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North DakotaTimber Industry—An Assessment of Timber Product Output and Use, 2003

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Foreword

This bulletin reports findings of a survey of all known primary wood-using mills in North Dakota in 2003. Details of the industry's size, composition, use of roundwood, and generation and disposition of residues are discussed. Such detailed information is necessary for intelligent planning and decisionmaking in wood procurement, forest resource management, forest industry development, and forest research.

Special thanks are given to the primary wood-using firms for supplying information for this study and to the North Dakota Forest Service for canvassing these wood-using firms. Their cooperation is greatly appreciated.

In this bulletin, all volumes are reported in product-specific standard units and/or cubic feet. When necessary, volumes reported by mills in nonstandard units were converted to standard units using regional conversion factors. Reported trends and changes in the North Dakota primary wood-using industry are based on comparisons with the previous surveys conducted in 1998, 1993, 1977, and 1954. Row and column data of tables may not sum due to rounding, but data in each table cell are accurately displayed.

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HIGHLIGHTS

PRIMARY WOOD-USING INDUSTRY

- The primary wood-using industry in North Dakota consisted of nine mills in 2003, the same as in 1998. All the active mills are small sawmill operations, that is, each has the capacity to produce up to 50 thousand board feet of product per year (table 1).

- Four of the nine active mills are located in the Red River watershed region of North Dakota; the rest are located in either the Missouri River or Souris River watershed regions (fig. 1).

- In 2003, the nine wood-using mills in North Dakota had industrial roundwood product receipts totaling 47 thousand cubic feet, a decrease of 19 percent from the 1998 survey (table 2).

- All the roundwood processed by these mills in 2003 was cut from North Dakota forest lands.

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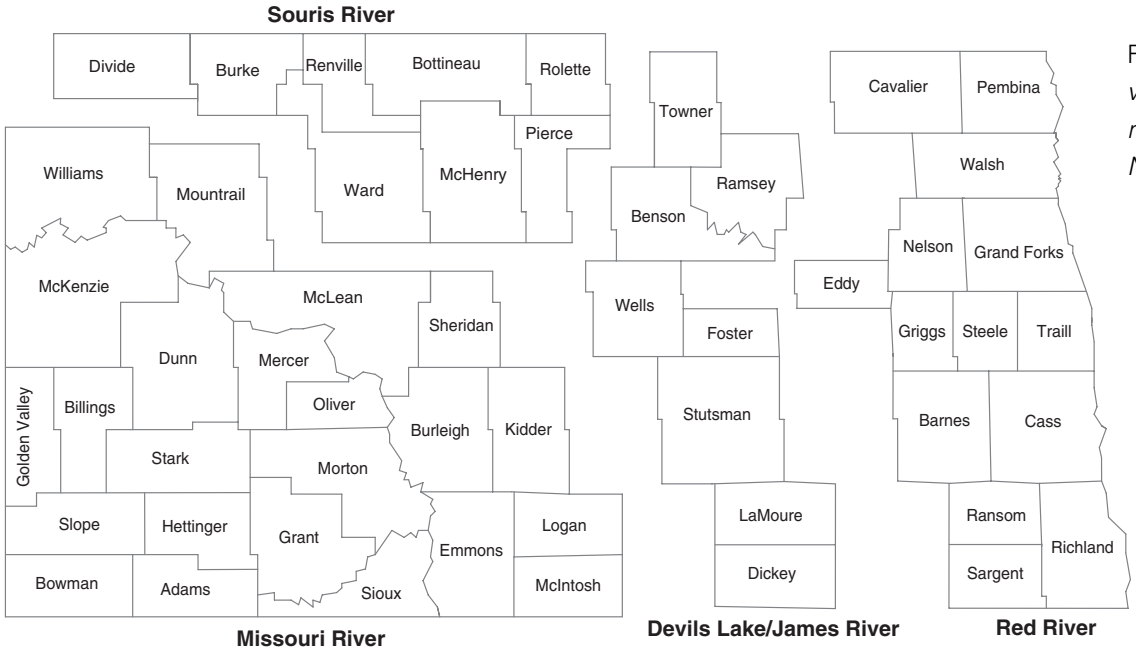
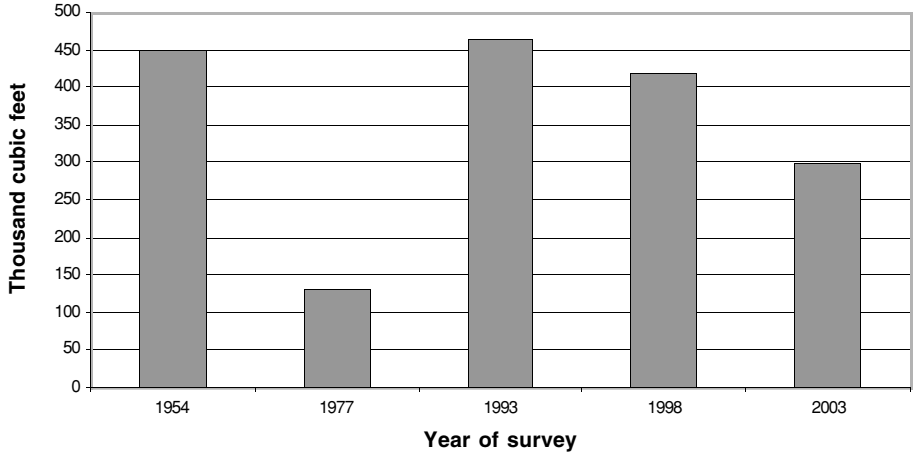


