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The Timber Industries of Delaware, 1985

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A Periodic Assessment of Timber Output

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Abstract

Over 5 million cubic feet of industrial roundwood were produced from Delaware's timberlands in 1985. This was a decrease from 1970 when production had reached almost 9 million cubic feet. While total production dropped more than 40 percent, sawlog production increased, still not enough to offset decreases of pulpwood, veneer logs, and other products. Nearly all of the mill residues generated by manufacturing primary forest products were used for fuel and agricultural uses. Delaware sawmills generated a total of 1.6 million cubic feet of bark and wood residues in 1985.

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Cover Photos

Tree-length harvesting is the preferred method of cutting loblolly pine in Delaware. Most of the state's loblolly pine is found in Sussex County, where it is harvested to make construction lumber, plywood veneer, piling, poles, and wood pulp. Here, pines in Sussex County are felled with a feller-buncher and several tree-length stems are grouped. The tree-length material is transported to a concentration yard where it is sorted and later cut into sawlogs, veneer logs, pulpwood, or pole and piling material.

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Highlights

The 1985 timber industry survey for Delaware showed that since 1970:

- Total timber output of industrial roundwood dropped to 5.3 million cubic feet, less than 60 percent of the volume produced 15 years earlier.
- Of all the roundwood produced, only sawlog production increased. The sawlog harvest rose over 40 percent to 18.7 million board feet. All other industrial roundwood production decreased.
- Pulpwood production decreased. Total pulpwood production dropped drastically--to less than a third of the volume in 1970. Roundwood used for pulpwood--the bulk of the demand--dropped from 62,243 cords to 18,432 cords. Chipped residues also were used less--dropping from 1,500 cords to 1,300 cords. The decline in pulpwood production accounted for nearly 80 percent of the state's decreased roundwood production.
- Veneer log production was approximately half of what it was in 1970, dropping to 2.7 million board feet.
- Piling production likewise was half of what it was in 1970, dropping to 583,000 lineal feet.
- Except for about 35,000 cubic feet of poles that were harvested, the production of other products ceased, causing the combined output of poles and other products to drop by 81 percent.
- Nearly all of the available sawmill residues were used. The proportion used for fuel nearly tripled, while that used for fiber dropped by 40 percent.

Background

The U.S. Department of Agriculture, Forest Service, conducts periodic forest surveys of every state to provide current information about the timber and related resources of the Nation. In the 14-state region served by the Northeastern Forest Experiment Station, all the states have now been surveyed at least three times. The latest survey of Delaware, conducted during 1985-86, included a timber industry canvass. This canvass was used to determine the output of timber products and the volume and final end-use of primary wood manufacturing residues.

This report is based on information collected from all primary manufacturers that used industrial roundwood from Delaware in 1985. In cooperation with the Forestry Section of the Delaware Department of Agriculture, a list of all of these manufacturers was assembled. Other, out-of-state firms that might have used industrial roundwood from Delaware timberlands were included in the canvass.

The primary manufacturers were contacted first through a questionnaire mailed by the Northeastern Station. Two additional questionnaires were sent to non-respondents. Roundwood receipts were estimated for the remaining Delaware non-respondents.

This report deals mainly with statistics for the 1985 canvass and for 1970, the year when the industry was last canvassed. Production statistics of some timber products, such as pulpwood and veneer logs, for intervening or previous years were included to facilitate comparisons and to indicate trends. Future canvasses will be required to disclose long-term production trends. Until an adequate data base is compiled over time, the reader is cautioned to use the statistics prudently.

Historical Perspective

Harvesting and processing timber were once important to the development and economy of Delaware. When the first settlers arrived, trees were nearly everywhere and "timbering was the first order of business for settlers of the First State. Swedes who came ashore hand split with maul and wedge the abundant native timber for their forts and unique log cabins" (Zolper 1988a).

As Wilmington and other large cities near Delaware grew, more demands were put on Delaware's forests. Local and European markets wanted rough and finished wood products, such as lumber, cedar shingles, and oak barrel staves for many different kinds of industries.

Forest land in Delaware provided raw materials for many diverse products, most notably for shipbuilding, shingles, and charcoal or fuelwood. Cypress and oak trees were cut to make ships' wheels, beams, planking, and hulls. White-cedar trees were used to make shingles that supplied Wilmington and overseas markets. Forest land was clearcut every 20 to 40 years for fuelwood and charcoal that would be used to heat homes and factories, or to fire forges, iron furnaces, and steam-powered machinery.

Then, starting in the mid-1800's until it peaked in the early 1900's, the timber industry began to change, brought about by changing markets and a deteriorating supply base. Less wood was being used in shipbuilding, and white-cedar trees used for shingles had been exhausted. When larger trees were gone, buried logs were salvaged to make hand-split items. Finally only smaller trees remained to be harvested for products such as beam poles, fence posts, and shade-tree stakes. Fuelwood demand also abated as anthracite coal from Pennsylvania began to be used as a source of fuel.

Peak industrial timber products output was attained in Delaware soon after the turn of this century. Since the early 1900's, the level of timber-products industry development and its geographic distribution within Delaware have been influenced more by timber availability and the growth of major market areas than by county or state boundaries. Most primary wood manufacturers located near the timber resource, while secondary manufacturers preferred proximity to their markets. Over the years, Wilmington and nearby Philadelphia grew into major urban areas and centers of waterborne commerce. They attracted many secondary industries using lumber and other wood products to make a variety of items for export as well as local use.

With improved transportation and a dwindling timber resource base, secondary industries began to rely upon timber and wood products from outside Delaware. These needs were mainly met through

shipments from abroad or transported down waterways from nearby Pennsylvania and New York. In fact, most of Delaware's secondary industries today still rely on an outside supply of wood, while much of the state's diminished industrial timber products output is shipped to nearby sawmills in Maryland and pulp mills in Pennsylvania and Virginia.

As the timber resource base was being reduced by land clearing for agriculture and urban expansion, the production of industrial roundwood and the number of primary wood manufacturers declined. Both lumber production and the number of sawmills had peaked in 1909 at the end of the state's most productive period (Fig. 1). About 150 sawmills produced over 55 million board feet of lumber that year. Both quickly bottomed out dur-

ing World War I. At its lowest point, slightly over 5 million board feet lumber was sawn by 25 mills.

During the 1920's the number of sawmills declined erratically, even though lumber production remained relatively stable. On the average, about 20 million board feet were sawn annually, largely due to improved manufacturing techniques. When the Nation's economy collapsed in 1929, Delaware lumber production and sawmill numbers naturally plummeted. By 1933, only 10 million board feet were produced by five operating sawmills.

In less than a quarter of a century after 1909, the lumber industry in the state nearly ceased to exist. These trends were representative of changes occurring throughout the Northeast as the softwood lumber industry, which had always been the mainstay of Delaware's timber economy, shifted from the region to the South and Lake States.

