Notes and Observations

Cruising Timber with Portable Tape Recorder Cuts Costs

Abstract. Recording timber-cruise data with a portable tape recorder cost 10 percent less than using paper and pencil. Data errors of 1.3 percent were not considered important owing to the usual review.

The time and cost of recording timber-cruise data with the conventional tatum paper holder and pencil were compared with that of a portable tape recorder. The results show that using a tape recorder can save money. Its efficiency more than offset costs of transcribing the data to standard forms. It may be inefficient to use a recorder, however, when only small numbers of trees are cruised on small sample plots.

The two methods were compared in 100 percent cruises made on six 2-½-acre plots on the Experimental Forest near Challenge, California. The plots were in a 90-year-old stand composed of five merchantable species: ponderosa pine (*Pinus ponderosa* Laws.), sugar pine (*Pinus lambertiana* Dougl.), Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), white fir (*Abies concolor* [Gord. & Glend.] Lindl.), and incense-cedar (*Libocedrus decurrens* Torr.). Heights and diameters were measured with a Biltmore stick. The number of stems per acre, species composition, and tree size were comparable among the six plots (Table 1).

Audio field data were recorded in numerical code in the sequence ordinarily used in the timber appraisal cruise forms (Fig. 1). This procedure permitted rapid office transcription to forms for automatic data processing. In terms of labor costs, use of the tape recorder showed a 10 percent saving over that of the tatum and pencil (Table 2).

Clerical errors by either method of recording field data were small —0.7 percent for tatum and 1.3 percent for tape recorder. All data are reviewed for incongruities and corrected in any case.

Cruising timber with a tape recorder offers four advantages: (1) a rapid cruise; (2) reduced expense; (3) fewer restrictions due to weather; and (4) increased opportunity for the cruiser to observe the timber stand.

A small tape recorder is easily carried in the back of the standard cruiser's jacket. A rubber band will help hold the microphone in the cruiser's hand. He can thread the wire to the microphone under

Unit XX _____ Strip No. XX _____ Location _____
National Forest XX _____ T____ R____ S____40____ Marking XX _____
Working Circle X _____ Date _____ Plot Size _____
Block X _____ Crew _____

Plot No.	Site Cl.	Species	DBH	Tot. Log Height	Log Grade by Log Position													Cond. Cl.	Age Cl.	C/L	Defect	T.S.I. Data and Remarks
					1	2	3	4	5	6	7	8	9	10	11	12	13					
XX	X	XX	XXX	XX	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	X	X	XX	

FIG. 1.—Timber appraisal cruise record form.

TABLE 1.—COMPARABLE DATA AMONG THE SIX PLOTS

	Cruised per acre	
	Trees	Logs
	— *Number* —	
Tape recorder:		
Plot 1	59	243
Plot 2	64	257
Plot 3	64	192
Average	62	231
Tatum:		
Plot 4	66	238
Plot 5	57	223
Plot 6	65	256
Average	63	239

TABLE 2.—TIMBER CRUISING TIME AND COST PER ACRE, USING A TAPE RECORDER AND A TATUM AND PENCIL

Plot	Timber cruiser		Transcriber		Total cost
	Time	Cost[1]	Time	Cost[2]	
	TAPE RECORDER				
	Minutes	*Dollars*	*Minutes*	*Dollars*	
1	62	2.76	13	0.41	3.17
2	56	2.49	17	0.54	3.03
3	48	2.14	17	0.54	2.67
Average	55	2.45	16	0.50	2.95
	TATUM AND PENCIL				
4	71	3.16	—	—	3.16
5	71	3.16	—	—	3.16
6	79	3.52	—	—	3.52
Average	74	3.29	—	—	3.29

[1]Based on cruiser's wages of $2.67 per hour.
[2]Based on transcriber's wages of $1.89 per hour.

his clothing to prevent it from snagging on brush and limbs.

As the cruiser becomes more experienced in using a tape recorder, he will tend to record while walking from tree to tree. As this technique is developed, greater savings can be expected.

Use of the tape recorder will prepare foresters to meet current developments in automatic data processing that transfers sound directly from tape to computer. A simple program can be designed for the computer that will check data for logic before further automatic processing is started.

