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**Studies in Management and Accounting for the**

# **FOREST PRODUCTS INDUSTRIES**

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## **Log Inventory Controls**

by

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# LOG INVENTORY CONTROLS

JIM ELLISOR

## INTRODUCTION

There are a variety of methods used to determine and control log inventories. Following are procedures narratives for two systems which have been used effectively in providing accurate inventory and usage volumes:

The two systems are referred to herein as the "tagged inventory system", wherein each log is separately identified with some sort of tag, and the "locked-in-deck system", in which logs are not controlled individually, but by a classification (species, and grade or type, ie., sawlogs, veneer logs, etc.). Both systems can provide accurate volumes for both usage and inventory, but there is a significant variation in the costs of implementation and maintenance and the types of information available.

Inventory valuation methods used will have a direct bearing on the practicality of either system and may well be the determining factor in making a choice between them. The impact of the control system on inventory valuation is not discussed in this report, but a review of the control system with inventory valuation in mind should help to identify any potential problem areas. Components of each system may easily be automated, but for simplicity of presentation, they are defined as manual systems. The locked-in-deck system requires little additional cost, can be used for all scaling methods, (stick scale, weight scale, sample scale, etc.), and is particularly useful at high volume/small log operations. This system is effective in providing inventory and usage volumes on a species basis.

It is probably not practical to attempt to provide volumes by grade and/or size with this system, since the inventory must be segregated by grade and size in the yard, which would require larger log yards than are available at most operations. Logs with different destinations also need to be decked separately to avoid the necessity of scaling the logs out of the deck.

The tagged inventory system facilitates the development of inventory and usage volumes by grade and origin. It also allows for unannounced check scales which can be compared to the paid-for scale. It does not necessarily require as large

a yard as may be necessary for locked-in deck, but additional costs are incurred in maintaining the tag listing, entering the tag number on the ticket, the cost of the tag itself, maintaining the usage control sheet, the removal of the tag and maintaining the inventory file. The physical inventory test is also more time consuming using this method. The high processing costs indicated can be reduced through automation and by using machine readable tags and scanners, etc. This system is generally beneficial where there are high log values, significant differences in costs by grade, a large emphasis on profit centers and accountability, and where logs are scaled at remote locations.

## Locked-In-Deck System

The locked-in-deck system of log inventory control is basically designed to account for logs delivered to a mill site which are ultimately to be used at that site. This system is basically the same as the "ramp" inventory system commonly used in the south. Although procedures may be modified to address these areas, the following assumptions are made:

- 1) The log yard is of sufficient size to allow for the creation of a number of smaller log decks rather than just a couple of large decks,
- 2) the individual decks are built to a uniform height for the entire length of the deck and the yard is sufficiently level to allow for this,
- 3) the logs are decked uniformly with no gaping empty areas in the middle of the deck caused by logs piled crosswise,
- 4) the logs are relatively uniform in length,
- 5) all logs are put into a deck the same day they are scaled and *no logs are removed from a deck until after the deck has been completed,*
- 6) scale tickets are numbered and used sequentially.

This system requires that the log yard be mapped out with pre-numbered decking areas established, based on the anticipated deliveries. An area is reserved for each species which will allow for building the number of decks required for that species. See log yard map Exhibit I. The objective is to put all incoming logs in the current deck for that species.

As an example, assume that a mill will receive 15 million feet of logs for the year. This volume consists of 10 million feet of Douglas-fir and 5 million feet of ponderosa pine. The yard has sufficient room to create 20 decks, each of which will hold approximately 800M. Deck number's 1-13 are established for Douglas-fir and 14-20 are established for ponderosa pine. All Douglas-fir logs received are put in deck Number 1 until that deck is full and all ponderosa pine logs delivered are put in deck Number 14 until that area is full. When each deck is filled, the next deck in sequence is started for the species.

