

UNIVERSITY OF MINNESOTA  
AGRICULTURAL EXPERIMENT STATION

LUMBER PRODUCTION AND WOOD  
UTILIZATION IN SOUTHEAST-  
ERN MINNESOTA

WITH SPECIAL REFERENCE TO THE FARM WOODLOT

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# LUMBER PRODUCTION AND WOOD UTILIZATION IN SOUTHEAST- ERN MINNESOTA

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L. W. REES

## INTRODUCTION

There are about 40,000,000 acres<sup>1</sup> of woodland in the central hardwood region, of which about 30,000,000 acres are in farm woodlots. Most of this area has been cut over, and the remaining stands represent the culled remnants of the original hardwood forests. As 75 per cent of the hardwood timber acreage is in woodlots, it is evident that they must supply a large proportion of the hardwood lumber of the future. The central hardwood region extends into Minnesota, consequently some of the important timber trees typical of that region are indigenous to this part of the state. About 25 per cent<sup>2</sup> of the land area of southeastern Minnesota is woodland and the remaining 75 per cent is devoted to the production of agricultural crops.

It seems to be the general opinion of farm owners that their woodlots are of little value. In many instances the timber is cut from areas unsuitable for agriculture and the land is allowed to remain idle or the woodlot is pastured. On the other hand, where cut-over land is suitable for agriculture, the owner usually clears it and puts it under cultivation, thus keeping it productive. The low value placed on the farm woodlot is in part, probably, caused by a lack of knowledge of a suitable market for woodlot products. When the timber is sold, the returns are so small and the waste so great that it appears to be a hopeless task to raise more of the same crop, even on land that will not support agricultural crops. As a result, most woodlots become unproductive. Improved methods of marketing would tend to make the farm woodlot a more important factor in farm management.

The present study was begun to determine: (1) the kinds and amounts of material sawed from the woodlots of southeastern Minnesota; (2) the present disposition of the product; and (3) the kinds and source of supply of the raw materials consumed by the wood-using industries located in southeastern Minnesota. The survey has shown that so little raw material produced by the woodlot is available to the industries that they are compelled to seek a dependable source of supply

<sup>1</sup> Tillotson, C. R. "Timber growing and logging practice in the central hardwood region." U. S. Dept. Agr. Bull. 1491. 1927.

<sup>2</sup> Cheyney, E. G. and Brown, R. M. "The farm woodlot of southeastern Minnesota: its composition, volume, growth, value, and future possibilities." Minn. Agr. Expt. Sta. Bull. 241, University Farm, St. Paul, Minn. 1927.

elsewhere to insure continuous operation. If high-grade lumber could be produced by the woodlots in sufficient quantities to supply wood-using industries, a market could probably be found and the material used to the advantage of both the woodlot owner and the wood-using industries.

### AREA STUDIED

The area studied is roughly bounded by a line from Stillwater to Minneapolis, thence to Mankato, Albert Lea, and the Iowa line and along the Mississippi and St. Croix Rivers back to Stillwater.

Some of the streams tributary to the Mississippi River, namely, the Minnesota, Cannon, Zumbro, Whitewater, and Root Rivers, traverse this area from west to east. All of these rivers have cut deep channels, especially as the Mississippi River is approached. Thus a rugged topography is pronounced, especially in those counties bordering the Mississippi, and the climax is reached in the extreme southeastern part of the state. Farther west the land surface becomes more rolling. This rolling type of topography may be considered as the transition zone between the original woodland area of southeastern Minnesota and the prairie region of the western part of the state.

### FOREST TYPES

Because of the generally rugged character of southeastern Minnesota, some of the land area is suitable only for timber production. The forests of this part of the state may be divided into two general types:<sup>3</sup> (1) the mixed hardwood type, in which maple, basswood, and elm are the principal species; and (2) the oak type, in which oaks predominate, but which may also contain a small amount of those species common to the mixed hardwood type.

### SAWMILL OPERATIONS

The sawmills operating in this region are of the portable type. They may be divided into three classes: (1) sawmills operated by farmers for private use who do not make a practice of sawing for others; (2) sawmills operated in connection with lumber yards and feed mills, that depend upon logs brought in small amounts by farmers living in the immediate neighborhood; and (3) sawmills operated by owners who make a practice of moving from place to place doing custom sawing. When a large amount of lumber is to be cut, it is cheaper to hire a portable mill to do the sawing than it is to haul the logs. Consequently, the sawmill owners who move from place to place

<sup>3</sup> Cheyney, E. G. and Brown, R. M. "The farm woodlot of southeastern Minnesota: its composition, volume, growth, value, and future possibilities." Minn. Agr. Expt. Sta. Bull. 241. University Farm, St. Paul, Minn. 1927.

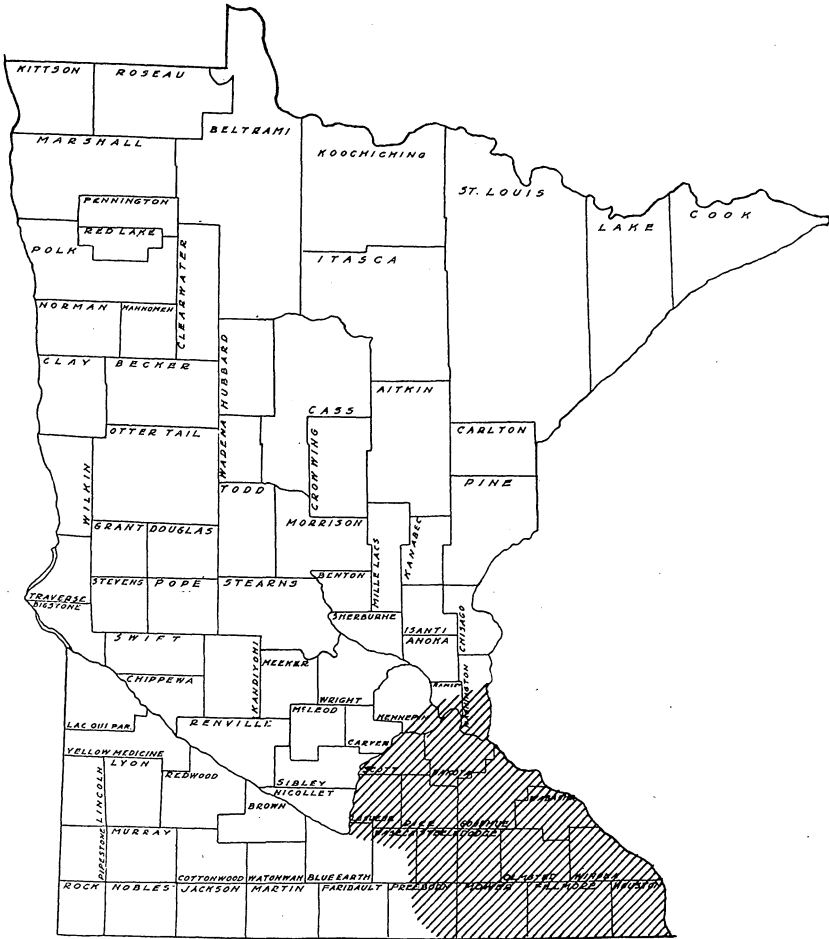


Fig. 1. Shaded Portion Indicates Area Studied.

get the large operations and produce the most lumber and ties. Inasmuch as lumber and tie operations are separate, they will be discussed separately. The lumber which is produced as “tie slabbings” is included under lumber production.

### LUMBER PRODUCTION

The lumber production by counties for the year 1928 is indicated in Table I. The total production of 6,178,300 board feet is computed from the data secured from 127 sawmill owners and include about 80 per cent of the sawmills located in the region. The average yearly production is slightly more than 45,000 board feet per mill. The smallest cut reported by one sawmill owner was 2,000 board feet; the largest,

400,000 board feet. The second largest cut reported was 268,000 board feet; the third, 180,000 board feet. Houston County leads in production, followed by Fillmore, Goodhue, Wabasha, Winona, and Olmstead Counties.

