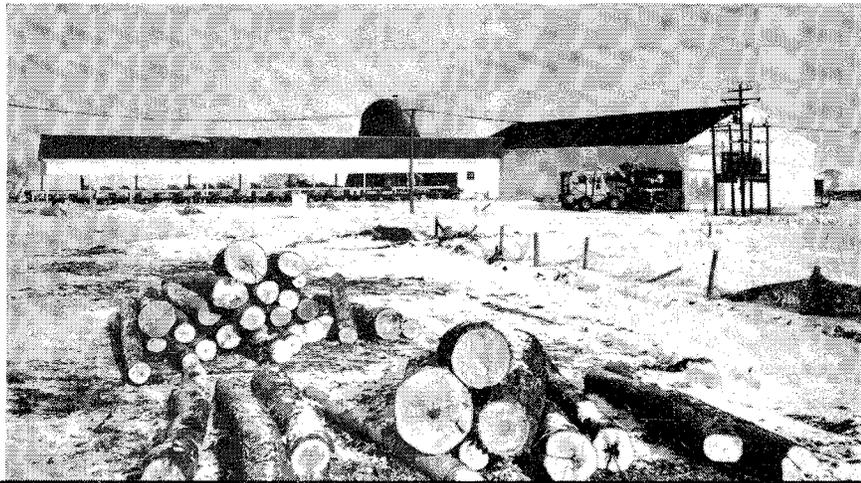


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Some Aspects of Sawmill Production and Marketing in North-Central Minnesota



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Sawmill Production and Marketing in North-Central Minnesota

GARY R. LINDELL AND RICHARD A. SKOK*

THE SAWMILL INDUSTRY IN MINNESOTA is by past standards small. Yet it is comprised of hundreds of statewide operations and annually provides employment for thousands of people. Between 1953 and 1962, sawtimber volume in the state increased by 3 billion board feet, an increase of approximately 25 percent. Such growth insures continuing future interest in this kind of economic enterprise.¹

The Study

The University of Minnesota School of Forestry cooperated in a north-central regional research project in which sawmill marketing processes were studied in selected portions of nine states. Results reported here were obtained from the Minnesota phase alone.

This study should be of assistance to present or potential owners and managers of sawmills and to public agents who assist firms, individuals, or communities in the development of such enterprises. It also should prove interesting to private and public land managers concerned with finding outlets for their standing timber. The future of this product as a Minnesota industry base will be determined largely by the ability of state mill owners to be: (1) competitive about cost structure and (2) aggressive and adaptable in their marketing programs. We are hopeful that the results of this study will be of assistance in achieving improvement in both of these areas.

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Data in this report were collected as part of Cooperative Regional Research Project NCM-27, "Timber Products Marketing in Selected Areas of the North-Central Region." The authors wish to thank the many sawmill operators, managers, and owners who gave up their time for the interviews that provided these data.

Cover photo courtesy of North Central Forest Experiment Station, U.S. Forest Service.

¹ Paul S. DeBald and Robert N. Stone. *Minnesota's Timber Volume*. Res. Note LS-43. Lake States For. Exp. Sta. Apr. 1964.

Study Methods

Mills studied were in the north-central counties of Minnesota (see figure 1). Mill listings for these counties for 1960 were obtained from the North Central Forest Experiment Station and the Office of Iron Range Resources and Rehabilitation Commission. All mills producing 100 thousand board feet or more in 1960 were considered to be in the population. These mills were divided by volume into three classes:

Class	1960 volume (thousand board feet)	Representatives interviewed
Class I*	100-499	28
Class II	500-999	16
Class III	1,000 or more	12

Approximately 26 percent of the mill representatives in Class I, all producing lumber for the market, were interviewed; all who could be reached in Classes II and III were interviewed. Mills that did custom sawing exclusively were not included in this study. All interviews were through personal contacts during the summer of 1961. The interview schedule was set up by the regional committee for the overall project.