The log yard supervisor or scaler controls which decks are to be filled and at what point to begin a new deck. It is also his responsibility to see that all logs are placed in the decks assigned. Under this system, all receipts for a given species, size or other classification are put in the current deck on a daily basis. The inventory clerk then summarizes the receipts for the day and adds them to the running total for that deck. As long as pre-numbered scale tickets are used, the log yard supervisor must simply indicate to the clerk the last ticket number to be used for entering volumes into the summary for that deck, with all higher numbered tickets to be summarized for the next deck assigned for that species.

The clerk keeps separate sheets for each deck and keeps both the gross and net footage for the deck with separate entries for each day's input and a running total of both gross and net volume for the deck to-date. The clerk also summarizes a sample of the log lengths being put in the deck which is used to determine the average width of the deck.

The log yard map (Exhibit I) shows the situation just described. Decks 11, 12 and 13 are old logs from the previous logging season. Deck number 11 is currently a "hot deck" and is being used to feed the mill. Decks 12 and 13 remain locked-in until deck number 11 is cut out. The volumes in decks 12 and 13 are known and have not changed from the previous year, when they were built. The volume per lineal foot of these decks was determined when the decks were locked-in and is being used to determine the usage from and remaining volume in deck 11.

Decks 1, 2, 3 and 14 are new decks locked-in during the current logging season. Decks 4 and 15 are currently being built and will be locked-in upon completion. Exhibit II shows the current status of the clerk's inventory sheet for deck 4.

You should note that all scale tickets are not

accounted for on this sheet but only those with Douglas-fir destined for this deck. A separate accounting for scale tickets is maintained. The format shown allows for a reconciliation of volume added to inventory with total volume received, by vendor. This reconciliation would be performed should the total volume received not agree with total volume added to inventory.

As the decks are being built, the log yard supervisor makes several tests to develop a cubic-to-board-foot conversion factor. This is done by summarizing the volume contained in X amount of lineal feet of deck which has a height of Y and the average length of the logs used for the sample. If he multiplies the X length by the Y height by the average log length and divides this total into the actual volume, he will develop a conversion factor.

When the deck is completed, the log yard supervisor then measures the total length of the deck, determines the average height of the deck, and obtains the average log length from the clerk. He extends these to obtain the cubic measurements and multiplies by the conversion factor to arrive at an estimated board footage volume for the deck. This volume is compared to the volume summarized by the clerk and if the volumes are reasonably close ( $\pm$  3-5 percent) the figures compiled by the clerk are fixed as the locked-in volume for that deck. The log yard supervisor then marks both ends of the deck with paint to indicate that the deck is locked and that no more logs are to be added to the deck.

Once he has developed factors for several decks, the same factor can be used on new decks, if the diameters and piling remain constant. If the lengths are relatively uniform, the deck width can be estimated, as the only purpose for these calculations is a rough check to determine that the volumes, as summarized by the clerk, are not unreasonable.