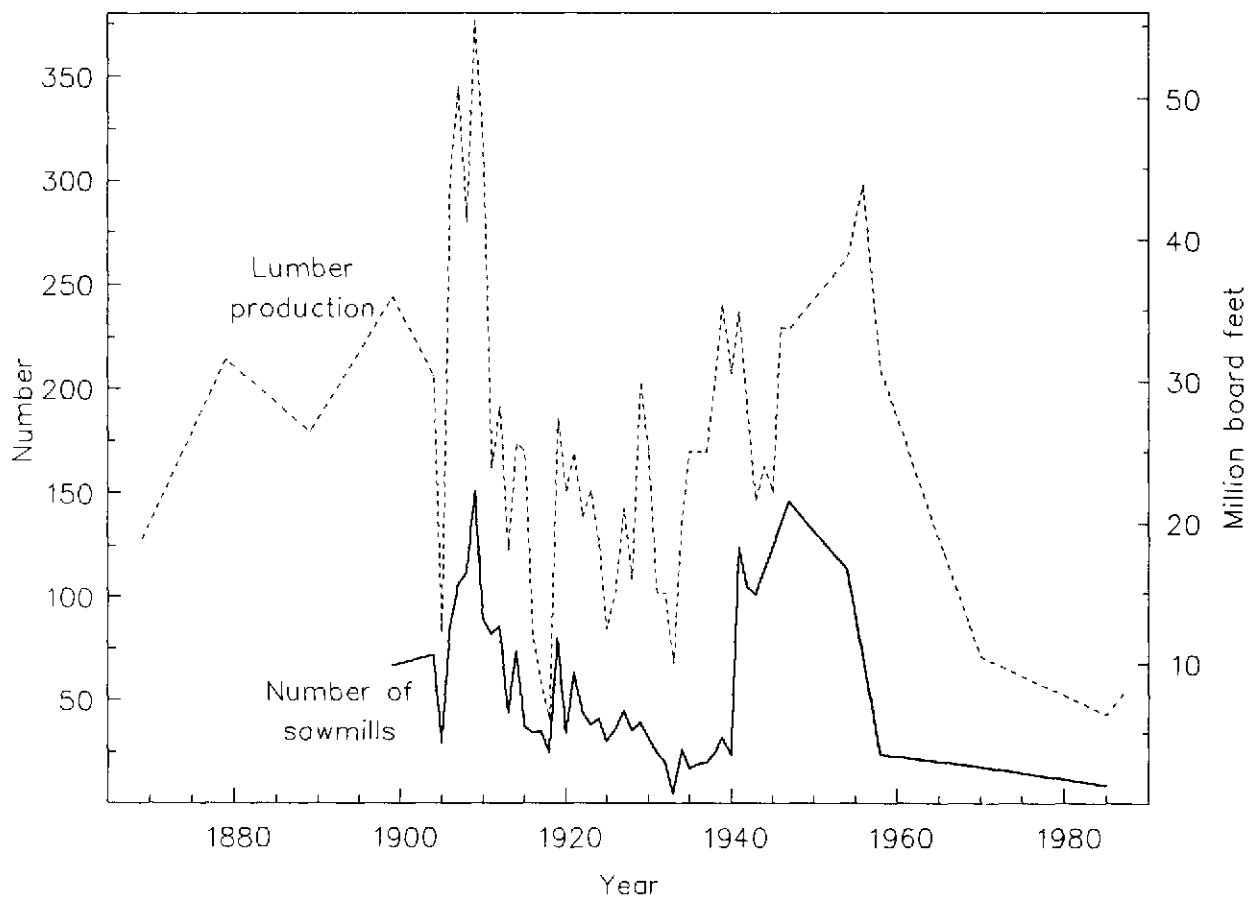


Figure 1. — Lumber production and the number of sawmills in Delaware for selected years between 1869 and 1987.

As the national economy improved, lumber production and the number of sawmills operating in Delaware increased. Stimulated by increased wartime demand for raw materials, the state's lumber production more than tripled between 1933 and 1941. It reached 35 million board feet in 1941 and remained there for most of the remaining decade. By the end of the 1940's, there were once again about 150 sawmills in Delaware--the same number as there had been when lumber production previously peaked.

The circumstances that were responsible for the rapid changes during the 1930's and 1940's had disappeared by the end of the 1950's. Wartime demand and post-war housing demands had prompted increased lumber production--demands that would soon be overshadowed. Annual lumber production levels and the number of operating sawmills would decline slowly for more than 30 years, as the demand for pine lumber for boxes, shipbuilding, and other special and industrial markets dropped.

Delaware's timber industry was beginning to change. The method for harvesting and converting roundwood into industrial timber products, the variety and volume of these products, and the number and type of manufacturers had changed since the early 1900's. Fifty or more years ago, a number of diverse products were produced by many sawmills, shingle and stave mills, and basket and container manufacturers operating throughout the state. Delaware never had a pulp mill, but like much of the state's sawlogs and veneer logs, pulpwood harvested in Delaware supplied demand in adjacent states.

During the early 1900's, when Delaware's sawlog production peaked, sawmills and other wood-using industries used mostly yellow pine from Kent and Sussex counties. This continued, to as late as 1956 when two-thirds of the softwood harvest was sawlogs. Then over the next 14 years, pronounced changes occurred in the species and products harvested.

Recent Trends - 1956 to Present

Species Mix for Sawlogs Changes

Softwoods had been the preferred species throughout much of Delaware's lumber manufac-

turing history. Hardwoods became significant only recently. From 1869 until about 1970, yellow pines--mostly loblolly--were the most widely used species for manufacturing lumber in Delaware. Pines were used for sawlogs, poles, piling, pulpwood, and veneer logs.

During 1956, sawlog production caused the timber harvest to peak at 12.7 million cubic feet, after taking nearly 50 years to do so. For a decade it fluctuated, reaching a low point in 1962. But by 1967, pulpwood began to take on more importance--production increased more than sawlog production, both in terms of volume and percentage of the total harvest. In the 1960's, pulp mills in neighboring states needed more raw material, so they sought softwood from Delaware. As a result, the softwood sawlog harvest dropped 5.7 million cubic feet between 1956 and 1970.

Compared to loblolly pine, hardwoods were always a small fraction of the total sawlog harvest and lumber production in Delaware. Of the little that was harvested, most was oak. Hardwoods contributed only about 10 to 20 percent of the state's total output until 1970. It was then that the species mix began to change, becoming more of a mixture of softwoods and hardwoods, mostly loblolly pine and oak.

The proportion of lumber from oak and pine, as well as from other species, was becoming much closer. Pine lumber production dropped sharply, while lumber from oak and other species increased. In 1970, hardwoods comprised nearly 7 million board feet of the state's 13 million board feet, over half of which was oak. Oak lumber had become considerably more important: pine sawlogs were becoming scarce and softwood pulpwood and pine veneer logs were in demand to supply mills in nearby states.

By 1985, the harvest of pine from Delaware timberlands dropped 65 percent, as demand fell for all roundwood except hardwood sawlogs. Production of loblolly and other yellow pines totalled 2.4 million cubic feet, or about 46 percent of the harvest (Fig. 2). About 61 percent of the pine harvest was pulpwood; most of the remainder was made into lumber or veneer. In recent years, much of the pine harvest has been taken to concentration yards in tree lengths, then segregated into piling, poles, pulpwood, sawlogs, and veneer logs.

Hardwood accounted for nearly all the state's lumber production in 1985--28 million cubic feet, 43 percent of which was from red and white oak sawlogs. These species accounted for approximately 23 percent of the total roundwood from the state (Fig. 2). Sweetgum was half the volume and percentage of oak. The remainder was yellow-poplar and soft maple.

Currently, all but a very small portion of the total harvest ends up as hardwood sawlogs, a situation that may change in the future. A nearby softwood veneer mill in Maryland has closed recently and regional pulp mills today have a tendency to use more hardwoods in the pulping process.

