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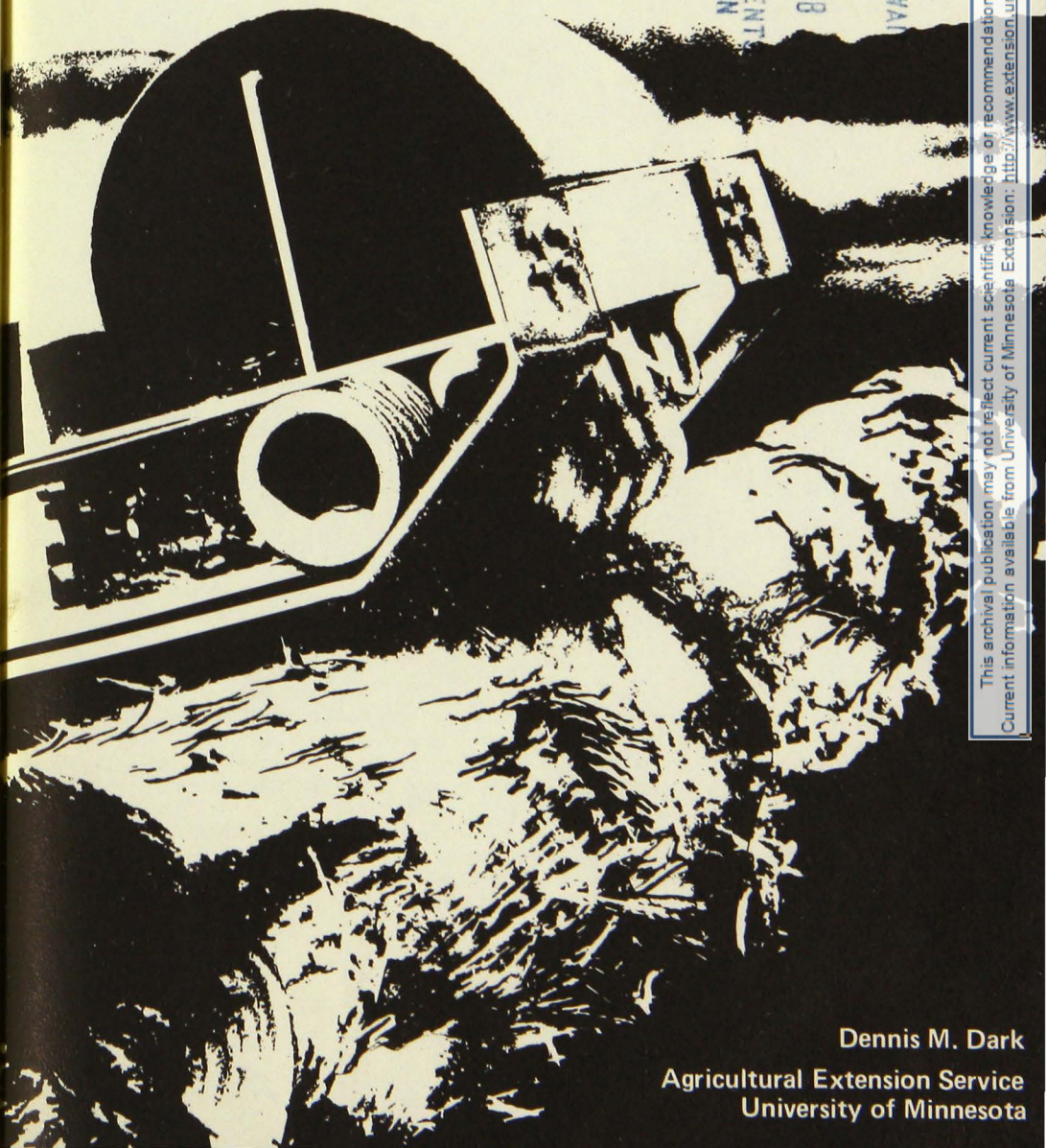

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Utilizing Diseased Elm in Minnesota

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Dutch elm disease was first identified in Minnesota in 1961. Because of the elm bark beetle, it has since spread throughout much of the state. Though there are still many elm trees standing, it is anticipated that most of these could be dead within ten to fifteen years.