TABLE I  
PRODUCTION OF LUMBER AND TIES BY COUNTIES, SOUTHEASTERN MINNESOTA, 1928

County	Lumber		Ties	
	Board feet	Per cent of total	Number	Per cent of total
Houston	1,510,800	24.5	71,970	39.0
Fillmore	921,600	15.0	88,270	47.6
Goodhue	898,200	14.5	2,400	1.3
Wabasha	602,000	9.8	6,765	3.7
Winona	574,700	9.4	.....	.....
Olmstead	379,000	6.1	15,495	8.4
Le Sueur*	311,000	5.0	.....	.....
Rice*	270,000	4.4	.....	.....
Steele*	225,000	3.6	.....	.....
Dodge*	170,000	2.7	.....	.....
Waseca	170,000	2.7	.....	.....
Dakota	146,000	2.3	.....	.....
Total	6,178,300	100.0	184,900	100.0

\* Not completely canvassed.

### Charges for Sawing

The usual charge for sawing lumber ranged from \$7 to \$12 per thousand board feet, depending upon (1) the kind of timber sawed; (2) the amount of labor furnished by the sawmill owner; and (3) the source of power. If water power is available, the sawing can be done somewhat cheaper than otherwise. Operators who move from place to place charge from \$9 to \$12 per thousand board feet and do not consider it profitable to move for amounts less than 20,000 board feet. Therefore it is customary for several farmers to club together, concentrate their material in one place, and hire a sawmill to cut the total amount. The number contributing to such a pool varies greatly. For one operation of 60,000 board feet, the total number contributing was forty-five. This made an average operation of about 1,300 feet, board measure, for each contributor.

### Woods Used for Lumber

In most sawmill operations, no exact record is kept of the amount of lumber produced from each tree species. The lumber for each owner is usually scaled as one lump sum and may consist of from one to several different kinds of wood. As nearly as could be determined, the oaks constitute the largest amount, followed by cottonwood, basswood, elm, maple, butternut, aspen, and northern white pine.

### Disposition of the Lumber Cut

Slightly more than one-tenth of one per cent of the total cut was reported as having been consumed by local wood-using industries or cut for marketing. In one instance this consisted of oak dimension stock (3x4 and 4x5 inches) which was to be dried under an open shed for a period of two years. This material brings about \$50 to \$100 per thousand board feet, delivered at the plant. In another case, where a manufacturing concern was in need of crating, the timber and land was bought for \$125 per acre, logged clean, and the land allowed to restock itself.

More than 99 per cent of the cut was used directly on farms for repairs and for buildings. The framework of buildings is usually made of red oak into which nails can be driven if it is not allowed to become thoroly seasoned before it is used. Cottonwood, elm, oak, and other woods are used for roof boards, floors, etc. White oak and ash are generally used for repairs on farm machinery.

### TIE OPERATIONS

Tie operations are usually carried on by contractors, who in turn are often financed by some large lumber company. Only a few exceptions occurred where the woodlot owner cut and disposed of his ties directly. The usual custom is for the contractor to buy the standing timber at so much for each tie produced. The following represents the production costs per tie as given by one contractor.

Stumpage .....	\$0.10
Felling and bucking .....	.12
Skidding to mill .....	.20
Sawing .....	.20
Hauling to shipping point.....	.10
Loading on cars .....	.04
Overhead .....	.05
	<hr/>
Total cost per tie .....	\$0.81

Another contractor reported a production cost of 82 cents per tie delivered at the shipping point.

The average reported selling price for all grades was 82 cents per tie. From this, it is evident that a large proportion of the better grades of ties would have to be produced so that the contractor might realize a fair return. The figure of 20 cents per tie for sawing, however, seems to be high, as most sawmill owners operating in this region received from 12 to 15 cents. In addition, the cost of sawing the lumber produced as tie slabbings was about \$9 per thousand board

feet. This lumber was retained by the contractor and sold for \$15 to \$20 per thousand board feet. It was sold at the place of production whenever possible and the amount above the cost of sawing was profit.

On another tie operation, the owner of the timber did his own logging and delivered the logs to the mill, where his responsibility ceased. Only the better grades of logs were cut into ties, consequently, only the higher grades of ties were produced. The price received for these logs delivered at the mill averaged about 57 cents for each tie. Figured on the same basis as that reported by the contractor mentioned above, this woodlot owner received approximately the following per tie:

Stumpage .....	\$0.25
Felling and bucking .....	.12
Skidding to mill .....	.20
	<hr/>
Total, per tie .....	\$0.57

The owner not only received a higher stumpage price, but also made good wages for himself and team. The lumber produced as "tie slab-bings" and that cut from timber which did not produce high-grade ties was retained by the owner at a cost of \$9 per thousand board feet for sawing. This was sold or used on the farm for repairs and buildings. The slabs were either used on the farm for fuel or sold at the mill.

The sawmill owner had a contract with a well known railroad company to deliver ties at New Albin, Iowa. The price per tie delivered at the right-of-way was:

Grade	Price per Tie
Usable rejects .....	\$0.60
Grade No. 1 6x6 in.—8 ft. ....	.75
Grade No. 2 6x7 in.—8 ft. ....	.87
Grade No. 3 6x8 in.—8 ft. ....	.97
Grade No. 4 7x8 in.—8 ft. ....	1.06
Grade No. 5 7x9 in.—8½ ft. ....	1.06

The cost per tie of manufacturing and delivering to market was approximately:

Stumpage and delivery to mill.....	\$0.57
Sawing .....	.18
Hauling to shipping point .....	.10
Loading .....	.03
Overhead .....	.05
	<hr/>
Total, per tie .....	\$0.93

The average selling price for the grades 3, 4, and 5, was \$1.03, giving an average profit of 10 cents per tie. The sawmill owner was



also earning wages at the rate of 18 cents per tie for sawing and an additional income of \$9 per thousand board feet for the lumber produced as tie slabbings and from logs that would not produce high-grade ties.

### Woods Used for Ties

A total of 184,900 ties (Table I) was reported as having been cut in Fillmore, Houston, Olmstead, Wabasha, and Goodhue Counties in 1928. The various species of oak produced the largest part of the total, but other woods, such as elm and black cherry, are sometimes used.

### Waste

Most specifications for hardwood cross-ties designate that Grade 1 shall be 6 inches thick, with a 6-inch face, and 8 feet long, usually written 6"x8"—8'. Grade 2 ties should be 6"x7"—8'; Grade 3, 6"x8"—8'; Grade 4, 7"x8"—8'; and Grade 5, 7"x9"—8½'.

To produce a tie of Grade 1, the log must be 8½ inches in diameter at the small end, assuming that the log is perfectly round and straight. It is evident that if ties only are cut, all logs less than 8½ inches in diameter must become waste material. Moreover, the price paid for the poorer grades of ties is generally low, whereas the cost of production is about the same as for producing high-grade ties. Efforts, therefore, are naturally concentrated on the production of the higher grades. Grade 3 is the lowest that can be produced with a profit and this requires a log 10 inches in diameter at the small end. Suppose that the butt log of a given tree is just large enough to produce a Grade 3 tie. The diameter at the top of the next 8-foot log will be less than 10 inches, resulting in a low-grade tie, or complete waste. A large amount of waste must therefore result unless provision is made for sawing the small logs and low-grade material into lumber, and the remaining tops, etc., into cordwood. This material may be sold or utilized on the farm.

It is evident that the amount of waste that must result when ties only are produced is not comprehended by the woodlot owner, and he is often inclined to feel antagonistic toward the contractor who bought the timber. When the timber in the woodlot is sold, all factors should be considered to completely utilize the timber. One of the first steps toward a permanent supply of forest products is proper utilization of the present supply.

