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SOLVE II

A TECHNIQUE TO IMPROVE EFFICIENCY AND SOLVE PROBLEMS IN HARDWOOD SAWMILLS

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ABSTRACT

The squeeze between rising costs and product values is getting tighter for sawmill managers. So, they are taking a closer look at the efficiency of their sawmills by making a complete analysis of their milling situation. Such an analysis requires considerable time and expense.

To aid the manager with this task, the USDA Forest Service's Northeastern Forest Experiment Station and the Northeastern Area of State and Private Forestry have developed and field tested a computerized sawmill analysis technique called SOLVE II. Although the technique has been computerized, most sawmill managers do not have the manpower and computer facilities needed to collect and process the data. So, state utilization foresters in the Northeast and S&PF specialists are helping the sawmill managers to apply SOLVE II.

The flexibility of this technique allows it to be used for most hardwood mills and some softwood mills. Mill layout does not affect its use as long as the sawn products for each individual log can be followed through the mill. However, it is necessary that the mill: (1) processes logs with scaling diameters of at least 6 inches and no greater than 30 inches, (2) processes logs with lengths of at least 8 feet and no greater than 16 feet, (3) at least partially processes all logs through one piece of equipment that limits production, and (4) has the necessary operating cost information. Managers of sawmills that meet these requirements will find SOLVE II a useful tool in analyzing their milling situation.

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A TECHNIQUE TO IMPROVE EFFICIENCY AND SOLVE PROBLEMS IN HARDWOOD SAWMILLS

CONTENTS

FOREWORD

This is the first of a series of five papers about the SOLVE II technique for analyzing hardwood sawmills. It gives the reader a general idea of the SOLVE II technique and explains what it will do. The second paper will be a step-by-step manual for using the technique to analyze a sawmill. The third paper will document the SOLVE II computer program and the procedure used to process the data. The fourth paper will show how the SOLVE II outputs are used to analyze a sawmill. And, the fifth paper will show standards, developed from the SOLVE II analysis of many sawmills, that can be used to judge the efficiency of specific mill types.

INTRODUCTION

RECENTLY, HARDWOOD SAWMILL MANAGERS have experienced increased log prices, a scarcity of desirable species, poor markets—especially for low-grade lumber, and a sharp increase in operating costs. Thus they are acutely aware of the need for least-cost processing efficiency in their mills.

To improve the efficiency of his mill, the manager should set up a program to: (1) increase yields from each log, (2) reduce conversion costs, (3) expand daily production, (4) upgrade product quality, (5) convert mill residue to profitable products, and (6) reduce downtime.

To meet these objectives, the manager needs the answers to the following questions: How much can I afford to pay for my sawlogs? For the products I make, what are my break-even log sizes for the various log grades by species? Are my conversion costs too great for some logs? Is my overrun what it should be? Am I making too many chips? Are my yields of No. 1 Common and Better lumber what they should be? And, do I have excessive downtime? There are other questions that the manager should consider, but these are the major ones.

Obviously, good records can provide some of the information needed by sawmill managers. Experience and observation will also help. But a properly designed mill study with specific objectives is the best source of information.

Until now, mill studies were complex and costly. They usually hindered production, and it took many hours to process the data by hand. Also, when new equipment was added, log sizes were changed, or new products were produced, the difficulty was increased. To overcome these problems, the manager needs an analytical tool that will provide the information needed for sound decision-making with a minimum of cost and effort.

To provide mill managers with such a tool, the USDA Forest Service's Northeastern Forest Experiment Station and Northeastern Area of State and Private Forestry (NA-S&PF) have developed and field-tested a computerized sawmill analysis technique called SOLVE II. The technique was computerized to minimize the time-consuming mathematics necessary for processing the input data.

We realize that most sawmill managers would find it difficult to use the SOLVE II technique without some assistance. Depending on the size and layout of the mill, from 3 to 12 men are usually required to collect accurate data. Once the data are collected, they must be placed on cards and run through a computer (520K capacity) with the SOLVE II computer program. Mill managers usually do not have this extra manpower available, nor do many of them have access to the necessary computer facilities. So the state utilization foresters for most northeastern states and NA-S&PF are providing the necessary assistance to make SOLVE II usable for sawmill managers.

This paper contains a general discussion of the SOLVE II concept, including descriptions of the analysis technique, the necessary input data, the output results, and some possible uses of the analysis technique.

SOLVE II TECHNIQUE

SOLVE II is used for both economic and noneconomic sawmill analysis. For the economic analysis, it provides information on chip yields (in dollars), lumber yields (in dollars), and product-conversion costs. From this information, SOLVE II provides the mill manager with: (1) the maximum values he can pay for his sawlogs for a preselected profit margin, and (2) the break-even value he can pay for his logs with a zero profit. The simplified relationships used to produce these log values are:

1. Maximum log value = product value - conversion cost - profit.
2. Zero profit log values = product value - conversion cost.

For the noneconomic analysis, SOLVE II provides information for checking such things as lumber overrun, lumber grade yields, lumber-recovery factor (LRF), chip yields, and sawing times.

SOLVE II not only provides a variety of analytical information; but also its flexibility allows it to be used for most hardwood mills and some softwood mills. This flexibility is reflected in the fact that mill layout does not affect the use of the technique as long as the sawn products for each individual log can be followed through the mill. The technique can also be applied to a variety of products without difficulty. However, the mill must meet the following requirements:

1. Process logs with scaling diameters of at least 6 inches and no greater than 30 inches.
2. Process logs with lengths of at least 8 feet and no greater than 16 feet. Odd-length logs are acceptable.
3. At least partially process all logs through one piece of equipment, usually a headsaw, that limits production.
4. Have cost data that reflect the cost of operating the mill from log yard through sale of products.

Once it has been determined that a sawmill meets these requirements, the data are collected, punched on cards, and processed with the SOLVE II computer program.

A logical question at this point is how many logs must be included in the sample. Obviously, only five or six logs for a given log grade will not be enough. We have found that satisfactory results can usually be obtained with at least four logs in each size class sampled within a species and log grade. In other words, if your sample includes a 16-foot log with a 12-inch scaling diameter, you should have at least four logs in this size class. But the sample does not need to include four logs for each size class in the range of size classes normally processed at the mill. The following tabulation shows what might be a satisfactory number of logs for a sample of a given species and log grade:

Diameter class (inches)	*Log length class (feet)*				
	8	*10*	*12*	*14*	*16*
10	4	0	4	0	0
11	4	7	4	4	4
12	5	14	15	5	5
13	4	5	4	0	0
14	5	0	0	5	0
15	0	0	4	0	0

SOLVE II INPUTS

The input data are divided into two groups. The first consists of basic mill data. The second consists of the information related to each sawlog. Elements of both input groups are listed below to show the type of information needed to produce the SOLVE II outputs.