Figure 1.—*Major watershed regions in North Dakota.*

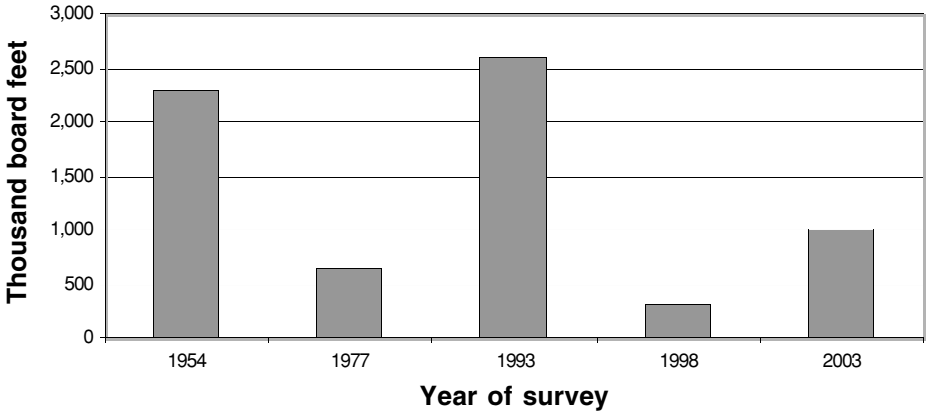
Figure 2.—*Industrial roundwood production, North Dakota, 1954-2003.*



INDUSTRIAL ROUNDWOOD PRODUCTION

- Between 1998 and 2003, the quantity of industrial roundwood harvested in the State decreased by 29 percent from 418 to 297 thousand cubic feet (fig. 2).
- Saw logs accounted for 60 percent of industrial roundwood harvested from North Dakota forest lands in 2003 (table 3).
- Sixty-one percent of the industrial roundwood volume harvested in 2003 was cottonwood species.
- Saw log production increased to over a million board feet in 2003, rebounding from a record low of 313 thousand board feet in 1998 (fig. 3).
- Cottonwood accounts for over 94 percent of the saw logs produced from North Dakota forest lands (table 4). Softwood species account for only one-half of one percent of the total saw log production in the State.
- Four counties—Cass, Grand Forks, Richland, and Traill—account for 77 percent of the saw logs produced in the State.