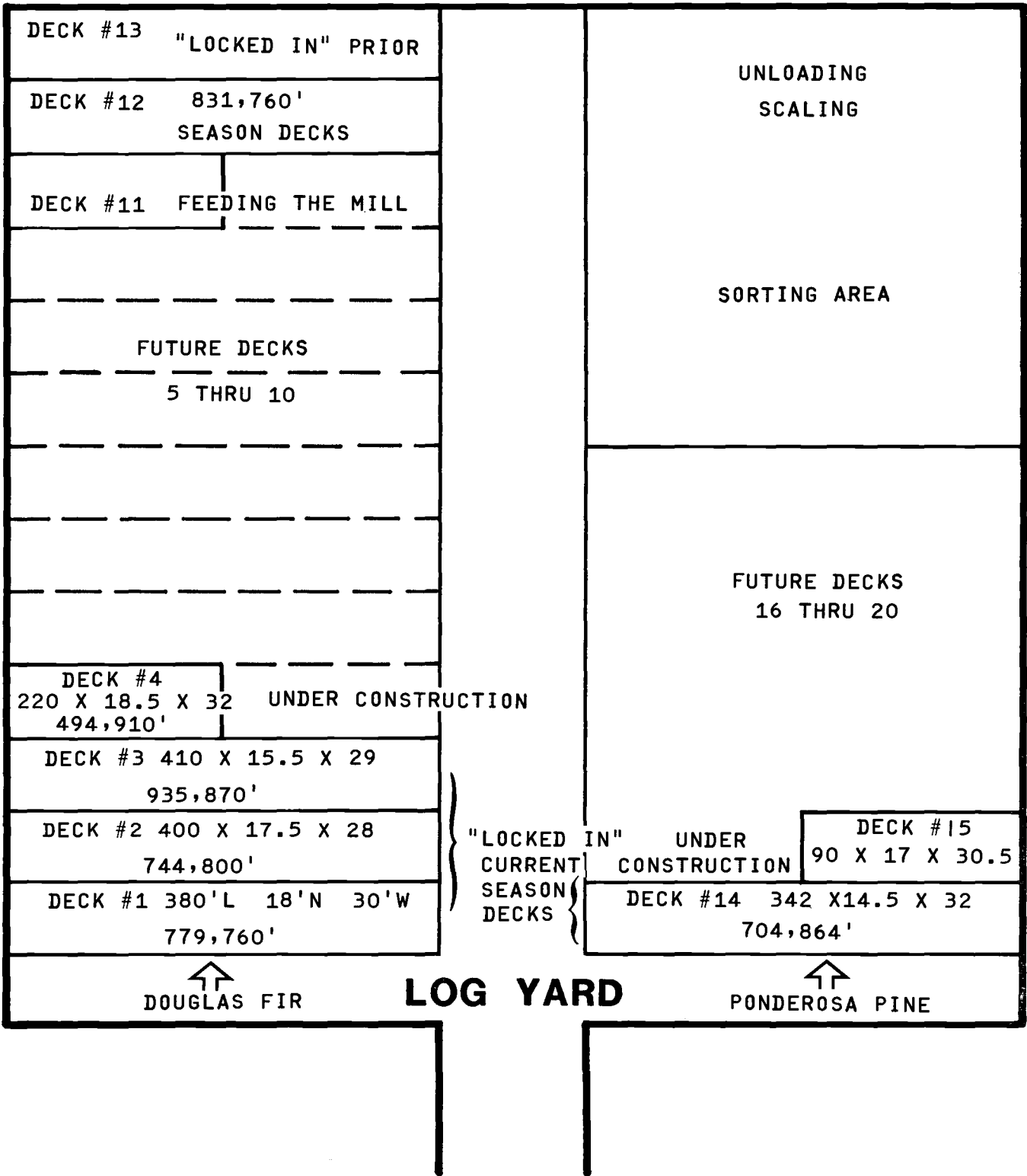
Exhibits III and IV show the test performed by the log yard supervisor. The cubic-to-board-foot factor of 3.8 is from tests performed as defined above. The defect factor is from the clerk's inventory sheet.

If there is a large variance, both the log yard supervisor and clerk should go back over their figures to determine if an error has been made. The clerk should reconcile total volumes received with the volumes added to the deck inventory for the period. The clerk will also want to make sure that the volumes—from the scale tickets were applied to the appropriate decks. The log yard supervisor will want to recheck the dimensions of

# LOG YARD MAP

Exhibit I

## MILL



DECK #13 "LOCKED IN" PRIOR

DECK #12 831,760'  
SEASON DECKS

DECK #11 FEEDING THE MILL

FUTURE DECKS  
5 THRU 10

DECK #4  
220 X 18.5 X 32 UNDER CONSTRUCTION  
494,910'

DECK #3 410 X 15.5 X 29  
935,870'

DECK #2 400 X 17.5 X 28  
744,800'

DECK #1 380'L 18'N 30'W  
779,760'

UNLOADING  
SCALING

SORTING AREA

FUTURE DECKS  
16 THRU 20

"LOCKED IN" UNDER  
CURRENT SEASON DECKS } CONSTRUCTION

DECK #15  
90 X 17 X 30.5

DECK #14 342 X 14.5 X 32  
704,864'