Basic mill data

1. Average yearly mill operating cost in dollars per minute.
2. Desired profit margin (percent of product sales).
3. Desired risk margin (percent of product sales).
4. Broker fee (percent of lumber sales) for selling lumber.
5. Cash discount (percent of lumber sales) to lumber buyers for prompt payment.
6. Lumber degrade factor for adjusting green lumber value to dry value due to shrinkage and degrade.
7. Average hours worked per day.
8. Average productive hours per day. (The difference between No. 7 and No. 8 is average downtime.)
9. Product prices.
10. Log rule used by the mill (International 1/4-inch, Doyle, Scribner Decimal C, or Vermont).

Sawlog data

1. Species name.
2. Log grade.
3. Small and large end diameters of each log (using Forest Service scaling procedure).
4. Log length (either nominal or actual).
5. Log defect volume in board feet (using Forest Service scaling procedure).
6. Sawing time for each log in minutes and hundredths of minutes.
7. Lumber yield by lumber grade and nominal thickness for each log.
8. Total green chip weight from a specific group of logs.

Not included in the above list of inputs are a number of codes and titles that are used by the computer to produce and identify the outputs. Also not included in the list are expected lumber

yields by diameter class and lumber grades for different log grades and species. When these yields are included in the inputs, the SOLVE II program compares the actual yields with the expected yields.

SOLVE II OUTPUTS

SOLVE II outputs are divided into four groups: (1) input data listing, (2) data summary tables, (3) regression statistics, and (4) cost and value tables. Because of the large number of individual outputs, examples of all of them will not be shown in the following discussion. However, a sample of the outputs can be found in the appendix.

Input data listing

The basic mill data and sawlog data used as inputs to this analysis are also printed as outputs. This allows the sawmill analyst to check for errors that may have occurred when the data were transferred from the tally sheets to computer cards. Also, when this listing is kept with the other outputs for a particular mill, it provides a complete picture of the analysis.

Data summary tables

The data summary tables are used to organize the input data into a usable form. Some of the tables are printed only to provide a more complete picture of the data. Others are printed to allow comparisons of the analysis results with published or known results.

The types of summary tables are listed below. Tables 1 through 10 in this list show summaries by diameter class for each log grade. Tables 11 through 16 show summaries by diameter and length classes for each log grade.

1. Number of sample logs
2. Lumber tally yields
3. Cubic-foot log volumes
4. Gross log volumes for three different log rules (International 1/4-inch, Scribner Decimal C, and Doyle or Vermont).
5. Net log volumes for the three different log rules
6. Lumber-recovery factors
7. Lumber overrun for the three different log rules
8. Lumber grade yields
9. Actual versus expected lumber grade yields
10. Nominal lumber thickness yields
11. Log frequency distribution
12. Green chip yields in tons per thousand board feet (MBF) (lumber tally)
13. Curved sawing times per log
14. Curved sawing times per MBF (lumber tally)
15. Curved lumber tally yields per log
16. Curved lumber tally yields per MBF (International 1/4-inch, Scribner Decimal C, Doyle, or Vermont)

Several of the above types of tables are shown for three different log rules. These tables are always shown for the International 1/4-inch, Scribner Decimal C, and Doyle rules unless the mill being analyzed is using the Vermont rule. In that case, tables for the Doyle rule are replaced by tables for the Vermont rule.

Regression statistics

In processing the input data, the computer performs six regressions for each log grade within a species to provide equations for curved average value by diameter and length classes. Equations are developed on the following data:

1. Log sawing time per log.
2. Log sawing time per MBF (lumber tally).
3. Board-foot lumber yields per log.
4. Board-foot lumber yields per MBF (International 1/4-inch, Scribner Decimal C, Doyle, or Vermont).
5. Dollar lumber values per log.
6. Dollar lumber values per MBF (lumber tally).

For each regression, the SOLVE II output shows the regression statistics and the resulting equation. Along with this information, graphs are presented showing plots of the data and the resulting curved values. This information allows the sawmill analyst to assure that the curves fit the data satisfactorily. He may also use this information to check for insufficient or erroneous data.

Cost and value tables

This part of the SOLVE II output consists of 10 separate tables of dollar values by diameter

and length class for each log grade. The tables show:

1. Curved lumber values in dollars per log.
2. Curved lumber values in dollars per MBF (lumber tally).
3. Chip values in dollars per log.
4. Chip values in dollars per MBF (lumber tally).
5. Total product values (chips plus lumber) in dollars per log, with deductions for broker fee and cash discount.
6. Total product values (chips plus lumber) in dollars per MBF (lumber tally), with deductions for broker fee and cash discount.
7. Product-conversion costs in dollars per log.
8. Product-conversion costs in dollars per MBF (lumber tally).
9. Maximum log values in dollars per MBF (log scale).
10. Zero profit log values in dollars per MBF (log scale).

The log scale used in tables listed as 9 and 10 is the log scale used by the sawmill. This can be either International 1/4-inch, Scribner Decimal C, Doyle, or Vermont. Table 9 (maximum log values in dollars per MBF log scale) shows what the mill operator can afford to pay for his delivered sawlogs for a desired profit and risk situation. Table 10 (Zero profit log values in dollars per MBF log scale) shows the prices that the mill operator can pay for his sawlogs and just break even. Thus, if he pays more for any of his logs than the values shown in this table, he will lose money on those logs.

SOLVE II USES

In development and testing, SOLVE II has already been used to answer management questions for a number of sawmills. For example, it was used in one Lake States mill to tell a manager whether he could afford to saw aspen logs, since his white pine resources were scarce. It was used in another Lake States mill to provide the mill manager with his break-even log sizes. These sizes were then used as a guide for his whole-tree chipping operation in the woods. In New England, the SOLVE concept was used to tell a mill manager whether he could afford to haul big white pine logs 200 miles. And it was used in a Middle Atlantic state to tell a mill manager how much he could afford to pay for his grade-1 logs to assure a steady supply of higher value logs. These are only a few of the questions that SOLVE II has answered for mill managers.

We will not attempt to discuss all of the possible uses of the SOLVE II outputs. Instead, we will look at how the outputs can be used to answer a few major questions for the sawmill manager. The questions that will be discussed are:

1. Is the efficiency of the mill satisfactory?
2. Are the yields by lumber grade satisfactory?
3. What can the mill manager afford to pay for his sawlogs for a given profit and risk situation?
4. What are the sawmills' break-even log sizes?

Is the efficiency of the mill satisfactory?

Two tables in the output that help answer this question are: (1) lumber-recovery factor (LRF) by log grade and diameter class, and (2) lumber overrun by log grade and diameter class for three log rules.