Figure 3.—*Total saw log production by survey year, North Dakota, 1954-2003.*



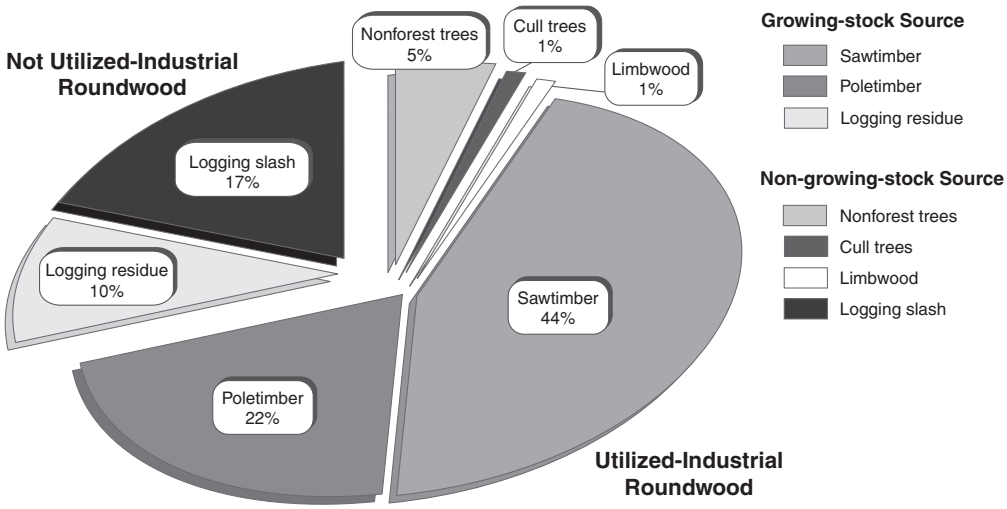


Figure 4.—*Distribution of timber removals for industrial roundwood by source of material, North Dakota, 2003.*

TIMBER REMOVALS FOR INDUSTRIAL ROUNDWOOD

- In the process of harvesting industrial roundwood, an estimated 405 thousand cubic feet of woody material was removed from North Dakota forest lands in 2003 (table 5, fig. 4), an 18-percent decrease from 1998.

- In 2003, industrial products accounted for 73 percent of the volume (297 thousand cubic feet) of woody material removed, down from 85 percent in 1998. The remaining materials were left on the ground as harvest residue.

- Of the volume left on the ground in 2003, about 64 percent was in tops and cull material (logging slash), and the rest (logging residue) came from growing-stock portions of live trees.

- The decline in product removals from North Dakota forest lands between 1998 and 2003 can be attributed to the increase in the harvest of saw logs and the decrease in the harvest of aspen pulpwood. Note: Since 2003, aspen pulpwood harvesting has increased in the Turtle Mountain region (Souris River watershed) for export to Minnesota.

- In 2003, harvesting of industrial roundwood products left 108 thousand cubic feet of harvest residue on the ground in North Dakota (table 6). Cottonwood accounted for more than 86 percent of all harvest residues generated by industrial roundwood harvesting.

- Nearly all (92 percent) of the harvest residues produced in 2003 came from the Red River watershed region of North Dakota.

- Over three-quarters of the woody material was harvested from growing-stock sources (sawtimber, poletimber, and logging residues) in 2003. The remaining material came from non-growing-stock sources including nonforest trees, limbwood, cull trees, and logging slash.

- Product extraction and the subsequent generation of logging residues removed 307 thousand cubic feet of growing-stock volume from the North Dakota timberland inventory in 2003 (table 7). In board foot equivalents, over a million board feet of this total was removed from the sawtimber portion of the growing-stock inventory (table 8).

PRIMARY MILL RESIDUES

- In the process of converting industrial roundwood into products such as lumber and pallets, the primary wood-using industry in North Dakota produced an estimated 720 green tons of mill residues (table 9).

