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✓ COMMODITY DRAIN FROM FORESTS
OF
THE LAKE STATES,
1948¹¹ X

ARTHUR G. HORN

DIVISION OF FOREST ECONOMICS

LAKE STATES FOREST EXPERIMENT STATION

U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
UNIVERSITY FARM, ST. PAUL I, MINN.

E. L. DEMMON, DIRECTOR

COMMODITY DRAIN FROM FORESTS OF THE LAKE STATES - 1948

By Arthur G. Horn, Forest Economist 2/

INTRODUCTION

Shortly after World War II, a field survey was initiated to determine more accurately the forest resource facts of the Lake States region. Collection and compilation of timber drain statistics was one of several important phases of this survey. As a means of determining the annual drain, the Station obtains annual or periodic reports for the principal forest industries, covering, in some cases, the year's production of finished products; in other cases, the receipts of sawlogs and bolts at the plants. From these the Station computes commodity drain, that is, the amount of live merchantable timber removed through cutting including logging waste during the year.

Frequent requests for production and drain data resulting from the survey are received. To more effectively meet these demands, we have prepared this publication giving Lake States production and drain figures for 1948. Similar reports for 1946 and 1947 are available on request. In using the data, it is important to keep in mind the standards and definitions used in compiling the information. (See definitions.)

Basis for Production Statistics

Since lumber production figures were not reported by the Bureau of the Census for 1948, the Station prepared an estimate based on comparison of 1946-1948 output of larger mills. To further strengthen this estimate, a spot-check of railroad carloadings for 1946, 1947, and 1948 was made at several of the general offices of railroad companies. This was supplemented by a canvass of mills adjacent to state boundaries to determine interstate movement of sawlogs.

For veneer, pulp distillation, excelsior, and cooperage industries, a complete canvass was made of all known plants early in 1949. The volume of logs and bolts received at these plants during the calendar year was used as a basis for production estimates.

1/ Maintained at University Farm, St. Paul, Minnesota, in cooperation with the University of Minnesota.

2/ The author gratefully acknowledges the assistance provided in some of the field work by J. R. Neetzol, H. L. Heinselman, H. H. Seeley, Z. A. Zasada, and W. M. Zillgitt, Foresters, Lake States Forest Experiment Station; and W. W. Barton, Forester, R-9 Regional Office. Acknowledgment is also due to the many owners and operators of wood-using mills and plants in the Lake States region who so kindly cooperated and furnished the basic information so necessary for this report.

Production statistics for such minor items as piling, poles, hewn ties and mine timbers, lagging, etc., were obtained by using results of 1947 survey of these items and comparing with reliable production indexes for 1947-48; i.e., annual underground ore production by states, pole and piling receipts of several large wholesalers and distributors who handle most of the regional output. Because financial limitations precluded making special surveys, estimates for fuelwood, posts, and miscellaneous items were based largely on surveys made during the latter stages of World War II. Some adjustments were made on the basis of more recent findings from wholesalers and distributors.

Conversion Factors

The Station, in conducting production surveys, has collected supplemental information on each product as to percent of wood volume obtained from live, dead, cull trees, and byproduct material; also proportion of volume cut from saw-timber and pole-timber trees. Gross volumes of individual products were determined by information furnished by industry. For example, stock records for posts, poles, and piling showed number of pieces by length, top, and butt diameters. Such information made possible calculations of gross volume for each product. By incorporating these findings with data collected during a previous field survey (1936-37), a set of conversion and waste factors have been made which are closely in line with present utilization standards of wood-using industries.

General Limitations of Data

The forest survey accuracy goal for drain data is ± 5 percent per billion cubic feet, which would permit a standard error of slightly more than 6 percent on the 1948 estimate for the Lake States. Because of absence of an accurate census of lumber and fuelwood for that year, the estimates presented here may not be within that limit. We feel, however, that the estimates are the best obtainable at this time and will serve a very useful purpose. Figures for most products are within the proposed limits. Some adjustments may be made later if better figures for lumber and fuelwood become available.

Survey Definitions

Commodity Production

The gross volume of a forest product produced from any class of material from commercial or noncommercial forest lands. Production has been expressed in the following standard survey units: Board-feet log scale International 1/4-inch rule, feet board measure lumber tally; cord (4x4x8 feet), rough wood basis; number of pieces; and number of cubic feet (inside bark).

Commodity Drain

The net volume of timber removed from growing stock on commercial forest lands through cutting and logging waste during the year, expressed in board feet, International 1/4-inch rule and cubic feet (i.b.).

Drain from Saw-Timber Trees

The net volume (board feet, International 1/4-inch) of the log portion in softwood trees 9 inches and larger and hardwood trees 11 inches and larger, d.b.h., removed or wasted during logging operations. The cubic-foot volume shown includes both the saw-timber equivalent plus the volume in the tops of softwood trees to a 4-inch minimum.

Drain from Pole-Timber Trees

The net volume in cubic feet (i.b.) of pole timber removed through cutting and logging waste during the year. Included in this class are softwood trees from 5.0- to 8.9-inch and hardwood trees from 5.0- to 10.9-inch d.b.h. It includes cubic foot volume found in the tree stems to a minimum top diameter of 4 inches (i.b.).

 

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HIGHLIGHTS OF THE COMMODITY DRAIN SURVEY

1948

PRODUCTION OF MAJOR PRODUCTS

Lumber Production

Nearly 1 billion 3 hundred million board feet of lumber was produced in 1948 by 4,000 or more sawmills in the Lake States. This was the largest annual cut since 1930. Michigan accounted for nearly one-half of the total output. Wisconsin was second and Minnesota third with about 34 percent and 18 percent respectively.

M bd.ft.

Lumber tally

Minnesota	240,000
Wisconsin	440,000
Michigan	615,000
Total	<u>1,295,000</u>

Pulpwood Production

Pulpwood production in 1948 amounted to approximately 2,184,000 standard cords (rough wood basis). This was approximately 8 percent above that of 1947, but was 3 percent less than that of the peak production year 1946.

Wisconsin mills received 1,248,000 cords, about 57 percent of the total pulpwood produced. Minnesota mills took 28 percent and Michigan mills 13 percent. The remaining one or two percent represents pulpwood shipped to mills outside the region.

Canada shipped about 760,000 cords and Montana and Colorado combined sent slightly more than 35,000 cords to Lake States mills.

Total domestic and imported wood receipts for 1948 amounted to nearly 3 million cords.

Standard cords (Unpeeled)

Minnesota	987,000
Wisconsin	468,000
Michigan	729,000
Total	<u>2,184,000</u>

Veneer Log Production

Approximately 117 million board feet of veneer logs were cut from Lake States timber and shipped to some 100 or more veneer mills operating in the region. Nearly two-thirds of the logs were produced in Michigan.

Commercial veneer plants, which manufacture mostly high-grade veneers and panels, consumed about 75 percent of the veneer logs produced. The container veneer industry, manufacturing cheese boxes, berry boxes, picnic baskets, fruit and vegetable baskets, hampers, etc., used 25 percent of the logs plus 16,210 cords cut for heading stock.

11 bd.ft. (Int'l. $\frac{1}{4}$ -inch)

Minnesota	7,000
Wisconsin	32,000
Michigan	78,000
Total	<u>117,000</u>

Miscellaneous Products

Utility Poles

Based on industry reports it is estimated that about 216,000 utility poles were produced in 1948. Although cedar was the principal species cut for poles, considerable jack pine was cut, seasoned, and treated, and used in constructing and maintaining lines in Minnesota and neighboring states.

Number of Pieces

Minnesota	140,000
Wisconsin	16,000
Michigan	60,000
Total	<u>216,000</u>

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Piling

No. of Lineal Feet

Minnesota	100,000
Wisconsin	175,000
Michigan	-
Total	<u>275,000</u>

Minnesota produced most of the northern pine piling and Wisconsin practically all of the hardwood piling in the region. Lake States production was between 10,000 or 11,000 pieces, equivalent to 275,000 lineal feet, which was considerably less than either the 1946 or 1947 output.

Continued heavy mining of Lake States ore has brought about a steady demand for mine timbers, mine poles, lagging, and other timber items. Production of wood for the mines in 1948 amounted to nearly 8 million cubic feet in the region. Of this amount about $3\frac{1}{2}$ million cubic feet was mine timbers, $2\frac{1}{4}$ million lagging, and another $2\frac{1}{4}$ million miscellaneous mine products. Tamarack, cedar, and maple were the species most heavily cut for mine materials.

Production of relatively stable products such as fuelwood, fence posts, shingles, lath, and cabin logs, continued at about the same general level as maintained during the past four or five years. Chemical wood, excelsior bolts, and cooperage logs on the other hand dropped to lower levels. In the case of chemical wood the drop amounted to as much as 40 percent over a year or two ago.

Mining Products

No. of^m Cubic Feet

Minnesota	2,770
Wisconsin	390
Michigan	<u>4,460</u>
Total	<u>7,620</u>

Interstate Log Movement

Movement of logs between the three Lake States continued at a rather brisk rate, especially between Michigan and Wisconsin. Logs cut in Michigan and shipped or trucked to Wisconsin's larger sawmills and other primary wood-using plants amounted to nearly 60 million board feet (International 1/4-inch rule) in 1948. Minnesota shipments to Wisconsin, which consisted almost entirely of veneer logs, amounted to a little less than 5 million board feet. Wisconsin in turn, shipped approximately 9½ million feet to Michigan and about 1 million to Minnesota.

M bd.ft. (Int'l. ¼-inch)
Michigan to Wisconsin:
30 million sawlogs
27 million veneer logs
Minnesota to Wisconsin:
5 million veneer logs
Wisconsin to Michigan:
10 million sawlogs
Wisconsin to Minnesota:
1 million sawlogs

DRAIN

Timber Drain From Cutting

The total commodity drain on Lake States forests during 1948 amounted to approximately 675 million cubic feet. The timber harvest was the largest in years, surpassing 1946 by 6 percent, and 1947 by about 1 percent.

M Cubic feet

Minnesota	184,590
Wisconsin	207,165
Michigan	283,115
Total	<u>674,870</u>

Saw-timber Drain

The total sawlog drain in the Lake States amounted to 1,458 million board feet during the year. The sawlog drain was about 2 percent less than 1947 but 7 percent more than 1946.

The cut from saw-timber trees, including low-grade cord-wood material, amounted to 359 million cubic feet, about $4\frac{1}{2}$ million cords, or 53 percent of the total drain. With the passing of each decade it becomes more evident that a smaller proportion of the total cut in the Lake States comes from sawlog trees.

M bd.ft. Int'l. $\frac{3}{4}$ " Rule

Minnesota	261,115
Wisconsin	438,000
Michigan	759,100
Total	<u>1,458,215</u>

The cut from pole-sized trees amounted to 316 million cubic feet ($4\frac{1}{3}$ million cords), representing 47 percent of the total drain. This trend is most pronounced in Minnesota where it is estimated that about 60 percent of the total drain in 1948 was comprised of material cut from trees of pole-timber size. The proportion was less in Wisconsin and Michigan, amounting to about 45 percent and 35 percent respectively.