Presently many of the trees being removed are taken to disposal sites and either burned or used as landfill. And, while this is an acceptable way of dealing with diseased elm, it leaves communities with little to show for their time and expense. However, there are alternatives. Diseased elm wood could be a valuable resource for a number of different wood industries. By finding outlets for the removed trees, communities may be able to recoup some of the cost of elm disposal efforts.

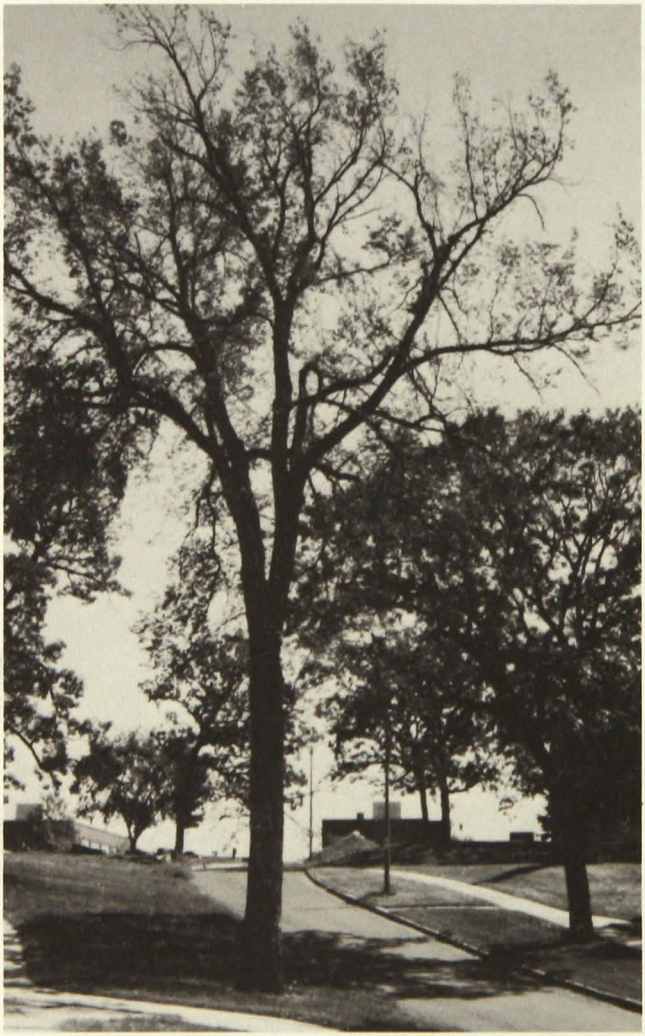


Figure 1. The American elm *(Ulmus americana)* is an abundant species in the cities and riverbottoms of Minnesota.

Figure 2. A relatively large amount of elm wood is being burned or landfilled.

Figure 3. If present trends continue, most elms will be removed in 10 to 15 years with little regard to their value.

Elm Wood Characteristics

Elm wood has several characteristics and mechanical properties which are important in determining its end use. It has a large amount of figure and a color and texture that give it an attractive appearance. The grain can be either straight or interlocking. Interlocking grain makes wood difficult to split and often causes excessive warping during drying.

Elm is relatively weak in endwise compression, and thus does not compare favorably with other species of wood when used as a structural column. It is moderately hard and has average nail-holding ability. In addition, it has a relatively high toughness and shock resistence rating. This means that it can be used under large impact loads with satisfactory results. Elm also lends itself well to bending without breaking.

Elm Tree Products

Four basic products may be produced from an elm tree; sawlogs, veneer logs, roundwood for chipped or mulched products, and fuelwood. These can be processed into more familiar and complex forms through additional milling. Products which may be manufactured from elm include: cooperage, boxes, crates, container veneer, standard veneer, paneling, furniture stock, vehicle parts, dairy, apiary, and poultry supplies, interior trim and molding, agricultural implements, lumber, railroad ties, pulp, mulch, animal bedding, poultry litter, hogged fuel, and chips.

Figure 4. Elm may be processed into several solid wood products, such as lumber.

Basic Log Specifications

Logs used in the lumber and veneer industries must meet certain specifications. Factors which determine log quality include: position in the tree, length, number of defects, diameter, taper, sweep, crook, and volume of usable wood. The best logs usually go into the manufacture of veneer, while those of slightly lower quality are processed into lumber. Low quality logs can be used in the production of chips or other "non-solid" wood products. Logs of all types must be free of dirt, grit, and metal so they can be processed with a minimal amount of wear on equipment. More information about elm log classification may be found in Minnesota Tree Line No. 11, "Basic Specifications for Elm Sawlogs."