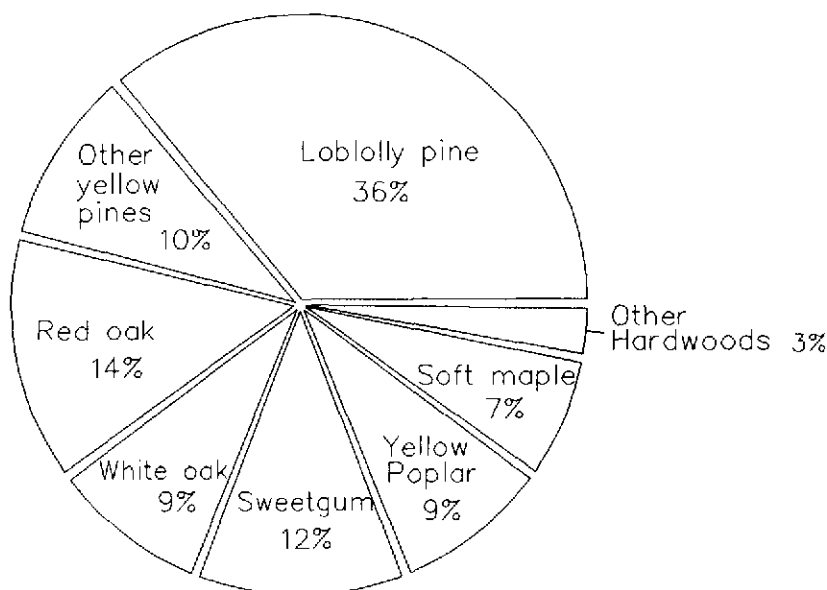


Figure 2. --Industrial timber in Delaware in 1985, by species, in percent.

Pulpwood Segment Grows, then Dwindles

Delaware did not have a pulp mill within its boundaries for most of its history, though papermaking was an early industry. A mill using rags was built in 1787 at Augustine, and a mill using wood to make pulp was built in 1881 at Christina; it stopped operating in 1839. Pulpwood harvested in Delaware has primarily supplied regional pulp mills with wood needed to make their products--paper, roofing felt, insulation, fiberboard, and paper board.

Over the last 30 years, the volume of pulpwood harvested from Delaware's timberlands has fluctu-

ated with product demand, market shifts, the condition and capacity of nearby mills, resource availability, and changes in the pulp and papermaking process. Roundwood pulpwood production in Delaware showed the largest percentage increases of all the 14 Northeastern states in both 1966 and 1967. The pulpwood harvest had increased annually from approximately 23,000 cords in 1956 to a record high of about 98,000 cords in 1967. It grew from a fairly minor part of the state's timber harvest in 1956 to its most significant product by 1967. The pulpwood segment more than doubled in 1 year to comprise nearly 60 percent of the 14 million cubic feet harvested for all products (Fig. 3).

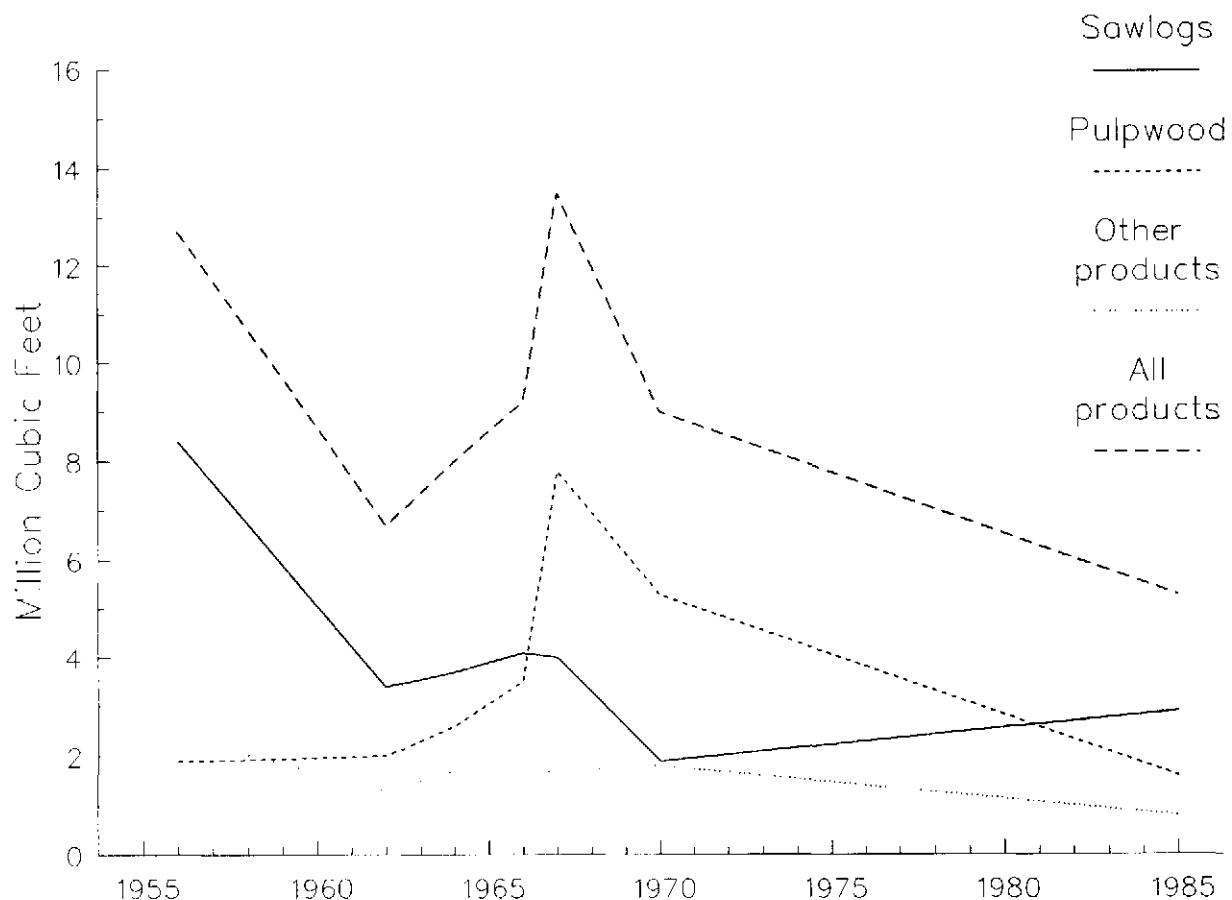


Figure 3. —Trend in industrial timber harvest in Delaware for selected years, by major product use.

Since the late 1960's, much has changed in the region to affect Delaware's roundwood pulpwood production. Pulp mills near Delaware were generally older and smaller than those in many parts of the country. These mills closed or cut production as they became too costly to operate and as their products were replaced by substitute products. Those in tidewater Virginia and western Maryland, once heavily supplied by wood from Sussex County, turned to log processors in Virginia for roundwood, and to wood chips from sawmills and other processing plants. Pulp mills in Pennsylvania began to rely more on manufacturing residues; and the board and roofing mills in New Jersey and the Philadelphia area slowed down or ceased production during the late 1970's and early 1980's.

From 1966 until 1981, pulpwood production continued to decline (Fig. 3). Slackening demand reduced the total timber harvest of industrial round-

wood. Pulpwood would remain the major portion of the total harvest for a while, providing an outlet for manufacturing residues. However, pulpwood would continue to decline until, in 1981, sawlog production and pulpwood production were almost equal. Four years later sawlogs outdistanced pulpwood, comprising over half of the state's total harvest. Pulpwood production had fallen steadily to about 26,000 cords, just about where it was 15 years before.

No longer supplying as much pulpwood, Delaware had once again become a sawlog-producing state. Remaining pulp mills in Pennsylvania and Maryland were using more hardwood bolts and manufacturing plant residues from log processors outside Delaware. Total pulpwood production dropped drastically--to less than a third of the 1970 volume. Roundwood use, the bulk of pulpwood demand, dropped from 62.2 to 18.4 thousand

cords, while the use of chipped residues decreased by 15 percent to 1.3 thousand cords (Fig. 4). The drop in the pulpwood harvest ac-

counted for nearly 80 percent of the state's decreased roundwood production.

