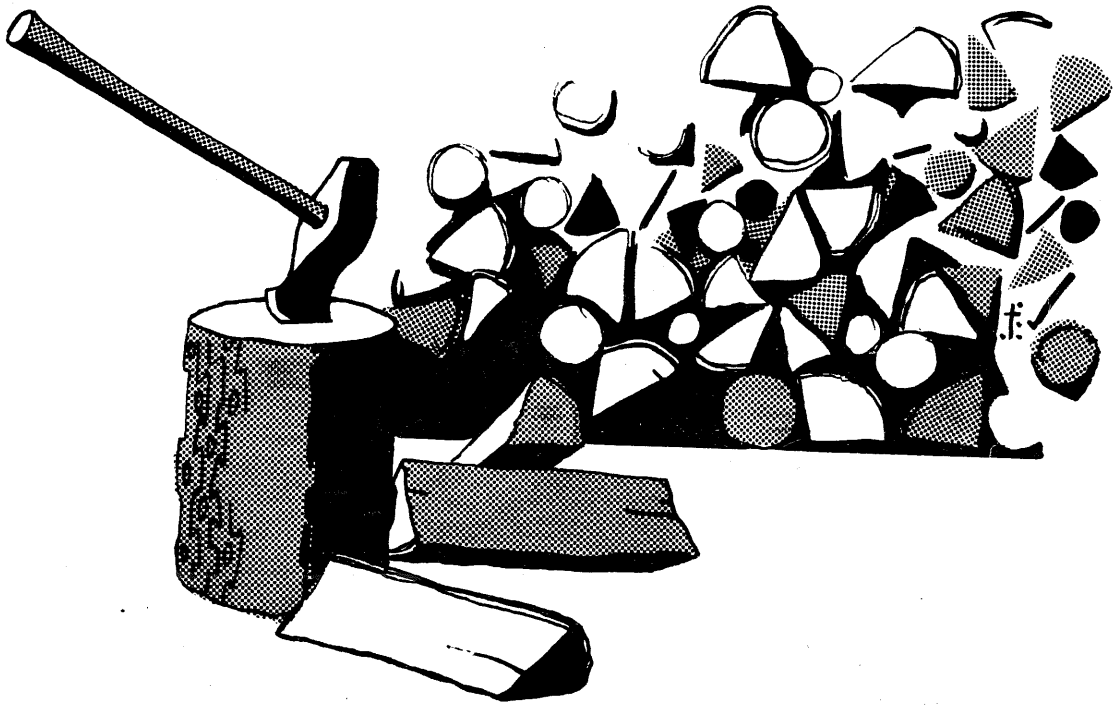
Minnesota Residential Fuelwood Survey



Minnesota
DEPARTMENT OF NATURAL RESOURCES

RESIDENTIAL FUELWOOD SURVEY

1988 - 1989

ABSTRACT

During the 1988-89 heating season, about 1.039 million cords of fuelwood were burned by private households. This is a 26 percent decrease from the 1984-85 heating season.

Currently, 33 percent of Minnesota households use fuelwood for some or all of their heating needs. Households using wood as their major source of heat make up 28 percent of all fuelwood consumers. Nearly one-third of the fuelwood consumed is oak.

RESIDENTIAL FUELWOOD SURVEY: 1988 - 1989

INTRODUCTION

During the spring of 1989, the Minnesota Department of Natural Resources conducted a survey to determine the volume of residential fuelwood burned during the 1988-89 heating season. Similar surveys had been conducted in 1979-80 and 1984-85.

The purpose of this study is to determine if current consumer use patterns for residential fuelwood have changed or remained the same.

STUDY OBJECTIVES

The objectives of this study are to:

1. Determine the total volume of fuelwood consumed in Minnesota during the 1988-89 heating season,

2. Determine the volume of fuelwood cut from growing stock trees,

3. Identify types and geographic distribution of households burning fuelwood,

4. Identify trends in residential fuelwood consumption, and

5. Compare and contrast household fuelwood consumption during the 1988-89 heating season with the 1979-80 and 1984-85 seasons.

STUDY METHODS

A telephone survey was selected as the most cost-efficient method for gathering household fuelwood use data. The survey sample was drawn from the total number of households in Minnesota. A listing of households by county was obtained from the Minnesota State Demographer's office. Each county was placed in one of five categories based on the U.S. Forest Service Survey Unit in which it was located. The total number of households was tallied for each survey unit.