Pole-timber Drain

M Cubic feet

Minnesota	115,525
Wisconsin	98,120
Michigan	102,380
Total	<u>316,025</u>

Drain by Commodities

Saw Timber

Logs and bolts cut for lumber, boxboards, and railroad cross ties as a group ranked first as the largest single drain item. In 1948 these three closely related products made up 70 percent of the sawlog and 45 percent of the total cubic-foot drain. About 54 percent of the board-foot "lumber" drain was hardwoods, 36 percent softwoods, and 10 percent aspen.

Pulpwood was second, accounting for nearly 170 million cubic feet or 25 percent of the total cubic-foot drain. Approximately two-thirds of the pulpwood drain in 1948 was in softwoods, and one-third in hardwoods. Use of hardwoods, particularly aspen, is on the increase and will be of more importance in the future.

Fuelwood, although two-thirds of it was nonmerchantable material, still ranked as the third largest drain item in the region, making up 9 percent of the sawlog and 18 percent of the total cubic-foot drain. Of the 124 million cubic feet of fuelwood drain, the volume was about equally divided between saw-timber and pole-timber trees. Hardwoods comprised about 65 percent, aspen 25 percent, and softwoods 10 percent of the fuelwood drain.

Of the other commodities, veneer logs and fence posts made up most of the remaining drain followed by mine materials, excelsior, chemical wood, poles, cooperage, and several other products.

Drain by Commodities

Pole Timber

Lumber	
Fuelwood	
Pulpwood	
Veneer logs	
Other

Saw Timber

Aspen, which accounted for about 22 percent of the total cubic-foot drain, was cut more heavily than any other species in the region. Maple, oak, and hemlock were next in order with 13, 12, and 9 percent respectively. However, in the board-foot saw-timber drain maple ranked first with approximately 302 million board feet, or 21 percent of the board-foot volume. Hemlock was second, accounting for 16 percent, oak third with 11 percent, and aspen fourth with 9 percent. In the pole-timber class, aspen was far out in front with nearly 110 million cubic feet (1½ million cords) representing 35 percent of the cut from pole-timber trees. Jack pine was second, accounting for 13 percent, oak and spruce tied for third with 10 percent each.

Drain by Species Groups

Pole Timber

Softwoods

Hardwoods

Aspen

FOREST PRODUCTS HARVESTED IN THE LAKE STATES - 1948

Sawlogs, box bolts, and tie cuts

Logs and bolts for commercial veneer

Logs and bolts for container veneer

Pulpwood logs and bolts

Fuelwood

Chemical wood

Excelsior

Piling

Poles

Posts

Hewn ties

Mine timbers

Mine lagging

Other mine material

Cooorage

Miscellaneous

Table 1.- Sawlog and box-bolt production in the Lake States - 1948

Species and origin	Volume cut and destination				Species and origin	Volume cut and destination			
	Total	Minn.	Wis.	Mich.		Total	Minn.	Wis.	Mich.
	M bd.ft., Int'l. $\frac{3}{4}$ -inch					M bd.ft., Int'l. $\frac{3}{4}$ -inch			
White pine	72,355	15,215	33,890	23,250	Elm	72,615	15,090	25,640	31,885
Minn.	15,215	15,215	-	-	Minn.	15,090	15,090	-	-
Wis.	33,575	-	33,370	205	Wis.	24,795	-	24,715	80
Mich.	23,565	-	520	23,045	Mich.	32,730	-	925	31,805
Red pine	67,040	29,410	26,970	10,660	Beech	26,020	-	1,110	24,910
Minn.	29,410	29,410	-	-	Minn.	-	-	-	-
Wis.	26,875	-	26,835	40	Wis.	890	-	890	-
Mich.	10,755	-	135	10,620	Mich.	25,130	-	220	24,910
Jack pine	79,625	56,795	8,300	14,530	Oak	116,750	13,490	68,035	35,225
Minn.	56,795	56,795	-	-	Minn.	13,490	13,490	-	-
Wis.	8,075	-	8,075	-	Wis.	67,765	-	67,740	25
Mich.	14,755	-	225	14,530	Mich.	35,495	-	295	35,200
Spruce	15,320	6,055	1,630	7,635	Aspen	133,685	66,940	70,635	44,110
Minn.	6,055	6,055	-	-	Minn.	66,070	66,070	-	-
Wis.	1,690	-	1,530	160	Wis.	70,305	870	69,435	-
Mich.	7,575	-	100	7,475	Mich.	45,310	-	1,200	44,110
Balsam	8,560	4,620	1,000	2,940	Cottonwood	13,295	8,165	1,810	3,320
Minn.	4,620	4,620	-	-	Minn.	8,165	8,165	-	-
Wis.	985	-	975	10	Wis.	1,810	-	1,810	-
Mich.	2,955	-	25	2,930	Mich.	3,320	-	-	3,320
Panarack	4,460	2,685	1,355	420	Ash	21,670	4,190	9,195	8,285
Minn.	2,685	2,685	-	-	Minn.	4,190	4,190	-	-
Wis.	1,355	-	1,355	-	Wis.	9,055	-	8,905	150
Mich.	420	-	-	420	Mich.	8,425	-	290	8,135
cedar	11,240	1,220	2,345	7,675	Hickory	890	-	130	760
Minn.	1,220	1,220	-	-	Minn.	-	-	-	-
Wis.	2,280	-	2,275	5	Wis.	130	-	130	-
Mich.	7,740	-	70	7,670	Mich.	760	-	-	760
Hemlock	213,040	-	68,250	144,790	Cherry	1,145	20	75	1,050
Minn.	-	-	-	-	Minn.	20	20	-	-
Wis.	66,175	-	63,095	3,080	Wis.	75	-	75	-
Mich.	146,865	-	5,155	141,710	Mich.	1,050	-	-	1,050
Softwood					Walnut	340	25	40	275
total	471,640	116,000	143,740	211,900	Minn.	25	25	-	-
Minn.	116,000	116,000	-	-	Wis.	40	-	40	-
Wis.	141,010	-	137,510	3,500	Mich.	275	-	-	275
Mich.	214,630	-	6,230	208,400	Misc.	4,185	275	1,355	2,555
Maple	256,370	2,185	74,795	179,390	Minn.	275	275	-	-
Minn.	2,185	2,185	-	-	Wis.	1,355	-	1,355	-
Wis.	64,975	-	62,685	2,290	Mich.	2,555	-	-	2,555
Mich.	189,210	-	12,110	177,100	Hardwood				
Birch	78,995	3,100	23,560	52,335	total	825,615	124,350	298,320	402,945
Minn.	3,100	3,100	-	-	Minn.	123,480	123,480	-	-
Wis.	19,595	-	16,470	3,125	Wis.	282,130	870	275,460	5,850
Mich.	56,300	-	7,090	49,210	Mich.	419,955	-	22,860	397,095
Basswood	51,655	10,870	21,940	18,845	All				
Minn.	10,870	10,870	-	-	species	1,297,255	240,350	442,060	614,845
Wis.	21,390	-	21,210	180	Minn.	239,480	239,480	-	-
Mich.	19,395	-	730	18,665	Wis.	423,190	870	412,970	9,350
					Mich.	634,585	-	29,090	605,495

Table 2.- Production of Logs for Commercial Veneer Industry in the Lake States
1948

Species and origin	Volume cut and destination					Imports	
	Total	Minnesota	Wisconsin	Michigan	Other U.S.	Other U.S.	Foreign Canada
In board feet, International $\frac{3}{4}$ -inch rule							
White pine	240	-	240	-	-	10	10
Minnesota	-	-	-	-	-	-	-
Wisconsin	160	-	160	-	-	-	-
Michigan	80	-	80	-	-	10	10
Maple	34,000	-	18,130	15,720	150	130	550
Minnesota	660	-	660	-	-	-	-
Wisconsin	7,840	-	7,840	-	-	90	350
Michigan	25,500	-	9,630	15,720	150	40	200
Birch	21,980	260	15,950	5,770	-	-	9,270
Minnesota	230	230	-	-	-	-	-
Wisconsin	4,810	30	4,780	-	-	-	6,650
Michigan	16,940	-	11,170	5,770	-	-	2,620
Basswood	8,560	100	7,820	610	30	500	60
Minnesota	2,090	90	2,000	-	-	-	-
Wisconsin	3,470	10	3,460	-	-	360	50
Michigan	3,000	-	2,360	610	30	140	10
Elm	7,180	-	6,550	590	40	460	50
Minnesota	1,550	-	1,550	-	-	-	-
Wisconsin	3,200	-	3,200	-	-	350	50
Michigan	2,430	-	1,800	590	40	110	-
Beech	7,220	-	940	6,280	-	-	10
Minnesota	-	-	-	-	-	-	-
Wisconsin	70	-	70	-	-	-	10
Michigan	7,150	-	870	6,280	-	-	-
Oak	4,520	-	4,220	220	80	280	210
Minnesota	370	-	370	-	-	-	-
Wisconsin	3,420	-	3,350	70	-	90	120
Michigan	730	-	500	150	80	190	90
Aspen	170	50	80	40	-	-	-
Minnesota	-	-	-	-	-	-	-
Wisconsin	120	50	70	-	-	-	-
Michigan	50	-	10	40	-	-	-
Ash	1,340	-	1,260	80	-	10	10
Minnesota	80	-	80	-	-	-	-
Wisconsin	610	-	610	-	-	10	10
Michigan	650	-	570	80	-	-	-
Walnut	560	-	50	-	510	-	-
Minnesota	90	-	-	-	90	-	-
Wisconsin	310	-	50	-	260	-	-
Michigan	160	-	-	-	160	-	-
Other 1/	240	-	190	10	40	370	70
Minnesota	140	-	140	-	-	-	-
Wisconsin	40	-	40	-	-	160	70
Michigan	60	-	10	10	40	210	-
All species	86,010	410	55,430	29,320	850	1,760	10,240
Minnesota	5,210	320	4,800	-	90	-	-
Wisconsin	24,050	90	23,630	70	260	1,060	7,310
Michigan	56,750	-	27,000	29,250	500	700	2,930

1/ Cottonwood, hackberry, sycamore, cherry, and yellow-poplar.

Table 3.- Production of logs and bolts for container veneer industry, in the
Lake States - 1948

Species and origin	Volume cut logs and bolts		Imports	
	Veneer logs	Heading stock	Other U. S.	Canada and foreign
	M bd.ft., Int'l. $\frac{3}{4}$ -inch	Standard cords (rough)	M bd.ft. Int'l. $\frac{3}{4}$ -inch	
White pine	10	-	-	-
Minnesota	10	-	-	-
Wisconsin	-	-	-	-
Michigan	-	-	-	-
Softwood total	10	-	-	-
Minnesota	10	-	-	-
Wisconsin	-	-	-	-
Michigan	-	-	-	-
Maple	8,780	2,050	-	-
Minnesota	120	-	-	-
Wisconsin	790	1,850	-	-
Michigan	7,870	200	-	-
Birch	2,320	440	-	-
Minnesota	40	-	-	-
Wisconsin	10	320	-	-
Michigan	2,270	120	-	-
Basswood	3,360	4,250	-	-
Minnesota	1,090	160	-	-
Wisconsin	1,230	4,030	-	-
Michigan	1,040	60	-	-
Elm	10,270	520	30	-
Minnesota	260	-	-	-
Wisconsin	4,870	330	-	-
Michigan	5,140	190	30	-
Beech	3,390	180	10	-
Minnesota	-	-	-	-
Wisconsin	-	-	-	-
Michigan	3,390	180	10	-
Oak	530	-	-	-
Minnesota	-	-	-	-
Wisconsin	260	-	-	-
Michigan	270	-	-	-
Aspen	860	8,120	-	-
Minnesota	250	100	-	-
Wisconsin	570	8,020	-	-
Michigan	40	-	-	-
Other 1/	1,320	650	10	-
Minnesota	130	30	-	-
Wisconsin	260	470	-	-
Michigan	930	150	10	-
Hardwood total	30,830	16,210	50	-
Minnesota	1,890	290	-	-
Wisconsin	7,990	15,020	-	-
Michigan	20,950	900	50	-
All species	30,840	16,210	50	-
Minnesota	1,900	290	-	-
Wisconsin	7,990	15,020	-	-
Michigan	20,950	900	50	-

1/ Cottonwood, ash, yellow poplar, sycamore.