## WOOD-USING INDUSTRIES

One of the important factors in maintaining wood-using industries in a locality is the presence of a near-by supply of raw material. The study of lumber production in southeastern Minnesota shows that very

little material from the woodlots is available to the wood-using industries situated in and around this region. Furthermore, the study of the industries shows that more than four-fifths of the necessary raw material is imported.

To eliminate unnecessary transportation charges, wood products are often manufactured near the source of supply, then shipped to distant markets to be assembled. Local sash and door manufacturers must now compete with manufacturers on the west coast, who place their products on the Minnesota market ready to be assembled or distributed. In addition to this, silo and tank staves, cooperage stock, casket and coffin stock, and chairs are often imported ready for assemblage. It is probable that in the future many other commodities will be received in a similar form if the necessary raw material is not provided through local production.

The various woods utilized by the wood-using industries in southeastern Minnesota in 1927 and in the entire state in 1911 are listed in Table II. In 1911, Minnesota supplied 86 per cent of the material required by its wood-using industries, whereas in 1927 the state supplied only 18.5 per cent of the raw material required by the wood-using industries of southeastern Minnesota.

Fifty-one woods are listed in Table II, twenty of which are softwoods and represent about two thirds of the total amount of lumber used in southeastern Minnesota in 1927. Nine of these woods, which comprise about 78 per cent of the softwood lumber, or about 52 per cent of the total for all species, are obtained from the Pacific Coast or Rocky Mountain regions; three are obtained from southern United States and represent about 2 per cent of the total amount of softwoods. Minnesota supplies about 17 per cent of the softwoods, and the remaining 3 per cent comes from Wisconsin, Michigan, and Canada.

Thirty-one hardwoods are listed in Table II. They represent about one third of the total amount of lumber consumed by the wood-using industries of southeastern Minnesota during 1927. Seven, or about one half of one per cent of all the hardwoods, come from foreign countries. About 37 per cent of the hardwoods are produced within the state. Of this amount, aspen supplies about one half, basswood one fourth, and oak, birch, soft elm, cottonwood, and black walnut about one fourth. The remaining 62.5 per cent of the hardwoods comes from southern United States and from Michigan and Wisconsin.

### Transportation Costs

As a large proportion of the lumber used by the wood-using industries of southeastern Minnesota comes from distant sources, it is evident that transportation costs must add considerably to the cost of the lumber. The freight rate on lumber shipped to Minneapolis and St. Paul

from the west coast is 62½ cents per hundredweight; from the Rocky Mountain region, 59 cents; from the south (Arkansas), 45 cents; and from Wisconsin and Michigan, from 12 to 15 cents. On the basis of 1,000 feet, board measure, the approximate cost added by transportation is about \$4.80 on birch and maple from Wisconsin, \$11.50 on surfaced western white pine from the Rocky Mountain region, and \$19 on rough oak and hickory from Arkansas.

### The Industries

The various wood-using industries can be divided into sixteen groups. This includes one miscellaneous group to include industries of which there is only one or two representative firms, and also to include those concerns which use only one or two kinds of wood. The industries are discussed in the order of importance, based upon the amount of lumber used during 1927. The miscellaneous group is placed last, as it does not represent a single industry.

Statistics dealing with the amount of lumber consumed are not constant from one year to the next. However, a study of this type yields valuable information upon the source of supply and the materials required by the wood-using industries. Prices are not considered, as the cost of lumber delivered varies, owing to (1) distance shipped, (2) supply and demand, (3) weight, and (4) competition. The figures as here presented were secured from 205 wood-using concerns, and were imparted by factory superintendents, purchasing agents, and shop foremen.

**Sash, doors, and general millwork.**—The largest wood-using industry reported in southeastern Minnesota is that represented by the manufacture of sash, doors, and general millwork. General millwork includes all types of interior finish, such as built-in cupboards and bookcases, moldings, wainscoting, and staircases. Twenty-seven woods are used in this industry (Table III). The first four listed, or 72.8 per cent, are conifers from the western states. Only 3.7 per cent was reported as having been produced in Minnesota. The better grades of lumber are required for this type of work, as it is generally used where the surface is exposed. The grades reported were firsts and seconds, and numbers 1, 2, and 3 shop. The western species are usually surfaced before shipping, but the other material is bought in the rough. The thickness of the lumber is 4/4", 5/4", 6/4", 8/4", 12/4", and 16/4", with a small amount of dimension stock. All widths and lengths are ordinarily included. Three-ply and five-ply panel stock of Douglas fir, birch, and oak are often used. These are bought by the square foot and no accurate estimate of the amount was secured. In addition, some foreign woods—Brazilian rosewood, English walnut, Austrian white oak—are used in the form of veneer.

TABLE II  
ANNUAL CONSUMPTION BY SPECIES IN FEET, BOARD MEASURE

Species		Southeastern Minnesota, 1927				Minnesota, 1911*			
Common name	Scientific name	Grown in Minnesota	Grown outside of Minnesota	Total	Per cent of total	Grown in Minnesota	Grown outside of Minnesota	Total	Per cent of total
Douglas fir .....	<i>Pseudotsuga taxifolia</i> Britt. ....		25,102,000	25,102,000	14.70	.....	19,597,271	19,597,271	2.04
Sugar pine .....	<i>Pinus lambertiana</i> Douglas. ....		20,793,000	20,793,000	12.70	.....	75,000	75,000	.01
Northern white pine, Norway pice, jack pine .....	<i>Pinus strobus</i> L., <i>Pinus resi- nosa</i> Sol., <i>Pinus banksi- ana</i> Lam. ....	14,608,000	825,000	15,433,000	9.10	687,343,958	10,298,893	697,642,851	72.82
Sitka spruce .....	<i>Picea sitchensis</i> Eng. ....		14,344,000	14,344,000	8.40	.....	9,457,020	9,457,020	.99
Western white pine .....	<i>Pinus monticola</i> D. Don. ....		11,704,000	11,704,000	6.80	.....	2,227,000	2,227,000	.23
Western yellow pine .....	<i>Pinus ponderosa</i> Lawson. ....		11,251,000	11,251,000	6.60	.....	1,533,800	1,533,800	.16
Birch .....	<i>Betula</i> species .....	417,000	9,747,000	10,164,000	5.90	12,217,800	18,562,244	30,780,044	3.21
Aspen (popple) .....	<i>Populus tremuloides</i> Mich- aux. ....	8,950,000	750,000	9,700,000	5.70	21,354,500	.....	21,354,500†	2.23
Oak .....	<i>Quercus</i> species .....	36,000	8,631,000	8,667,000	5.00	5,974,744	19,295,551	25,270,295	2.63
Basswood .....	<i>Tilia glabra</i> Vent. ....	3,532,000	3,742,000	7,274,000	4.25	9,714,426	14,564,343	24,278,769	2.53
White spruce, balsam, and larch .....	<i>Picea glauca</i> Voss. <i>Abies bal- samica</i> Miller., <i>Larix</i> spe- cies .....	4,738,000	1,250,000	5,988,000	3.50	83,484,855	1,955,295	85,440,150	8.92
Red gum .....	<i>Liquidambar styraciflua</i> L. ....		5,584,000	5,584,000	3.27	.....	872,880	872,880	.09
Hard maple .....	<i>Acer saccharum</i> Marsh. ....		3,769,000	3,769,000	2.23	1,078,000	6,336,287	7,414,287	.77
Redwood .....	<i>Sequoia sempervirens</i> L. ....		2,687,000	2,687,000	1.21	.....	135,595	135,595	.01
Hickory .....	<i>Carya</i> species .....		2,153,000	2,153,000	1.18	100	244,300	244,400	.03
Hemlock .....	<i>Tsuga</i> species .....		1,849,000	1,849,000	1.08	.....	10,876,768	10,876,768	1.13
Tupelo gum .....	<i>Nyssa</i> species .....		1,622,000	1,622,000	.95	.....	.....	.....	....
Engelmann spruce .....	<i>Picea engelmannii</i> Engelm. ....		1,500,000	1,500,000	.87	.....	.....	.....	....
Soft elm .....	<i>Ulmus americana</i> L. ....	32,000	1,300,000	1,332,000	.78	1,328,490	1,655,847	2,984,337	.31
Port Orford cedar .....	<i>Chamaecypris lawsoniana</i> Parl. ....		1,210,000	1,210,000	.71	.....	.....	.....	....
Soft maple .....	<i>Acer</i> species .....	226,000	958,000	1,184,000	.69	146,766	192,766	339,532	.04