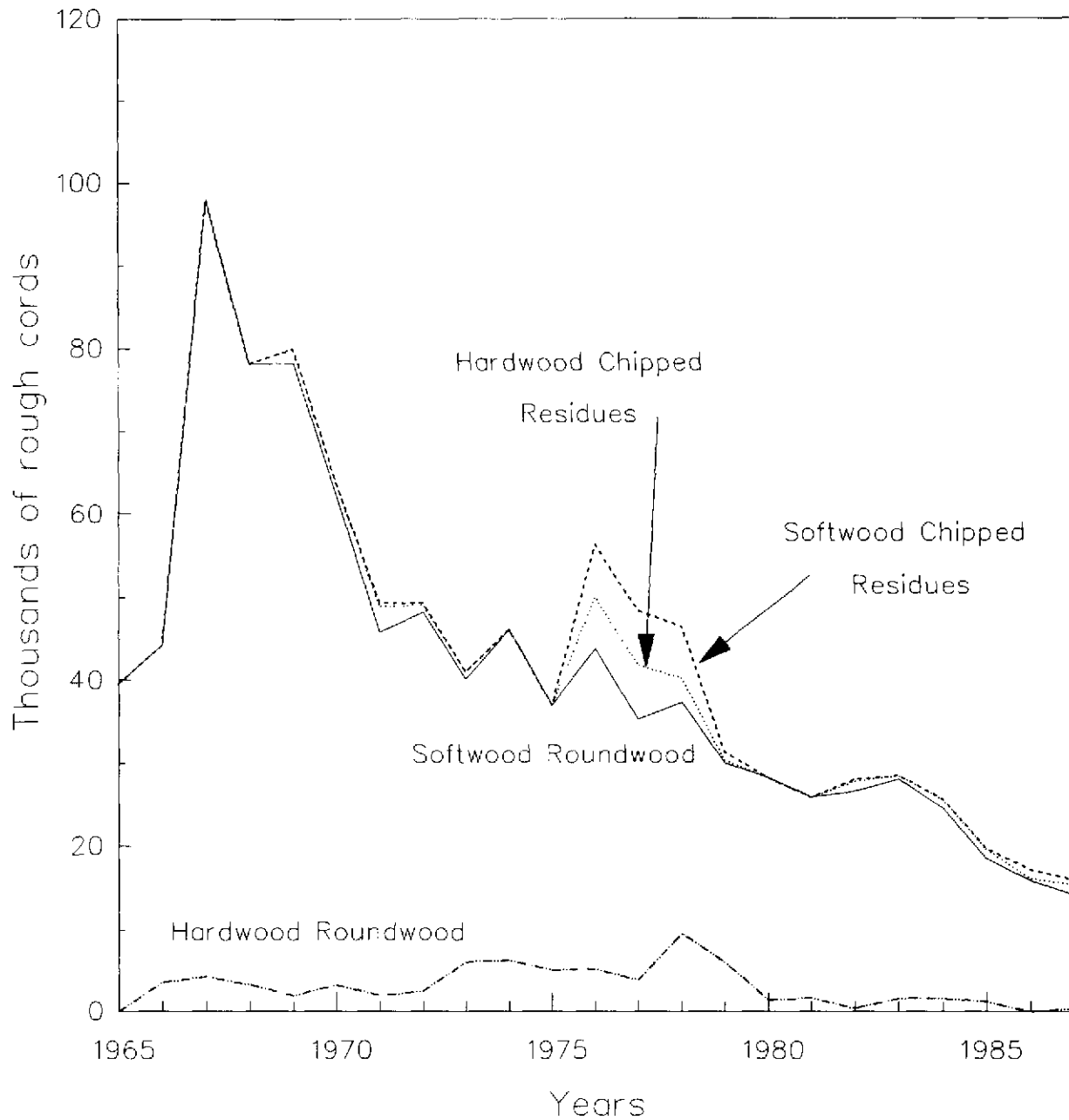


Figure 4. —Trends in pulpwood production in Delaware for selected years, by source, 1965-1987. Hardwood and softwood chipped residues are in rough-cord equivalents.

Other Industries Hit a Low

Delaware timberlands traditionally have supplied a number of smaller industries that use roundwood other than sawlogs and pulpwood--industries that we call other products. Most of the timber harvested over the years for other products has been for cooperage, veneer, posts, poles, and piling. Manufacturers usually have exacting requirements and are willing to pay a premium for certain species, grades, sizes, and other physical attributes.

From 1956 until 1970, production of industrial roundwood for veneer, piling, and other products accounted for about 20 percent of the state's total timber harvest. In 1956, the harvest of these products was 2.4 million cubic feet; and in 1970, it was 1.8 million--a 27 percent drop. Production remained at 20 percent because harvesting for all products dropped. Fifteen years later, in 1985, the volume harvested for these high-quality, high-value logs dropped to less than a million cubic feet--less than half as much as 1970. Veneer and piling were the two most important other products harvested.

Over the years, most of the veneer logs harvested in Delaware resulted from demand outside the state. Between 1956 and 1970, both the volume and species mix of veneer logs in Delaware changed. In 1956, all of Delaware's veneer log harvest came from hardwood trees, used primarily to supply three basket veneer mills in the state and more than twice that number in New Jersey. Between 1956 and 1968, the production of hardwood veneer logs in Delaware fell by 25 percent because of decreased demand, higher raw material costs, and increased product substitution for wooden baskets.

	1956	1963	1968	1970
	<i>(in million board feet)</i>			
Softwood	-	0.7	6.2	3.0
Hardwood	4.4	5.1	3.3	2.3
Total	4.4	5.8	9.5	5.3

The region's veneer industry was changing. Eventually, most of the wooden basket manufacturers were forced to close, but Delaware's veneer log production more than doubled by 1968. Nearly 70 percent of the volume produced came from yellow

pinus. These species were needed to supply a rapidly growing and fairly new softwood plywood industry in nearby states. Most of the hardwood logs were being shipped to the remaining basket makers: one in Delaware and seven in New Jersey. By 1970, however, the state's veneer log harvest had dropped to about half of the 9.5 million board feet produced just 2 years earlier. Delaware's remaining mill and two New Jersey mills had closed their doors. A steady decline continued until only one remained in 1980.

During most of the 1970's and through 1980, veneer log production averaged about 5.6 million board feet annually, peaking once more in 1972 at 7.0 million board feet. Most of this production consisted of yellow pine logs and bolts for plywood manufacture in Maryland, North Carolina, and Virginia. Oaks, sweetgum, and yellow-poplar comprised most of the hardwoods that were manufactured into baskets at the one remaining mill in New Jersey, and for furniture manufactured in North Carolina, Virginia, and Pennsylvania.

By the mid 1980's, the demand for veneer-quality roundwood from Delaware waned. Less than 2 million board feet of veneer logs were harvested in 1984. One year later, the harvest rose to 2.7 million board feet, but was still 50 percent less than in 1978. Approximately 2 million board feet of the veneer logs and bolts harvested from loblolly pine in Sussex County was sent to a mill in Maryland. This mill, using most of the state's pine logs, nearly shut down in 1984 and 1985, finally going out of business a couple of years later.

The remaining basket mill in New Jersey slowed production. No hardwood was sent to Pennsylvania in 1985; all hardwood logs or bolts, 82 percent of which was yellow-poplar, was transported to mills in Maryland, North Carolina, and Virginia. In less than a quarter of a century, the veneer industry in and around Delaware had gone from a robust part of the region's timber economy meeting diverse special needs to supplying a handful of manufacturers far away.