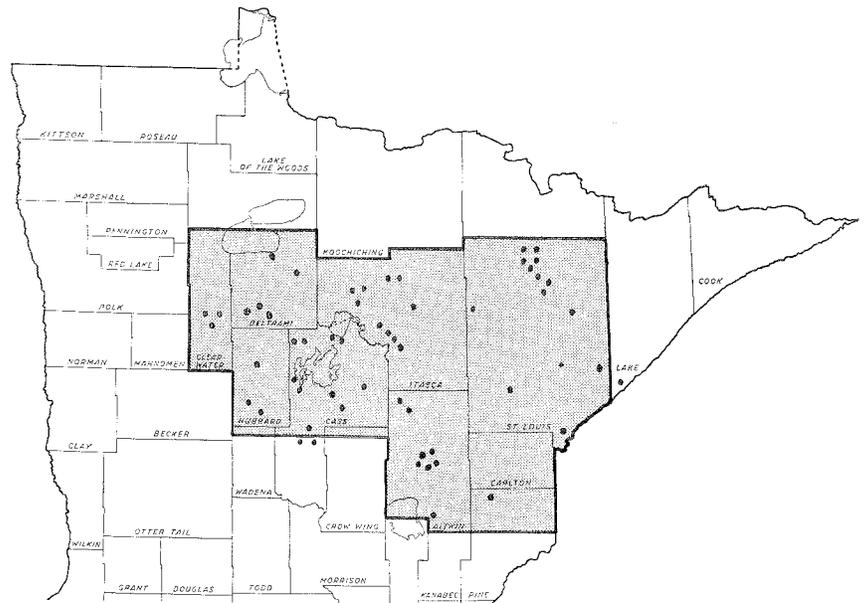


Figure 1. Distribution of sawmills in sample.

* Whenever estimates are made for the total population in this report, a standard error of estimate is presented because of the limited sampling of Class I mills.

Lumber Production and Marketing

Species

North-central Minnesota sawmills studied relied heavily on pine lumber as their most marketable commodity (see figure 2). Over one-half of their lumber production in 1960 was red, white, or jack pine. Aspen lumber accounted for slightly more than one-fourth of the lumber volume produced in that year. Therefore, these Minnesota mills had a basically pine-aspen lumber product base.²

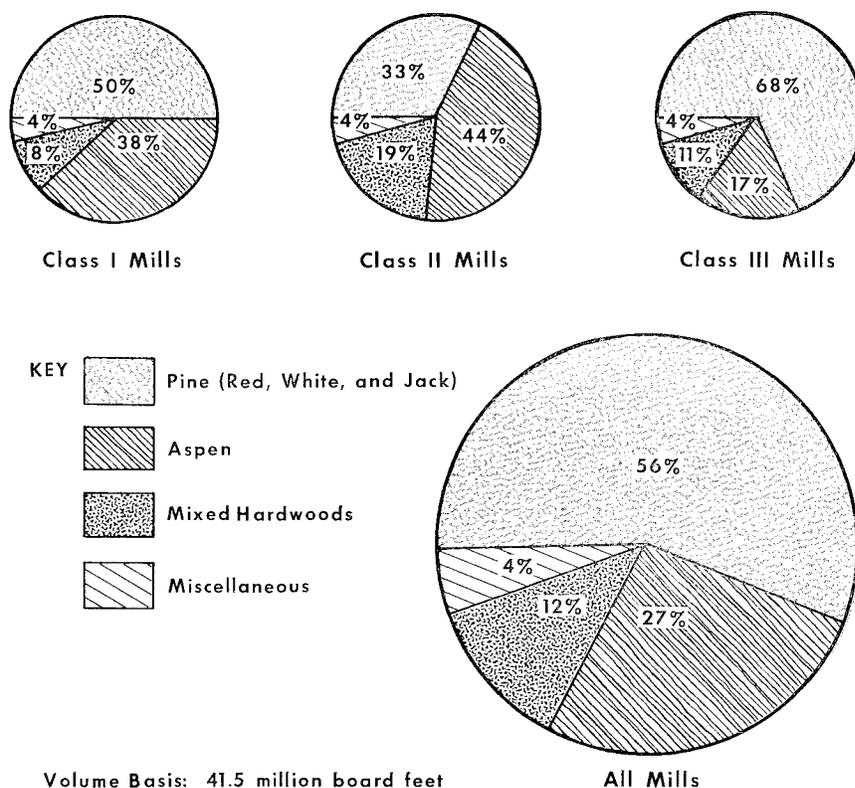


Figure 2. Percent of market lumber production by species, by mill class and for all mills.

² Comparing this conclusion with reported lumber production by species (51 percent pine, 30 percent aspen) in the central pine district of Minnesota indicates close correspondence between sample mills and all mills on this characteristic. Production data for this comparison were obtained from: Arthur G. Horn. *Minnesota Produces 161 Million Board Feet of Lumber—1960*. Tech. Notes No. 623. Lake States For. Exp. Sta. July 1962.