Cottonwood .....	<i>Populus deltoides</i> Marsh...	228,000	814,000	1,042,000	.61	.....	1,594,519	1,594,519	.17
Black walnut .....	<i>Juglans nigra</i> L.....	3,000	876,000	879,000	.51	.....	176,639	176,639†	.02
Yellow poplar .....	<i>Liriodendron tulipifera</i> L.....	.....	830,000	830,000	.48	.....	821,187	821,187	.09
Rock elm .....	<i>Ulmus racemosa</i> Thomas.....	.....	798,000	798,000	.47	.....	564,664	564,664	.06
Cypress .....	<i>Taxodium distichum</i> Rich.....	.....	672,000	672,000	.39	.....	819,862	819,862	.09
White ash .....	<i>Fraxinus americana</i> L.....	.....	649,000	649,000	.38	1,140,557	4,201,632	5,342,189	.56
Southern yellow pine .....	<i>Pinus</i> species .....	.....	598,000	598,000	.35	.....	4,081,410	4,081,410	.42
Sycamore .....	<i>Platanus 'occidentalis</i> L.....	.....	410,000	410,000	.24	.....	.....	.....	.....
Western red cedar .....	<i>Thuja plicata</i> D. Don.....	.....	407,000	407,000	.24	.....	943,231	943,231	.10
Hackberry .....	<i>Celtis occidentalis</i> L.....	.....	300,000	300,000	.17	.....	.....	.....	.....
Mahogany .....	<i>Suietonia</i> species, etc.§.....	.....	258,000	258,000	.15	.....	481,405	481,405	.05
Magnolia .....	<i>Magnolia acuminata</i> L.....	.....	248,000	248,000	.14	.....	.....	.....	.....
Chestnut .....	<i>Castanea dentata</i> Borkh.....	.....	243,000	243,000	.13	.....	1,041,850	1,041,850	.11
Eastern red cedar .....	<i>Juniperous virginiana</i> L.....	.....	88,000	88,000	.05	.....	.....	.....	.....
Willow .....	<i>Salix</i> species .....	.....	78,000	78,000	.04	.....	.....	.....	.....
Butternut .....	<i>Juglans cinerea</i> L.....	.....	40,000	40,000	.02	25,000	95,000	120,000	.01
Balsa .....	<i>Ochroma</i> species .....	.....	15,000	15,000	.01	.....	.....	.....	.....
Black ash .....	<i>Fraxinus nigra</i> Marsh.....	.....	5,000	5,000	¶	582,000	356,403	938,403	.10
Spanish cedar .....	<i>Cedrela odorata</i> L.....	.....	5,000	5,000	¶	.....	50,000	50,000	.01
English oak .....	<i>Quercus robor</i> L.....	.....	5,000	5,000	¶	.....	.....	.....	.....
Beech .....	<i>Fagus grandifolia</i> Ehrh. ....	.....	3,000	3,000	¶	.....	20,000	20,000	¶
Teak .....	<i>Tectona grandis</i> L.....	.....	3,000	3,000	¶	.....	.....	.....	.....
Ebony.....	<i>Diospyros</i> species.....	.....	2,000	2,000	¶	.....	.....	.....	.....
Rosewood .....	<i>Dalbergia nigra</i> Fr. Allem.....	.....	1,000	1,000	¶	.....	.....	.....	.....
Black cherry .....	<i>Prunus serotina</i> Ehrh.....	.....	1,000	1,000	¶	.....	155,540	155,540	.02
Northern white cedar .....	<i>Thuja occidentalis</i> L.....	.....	.....	.....	...	346,000	4,000	350,000	.04
Total .....		32,770,000	138,120,000	170,890,000	100.00	824,737,196	133,288,202	958,025,398	100.00
Per cent total.....		18.5	81.50	100.00		86.00	14.00	100.00	

\* These figures are taken from "Wood Industries of Minnesota" by Maxwell, H., Harris, J. T., and Cox, W. T.

† Includes 13,118,000 board feet of balsam, poplar, *Populus balsamifera*.

‡ Includes 15,000 board feet of Circassian walnut, *Juglans regia*.

§ Includes several woods sold as mahogany.

¶ Less than 1/100 of 1 per cent.

TABLE III  
SASH, DOORS, AND GENERAL MILLWORK

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Sugar pine		19,775,000	19,775,000	31.00
Douglas fir		10,148,000	10,148,000	15.90
Western yellow pine		8,865,000	8,865,000	13.90
Western white pine		7,638,000	7,638,000	12.00
Oak	3,000	5,764,000	5,767,000	9.00
Birch		5,029,000	5,029,000	7.90
Northern white pine	2,333,000	35,000	2,368,000	3.70
Sitka spruce		1,086,000	1,086,000	1.70
Red gum		815,000	815,000	1.29
Black walnut	3,000	534,000	537,000	.80
Hard maple		381,000	381,000	.60
Southern yellow pine		380,000	380,000	.59
Basswood	21,000	253,000	274,000	.43
Yellow poplar		247,000	247,000	.39
Cypress		246,000	246,000	.38
Magnolia		141,000	141,000	.22
Eastern red cedar		38,000	38,000	.06
Mahogany		35,000	35,000	.05
Norway pine		30,000	30,000	.05
White spruce		18,000	18,000	.02
Chestnut		10,000	10,000	.02
Black ash		5,000	5,000	*
English oak		5,000	5,000	*
Teak		3,000	3,000	*
Red elm		2,000	2,000	*
Cottonwood	2,000		2,000	*
White ash		1,000	1,000	*
Total	2,380,000	61,466,000	63,846,000	100.00
Per cent	3.7	96.3	100.00	

\* Less than 1/100 of 1 per cent.

**Boxes, crates, baskets, and cigar boxes.**—About twenty woods are listed as being used in the manufacture of boxes and crates of various kinds. Inasmuch as northern white pine, Norway pine, and jack pine are often sold together for this purpose, they have been listed together. Most of the lumber used is of the lower grades. The usual grades are No. 3 to No. 5 Common. Spanish cedar, tupelo gum, and some yellow poplar and basswood are used in the manufacture of cigar boxes. Some  $\frac{3}{8}$  inch basswood, which is used for cigar-makers' accessories, such as rolling boards, packing cases, is included. For the manufacture of baskets, birch, basswood, elm, and hard maple are bought in log form and cut into veneers by the rotary process. About 600,000 board feet of material, log scale, are used for this purpose. The lumber is employed in the manufacture of boxes and crates. These consume the greater part of the total amount. Obviously it would be almost impossible to canvass all concerns using crating, but where such was reported it has been included and this constitutes approximately 12.5 per cent of the total. The usual required thicknesses are  $3/8''$ ,  $2/4''$ ,  $3/4''$ ,  $4/4''$ ,

6/4", and 8/4". Most of the material is received in the rough, altho the thinner materials often come in the form of box shooks ready to be assembled. The thicker materials are resawed, if necessary, and surfaced at the box factory. All lengths and widths are included in the rough lumber.