Table 4.- Pulpwood production and imports in the Lake States - 1948

Species and origin	Volume cut and destination				Imports		
	Total	Minnesota	Wisconsin	Michigan	Other U. S.	Other U. S.	Canada and foreign
In standard cords - unpeeled							
Pine	493	143	263	87	-	29	104
Minnesota	287	143	122	22	-	-	44
Wisconsin	117	-	117	-	-	28	15
Michigan	89	-	24	65	-	1	45
Spruce	436	143	242	39	12	7	560
Minnesota	268	143	113	-	12	-	51
Wisconsin	34	-	34	-	-	7	415
Michigan	134	-	95	39	-	-	94
Balsam	400	76	269	54	1	-	32
Minnesota	150	76	73	-	1	-	1
Wisconsin	87	-	87	-	-	-	9
Michigan	163	-	109	54	-	-	22
Tamarack	9	3	5	1	-	-	-
Minnesota	4	3	1	-	-	-	-
Wisconsin	3	-	3	-	-	-	-
Michigan	2	-	1	1	-	-	-
Hemlock	183	-	137	46	-	-	-
Minnesota	-	-	-	-	-	-	-
Wisconsin	51	-	51	-	-	-	-
Michigan	132	-	86	46	-	-	-
Softwood total	1,521	365	916	227	13	36	696
Minnesota	709	365	309	22	13	-	96
Wisconsin	292	-	292	-	-	35	439
Michigan	520	-	315	205	-	1	161
Birch	17	-	17	-	-	-	-
Minnesota	2	-	2	-	-	-	-
Wisconsin	8	-	8	-	-	-	-
Michigan	7	-	7	-	-	-	-
Aspen	625	249	314	47	15	-	64
Minnesota	276	249	27	-	-	-	15
Wisconsin	167	-	167	-	-	-	18
Michigan	182	-	120	47	15	-	31
Misc. hdwds.	19	-	-	19	-	-	-
Minnesota	-	-	-	-	-	-	-
Wisconsin	-	-	-	-	-	-	-
Michigan	19	-	-	19	-	-	-
Hardwood total	661	249	331	66	15	-	64
Minnesota	278	249	29	-	-	-	15
Wisconsin	175	-	175	-	-	-	18
Michigan	208	-	127	66	15	-	31
Slabs, etc.	2	-	1	1	-	-	-
Minnesota	-	-	-	-	-	-	-
Wisconsin	1	-	1	-	-	-	-
Michigan	1	-	-	1	-	-	-
All species	2,184	614	1,248	294	28	36	760
Minnesota	987	614	338	22	13	-	111
Wisconsin	468	-	468	-	-	35	457
Michigan	729	-	442	272	15	1	192

Table 5.- Production of miscellaneous cordwood in the Lake States - 1948

Species and origin	Volume cut by states			Species and origin	Volume cut by states		
	Fuelwood	Chemical	Excelsior		Fuelwood	Chemical	Excelsior
	1/	wood			1/	wood	
	M standard cords				M standard cords		
White pine	170	-	-	Birch	330	19	-
Minnesota	20	-	-	Minnesota	90	-	-
Wisconsin	100	-	-	Wisconsin	130	-	-
Michigan	50	-	-	Michigan	110	19	-
Red pine	30	-	-	Basswood	160	-	1
Minnesota	10	-	-	Minnesota	80	-	-
Wisconsin	10	-	-	Wisconsin	40	-	1
Michigan	10	-	-	Michigan	40	-	-
Jack pine	155	-	-	Elm	440	1	-
Minnesota	70	-	-	Minnesota	140	-	-
Wisconsin	80	-	-	Wisconsin	100	-	-
Michigan	5	-	-	Michigan	200	1	-
Spruce	45	-	-	Beech	45	6	-
Minnesota	30	-	-	Minnesota	-	-	-
Wisconsin	5	-	-	Wisconsin	5	-	-
Michigan	10	-	-	Michigan	40	6	-
Balsam	50	-	-	Oak	1,190	1	-
Minnesota	40	-	-	Minnesota	240	-	-
Wisconsin	5	-	-	Wisconsin	590	-	-
Michigan	5	-	-	Michigan	360	1	-
Tamarack	290	-	-	Aspen	860	4	83
Minnesota	220	-	-	Minnesota	380	-	-
Wisconsin	60	-	-	Wisconsin	240	4	41
Michigan	10	-	-	Michigan	240	-	42
Cedar	60	-	-	Miscellaneous	295	1	-
Minnesota	10	-	-	Minnesota	150	-	-
Wisconsin	40	-	-	Wisconsin	75	-	-
Michigan	10	-	-	Michigan	70	1	-
Hemlock	300	-	-	Hardwood total	3,900	67	84
Minnesota	-	-	-	Minnesota	1,100	-	-
Wisconsin	200	-	-	Wisconsin	1,400	4	42
Michigan	100	-	-	Michigan	1,400	63	42
Softwood total	1,100	-	-	Slabs, etc.	670	22	-
Minnesota	400	-	-	Minnesota	120	-	-
Wisconsin	500	-	-	Wisconsin	250	3	-
Michigan	200	-	-	Michigan	300	19	-
Maple	580	35	-	All species	5,670	89	84
Minnesota	20	-	-	Minnesota	1,620	-	-
Wisconsin	220	-	-	Wisconsin	2,150	7	42
Michigan	340	35	-	Michigan	1,900	82	42

1/ Five year average 1945-49.

Table 6.- Production of miscellaneous piece products in the Lake States - 1948

Species and origin	Piling	Utility, poles	Fence, posts	Hewn ties	Species and origin	Piling	Utility, poles	Fence, posts	Hewn ties
Thousand pieces					Thousand pieces				
White pine	.1	-	-	-	Maple	.6	-	400	-
Minnesota	-	-	-	-	Minnesota	-	-	200	-
Wisconsin	.1	-	-	-	Wisconsin	.6	-	100	-
Michigan	-	-	-	-	Michigan	-	-	100	-
Red pine	3	5	200	-	Birch	-	-	250	-
Minnesota	2.5	5	100	-	Minnesota	-	-	50	-
Wisconsin	.5	-	100	-	Wisconsin	-	-	100	-
Michigan	-	-	-	-	Michigan	-	-	100	-
Jack pine	1	21	550	-	Elm	4.5	-	450	-
Minnesota	1	20	300	-	Minnesota	-	-	50	-
Wisconsin	-	1	150	-	Wisconsin	4.5	-	200	-
Michigan	-	-	100	-	Michigan	-	-	200	-
Spruce	-	-	-	1	Oak	1	-	14,600	-
Minnesota	-	-	-	-	Minnesota	-	-	3,000	-
Wisconsin	-	-	-	-	Wisconsin	1	-	7,800	-
Michigan	-	-	-	1	Michigan	-	-	3,800	-
Balsam	-	-	250	-	Aspen	-	-	1,400	-
Minnesota	-	-	200	-	Minnesota	-	-	700	-
Wisconsin	-	-	50	-	Wisconsin	-	-	400	-
Michigan	-	-	-	-	Michigan	-	-	300	-
Tamarack	-	-	750	1	Ash	.2	-	-	-
Minnesota	-	-	300	1	Minnesota	-	-	-	-
Wisconsin	-	-	300	-	Wisconsin	.2	-	-	-
Michigan	-	-	150	-	Michigan	-	-	-	-
Cedar	-	190	7,400	15	Miscellaneous	1/.2	-	600	-
Minnesota	-	115	1,000	2	Minnesota	-	-	100	-
Wisconsin	-	15	1,400	-	Wisconsin	.2	-	300	-
Michigan	-	60	5,000	13	Michigan	-	-	200	-
Femlock	-	-	150	2	Hardwood total	6.5	-	17,700	-
Minnesota	-	-	-	-	Minnesota	-	-	4,100	-
Wisconsin	-	-	100	-	Wisconsin	6.5	-	8,900	-
Michigan	-	-	50	2	Michigan	-	-	4,700	-
Softwood total	4.1	216	9,300	19	All species	10.6	216	27,000	19
Minnesota	3.5	140	1,900	3	Minnesota	3.5	140	6,000	3
Wisconsin	.6	16	2,100	-	Wisconsin	7.1	16	11,000	-
Michigan	-	60	5,300	16	Michigan	-	60	10,000	16

1/ Hickory

Table 7.- Production of mining materials in the Lake States - 1943

Volume of Logs and Bolts Cut by States									
Species and origin	Total	Mine timbers	Mine lagging	Other 1/	Species and origin	Total	Mine timbers	Mine lagging	Other 1/
Thousand cubic feet					Thousand cubic feet				
White pine	25	20	-	5	Maple	1,435	1,090	-	345
Minnesota	20	20	-	-	Minnesota	20	20	-	-
Wisconsin	-	-	-	-	Wisconsin	70	50	-	20
Michigan	5	-	-	5	Michigan	1,345	1,020	-	325
Red pine	85	80	-	5	Birch	450	385	-	65
Minnesota	85	80	-	5	Minnesota	10	10	-	-
Wisconsin	-	-	-	-	Wisconsin	45	30	-	15
Michigan	-	-	-	-	Michigan	395	345	-	50
Jack pine	1,150	830	180	140	Elm	125	110	-	15
Minnesota	1,150	830	180	140	Minnesota	40	40	-	-
Wisconsin	-	-	-	-	Wisconsin	15	10	-	5
Michigan	-	-	-	-	Michigan	70	60	-	10
Spruce	5	-	-	5	Beech	80	75	-	5
Minnesota	-	-	-	-	Minnesota	-	-	-	-
Wisconsin	-	-	-	-	Wisconsin	-	-	-	-
Michigan	5	-	-	5	Michigan	80	75	-	5
Tamarack	2,075	375	220	1,480	Oak	25	20	-	5
Minnesota	1,045	320	-	725	Minnesota	-	-	-	-
Wisconsin	140	10	5	125	Wisconsin	15	10	-	5
Michigan	890	45	215	630	Michigan	10	10	-	-
Cedar	1,765	-	1,755	10	Ash	70	70	-	-
Minnesota	330	-	330	-	Minnesota	70	70	-	-
Wisconsin	90	-	90	-	Wisconsin	-	-	-	-
Michigan	1,345	-	1,335	10	Michigan	-	-	-	-
Emlock	330	300	5	25	Hdwd. total	2,185	1,750	-	435
Minnesota	-	-	-	-	Minnesota	140	140	-	-
Wisconsin	15	10	-	5	Wisconsin	145	100	-	45
Michigan	315	290	5	20	Michigan	1,900	1,510	-	390
Sftwd. total	5,435	1,605	2,160	1,670	All species	7,620	3,355	2,160	2,105
Minnesota	2,630	1,250	510	870	Minnesota	2,770	1,390	510	870
Wisconsin	245	20	95	130	Wisconsin	390	120	95	175
Michigan	2,560	335	1,555	670	Michigan	4,460	1,845	1,555	1,060

1/ Mine cribbing poles, trestle logs, hewed shaft timbers, smelter brands, and etc.

