RESEARCH NOTE NC-2

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55101

Pulpwood Chip Production and Markets in the Lake States

As a major pulp and paper production area, the Lake States is a potential market for pulpwood chips. As a producer of solid wood products, it has a considerable potential for the production of pulpwood chips from coarse sawmill residues (slabs, edgings, and trim) and other sources. Only a small amount of the available residues, however, is now being utilized. In response to numerous inquiries about pulp chips and sawmill residues, a study was begun on their production and marketing as well as any problem aspects that might require additional research. This Note is a preliminary report.

Utilization of wood chips from sawmills for the manufacture of pulp and paper requires that they be relatively free of bark.[1] Barking equipment is now at a cost level that justifies its use at many Lake States sawmills. Under some circumstances and in some locations, the cost of chipping equipment and accessories has declined enough to make their use feasible. This situation is responsible for a relatively recent increase in chip production. Even so, sawmill residues still supply only 5 percent of pulpwood requirements in the Lake States compared with 17 percent in the South.

Present Status of Chip Production

In mid 1965, sawmills with chipping equipment numbered 35 in the Lake States—18 in Michigan, 15 in Wisconsin, and 2 in Minnesota (fig. 1). Four chippers not at sawmills also produce pulp chips from residues of pallet, box, and veneer manufacturers. In addition, two nonintegrated chipping operations concentrate sawmill residues and roundwood. A few of the sawmills concentrate and chip bark-free residues from other mills as well as from their own. Bark removal equipment is used by 87 sawmills in the Lake States.

Railroad and trucking facilities are available to most sawmills. Sawmill residues, however, must be in sufficient volumes to make their transportation as chips or coarse residue to a pulpmill economically feasible. Although most residue is being transported less than 100 miles, some is moving as far as 300 miles.

Marketing

Sawmill residues are sold to pulpmills, other sawmills, or other plants with chipping facilities. Nine pulpmills in the Lake States purchased chips or slabs in 1965. A small volume of chips, including some chips with bark which are used to make roofing felt or similar products, is shipped to mills in adjacent States.

Although some chips and slabs are purchased by volume, most purchases are made on a weight basis using the ton (2,000 pounds) as the pricing unit. This may be either a green ton or its moisture-free equivalent, but the trend appears to be toward the latter. Occasionally chips are also purchased by the unit, which may be 2,400 pounds (1.2 tons) or some other weight specified by the purchaser.

The relationship of green and "dry" chip prices at various moisture contents is shown in figure 2. As an example, a green ton price of $7.00 at a moisture content of 35 percent of total weight is equivalent to a dry-ton price of $10.77. Using a lumberman's moisture measurement basis (dry wood equals 100 percent), this same material would have a moisture content of 54 percent. If a sawmill operator's moisture meter indicates his slabs have 25-percent moisture, this is equivalent to 20 percent based on the total weight used by pulpmills.

[1] *Allowable percent of bark depends upon the type of paper or pulp produced. It is generally 1 to 3 percent but may be 5 percent or more for products such as roofing felt.*