The 1979-80 survey data showed that one-third of all Minnesota households burned wood. However, the percent of households burning wood within a survey unit varied from 28 to 54 percent. To assure a representative sample, household telephone numbers were chosen using the same sampling design logic as the 1979-80 and 1984-85 studies. Fuelwood consumption data from the earlier studies was also used to select sample households. A total of 1,853 sample households were needed (Table 8). Telephone numbers for the sample were generated by Survey Sampling, Inc. of Fairfield, Connecticut.

HOUSEHOLDS SAMPLED

Survey Unit	#	%
Aspen-Birch	300	16
Northern Pine	250	13
Central Hardwoods	386	21
Prairie	482	26
Metro	435	24
Total	1,853	100

TABLE 10

The telephone survey was conducted over a five-week period beginning May 8, 1989. To assure a high response rate, telephone calls were made primarily during evening hours. Telephone numbers that were busy or where no one answered, were redialed on successive days until a response was obtained. After the tenth call-back, if there was no response, the number was treated as a nonresponse. The response rate was 80 percent.

As in the 1979-80 survey, households responding were classified by: a) location by county, b) population-size class, and c) fuelwood-use class.

Four population size classes were defined:

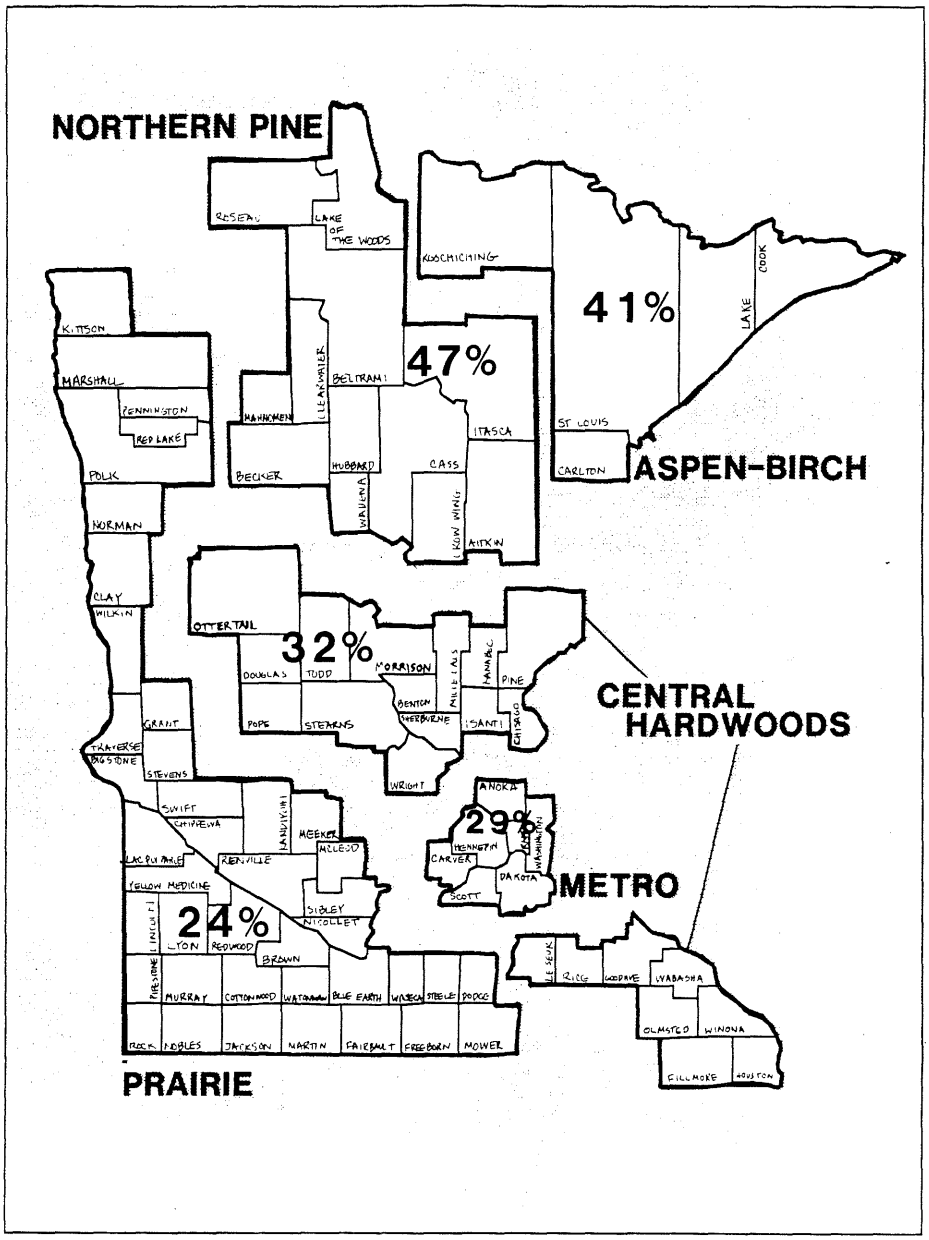
1. RURAL - households located in population centers of less than 2,500 people.
2. SMALL TOWN - households located in population centers of 2,500 to 10,000 people.
3. LARGE TOWN - households located in population centers of 10,000 to 100,000 people.
4. VERY LARGE TOWN - households located in population centers of 100,000 or more people.