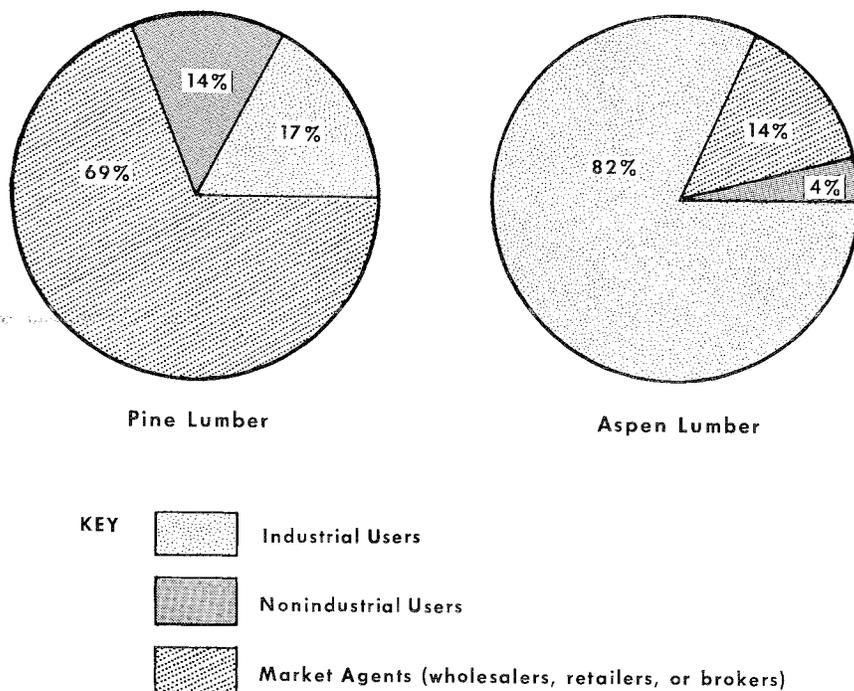


Figure 3. Percent of pine and aspen sold in 1960, by type of buyer.

Besides producing sawed lumber for the open market, these mills also produced 3.1 million board feet of custom-sawed material in 1960. Class II and III mills accounted for more than 80 percent of this total. Again, pine and aspen were the dominant species.

Market Outlets

The kind of lumber produced and the end use of lumber are closely related. Most aspen lumber produced in the study area was used industrially in the manufacture of containers or crates or as blocking. Pine lumber was most frequently used for construction activities. Well established mill outlet patterns are discernible from study data (see figure 3 and table 1).

Pine lumber sales by Class III mills were made mainly through direct transactions with retailers and those of Class II mills through direct transactions with wholesalers and nonindustrial users. Sales by Class I mills most often were made directly with users. In all mill classes, aspen was most often sold directly to the industrial user (see table 2).

Market agents (wholesalers, retailers, and brokers) were the principal purchasers of pine lumber, emphasizing the predominant use of this species for construction purposes (see figure 3). A relatively small

Table 1. Percent of aspen and pine lumber sold to type of buyer, by mill class

Type of buyer	Class I		Class II		Class III		All mills	
	Aspen	Pine	Aspen	Pine	Aspen	Pine	Aspen	Pine
.....percent.....								
Direct users								
Industrial user	63	20	82	8	96	17	82	17
Nonindustrial user	8	56	1	46	2	5	4	14
Market agents								
Wholesaler ..	10	14	3	46	0	14	4	16
Broker	19	6	14	0	0	15	9	13
Retailer	0	4	0	0	2	49	1	40
Total	100	100	100	100	100	100	100	100
.....thousand board feet.....								
Volume basis .	2,017	2,557	2,935	1,510	3,420	17,170	8,372	21,237

volume of aspen entered the normal trade channels because sales usually were made directly to users. Industrial users were the primary purchasers of aspen lumber.