The table of lumber-recovery factors (LRF is calculated by dividing the board-foot lumber yield by the cubic-foot log volume) is one measure of the efficiency of a mill. The table not only shows these factors by diameter class for each log grade, but also shows average factors for each log grade and an average factor for all grades combined. When these factors are known for different mill types, the mill manager can compare the efficiency of his mill with that of other mills sawing similar logs and producing similar products.

Another measure of efficiency is the lumber overrun obtained by the sawmill. Tables of percent overrun by diameter class and log grade are shown for three log rules so the sawmill manager can check his overrun with published or known overruns even if they are shown for a log rule different from the one he is using. This allows the manager to compare the efficiency of his mill with that of mills in similar situations in different parts of the country.

If the mill manager finds that his lumber-recovery factors or overruns are lower than they should be, there are several things he can do.

First, he can check his chip yields. If they seem unusually high, he can check to make sure the head sawyer is not slabbing too heavily. He can also check trimming and edging practices. If these spot checks do not pinpoint the problem, it may be necessary to set up some small studies in specific areas of the sawmill. The important thing is that the mill manager's attention has been directed to a problem area.

Are the yields by lumber grade satisfactory?

To help answer this question, tables are printed that show actual yields in percent by lumber grade and diameter class for each log grade. If expected yields are known and entered as input data, the outputs also show a comparison of the mills' yields with the expected yields. This comparison is based only on the log diameter classes that are found in both the actual yields and the expected yields.

If the sawmill operator does not know the expected lumber yields for his log grades, he can find lumber yields for a number of species in Forest Service Research Paper FPL-63.[1] These yields are shown for the Forest Service log grades only. Of course, the study logs would then have to be graded according to FS standards. The Grade and Quality of Hardwood Timber Project (Work Unit 3102) of the Northeastern Forest Experiment Station at Delaware, Ohio, is in the process of upgrading these FPL-63 yields with new information for approximately 14 species. The revised yield tables should be available soon. Also, we are in the process of developing standards for different milling situations. Once these standards have been prepared, they will be available for use in the analysis.

If the manager enters expected yields as input data and finds that his lumber grade yields (for example, No. 1 Common and Better) for a given log grade are well below the expected yields, he should first try to explain this difference by checking the products he is producing. Special products can affect the yields in some lumber grades. If he cannot attribute the difference to special products, he should then check the practices used by his head sawyer, edgerman, and trimmerman. Finally, he might check his log-grading and lumber-inspection practices.

What can the mill manager afford to pay for his sawlogs for a given profit and risk situation?

To help answer this question, the output provides tables showing the maximum values in dollars per MBF log scale, by diameter and length classes for each log grade. Each of these tables also shows the average maximum price per MBF log scale that the mill operator could have paid for the logs used in the analysis. These maximum dollar values are what the manager can pay for his logs and still make the desired profit.

If the mill manager is paying more for his sawlogs than the values shown in the tables, he is not making his desired profit. To improve profitability, he must increase lumber recovery, reduce costs, upgrade products, or achieve some combination of these.

If he is paying less than the values shown in the tables, he can use the tables as guides for buying future logs. If supply has been a problem, he may want to pay more for his logs to attract a larger supply of logs. Or, to improve his supply of better logs, he may want to pay more for his better logs and less for poorer logs.

The tables of maximum sawlog values can also be used to show the effect that a change in mill operating cost or a change in product selling prices would have on what can be paid for sawlogs. As long as the products cut and the mill layout remain the same, the manager can change the price or the cost data and rerun the original data to get updated table values. This can be done every time there is a significant change in price or cost.

What are the mills' break-even log sizes?

To help answer this question, the output provides tables of zero-profit log values by diameter and length classes for each log grade. Any logs showing a negative value in these tables cost more to process than the value of the products obtained from them. These logs are usually found in the lower log grades, but may be found in higher grades of low-value species.

[1]Vaughn, C. L., A. C. Wollin, K. A. McDonald, and E. H. Bulgrin. **Hardwood log grades for standard lumber.** USDA For. Serv. Res. Pap. FPL-63, 52 p., illus. U. S. For. Prod. Lab., Madison, Wis. 1966.

By subtracting his current log price from the dollar values found in the zero-profit table, the mill manager can find potential dollar profit or dollar loss for each size class of logs. A zero difference (table value same as log price) indicates that the logs in that size class are break-even logs. A positive difference indicates the potential profit for that log size. And a negative difference indicates the potential loss for that log size.

A sawmill manager usually must take the logs as they come. However, if the zero-profit table shows that he is getting too many logs below his break-even sizes, he may want to consider adding equipment that can process these logs at a lower cost. Or, he might investigate the market for products that will give a better return. Even if he cannot do anything about these logs, it is important that the sawmill manager know that they are not paying for themselves so that he can search for a solution to the problem.

CONCLUSION

The questions discussed above are of the type that can be answered with the SOLVE II sawmill analysis technique. For many questions, the output does not identify the specific problem, but it does indicate problem areas. In some cases, close observation during the data-collection phase of the analysis may help to pinpoint the problems. In other cases, it may be necessary to return to the mill for specific tests. Even though problems may not be pinpointed, it is important to note that SOLVE II allows the sawmill manager to take a good overall look at his operation with a minimum of effort.

To aid in the future use of SOLVE II, we plan to publish a paper showing standards that can be used to judge the efficiency of specific mill types. These standards will be developed from the SOLVE II analysis of many sawmills and will be shown for such things as LRF, overrun, lumber grade yield, conversion costs, chip yields, and downtime. Rough standards have already been developed from the sawmill information that was used to develop and test this analysis technique. These standards will be improved as more information becomes available.

SOLVE II is now being used by state foresters as part of their program to improve the efficiency of hardwood sawmills in eight northeastern states. Mill efficiency and profitability walk hand in hand. Tightening mill operations and eliminating poor practices will help increase yields, reduce costs, increase production, upgrade products, and reduce residues. Mill managers have come a long way toward meeting these objectives. However, SOLVE II can help them go even further, and make more efficient use of our renewable resources.

APPENDIX

The purpose of this Appendix is to show the different types of information that can be found in the SOLVE II printout. Only one example is shown for each type of information. For example, the regression analysis is shown only for sawing times per log. In a total printout, regression analyses are also shown for five other types of information. Some of the tables have been abridged to save space (this is shown by arrows) and the space between them has been reduced.