Four fuelwood use classes were also identified:

1. NONUSER - households that do not burn fuelwood.
2. MAJOR - fuelwood provides the main source of heat in the home, the user may have another fuel system for back-up purposes. More than 50 percent of the household heat is from wood.
3. SUPPLEMENTARY - fuelwood is used as a back-up heating system, with another fuel providing the major source of heat. Less than 50 percent of the household heat is from wood.
4. PLEASURE - fuelwood is burned for pleasure only. Some heating benefit may result, but fuelwood is not relied on as a heating system.

CHARACTERISTICS OF FUELWOOD USERS:

Statewide, 33 percent of the households burn fuelwood, the same as in the previous two surveys. As shown on the map, the percent of households burning fuelwood within each survey unit varies from 24 percent to 47 percent (Map 3). Major users make up 18 percent of the households burning fuelwood. Forty-six percent of the households burn wood as a supplementary source of heat, and 36 percent burn wood for pleasure only (Figure 23). Seventy-three percent of all households using fuelwood have done so for more than five years.



MAP 3 - Percent of Households Burning by Survey Unit

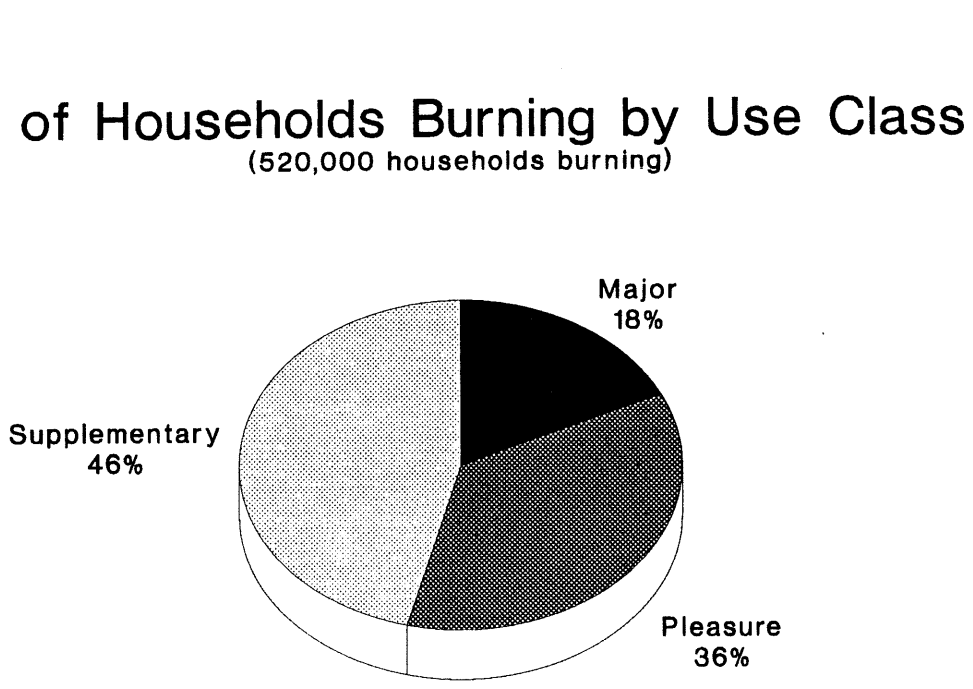


FIGURE 23

The percent of households in each user class varies among survey units (Figure 24). The percentage of households burning wood as their major source of heat, is highest in the aspen-birch and northern pine units of the state. The highest proportion of households burning fuelwood as a supplementary heat source are in the central hardwoods and prairie units of the state. Households burning primarily for pleasure are most heavily represented in the metro unit.