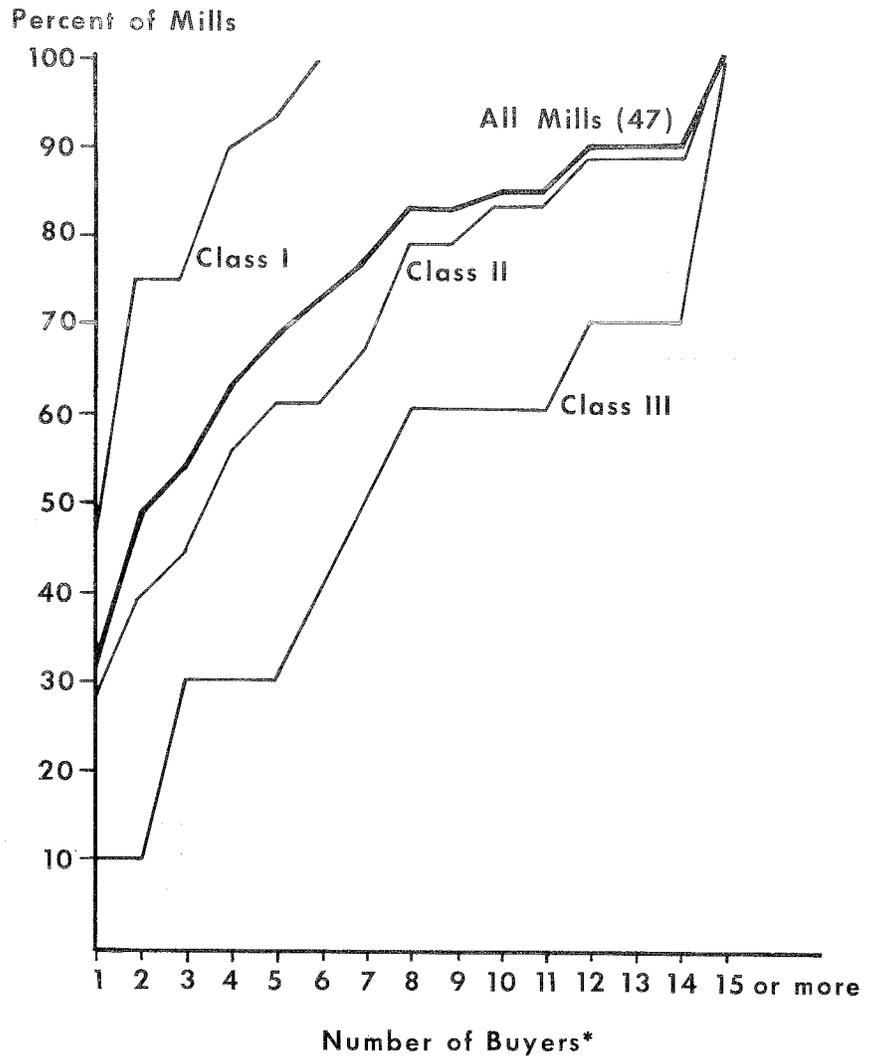
Pine used for construction was more often subject to substitution from western lumber than was aspen. Aspen lumber, on the other hand, was susceptible to substitution by nonlumber materials in the container field. Sullivan cites "substitution of other materials for lumber and veneer in containers" as one of the major reasons for the decline of the wooden container industry in Minnesota.³

Faced with out-of-state lumber and nonlumber material competition, a mill's position with respect to the number of buyers it has provides some basis for judging stability. Logically, a mill that has one buyer is more likely to be in a disadvantageous bargaining position than the mill that has several buyers, though exceptions to such a generalization do exist.

Table 2. Average number of buyers and average lumber volume purchased per buyer, by mill class

Mill class	Average number of buyers per mill	Average lumber volume produced per mill	Average lumber volume purchased per buyer
..... thousand board feet.....			
I	1.9±7	225	118±43
II	6.4	616	96
III	20.5	2,078	101

³ Edward T. Sullivan. *The Wooden Container Industry In Minnesota*. Paper No. 4044. Sci. J. Series. Univ. of Minn. Agr. Exp. Sta. Dec. 1958.



* Exclusive of sales to direct users by three mills in Class I.

Figure 4. Cumulative percent of mills, by number of buyers dealt with in 1960.

Mill operators reported the number of buyers to whom they sold lumber in 1960. As expected, there was a substantial range of buyers, from 1 to more than 100. From figure 4, however, it is evident that nearly 50 percent of all the mill operators dealt with no more than two lumber buyers in 1960.

Comparing mill size with number of buyers shows that the large mills tended to have more buyers than the small mills. No mill in Class

Table 3. Average maximum distance to market, by mill class

Mill class	Average maximum distance to market
I	155±41 miles
II	152 miles
III	313 miles

I had more than six buyers, and three-fourths of the Class I mills had no more than two buyers. Owners of three mills in this class sold all their volume directly at retail to local building contractors and final consumers for use in home and building construction and repair. Significantly, the owners of at least half the large mills (Class III) dealt with at least seven buyers.

Data in table 2 indicate that, on the average, the number of buyers a mill has is related directly to the volume of lumber produced at the mill and not to significant increases in volume sold per buyer. Mill operators consistently reported that the volume they sold per buyer in all types of markets had been declining in the years just previous to 1960, the study year.

Market Area

The aspen and pine lumber manufactured in the study area was marketed regionally, though the largest share remained in Minnesota. Some aspen and pine lumber was sold in Wisconsin, Illinois, North Dakota, and Iowa, and Michigan buyers purchased some pine. Heavy sales of aspen in the Twin Cities area were noted, again reflecting this species' high industrial use. Owners of large (Class III) mills tended to market their lumber at greater distances from the mill than did the owners of small mills. The average reported maximum distances to markets are shown in table 3.

Little difference was found between the maximum distances pine and aspen lumber were marketed. Figure 5 shows that nearly equal percentages of mills from each distance class reported sales of aspen and pine lumber.