Solid Wood Products

Three basic types of ties can be produced from sawlogs. They include landscaping timbers, architectural timbers, and railroad ties. Appearance is the most important consideration for landscaping and architectural timbers. However, they must also be sound and treated with a wood preservative if they are to be used in contact with the ground.

The most important specification used in railroad tie evaluation is size. There are five railroad ties sizes. All must be 8½ feet in length (switch ties and bridge ties are often longer), but they may vary in width from 6 to 9 inches and in thickness from 6 to 7 inches. Railroad ties must not have excessively large defects due to rot, ring shake, or end checks. Ties with large defects are unacceptable for use as railroad ties because they break up quickly and must be replaced before they have paid for themselves.

Lumber is produced from elm sawlogs. Although elm lumber should be graded according to national hardwood lumber grading rules, most is sold ungraded. These rules utilize different wood characteristics to separate lumber into several grades. Characteristics included are: length, width, amount of defect free material, amount of pitch, amount of wane, size of defects, and the number of defects within each piece. The grade of elm lumber is important and determines whether it will be used for the manufacture of pallets, cabinets, flooring, rough structures, store fixtures, crates, boxes, furniture, trim, molding, or other millwork.

Elm sawlogs may also be used to produce cooperage for the manufacture of wooden barrels. The most common form of elm cooperage is slack cooperage. Slack barrels are used for packaging, shipping, and storing dry products such as flour and nails. Elm logs which are not long enough to fall into the sawlog or veneer classification are also sometimes used to produce slack cooperage.

Figure 5. Most bark-off chip users require that the chips be of a certain width, length and thickness.

Veneer Products

Better quality elm logs are often used for veneers which may be used to manufacture several types of plywood, such as decorative paneling. Veneer logs should be at least 10 inches in diameter, 8½ feet long, straight, free of heart rot and ring shake, and have very little taper. Veneers should be graded according to grades developed by various plywood trade organizations. The elm veneer market is severely limited in Minnesota because of a lack of face veneer mills and an abundance of other species.

Figure 6. Elm which has been processed into bark-on chips

Products Manufactured From Other Roundwood

Various forms of elm roundwood can be used to manufacture chips. These are divided into two classes, bark-on chips and bark-off chips. Bark-on chips usually contain much more dirt and grit than bark-off chips, and this adds to the problems and costs of manufacturing. Therefore, bark-on chips are less desirable for fiber products than bark-off chips.

Chips must meet certain size specifications, depending on the fiber product in which they are to be used. Most industries using chips require that the chips be of uniform width, thickness and length. Buyers of bark-off chips also require that chip contaminants be limited to from 1 percent to 3 percent of the total weight of a load of chips. Chips can be used in the production of pulp, paper or various forms of particleboard. However, there are not nearly enough manufacturers in Minnesota at present to consume all of the chips which could be potentially produced in the state.

Animal bedding, poultry litter, and mulch may also be produced from various forms of round

Figure 7. Bark-on chips and bark pellets make good wood fuel.

wood. These products must meet certain size specifications required by purchasers.

Elm sawing and milling residues are sold as sawdust and fines, both of which must meet two specifications. The most important is that they be dried to the buyer's specifications upon delivery. They must also pass through either a $^{3}/_{16}$-inch mesh or a $^{5}/_{32}$-inch mesh, depending upon the final product. Elm sawdust and fines are used for animal bedding and sweeping compound.

Fuelwood Products

Fuel chips, firewood, and pelletized fuel are other possible items that can be made from elm roundwood. In fact, there are many indications that fuelwood production could be a major outlet for diseased elm. Specific end uses for these wood fuel products will depend on the type of burning unit available. Most industrial users want chips or pellets of uniform size which are at least partially dried. Residential users, on the other hand, require firewood which will fit into their particular fireplace or stove. Such firewood should be debarked and dried to a moisture content of 15 percent to 25 percent before it is used.

Figure 8. To avoid spreading Dutch elm disease, firewood must be debarked before it can be stacked and dried.