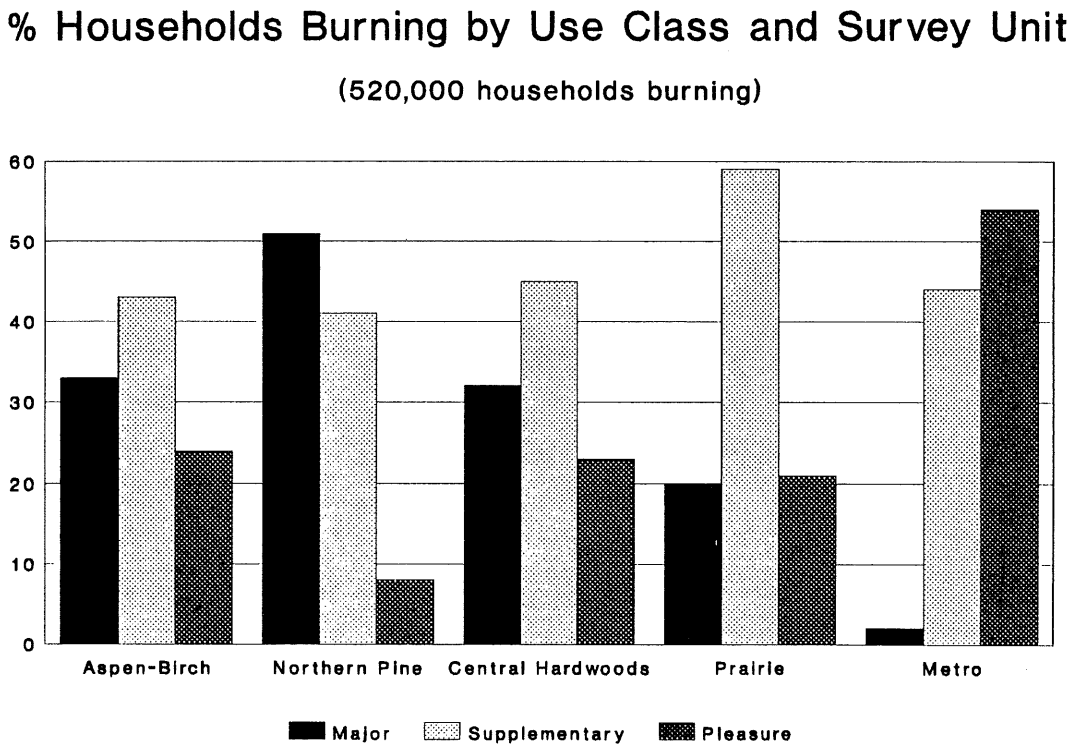


FIGURE 24

Major fuelwood consumers are more likely than other consumers to live in rural areas or small towns. Consumers burning primarily for pleasure are more likely than others to live in large towns or metro areas (Figure 25).