INPUT DATA

```
MILL.....................ED'S MILL
DATE..................... 11 / 13 / 75
OPERATING COST / MINUTE..  1.23
CHIP PRICE / TON......... 10.50
DESIRED PROFIT MARGIN....    15
NECESSARY RISK MARGIN....     1
BROKER FEE...............     0
CASH DISCOUNT............     1
AVE. PROD. TIME / DAY....  7.33
AVE. HOURS WORK / DAY....  8.00
MILL TYPE CODE...........  5
```

LUMBER PRICES
SPECIES - HARD MAPLE

THICK -NESS	LUMBER GRADE										
	FAS	SEL	1C	2C	3C						
2/4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3/4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4/4	325.	305.	230.	150.	130.	0.	0.	0.	0.	0.	0.
5/4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6/4	350.	330.	260.	155.	135.	0.	0.	0.	0.	0.	0.
7/4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8/4	0.	0.	0.	0.	118.	0.	0.	0.	0.	0.	0.

RAW LUMBER YIELD DATA

LOG NO.	LOG GRADE	SMALL DIAM.	LARGE DIAM.	LOG LGTH	LOG DEF.	SPECIES				SAWING TIME		SAWING ORDER			
	BOARD THICK	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS	LBR GRD	SURF MEAS/
234	3 17.		17.	10.0	20.	HARD MAPLE				1.40		1			
	4.	3	6.	4	23.	5	17.	0	0.	0	0.	0	0.	0	0.
	6.	5	23.	0	0.	0	0.	0	0.	0	0.	0	0.	0	0.
244	3 17.		19.	14.0	21.	HARD MAPLE				2.30		2			
	4.	2	8.	3	5.	4	22.	5	23.	0	0.	0	0.	0	0.
	6.	2	14.	3	26.	4	16.	5	7.	0	0.	0	0.	0	0.
205	2 16.		18.	14.0	20.	HARD MAPLE				1.41		3			
	4.	1	7.	2	7.	3	23.	0	0.	0	0.	0	0.	0	0.
	6.	2	28.	3	9.	4	18.	0	0.	0	0.	0	0.	0	0.
241	3 17.		21.	10.0	33.	HARD MAPLE				1.50		4			
	4.	1	5.	2	4.	3	20.	4	5.	5	5.	0	0.		
	6.	3	24.	4	5.	0	0.	0	0.	0	0.	0	0.		
167	2 17.		18.	10.0	24.	HARD MAPLE				1.51		5			
	4.	2	11.	4	7.	5	25.	0	0.	0	0.	0	0.		
	6.	1	12.	3	18.	4	5.	0	0.	0	0.	0	0.		
166	3 17.		17.	10.0	12.	HARD MAPLE				1.30		6			
	4.	3	7.	4	4.	5	5.	0	0.	0	0.	0	0.		
	6.	1	7.	2	8.	3	9.	4	20.	5	14.	0	0.		

DATA SUMMARY TABLES

HARD MAPLE
NO OF LOGS BY LOG GRADE

DIAM. CLASS	1	2	3	4	5	DIAM. TOTL
10	0	11	10	0	0	21
11	0	15	17	0	0	32
12	0	15	16	0	0	31
13	0	17	15	0	0	32
14	0	17	15	0	0	32
15	0	15	15	0	0	30
16	0	16	15	0	0	31
17	0	16	13	0	0	29
GRADE TOTL	0	122	116	0	0	238

HARD MAPLE
BF LUMBER TALLY BY LOG GRADE

DIAM. CLASS	1	2	3	4	5	DIAM. TOTL
10	0	659	458	0	0	1117
11	0	899	1181	0	0	2080
12	0	1373	1233	0	0	2606
13	0	1531	1452	0	0	2983
14	0	1919	1671	0	0	3590
15	0	1856	1721	0	0	3577
16	0	2278	1995	0	0	4273
17	0	2559	1910	0	0	4469
GRADE TOTL	0	13074	11621	0	0	24695

HARD MAPLE
CUBIC FT. LOG VOLUME BY LOG GRADE

DIAM. CLASS	1	2	3	4	5	DIAM. TOTL
10	0.0	90.697	75.835	0.0	0.0	166.532
11	0.0	150.726	171.571	0.0	0.0	322.297
12	0.0	183.716	185.632	0.0	0.0	369.348
13	0.0	228.277	203.775	0.0	0.0	432.052
14	0.0	281.571	235.942	0.0	0.0	517.512
15	0.0	272.293	260.704	0.0	0.0	532.997
16	0.0	325.988	294.072	0.0	0.0	620.060
17	0.0	369.111	273.720	0.0	0.0	642.831
GRADE TOTL	0.0	1902.379	1701.250	0.0	0.0	3603.628

HARD MAPLE
GRS LOG VOL DOYLE BY LOG GRADE

DIAM. CLASS	1	2	3	4	5	DIAM. TOTL
10	0	304	268	0	0	572
11	0	591	689	0	0	1280
12	0	780	832	0	0	1612
13	0	1127	975	0	0	2102
14	0	1371	1233	0	0	2604
15	0	1455	1500	0	0	2955
16	0	1872	1728	0	0	3600
17	0	2200	1724	0	0	3924
GRADE TOTL	0	9700	8949	0	0	18649

HARD MAPLE

DIAM. CLASS	GRS LOG VOL SCRIB.C BY LOG GRADE 1	2	3	4	5	DIAM. TOTL
10	0	420	350	0	0	770
11	0	730	870	0	0	1600
12	0	970	1040	0	0	2010
13	0	1320	1140	0	0	2460
14	0	1570	1410	0	0	2980
15	0	1700	1750	0	0	3450
16	0	2080	1920	0	0	4000
17	0	2400	1890	0	0	4290
GRADE TOTL	0	11190	10370	0	0	21560

HARD MAPLE

DIAM. CLASS	GRS LOG VOL INT 1/4 BY LOG GRADE 1	2	3	4	5	DIAM. TOTL
10	0	515	450	0	0	965
11	0	920	1080	0	0	2000
12	0	1140	1220	0	0	2360
13	0	1580	1365	0	0	2945
14	0	1820	1635	0	0	3455
15	0	1860	1925	0	0	3785
16	0	2300	2120	0	0	4420
17	0	2640	2060	0	0	4700
GRADE TOTL	0	12775	11855	0	0	24630

HARD MAPLE

DIAM. CLASS	NET LOG VOL DOYLE BY LOG GRADE 1	2	3	4	5	DIAM. TOTL
10	0	304	268	0	0	572
11	0	578	689	0	0	1267
12	0	766	832	0	0	1598
13	0	1118	969	0	0	2087
14	0	1371	1220	0	0	2591
15	0	1418	1474	0	0	2892
16	0	1813	1728	0	0	3541
17	0	2159	1638	0	0	3797
GRADE TOTL	0	9527	8818	0	0	18345