As indicated in Table IV, jack, Norway, and white pines supply most of the material, followed by aspen. These produce about 50 per cent of the material and are secured almost entirely within the state. Of the total amount used for boxes, crates, etc., about 67 per cent is produced within Minnesota, and 33 per cent comes from outside the state.

TABLE IV  
BOXES, CRATES, BASKETS, AND CIGAR BOXES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Jack pine, Norway pine, Northern white pine	10,829,000	750,000	11,579,000	31.42
Aspen	8,950,000	750,000	9,700,000	26.20
Balsam, Spruce, and Larch	3,220,000	500,000	3,720,000	10.10
Basswood	1,975,000	1,503,000	3,478,000	9.41
Western white pine		3,300,000	3,300,000	8.91
Hemlock		1,849,000	1,849,000	5.00
Birch	115,000	1,405,000	1,520,000	4.10
Western yellow pine		1,050,000	1,050,000	2.85
Douglas fir		203,000	203,000	.56
Yellow poplar		201,000	201,000	.55
Soft elm	30,000	117,000	147,000	.42
Tupelo gum		72,000	72,000	.20
Hard maple		60,000	60,000	.16
White ash		25,000	25,000	.07
Oak		10,000	10,000	.03
Spanish cedar		5,000	5,000	.02
Total	25,119,000	11,800,000	36,919,000	100.00
Per cent	67.00	33.00	100.00	

**Cooperage.**—Under "cooperage," are included all containers that are made with staves and bound together with hoops. This includes both slack and tight barrels, pails, and tubs. The various woods employed for this purpose are listed in Table V. Only 10.6 per cent of the material is produced within the state and this is bought in log form. The local grown basswood is used for tubs and pails; soft maple (silver maple) and cottonwood are used for heading. The other material is received in the finished form (staves and heading), and reaches the Minnesota market ready to assemble. Sitka spruce is manufactured into butter tubs and the others woods are employed in the manufacture of other forms of cooperage. The thickness of the staves and heading depend upon the type of container to be manufactured.

**Ladders, woodenware, and novelties.**—The various woods used in the manufacture of these articles are shown in Table VI. Wooden-

TABLE V  
COOPERAGE

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Sitka spruce .....		10,400,000	10,400,000	56.50
Red gum .....		3,000,000	3,000,000	16.35
Basswood .....	1,500,000	150,000	1,650,000	9.00
Douglas fir .....		1,000,000	1,000,000	5.40
Soft elm .....		900,000	900,000	4.90
Red oak .....		480,000	480,000	2.60
White ash .....		300,000	300,000	1.63
Soft maple .....	225,000		225,000	1.21
Cottonwood .....	225,000		225,000	1.21
White oak .....		120,000	120,000	.65
Hard maple .....		100,000	100,000	.55
Total .....	1,950,000	16,450,000	18,400,000	100.00
Per cent .....	10.6	89.4	100.00	

ware includes clothes racks, ironing boards, bread boards, and pastry boards. None of the material used in this industry is reported as having been produced within Minnesota. Douglas fir is used in the manufacture of step and extension ladders and hickory is used for ladder rungs. The hickory is received in round form,  $1\frac{1}{8}$  inches in diameter, and is ready for use. The other woods are used in the manufacture of woodenware and novelties. All of the hardwoods are bought in the form of rough lumber, whereas the softwoods are surfaced before shipping. Douglas fir is used in thicknesses of  $4\frac{1}{4}$ " and  $6\frac{1}{4}$ ". The other woods are all  $4\frac{1}{4}$ " stock.

TABLE VI  
LADDERS, WOODENWARE, AND NOVELTIES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Douglas fir .....		8,040,000	8,040,000	64.90
Yellow birch .....		1,610,000	1,610,000	12.80
Sugar pine .....		1,015,000	1,015,000	8.10
Western yellow pine .....		1,000,000	1,000,000	8.00
Cottonwood .....		500,000	500,000	4.00
Sitka spruce .....		150,000	150,000	1.18
Oak .....		10,000	10,000	.80
Yellow poplar .....		2,000	2,000	.15
Hickory .....		1,000	1,000	.07
Total .....		12,328,000	12,328,000	100.00
Per cent .....		100.00	100.00	

**Furniture.**—The furniture industry in southeastern Minnesota, altho represented by about 21 different factories, does not use a large amount of lumber. This is probably because a large amount of veneers and panel stock (plywood) are used that was not estimated on a board-foot basis, and often no estimate of the total number of square feet



could be obtained. However, somewhat more than 12,000,000 square feet of this material is employed in the manufacture of furniture. The more expensive woods, including black walnut and mahogany, are commonly used in the form of veneer  $\frac{1}{8}$  inch in thickness. Other woods often used in the form of veneer are oak, birch, and red gum. Yellow poplar and birch are often received in the form of plywoods and are employed as mirror backing, drawer bottoms, and as backs and ends in dressers and buffets. The lumber is used for furniture, parlor frames, box mattresses, cabinet work, and chests. Rock elm is received in the form of "dowels" and is used for frames in wicker furniture. Most of the lumber is  $\frac{4}{4}$ " material, altho other thicknesses such as  $\frac{3}{4}$ ",  $\frac{5}{4}$ ",  $\frac{6}{4}$ ", and  $\frac{8}{4}$ " are also used. Clear material is necessary in the manufacture of furniture, but as a large amount of small pieces or "dimension stock" is utilized, the lower grades often serve the purpose. This would seem to result in considerable waste, but this is not so great when it is realized that only knots and otherwise defective material are discarded. The various woods used are listed in Table VII. A study of this table will reveal the fact that the so-called "hardwoods" supply most of the material, as only 150,000 board feet of "softwoods" are included.

TABLE VII  
FURNITURE

Species	Amount, board feet			
	Grown in Minnesota	Grown outside of Minnesota	Total	Per cent of total
Black gum .....		1,550,000	1,550,000	19.90
Red gum .....		1,117,000	1,117,000	14.32
Soft maple .....		880,000	880,000	11.30
Yellow birch .....		829,000	829,000	10.65
Rock elm .....		625,000	625,000	8.00
Sycamore .....		410,000	410,000	5.25
Basswood .....		378,000	378,000	4.86
Hackberry .....		300,000	300,000	3.85
Black walnut .....		296,000	296,000	3.80
Chestnut .....		228,000	228,000	2.83
Soft elm .....		210,000	210,000	2.70
Hard maple .....		207,000	207,000	2.65
Mahogany .....		197,000	197,000	2.54
Oak .....		190,000	190,000	2.45
White ash .....		92,000	92,000	1.19
Magnolia .....		81,000	81,000	1.03
Sitka spruce .....		75,000	75,000	.96
Willow .....		51,000	51,000	.65
Eastern red cedar .....		50,000	50,000	.65
Western white pine .....		12,000	12,000	1.55
Cypress .....		10,000	10,000	.13
Yellow poplar .....		9,000	9,000	.11
Douglas fir .....		3,000	3,000	.03
Total .....		7,800,000	7,800,000	100.00
Per cent .....		100.00	100.00	

**Refrigerators.**—Only three concerns reported the manufacture of refrigerators, two of which made refrigerators exclusively. Most refrigerators are made with wooden frames and are finished with porcelain. All the woods reported, except oak and balsa, are used for the frames. Oak is employed for the exterior finish of those finished in wood; balsa is used for buffers in shipping. Insulating material is supplied by compressed cork. Only one wood, northern white spruce, is produced within the state. This constitutes about 20.3 per cent of the total amount. All of the material, except some of the western woods, are bought in the rough and range from 4/4" to 12/4" in thickness. The various woods employed are listed in Table VIII.