Sawmill Capacity

The sawmills in the study area had a reported total annual capacity of about 130 million board feet. Actual 1960 production was reported to be 65 million (± 17 percent) board feet. Production in this case included lumber sawed for sale as well as custom-sawed lumber. On the average, then, production in that year was only 50 percent of the overall reported annual capacity. Production as a percent of reported capacity

varied as follows:	Class I	44 percent
	Class II	51 percent
	Class III	57 percent

Such a capacity-production relationship is not uncommon among sawmills of the size found in northern Minnesota. Undoubtedly, the discrepancy reflects the relatively high variable cost to fixed cost ratio for this enterprise, a factor that results in mill shutdown when price declines reflect a slow market. Data on capacity operation in 1960 support this hypothesis. The relatively high investment mills (large mills, Classes II and III) operated at a fuller capacity on the average than the Class I mills, which had lower capital investment. Many of the small mills shut down for the rest of the year after producing lumber for only a few months. This practice often reflects the complementary income-producing nature of the sawmill with other owner-operator enterprises.

Assuming reported capacity data to be reasonably accurate, owners of existing mills in north-central Minnesota could have doubled their annual output without the entry of new mills or the expansion of existing ones. However, the operational efficiency of existing idle capacity might vary considerably, thereby favoring expansion of output in some existing mills and entry of new mills rather than utilization of other segments of existing industry capacity. Relative profitability of alternatives is the best guide for determining which course to follow.

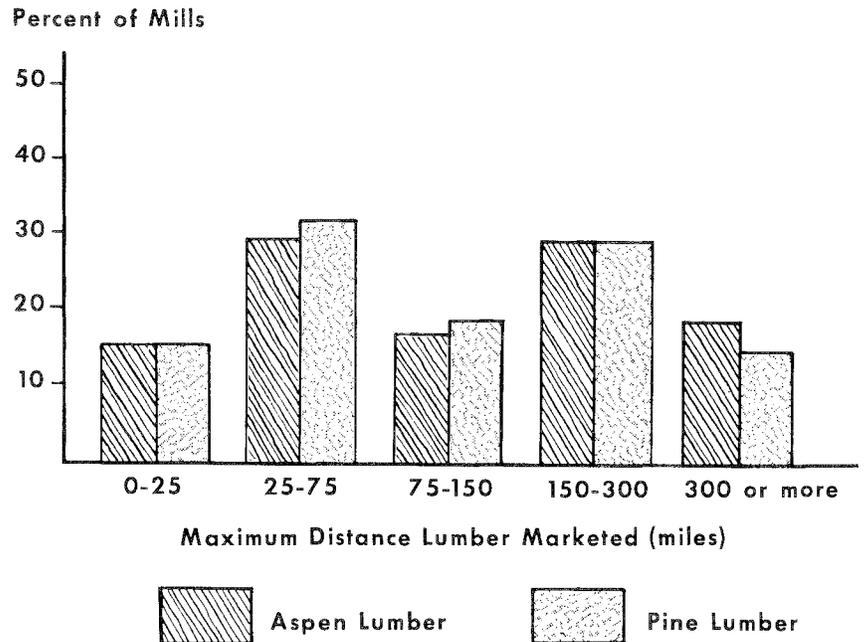


Figure 5. Maximum marketing distances for pine and aspen lumber from study area sawmills.

Number of Years of Operation

Of the 54 mills reporting, 65 percent had been operating in their 1961 location since 1946. In most cases, the time the mill was established at its 1961 location corresponded to the year in which the mill began operation.

The period immediately following World War II was one of rapid expansion for U.S. sawmills—increased lumber production was needed to meet accelerating domestic construction needs. A rapid rise in lumber price early in the postwar period encouraged entry (see table 4). The sawmill industry in the study area responded like the rest of the nation, as indicated in table 5.

Employment Requirements

Production activities at sawmills in the study area ranged from logging to the sale of finished lumber. Some mills were engaged in all

Table 4. Wholesale lumber price indexes, United States (1947-49 = 100)

Year	Price index, all lumber	Year	Price index, all lumber
1946	59.3	1954	117.3
1947	94.5	1955	124.4
1948	107.3	1956	127.2
1949	98.2	1957	119.7
1950	114.5	1958	118.0
1951	123.6	1959	127.1
1952	120.5	1960	121.4
1953	119.3		

Source: Bureau of Labor Statistics, U. S. Department of Labor

Table 5. Year mills began operation at 1961 location

Year of establishment at 1961 location	Mill class			All mills	Percent
	I	II	III		
1956-60	4	3	2	9	17
1951-55	5	4	2	11	20
1946-50	6	5	4	15	28
1941-45	2	4	1	7	13
1931-40	5	1	1	7	13
1930 or earlier	2	1	2	5	9
Total	24	18	12	54	100

phases; others were concerned with limited activities such as milling rough lumber only. The number of mill employees varied according to the level of mill output and the extent to which the mill was vertically integrated backward and/or forward.

