 - Exhibit 05

Proper Bucking Point to Eliminate Unmerchantable Piece



- b. The following is an example of a tree that has un-merchantable material in the middle but has merchant-able material on both ends. For these types of external defects, it is essential that the sale administrator check bucking prior to removal of the merchantable material.

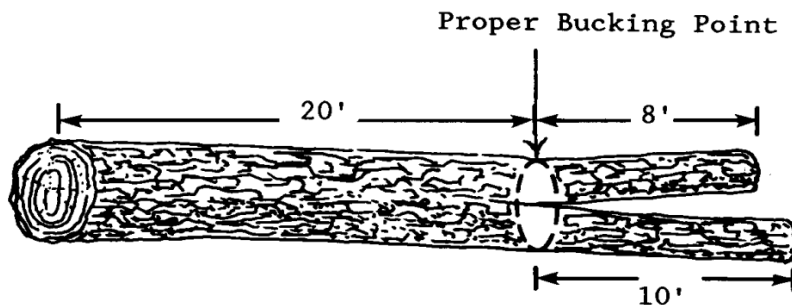
42.5 - Exhibit 06
Proper Bucking Point to Eliminate Crook



5. Proper bucking of crooked logs can eliminate much of the defect. Loss that occurs is from bark seams, splits, cross grain, and flat sides. The 2 foot multiple rule also applies to crooked logs. Measure lengths from the butt cut in 2 foot multiples, plus trim, to determine the bucking point for a crook. The ideal bucking point when the top contains merchantable logs in each fork would be when the 2 foot multiple falls exactly at the point where daylight shows in the crook. When this does not occur, move back to the next 2 foot multiple towards the large end of the log for the correct bucking point.

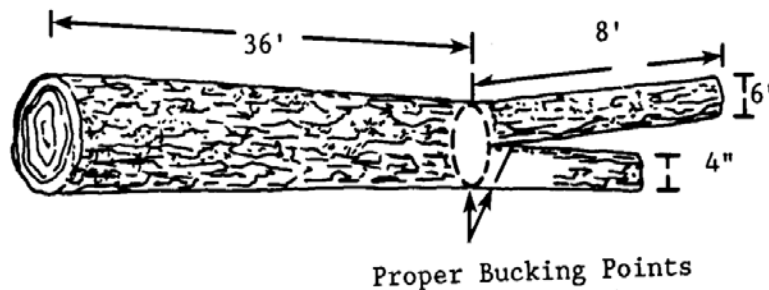
The following exhibit is an example of bucking forked logs:

42.5 - Exhibit 07
Proper Bucking Point of Forked Logs



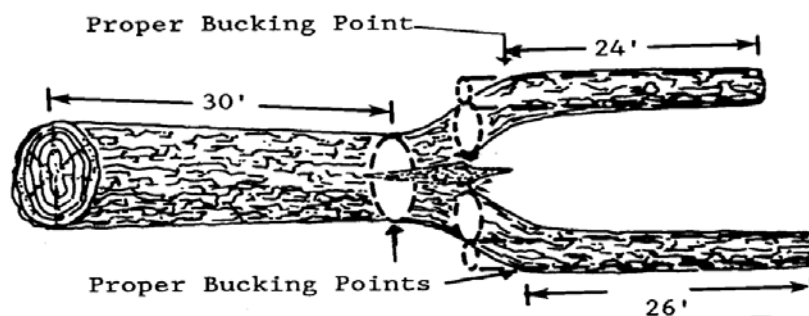
6. Occasionally, a tree forks near the merchantable top diameter. If the fork is less than 4 feet from the merchantable top diameter inside bark (DIB), the bucking point must be moved backward towards the large end of the log into the fork in 2 foot multiples to create a top log that meets the minimum piece length. See the following exhibit for an example:

42.5 - Exhibit 08
Proper Bucking Point on Forked Logs With a Substandard Fork



7. At times, bucking out forks may be necessary.
- This occurs when defect, such as rot caused by a sucker limb or old dead top, is present in the fork or crotch. The first bucking point would be determined by measuring the log length from the larger end in 2 foot multiples. Determine the second bucking point at the upper end using the long butting procedure for crook, sweep, or internal defect, whichever is applicable.