Table 8.- Production of cooperage logs and bolts in the Lake States - 1948

Species	Total	Volume cut by states		
		Minnesota	Wisconsin	Michigan
<u>M bd.ft., Int'l. $\frac{3}{4}$-inch rule</u>				
Maple	50	50	-	-
Basswood	270	100	170	-
Elm	900	900	-	-
Oak	1,260	550	710	-
Aspen	50	50	-	-
Cottonwood	400	400	-	-
Ash	50	50	-	-
All species	2,980	2,100	880	-

Table 9.- Production of miscellaneous products^{1/} in the Lake States - 1948
(Five year average 1945-49)

Species	Total	Volume cut by states		
		Minnesota	Wisconsin	Michigan
		Thousand cubic feet		
White pine	180	60	60	60
Red pine	90	40	20	30
Jack pine	210	90	40	80
Spruce	50	20	10	20
Balsam	140	50	20	70
Tamarack	50	20	10	20
Cedar	690	90	160	440
Hemlock	40	-	20	20
Softwood total	1,450	370	340	740
Maple	410	-	90	320
Birch	230	190	30	10
Basswood	170	80	70	20
Elm	80	-	-	80
Beech	670	-	-	670
Oak	100	10	10	80
Aspen	1,520	960	380	180
Ash	10	-	-	10
Other	70	-	20	50
Hardwood total	3,260	1,240	600	1,420
All species	4,710	1,610	940	2,160

^{1/} Rough forest products used for manufacture of matches, clothespins, bowling pins, handles, wooden ware, rustic furniture, toys, shingles, lath, log cabin materials, etc.

CUTTING DRAIN ON PRIMARY GROWING STOCK - 1948

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Table 10.--Sawlogs and box-bolt timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber		Pole-timber
			trees		trees
	M bd.ft.:	M cu.ft.:	M bd.ft.:	M cu.ft.:	M cu. ft.
White pine	58,710	15,950	58,710	12,100	3,850
Minnesota....	9,070	3,460	9,070	1,870	1,590
Wisconsin....	29,170	7,390	29,170	6,010	1,380
Michigan.....	20,470	5,100	20,470	4,220	880
Red pine.....	50,200	14,910	50,200	10,340	4,570
Minnesota....	17,520	6,680	17,520	3,610	3,070
Wisconsin....	23,340	5,910	23,340	4,810	1,100
Michigan.....	9,340	2,320	9,340	1,920	400
Jack pine.....	53,670	17,850	53,670	11,050	6,800
Minnesota....	33,840	12,890	33,840	6,970	5,920
Wisconsin....	7,010	1,770	7,010	1,440	330
Michigan.....	12,820	3,190	12,820	2,640	550
Spruce.....	11,660	3,390	11,660	2,400	990
Minnesota....	3,610	1,370	3,610	740	630
Wisconsin....	1,470	370	1,470	300	70
Michigan.....	6,580	1,650	6,580	1,360	290
Balsam.....	6,180	1,910	6,180	1,280	630
Minnesota....	2,750	1,050	2,750	570	480
Wisconsin....	860	220	860	180	40
Michigan.....	2,570	640	2,570	530	110
Tamarack.....	3,150	1,000	3,150	650	350
Minnesota....	1,600	610	1,600	330	280
Wisconsin....	1,180	290	1,180	240	50
Michigan.....	370	100	370	80	20
Cedar.....	9,430	2,450	9,430	1,940	510
Minnesota....	730	280	730	150	130
Wisconsin....	1,980	500	1,980	410	90
Michigan.....	6,720	1,670	6,720	1,380	290
Hemlock.....	185,080	46,350	185,080	38,120	8,230
Minnesota....	...	...	...	...	...
Wisconsin....	57,490	14,560	57,490	11,840	2,720
Michigan.....	127,590	31,790	127,590	26,280	5,510
Softwood total	378,080	103,810	378,080	77,880	25,930
Minnesota....	69,120	26,340	69,120	14,240	12,100
Wisconsin....	122,500	31,010	122,500	25,230	5,780
Michigan.....	186,460	46,460	186,460	38,410	8,050

UNITED STATES DEPARTMENT OF AGRICULTURE

OFFICE OF THE SECRETARY, WASHINGTON, D. C.

Report on the results of the investigation of the effects of the application of the various types of fertilizer on the growth of the various types of crops.

REPORT ON THE RESULTS OF THE INVESTIGATION OF THE EFFECTS OF THE APPLICATION OF THE VARIOUS TYPES OF FERTILIZER ON THE GROWTH OF THE VARIOUS TYPES OF CROPS.

By the Bureau of Plant Industry, United States Department of Agriculture.

WASHINGTON, D. C.

1914

REPORT

ON THE RESULTS OF THE INVESTIGATION OF THE EFFECTS OF THE APPLICATION OF THE VARIOUS TYPES OF FERTILIZER ON THE GROWTH OF THE VARIOUS TYPES OF CROPS.

CROPS	FERTILIZERS				RESULTS
	1	2	3	4	
WHEAT	100.0	100.0	100.0	100.0	100.0
BARLEY	100.0	100.0	100.0	100.0	100.0
RYE	100.0	100.0	100.0	100.0	100.0
OATS	100.0	100.0	100.0	100.0	100.0
MAIZE	100.0	100.0	100.0	100.0	100.0
SOYBEANS	100.0	100.0	100.0	100.0	100.0
PEAS	100.0	100.0	100.0	100.0	100.0
BEANS	100.0	100.0	100.0	100.0	100.0
VEGETABLES	100.0	100.0	100.0	100.0	100.0
FRUITS	100.0	100.0	100.0	100.0	100.0
GRASSES	100.0	100.0	100.0	100.0	100.0
LEGUMES	100.0	100.0	100.0	100.0	100.0
ROOTS	100.0	100.0	100.0	100.0	100.0
SEEDS	100.0	100.0	100.0	100.0	100.0
STRAW	100.0	100.0	100.0	100.0	100.0
WHEAT	100.0	100.0	100.0	100.0	100.0
BARLEY	100.0	100.0	100.0	100.0	100.0
RYE	100.0	100.0	100.0	100.0	100.0
OATS	100.0	100.0	100.0	100.0	100.0
MAIZE	100.0	100.0	100.0	100.0	100.0
SOYBEANS	100.0	100.0	100.0	100.0	100.0
PEAS	100.0	100.0	100.0	100.0	100.0
BEANS	100.0	100.0	100.0	100.0	100.0
VEGETABLES	100.0	100.0	100.0	100.0	100.0
FRUITS	100.0	100.0	100.0	100.0	100.0
GRASSES	100.0	100.0	100.0	100.0	100.0
LEGUMES	100.0	100.0	100.0	100.0	100.0
ROOTS	100.0	100.0	100.0	100.0	100.0
SEEDS	100.0	100.0	100.0	100.0	100.0
STRAW	100.0	100.0	100.0	100.0	100.0
WHEAT	100.0	100.0	100.0	100.0	100.0
BARLEY	100.0	100.0	100.0	100.0	100.0
RYE	100.0	100.0	100.0	100.0	100.0
OATS	100.0	100.0	100.0	100.0	100.0
MAIZE	100.0	100.0	100.0	100.0	100.0
SOYBEANS	100.0	100.0	100.0	100.0	100.0
PEAS	100.0	100.0	100.0	100.0	100.0
BEANS	100.0	100.0	100.0	100.0	100.0
VEGETABLES	100.0	100.0	100.0	100.0	100.0
FRUITS	100.0	100.0	100.0	100.0	100.0
GRASSES	100.0	100.0	100.0	100.0	100.0
LEGUMES	100.0	100.0	100.0	100.0	100.0
ROOTS	100.0	100.0	100.0	100.0	100.0
SEEDS	100.0	100.0	100.0	100.0	100.0
STRAW	100.0	100.0	100.0	100.0	100.0
WHEAT	100.0	100.0	100.0	100.0	100.0
BARLEY	100.0	100.0	100.0	100.0	100.0
RYE	100.0	100.0	100.0	100.0	100.0
OATS	100.0	100.0	100.0	100.0	100.0
MAIZE	100.0	100.0	100.0	100.0	100.0
SOYBEANS	100.0	100.0	100.0	100.0	100.0
PEAS	100.0	100.0	100.0	100.0	100.0
BEANS	100.0	100.0	100.0	100.0	100.0
VEGETABLES	100.0	100.0	100.0	100.0	100.0
FRUITS	100.0	100.0	100.0	100.0	100.0
GRASSES	100.0	100.0	100.0	100.0	100.0
LEGUMES	100.0	100.0	100.0	100.0	100.0
ROOTS	100.0	100.0	100.0	100.0	100.0
SEEDS	100.0	100.0	100.0	100.0	100.0
STRAW	100.0	100.0	100.0	100.0	100.0

Table 10.--Sawlogs and box-bolt timber drain in the Lake States--1948
(continued)

Species and origin	Net timber drain, by size class				
	Total		Saw-timber		Pole-timber
			trees		trees
	M bd. ft.	M cu. ft.	M bd. ft.	M cu. ft.	M cu. ft.
Maple.....	221,950	60,510	221,950	53,420	7,090
Minnesota....	1,640	520	1,640	390	130
Wisconsin....	56,320	15,180	56,320	13,400	1,780
Michigan.....	163,990	44,810	163,990	39,630	5,180
Birch.....	68,110	18,470	68,110	16,200	2,270
Minnesota....	2,320	740	2,320	550	190
Wisconsin....	16,990	4,580	16,990	4,040	540
Michigan.....	48,800	13,150	48,800	11,610	1,540
Basswood.....	43,480	12,130	43,480	10,340	1,790
Minnesota....	8,130	2,600	8,130	1,930	670
Wisconsin....	18,540	5,000	18,540	4,410	590
Michigan.....	16,810	4,530	16,810	4,000	530
Elm.....	61,150	17,050	61,150	14,550	2,500
Minnesota....	11,290	3,610	11,290	2,690	920
Wisconsin....	21,490	5,790	21,490	5,110	680
Michigan.....	28,370	7,650	28,370	6,750	900
Beech.....	22,560	6,080	22,560	5,370	710
Minnesota....	...	...	...	...	...
Wisconsin....	780	210	780	190	20
Michigan.....	21,780	5,870	21,780	5,180	690
Oak.....	99,590	27,350	99,590	23,700	3,650
Minnesota....	10,090	3,220	10,090	2,400	820
Wisconsin....	58,730	15,840	58,730	13,980	1,860
Michigan.....	30,770	8,290	30,770	7,320	970
Aspen.....	88,890	50,260	88,890	22,080	28,180
Minnesota....	39,330	17,840	39,330	9,830	8,010
Wisconsin....	27,450	19,980	27,450	6,860	13,120
Michigan.....	22,110	12,440	22,110	5,390	7,050
Cottonwood.....	10,560	3,150	10,560	2,510	640
Minnesota....	6,110	1,950	6,110	1,450	500
Wisconsin....	1,570	420	1,570	370	50
Michigan.....	2,880	780	2,880	690	90
Miscellaneous..	23,950	6,630	23,950	5,710	920
Minnesota....	3,390	1,080	3,390	800	280
Wisconsin....	9,250	2,500	9,250	2,210	290
Michigan.....	11,310	3,050	11,310	2,700	350
Hardwood total.	640,240	201,630	640,240	153,880	47,750
Minnesota....	82,300	31,560	82,300	20,040	11,520
Wisconsin....	211,120	69,500	211,120	50,570	18,930
Michigan.....	346,820	100,570	346,820	83,270	17,300
All species....	1,018,320	305,440	1,018,320	231,760	73,680
Minnesota....	151,420	57,900	151,420	34,280	23,620
Wisconsin....	333,620	100,510	333,620	75,800	24,710
Michigan.....	533,280	147,030	533,280	121,680	25,350