HARD MAPLE

DIAM. CLASS	NET LOG VOL SCRIB.C BY LOG GRADE 1	2	3	4	5	DIAM. TOTL
10	0	420	350	0	0	770
11	0	717	870	0	0	1587
12	0	956	1040	0	0	1996
13	0	1311	1134	0	0	2445
14	0	1570	1397	0	0	2967
15	0	1663	1724	0	0	3387
16	0	2021	1920	0	0	3941
17	0	2359	1804	0	0	4163
GRADE TOTL	0	11017	10239	0	0	21256

HARD MAPLE

DIAM. CLASS	NET LOG VOL INT 1/4 BY LOG GRADE 1	2	3	4	5	DIAM. TOTL
10	0	515	450	0	0	965
11	0	907	1080	0	0	1987
12	0	1126	1220	0	0	2346
13	0	1571	1359	0	0	2930
14	0	1820	1622	0	0	3442
15	0	1823	1899	0	0	3722
16	0	2241	2120	0	0	4361
17	0	2599	1974	0	0	4573
GRADE TOTL	0	12602	11724	0	0	24326

HARD MAPLE

DIAM. CLASS	LUMBER RECOV. FACT. BY LOG GRADE 1	2	3	4	5	DIAM. AVE
10	0.0	7.266	6.039	0.0	0.0	6.707
11	0.0	5.964	6.883	0.0	0.0	6.454
12	0.0	7.473	6.642	0.0	0.0	7.056
13	0.0	6.707	7.125	0.0	0.0	6.904
14	0.0	6.815	7.082	0.0	0.0	6.937
15	0.0	6.816	6.601	0.0	0.0	6.711
16	0.0	6.988	6.784	0.0	0.0	6.891
17	0.0	6.933	6.978	0.0	0.0	6.952
GRADE AVE	0.0	6.872	6.831	0.0	0.0	6.853

HARD MAPLE

DIAM. CLASS	OVER RUN DOYLE BY LOG GRADE 1	2	3	4	5	DIAM. AVE
10	0.0	116.8	70.9	0.0	0.0	95.3
11	0.0	55.5	71.4	0.0	0.0	64.2
12	0.0	79.2	48.2	0.0	0.0	63.1
13	0.0	36.9	49.8	0.0	0.0	42.9
14	0.0	40.0	37.0	0.0	0.0	38.6
15	0.0	30.9	16.8	0.0	0.0	23.7
16	0.0	25.6	15.5	0.0	0.0	20.7
17	0.0	18.5	16.6	0.0	0.0	17.7
GRADE AVE	0.0	37.2	31.8	0.0	0.0	34.6

HARD MAPLE

DIAM. CLASS	OVER RUN SCRIB.C BY LOG GRADE 1	2	3	4	5	DIAM. AVE
10	0.0	56.9	30.9	0.0	0.0	45.1
11	0.0	25.4	35.7	0.0	0.0	31.1
12	0.0	43.6	18.6	0.0	0.0	30.6
13	0.0	16.8	28.0	0.0	0.0	22.0
14	0.0	22.2	19.6	0.0	0.0	21.0
15	0.0	11.6	-0.2	0.0	0.0	5.6
16	0.0	12.7	3.9	0.0	0.0	8.4
17	0.0	8.5	5.9	0.0	0.0	7.4
GRADE AVE	0.0	18.7	13.5	0.0	0.0	16.2

HARD MAPLE

DIAM. CLASS	OVER RUN INT 1/4 BY LOG GRADE 1	2	3	4	5	DIAM. AVE
10	0.0	28.0	1.8	0.0	0.0	15.8
11	0.0	-0.9	9.4	0.0	0.0	4.7
12	0.0	21.9	1.1	0.0	0.0	11.1
13	0.0	-2.5	6.8	0.0	0.0	1.8
14	0.0	5.4	3.0	0.0	0.0	4.3
15	0.0	1.8	-9.4	0.0	0.0	-3.9
16	0.0	1.7	-5.9	0.0	0.0	-2.0
17	0.0	-1.5	-3.2	0.0	0.0	-2.3
GRADE AVE	0.0	3.7	-0.9	0.0	0.0	1.5

From this point on, the output is shown for each log grade found in the input data.

HARD MAPLE

LUMBER GRADE YIELD FOR LOG GRADE 2 IN PERCENT

DIAM. CLASS	NO. LOGS	LUMBER TALLY	FAS	SEL	LUMBER GRADES 1C	2C	3C			
10	11.	659.	2.1	10.3	17.3	36.6	33.7	0.0	0.0	0.0
11	15.	899.	3.8	5.8	15.1	29.9	45.4	0.0	0.0	0.0
12	15.	1373.	2.2	8.7	22.7	26.7	39.8	0.0	0.0	0.0
13	17.	1531.	2.5	14.2	20.6	23.8	38.9	0.0	0.0	0.0
14	17.	1919.	6.8	24.3	24.8	20.2	24.0	0.0	0.0	0.0
15	15.	1856.	6.4	18.0	26.8	17.0	31.7	0.0	0.0	0.0
16	16.	2278.	7.0	22.9	25.2	19.2	25.7	0.0	0.0	0.0
17	16.	2559.	17.2	20.8	24.2	16.2	21.6	0.0	0.0	0.0
AVE.	122.	13074.	7.4	17.7	23.3	21.4	30.3	0.0	0.0	0.0

ACT. VS. EXP. LUMBER GRADE YIELDS IN PERCENT
LOG GRADE 2

	DIAM. RANGE	NO. LOGS	FAS	SEL	LUMBER GRADE 1C	2C	3C		
ACT. AVE.	10- 17	122	7.4	17.7	23.3	21.4	30.3	0.0	0.0
	DIAM. RANGE	NO. LOGS	FAS	SEL	LUMBER GRADE 1C	2C	3C		
EXP. AVE.	10- 17	1108	5.2	8.0	27.6	24.1	35.0	0.0	0.0

LUMBER THICKNESS YIELD FOR LOG GRADE 2 IN PERCENT

DIAM. CLASS	THICK -NESS	LUMBER GRADES FAS	SEL	1C	2C	3C		AVE.
10								
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	0.0	26.5	61.4	57.7	57.2	0.0	53.7
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	100.0	73.5	38.6	42.3	42.8	0.0	46.3
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11								
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	14.7	32.7	39.7	78.8	62.0	0.0	60.2
	6	75.6	81.0	73.4	41.6	66.8	0.0	67.5
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	1.0	0.0	0.3
17								
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	11.6	26.1	39.8	57.2	48.1	0.0	36.7
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	88.4	73.9	60.2	42.8	51.9	0.0	63.3
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AVE.								
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	4	16.6	24.3	38.2	66.3	45.1	0.0	42.2
	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	6	83.4	75.7	61.8	33.7	52.1	0.0	56.9
	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8	0.0	0.0	0.0	0.0	2.8	0.0	0.9