↑  
DOUGLAS FIR

LOG YARD

↑  
PONDEROSA PINE

## CLERK'S INVENTORY SHEET

Douglas-fir  
Deck #4 1980  
Exhibit II

	Logger/Vendor	Scale Ticket #5	Gross	Net	Balance
4/3	Contract Logging Co.	29050-5	27300	24300	
	I.R. Seller	29057	6830	6100	
	Interplant	29066 & 67	20480	18230	
	Company Logging	29058-64	13650	12460	
	Contract Logging Co.	29068-79	34130	30050	91140
4/4	Construct Logging Co.	29080-87	37940	34920	
	I.R. Seller	29089-90	12480	11540	
	Company Logging	29090-93	32480	29840	167440
4/5	Interplant	29094-98	35690	32040	
	I.R. Seller	29099-105	31080	27890	
	Contract Logging Co.	29106-124	69630	62580	
	Company Logging	29125-29	22560	20270	
	I.R. Seller	29130-32	19490	17500	
	Interplant	29134-37	26290	23630	
	Company Logging	29138-46	41370	37140	
	Construct Logging Co.	29148-57	46940	42020	430510
			478340	430510	Defect %
					10%
					Factor 90%

## SUPERVISOR'S TEST

Exhibit III

Deck #	Species	Length	Height	Width	Factor	X	Defect	Factor =	Inventory /test	Inventory /book	Variance
4	Douglas-fir	220'	X 18.5'	X 32'	X 3.8	X 90%	=	445,420	430510	+ 3.5%	

# CHECK SCALE SUMMARY

Exhibit IV

SCALER \_\_\_\_\_

DATE \_\_\_\_\_

SOURCE \_\_\_\_\_

CHECK SCALER \_\_\_\_\_

SPECIES Red Oak

PLANT \_\_\_\_\_

## ORIG. SCALE

## CHECK SCALE

<i>No. of Logs</i>	<i>FOOTAGE</i>	<i>GRADE</i>	<i>FOOTAGE</i>	<i>No. of Logs</i>
36	<u>3480</u>	A.	<u>3160</u>	36
	<u>330</u>	B.	<u>600</u>	
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	
	_____		_____	
	<u>3810</u>	TOTAL FOOTAGE	<u>3760</u>	

\$ \_\_\_\_\_ TOTAL LOG VALUE \$ \_\_\_\_\_

DIFFERENCE

\$ \_\_\_\_\_

## REMARKS

7 B Grade—2 Defects

29 A Grade—Good

# SCALE BY TAG NUMBER

Exhibit III

SCALE TICKET NO.	063229
------------------------	--------

Vendor/Jobber (1)				Date (5)				
Street/Description (2)				Scaler (6)				
Loading Point (3)		Ship To (4)		Car No.				
Log No. SWY (7)	OK (8)						EL. OAK	Log No. SWY-17
	A	B					H 6 A B	
1	63730	7					7	55
2	31	5					5	56
3	32	5					6	57
4	33	5					8	58
5	34	8					7	59
6	35	5					6	60
7	36	5					12	61
8	37	12					6	62
9	38	5					14	63
10	39	4					14	64
11	40	5					21	65
12	41	5						66
13	42	6					8	67
14	43	8					6	68
15	44	7					6	69
16	45	5					8	770
17	46	7					6	71
18	47	5					7	72
19	48	5					7	73
20	49	7					12	74
21	50	6					7	75
22	51	17					6	76
23	52	6					8	77
24	53	6						
25	54	15						
Total		154	17					181
OK A		3350						
B		230						
EL-A		110						
		3690 c.l.						