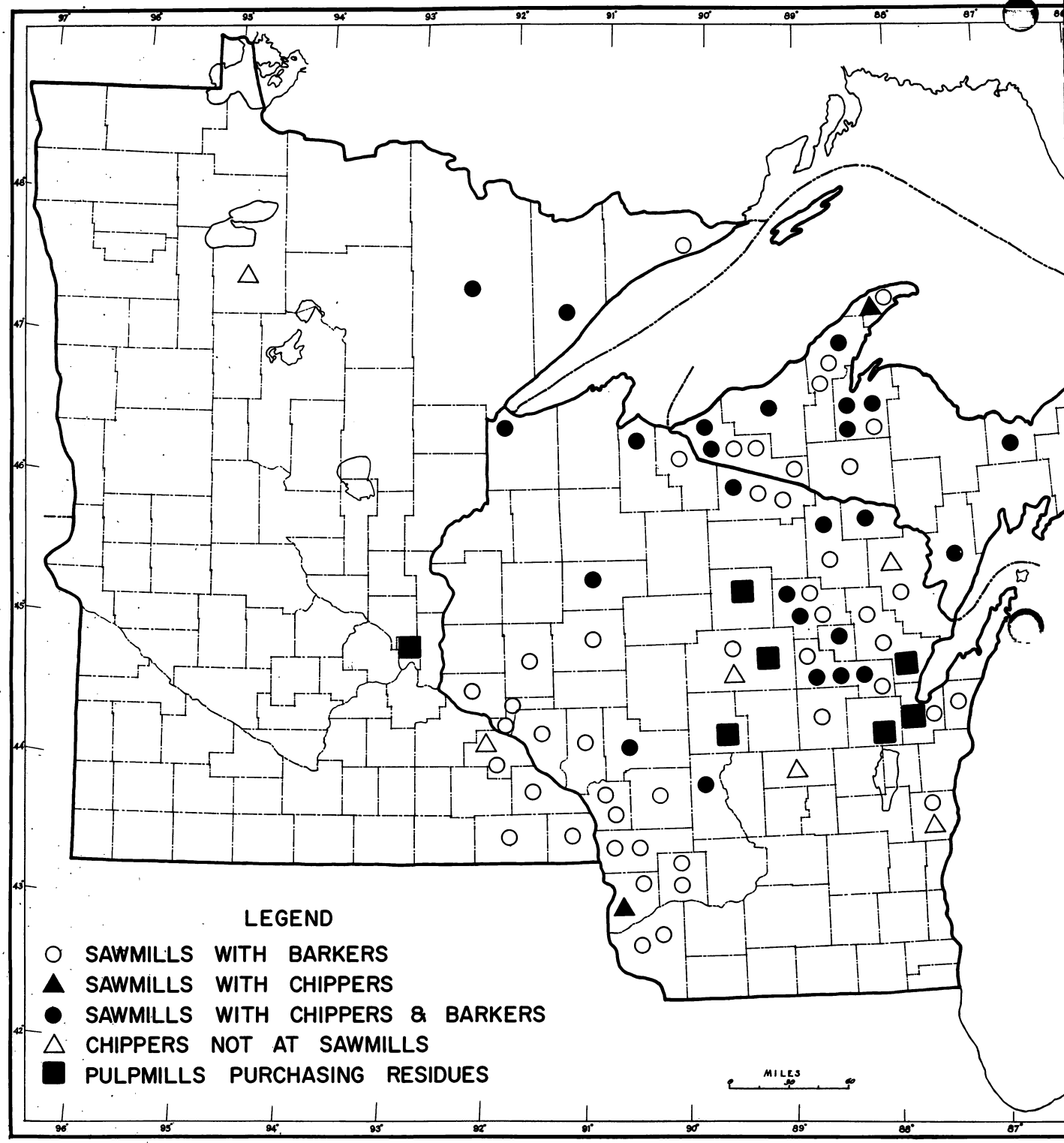
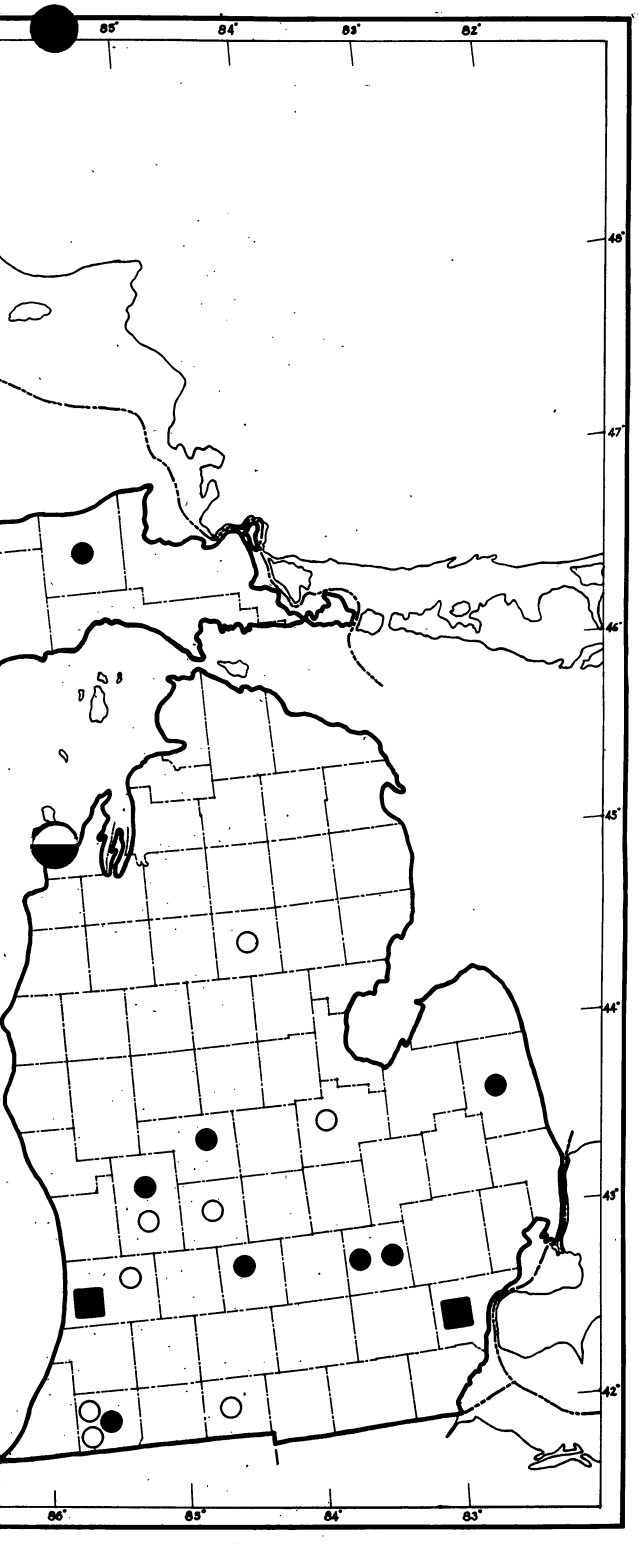