HARD MAPLE
LOG FREQUENCY DISTRIBUTION (PERCENT)
BY LOG LENGTH AND DIAMETER
LOG GRADE - 2

LOG DIAM.	LOG LENGTH 6	8	10	12	14	16	18	AVE.
10	0.0	0.0	3.28	3.28	0.0	2.46	0.0	9.02
11	0.0	0.0	3.28	3.28	3.28	2.46	0.0	12.30
12	0.0	0.0	3.28	3.28	2.46	3.28	0.0	12.30
13	0.0	0.0	3.28	3.28	4.10	3.28	0.0	13.93
14	0.0	0.0	3.28	4.10	3.28	3.28	0.0	13.93
15	0.0	0.0	3.28	3.28	3.28	2.46	0.0	12.30
16	0.0	0.0	3.28	3.28	3.28	3.28	0.0	13.11
17	0.0	0.0	3.28	3.28	3.28	3.28	0.0	13.11
AVE.	0.0	0.0	26.23	27.05	22.95	23.77	0.0	

HARD MAPLE
CHIP YIELD PER MBF (LUMBER TALLY)
BY LOG LENGTH AND DIAMETER
LOG GRADE - 2

LOG DIAM.	LOG LENGTH 8	10	12	14	16
10	0.0	2.03	1.77	1.61	1.49
11	0.0	1.77	1.58	1.45	1.35
12	0.0	1.59	1.44	1.33	1.26
13	0.0	1.46	1.33	1.25	1.18
14	0.0	1.36	1.25	1.18	1.13
15	0.0	1.28	1.19	1.13	1.08
16	0.0	1.22	1.14	1.09	1.05
17	0.0	1.17	1.10	1.05	1.02

The following regression information and graphs are also shown for five other sets of information:

Sawing time / M bm
Lumber yield / log
Lumber yield / M bm
Dollar yield / log
Dollar yield / M bm (tally)

ED'S MILL

SPECIES - HARD MAPLE

LOG GRADE - 2

SAWING TIME / LOG

EQUATION NO. 1

LEAST SQUARES SOLUTION -- Y=B0+(B1*X1)+(B2*X2)

Y = SAWING TIME / LOG (MINUTES)
X1 = LOG DIAMETER (INCHES)
X2 = X1 SQUARED X LOG LENGTH (FEET)

ANALYSIS OF VARIANCE

SOURCE	DF	SS	MS	F
CONST.	1	219.8604	219.8604	2867.4485
X1	1	4.5804	4.5804	59.7383
X2	1	2.4505	2.4505	31.9596
RES.	115	8.8176	0.0767	
TOTAL	118	235.7089		

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENT (X1,Y) = 0.53760
CORRELATION COEFFICIENT (X2,Y) = 0.66260
CORRELATION COEFFICIENT (X1,X2)= 0.86301
MULT. CORRELATION COEFF.(R) = 0.66606
COEFF. OF DETERMINATION (R**2) = 0.44363

REGRESSION COEFFICIENTS

		STANDARD ERROR
B0 =	0.87719	
B1 =	-0.02252	0.02312
B2 =	0.00032	0.00006

STANDARD ERROR OF ESTIMATE = 0.27690

EQUATION NO. 1

Y = 0.87719 + (-0.02252 * X1) + (0.00032 * X2)

ED'S MILL

SPECIES - HARD MAPLE

LOG GRADE - 2

SAWING TIME / LOG

EQUATION NO. 1

LEAST SQUARES SOLUTION -- Y=B0+(B1*X1)+(B2*X2)

Y = SAWING TIME / LOG (MINUTES)
X1 = LOG DIAMETER (INCHES)
X2 = X1 SQUARED X LOG LENGTH (FEET)

Curved average values

OBSERVED AND PREDICTED VALUES

Difference between observed and predicted values

OBS. NO.	LOG NO.	LOG DIAM.	LOG LGTH	OBSERVED Y	PREDICTED Y	RESIDUALS
1	205	16.	14.	1.41000	1.68067	0.27067
2	167	17.	10.	1.51000	1.43278	-0.07722
3	233	17.	10.	1.47000	1.43278	-0.03722
4	228	16.	14.	1.55000	1.68067	0.13067
5	237	17.	14.	1.78000	1.80818	0.02818
6	139	17.	12.	2.01000	1.62048	-0.38952
7	243	11.	16.	2.27000	1.25812	-1.01188
8	240	10.	16.	1.24000	1.17154	-0.06846
9	211	17.	10.	1.68000	1.43278	-0.24722
10	194	10.	12.	0.97000	1.04164	0.07164
102	57	15.	14.	2.15000	1.56226	-0.58774
103	87	13.	14.	1.84000	1.35271	-0.48729
104	15	16.	10.	1.62000	1.34814	-0.27186
105	42	12.	16.	1.58000	1.35510	-0.22490
106	82	11.	12.	1.04000	1.10095	0.06095
107	137	11.	12.	0.94000	1.10095	0.16095
108	201	10.	12.	0.74000	1.04164	0.30164
109	152	12.	12.	1.03000	1.16806	0.13806
110	41	14.	12.	1.16000	1.32564	0.16564
111	28	16.	12.	1.38000	1.51441	0.13441
112	125	15.	16.	1.77000	1.70839	-0.06161
113	73	15.	12.	1.30000	1.41613	0.11613
114	75	13.	14.	1.27000	1.35271	0.08271
115	191	12.	14.	1.50000	1.26158	-0.23842
116	74	13.	14.	1.71000	1.35271	-0.35729
117	38	14.	12.	1.31000	1.32564	0.01565
118	32	15.	16.	1.54000	1.70839	0.16839