Sawmill owners reported the following average number of full- and part-time employees:⁴

Mill class	Average number of employees		Average lumber volume produced per year (thousand board feet)
	Full-time	Part-time	
I	2.7	2.8	247
II	4.7	4.3	695
III	18.0	4.6	2,176

Large mills (Class III) provided the best opportunities for full-time jobs, as measured by full- to part-time employee ratios. Besides the direct mill employment indicated above, considerable indirect employment was created by mills that purchased sawlogs from independent producers. Table 6 indicates the agent source of sawlog supply for the three mill classes. Note that as mill size increased, the tendency for sawmills to rely on independent producers and dealers for their sawlogs increased, i.e., there was less tendency for functions to be vertically integrated backward. This tendency may reflect the influence of the Federal Fair Labor Standards Act 12-plus employee rule applicable to seasonal occupations such as timber harvesting. Under this rule, the employer is not subject to the conditions of the Act when he employs fewer than 12 men. When they needed large volumes of lumber, mill operators may have preferred to rely on independent producers rather than hire large crews, thus exceeding the 12-plus rule limit.

Table 6. Agent source of sawlog supplies, by mill class

Mill class	Type of agent		Total volume*
	Own employees	Independent producers	
	percent of volume obtained		thousand board feet
I	56	43	5,400
II	48	52	11,070
III	35	65	24,690
All mills	41	59	41,160

* Based on known reported volumes.

⁴ A regression analysis yielded the following results:

$$y = 375.62 + 27.94X_1 + 14.56X_2 \text{ with } R^2 = .563$$

where y = thousand board feet of lumber produced in 1960
 X_1 = number of reported full-time employees
 X_2 = number of reported part-time employees

Sawmill operators frequently remarked that they could purchase sawlogs more cheaply than they could produce them. However, operators of large mills did use their own employees for sawlog production when they could obtain material from mill-owned land. Nearly 16 percent of the Class III sawlog volume was accounted for in this manner.

In many cases where the operator of a small mill relied on his mill for all or a large share of his income, the sawing period covered only a portion of each year and logging the remainder. Logging all or part of his supply was a logical complement to his small sawmill operation.

Some indication of the indirect employment created by mill procurement of sawlogs was given by reports indicating the median number of producers and dealers sawmill operators bought from in 1960. The median Class I mill owner, who purchased at least a part of his sawlog supply, reported that he dealt with six such agents in 1960. Corresponding median mill data for Class II and III mills were 9 and 30 producers and/or dealers, respectively. Of course, some of these producers and dealers sold to more than one mill.

Sawlog and Stumpage Procurement

Ownership

The forest land from which sawmills in north-central Minnesota have drawn their sawlog supply has a complicated ownership pattern (see table 7).

Sawlog receipts for mills in the study area in 1960 were 63.8 million board feet. By sawmill class, receipts were:

Class I—26.2 million board feet \pm 42 percent
Class II—11.8 million board feet
Class III—25.8 million board feet
All mills—63.8 million board feet \pm 17 percent

Note that the small mills, by reason of their numbers, handled a sawlog volume comparable to that of the Class III mills despite the fact that they (small mills) operated at the lowest percent of capacity and individually represented low production levels.

An analysis of sawlog receipts according to land ownership revealed the importance of public lands, particularly state and county lands, as a supply source (see table 8). Only the largest mills (Class III) placed heavy reliance on private lands for sawlog supply. Data in table 7 show that public ownership in the supply area accounted for nearly two-thirds of the commercial forest land acreage and the sawtimber volume. Hence, an extremely close correspondence between ownership and supply source was experienced in this year by the study mills.

Supply Area

As the size of the sawmill increased, the supply area from which the mill drew its sawlogs also increased. Mill operators in the study area

Table 7. Ownership of commercial forest land and sawtimber volume in sawmill supply area

Ownership	Commercial forest land		Sawtimber volume	
	Thousand acres	Percent	Million board feet	Percent
Public:				
Federal	1,510	17	1,388	18
State	1,646	18	1,548	20
County and municipal	2,578	28	1,997	26
Private:				
Farmer owned ...	1,118	12	800	10
Forest industry ..	288	3	384	5
Miscellaneous private	1,960	22	1,589	21
Total	9,100	100	7,706	100

Sources:

County reports from: Aitkin, 1961; Beltrami, 1961; Carlton, 1962; Cass, 1961; Clearwater, 1961; Hubbard, 1961; Itasca, 1961; Pine, 1962; and St. Louis, 1962. Office of Iron Range Resources and Rehabilitation. "Timber Resources of Minnesota." St. Paul, Minn.

