



LSU FORESTRY NOTES

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LOUISIANA STATE UNIVERSITY & A & M COLLEGE
School of Forestry

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CALCULATION OF LOCAL VOLUME FACTORS FOR RELASCOPE CRUISING

In these days of climbing stumpage prices it is frequently desirable to attain more precision from a relascope cruise than is possible using ready-made volume factors. Like any factors made to be approximately applicable over a wide range of conditions, volume factors may give very misleading results under certain local conditions. For this reason it is desirable to check ready-made factors under local conditions, and to calculate local factors if sufficient precision is not attained.

As noted by Grosenbaugh^{1/} local volume factors are obtained by sampling local volume-basal area ratios for each merchantable length class recognized. If such ratios are available they should of course be used. If not they can be obtained by a conventional plot cruise, or as part of the relascope cruise to which they will be applied. The latter is normally the more economical and is discussed below.

The steps in calculating the local volume factor are seven:

1. On a desired portion of the sampling points (the points should be selected in an unbiased manner) tally the trees so that the volume of each may be determined; ordinarily this is by Dbh and merchantable length.
2. Calculate the number of trees per point for each diameter-height combination. For example, if on 100 sampling points there are tallied 700 ten-inch, 1-log trees and 500 ten-inch, 2-log trees, then there are $\frac{700}{100} = 7$ ten-inch, 1-log trees per plot and $\frac{500}{100} = 5$ ten-inch, 2-log trees per plot.
3. Determine the number of trees per acre for each diameter-height combination. Because the larger, more valuable trees are sampled more intensively than smaller trees, each diameter class requires its own conversion figure to convert from a plot basis to an acre basis^{2/}.
4. Calculate volume per acre for each diameter-height combination by multiplying number of trees per acre times volume per tree.
5. Total the volumes per acre for each length class, combining all diameters.
6. Determine the basal area per acre for each length class; multiply the number of trees per plot in each length class by the relascope basal area factor. Note that field data from relascopes with differing basal area conversion factors cannot be combined until steps 1 through 6 have been performed.

^{1/} Grosenbaugh, L. R. 1952. Shortcuts for cruisers and scalars. So. For. Exp. Sta. Occ. Paper 126, p. 7.

^{2/} Briscoe, C. B. 1957. Stand table construction from relascope plots, LSU For. Note #15. 2 pp.

7. Divide volume per acre for each length by the basal area per acre of the same length class. The dividend is the volume factor, and

$$\text{Volume per Acre} = \left(\frac{\text{Total No. Trees Tallied}}{\text{No. Sampling Points}} \right) (\text{Relascope Basal Area Factor}) (\text{Vol. Factor}).$$

Note that for any particular relascope the last two factors above are constant and can be combined into one relascope volume factor, so that

$$\text{Volume per Acre} = \left(\frac{\text{Total No. Trees Tallied}}{\text{No. Sampling Points}} \right) (\text{Relascope Volume Factor})$$

A sample calculation is shown below.

Computational Form

Relascope Factor: 10

| Dbh Class | Trees Per Point ^{1/} | | | Plots ^{2/} Per Acre | Trees Per Acre ^{3/} | | | Volume Per Tree ^{4/} | | | Volume Per Acre ^{5/} | | |
|-----------|-------------------------------|-------|-------|------------------------------|------------------------------|-------|-------|-----------------------------------|-------|-------|-------------------------------|-------|-------|
| | 1-log | 2-log | 3-log | | 1-log | 2-log | 3-log | 1-log | 2-log | 3-log | 1-log | 2-log | 3-log |
| 10 | 0.136 | 0.136 | -- | 18.349 | 2.5 | 2.5 | -- | 40 | 60 | 70 | 100 | 150 | -- |
| 12 | 0.785 | 0.628 | 0.157 | 12.739 | 10.0 | 8.0 | 2.0 | 50 | 90 | 120 | 500 | 720 | 240 |
| 14 | 0.428 | 0.534 | 0.107 | 9.355 | 4.0 | 5.0 | 1.0 | 80 | 130 | 170 | 320 | 650 | 170 |
| 16 | 0.140 | 0.419 | 0.140 | 7.163 | 1.0 | 3.0 | 1.0 | 100 | 170 | 230 | 100 | 510 | 230 |
| Total | 1.489 | 1.717 | 0.404 | | | | | | | | | | |
| | | | | | | | | Boardfeet per Acre ^{6/} | | | 1020 | 2030 | 640 |
| | | | | | | | | Basal Area per Acre ^{7/} | | | 14.89 | 17.17 | 4.04 |
| | | | | | | | | Volume Factor ^{8/} | | | 68.5 | 118.2 | 158.4 |

1/ Total number of trees tallied divided by number of plots.

2/ Plots per acre = $\frac{\text{Relascope Factor}}{\text{Basal Area per Tree}}$

3/ Trees per plot times plots per acre.

4/ Volume table volumes.

5/ Trees per acre times volume per tree.

6/ Total over all Dbh classes.

7/ Trees per plot for each length class times relascope factor.

8/ Boardfeet per acre divided by basal area per acre.

Charles B. Briscoe
Assistant Forester