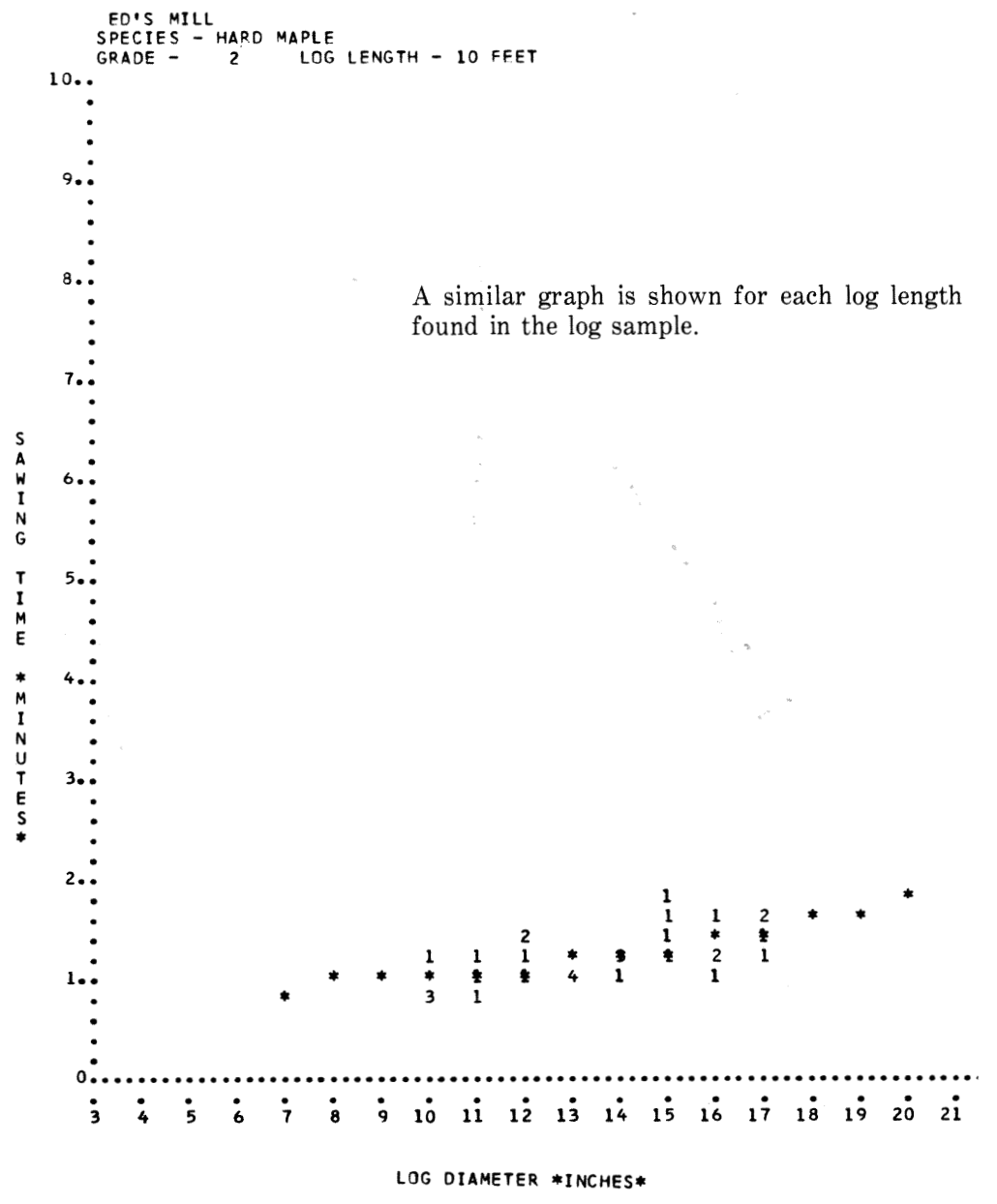
RESIDUAL CHECK FOR OUTLYING DATA

UPPER LIMIT (+4 STAND. DEV.) = 1.09343

LOWER LIMIT (-4 STAND. DEV.) = -1.09343

OUTLYING RESIDUALS

OBSERVATION	RESIDUAL
NONE	NONE



A similar graph is shown for each log length found in the log sample.

ED'S MILL

CURVED LUMBER TALLY
(VOLUME / LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	VOLUMES PER LOG				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	46	54	63	71
11	- -	54	65	75	85
12	- -	64	76	88	101
13	- -	74	88	103	117
14	- -	85	102	118	135
15	- -	97	116	135	155
16	- -	110	132	153	175
17	- -	123	148	173	197
18	- -	- -	- -	- -	- -

107 = AVE. / LOG

ED'S MILL

CURVED LUMBER YIELD
(VOLUMES / MBF-(SCRI))

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	VOLUMES PER MBF				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	1535	1505	1484	1469
11	- -	1430	1405	1388	1375
12	- -	1344	1324	1309	1298
13	- -	1274	1256	1244	1234
14	- -	1214	1199	1189	1180
15	- -	1164	1151	1141	1134
16	- -	1120	1109	1100	1094
17	- -	1082	1072	1065	1059
18	- -	- -	- -	- -	- -

1185 = AVE. / MBF-(SCRI)

ED'S MILL

CURVED LUMBER VALUE
(DOLLARS / LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	DOLLARS PER LOG				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	5.99	8.16	10.34	12.52
11	- -	8.49	11.12	13.75	16.39
12	- -	11.20	14.34	17.47	20.61
13	- -	14.14	17.82	21.50	25.18
14	- -	17.29	21.56	25.82	30.09
15	- -	20.66	25.56	30.46	35.36
16	- -	24.25	29.82	35.39	40.97
17	- -	28.05	34.35	40.64	46.93
18	- -	- -	- -	- -	- -

22.83 = AVE. VALUE (DOLLARS) / LOG

ED'S MILL

CURVED LUMBER VALUE
(DOLLARS / MBF-LMBR TALLY)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	DOLLARS PER MBF				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	155.39	162.96	168.36	172.42
11	- -	172.28	178.53	183.00	186.35
12	- -	185.78	191.03	194.79	197.60
13	- -	196.80	201.27	204.47	206.87
14	- -	205.94	209.80	212.56	214.63
15	- -	213.65	217.01	219.41	221.21
16	- -	220.22	223.17	225.29	226.87
17	- -	225.89	228.51	230.38	231.78
18	- -	- -	- -	- -	- -

210.68 = AVE. (DOLLARS) / MBF-LMBR TALLY

ED'S MILL

CHIP VALUES
(DOLLARS PER LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM*	LENGTH				
*	8	10	12	14	16
*	-------- DOLLARS PER LOG --------				
6 *	- -	- -	- -	- -	- -
7 *	- -	- -	- -	- -	- -
8 *	- -	- -	- -	- -	- -
9 *	- -	- -	- -	- -	- -
10 *	- -	0.97	1.01	1.06	1.11
11 *	- -	1.01	1.07	1.14	1.21
12 *	- -	1.06	1.15	1.24	1.33
13 *	- -	1.13	1.24	1.35	1.46
14 *	- -	1.21	1.34	1.47	1.60
15 *	- -	1.30	1.45	1.60	1.76
16 *	- -	1.40	1.57	1.75	1.92
17 *	- -	1.51	1.71	1.91	2.11
18 *	- -	- -	- -	- -	- -