Table 8. Percent of mill sawlog receipts, by land ownership source

Ownership	Mill class			
	I	II	III	All mills
.....percent.....				
Private:				
Own land	5	7	15	10
Farm	7	0	4	4
Other	16	13	33	22
Total	28	20	52	36
Public:				
Federal	16	20	10	14
State and county	49	47	24	39
Total	65	67	34	53
Unknown	7	13	14	11

reported these median supply area radii for 1960: Class I—20 miles; Class II—30 miles; and Class III—50 miles. Few sawmill operators reported that their supply area had been increasing through depletion of saw-timber resources. While 33 percent of the Class II mill operators reported such a change over the 5 years previous to the study, only 8 percent of the Class I mill operators and none of the Class III mill operators reported any need to enlarge their sawlog supply area.

Procurement Practices

A larger percent of the sawlogs purchased by operators of small saw-mills (Class I) was purchased with no prior agreement between mill operator and producer than was the case with Class II and Class III mills (see table 9). Operators of large mills more often made their purchases through oral or written agreements. It is a generally accepted practice among owners in all mill classes to arrange for sawlog purchases from independent producers and suppliers after the logs have been harvested. Much of the sawlog material acquired in this manner comes from integrated harvesting operations where pulpwood is the principal product cut. Such timber producers sell logs of sufficient size to meet mill specifications without prior agreement whenever and wherever they can.

Mill owners who purchased publicly owned stumpage did so through a written contract. Such contracts were specific as to species, volumes, timber size, timber quality, time or period of harvest, payment method, and time and basis for measurement of volume removed. Written contracts for stumpage acquired from private landowners were much less specific. Sales by private landowners usually were made on a lump sum basis, with the buyer agreeing to pay the landowner a given sum of money for being allowed to remove any timber he deemed merchantable from a given tract of land. Generally, the only restriction imposed on the purchaser under such an agreement was that he take reasonable care with young trees during harvesting operations.

Most sawmill operators reported that they advanced sawlog producers loans ranging from \$50 to \$10,000. Small loans generally were made to finance stumpage purchases. Repayment was made by deducting the loan from sawlog receipts upon delivery of logs to the mill. The large

Table 9. Percent of sawlogs purchased by mill classes, by type of purchasing agreement

Type of purchasing agreement	Mill class		
	I	II	III
percent. . . .		
Oral	0	40	17
Written	16	0	29
No prior agreement	67	47	44
Not specified	17	13	10

sums most often were advanced for equipment purchases. According to study reports, no mill operator charged any interest for this financing.

Stumpage and Sawlog Prices

Mill operators reported that they usually were able to purchase sawlogs from producers at the prices they offered. Purchases of sawtimber stumpage were made at the seller's appraised price when small volumes of public timber were involved and at a bid price at or above the appraised price when large blocks of public timber were sold at auction. To purchase stumpage from private landowners, a mill operator or his agent usually examined the timber and then offered the owner a lump sum for the tract. Again, operators reported that the offered price normally prevailed.

The average reported prices paid for sawlogs and stumpage are given in table 10. Little price variation was found among mill classes except for jack and white pine stumpage and aspen sawlogs, which were significantly higher priced for Class II and III mills than for Class I mills.⁵

For each of the principal pine species purchased by sawmill operators in north-central Minnesota, the ratio of average sawlog price to average stumpage price was approximately 2.5:1. The other frequently processed species, aspen, had a corresponding ratio of 6.9:1. For each species, the average absolute margin between the stump and delivered sawlog price was in the range of \$25-\$30. Thus, the availability of aspen sawtimber stumpage relative to market requirements resulted in very low stumpage prices and accounted for this difference between ratios. The average costs of harvesting and delivering sawlogs to the mills apparently were very similar for each of the principal species handled.

Figure 6 shows the average delivered prices paid for sawlogs in north-central Minnesota for the period 1958-63 as reported by the Iron Range Resources and Rehabilitation Commission. Comparing prices re-

Table 10. Average prices paid, by species and mill class

Mill class	Species							
	White pine		Red pine		Jack pine		Aspen	
	Stump- age	Saw- log*	Stump- age	Saw- log*	Stump- age	Saw- log*	Stump- age	Saw- log*
 dollars per thousand board feet.....							
I	\$19.15	\$50.10	\$19.19	\$49.07	\$12.88	\$41.28	\$4.28	\$28.00
II	21.75	50.00	21.75	50.00	19.00	45.83	4.33	29.00
III	23.83	51.79	23.83	51.79	18.50	42.50	4.00	32.50
All mills	20.71	50.56	20.91	50.05	16.57	43.05	4.26	29.39

* Delivered prices

⁵ Prices were significantly different at and above the 5-percent level.