- A little more than half of this volume was in the form of coarse wood residue, such as slabs and edgings, which is suitable for chipping (fig. 5). However, no outlet currently exists for this potential supply of pulp chips, so most of it ends up as domestic fuelwood.

- Fine wood residues, such as sawdust and shavings, make up about 28 percent of the mill residues generated, of which 80 percent is used for miscellaneous products such as bedding, litter, and mulch.

- Bark makes up the remainder of the mill residues, of which 19 percent is used for miscellaneous products such as mulch or livestock bedding.

- Overall, half of the mill residues generated by North Dakota mills in 2003 ended up as byproducts (fig. 6). The remaining 50 percent went unused, an increase of 10 percent since 1998.

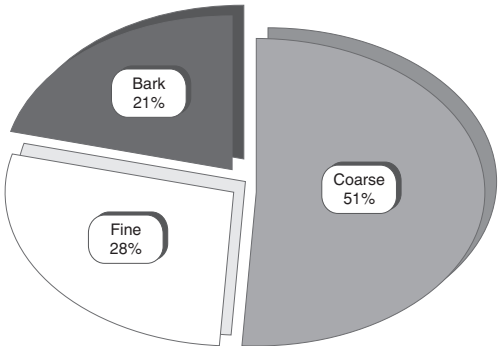
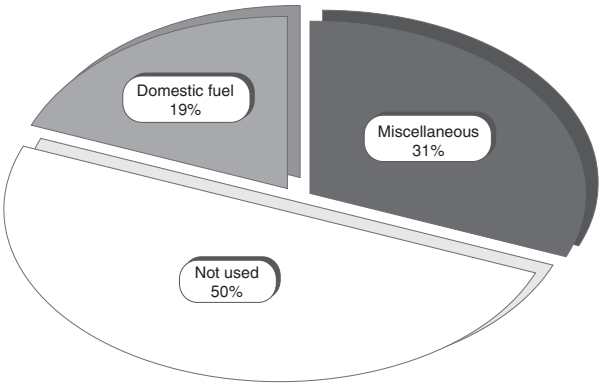


Figure 5.—*Distribution of residues generated by wood-using mills by type of residue, North Dakota, 2003.*

Figure 6.—*Distribution of residues generated by primary wood-using mills by method of disposal, North Dakota, 2003.*



APPENDIX

STUDY METHODS

This study was a cooperative effort of the North Dakota Forest Service (NDFS) and the North Central Research Station (NCRS). Using mail questionnaires supplied by NCRS and designed to determine the size and composition of the North Dakota primary wood-using industry, its use of roundwood, and its generation and disposition of wood residues, the NDFS canvassed all known primary wood-using mills within the State. The NDFS followed up on nonresponding mills using additional mailings, telephone, and personal contacts until all known mills had responded. Completed questionnaires were sent to NCRS for editing and processing.

As part of data editing and processing, all industrial roundwood volumes reported on the questionnaires were converted to standard units of measure using regional conversion factors. Timber removals by source of material and harvest residues generated during logging were estimated from standard product volumes using factors developed from logging utilization studies previously conducted by NCRS. Finalized data on North Dakota industrial roundwood receipts were loaded into a regional timber-removals database and supplemented with data on out-of-State uses of North Dakota roundwood to provide a complete assessment of timber product output in the State.

DEFINITIONS OF TERMS

Board foot
Unit of measure applied to roundwood. It relates to lumber that is 1 foot long, 1 foot wide, and 1 inch thick (or its volume equivalent).

Central stem
The portion of a tree between a 1-foot stump and the minimum 4.0-inch top diameter outside bark or the point where the central stem breaks into limbs.

Coarse mill residue
Wood residue suitable for chipping such as slabs, edgings, and veneer cores.

Commercial species
Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality such as hophornbeam, peachleaf willow, and wild plum.)