Figure 1.—Location of (1) plants converting residues to chips for pulpmills and mills purchasing pulpable residues, 1965.



(2) pulp-

Delivered prices (1965) in the Lake States for hardwood slabs vary from about $3.50 to $4.50 per green ton and $7.00 to $7.50 per dry ton. Hardwood and aspen chip prices vary from $7.00 to $9.00 per green ton and $14.50 to $16.80 per dry ton. Softwood prices are slightly higher and vary according to species.

Wood Recovery

The yield of chippable residue produced by sawmills is influenced by many factors including the nature of raw materials, end product sawn, equipment used, and management policy. Variations in these factors result in yields ranging from approximately 0.95 to 1.75 green tons per 1,000 board feet of lumber produced.

The amount of chips produced at sawmills can be increased by bringing in or purchasing top bolts, logs below lumber grade, or pulpwood. At this time, however, data are insufficient to permit generalizing on economic conditions favoring or limiting this practice. Major factors to be considered are raw material costs, distance to market, processing costs, and market price.

On the basis of the 1964 lumber production in the Lake States, it is estimated that sawmill residues probably could supply up to about three times the current production of chips. Residues from veneer plants, pallet plants, and related industries could increase this volume. Average annual unused residues between 1958 and 1962 at plants in the Lake States are shown in table 1, and average annual volumes produced in that same period are shown in table 2. Some of the residues shown as used and unused at the time of the survey in 1962 are currently being used for pulp chips.