Current Prices For Basic Elm Wood Products

A summary of product prices for familiar elm products can be found in Minnesota Tree Line No. 10, "The Portable Bandmill, A Means of Sawing Diseased Elm and Oak." However, these prices are sub-

ject to change periodically. A good way to keep up with these changes is by reading the "Hardwood Market Report." This report is published weekly by Abe Lernsky, P.O. Box 4042, 28 North Cleveland, Memphis, Tennessee 38104.

A more localized listing of elm prices can be found in the "Wisconsin Forest Products Price Review," available free by writing to: Extension Forester, Department of Forestry, 1630 Linden Drive, University of Wisconsin, Madison, Wisconsin 53706.

Deterrents To Marketing

Many people mistakenly believe that Dutch elm disease adversely affects elm wood. However, the Dutch elm disease itself does not structurally damage the wood. The real problem is created by rotting organisms which can invade a diseased elm as soon as six months after its death. Before a marketing program for elm materials can be successful, potential buyers need to be aware of these facts.

Another factor which may deter marketability is discoloration of diseased elm wood. This may be caused by the Dutch elm disease fungus, incipient decay or metal in the wood. Most buyers of high quality logs specify that they be relatively free from discoloration.

Storage of diseased elm wood is frequently a significant problem. Trees identified as having the disease must be removed within 5 to 30 days after discovery between April 15 and September 15. Dur-

Figure 9. Diseased elm cannot be stored with bark on between April 1 and September 15.

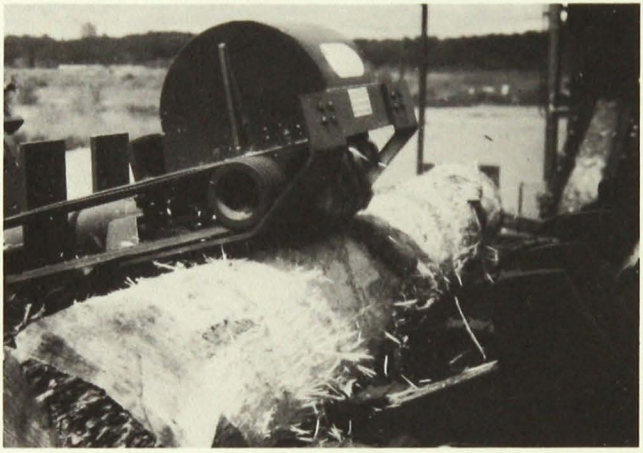


Figure 10. Debarking elm logs is one way to get around the storage problem.

ing this same period, wood from these trees may not be stored unless it has been debarked, and elm logs with bark-on must be processed immediately if they are to be utilized within this time. Between April 1 and September 15 mill operators cannot stockpile logs which have not been debarked. This could present problems because it might mean that operators would have a surplus of logs with bark on which must be disposed of immediately one day, and a lack of logs the next. To operate efficiently mill operators will have to have a steady stream of debarked logs flowing into the mills.

The presence of metal in elm logs may pose problems to processors. It could cause many equipment breakdowns and increased repair or maintenance time. For this reason, many mill operators are unwilling to process diseased elm.

Elm lumber is relatively difficult to dry, because of problems associated with its twisted grain. Therefore, kiln operators must take precautions to successfully kiln dry this wood. Other species are easier to dry and are often preferred by kiln operators. However, kiln drying elm lumber can be very profitable. More information about drying elm can be found in Minnesota Tree Line No. 9, "Drying Elm Lumber."

Many elm trees being removed are cut into smaller segments without regard to size or shape. As a result, branches are mixed with sawlogs and both are mixed with brush after felling. This assortment is then indiscriminately loaded on to trucks and

shipped to a disposal site. Shipping this mixed material results in higher costs at the processing site.

Adding to this, much of the elm wood removed is located in urban areas where shipping costs are already substantial. Higher urban transportation costs are mainly due to stop-and-go driving and the long distances to disposal sites. A final factor adding to cost is that some municipalities have ordinances which prohibit the transportation of diseased elm materials through their area. Because of this, a trucker often cannot take a direct route to a disposal site, and extra costs are incurred.