Cull removals
Net volume of rough and rotten trees, plus the net volume in sections of the central stem of growing-stock trees that do not meet regional merchantability standards, harvested for industrial roundwood products.

Dead removals
Net volume of dead trees harvested for industrial roundwood products.

Diameter at breast height (d.b.h.)
The outside bark diameter at 4.5 feet above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Fine mill residue
Wood residue not suitable for chipping such as sawdust and veneer clippings.

Forest land
Land at least 10 percent stocked (Note: Historically, 16.7 percent was used based on full stocking equaling 167 percent) by forest trees of any size, or formerly having had such tree cover, and not currently developed for non-forest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelter-belt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails or clearings in forest areas shall be classed as forest if less than 120 feet wide. Streams and other bodies of water shall be classed as forest if less than 30 feet wide.

Growing-stock removals
The growing-stock volume removed from the timberland inventory by harvesting industrial roundwood products. (Note: Includes sawtimber removals, poletimber removals, and logging residues.)

Growing-stock tree
A live timberland tree of commercial species that contains at least one 12-foot saw log or two saw logs 8 feet or longer meeting minimum log/tree grade requirements, now or prospectively, and that meets specified standards of size, quality, and merchantability. At least one-third of the gross board-foot volume must be merchantable material and at least 50 percent sound at any point. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume
Net volume of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0 inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hardwoods
Dicotyledonous trees, usually broad-leaved and deciduous.

Harvest residues
The total net volume of unused portions of trees cut or killed by logging. (Note: Includes both logging residues and logging slash.)

Industrial roundwood production
The quantity of industrial roundwood harvested in a geographic area.

Industrial roundwood products
Saw logs, pulpwood, veneer logs, poles, commercial posts, pilings, cooperage logs, particleboard bolts, shaving bolts, lath bolts, charcoal bolts, and chips from roundwood used for fuel, pulp, or board products.

Industrial roundwood receipts
The quantity of industrial roundwood received by commercial mills in a geographic area.

International ¼-inch rule
A log rule or formula for estimating the board-foot volume of logs, allowing ½-inch of taper for each 4-foot length. The rule appears in a number of forms that allow for kerf. In this form, ¼-inch of kerf is assumed. This rule is used as the USDA Forest Service standard log rule in the Eastern United States.

Limbwood removals
Net volume of all portions of a tree other than the central stem (including forks, large limbs, tops, and stumps) harvested for industrial roundwood products.

Logging residue
Net volume of unused portions of the merchantable central stem of growing-stock trees cut or killed by logging.

Logging slash
Net volume of unused portions of the unmerchantable (non-growing-stock) sections of trees cut or killed by logging.

Merchantable sections
Sections of the central stem of growing-stock trees that meet either pulpwood or saw log specifications.

Net volume
Gross volume less deductions for rot, sweep, or other defects affecting use for roundwood products.

Noncommercial species
Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial roundwood products. Classified in volume tables as rough trees.

Nonforest land
Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 39.9-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, improved roads and nonforest strips must be more than 120 feet wide and more than 1 acre to qualify as nonforest land.)

Nonforest land removals
Net volume of trees on nonforest lands harvested for industrial roundwood products.

Poletimber
A growing-stock tree at least 5.0 inches d.b.h. but smaller than sawtimber size (9.0 inches d.b.h. for softwoods, 11.0 inches d.b.h. for hardwoods).

Poletimber removals
Net volume in the merchantable central stem of poletimber trees harvested for industrial roundwood products.

Primary wood-using mills
Mills receiving roundwood or chips from roundwood for processing into products.

Primary wood-using mill residues
Wood materials (coarse and fine) and bark generated at manufacturing plants from roundwood processed into principal products. These residues include wood products (byproducts) obtained incidental to production of principal products and wood materials not utilized for some byproduct.

Rotten tree
A tree that does not meet regional merchantability standards because of excessive unsound cull.

Rough tree
A tree that does not meet regional merchantability standards because of excessive sound cull. Includes non-commercial tree species.