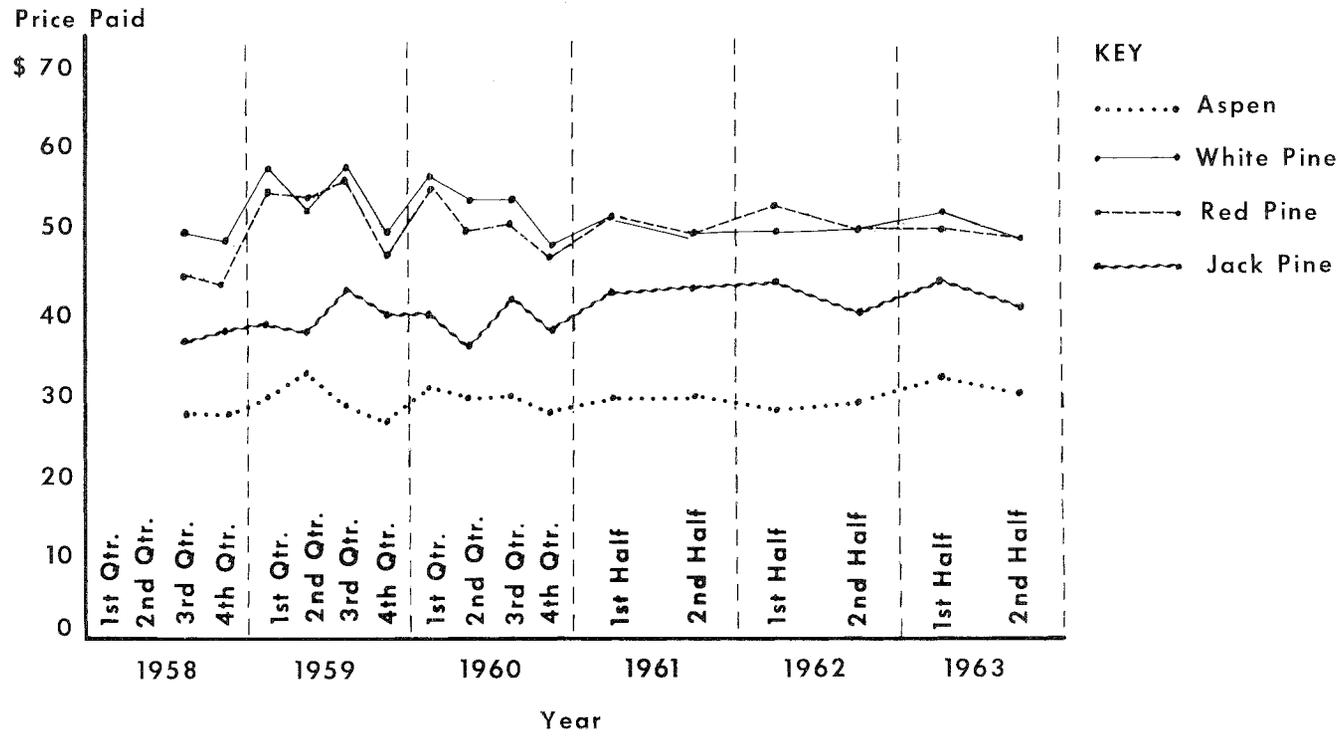


Figure 6. Prices paid per thousand board feet for sawlogs (decimal C. log rule) delivered at the mill, selected hardwoods and conifers.

Source: Office of Iron Range Resources and Rehabilitation. "Minnesota Forest Products Marketing and Pricing Review." 1958-63.

ported by mill operators in the 1960 study with those of the Commission showed a very close correspondence for that year. Sawlog prices in this area have shown no consistent upward or downward trend over the 5-year period.

Summary

North-central Minnesota sawmills produce lumber primarily for a two-commodity market—aspens for industrial use and pine for use in construction. Mills typically are small in terms of production compared to mills in other lumber producing regions of the United States.

Excess operable capacity existed during the study period but undoubtedly is typical of the industry in this area most of the time. Lack of adequate markets for full-year operation and the ease of entry and exit are the principal handicaps to a higher level of individual firm operation.

Markets presently utilized are regional for both pine and aspen. However, aspen most often is sold by the mill directly to industrial users, while pine lumber usually is sold to wholesalers and retailers for resale to consumers.

Small mills in the area are hampered by reliance on relatively few buyer outlets. Consequently, they are in a weakened bargaining position in dealing with purchasers.

Usually, sawlog supplies were obtained from stumpage in public ownership. Increased reliance on such a source can be expected due to the length of time required to produce sawlog stumpage. Mill owners generally indicated no need to expand their raw material supply area in recent years. Sawlog price trends for the period from 1958 to 1963 showed no important changes.