NOTE - Miscellaneous species:	Ash	Cherry	Hickory	Walnut	Other
Minnesota (percent)	93	1	..	1	5
Wisconsin (percent)	85	1	1	1	12
Michigan (percent)	65	8	6	2	19

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120
121	122	123	124	125	126
127	128	129	130	131	132
133	134	135	136	137	138
139	140	141	142	143	144
145	146	147	148	149	150
151	152	153	154	155	156
157	158	159	160	161	162
163	164	165	166	167	168
169	170	171	172	173	174
175	176	177	178	179	180
181	182	183	184	185	186
187	188	189	190	191	192
193	194	195	196	197	198
199	200	201	202	203	204
205	206	207	208	209	210
211	212	213	214	215	216
217	218	219	220	221	222
223	224	225	226	227	228
229	230	231	232	233	234
235	236	237	238	239	240
241	242	243	244	245	246
247	248	249	250	251	252
253	254	255	256	257	258
259	260	261	262	263	264
265	266	267	268	269	270
271	272	273	274	275	276
277	278	279	280	281	282
283	284	285	286	287	288
289	290	291	292	293	294
295	296	297	298	299	300
301	302	303	304	305	306
307	308	309	310	311	312
313	314	315	316	317	318
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745	746	747	748	749	750
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823	824	825	826	827	828
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835	836	837	838	839	840
841	842	843	844	845	846
847	848	849	850	851	852
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937	938	939	940	941	942
943	944	945	946	947	948
949	950	951	952	953	954
955	956	957	958	959	960
961	962	963	964	965	966
967	968	969	970	971	972
973	974	975	976	977	978
979	980	981	982	983	984
985	986	987	988	989	990
991	992	993	994	995	996
997	998	999	1000	1001	1002

Table 11.--Vencer log (commercial) timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				Net timber drain, by size class			
	Total	Saw-timber trees	Pole- timber	Species and origin	Total	Saw-timber trees	Pole- timber	Species and origin
	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M cu.ft.:		M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M cu.ft.:	
White pine....	240	50	240	50	4,690	880	4,690	880
Minnesota...	..	..	..	..	380	70	380	70
Wisconsin...	160	30	160	30	3,530	660	3,530	640
Michigan....	80	20	80	20	780	150	780	150
Softwood total	240	50	240	50	140	40	140	30
Minnesota...	..	..	..	..	..	..	..	..
Wisconsin...	160	30	160	30	90	30	90	20
Michigan....	80	20	80	20	50	10	50	10
Maple.....	35,880	6,880	35,880	6,830	150	30	150	30
Minnesota...	670	140	670	130	150	30	150	30
Wisconsin...	8,100	1,510	8,100	1,470	..	..	..	..
Michigan....	27,110	5,230	27,110	5,230	..	..	..	..
Birch.....	23,200	4,450	23,200	4,430	2,160	400	2,160	400
Minnesota...	230	50	230	50	170	40	170	40
Wisconsin...	4,960	920	4,960	900	1,070	190	1,070	190
Michigan....	18,010	3,480	18,010	3,480	920	170	920	170
Basswood.....	8,910	1,720	8,910	1,680	90,200	17,300	90,200	17,300
Minnesota...	2,140	430	2,140	410	5,320	1,070	5,320	1,030
Wisconsin...	3,580	670	3,580	650	24,640	4,600	24,640	4,470
Michigan....	3,190	620	3,190	620	60,240	11,630	60,240	11,630
Elm.....	7,470	1,430	7,470	1,400	90,440	17,350	90,440	17,180
Minnesota...	1,580	310	1,580	300	5,320	1,070	5,320	1,030
Wisconsin...	3,310	620	3,310	600	24,800	4,630	24,800	4,500
Michigan....	2,580	500	2,580	500	60,320	11,650	60,320	11,650
Beech.....	7,600	1,470	7,600	1,470	..	..	..	..
Minnesota...	..	..	..	..	..	..	..	..
Wisconsin...	..	..	..	..	..	..	..	..
Michigan....	7,600	1,470	7,600	1,470	..	..	..	..
NOTE - Miscellaneous species:				Ash	Walnut	Other		
Minnesota (percent)				50	50	..		
Wisconsin (percent)				60	30	10		
Michigan (percent)				75	20	5

Table 12.--Veneer logs and bolts (container) timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				Net timber drain, by size class			
	Total	Saw-timber trees	Pole- timber trees	Species and origin	Total	Saw-timber trees	Pole- timber trees	Species and origin
	M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.	M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.	M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.		M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.	M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.	M bd.ft.:M cu.ft.:M bd.ft.:M cu.ft.:M cu.ft.	
White pine....	10	10	..	..:Oak.....	510	120	510	110
Minnesota...	10	10	..	..:Minnesota...	..	..	..	..
Wisconsin...	..	..	..	..:Wisconsin...	230	60	230	50
Michigan....	..	..	..	..:Michigan....	230	60	280	60
Softwood total	10	10	..	..:Aspen.....	950	1,005	950	210
Minnesota...	10	10	..	..:Minnesota...	240	75	240	60
Wisconsin...	..	..	..	..:Wisconsin...	670	920	670	140
Michigan....	..	..	..	..:Michigan....	40	10	40	10
Maple.....	9,840	2,175	9,840	95:Cottonwood....	210	55	210	50
Minnesota...	110	25	110	5:Minnesota...	130	35	130	30
Wisconsin...	1,360	360	1,360	70:Wisconsin...	50	10	50	10
Michigan....	8,370	1,790	8,370	20:Michigan....	30	10	30	10
Birch.....	2,600	575	2,600	25:Miscellaneous	1,360	300	1,360	280
Minnesota...	40	15	40	5:Minnesota...	..	..	..	..
Wisconsin...	120	40	120	10:Wisconsin...	350	90	350	70
Michigan....	2,440	520	2,440	10:Michigan....	1,010	210	1,010	210
Basswood.....	4,680	1,160	4,680	170:Hardwood total	33,990	8,570	33,990	7,200
Minnesota...	1,030	260	1,030	50:Minnesota...	1,790	470	1,790	380
Wisconsin...	2,530	660	2,530	120:Wisconsin...	9,770	3,310	9,770	2,080
Michigan....	1,120	240	1,120	..:Michigan....	22,430	4,790	22,430	4,740
Elm.....	10,190	2,400	10,190	240:All species...	34,000	8,570	34,000	7,200
Minnesota...	240	60	240	10:Minnesota...	1,800	470	1,800	380
Wisconsin...	4,460	1,170	4,460	220:Wisconsin...	9,770	3,310	9,770	2,080
Michigan....	5,490	1,170	5,490	10:Michigan....	22,430	4,790	22,430	4,740
Beech.....	3,650	780	3,650	10:	..	..	..	..
Minnesota...	..	..	..	..:	..	..	..	..
Wisconsin...	..	..	..	..:	..	..	..	..
Michigan....	3,650	780	3,650	10:	..	..	..	..
NOTE - Miscellaneous species:				Ash	100	30	40	
Wisconsin (percent)				Sycamore	..	30	40	
Michigan (percent)				Yellow-poplar	..	40	..

Table 13.--Pulpwood timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				Net timber drain, by size class			
	Total	Saw-timber trees	Pole- timber	Species and origin	Total	Saw-timber trees	Pole- timber	Species and origin
	M bd.ft.:M cu.ft.	M bd.ft.:M cu.ft.	M cu.ft.		M bd.ft.:M cu.ft.	M bd.ft.:M cu.ft.	M cu.ft.	
Jack pine.....	13,550	36,590	13,550	34,000: Basswood.....	220	190	220	50
Minnesota....	8,500	21,460	8,500	19,830: Minnesota....	..	..	..	..
Wisconsin....	2,840	9,240	2,840	8,690: Wisconsin....	..	..	..	..
Michigan....	2,210	5,890	2,210	5,480: Michigan....	220	190	220	50
Spruce.....	12,140	31,720	12,140	29,410: Elm.....	560	480	560	130
Minnesota....	7,990	20,170	7,990	18,640: Minnesota....	..	..	..	..
Wisconsin....	830	2,690	830	2,530: Wisconsin....	..	..	..	..
Michigan....	3,320	8,860	3,320	8,240: Michigan....	560	480	560	130
Balsam.....	10,640	28,960	10,640	26,940: Beech.....	70	60	70	20
Minnesota....	4,460	11,250	4,460	10,400: Minnesota....	..	..	..	..
Wisconsin....	2,120	6,880	2,120	6,470: Wisconsin....	..	..	..	..
Michigan....	4,060	10,830	4,060	10,070: Michigan....	70	60	70	20
Tamarack.....	270	730	270	680: Oak.....	820	690	820	190
Minnesota....	150	370	150	340: Minnesota....	..	..	..	..
Wisconsin....	60	210	60	200: Wisconsin....	..	..	..	..
Michigan....	60	150	60	140: Michigan....	820	690	820	190
Hemlock.....	44,820	14,040	44,820	5,400: Aspen.....	20,250	52,980	20,250	4,660
Minnesota....	..	..	..	..: Minnesota....	14,280	23,380	14,280	3,440
Wisconsin....	1,100	3,950	1,100	3,740: Wisconsin....	3,460	14,170	3,460	820
Michigan....	43,720	10,090	43,720	1,660: Michigan....	2,510	15,430	2,510	600
Softwood total	81,420	112,040	81,420	96,430: Hardwood total	23,160	56,050	23,160	5,540
Minnesota....	21,100	53,250	21,100	49,210: Minnesota....	14,370	23,510	14,370	3,460
Wisconsin....	6,950	22,970	6,950	21,630: Wisconsin....	3,700	14,910	3,700	880
Michigan....	53,370	35,820	53,370	25,590: Michigan....	5,090	17,630	5,090	1,200
Maple.....	220	190	220	140: All species....	104,580	168,090	104,580	21,150
Minnesota....	..	..	..	..: Minnesota....	35,470	76,760	35,470	7,500
Wisconsin....	..	..	..	..: Wisconsin....	10,650	37,880	10,650	2,220
Michigan....	220	190	220	140: Michigan....	58,460	53,450	58,460	11,430
Birch.....	1,020	1,460	1,020	1,220:				
Minnesota....	90	130	90	110:				
Wisconsin....	240	740	240	680:				
Michigan....	690	590	690	430:

Table 14.--Fuelwood timber drain in the Lake States (5-year average 1945-49)