TABLE VIII  
REFRIGERATORS

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Sitka spruce .....		2,450,000	2,450,000	32.00
White spruce .....	1,500,000	250,000	1,750,000	23.50
Engelmann spruce .....		1,500,000	1,500,000	20.10
Douglas fir .....		900,000	900,000	13.00
Western white pine .....		475,000	475,000	6.90
Yellow poplar .....		200,000	200,000	2.90
Oak .....		50,000	50,000	.71
Magnolia .....		25,000	25,000	.34
White ash .....		25,000	25,000	.34
Balsa .....		15,000	15,000	.21
Total .....	1,500,000	5,890,000	7,390,000	100.00
Per cent .....	20.3	79.7	100.00	

**Road graders and farm machinery.**—Altho 18 concerns are included, the amount of lumber consumed is not very large. This is owing to the fact that metal is being used more and more in the manufacture of machinery of all types. Only a comparatively short time ago, threshing machine separators were made almost entirely of wood. Wood is now employed for pitman rods, straw racks, and screen frames. Wood, however, is still used to a considerable extent in the manufacture of wagons, grain separators, and some other types of farm vehicles and machinery. Only 4.4 per cent of the material is secured within the state. The hardwoods (Table IX) predominate. Hickory heads the list and includes 29 per cent of the total amount. The lumber is bought in the rough and comes in thicknesses 4/4", 5/4", 8/4", 10/4", 12/4", and 16/4". Some dimension stock is also included, from which sleigh beams, wagon and sleigh bolsters are made.

**Tanks and silos.**—Only three woods are reported in the manufacture of tanks and silos and all are imported from the west or south. These woods are listed in Table X. Redwood and cypress are among

our most durable woods and are largely employed in building tanks, altho some of the redwood is used in the manufacture of silos. At the present time, many silos are made of cement blocks, but according to some dealers, the acid from the silage deteriorates cement quicker than it does wood, therefore the wooden silo may be more economical. The material is received in the finished form and Douglas fir and redwood silo staves are grooved ready to assemble. One-half inch clear redwood siding is also used. Silo staves are uniform in length and width and are 8/4" thick. The tank stock is ordinarily 6/4" material.

TABLE IX  
ROAD GRADERS AND FARM MACHINERY

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Hickory .....		2,089,000	2,089,000	29.00
Oak .....	8,000	1,065,000	1,073,000	14.91
Douglas fir .....		887,000	887,000	12.30
Red gum .....		652,000	652,000	9.00
Basswood .....		565,000	565,000	7.81
Hard maple .....		542,000	542,000	7.50
Cottonwood .....		314,000	314,000	4.35
Birch .....		302,000	302,000	4.18
Norway pine .....	255,000		255,000	3.54
Rock elm .....		170,000	170,000	2.35
Southern yellow pine .....		67,000	67,000	.93
White ash .....		65,000	65,000	.90
Sitka spruce .....		65,000	65,000	.90
Northern white pine .....	52,000		52,000	.72
Soft maple .....		51,000	51,000	.71
Western white pine .....		50,000	50,000	.69
Yellow poplar .....		15,000	15,000	.21
Total .....	315,000	6,899,000	7,214,000	100.00
Per cent .....	4.4	95.6	100.00	

TABLE X  
TANKS AND SILOS

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Redwood .....		1,735,000	1,735,000	49.90
Douglas fir .....		1,690,000	1,690,000	48.60
Cypress .....		51,000	51,000	1.50
Total .....		3,476,000	3,476,000	100.00
Per cent .....		100.00	100.00	

**Car construction.**—Under car construction are included data from only one concern manufacturing freight cars, and from one repair shop. Douglas fir is the only wood reported as being manufactured into freight cars. This is employed as flat- and box-car decking and for siding on single-sheath box cars. All the other woods and part of the

Douglas fir are used for repairs on passenger cars and engine cabs. The material is bought in the rough. The oak and Douglas fir are bought in the form of 4/4" material or dimension stock up to 12" x 14". The latter usually serve as passenger car sills. All other materials are used in varying thicknesses of 4/4", 5/4", 6/4", 8/4", 10/4", 12/4", 16/4", and 20/4". Basswood is received only as 4/4" stock, whereas red elm, hickory, and maple are 8/4" stock. Mahogany and walnut are largely used in the form of veneer. Only 20,000 board feet of basswood, or 0.70 per cent of the total amount, is produced within the state of Minnesota. The various woods employed for car construction are listed in Table XI.

TABLE XI  
CAR CONSTRUCTION

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Douglas fir .....		1,750,000	1,750,000	61.50
Oak .....		500,000	500,000	17.60
Tamarack .....		500,000	500,000	17.60
Yellow poplar .....		40,000	40,000	1.40
Basswood .....	20,000		20,000	.70
White ash .....		20,000	20,000	.70
Hard maple .....		5,000	5,000	.17
Sugar pine .....		3,000	3,000	.11
Yellow birch .....		2,000	2,000	.07
Hickory .....		1,000	1,000	.03
Rock elm .....		1,000	1,000	.03
Southern yellow pine .....		1,000	1,000	.03
Black walnut .....		1,000	1,000	.03
Black cherry .....		1,000	1,000	.03
Total .....	20,000	2,825,000	2,845,000	100.00
Per cent .....	0.70	99.30	100.00	

**Poulterers', dairymen's, and beekeepers' supplies.**—These three industries are included together merely because it is a convenient form of grouping and the precedent has already been established. The various woods employed are listed in Table XII. The main articles produced are incubators, beehives, and milk delivery crates. The basswood is manufactured almost entirely into honey sections. The material, except the western woods, is bought in the form of rough lumber. The thickness includes 2/4", 4/4", 6/4", and 8/4" material. White birch is the only species reported as being produced within the state and constitutes only 10.7 per cent of the total.

**Caskets.**—In general, only the more durable woods are used in the manufacture of caskets and rough boxes. The northern and western white pines listed in Table XII are employed mostly for shipping boxes, but these often serve as the rough box in burial. Butternut is manufactured only into caskets; the other woods are made into caskets

and rough boxes. About one fourth of the material is produced within the state. The lumber is received in either rough or finished form. The finished lumber usually comes ready to assemble. The thickness of the material is either 4/4", 6/4", or 8/4" and generally in specified widths.

TABLE XII  
POULTERERS', DAIRYMEN'S, AND BEEKEEPERS' SUPPLIES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Hard maple .....		1,965,000	1,965,000	70.80
Birch .....	300,000	100,000	400,000	13.90
Western yellow pine .....		233,000	233,000	8.34
Basswood .....		160,000	160,000	5.75
Redwood .....		21,000	21,000	.75
Douglas fir .....		13,000	13,000	.46
Total .....	300,000	2,492,000	2,792,000	100.00
Per cent .....	10.7	89.3	100.00	

**Fixtures.**—Fixtures occupy a position between general millwork on the one hand and furniture on the other, and include bank, store, and office equipment. The better class of cabinet woods, as well as many other species, are used for this purpose. A reference to Table XIV will show that none of the material is reported as having been grown within Minnesota. The lumber is received in the rough except the western woods, which usually come surfaced. A number of woods are also used in the form of veneers. Among these are zebra wood, satinwood, English hawthorn and Carpathian elm. Probably 90 per cent of the lumber is one-inch stock, but a small amount of 5/4" and 6/4" material is used. Basswood is the most important species and supplies more than one third of the total amount. This is used mostly for interior frames and shelving.