Another valuable product from Delaware--pilings--has always been in demand along the Northeastern seaboard, not only for constructing piers, wharves, and other structures in or near water, but for supporting foundations of bridges and other heavy structures. Not many loggers specifically harvest trees for piling. They sort these valuable

products from among other industrial roundwood. The lack of availability and access to high-quality loblolly pine trees needed for piling has likely affected output.

Except for veneer, the decreased importance of other products has been primarily due to the loss of local markets over the last 30 years. As recently as 1969, Delaware log processors produced more than half of the piling treated at Northeastern wood-preservation plants.

Piling production from Delaware timber lands in 1985 was 350,000 cubic feet, or about 583,000 lineal feet. This volume was about half the volume produced in 1970 and only about a third of the volume produced in 1956. In 1956, the piling volume exceeded Delaware's veneer log production by over 400,000 cubic feet. In both 1970 and 1985, however, piling volume had dropped to about 80 percent of the veneer log harvest.

Since 1956, most of the volume harvested for products other than sawlogs and pulpwood has been for veneer logs and piling. In 1956, these two products made up about 80 percent of the harvest for other products; about 90 percent in 1970. Between 1970 and 1985, the cooperage industry had disappeared; and farmers, landscapers, and homeowners began to purchase fence posts at local lumber yards and retail outlets that were produced outside Delaware. Only about 9,000 poles were produced in Delaware in 1985.

Source and Destination of Roundwood

Nearly all of the woodland in Delaware is timberland owned by farmers, who as a group generally intend to eventually harvest trees. The dominant forest-type groups are oak-hickory and loblolly-shortleaf pine, covering most of the forested land and accounting for most of the timber volume.¹

Over 60 percent of the forests are in the southern part of the state, in Sussex County. It is mainly

covered with yellow pines, mostly loblolly pine. About 25 percent of Kent County is tree-covered, by mostly hardwoods such as oak, hickory, and maple scattered throughout large stands in the western part of the county. The state's remaining timber is primarily found on small tracts of land in northern and considerably more urban New Castle County.

Largest Production from Sussex County

Over the years, most of Delaware's industrial timber harvest has come from Kent and Sussex counties--the states two largest and most heavily forested counties. In 1985 nearly three-fourths of the state's roundwood production, which was equally distributed between sawlogs and pulpwood, came from Sussex County. In 1985, about 1.5 million cubic feet, or about 30 percent of the state's harvest, was produced in the county. Nearly all of the 827,000 cubic feet of other products (poles, piling, and veneer logs) produced in Delaware in 1985 came from Sussex County. The 722,000 cubic feet of the county's other products equalled more than half of 1.3 million cubic feet of sawlogs from the other two counties combined.

All of Delaware's recent pulpwood harvest, nearly all of which has come from Sussex County, has gone to mills in nearby states. Except for the large pulpwood producing counties in Maine, more pulpwood has been harvested annually since 1966 in Sussex County than in most northeastern counties. In 1970, it was the 12th highest county among the region's pulpwood-harvesting counties. Even today, it produces more than most counties.

Exports Exceed Imports

Nearly three-fourths of the lumber sawn in Delaware in 1985 came from sawlogs harvested within the state. Overall, the state was a net exporter of sawlogs. Nearly twice as many sawlogs were sent out of the state than were received from log processors in other states.

¹More specific data on forest area, ownership, and timber volumes in Delaware have been published by Frieswyk and DiGiovanni (1989).

All of Delaware's intrastate sawlog shipments in 1985 were with log processors or sawmills in Maryland. About 3.5 million board feet more sawlogs were shipped to Maryland than were received from Maryland. Over twice as many hardwood as softwood logs were shipped to Maryland mills, including nearly all of the 2.5 million board feet of loblolly and other yellow pine sawlogs produced in Delaware. Altogether, 5.3 million board feet, or about 35 percent of Delaware's hardwood sawlogs, went to Maryland sawmills in 1985.

In addition to the 7.8 million board feet of sawlogs shipped to Maryland, Delaware's timber harvesters delivered 10.9 million board feet to mills inside the state. Delaware sawmills processed 15.2 million board feet of sawlogs in 1985, including the hardwoods received from Maryland.

Considerably more oak and yellow-poplar sawlogs were shipped out-of-state than were received, nearly three-fourths as many oak logs and nearly 3 times as many yellow-poplar logs. The exchange of sweetgum was about even. The balance of Delaware's imported logs was maple and other minor hardwoods such as beech, hickory, and locust. All of the 4.3 million sawlogs received in Delaware were from hardwoods.

Manufacturing Residues

Primary manufacturing residues--bark, chips, slabs, sawdust--have increased in value and utility over the years. Environmental considerations have discouraged Delaware's wood-product manufacturers from dumping and openly burning their residues. They have been encouraged to market or use the material internally.

So, Delaware sawmills have become more efficient in converting logs and tree-length material into products, and have recognized the benefits and utility of recycling the residues. Delaware farmers and horticulturists have used bark and smaller, woody residues for years. Pulp mills in nearby states use coarse, chippable woody residues because they are an available and dependable alternative source of raw material. Several of the sawmills in the state convert coarse, woody residues to fine material similar to sawdust and sell it to local chicken farmers in Delaware and Maryland. And residential wood-stove owners also use coarse

residues, such as slabs and edgings, to heat their homes.

Between 1970 and 1985, the use of these residues changed considerably (Fig. 5). In 1970, nearly 10 percent of the wood residues produced by the state's sawmills went unused. In 1985, there was a very heavy demand for all types of residues, both bark and woody material (includes coarse and fine residues). About 1.6 million cubic feet of bark and wood residues were generated by Delaware's sawmills, of which 1.3 million cubic feet were woody materials. All of the bark and essentially all of the wood residues were recovered and used--less than 1 percent was left unused.

The volume used for fiber dropped 40 percent, to 111,000 cubic feet. Even though the volume of chippable material rose because of increased lumber production, there were not as many pulp mills in 1985 to use these available residues. Pulp mills in nearby states used about 25 percent of the woody residues in 1970, but less than 10 percent in 1985. Coarse residues accounted for 14 percent of the total residues useful for woodpulp.

Agricultural uses accounted for the largest share of wood-residue use in 1970 and 1985--both in terms of percentage and volume recovered. Agricultural uses include livestock bedding, horticultural mulch, and chicken litter. Since 1970, the amount recycled for these uses more than doubled from 406,000 cubic feet to 823,000 cubic feet.

In 1985, a third of the bark and half of the woody material generated as residue were recovered for agricultural purposes. Most of the coarse residue and all of the fine residues were converted into chicken litter for the poultry industry. In 1970, the volume of coarse residues used for fiber was more than double the volume used for chicken litter. By 1985, however, the volume of coarse residue made into chicken litter was more than 6 times that used for fiber.

Between 1970 and 1985, a much greater percentage of the residues was used as domestic fuel. The volume of residues used to heat homes more than doubled--accounting for 42 percent of the total residue use. Wood residues used to heat homes rose to 482,000 cubic feet. Over 200,000 cubic feet of slabbed bark was also burned.