Roundwood
Logs, bolts, or other round sections cut from trees (including chips from roundwood).

Sapling
A live tree between 1.0 and 5.0 inches d.b.h.

Sapling removals
Net volume in saplings harvested for industrial roundwood products.

Saw log
A log meeting minimum standards of diameter, length, and defect, sound and straight, and with a minimum diameter outside bark of 7 inches for softwoods and 9 inches for hardwoods, or other combinations of size and defect specified by regional standards.

Saw log portion
That portion of the central stem of sawtimber trees between the stump and the saw log top.

Saw log top
The point on the central stem of sawtimber trees above which a saw log cannot be produced. The minimum saw log top is 7.0 inches diameter outside bark (d.o.b.) for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber removals
As used in table 5, sawtimber removals refers to the net volume in the merchantable central stem of sawtimber trees harvested for industrial roundwood products. (Note: Includes the saw log and upper stem portions of sawtimber trees.) In the case of sawtimber volume removed from timberland inventory as in table 8, sawtimber removals refers to the net volume in the saw log portion of sawtimber trees harvested for roundwood products or left on the ground as logging residue, and is usually expressed in thousands of board feet (International ¼-inch rule).

Sawtimber tree
A growing-stock tree containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. and hardwoods must be at least 11.0 inches d.b.h.

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

Timberland
Forest land that is producing, or is capable of producing, in excess of 20 cubic feet per acre per year of industrial roundwood products under natural conditions, is not withdrawn from timber utilization by statute or administrative regulation, and is not associated with urban or rural development.

Timber product output
The volume of roundwood products produced from an area's forests.

Timber removals
The total net volume of trees removed for industrial roundwood products or left on the ground as harvest residues.

Tree
A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Upper stem portion
That portion of the central stem of sawtimber trees between the saw log top and the minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

COMMON AND SCIENTIFIC NAMES OF TREE SPECIES MENTIONED IN THIS REPORT

SOFTWOODS

Redcedar ..... *Juniperus* spp.

Ponderosa pine ..... *Pinus ponderosa*

White spruce ..... *Picea glauca*

HARDWOODS

White oak

Bur oak ..... *Quercus macrocarpa*

Ash

Black ash (rarely found) ..... *Fraxinus nigra*

Green ash ..... *Fraxinus pennsylvanica*

Aspen

Quaking aspen ..... *Populus tremuloides*

Balsam poplar ..... *Populus balsamifera*

Cottonwood

Eastern cottonwood ..... *Populus deltoides*

Plains cottonwood ..... *Populus sargentii*

American basswood ..... *Tilia americana*

Elm

American elm ..... *Ulmus americana*

Slippery elm (rarely found) ..... *Ulmus rubra*

White birch ..... *Betula papyrifera*

TABLE TITLES

TABLES

Table 1.--Number of primary wood-using mills in North Dakota, 2003

Kind of Mill		1993	1998	2003
Sawmills	Medium	1	8	0
Sawmills	Small	10	8	9
Other mills		1	1	0
Total		12	9	9

Medium mill: 50 to 1,00 MBF/year.
Small Mill: < 50 MBF/year.
Other mills: Includes particleboard, cabin logs, and post and pole mills.
MBF: Thousand board feet, International 1/4-inch.

Table 2.--Industrial roundwood receipts by type of mill in North Dakota, 2003

(In cubic feet)

Softwood	1993	1998	2003	Percentage change from 1998
Sawmills		1,384	895	-35.3%
Other mills	9,921	4,361		
Total	9,921	5,745	895	-84.4%

Hardwood	1993	1998	2003	Percentage change from 1998
Sawmills	506,676	53,516	47,012	-12.2%
Total	506,676	53,516	47,012	-12.2%

All species	1993	1998	2003	Percentage change from 1998
Sawmills	506,976	54,900	47,906	-12.7%
Other mills	9,921	4,361		
Total	516,597	59260	47,906	-19.2%

Rows and columns may not sum due to rounding.