TABLE XIII  
CASKETS

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Redwood .....		923,000	923,000	36.00
Northern white pine .....	650,000		650,000	25.30
Western red cedar .....		400,000	400,000	15.60
Cypress .....		350,000	350,000	13.70
Western white pine .....		200,000	200,000	7.80
Butternut .....		40,000	40,000	1.60
Total .....	650,000	1,913,000	2,563,000	100.00
Per cent .....	25.3	74.7	100.00	

TABLE XIV  
FIXTURES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Basswood .....		300,000	300,000	36.50
Birch .....		116,000	116,000	14.05
Oak .....		116,000	116,000	14.05
Sitka spruce .....		93,000	93,000	11.30
Douglas fir .....		49,000	49,000	5.95
Black walnut .....		45,000	45,000	5.47
Mahogany .....		26,000	26,000	3.16
Western white pine .....		18,000	18,000	2.19
White ash .....		13,000	13,000	1.57
Northern white pine .....		10,000	10,000	1.21
Soft maple .....		10,000	10,000	1.21
Chestnut .....		5,000	5,000	.61
Cypress .....		5,000	5,000	.61
Yellow poplar .....		5,000	5,000	.61
Willow .....		5,000	5,000	.61
Western yellow pine .....		3,000	3,000	.36
Ebony .....		2,000	2,000	.24
Rosewood .....		1,000	1,000	.15
Redwood .....		1,000	1,000	.15
Total .....		823,000	823,000	100.00
Per cent .....		100.00	100.00	

Skiis and tobaggans; playground, water, and gymnasium equipment.—The woods used in the manufacture of these articles are presented in Table XV. Northern white pine is secured wholly within the state, and two other woods, oak and basswood, supply small local amounts. About one fourth of the material is secured from within the state. Skiis are made from southern yellow pine, hard maple, white ash, hickory, and birch; hard maple is the principal wood used for tobaggans with cross pieces of magnolia, ash, or hickory. The

TABLE XV  
SKIIS AND TOBOGGANS; PLAYGROUND, WATER, AND GYMNASIUM EQUIPMENT

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Northern white pine .....	190,000		190,000	26.25
Southern yellow pine .....		150,000	150,000	20.45
Hard maple .....		100,000	100,000	13.60
Birch .....		75,000	75,000	10.23
Douglas fir .....		60,000	60,000	8.10
White ash .....		51,000	51,000	6.90
Western yellow pine .....		50,000	50,000	6.83
Hickory .....		36,000	36,000	4.92
Basswood .....	5,000		5,000	.68
Oak .....	5,000		5,000	.68
Redwood .....		5,000	5,000	.68
Soft maple .....		4,000	4,000	.55
Magnolia .....		1,000	1,000	.13
Total .....	200,000	532,000	732,000	100.00
Per cent .....	27.30	72.70	100.00	

other woods are variously employed for water wheels, water toboggans, slides, kiddie gymns, and some toys. The lumber is generally received in the rough and comes in thicknesses of 2/4", 4/4", 5/4", 6/4", and 8/4".

**Truck and bus bodies.**—The manufacture of truck and bus bodies is comparatively new in Minnesota as this industry was not reported in 1911. Only a small amount of material, i.e., 513,000 board feet, was used in 1927 and some of this went for repairs. Only about 10 per cent of the lumber is produced within the state and, except the northern white pine, is used locally. The various woods employed are listed in Table XVI. Oak heads the list and is used mostly for frame work and flooring. Ash, hickory, maple, elm, and birch are manufactured into frames. The lumber is received in the rough except the western woods, which usually come surfaced. Thicknesses from 4/4" to 12/4" are generally required.

TABLE XVI  
TRUCK AND BUS BODIES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Oak	20,000	225,000	245,000	47.80
Yellow poplar		76,000	76,000	14.80
White ash		57,000	57,000	11.11
Basswood	11,000	22,000	33,000	6.44
Hickory		26,000	26,000	5.07
Sitka spruce		25,000	25,000	4.87
Douglas fir		24,000	24,000	4.68
Northern white pine	14,000		14,000	2.73
Soft elm	2,000	5,000	7,000	1.36
Hard maple		2,000	2,000	.39
Birch	2,000		2,000	.39
Cottonwood	1,000		1,000	.18
Soft maple	1,000		1,000	.18
Total	51,000	462,000	513,000	100.00
Per cent	9.92	92.08	100.00	

TABLE XVII  
BOATS

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Douglas fir		175,000	175,000	70.30
White oak		51,000	51,000	20.50
Western white pine		11,000	11,000	4.40
Western red cedar		7,000	7,000	2.80
Soft elm		3,000	3,000	1.20
Redwood		2,000	2,000	.80
Total		249,000	249,000	100.00
Per cent		100.00	100.00	

**Boats.**—The manufacture of boats in southeastern Minnesota is not a large industry; only 249,000 board feet of lumber was reported as having been used for this purpose in 1927. The various woods used are presented in Table XVII. Douglas fir supplies over 70 per cent of the total amount and this, along with the white oak, is employed entirely in the manufacture of river boats, row boats, and outboard motor boats. None of the lumber is produced in Minnesota. Rough lumber, varying in thickness from 4/4" to 8/4", supplies most of the total amount. Some Douglas fir dimension stock, up to 12" x 12" and 40 feet long, is required.

**Miscellaneous.**—Under miscellaneous are included a number of industries of which there are only a few representative firms, or the woods used are not sufficiently varied to warrant separate divisions. Under this heading are included manufacturers of trunks and suitcases, brooms, artificial limbs, storage batteries, and a number of concerns of which there is only one representative company. The amount used, 3,000,000 board feet, represents about 1.7 per cent of the total for southeastern Minnesota, and of this only a small amount is grown within the state. The Port Orford cedar listed is used entirely for battery separators. The basswood is variously employed, but the greater amount is manufactured into trunks and suitcases. Douglas fir panel stock, 3 ply, is also used in the manufacture of trunks and suitcases. The Douglas fir panel stock is not included in Table XVII. Only one concern reported the manufacture of broom handles and these are made of maple. The other broom manufacturers buy the handles made from Douglas fir in finished form. The willow is used in the manufacture of artificial limbs. The other woods listed in Table XVIII are manufactured into various other articles.

TABLE XVIII  
MISCELLANEOUS

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Port Orford cedar		1,210,000	1,210,000	40.30
Basswood		411,000	411,000	13.70
Hard maple		407,000	407,000	13.60
Northern white pine	285,000		285,000	9.50
Birch		279,000	279,000	9.30
Douglas fir		160,000	160,000	5.40
Soft elm		65,000	65,000	2.18
Oak		50,000	50,000	1.65
Western yellow pine		50,000	50,000	1.65
Yellow poplar		35,000	35,000	1.15
Willow		22,000	22,000	.73
Soft maple		13,000	13,000	.42
Cypress		10,000	10,000	.32
Beech		3,000	3,000	.10
Total	285,000	2,715,000	3,000,000	100.00
Per cent	9.50	90.50	100.00	



### Summary of Woods Used by Industries

The various amounts of woods used by industries is summarized in Table XIX. A total of 170,890,000 board feet was reported. Of this amount the industry represented by the manufacture of sash, doors, and general millwork requires the larger amount, or 37.40 per cent of the total; the manufacture of boats requires the smallest amount and represents only 0.15 per cent. Only 18.5 per cent of the lumber is produced within the state, 81.5 per cent being imported.

The reasons given by several manufacturers for not using more home-grown materials are: (1) The supply is not adequate to meet the demands. (2) The hardwood lumber is not graded and the buyer can not depend upon receiving the type of material that is required. (3) The hardwood lumber is not properly sawed. The boards are not uniform in thickness or the log is not properly sawed to produce the best material. These are all serious objections and until they are remedied the producer can not expect to find a ready market or receive the best possible price for his material.