Species and origin	Net timber drain, by size class				
	Total		Saw-timber		Pole-timber
			trees		trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu. ft.	M cu.ft.
White pine.....	930	1,540	930	750	790
Minnesota....	110	210	110	120	90
Wisconsin....	450	870	450	390	480
Michigan.....	370	460	370	240	220
Red pine.....	170	280	170	150	130
Minnesota....	60	100	60	60	40
Wisconsin....	40	90	40	40	50
Michigan.....	70	90	70	50	40
Jack pine.....	800	1,460	800	750	710
Minnesota....	400	720	400	420	300
Wisconsin....	360	700	360	310	390
Michigan.....	40	40	40	20	20
Spruce.....	260	440	260	250	190
Minnesota....	170	310	170	180	130
Wisconsin....	20	40	20	20	20
Michigan.....	70	90	70	50	40
Balsam.....	290	490	290	280	210
Minnesota....	230	410	230	240	170
Wisconsin....	20	40	20	20	20
Michigan.....	40	40	40	20	20
Tamarack.....	1,580	2,950	1,580	1,670	1,280
Minnesota....	1,240	2,330	1,240	1,380	950
Wisconsin....	270	530	270	240	290
Michigan.....	70	90	70	50	40
Cedar.....	310	540	310	270	270
Minnesota....	60	100	60	60	40
Wisconsin....	180	350	180	160	190
Michigan.....	70	90	70	50	40
Hemlock.....	1,640	2,680	1,640	1,260	1,420
Minnesota....	...	...	...	...	...
Wisconsin....	900	1,750	900	780	970
Michigan.....	740	930	740	480	450
Softwood total..	5,980	10,380	5,980	5,380	5,000
Minnesota....	2,270	4,180	2,270	2,460	1,720
Wisconsin....	2,240	4,370	2,240	1,960	2,410
Michigan.....	1,470	1,830	1,470	960	870

Table 14.--Fuelwood timber drain in the Lake States (5-year average 1945-49)
(Continued)

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole-timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
Maple.....	19,960	16,150	19,960	9,150	7,000
Minnesota....	700	460	700	330	130
Wisconsin....	7,850	5,870	7,850	3,390	2,480
Michigan.....	11,410	9,820	11,410	5,430	4,390
Birch.....	11,950	8,770	11,950	5,270	3,500
Minnesota....	3,660	2,120	3,660	1,510	610
Wisconsin....	4,600	3,470	4,600	2,000	1,470
Michigan.....	3,690	3,180	3,690	1,760	1,420
Basswood.....	5,570	4,100	5,570	2,600	1,500
Minnesota....	2,800	1,870	2,800	1,340	530
Wisconsin....	1,430	1,070	1,430	620	450
Michigan.....	1,340	1,160	1,340	640	520
Elm.....	15,180	11,720	15,180	7,070	4,650
Minnesota....	4,900	3,280	4,900	2,340	940
Wisconsin....	3,570	2,670	3,570	1,540	1,130
Michigan.....	6,710	5,770	6,710	3,190	2,580
Beech.....	1,520	1,300	1,520	720	580
Minnesota....	...	...	...	...	...
Wisconsin....	180	140	180	80	60
Michigan.....	1,340	1,160	1,340	640	520
Oak.....	41,540	31,720	41,540	18,840	12,880
Minnesota....	8,400	5,600	8,400	4,000	1,600
Wisconsin....	21,060	15,730	21,060	9,090	6,640
Michigan.....	12,080	10,390	12,080	5,750	4,640
Aspen.....	19,260	32,240	19,260	8,860	23,380
Minnesota....	9,450	14,780	9,450	4,750	10,030
Wisconsin....	3,020	8,680	3,020	1,350	7,330
Michigan.....	6,790	8,780	6,790	2,760	6,020
Miscellaneous...	10,280	7,550	10,280	4,790	2,760
Minnesota....	5,250	3,520	5,250	2,510	1,010
Wisconsin....	2,680	2,010	2,680	1,160	850
Michigan.....	2,350	2,020	2,350	1,120	900
Hardwood total..	125,260	113,550	125,260	57,300	56,250
Minnesota....	35,160	31,630	35,160	16,780	14,850
Wisconsin....	44,390	39,640	44,390	19,230	20,410
Michigan.....	45,710	42,280	45,710	21,290	20,990
All species.....	131,240	123,930	131,240	62,680	61,250
Minnesota....	37,430	35,810	37,430	19,240	16,570
Wisconsin....	46,630	44,010	46,630	21,190	22,820
Michigan.....	47,180	44,110	47,180	22,250	21,860

Table 15.--Piling timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber		Pole-timber
			trees		trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu. ft.
White pine.....	10	..	10	..	..
Minnesota...	..	..	..	..	..
Wisconsin...	10	..	10	..	..
Michigan....	..	..	..	..	..
Red pine.....	425	85	425	85	..
Minnesota...	340	70	340	70	..
Wisconsin...	85	15	85	15	..
Michigan....	..	..	..	..	..
Jack pine.....	80	15	80	15	..
Minnesota...	80	15	80	15	..
Wisconsin...	..	..	..	..	..
Michigan....	..	..	..	..	..
Softwood total..	515	100	515	100	..
Minnesota...	420	85	420	85	..
Wisconsin...	95	15	95	15	..
Michigan....	..	..	..	..	..
Maple.....	60	15	60	15	..
Minnesota...	..	..	..	..	..
Wisconsin...	60	15	60	15	..
Michigan....	..	..	..	..	..
Elm.....	440	105	440	105	..
Minnesota...	..	..	..	..	..
Wisconsin...	440	105	440	105	..
Michigan....	..	..	..	..	..
Oak.....	80	20	80	20	..
Minnesota...	..	..	..	..	..
Wisconsin...	80	20	80	20	..
Michigan....	..	..	..	..	..
Miscellaneous...	40	10	40	10	..
Minnesota...	..	..	..	..	..
Wisconsin...	40	10	40	10	..
Michigan....	..	..	..	..	..
Hardwood total..	620	150	620	150	..
Minnesota...	..	..	..	..	..
Wisconsin...	620	150	620	150	..
Michigan....	..	..	..	..	..
All species.....	1,135	250	1,135	250	..
Minnesota...	420	85	420	85	..
Wisconsin...	715	165	715	165	..
Michigan....	..	..	..	..	..

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367	368	369	370	371	372
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379	380	381	382	383	384
385	386	387	388	389	390
391	392	393	394	395	396
397	398	399	400	401	402
403	404	405	406	407	408
409	410	411	412	413	414
415	416	417	418	419	420
421	422	423	424	425	426
427	428	429	430	431	432
433	434	435	436	437	438
439	440	441	442	443	444
445	446	447	448	449	450
451	452	453	454	455	456
457	458	459	460	461	462
463	464	465	466	467	468
469	470	471	472	473	474
475	476	477	478	479	480
481	482	483	484	485	486
487	488	489	490	491	492
493	494	495	496	497	498
499	500	501	502	503	504
505	506	507	508	509	510
511	512	513	514	515	516
517	518	519	520	521	522
523	524	525	526	527	528
529	530	531	532	533	534
535	536	537	538	539	540
541	542	543	544	545	546
547	548	549	550	551	552
553	554	555	556	557	558
559	560	561	562	563	564
565	566	567	568	569	570
571	572	573	574	575	576
577	578	579	580	581	582
583	584	585	586	587	588
589	590	591	592	593	594
595	596	597	598	599	600
601	602	603	604	605	606
607	608	609	610	611	612
613	614	615	616	617	618
619	620	621	622	623	624
625	626	627	628	629	630
631	632	633	634	635	636
637	638	639	640	641	642
643	644	645	646	647	648
649	650	651	652	653	654
655	656	657	658	659	660
661	662	663	664	665	666
667	668	669	670	671	672
673	674	675	676	677	678
679	680	681	682	683	684
685	686	687	688	689	690
691	692	693	694	695	696
697	698	699	700	701	702
703	704	705	706	707	708
709	710	711	712	713	714
715	716	717	718	719	720
721	722	723	724	725	726
727	728	729	730	731	732
733	734	735	736	737	738
739	740	741	742	743	744
745	746	747	748	749	750
751	752	753	754	755	756
757	758	759	760	761	762
763	764	765	766	767	768
769	770	771	772	773	774
775	776	777	778	779	780
781	782	783	784	785	786
787	788	789	790	791	792
793	794	795	796	797	798
799	800	801	802	803	804
805	806	807	808	809	810
811	812	813	814	815	816
817	818	819	820	821	822
823	824	825	826	827	828
829	830	831	832	833	834
835	836	837	838	839	840
841	842	843	844	845	846
847	848	849	850	851	852
853	854	855	856	857	858
859	860	861	862	863	864
865	866	867	868	869	870
871	872	873	874	875	876
877	878	879	880	881	882
883	884	885	886	887	888
889	890	891	892	893	894
895	896	897	898	899	900
901	902	903	904	905	906
907	908	909	910	911	912
913	914	915	916	917	918
919	920	921	922	923	924
925	926	927	928	929	930
931	932	933	934	935	936
937	938	939	940	941	942
943	944	945	946	947	948
949	950	951	952	953	954
955	956	957	958	959	960
961	962	963	964	965	966
967	968	969	970	971	972
973	974	975	976	977	978
979	980	981	982	983	984
985	986	987	988	989	990
991	992	993	994	995	996
997	998	999	1000	1001	1002

Table 16.--Chemical-wood timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole-timber trees
	: M bd.ft.	: M cu.ft.	: M bd.ft.	: M cu.ft.	: M cu.ft.
Maple.....	6,150	1,650	6,150	1,460	190
Minnesota...	...	...	...	...	...
Wisconsin...	20	...	20	...	...
Michigan....	6,130	1,650	6,130	1,460	190
Birch.....	3,360	900	3,360	800	100
Minnesota...	...	...	...	...	...
Wisconsin...	20	...	20	...	...
Michigan....	3,340	900	3,340	800	100
Elm.....	190	60	190	50	10
Minnesota...	...	...	...	...	...
Wisconsin...	...	...	...	...	...
Michigan....	190	60	190	50	10
Beech.....	1,110	300	1,110	260	40
Minnesota...	...	...	...	...	..
Wisconsin...	...	...	...	...	..
Michigan....	1,110	300	1,110	260	40
Oak.....	190	60	190	50	10
Minnesota...	...	..	...	..	..
Wisconsin...	...	..	...	..	..
Michigan....	190	60	190	50	10
Aspen.....	620	170	620	150	20
Minnesota...	...	...	...	...	..
Wisconsin...	620	170	620	150	20
Michigan....	...	...	...	...	..
Miscellaneous...	190	60	190	50	10
Minnesota...	...	..	...	..	..
Wisconsin...	...	..	...	..	..
Michigan....	190	60	190	50	10
Hardwood total..	11,810	3,200	11,810	2,820	380
Minnesota...	...	...	...	...	...
Wisconsin...	660	170	660	150	20
Michigan....	11,150	3,030	11,150	2,670	360
All species.....	11,810	3,200	11,810	2,820	380
Minnesota...	...	...	...	...	...
Wisconsin...	660	170	660	150	20
Michigan....	11,150	3,030	11,150	2,670	360

NOTE - Miscellaneous species: Ash
 Michigan..... 100 percent

 