Probably the most critical deterrent to marketing elm wood is that a great majority of the diseased wood does not meet the specifications of various

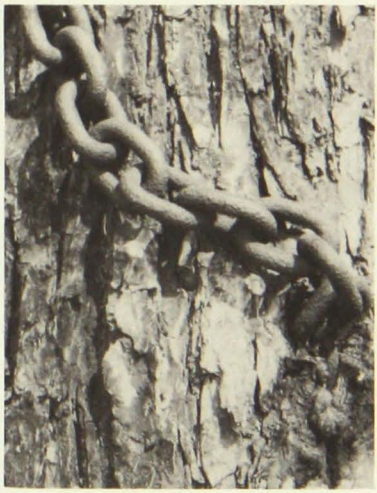


Figure 11. Metal, which is common in urban elm logs, will cause equipment breakdowns.

Figure 12. Logs must be sorted from brush so processors can handle them efficiently.

processors. For instance, one requirement is that sawlogs should be about 8 to 14 feet in length with a 6-inch trim allowance. However, trees with potential sawlogs are often bucked into lengths less than 8 feet because it makes the logs easier for a tree removal company to handle. Logging contractors will have to cut elm wood in a manner which will allow various product manufactures to utilize the wood efficiently.

The amount of elm wood that will be removed over the next few years is very large, and it will be removed in a relatively short period of time. These two factors have already led to problems in handling all of the diseased elm being cut and removed. Some of the processors trying to utilize elm have been overwhelmed with the quantity of raw materials and are finding it hard to meet storage requirements. They do not have enough equipment to process these large amounts. The problem is especially severe in handling brush. Furthermore, the form in which a great deal of diseased elm wood is received causes processors to utilize their equipment inefficiently.

Even if processors had enough equipment to handle the available resource, they might still find it hard to sell their products. There are two reasons for this. First, the total market (including other species of wood) for some products such as bark-off chips is currently smaller in volume than the amount that is presently produced from elm wood. Second, there has been little effort to identify the size and needs of markets in Minnesota which can use elm wood. And, if these markets were identified, there is still the question of how this vast amount of material will affect them. Chances are that flooding these markets with elm could severely reduce product prices.

Most investors view all of this quite negatively. The initial investment for equipment which could effectively process diseased elm wood is very large. The risk associated with operating this equipment, processing the wood and selling a product is very high. And, the rate of return they can expect from their operations is very low. As a result, people have been reluctant to invest in equipment for processing diseased elm wood.

Potential Solutions

There are many things which could be done to help solve the problems associated with the disposal of diseased elm wood. The items mentioned

below are offered to generate thought about elm removal and utilization. However, it should be pointed out that though more efficient utilization and disposal might reduce removal and disposal costs, it cannot eliminate them.

One of the most critical components of a Dutch elm disease program is public education. The public needs to be fully informed about such things as potential uses of elm wood, and the common misconceptions about the quality of diseased wood. And, even more important, they should understand how utilization of diseased elm wood and the sale of products manufactured from elm could reduce the cost of removal programs.

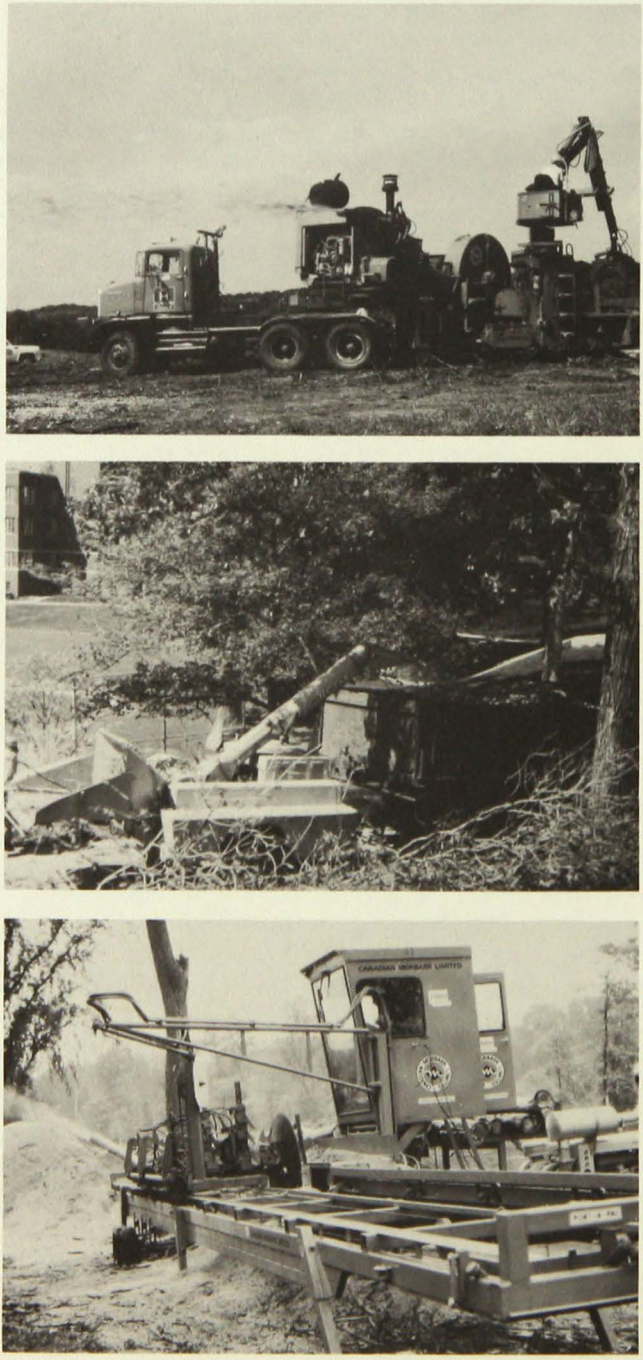
Diseased elm logs which have been debarked must be allowed to be stored throughout the year. Isolated locations may be designated as low risk areas for storage of logs with bark intact. This may be required during years when losses are at a peak. The best solution, however, is to debark elm logs.