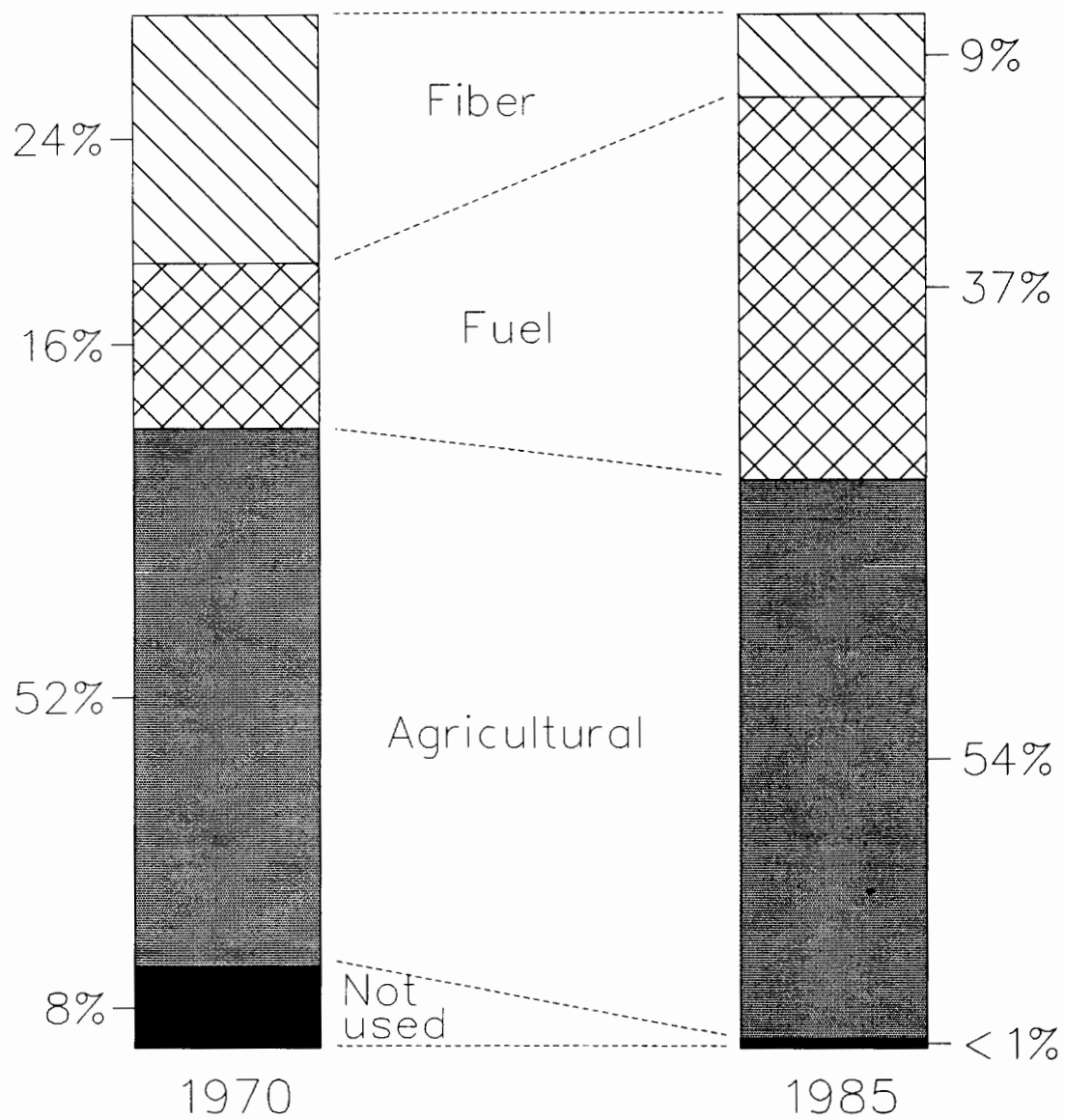


Figure 5. —Trends in the use of wood residue from Delaware sawmills in 1970 and 1985.

Summary

At one time, Delaware timber industries supplied a variety of wood products both inside and outside the state. Over the years, many changes occurred. Demand for lumber fluctuated, but was always the primary product made from timber harvested in Delaware, until the 1960's when the species used for sawlogs changed and demand for pulpwood dominated.

At that time, most timber harvesters began cutting softwood pulpwood, which was used to supply mills in nearby states. Timber processors had changed from sawlog harvesters to pulpwood harvesters, but were unable to stave off the substantial production declines of other products. By 1970, total roundwood production dropped by nearly 30 percent to 9 million cubic feet.

The last of the Delaware's three veneer mills had closed and sawlog production fell when most of the state's sawmills closed and out-of-state demand slackened. The construction of a plywood mill in Maryland had helped to increase softwood veneer log production somewhat, but the softwood harvest in 1970 for all roundwood products, including pulpwood, only slightly surpassed that of softwood sawlogs just 14 years earlier.

Between 1970 and 1985, sawlog production rose again. This resurgence was not quite sufficient to offset the decline in harvesting of veneer logs and other minor products. The volume harvested for products such as cooperage, piling, poles, and posts had generally decreased over the years--primarily due to a continued erosion of markets and decreasing demand. On top of this came a decrease of 3.7 million cubic feet in the pulpwood harvest.

By 1985, the production of all products except for hardwood sawlogs decreased substantially, and only a handful of primary wood-manufacturers remained in Delaware. Hardwood sawlogs and softwood roundwood seem to have become the mainstay for the state's timber industry, but only nine sawmills remain. These sawmills use the bulk of the low-quality hardwood logs cut in the state and most of the logs brought into the state. Nearly all of the state's annual softwood harvest and quality hardwood leaves the state for manufacture elsewhere into lumber, veneer logs, or woodpulp.

Favorable economic conditions, increased demand for local hardwood and softwood lumber, especially pallet material, a maturing of hardwood timber resources, and large-capacity sawmills have contributed to maintain current levels of production. As in most other states in the Northeast and in most other regions of the country, most of Delaware's lumber is produced by high-production mills capable of producing more than 1 million board feet annually. Of Delaware's nine mills in 1985, six of the seven commercial mills could produce over 1 million board feet per year. There were only two custom sawmills cutting under 50,000 board feet annually.

So, it seems that the timber and wood-using industries in Delaware have stabilized, with no expectation of any further significant decline nor much improvement. Although land clearing for agriculture, urban expansion, and community development will continue to remove forest and timberland, the volume of hardwood timber is expected to continue to increase slightly as it has in recent years. Even though the Maryland veneer mill closed recently, primary demand for softwoods from Delaware should continue to remain outside the state.

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Definition of Terms

Boltwood. Roundwood, usually cut into 4 to 6 foot lengths, to be either sawn into lumber, prepared for making woodpulp, or used to make other products such as cooperage, turned products, and veneer.

Coarse residues. Manufacturing residues suitable for chipping, such as slabs, edgings, and veneer cores.

Cord. 128 cubic feet of wood, bark, and air space, or 85 cubic feet of solid wood.

Fine residues. Manufacturing residues not suitable for chipping, such as sawdust, and shavings.

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Industrial timber harvest. Total production of roundwood timber generated from harvesting trees for use by the primary wood manufacturing industry, excluding round timber used to fuel industrial heating and power facilities.

Industrial wood or roundwood. Logs, bolts, or other roundwood generated from harvesting trees for use by the primary wood manufacturing industry, excluding round timber used to fuel industrial heating and power facilities.

Manufacturing plant residues. Bark and woody materials that are generated when roundwood is converted into wood products; includes slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings.

Piling. Relatively slender roundwood cut to the maximum length possible within specifications of top-diameter, strength, straightness, and soundness--driven into the soil usually to provide vertical or lateral support in buildings, foundations, and other structures.

Plant byproducts. Wood products such as pulp chips, recycled from manufacturing plant residue.

Poles. Roundwood cut to standard sizes and meeting specifications of strength, straightness, and soundness--driven into the soil usually to provide vertical or lateral support for electric and telephone transmission lines.

Posts. Short, round timber products to be used in the upright position to support fence structures.

Primary wood manufacturing plant. A plant that converts roundwood to wood products such as woodpulp, lumber, veneer, cooperage, and dimension.