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Table 17.--Excelsior timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber		Pole-timber
			trees		trees
	M bd. ft.	M cu. ft.	M bd. ft.	M cu. ft.	M cu. ft.
Basswood.....	25	80	25	5	75
Minnesota....	..	..	..	..	..
Wisconsin....	15	65	15	5	60
Michigan.....	10	15	10	..	15
Aspen.....	410	6,605	410	115	6,490
Minnesota....	..	..	..	..	..
Wisconsin....	320	3,250	320	90	3,160
Michigan.....	90	3,355	90	25	3,330
Hardwood total..	435	6,685	435	120	6,565
Minnesota....	..	..	..	..	..
Wisconsin....	335	3,315	335	95	3,220
Michigan.....	100	3,370	100	25	3,345
All species.....	435	6,685	435	120	6,565
Minnesota....	..	..	..	..	..
Wisconsin....	335	3,315	335	95	3,220
Michigan.....	100	3,370	100	25	3,345

 

Table 18.--Fence-post timber drain in the Lake States (5-year average 1945-49)

Species and origin	Net timber drain, by size class				Net timber drain, by size class			
	: Saw-timber		: Pole-		: Saw-timber		: Pole-	
	: M bd.ft.:M cu.ft.:	: M bd.ft.:M cu.ft.:	: M bd.ft.:M cu.ft.:	: M cu.ft.:	: M bd.ft.:M cu.ft.:	: M bd.ft.:M cu.ft.:	: M cu.ft.:	: M cu.ft.:
Total	120	100	20	80	Total	250	450	80
Red pine.....	320	280	70	210	Maple.....	150	280	150
Minnesota...	170	150	40	110	Minnesota...	30	60	30
Wisconsin...	90	80	20	60	Wisconsin...	60	110	60
Michigan...	60	50	10	40	Michigan...	60	110	60
Jack pine.....	320	280	70	210	Birch.....	150	280	150
Minnesota...	170	150	40	110	Minnesota...	30	60	30
Wisconsin...	90	80	20	60	Wisconsin...	60	110	60
Michigan...	60	50	10	40	Michigan...	60	110	60
Balsam.....	140	140	40	100	Elm.....	290	520	290
Minnesota...	110	110	30	80	Minnesota...	30	60	30
Wisconsin...	30	30	10	20	Wisconsin...	130	230	130
Michigan...	..	..	..	..	Michigan...	130	230	130
Tamarack.....	430	400	100	300	Oak.....	9,150	16,510	2,690
Minnesota...	170	150	40	110	Minnesota...	1,880	3,410	1,880
Wisconsin...	170	170	40	130	Wisconsin...	4,890	8,810	4,890
Michigan...	90	80	20	60	Michigan...	2,380	4,290	2,380
Cedar.....	4,200	3,960	900	3,060	Aspen.....	880	1,540	880
Minnesota...	570	510	130	380	Minnesota...	440	800	440
Wisconsin...	790	760	170	590	Wisconsin...	250	450	250
Michigan...	2,840	2,690	600	2,090	Michigan...	190	290	190
Hemlock.....	90	80	20	60	Miscellaneous	380	690	380
Minnesota...	..	..	..	..	Minnesota...	60	120	60
Wisconsin...	60	50	10	40	Wisconsin...	190	340	190
Michigan...	30	30	10	20	Michigan...	130	230	130
Softwood total	5,300	4,960	1,150	3,810	Hardwood total	11,100	19,990	11,100
Minnesota...	1,080	970	250	720	Minnesota...	2,570	4,680	2,570
Wisconsin...	1,200	1,140	260	880	Wisconsin...	5,580	10,050	5,580
Michigan...	3,020	2,850	640	2,210	Michigan...	2,950	5,260	2,950
: All species...								
Minnesota...	3,650	3,650	16,400	24,950	Minnesota...	3,650	5,650	3,650
Wisconsin...	6,780	6,780	11,190	11,190	Wisconsin...	6,780	11,190	6,780
Michigan...	5,970	5,970	8,110	8,110	Michigan...	5,970	8,110	5,970

Table 19.--Utility pole timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole- timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
Red pine.....	280	75	280	60	15
Minnesota.....	280	75	280	60	15
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Jack pine.....	1,250	310	1,250	265	45
Minnesota.....	1,230	300	1,230	260	40
Wisconsin.....	20	10	20	5	5
Michigan.....	..	..	..	..	..
Cedar.....	3,620	1,510	3,620	880	630
Minnesota.....	2,370	940	2,370	590	350
Wisconsin.....	310	120	310	70	50
Michigan.....	940	450	940	220	230
Softwood total...	5,150	1,895	5,150	1,205	690
Minnesota.....	3,880	1,315	3,880	910	405
Wisconsin.....	330	130	330	75	55
Michigan.....	940	450	940	220	230
All species.....	5,150	1,895	5,150	1,205	690
Minnesota.....	3,880	1,315	3,880	910	405
Wisconsin.....	330	130	330	75	55
Michigan.....	940	450	940	220	230

 

Table 20.--Hewed ties timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole- timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
Spruce.....	5	..	5	..	..
Minnesota.....	..	..	..	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	5	..	5	..	..
Tamarack.....	5	..	5	..	..
Minnesota.....	5	..	5	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Cedar.....	50	20	50	10	10
Minnesota.....	10	..	10	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	40	20	40	10	10
Hemlock.....	10	..	10	..	..
Minnesota.....	..	..	..	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	10	..	10	..	..
Softwood total...	70	20	70	10	10
Minnesota.....	15	..	15	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	55	20	55	10	10
All species.....	70	20	70	10	10
Minnesota.....	15	..	15	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	55	20	55	10	10

Table 21.--Mire material timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				Net timber drain, by size class				
	Total	Saw-timber trees	Pole- timber trees	Species and origin	Total	Saw-timber trees	Pole- timber trees		
M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:	M bd.ft.:M cu.ft.:M cu.ft.:M cu.ft.:		
White pine....	75	20	15	5 : Maple.....	5,850	2,015	5,850	1,510	505
Minnesota...	70	20	15	5 : Minnesota...	110	30	110	30	..
Wisconsin...	..	..	..	.. : Wisconsin...	250	100	250	65	35
Michigan....	5	..	..	.. : Michigan....	5,490	1,885	5,490	1,415	470
Red pine.....	390	85	70	15 : Birch.....	1,825	630	1,825	470	160
Minnesota...	390	85	70	15 : Minnesota...	55	15	55	15	..
Wisconsin...	..	..	..	.. : Wisconsin...	160	60	160	40	20
Michigan....	..	..	..	.. : Michigan....	1,610	555	1,610	415	140
Jack pine.....	5,290	1,130	955	175 : Elm.....	565	180	565	150	30
Minnesota...	5,290	1,130	955	175 : Minnesota...	220	60	220	60	..
Wisconsin...	..	..	..	.. : Wisconsin...	55	20	55	15	5
Michigan....	..	..	..	.. : Michigan....	290	100	290	75	25
Spruce.....	5	..	5	.. : Beech.....	330	110	330	85	25
Minnesota...	..	..	..	.. : Minnesota...	..	..	..	..	..
Wisconsin...	..	..	..	.. : Wisconsin...	..	..	..	..	..
Michigan....	5	..	5	.. : Michigan....	330	110	330	85	25
Tamarack.....	5,070	1,795	1,160	635 : Oak.....	95	35	95	25	10
Minnesota...	4,000	1,025	870	155 : Minnesota...	..	..	..	..	..
Wisconsin...	90	115	25	90 : Wisconsin...	55	20	55	15	5
Michigan....	980	655	265	390 : Michigan...	40	15	40	10	5
Cedar.....	2,810	1,390	690	700 : Miscellaneous	390	110	390	110	..
Minnesota...	1,265	325	275	50 : Minnesota...	390	110	390	110	..
Wisconsin...	60	75	15	60 : Wisconsin...	..	..	..	..	..
Michigan....	1,485	990	400	590 : Michigan....	..	..	..	..	..
Hemlock.....	360	250	100	150 : Hardwood total	9,055	3,080	9,055	2,350	730
Minnesota...	..	..	..	.. : Minnesota...	775	215	775	215	..
Wisconsin...	10	15	5	10 : Wisconsin...	520	200	520	135	65
Michigan....	350	235	95	140 : Michigan....	7,760	2,665	7,760	2,000	665
Softwood total	14,000	4,670	2,990	1,630 : All species...	23,055	7,750	23,055	5,340	2,410
Minnesota...	11,015	2,585	2,185	400 : Minnesota...	11,790	2,300	11,790	2,400	400
Wisconsin...	160	205	45	160 : Wisconsin...	680	405	680	180	225
Michigan....	2,825	1,880	760	1,120 : Michigan....	10,585	4,545	10,585	2,760	1,785

NOTE - Miscellaneous species: Ash - Minnesota, 100 percent

NOTE - Miscellaneous species: Ash - Minnesota, 100 percent.

Table 22.--Cooperage timber drain in the Lake States--1948

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole- timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
Maple.....	50	10	50	10	..
Minnesota.....	50	10	50	10	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Basswood.....	200	60	200	50	10
Minnesota.....	100	20	100	20	..
Wisconsin.....	100	40	100	30	10
Michigan.....	..	..	..	..	..
Elm.....	910	200	910	200	..
Minnesota.....	910	200	910	200	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Oak.....	995	280	995	230	50
Minnesota.....	555	120	555	120	..
Wisconsin.....	440	160	440	110	50
Michigan.....	..	..	..	..	..
Aspen.....	50	10	50	10	..
Minnesota.....	50	10	50	10	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Cottonwood.....	405	90	405	90	..
Minnesota.....	405	90	405	90	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Miscellaneous.....	50	10	50	10	..
Minnesota.....	50	10	50	10	..
Wisconsin.....	..	..	..	..	..
Michigan.....	..	..	..	..	..
Hardwood total...	2,660	660	2,660	600	60
Minnesota.....	2,120	460	2,120	460	..
Wisconsin.....	540	200	540	140	60
Michigan.....	..	..	..	..	..
All species.....	2,660	660	2,660	600	60
Minnesota.....	2,120	460	2,120	460	..
Wisconsin.....	540	200	540	140	60
Michigan.....	..	..	..	..	..

NOTE - Miscellaneous species: Ash - Minnesota, 100 percent.