- 1) Supplier
- 2) Log source
- 3) Loading point
- 4) Destination
- 5) Date scaled
- 6) Scale
- 7) Tag #—SWY-7 = series
- 7) Tag #—68730 = tag #
- 8) Scale by species and grade



the deck and make sure the cubic-to-board-foot factor appears appropriate in light of the comparable density of the deck. If, after checking, there remains a disagreement, it would be best to have the log yard supervisor's superior examine and approve his figures as the basis for the inventory. This variance would probably be the result of logs not being put in the appropriate deck. Frequent occurrence of large variances is evidence of a control problem for which corrective action should be taken as soon as possible. This procedure is repeated for each deck built.

When it becomes time to remove logs from inventory, they are removed one deck at a time. Usage is determined by the same method as used to test the volume in the deck. If the deck is a uniform height, a factor of board footage to lineal feet of deck can be calculated to determine usage or inventory remaining. In all cases, the deck taper at either end of the deck must be taken into account when determining the length of the deck.

When an entire deck has been cut-out, the locked-in volume for that deck would be zero and the original volume would have been charged to usage. Use of this system eliminates the need for annual cut-out adjustments as each deck cut-out is effectively the same thing.

To physically test an inventory maintained on this basis the auditor needs only to reconstruct the figures developed by the log yard supervisor.

### **Tagged Inventory System**

The tagged inventory system requires that each log be scaled individually and a unique pre-numbered tag affixed to each log. The system cannot be used for logs scaled by weight and other sample scaling techniques. The tag number is entered on the log scale ticket next to the actual scale at the time the log is scaled. The basic purpose for the tag is to provide unique identification for each log and it must remain on the log until the log is ultimately consumed. There are several types of tags available from forestry supplies vendors. Depending on the physical composition of the tag, it may be simply read and recorded at time of consumption, or it may be necessary to remove it from the log. Tags should be issued on a controlled basis and used in sequence. It is a good idea to use an alpha prefix on the tag to avoid potential tag number duplication as well as provide a simple method of purging obsolete tags from the inventory file.

A copy of the scale ticket, with the tag number listed next to the actual scale, is filed in tag number

sequence in a binder, which becomes the perpetual inventory file. Using this system, logs can be scaled at remote locations and the related scale tickets kept in a separate binder for "logs in transit". When the logs are received at the mill location, the corresponding scale tickets are moved to the yard inventory binder. This movement from intransit to yard inventory is done by tag number and does not require that logs be re-scaled and is especially useful where log buyers are required to record a mutual scale at the point of sale and may consolidate purchases from different vendors for shipment to the mill. Logs scaled at the mill would be identified as such on the scale tickets and these tickets would be entered directly to the yard inventory binder. By using and accounting for pre-numbered scale tickets and tag numbers, there should be little problem in making sure all appropriate additions are made to the inventory.

Additions to inventory as described above are relatively easy to control and maintain. As a practical matter, the binders are not summarized, but serve only as a tool in developing accurate usage. A daily summary of additions to the binder is maintained as well as daily summaries of usage, remanufacture, sales and transfers. These transaction summaries are then used to develop inventory volumes. As logs are removed from inventory, you will encounter the problem of accounting for logs with lost tags. To account for volumes of logs used which had lost tags requires that you create an offset file, as described below. Computerized maintenance of the files would make it practical to summarize the scale volume for the open tag numbers in the inventory file. The volume summarized from the open tag numbers, less the volume in the offset file for no tag logs, would be the inventory volume.

As logs are used, remanufactured or shipped, the tags must be either read or removed for use in reducing the inventory. A control sheet should be kept listing the tag number for each log used, as well as an entry for each log for which the tag has been lost prior to this time. The actual scale for logs used is accumulated, based on the tags removed, and these tag numbers are deleted from the file (by crossing the number off the scale ticket). For logs with no tags and those read but previously removed from the file (caused by transpositions, etc.) an estimated volume is determined and added to the usage volume, as well as entered in a special offset file as reduction to inventory. An estimated volume can be developed by determining the average volume for those tags deleted from

the file and applying this average to the logs without tags or unmatched tag numbers.

