



# STATE FOREST NOTES

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## BOARD FOOT BY THE POUND

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The use of weight scaling may reduce your log handling costs. It has on Jackson State Forest in young growth redwood and Douglas-fir.



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Weight scaling is the weighing of all truck loads of logs and usually the sample scaling of some of those loads. Several companies in other forest regions have been weighing truck loads of logs to determine board feet or cubic feet contents since the 1950's. Since 1964, California Division of Forestry foresters on Jackson State Forest have been investigating the feasibility of using this method of selling logs as an alternative to 100 percent scaling.

To be effective, it was felt that the sampling must have an acceptable error which does not exceed plus or minus two percent at the 95.4 percent level of probability. The plus or minus two percent acceptable error is currently the standard of accuracy accepted by the California Division of Forestry for check scaling this type of timber.

Over 2,000 truck loads of logs have been both scaled and weighed. They came from eight timber sale areas with different species composition and aspects. When these factors were analyzed separately, there were differences between species, e.g., redwood averaged 12.4 lbs. per board foot and Douglas-fir 10.0 lbs. per board foot. Timber of the same species from north facing slopes weighed less than that from south aspects.

Redwood loads were segregated into three size groups based on number of logs per load: loads having nine or less logs, 10 to 15 logs, and 25 or more logs. The mean board foot to weight ratio for number of logs per load was as follows:

9 logs/load; mean = 0.093777 bd.ft./lb. = 10.66 lbs./bd. ft.  
10-15 logs/load; mean = 0.083716 bd.ft./lb. = 11.95 lbs./bd. ft.  
25 logs/load; mean = 0.073416 bd.ft./lb. = 13.62 lbs./bd. ft.

The board foot to weight ratios of loads of small logs are significantly heavier than ratios of large logs. Loads of small logs had less variability in their ratios than loads of large logs.

Part of the difference between means of different log sizes can be explained by the log rule used. Overrun within the Scribner Decimal C Log Rule is carried into the weight ratio, especially in the small logs. To illustrate this fact, 153 truck loads of logs were scaled, and the volumes extended twice: one with the Scribner Decimal C Log Rule and again with the International 1/4 Inch Log Rule. The latter log rule gave 14 percent more volume than did the Scribner Log Rule. This was expected since International 1/4 Inch Log Rule more closely estimates actual lumber or board foot recovery from smaller logs than the Scribner Log Rule.

Even more dramatic is the reduction in the number of loads needed to reach the acceptable error of plus or minus two percent by simply changing the log rule. The number of loads required when using Scribner Decimal C was 252. When the same loads were rescaled using International 1/4 Inch Log Rule only 177 loads were needed. Cubic volumes

were not calculated. However, based on other work, the variability and the number of samples needed to accurately estimate the mean should be further reduced by using cubic volume.

From the data that has been analyzed for most of the young growth timber sales, the variability found on each timber sale requires that about 200 to 250 loads be randomly selected to meet the accuracy standard for the whole sale. This applies regardless of species mix or aspect.

The separation of species would require over 150 loads for each species. Dealing with three to five species would require 450 to 750 sample loads if the accuracy standard were to be met for each species.

It has been our experience in conventional scaling that a scaler cannot scale accurately 15 or more logs on a truck. Why not scale at the mill? Because, for one thing, the logs have been going to as many as four different mills. Therefore in the past generally, scaling has been done at log landings. Landings scale is limited to the production of the logging side which amounts to seven million board feet a year.

Selling 12 million board feet or more of young growth timber in multiples of six million produces a more efficient sale for the logger but requires two or more scalers for conventional scaling. Moreover, although the installation of a 50 to 60 ton truck scale initially costs about \$10,000, it can be depreciated over a long period of time. When weighing and sample scaling are used, one scaler can scale the sample loads and still have time for other work. The sample scaling is usually done at the mill yard after the logs have been unloaded and spread out on the ground. There they are accurately scaled. A lower salaried employee can do all the weighing and it takes only one to two minutes to get the tare or gross weights for each load. From this standpoint, the job that two or more scalers did previously can now be done with one part time scaler and a full time weighmaster. Large sales are more advantageous for weight scaling as they lower operating costs. It saves time for both the logger and the hauler.

In 1968 on Jackson State Forest, two young growth sales were sold using the board foot to weight ratio method. In 1969, 21 million board feet of young growth timber were sold on this basis. Because such good results were realized from the use of weight scaling in young growth sales, the entire 1970 annual allowable cut of 34 million board feet, including 15 million feet of old growth timber, was sold using weight to help determine volume. Further work is being done to explore the economic advantages of the use of weight scaling in old growth timber.

It now appears that weighing is here to stay as a method of handling large volume timber sales on Jackson State Forest.

It is operational and it works.

REFERENCES

- BONNETT, H. W. Weight and Sample Scaling in Region Form, April 1964. U. S. Forest Service, 12 pp.
- BRITISH COLUMBIA. Weight Scaling Manual, August 1969. 73 pp.
- FREEMAN, E. A. Weight-Scaling Sawlog Volume by the Truckload. Forest Products Journal, October 1962. pp. 473-475.
- HUEY, Dr. Ben M. Weight Scaling Gains in the Rockies. Forest Industries, March 1967. pp. 70-71.
- JOHNSON, Floyd A. Some Thoughts on Sample Scaling, Forest Industry. June 1965. pp. 62-63.
- LANGE, Keith D. Selling Stumpage by Weight in the South: A Case Study. Journal of Forestry, November 1962. pp. 816-820.
- PAGE, R. H. Weight as a Measure of Volume for Southern Yellow Pine Timber, Forest Products Journal. July 1961. pp. 300-302.
- ROW, Clark and Sam GUTTENBERG. Determining Weight-Volume Relationships for Saw Logs. Forest Products Journal, May 1966. pp. 39-47.
- ST. REGIS PAPER COMPANY. Scaling by Weight Cuts Costs. Forest Industries. V 90:4, April 1963. p. 70.