EUGENE W. FOBES
Forest Products Technologist

July 1966

FLOYD M. HOVARTER
Wood Utilization Specialist
Wisconsin Conservation Department

(See next page for fig. 2 and tables)

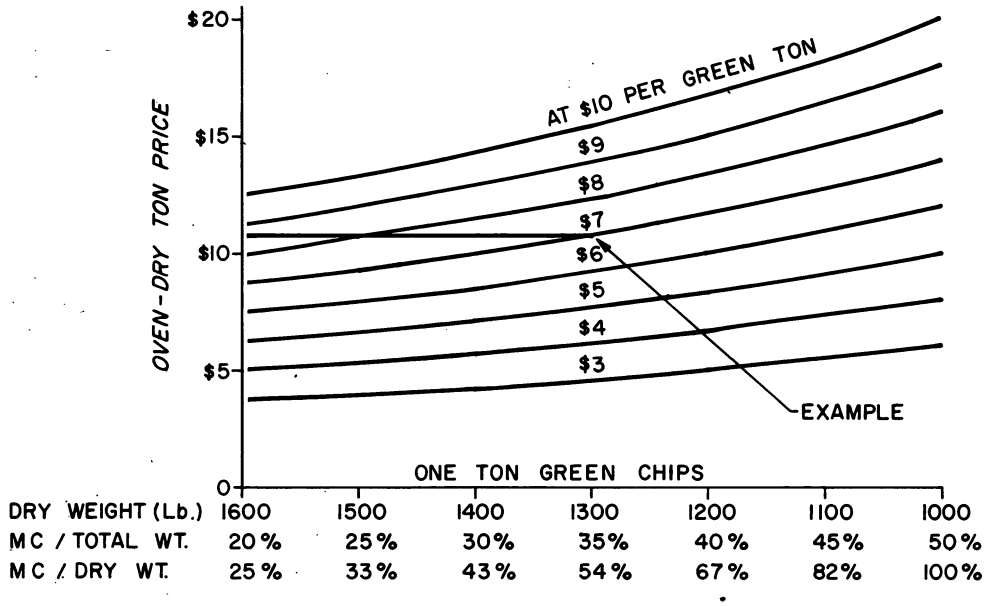


Figure 2.—Comparison of the prices of green wood vs. oven-dry wood. The dry weight of a ton of green wood varies according to species and length of storage. MC=moisture content. MC/total wt. is the pulpmills' moisture measurement basis. MC/dry wt. is the lumberman's moisture measurement basis.

Table 1.—Average annual volume of unused plant residues of softwoods and hardwoods by industrial source and type of residue, Lake States, 1958-62

(In thousand cubic feet)

Species and character of residues	Industrial source			
	Lumber	Veneer	Other primary industries	All industries
All species	28,490	130	445	29,065
Coarse[1]	10,980	20	160	11,160
Fine[2]	17,510	110	285	17,905
Softwoods	9,900	--	70	9,970
Coarse[1]	4,070	--	45	4,115
Fine[2]	5,830	--	25	5,855
Hardwoods	18,590	130	375	19,095
Coarse[1]	6,910	20	115	7,045
Fine[2]	11,680	110	260	12,050

Source: Unpublished data on file at the North Central Forest Experiment Station.

1/ Slabs, edgings, veneer cores, etc.
2/ Sawdust, shavings, veneer clippings, etc.

Table 2.—Average annual volume of all plant residues of softwoods and hardwoods by industrial source and type of residue, Lake States, 1958-62.

(In thousand cubic feet)

Species and character of residues	Industrial source			
	Lumber	Veneer	Other primary industries	All industries
All species	56,300	5,550	2,250	64,100
Coarse[1]	29,900	2,190	1,110	33,200
Fine[2]	26,400	3,360	1,140	30,900
Softwoods	16,750	--	200	16,950
Coarse[1]	9,000	--	110	9,110
Fine[2]	7,750	--	90	7,840
Hardwoods	39,550	5,550	2,050	47,150
Coarse[1]	20,900	2,190	1,000	24,090
Fine[2]	18,650	3,360	1,050	23,060

Source: Unpublished data on file at the North Central Forest Experiment Station

1/ Slabs, edgings, veneer cores, etc.
2/ Sawdust, shavings, veneer clippings, etc.