For logs which are remanufactured, the same procedures are used in determining the volume to be removed from inventory. The resultant "new" logs are tagged, scaled, and added back to the inventory. This method allows for simple and accurate determination of value added through remanufacture based on the actual price paid initially, versus the new value of the logs. The volume and/or grade for log sales or transfers can be determined from the tag and the invoice prepared using the actual scale.

The physical test of inventory volume consists of the following steps:

1. Count the number of logs in each deck.
2. Using a random sampling of approximately 25 percent of the logs in the deck, record the tag numbers and determine the respective volume from the inventory file.
3. An average volume per log is developed for those tested and applied to the total log count for the deck.
4. This is done for each deck and the summary of all decks is compared to the inventory volumes booked.

Normal care must be taken relative to log movement, intransit volumes, etc. Any adjustments to inventory resulting from the test would be made against the offset file.

Over a period of time, the accumulation of a large amount of no-tag logs will cause the offset file to grow to an undesirable volume. To solve this problem it is necessary to maintain a procedure for a cyclical inventory cut-out. This can be done by using a new letter prefix on the tags for each logging season. Normal log rotation would cause the oldest logs to be used first. At the time all the logs are cut-out, the volume remaining open in the inventory binder is summarized and compared to the volume in the offset file with any difference being the resultant inventory cut-out adjustment. The

cycle chosen could be variable, dependent on experience, as long as the logs are properly segregated in the yard and tag numbers are used sequentially. In any event, the cut-out should be performed at least annually to avoid carrying errors forward from year to year.

An important area of log inventory control is the accuracy of the scaler. With most systems, once logs are scaled into inventory, there is little chance of determining whether errors are made by the scaler. Using the tagged inventory system, check scales are simply a matter of having an independent check scaler record the tag number and re-scaling the logs. The new scale is then compared to the original scale. Scaling errors are apparent and the systematic use of these check scales provide a deterrent to any fraudulent scaling.

### **Summary**

It is apparent that considerably more effort and expense is required to maintain a tagged inventory system than a locked-in-deck system. This extra cost, coupled with the decreasing supply of large, high value, old growth logs, has contributed to a decline in the popularity of tag systems. The increasing availability of computers may reduce the cost differential, but probably not to the point of making a tag system practical for high volume/small log operations. Computer systems also make it possible to obtain some information available from the locked-in-deck systems previously not practical, such as the size and grade composition of a deck. While the locked-in-deck type system is probably used more than the tag system, and may continue to grow in popularity, increasing emphasis on putting the right log to the right mill could lead to the use of a combination of the two systems. Where concentration yards are used and/or logs are decked at remote locations, tags may be used to serve as an indication of ownership and allow for transfer to multiple destinations at the original scale without the cost of re-scaling. At their destination, these logs would then become part of a locked-in-deck inventory.

## **Monographs published to date:**

“The Rush to LIFO: Is it Always Good for Wood Products Firms?” Issued in December 1974 and published in condensed form in the April 1975 issue of Forest Industries. This monograph was revised and reissued in January 1976.

“Accounting and Financial Management in the Forest Products Industries: A Guide to the Published Literature,” issued in June 1975. (A supplement to this monograph was issued in March 1977 and January 1981).

“A Decision Framework for Trading Lumber Futures,” issued in October 1975.

“Capital Gains Tax Treatment in the Forest Products Industries,” issued June 1976.

“Measurement Difficulties in the Log Conversion Process,” issued June 1977.

“Capital Budgeting Practices in the Forest Products Industry,” issued March 1978.

“A Reporting and Control System for Wood Products Futures Trading Activities,” issued July 1978.

“Selected Issues of Financial Accounting and Reporting for Timber,” issued November 1978.

“Pool Log Transfer System,” issued August 1979.

“Fundamentals of Financing Major Timber Acquisitions” issued February 14, 1980.

“LIFO Inventories in the Forest Products Industry,” issued July 1980.

“Accounting Treatment for Wood Products Futures Trading Activities,” issued October 1980.

“Accounting Controls for a Forest Products Firm,” issued January 1981.

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