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Estimations in Determining Girard Form Class of Loblolly Pine[1]

Abstract. Regression equations were developed for the estimation of Girard form class directly, and for double bark thickness at 17 feet to use in Girard form class calculations applicable to young plantations of loblolly pine in the Piedmont area.

The use of Girard form class as the third variable (after d.b.h. and height) increases the accuracy of a volume table, but the determination of the form class value is often a laborious procedure. To obtain the measurements of diameter inside bark at 17 feet requires the use of a ladder or calipers of some type. With the latter, measurements of double bark thickness at 17 feet ($2BT_{17'}$) cannot be readily obtained.

It appears two methods of approach can be used to facilitate the form class determination. The first is the use of a lower bole ratio such as was indicated by Horn,[2] and which has been used since in various forms by several workers for a number of species. The diameters used in the ratio must be reasonably accessible from the ground. The second method is the incorporation of an estimate of $2BT_{17'}$ along with the use of calipers or optical dendrometers. It appears this $2BT_{17'}$ can be estimated from lower bole measurements.

Four plantations of loblolly pine (*Pinus taeda* L.) aged respectively 18, 23, 25, and 29 years were studied in the lower Piedmont of North Carolina to develop both methods of estimation. A total of 500 stems from the dominant and codominant crown classes were studied. The mean values for the number of stems per acre were 852, 1,387, 722, and 490 respectively.

A lower bole ratio of $d.i.b._{7'}/d.o.b._{2.5'}$ and Girard form class ($d.i.b._{17'}/d.o.b._{4.5'}$) were calculated for each tree. The mean values for each area are shown in Table 1. The trend of mean values was for the lower bole ratio to be increasingly greater than Girard form class with lesser plantation age. This tendency may be attributed to a greater butt swell in the older plantations.

Linear regressions of Girard form class (Y) on lower bole ratio (X) were calculated for each area. The correlations were significant at the 1 perecent level in the older two areas, and at the 5 percent level in the youngest area, but in the heavily stocked plantation the correlation was not significant. The highest correlation was in the 25-year-old area with a value of $r = .79$. Tests of homogeneity indicated the significant regressions could be pooled to give the common expression $Y = 15.61 + .7663(X)$. The correlation coefficient was .65. The standard error of the estimate at the mean was .17, with the standard error of the regression coefficient at .14. The correlation coefficient of .65 was the same as that obtained by Shipman[3] for bottomland sweetgum using the Horn ratio, but was somewhat less than the .83 derived by Horn because of the rigid specifications for sampling used by Horn.

With regard to estimating double bark thickness at 17 feet, two independent variables were used in simple linear regression analyses in each area (d.b.h. and $2BT_{4.5'}$). The magnitude of $2BT_{17'}$ for each d.b.h. class was reasonably uniform among the plantations with the exception of the 25-year-old area where the bark at 17 feet was generally thinner. The correlations of $2BT_{17'}$ with each independent variable were significant at the 1 percent level in each area. $2BT_{4.5'}$ proved a slightly better estimator of $2BT_{17'}$ in all areas except the 23-year-old heavily stocked plantation. The correlation coefficients ranged from .58 to .89 (with d.b.h.) and from .78 to .91 (with $2BT_{4.5'}$). Regression equations were calculated for each area, but were not pooled because the variances of the dependent variable ($2BT_{17'}$) were not homogeneous.

Attempts to use multiple re-

[1]Based on a portion of a thesis submitted in partial fulfillment of the requirements for the M.S. degree in forestry, North Carolina State of the University of North Carolina at Raleigh.

[2]Horn, A. F. A simplified method of estimating form class of loblolly and shortleaf pine stands in Mississippi. Jour. Forestry 54:185-187. 1956.

[3]Shipman, R. D. Girard *vs.* Horn form class estimation on sweetgum. Jour. Forestry 60:343-344. 1962.

TABLE 1.—MEAN VALUES OF GIRARD FORM CLASS AND LOWER BOLE RATIO ($DIB_{7'}/DOB_{2.5'}$) FOR FOUR PLANTATIONS OF LOBLOLLY PINE

Age	Mean d.b.h.	Girard form class	Lower bole ratio
29	9.33	75.82	74.99
25	7.14	74.65	75.94
23	6.70	71.87	76.17
18	7.35	68.23	73.36