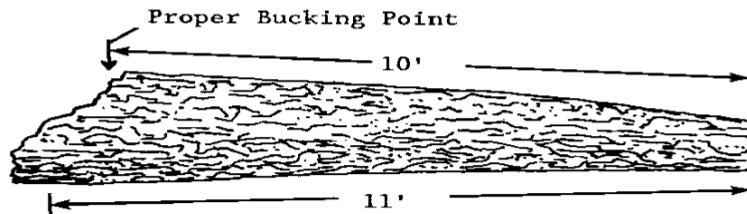
42.5 - Exhibit 09
Forked Log With Internal Defect



8. Breaks must be bucked to a point that meets contract specification, such as $33 \frac{1}{3}$ net percent of gross as long as merchant- able lumber can be manufactured.
- Breaks commonly occur in the tops of trees during felling. To determine if a piece is merchantable and/or the proper bucking point, locate the point that represents one-

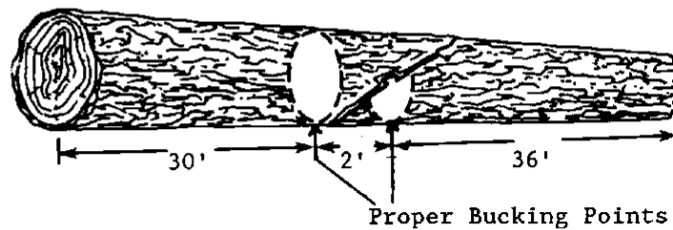
half of the surface area of the break on the large end and measure the length in 2 foot multiples to the minimum contract top diameter.

42.5 - Exhibit 10
Bucking Point on Broken End Log With Length Determination



- b. Breaks frequently occur in a tree during felling. Utilization should occur in the bottom log(s) by measuring from the butt to the break. The length should be in 2 foot multiples.

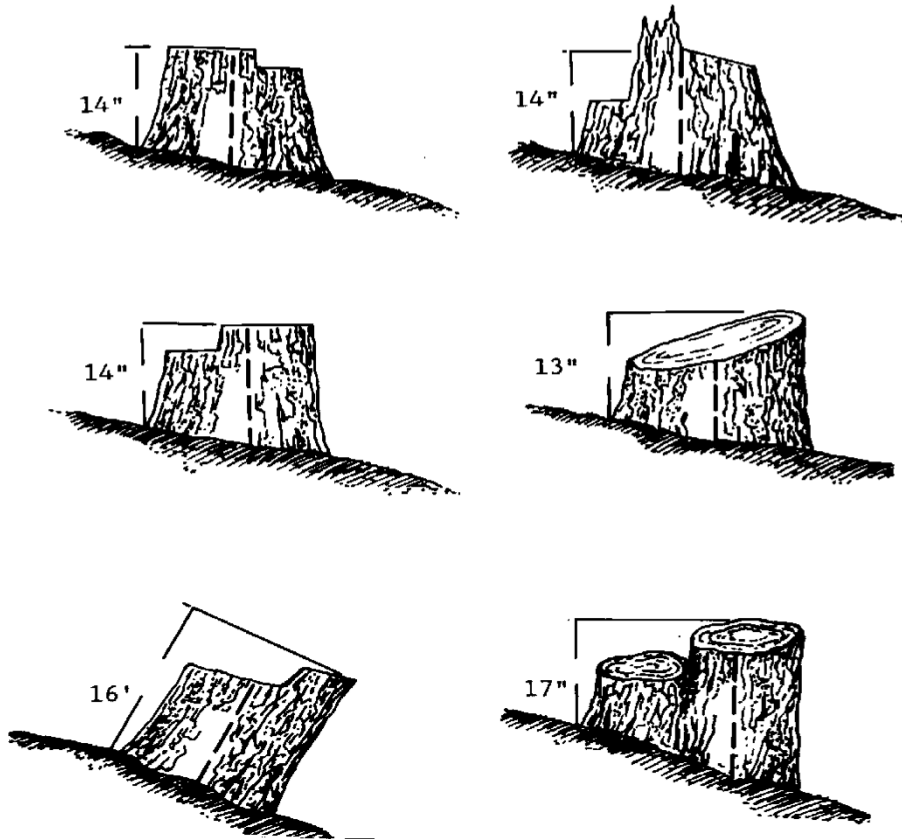
42.5 - Exhibit 11
Log With Break in the Mid-Section



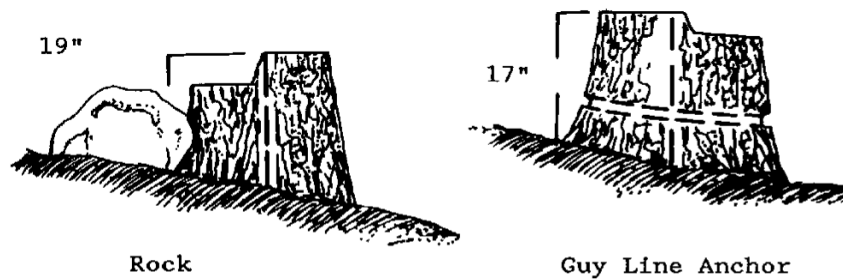
42.6 - Stump Heights

To determine stump heights, measure from high ground, paralleling the vertical axis of the stump, up to the point where a projected right angle intercepts the highest mechanical cut on the top of the stump. High stumps may be permitted when they are caused by obstructions or unsafe conditions. The contract specified maximum allowable stump height is 12 inches in the following exhibits.