Investments in needed equipment and facilities must be encouraged. For example, metal detectors will help reduce the metal problems, and chippers will make brush handling and processing easier. Consultants might also be retained to make recommendations for more effective and efficient machinery and facilities which would make utilization operations more profitable. In many cases, the necessary investments can be subsidized through government grant programs or tax incentives. Local and state governments might purchase needed equipment and lease it to raw material processors who would be willing to buy diseased elm wood.

To overcome the problems of meeting the specifications of wood processors, contracts for local diseased elm removal should include cutting specifications such as bucking logs into proper lengths. Specifications which call for sorting materials according to size and quality must also be incorporated into removal contracts. In all cases, specifications should be made which coincide with the requirements of wood products buyers.

In addition, it is necessary to identify and reach potential elm markets. A list of Minnesota sawmills that reported sawing elm in 1971 is included in the Appendix. Specific wood requirements of cabinet, pallet, furniture, container, lumber, veneer, plywood, mobile home and tie manufactures should be investigated before an effective marketing program can be developed.

Figure 13. Wood processing equipment such as portable chippers, which are especially suited to handling large branches and brush (top and middle) or sawmills for handling logs (bottom) is important.



APPENDIX

SAWMILLS THAT REPORTED SAWING ELM IN MINNESOTA DURING 1971*

Aitkin County

Albert Danielson
McGrath, MN 56350

Albert Erickson
Isle, MN 56342

John Erickson
Aitkin, MN 56431

John Holm
Palisade, MN 56469

Lakeside Mfg. Company
McGregor, MN 55760

Northern Timber Company
Aitkin, MN 56431

Levi Packer
Palisade, MN 56469

Richard Demenge Mill
McGregor, MN 55760

Clayton Telander
Mora, MN 55051

Curtis Weston
Palisade, MN 56469

Younghann Supply Company
Palisade, MN 56469

Richard Zantow
Isle, MN 56342

O'Neil Lumber Company
Aitkin, MN 56431

Anoka County

Pioneer Wood Products
Anoka, MN 55303

Lester Thomson
Bethel, MN 55055

Beltrami County

Dickinson Lumber Company
Bemidji, MN 56601

Gregg Builders Supply
Bemidji, MN 56601

Midway Lumber Company
Hines, MN 56647

Sherwin Sax
Grygla, MN 56727

Turtle River Sawmill
Bemidji, MN 56601

Blue Earth County

Delphi Urban Sawmill
Vernon Center, MN 56090

Carlton County

Arnold Semereau
Holyoke, MN 55749

Carver County

N. Vanderlinde Sawmill
Watertown, MN 55749

Cass County

Alfred Retka
Prairie, MN 56347

Tobiason Bros. Lumber
Remer, MN 56672

Harris Enterprises
Harris, MN 56672

Chisago County

Alan B. Wilcox
Harris, MN 55032

**Taken from a list compiled by the U.S. Forest Service in cooperation with the Minnesota D.N.R.*

Clearwater County

Larson Lumber Company
Bagley, MN 56621

Martin Lumber Company