TABLE 1. - <i>Continued</i>					
Station	Depth	Temperature	Salinity	Density	Direction
100	0	20.0	35.0	1.0234	000
100	10	19.5	35.0	1.0234	000
100	20	19.0	35.0	1.0234	000
100	30	18.5	35.0	1.0234	000
100	40	18.0	35.0	1.0234	000
100	50	17.5	35.0	1.0234	000
100	60	17.0	35.0	1.0234	000
100	70	16.5	35.0	1.0234	000
100	80	16.0	35.0	1.0234	000
100	90	15.5	35.0	1.0234	000
100	100	15.0	35.0	1.0234	000
100	110	14.5	35.0	1.0234	000
100	120	14.0	35.0	1.0234	000
100	130	13.5	35.0	1.0234	000
100	140	13.0	35.0	1.0234	000
100	150	12.5	35.0	1.0234	000
100	160	12.0	35.0	1.0234	000
100	170	11.5	35.0	1.0234	000
100	180	11.0	35.0	1.0234	000
100	190	10.5	35.0	1.0234	000
100	200	10.0	35.0	1.0234	000
100	210	9.5	35.0	1.0234	000
100	220	9.0	35.0	1.0234	000
100	230	8.5	35.0	1.0234	000
100	240	8.0	35.0	1.0234	000
100	250	7.5	35.0	1.0234	000
100	260	7.0	35.0	1.0234	000
100	270	6.5	35.0	1.0234	000
100	280	6.0	35.0	1.0234	000
100	290	5.5	35.0	1.0234	000
100	300	5.0	35.0	1.0234	000
100	310	4.5	35.0	1.0234	000
100	320	4.0	35.0	1.0234	000
100	330	3.5	35.0	1.0234	000
100	340	3.0	35.0	1.0234	000
100	350	2.5	35.0	1.0234	000
100	360	2.0	35.0	1.0234	000
100	370	1.5	35.0	1.0234	000
100	380	1.0	35.0	1.0234	000
100	390	0.5	35.0	1.0234	000
100	400	0.0	35.0	1.0234	000
100	410	0.0	35.0	1.0234	000
100	420	0.0	35.0	1.0234	000
100	430	0.0	35.0	1.0234	000
100	440	0.0	35.0	1.0234	000
100	450	0.0	35.0	1.0234	000
100	460	0.0	35.0	1.0234	000
100	470	0.0	35.0	1.0234	000
100	480	0.0	35.0	1.0234	000
100	490	0.0	35.0	1.0234	000
100	500	0.0	35.0	1.0234	000
100	510	0.0	35.0	1.0234	000
100	520	0.0	35.0	1.0234	000
100	530	0.0	35.0	1.0234	000
100	540	0.0	35.0	1.0234	000
100	550	0.0	35.0	1.0234	000
100	560	0.0	35.0	1.0234	000
100	570	0.0	35.0	1.0234	000
100	580	0.0	35.0	1.0234	000
100	590	0.0	35.0	1.0234	000
100	600	0.0	35.0	1.0234	000
100	610	0.0	35.0	1.0234	000
100	620	0.0	35.0	1.0234	000
100	630	0.0	35.0	1.0234	000
100	640	0.0	35.0	1.0234	000
100	650	0.0	35.0	1.0234	000
100	660	0.0	35.0	1.0234	000
100	670	0.0	35.0	1.0234	000
100	680	0.0	35.0	1.0234	000
100	690	0.0	35.0	1.0234	000
100	700	0.0	35.0	1.0234	000
100	710	0.0	35.0	1.0234	000
100	720	0.0	35.0	1.0234	000
100	730	0.0	35.0	1.0234	000
100	740	0.0	35.0	1.0234	000
100	750	0.0	35.0	1.0234	000
100	760	0.0	35.0	1.0234	000
100	770	0.0	35.0	1.0234	000
100	780	0.0	35.0	1.0234	000
100	790	0.0	35.0	1.0234	000
100	800	0.0	35.0	1.0234	000
100	810	0.0	35.0	1.0234	000
100	820	0.0	35.0	1.0234	000
100	830	0.0	35.0	1.0234	000
100	840	0.0	35.0	1.0234	000
100	850	0.0	35.0	1.0234	000
100	860	0.0	35.0	1.0234	000
100	870	0.0	35.0	1.0234	000
100	880	0.0	35.0	1.0234	000
100	890	0.0	35.0	1.0234	000
100	900	0.0	35.0	1.0234	000
100	910	0.0	35.0	1.0234	000
100	920	0.0	35.0	1.0234	000
100	930	0.0	35.0	1.0234	000
100	940	0.0	35.0	1.0234	000
100	950	0.0	35.0	1.0234	000
100	960	0.0	35.0	1.0234	000
100	970	0.0	35.0	1.0234	000
100	980	0.0	35.0	1.0234	000
100	990	0.0	35.0	1.0234	000
100	1000	0.0	35.0	1.0234	000

Table 23.--Miscellaneous products timber drain in the Lake States
(5-year average 1945-49)

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole- timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
White pine.....	750	220	750	150	70
Minnesota.....	250	70	250	50	20
Wisconsin.....	190	70	190	40	30
Michigan.....	310	80	310	60	20
Red pine.....	410	110	410	80	30
Minnesota.....	200	50	200	40	10
Wisconsin.....	50	20	50	10	10
Michigan.....	160	40	160	30	10
Jack pine.....	950	270	950	190	80
Minnesota.....	390	110	390	80	30
Wisconsin.....	140	50	140	30	20
Michigan.....	420	110	420	80	30
Spruce.....	250	70	250	50	20
Minnesota.....	100	30	100	20	10
Wisconsin.....	50	10	50	10	..
Michigan.....	100	30	100	20	10
Balsam.....	660	180	660	130	50
Minnesota.....	250	70	250	50	20
Wisconsin.....	50	20	50	10	10
Michigan.....	360	90	360	70	20
Tamarack.....	250	70	250	50	20
Minnesota.....	100	30	100	20	10
Wisconsin.....	50	10	50	10	..
Michigan.....	100	30	100	20	10
Cedar.....	1,420	760	1,420	340	420
Minnesota.....	340	100	340	70	30
Wisconsin.....	580	210	580	120	90
Michigan.....	500	450	500	150	300
Hemlock.....	150	50	150	30	20
Minnesota.....	..	..	..	..	..
Wisconsin.....	50	20	50	10	10
Michigan.....	100	30	100	20	10
Softwood total.....	4,840	1,730	4,840	1,020	710
Minnesota.....	1,630	460	1,630	330	130
Wisconsin.....	1,160	410	1,160	240	170
Michigan.....	2,050	860	2,050	450	410

$\frac{1}{2} \left(\frac{1}{2} \right) = \frac{1}{4}$

Table 23.--Miscellaneous products timber drain in the Lake States
(5-year average 1945-49)--continued

Species and origin	Net timber drain, by size class				
	Total		Saw-timber trees		Pole- timber trees
	M bd.ft.	M cu.ft.	M bd.ft.	M cu.ft.	M cu.ft.
Maple.....	2,080	520	2,080	400	120
Minnesota.....	..	..	..	..	..
Wisconsin.....	410	130	410	90	40
Michigan.....	1,670	390	1,670	310	80
Birch.....	1,540	310	1,540	290	20
Minnesota.....	1,350	260	1,350	250	10
Wisconsin.....	140	40	140	30	10
Michigan.....	50	10	50	10	..
Basswood.....	940	220	940	190	30
Minnesota.....	530	100	530	100	..
Wisconsin.....	320	100	320	70	30
Michigan.....	90	20	90	20	..
Elm.....	430	100	430	80	20
Minnesota.....	..	..	..	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	430	100	430	80	20
Beech.....	2,890	800	2,890	640	160
Minnesota.....	..	..	..	..	..
Wisconsin.....	..	..	..	..	..
Michigan.....	2,890	800	2,890	640	160
Oak.....	510	120	510	100	20
Minnesota.....	50	10	50	10	..
Wisconsin.....	30	10	30	10	..
Michigan.....	430	100	430	80	20
Aspen.....	5,300	2,190	5,300	1,300	890
Minnesota.....	4,240	1,440	4,240	1,080	360
Wisconsin.....	360	540	360	90	450
Michigan.....	700	210	700	130	80
Miscellaneous.....	390	100	390	80	20
Minnesota.....	..	..	..	..	..
Wisconsin.....	70	30	70	20	10
Michigan.....	320	70	320	60	10
Hardwood total.....	14,080	4,360	14,080	3,080	1,280
Minnesota.....	6,170	1,810	6,170	1,440	370
Wisconsin.....	1,330	850	1,330	310	540
Michigan.....	6,580	1,700	6,580	1,330	370
All species.....	18,920	6,090	18,920	4,100	1,990
Minnesota.....	7,800	2,270	7,800	1,770	500
Wisconsin.....	2,490	1,260	2,490	550	710
Michigan.....	8,630	2,560	8,630	1,780	780

Handwritten mathematical notes on a grid background, featuring various equations and derivations. The text is written in a cursive script and includes several sections of calculations, some with headings like "PROBLEM" and "SOLUTION".

Key sections and equations include:

- PROBLEM 1:**
$$x^2 + y^2 = r^2$$
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 2:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 3:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 4:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 5:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 6:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 7:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 8:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 9:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$
- PROBLEM 10:**
$$\frac{d}{dt}(x^2 + y^2) = \frac{d}{dt}r^2$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2r \frac{dr}{dt}$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = r \frac{dr}{dt}$$

Table 24.--Total timber drain in the Lake States--1948
(continued)

Species and origin	Net timber drain, by size class				Net timber drain, by size class			
	Total	Saw-timber trees	Pole- timber trees	Species and origin	Total	Saw-timber trees	Pole- timber trees	Total
	bd.ft.:M cu.ft.:M	bd.ft.:M cu.ft.:M	bd.ft.:M cu.ft.:M		bd.ft.:M cu.ft.:M	bd.ft.:M cu.ft.:M	bd.ft.:M cu.ft.:M	bd.ft.:M cu.ft.:M
Maple.....	302,290	90,565	302,290	75,005	15,560:Oak.....	158,170	77,785	158,170
Minnesota	3,410	1,415	3,410	950	465: Minnesota...	21,355	12,430	21,355
Wisconsin	74,430	23,275	74,430	18,740	4,535: Wisconsin...	89,045	41,310	89,045
Michigan	224,450	65,875	224,450	55,315	10,560: Michigan...	47,770	24,045	47,770
Birch.....	113,035	35,845	113,755	28,300	7,545:Aspen.....	133,750	147,040	136,750
Minnesota	2,775	3,390	7,775	2,415	975: Minnesota...	68,030	58,325	68,030
Wisconsin	27,290	9,960	27,290	7,120	2,840: Wisconsin...	36,240	48,190	36,240
Michigan	76,690	22,495	78,690	18,765	3,730: Michigan...	32,480	40,525	32,480
Basswood....	64,025	19,660	64,025	15,905	3,755:Cottonwood....	11,325	3,325	11,325
Minnesota	14,730	5,230	14,730	4,010	1,270: Minnesota...	6,795	2,105	6,795
Wisconsin	26,515	7,305	26,515	6,325	1,280: Wisconsin...	1,620	430	1,620
Michigan	22,780	6,775	22,780	5,570	1,205: Michigan...	2,910	790	2,910
Elm.....	97,375	34,245	97,375	25,985	8,260:Miscellaneous.	39,190	15,860	39,190
Minnesota	19,170	7,580	19,170	5,650	1,930: Minnesota...	9,310	4,880	9,310
Wisconsin	33,455	10,605	33,455	8,360	2,245: Wisconsin...	13,650	5,170	13,650
Michigan	44,750	16,060	44,750	11,975	4,085: Michigan...	16,230	5,810	16,230
Beech.....	39,730	10,900	39,730	9,335	1,565:Hardwood total	962,610	435,225	962,610
Minnesota	...	...	...	...	..: Minnesota...	150,575	95,405	150,575
Wisconsin	960	350	960	270	80: Wisconsin...	303,205	146,895	303,205
Michigan	38,770	10,550	38,770	9,065	1,485: Michigan...	508,830	192,925	508,830
					:All species...	1,458,215	674,880	1,458,215
					: Minnesota...	261,115	134,590	261,115
					: Wisconsin...	438,000	207,175	438,000
					: Michigan...	759,100	283,115	759,100

NOTE - Miscellaneous species:				Yellow-poplar		Other	
Miscellaneous species:	(percent)	Ash	Cherry	Hickory	Walnut		
						59	
						31	
						31