42.6 - Exhibit 01
Unacceptable High Stumps



42.6 - Exhibit 02
Acceptable High Stumps



43 - Scaling Debarked Logs

In some situations, logs can be presented for scaling after the bark has been removed. This may present the following problems:

1. Reduction in the scaling diameter, if any, by mechanical debarking and loss of wood fibers. This is generally no problem with hydraulic barkers. A volume-adjustment factor might be agreed upon if a study showed loss in scaling volume after debarking. Also see section 17.5.
2. Destruction of defect side indicators. This is more than compensated for by the removal of slime and dirt in the debarking process. Also the mill deck cutoff saw provides fresh end cuts.
3. Removal of species indicators, especially where large price differentials exist between species. This may be offset by arranging to paint or brand the species on the log ends before debarking or by presorting logs by species.
4. Removal of brand indicators. Procedures are similar to those outlined above.

In summary, there may be problems but also good reasons to accept debarked log scaling if proper precautions are taken to identify species and ownership.

44 - Timber Trespass

Stump scales and stump cruises are made when logs are removed from the woods before being scaled and cannot be later scaled, as is often the case in timber trespass cases. All measurements must be performed by certified scalers and cruisers, and should be coordinated with the Law Enforcement staff prior to any field work. Sections 44.1 through 44.3 contain the suggested procedure for obtaining volume.

Use extreme care in scaling trespass timber, especially by a stump scale, and keep complete accounts and legible notes of the method used. This information may be needed as legal evidence in court.

44.1 - Stump Scaling

If the logs within the tree can be reconstructed, use the following procedure:

1. Locate the top of the tree and measure the diameter at the point where the last log was bucked.

2. Measure the distance from the stump end to the top and convert this distance to the number of logs. Consider trim. Holes in the ground often help to locate where the butt rested; sawdust helps to show the length of logs.
3. Measure the stump diameter; stamp and number the stump. Establish the diameter breast height (dbh) from this measurement by comparison with adjacent trees or tested tables. Consider numbering with an aluminum tag.
4. Obtain diameter inside bark (dib) at the top of the first 16-foot log by use of d.b.h. and average form class for stand. Volume tables based on d.b.h. and number of logs is sometimes used.
5. Use actual taper, or local taper tables, to establish the diameter of all logs obtained in step 2.
6. Record length and diameters of these logs, identified by the stump number. Consider trim. Make deductions for defect on the basis of what you see in the stump, top, or any cull logs left. Record lengths according to the common bucking practice for the area.
7. Number and stamp "US" on each stump and top to indicate that logs have been scaled.

For example: (20-foot maximum scaling length.)

Top diameter-8 inches.

Distance from stump end to top-96 feet.

Number of logs from evidence on the ground-four 16-foot, one 10-foot, and one 8-foot log.

Stump diameter-30 inches; d.b.h. 26 inches.

Average form class-80; 80 percent of 26 inches 21 inches d.i.b. at top of first 16-foot log.

Taper from 8-inch top to 21 inches (diameter of first log) is 13 inches.

This provides the following diameters for all logs: 21, 19, 16, 13, 11, and 8 inches.

Record-16'-21", 16'-19", 16'-16", 16'-13", 10'-11", and 8'-8", with a total scale of 85.

Merchantable volume left in tops, in high stumps, and in unused logs are scaled and recorded separately. Stamp "US" on each stump and top, and number each piece for future identification.

44.2 - Stump Cruising

Timber theft cruising instructions are contained in Forest Service Handbook (FSH) 2409.12, chapter 80, section 81.

44.3 - Scaling When Stumps and Other Direct Evidence is Lacking

If a trespass, or other unauthorized cutting, is discovered after the stumps have been disturbed by clearing, site preparation, or similar activities, indirect methods must be used to determine actual volume. In some cases, cruise or compartment examination data may be available for the area.

If so, it should be used to the extent possible. The situation, however, may be that there is no existing data for the area. The approved method for determining volume is a cruise on similar timber using the most recent aerial photos of the cut timber as a basis for selecting a similar stand. Other stand attributes, such as species distribution, elevation, aspect, and site index should be as close as possible to the cut timber. The selected stand should then be cruised using approved Regional standards for tree-measurement sales.

45 - Special Sectional Problems

Special sectional problems such as scaling, sinkers, jackpots, and so on, which have minor general significance in the scaling of National Forest timber may be addressed in Regional supplements.