Shevlin, MN 56675

Crow Wing County

Cross Lake Wood Products
Cross Lake, MN

Palmer Mill
Emily, MN 56447

Park Region Timber Company
Brainerd, MN 56401

Schilling Sawmill
Brainerd, MN 56401

Douglas County

Holme City Feed Mill
Alexandria, MN 56308

Lloyd Larson
Alexandria, MN 56308

Fillmore County

Milton Gerard
Mabel, MN 55954

Root River Hardwoods
Preston, MN 55965

Harland Vande Zande
Whalen, MN 55986

Freeborn County

T. M. Ruble
Oakland, MN 56076

Goodhue County

Dean Poe
Cannon Falls, MN 55009

Hennepin County

Alex Reiser Sawmill
Wayzata, MN 55391

Johnson Brothers Sawmill
Watertown, MN 55388

Houston County

Frey Forest Products
LaCrescent, MN 55947

Northwest Tie Company
Spring Grove, MN 55974

Harold Rosendahl
Spring Grove, MN

Isanti County

Oliver Anderson
Stanchfield, MN

Lyman Hull
Cambridge, MN 55008

Itasca County

Orville Nestbers
Alvwood, MN 56620

John Nylund
Marcell, MN 56657

Charles A. Peason
Bovey, MN 55709

Rajala Mill
Big Fork, MN 56628

Kanabec County

Gibas-Karg Sawmill
Wahkon, MN 56368

Severn Sawmill
Mora, MN 55051

Kandiyohi County

Clifford Olson
Spicer, MN 56288

Paul Sandeen
New London, MN 56273

Lake County

John Hendrickson
Two Harbors, MN 55616

Le Sueur County

Elmer Lamprecht
New Prague, MN 56071

H & S
Waterville, MN 56096

McLeod County

Hlvaka Sawmill
Silver Lake, MN 55381

Pope Bros. Pallet
Hutchinson, MN 55350

Reinert Pallet
Hutchinson, MN 55350

Mahnomen County

Anderson Lumber Company
Mahnomen, MN 56557

James Snobl
Mahnomen, MN

Meeker County

David Mullykangas
Kimball, MN 55353

Earl Reil
Litchfield, MN 55355

Mille Lacs County

Kenneth Ratzlaff
Princeton, MN 56359

Morrison County

Frank Helmerick
Randall, MN 56475

Arnold Sunquist
Upsala, MN 56384

Olmsted County

Ogengler Lumber Company
Caledonia, MN 55971

Ottertail County

Ellsword Grahn
Vergas, MN 56587

Walter Stewart
Menahga, MN 56464

Pine County

Arrowood, Inc.
Sturgeon Lake, MN 55783

Redwood County

Stanford Anderson
Belview, MN 56214

Rice County

Al Code Sawmill
Northfield, MN 55057

Dundas Sawmill
Dundas, MN 55019

Roseau County

Orlen Eidsmore
Roseau, MN 56751

Frank Glesner
Warroad, MN

St. Louis County

Harlow Johnson
Duluth, MN 55803

Rice Lake Lumber & Pallet
Duluth, MN 55803

Scott County

Jordan Sawmill
Jordan, MN 55352

Lambrecht Sawmill
New Prague, MN 56071

Sibley County

Frandsens
Winthrop, MN 55334

Stearns County

Bell Wood Products
Cold Spring, MN 56320

William Beumer
St. Cloud, MN

Fiedler Brothers
St. Joseph, MN 56374

Ralph Job
Freeport, MN 56331

Lake Region Timber Company
Avon, MN 56310

Frank Pope
Kimball, MN 55353

Richard Stearn
Paynsville, MN 56362

Todd County

John Leirmo
Long Prairie, MN 56347

Wabasha County

A & B Lumber Company
Kellogg, MN 55945

Lloyd Johnson
Kellogg, MN 55945

Wadena County

Minnesota Forest Products
Menahga, MN 56464

Waseca County

Ted Schroeder
Waseca, MN 56093

Wright County

Donald Ebner
Elk River, MN 55330

Elk River Box
Elk River, MN 55330

Dixon Schmidt
Buffalo, MN 55313