1.39 = AVE. / LOG

ED'S MILL

CHIP VALUES
(DOLLARS PER MBF-LMBR TALLY)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM*	LENGTH				
*	8	10	12	14	16
*	-------- DOLLARS PER MBF --------				
6 *	- -	- -	- -	- -	- -
7 *	- -	- -	- -	- -	- -
8 *	- -	- -	- -	- -	- -
9 *	- -	- -	- -	- -	- -
10 *	- -	21.26	18.62	16.86	15.62
11 *	- -	18.61	16.57	15.21	14.23
12 *	- -	16.72	15.10	14.00	13.21
13 *	- -	15.33	14.00	13.09	12.43
14 *	- -	14.27	13.16	12.39	11.84
15 *	- -	13.44	12.49	11.84	11.36
16 *	- -	12.78	11.96	11.39	10.98
17 *	- -	12.24	11.53	11.03	10.67
18 *	- -	- -	- -	- -	- -

12.98 = AVE. / MBF-LMBR TALLY

ED'S MILL

PRODUCT VALUE
(DOLLARS PER LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM*	LENGTH				
*	8	10	12	14	16
*	-------- DOLLARS PER LOG --------				
6 *	- -	- -	- -	- -	- -
7 *	- -	- -	- -	- -	- -
8 *	- -	- -	- -	- -	- -
9 *	- -	- -	- -	- -	- -
10 *	- -	6.90	9.09	11.30	13.51
11 *	- -	9.41	12.08	14.76	17.44
12 *	- -	12.16	15.34	18.53	21.73
13 *	- -	15.13	18.88	22.63	26.38
14 *	- -	18.33	22.68	27.03	31.39
15 *	- -	21.76	26.75	31.76	36.76
16 *	- -	25.41	31.10	36.79	42.48
17 *	- -	29.28	35.71	42.14	48.56
18 *	- -	- -	- -	- -	- -

23.99 = AVE. / LOG

ED'S MILL

PRODUCT VALUE
(DOLLARS PER MBF-LMBR TALLY)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM*	LENGTH				
*	8	10	12	14	16
*	-------- DOLLARS PER MBF --------				
6 *	- -	- -	- -	- -	- -
7 *	- -	- -	- -	- -	- -
8 *	- -	- -	- -	- -	- -
9 *	- -	- -	- -	- -	- -
10 *	- -	175.10	179.94	183.54	186.31
11 *	- -	189.17	193.32	196.38	198.71
12 *	- -	200.65	204.23	206.84	208.83
13 *	- -	210.16	213.26	215.52	217.24
14 *	- -	218.15	220.86	222.83	224.32
15 *	- -	224.95	227.33	229.06	230.36
16 *	- -	230.79	232.90	234.43	235.58
17 *	- -	235.87	237.75	239.10	240.13
18 *	- -	- -	- -	- -	- -

221.56 = AVE. / MBF-LMBR TALLY

ED'S MILL

SAWING TIMES
(MINUTES PER LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	-------- MINUTES PER LOG --------				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	0.98	1.04	1.11	1.17
11	- -	1.02	1.10	1.18	1.26
12	- -	1.07	1.17	1.26	1.36
13	- -	1.13	1.24	1.35	1.46
14	- -	1.20	1.33	1.45	1.58
15	- -	1.27	1.42	1.56	1.71
16	- -	1.35	1.51	1.68	1.85
17	- -	1.43	1.62	1.81	2.00
18	- -	- -	- -	- -	- -

1.37 = AVE. / LOG

ED'S MILL

SAWING TIMES
(MINUTES PER MBF-LMBR TALLY)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	-------- MINUTES PER MBF --------				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	19.44	18.06	17.08	16.34
11	- -	17.58	16.44	15.62	15.01
12	- -	16.12	15.17	14.48	13.97
13	- -	14.97	14.16	13.57	13.14
14	- -	14.04	13.33	12.83	12.45
15	- -	13.27	12.65	12.22	11.89
16	- -	12.62	12.09	11.70	11.41
17	- -	12.08	11.60	11.26	11.01
18	- -	- -	- -	- -	- -

13.18 = AVE. / MBF-LMBR TALLY

ED'S MILL

CONVERSION COST
(DOLLARS PER LOG)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	-------- DOLLARS PER LOG --------				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	1.31	1.40	1.49	1.57
11	- -	1.37	1.48	1.58	1.69
12	- -	1.44	1.57	1.69	1.82
13	- -	1.52	1.67	1.82	1.96
14	- -	1.61	1.78	1.95	2.12
15	- -	1.70	1.90	2.10	2.29
16	- -	1.81	2.03	2.26	2.48
17	- -	1.92	2.18	2.43	2.68
18	- -	- -	- -	- -	- -

1.84 = AVE. / LOG

ED'S MILL

CONVERSION COST
(DOLLARS PER MBF-LMBR TALLY)

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH 8	10	12	14	16
	-------- DOLLARS PER MBF --------				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	26.10	24.25	22.93	21.94
11	- -	23.59	22.07	20.97	20.15
12	- -	21.65	20.36	19.44	18.75
13	- -	20.10	19.00	18.22	17.63
14	- -	18.84	17.90	17.22	16.72
15	- -	17.81	16.99	16.40	15.96
16	- -	16.95	16.22	15.71	15.32
17	- -	16.22	15.58	15.12	14.78
18	- -	- -	- -	- -	- -

17.69 = AVE. / MBF-LMBR TALLY

ED'S MILL

MAXIMUM LOG VALUE
(DOLLARS PER MBF-(SCRI))

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH				
	8	10	12	14	16
	DOLLARS PER MBF				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	185.70	191.05	194.83	197.62
11	- -	193.46	197.21	199.85	201.80
12	- -	197.49	200.16	202.03	203.40
13	- -	199.26	201.18	202.52	203.50
14	- -	199.64	201.03	201.99	202.70
15	- -	199.17	200.17	200.87	201.38
16	- -	198.16	198.89	199.39	199.75
17	- -	196.84	197.36	197.72	197.98
18	- -	- -	- -	- -	- -

199.52 = AVE. / MBF-(SCRI)

ED'S MILL

'0' PROFIT LOG VALUE
(DOLLARS PER MBF-(SCRI))

HARD MAPLE

GRADE 2

DATE 11/ 13/ 75

DIAM	LENGTH				
	8	10	12	14	16
	DOLLARS PER MBF				
6	- -	- -	- -	- -	- -
7	- -	- -	- -	- -	- -
8	- -	- -	- -	- -	- -
9	- -	- -	- -	- -	- -
10	- -	228.71	234.39	238.42	241.40
11	- -	236.73	240.69	243.46	245.51
12	- -	240.65	243.42	245.36	246.79
13	- -	242.09	244.05	245.41	246.41
14	- -	242.03	243.41	244.37	245.07
15	- -	241.05	242.02	242.69	243.18
16	- -	239.52	240.20	240.66	241.00
17	- -	237.67	238.13	238.45	238.67
18	- -	- -	- -	- -	- -

241.53 = AVE. / MBF-(SCRI)