Table 3.--Industrial roundwood production by species group and type of product, North Dakota, 2003

Species group	Saw logs		Pulpwood		All products
	BF	CF	Cords	CF	
Softwoods					
Ponderosa pine	216	37			37
Redcedar	324	62			62
Spruce	4,140	795			795
Total	4,680	895			895
Hardwoods					
Ash	6,572	1,105			1,105
Aspen	28,400	5,263	1,390	104,271	109,534
Balsam poplar			9	643	643
Basswood	2,000	352			352
Cottonwood	952,040	167,559	186	13,967	181,526
Elm		57			57
Hackberry	1,380	243			243
Softmaple	1,000	176			176
White oak group	11,704	1,969			1,969
Total	1,003,420	176,723	1,585	118,882	295,605
All species	1,008,100	177,618	1,585	118,882	296,500

BF: Board feet, International 1/4-inch rule.

CF: Cubic feet

Rows and columns may not sum due to rounding.

Table 4.--Saw log production by species group and State of destination, North Dakota, 2003

(In board feet)

	Minnesota	North Dakota	Total
Softwoods			
Redcedar		324	324
Spruce		4,140	4,140
Ponderosa		216	216
Total		4,680	4,680
Hardwoods			
Soft maple		1,000	1,000
Hackberry		1,380	1,380
Ash		6,572	6,572
Cottonwood	737,000	215,040	952,040
Aspen		28,400	28,400
White oak group		11,704	11,704
Basswood		2,000	2,000
Elm		324	324
Total		266,420	1,003,420
All species		271,100	1,008,100

Columns may not sum due to rounding.

Board feeet, International 1/4-inch rule.

Table 5.--Wood material harvested for industrial roundwood by source of material and species group, North Dakota, 2003

Species group	Growing stock				Non-growing stock					Total material used for products	Total material not used	Total material harvested
	Used for products		Not used		Used for products			Not used				
	Saw-timber	Pole-timber	Logging residue	Total	Limb-wood	Cull trees	Nonforest trees	Logging slash	Total			
Softwoods												
Ponderosa pine	0.0	0.0	0.0	0.0	0.0	0.0	--	0.0	0.0	0.0	0.0	0.1
Redcedar	0.1	0.0	0.0	0.1	0.0	0.0	--	0.0	0.0	0.1	0.0	0.1
Spruce	0.7	0.0	0.0	0.8	0.0	0.0	--	0.2	0.2	0.8	0.2	1.0
Total	0.8	0.0	0.0	0.9	0.0	0.0	--	0.0	0.0	0.9	0.0	1.1
Hardwoods												
Ash	1.1	0.0	0.2	1.2	0.0	0.0	--	0.3	0.3	1.1	0.4	1.5
Aspen	20.8	70.5	5.7	97.1	0.1	0.0	18.1	7.3	25.5	109.5	13.0	122.6
Balsam poplar	0.1	0.4	0.0	0.6	--	--	0.1	0.0	0.2	0.6	0.1	0.7
Basswood	0.3	0.0	0.1	0.4	0.0	0.0	--	0.1	0.1	0.4	0.2	0.5
Cottonwood	152.3	19.0	32.7	204.8	4.5	3.3	2.4	60.7	70.9	181.5	93.4	274.9
Elm	0.0	0.0	0.0	0.1	0.0	0.0	--	0.0	0.0	0.1	0.0	0.1
Hackberry	0.2	0.0	0.0	0.3	0.0	0.0	--	0.1	0.1	0.2	0.1	0.4
Softmaple	0.2	0.0	0.0	0.2	0.0	0.0	--	0.1	0.1	0.2	0.1	0.3
White oak group	1.9	0.0	0.3	2.2	0.0	0.0	--	0.5	0.5	2.0	0.8	2.7
Total	176.9	90.1	39.1	306.1	4.6	3.5	20.6	69.1	97.7	295.6	108.2	403.8
All species	177.8	90.1	39.1	306.9	4.6	3.5	20.6	69.3	97.9	296.5	108.4	404.9

Rows and columns may not sum due to rounding.