Pulpwood. Roundwood, usually converted into 4 or 5 foot lengths, or chips and chipped plant residues that are used to make woodpulp.

Roundwood. Log, bolts, and other round timber generated from harvesting trees for industrial or consumer use.

Roundwood production. The volume of roundwood, such as logs and bolts, harvested from trees for conversion into wood products.

Roundwood receipts. The volume of roundwood, such as logs and bolts, received by primary wood-manufacturing plants for conversion into wood products.

Sawlog. A roundwood product, from which a product such as lumber is sawn, and which meets regional standards of minimum diameter, length, and freedom from defect.

Softwoods. Coniferous trees, usually evergreen, with needles or scale-like leaves.

Timberland. Formerly known as commercial forest land; forest land able to produce crops of more than 20 cubic feet per acre per year of industrial wood and not withdrawn from timber utilization.

Timber products output. Roundwood harvested from growing stock on commercial forest land; from other sources such as cull trees, salvable dead trees, limbs and tops, and saplings; and from trees on noncommercial and nonforest lands. In-

cludes the volume recovered from manufacturing plant byproducts.

Unused manufacturing residues. Plant residues that are dumped or destroyed and not recovered from plant byproducts.

Veneer log or bolt. A roundwood product, from which veneer is sliced or sawn, and which meets regional standards of minimum diameter, length, and freedom from defect.

Round Timber Conversions for Major Products

Softwood sawlogs and veneer logs: 1,000 board feet² = 165.1 cubic feet

Hardwood sawlogs and veneer logs: 1,000 board feet² = 151.6 cubic feet

Pulpwood and turnery bolts: 1 standard cord = 85 cubic feet of solid wood
= 5.4 green tons of hardwoods
= 3.6 green tons of softwoods

²(International 1/4-inch rule)

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Table 1.--Change in industrial roundwood production in Delaware, by major product, species group, standard unit, and thousand cubic feet, 1956-70 and 1970-85

Product	Standard unit	1956	1970	Percent change 1956-70	1985	Percent change 1970-85
SOFTWOOD						
Sawlogs	M board feet ^a	35,185	6,326	-82	2,525	-60
Veneer logs	M board feet ^a	--	2,988	b	2,000	-33
Pulpwood	Standard cords ^c	22,500	59,062	b	17,261	-71
Piling	M lineal feet	1,110	700	-37	280	-60
Other products ^d	M cubic feet	430	48	-89	35	-27
All products	M cubic feet	9,675	6,908	-29	2,417	-65
HARDWOOD						
Sawlogs	M board feet ^a	9,353	6,787	-27	16,149	b
Veneer logs	M board feet ^a	4,395	2,328	-47	741	-68
Pulpwood	Standard cords ^c	--	3,181	b	1,171	-63
Piling	M lineal feet	750	472	-37	303	-36
Other products ^d	M cubic feet	109	138	+27	--	-100
All products	M cubic feet	2,988	2,077	-30	2,842	-37
ALL SPECIES						
Sawlogs	M board feet ^a	44,538	13,113	-71	18,674	+42
Veneer logs	M board feet ^a	4,395	5,316	+21	2,741	-48
Pulpwood	Standard cords ^c	22,500	62,243	b	18,432	-70
Piling	M lineal feet	1,806	1,172	-37	583	-50
Other products ^d	M cubic feet	539	186	-65	35	-81
All products	M cubic feet	12,663	8,985	-29	5,259	-42

Table 1.--Continued

Product	1956	1970	Percent change 1956-70	1985	Percent change 1970-85
----- Thousand cubic feet -----					
SOFTWOOD					
Sawlogs	6,644	952	-86	417	-56
Veneer logs	--	468	b	330	-29
Pulpwood ^c	1,902	5,020	b	1,467	-71
Piling	689	420	-39	168	-60
Other products ^d	430	48	-89	35	-27
All products	9,675	6,908	-29	2,417	-65
HARDWOOD					
Sawlogs	1,701	979	-42	2,448	b
Veneer logs	713	407	-43	112	-72
Pulpwood ^c	--	270	b	100	-63
Piling	465	283	-39	182	-36
Others products ^d	109	138	+27	--	-100
All products	2,988	2,077	-30	2,842	-37
ALL SPECIES					
Sawlogs	8,345	1,931	-77	2,865	+48
Veneer logs	713	875	+23	442	-49
Pulpwood ^c	1,912	5,290	b	1,567	-70
Piling	1,154	703	-39	350	-50
Other products ^d	539	186	-65	35	-81
All products	12,663	8,985	-29	5,259	-42

^aInternational 1/4-inch rule.^bGreater than 100 percent change.^cUsing 85 cubic feet of solid wood per cord.^dIncludes cooperage, poles and posts in 1956 and 1970; only poles in 1985.

Table 2.--Industrial roundwood production in Delaware, by species, major product, standard unit, and thousand cubic feet, 1985

Species	Sawlogs	Veneer logs	Pulpwood	Other products ^a	All products
	<u>Thousand board feet^b</u>	<u>Thousand board feet^b</u>	<u>Standard cords</u>	<u>Thousand cubic feet</u>	<u>Thousand cubic feet</u>
Hemlock	21	--	--	--	4
Loblolly pine	1,003	2,000	13,809	203	1,872
Other yellow pines	1,501	--	3,452	--	541
Total softwoods	2,525	2,000	17,261	203	2,417
Beech	60	--	35	--	12
Hickory	640	6	--	--	99
Soft maple	2,252	--	538	--	387
Red oak	4,211	37	--	76	721
White oak	2,785	52	--	42	472
Sweetgum	3,642	9	351	27	610
Black walnut	17	--	--	--	3
Yellow-poplar	2,252	606	--	37	468
Other hardwoods ^c	290	31	247	--	70
Total hardwoods	16,149	741	1,171	182	2,842
All species	18,674	2,741	18,432	385	5,259

Table 2.--continued

Species	Sawlogs	Veneer logs	Pulpwood	Other products ^a	All products
	<u>Thousand cubic feet</u>				
Hemlock	4	--	--	--	4
Loblolly pine	165	330	1,174	203	1,872
Other yellow pines	248	--	293	--	541
Total softwoods	417	330	1,467	203	2,417
Beech	9	--	3	--	12
Hickory	98	1	--	--	99
Soft maple	341	--	46	--	387
Red oak	639	6	--	76	721
White oak	422	8	--	42	472
Sweetgum	522	1	30	27	610
Black walnut	3	--	--	--	3
Yellow-poplar	340	91	--	37	468
Other hardwoods ^c	44	5	21	--	70
Total hardwoods	2,448	112	100	182	2,842
All species	2,865	442	1,567	385	5,259

^aIncludes only piling, except for 35,000 cubic feet of loblolly pine poles.

^bInternational 1/4-inch rule.

^cIncludes hard maple, locust, and other minor species.