TABLE XIX  
SUMMARY OF WOODS USED BY INDUSTRIES

Species	Amount, board feet			Per cent of total
	Grown in Minnesota	Grown outside of Minnesota	Total	
Sash, doors, and general millwork . . . .	2,380,000	61,466,000	63,846,000	37.40
Boxes, crates, baskets, and cigar boxes . .	25,119,000	11,800,000	36,919,000	21.60
Cooperage . . . . .	1,950,000	16,450,000	18,400,000	10.70
Ladders, woodenware, and novelties . . . . .		12,328,000	12,328,000	7.25
Furniture . . . . .		7,800,000	7,800,000	4.56
Refrigerators . . . . .	1,500,000	5,890,000	7,390,000	4.32
Road graders and farm machinery . . . . .	315,000	6,899,000	7,214,000	4.22
Tanks and silos . . . . .		3,476,000	3,476,000	2.03
Car construction . . . . .	20,000	2,825,000	2,845,000	1.67
Poulterers', dairymen's and beekeepers' supplies . . . . .	300,000	2,492,000	2,792,000	1.64
Caskets . . . . .	650,000	1,913,000	2,563,000	1.51
Fixtures . . . . .		823,000	823,000	.47
Skis and toboggans, playground, water, and gymnasium equipment . . . . .	200,000	532,000	732,000	.43
Truck and bus bodies . . . . .	51,000	462,000	513,000	.30
Boats . . . . .		249,000	249,000	.14
Miscellaneous . . . . .	285,000	2,715,000	3,000,000	1.76
Total . . . . .	32,770,000	138,120,000	170,890,000	100.00
Per cent . . . . .	18.5	81.5	100.00	

### RECOMMENDATIONS FOR MARKETING WOODLOT PRODUCTS

Probably the most difficult problem which the average woodlot owner has to solve is that of finding the best market through which he can quickly and easily dispose of his product. He is often inclined to accept the first offer which appears reasonable and is usually dissatis-

fied when the transaction is completed. This feeling is probably greatly augmented by the fact that the average woodlot owner is unfamiliar with lumber and with the general market, and is therefore unable to judge the extent of his resources and to dispose of his product to the best advantage.

Several methods of selling timber usually present themselves and a hasty decision should not be made, but all should be studied to determine which method is the most advantageous.

### Usual Selling Methods

The most common selling method is for some sawmill owner or contractor to buy the standing timber either for a lump sum or by mill run, the price depending on the grade and the type of material obtained. When the lumber is sold on the stump, the woodlot owner knows in advance exactly how much he is to receive. If the owner is able to wait for his money, probably the mill-run method is the most satisfactory. In either case, the farmer does not need to worry about logging, sawmilling, and the ultimate disposition of the product. The woodlot, however, is generally left in a very poor condition and this often causes the owner much dissatisfaction. Other disagreements are most likely to occur during the sawing operations.

Another method often practiced is that the farmer do his own logging and sell his own product, either by selling the logs directly to a manufacturer or by hiring a portable sawmill to do the sawing at a specified rate. In this case the farmer is in charge of the logging operations and is in a position to remove only those trees that are mature or defective. He gains by using his teams and men during the winter when they would otherwise be idle, and retains the profit of the middle man. The chief disadvantages are that he is usually not in touch with the best markets and is unfamiliar with lumber grades.

Still another method, generally advocated, is that of co-operative marketing. Under the conditions that exist in southeastern Minnesota, it would probably be more advisable to inaugurate a system of "collective selling" which is co-operative marketing on a small scale. It is probably generally recognized, but is given no serious consideration, that marketing in large quantities is more advantageous than marketing in small quantities. This is an important factor for the inauguration of such a plan, especially if several small owners are planning to sell. Their combined product would probably make an attractive proposition.

So that the system may be a success, it is necessary to organize informally and select a committee, this committee to make arrangements for delivery of the product by the individual producer. The owner receives his reimbursement upon acceptance by the buyer. This

puts the responsibility of harvesting and delivering the product upon the owner, the committee merely acting as a sales agency. The committee should inquire into various markets before a final decision is made, then a contract should be drawn up stating the terms of the transaction. After the marketing is complete, the organization is automatically dissolved. If the resources are sufficiently large, it may be desirable to form a permanent organization and market a part of the crop each year.

### Cross Ties

It is the opinion of the writer that much of the material found through the southern part of the state can be marketed most advantageously in the form of cross ties. This is especially true in regard to the heavier hardwoods. Two reasons for this conclusion are: (1) much of the existing material is too low grade for lumber; (2) the producer's responsibility ceases when the ties are delivered to the nearest point of shipment.

The specifications and contract prices for hardwood cross ties such as oak, maple, and birch, as obtained from one well known railroad company, are:

Grade 1—6"x6"—8' hewed and slabbed .....	\$0.67
Grade 2—6"x7"—8' hewed and slabbed .....	.78
Grade 3—6"x8"—8' hewed, slabbed and sawed .....	.87
Grade 4—7"x8"—8' hewed, slabbed and sawed .....	.96
Grade 5—7"x9"—8½' hewed, slabbed and sawed .....	1.00

Often not more than 15 per cent of grades 1 and 2, combined, are accepted. The prices are f.o.b. and are subject to change. All ties should be cut from live timber and must be free from bark. Variations in lengths, thicknesses, and widths will be allowed as follows. It is always well to cut a little oversize than undersize; this will allow for subsequent shrinkage.

Length—½" over and ½" under designated length

Thickness—½" over and ⅛" under designated thickness

Width—3" over and ⅛" under designated width.

The lumber produced as tie slabbings and that obtained from material too small to make a tie of good grade could be used on the farm or, if the quantity is sufficiently large, a market may be obtained elsewhere. Much of it could probably be sold locally.

### Lumber and Logs

The different kinds of lumber produced from the woodlots of southeastern Minnesota are used in large quantities by the various wood-using industries situated in and around the region. There is no reason why the lumber produced from woodlots can not be sold. If lumber

is sawed for the general market, it is well to ascertain that the sawyer is equipped to turn out lumber of uniform thickness and knows how to cut the log to secure the best grades.

It is often possible to sell the timber in the log. This is especially true if it is used for some forms of cooperage, for box shooks and crating, or if it is to be cut into veneers. Before selling, it is advisable to try to sell in the log form, as this eliminates the necessity and responsibility of sawing. Some timbers commonly bought in the log are: basswood, birch, maple, cottonwood, and aspen. The same plan is often possible in marketing material for cross ties. The farmer does the logging and delivers the logs to the sawmill at a stipulated price and here his responsibility ceases. In this case the sawmill owner is responsible for the manufacture and the disposition of the product.

### Profitable Selling Pointers<sup>4</sup>

The following are some selling pointers offered by W. R. Mattoon, extension forester, the United States Forest Service.

Get a reliable estimate of the amount and value of the timber to be sold. If necessary, get experienced help. Know what you want to sell.

Get prices for various wood products from as many sawmills and other wood plants as possible.

Before selling, consult neighbors who have sold, and benefit from their experiences. Ask your county agricultural agent and your state forestry department for information.

Investigate local timber markets and prices. Your timber may be worth more locally because transportation is saved.

Advertise in papers and otherwise stimulate outside competition.

Secure bids for your timber on the stump by the "lump" or "boundary," and if practicable, for the timber cut and delivered at the mill or railroad.

Be sure you are selling to responsible purchasers.

Remember that standing timber can wait over a period of low prices without rapid deterioration. Take advantage of this by selling when prices are favorable.

Use a written agreement in selling timber, especially if cutting is done by the purchaser.

Cut or "harvest" your own timber crop. Thus, along with your timber you will sell your labor and that of your teams or trucks, just as you do in selling your wheat, cotton or corn. Selling cut timber products in the log, pole, tie, or cord means increased money income and woodlands left in better condition for growing another crop of timber.

Grow your own timber products. Keep the cash at home. Use the lower grades of timber for farm purposes, when satisfactory, and sell the choicer grades. It means larger farm income.

\* \* \* Keep out of the sawmill business. The average farmer should be a producer and not, as a rule, a manufacturer of timber products.

<sup>4</sup> Mattoon, W. R. The Farm Woods. U. S. Dept. of Agr. Forest Service Leaflet No. 20.