Table 6.-- Harvest residue generated by industrial roundwood harvesting by county and species group, North Dakota, 2003

(In cubic feet)

County group	Redcedar	Spruce	Ponderosa pine	Soft maple	Hackberry	Ash	Cottonwood	Balsam poplar	Aspen	White oak group	Basswood	Elm	All species
Red River	--	186	--	96	133	402	91,015	--	6,974	744	193	--	99,743
Souris River	--	--	--	--	--	--	1,793	75	6,033		--	--	7,913
Missouri River	15	--	14	--	--	28	607	--	--	21	--	31	716
Devils Lake & James River	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	15	186	14	96	133	430	93,415	75	13,018	765	193	31	108,373

Columns and rows may not sum due to rounding.

Table 7.--Growing-stock removals from timberland for industrial roundwood by county and species group, North Dakota, 2003

(In cubic feet)

County group	Redcedar	Spruce	Ponderosa pine	Soft maple	Hackberry	Ash	Cottonwood	Balsam poplar	Aspen	White oak group	Basswood	Elm	All species
Red River	--	787	--	201	278	1,149	190,151	--	52,308	2,130	403	--	247,407
Souris River	--	--	--	--	--	--	12,613	566	44,781	--	--	--	57,961
Missouri River	62		38	--	--	81	1,268	--	--	61	--	65	1,574
Devils Lake & James River	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	62	787	38	201	278	1,230	204,322	566	97,089	2,191	403	65	306,942

Columns and rows may not sum due to rounding.

Table 8.--Sawtimber removals from timberland for industrial roundwood by county and species group, North Dakota, 2003

(In board feet)

County group	Redcedar	Spruce	Ponderosa pine	Soft maple	Hackberry	Ash	Cottonwood	Balsam poplar	Aspen	White oak group	Basswood	Elm	All species
Red River	--	3,826	--	1,002	1,383	5,916	946,127	--	61,026	10,965	2,004	--	1,032,250
Souris River	--	--	--	--	--	--	15,943	660	67,221	--	--	--	83,824
Missouri River	299	--	212	--	--	416	6,308	--	--	312	--	325	7,873
Devils Lake & James River	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	299	3,826	212	1,002	1,383	6,332	968,379	660	128,247	11,277	2,004	325	1,123,946

Columns and rows may not sum due to rounding.

Table 9.--Residues produced at primary wood-using mills by type of material and type of use, North Dakota, 2003

(In tons, green weight)

	Bark		Coarse		Fine		Total	
Type of use	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
Domestic fuel	1.27	12.78	6.09	116.16	--	--	7.35	128.94
Miscellaneous	--	15.39	--	43.20	0.09	163.19	0.09	221.78
Not used	0.37	123.69	0.18	197.64	2.01	38.62	2.57	359.95
Total	1.64	151.86	6.27	357.00	2.11	201.81	10.02	710.67

Haugen, David E.; Harsel, Robert A.

2005. **North Dakota timber industry—an assessment of timber product output and use, 2003.** Resour. Bull. NC-252. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 18 p.

Reports findings of a survey of all primary wood-using mills in North Dakota in 2003 and compares those findings with earlier surveys. Production and receipts of industrial roundwood are reported by product, species, and county. Also reports the quantity, type, and disposition of wood and bark residues generated by North Dakota's primary wood-using industry.

KEY WORDS: Bark, mill, production, roundwood, residues, saw logs.

MISSION STATEMENT

We believe the good life has its roots in clean air, sparkling water, rich soil, healthy economies, and a diverse living landscape. Maintaining the good life for generations to come begins with everyday choices about natural resources. The North Central Research Station provides the knowledge and the tools to help people make informed choices. That's how the science we do enhances the quality of people's lives.

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