Table 3.--Industrial roundwood production in Delaware, by county, species group, major product, standard unit, and thousand cubic feet, 1985

County and species group	Sawlogs	Veneer logs	Pulpwood	Piling	All products
	<u>Thousand board feet</u> ^a		<u>Standard cords</u>	<u>Thousand lineal feet</u>	<u>Thousand cubic feet</u>
Kent					
Softwood	66	--	--	--	11
Hardwood	5,957	97	--	150	1,008
Total	6,023	97	--	150	1,019
New Castle					
Softwood	66	--	b	--	11
Hardwood	2,552	--	--	--	387
Total	2,618	--	b	--	398
Sussex					
Softwood	2,393	2,000	17,261	422 ^c	2,395 ^c
Hardwood	7,640	644	1,171	153	1,447
Total	10,033	2,644	18,432	575 ^c	3,842 ^c
All counties					
Softwood	2,525	2,000	17,261	422 ^c	2,417 ^c
Hardwood	16,149	741	1,171	303	2,852
Total	18,674	2,741	18,432	725 ^c	5,259 ^c

Table 3.--continued

County and species group	Sawlogs	Pulpwood	Other products ^a	All products
----- <u>Thousand cubic feet</u> -----				
Kent				
Softwood	11	--	--	11
Hardwood	903	--	105	1,008
Total	914	--	105	1,019
New Castle				
Softwood	11	e	--	11
Hardwood	387	--	--	387
Total	398	e	--	398
Sussex				
Softwood	395	1,467	533	2,395
Hardwood	1,158	100	189	1,447
Total	1,553	1,567	722	3,842
All counties				
Softwood	417	1,467	533	2,417
Hardwood	2,448	100	294	2,842
Total	2,865	1,567	827	5,259

^aInternational 1/4-inch rule.

^bLess than 50 cords.

^cIncludes about 142 lineal feet, or about 35,000 cubic feet, of pole material, representing about 9,000 poles.

^dIncludes piling, poles, and veneer logs.

^eLess than 5,000 cubic feet.

Table 4.--Number of operating sawmills in Delaware, by county and type of sawmill, 1970 and 1985

County	Type of sawmill				Total	
	Custom ^a		Commercial ^b			
	1970	1985	1970	1985	1970	1985
Kent	1	1	7	3	8	4
New Castle	1	-	-	1	1	1
Sussex	1	1	8	3	9	4
All counties	3	2	15	7	18	9

^aCapable of producing no more than 50,000 board feet of sawn material per year.

^bIn 1970, capable of producing over 50,000 board feet per year. In 1985, all commercial mills produced over 500,000 board feet; there were no mills producing between 50,000 and 500,000 board feet in Delaware.

Table 5.--Sawlog production and receipts in Delaware and between Maryland, by species, 1985

(In thousands of board feet, International 1/4-inch rule)

Species	Cut and retained in state	Shipped to Maryland	Total production	Received from Maryland	Total receipts
Hemlock	21	--	21	--	21
Loblolly pine	--	1,003	1,003	--	--
Other yellow pines	25	1,476	1,501	--	25
Total softwoods	46	2,479	2,525	--	46
Soft maple	1,906	346	2,252	731	2,637
Red oak	2,477	1,734	4,211	1,067	3,544
White oak	1,872	913	2,785	467	2,339
Yellow-poplar	1,227	1,023	2,250	379	1,606
Sweetgum	2,390	1,250	3,640	1,240	3,630
Other hardwoods ^a	968	39	1,007	394	1,362
Total hardwoods	10,840	5,305	16,145	4,278	15,118
All species	10,886	7,784	18,670	4,278	15,164

^aIncludes beech, hickory, locust, hard maple, black walnut, and other minor species.

Table 6.--Change in species composition of sawlog harvests in Delaware, by major species group, 1970-85

Species	1970		1985		Change 1970-85
	<u>Thousand board feet^a</u>	<u>Percent</u>	<u>Thousand board feet^a</u>	<u>Percent</u>	<u>Percent</u>
Yellow pines	6,326	48	2,504	13	-60
Hemlock	--	--	21	1	+b
Total softwoods	6,326	48	2,525	14	-60
Beech	122	1	60	--	-51
Hickory	100	1	640	3	+b
Maple	339	3	2,266	12	+b
Red oak	2,418	18	4,211	23	+74
White oak	1,273	10	2,785	15	+b
Yellow-poplar	902	7	2,250	12	+b
Sweetgum	1,628	12	3,640	20	+b
Black walnut	5	--	17	--	+b
Other hardwoods ^c	--	--	274	1	+b
Total hardwoods	6,787	52	16,145	86	+b
All species	13,113	100	18,670	100	+42

^aInternational 1/4-inch rule.

^bGreater than 100 percent.

^cIncludes locust and other minor species.

Table 7.--Pulpwood production in Delaware, by type of pulpwood, 1966-85

(In thousands of rough cords)

Year	Type of pulpwood						
	All types	Total roundwood	Roundwood		Total residues	Chipped residues ^a	
			Softwood	Hardwood		Softwood	Hardwood
1966	44.3	44.3	40.8	3.5	--	--	--
1967	97.9	97.9	93.7	4.2	--	--	--
1968	78.1	78.1	74.9	3.2	--	--	--
1969	79.9	78.2	76.3	1.9	1.7	--	1.7
1970	63.7	62.2	59.1	3.2	1.5	--	1.5
Total	363.9	360.7	344.8	16.0	3.2	--	3.2
1971	49.3	45.8	43.9	1.9	3.5	0.4	3.1
1972	49.3	48.2	45.7	2.5	1.1	.2	.9
1973	41.0	40.0	33.9	6.1	1.0	--	1.0
1974	46.1	46.1	39.8	6.3	--	--	--
1975	36.9	36.9	31.8	5.1	--	--	--
Total	222.6	217.0	195.1	21.9	5.6	0.6	5.0
1976	56.3	43.7	38.4	5.3	12.6	6.3	6.3
1977	48.4	35.2	31.4	3.8	13.2	6.6	6.6
1978	46.5	37.3	27.8	9.5	9.2	6.2	3.0
1979	31.3	30.0	23.9	6.1	1.3	1.0	.3
1980	28.2	28.2	26.8	1.4	--	--	--
Total	210.7	174.4	148.3	26.1	36.3	20.1	16.2
1981	25.8	25.8	24.1	1.7	--	--	--
1982	28.0	26.5	26.1	.4	1.5	.3	1.2
1983	28.5	28.0	26.4	1.6	0.5	--	.5
1984	25.6	24.5	22.9	1.6	1.1	.1	1.0
1985	19.7	18.4	17.2	1.2	1.3	.1	1.2
Total	127.6	123.2	116.7	6.5	4.4	0.5	4.9

^aRough-cord equivalents.

Table 8.--Production and disposition of sawmill residues in Delaware, by type of residue, type of use, and species group, 1985

(In thousands of cubic feet)

Type and disposition of residue	All species	Softwoods	Hardwoods
Bark			
Fiber ^a	--	--	--
Fuel	206	90	116
Agricultural ^b	119	10	109
All uses	325	100	225
Unused	--	--	--
Coarse ^c			
Fiber	111	9	102
Fuel	482	204	278
Agricultural	181	1	180
All uses	774	228	542
Unused	1	1	--
Fine ^d			
Fiber	--	--	--
Fuel	--	--	--
Agricultural	523	187	336
All uses	523	187	336
Unused	6	3	3
All types			
Fiber	111	9	102
Fuel	688	294	394
Agricultural	823	198	625
All uses	1,622	515	1,103
Unused	7	4	4

^aIncludes woodpulp and composite products.

^bIncludes livestock bedding, chicken litter, and farm and horticultural mulch.

^cIncludes slabs, edgings, trimmings, veneer cores, and other materials suitable for chipping.

^dIncludes sawdust, shavings, and other material considered unsuitable for chipping.

Nevel, Robert L., Jr.; Wharton, Eric H. 1991. **The Timber industries of Delaware, 1985**--a periodic assessment of timber output. Resour. Bull. NE-118. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 28 p.

Evaluates timber output of Delaware. Results are based on a survey of the primary processing mills located in the state, and on mills in other states that used wood from Delaware. Contains statistics on industrial timber production and mill receipts, number of sawmills and lumber production, and the production and final end use of manufacturing residues. Comparisons are made between historical and current data, and trends in industrial wood output are noted. Contains graphics and statistical tables.

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