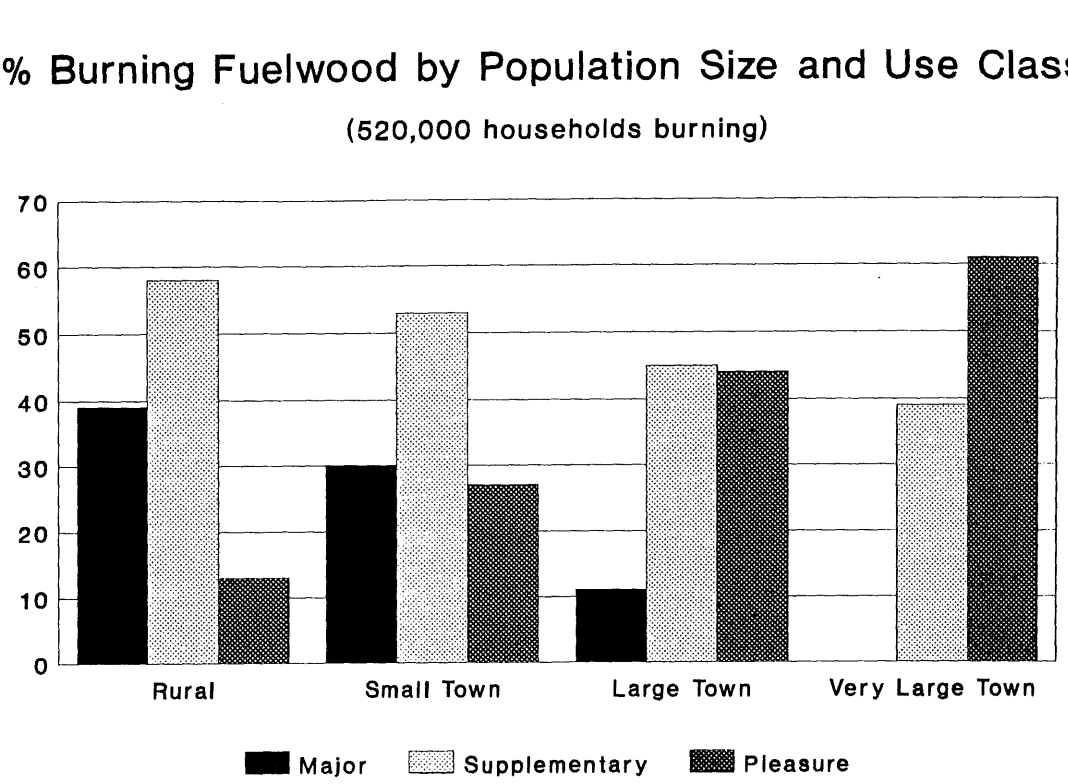


FIGURE 25

Households burning fuelwood as a supplementary heat source are about equally distributed across the state, though a slightly higher proportion are located in rural areas.

Households surveyed identified six major kinds of facilities used for wood burning (Figure 26). The volume of wood burned in each kind of facility varies (Figure 27).

Within each survey unit, households in similar fuelwood use classes use similar types of woodburning facilities. Households, in areas other than the metro unit, are more likely to use woodburning stoves than any other type of facility. At least 50 percent of the households burning wood as a major source of heat use stoves, furnaces, or both (Figure 28). Excluding the metro unit, half of the households burning wood as a supplementary heat source use woodburning stoves (Figure 29). In the metro unit, more than one-third of the households that burn wood as a supplementary heat source use regular fireplaces. Finally, statewide, households that burn primarily for pleasure are more likely to have regular or modified fireplaces than any other type of facility (Figure 30).

% of Households Using Various Facilities

(520,000 households)

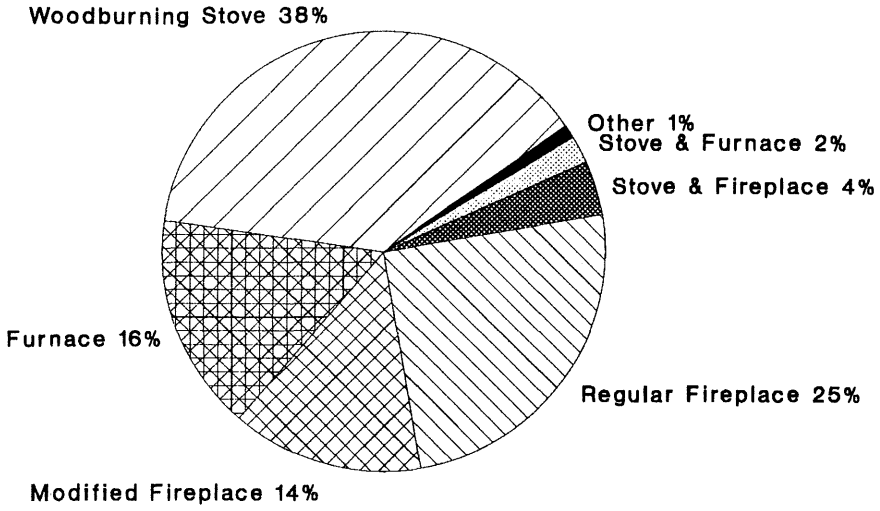


FIGURE 26

% Volume Burned by Type of Facility

(1.039 million cords)

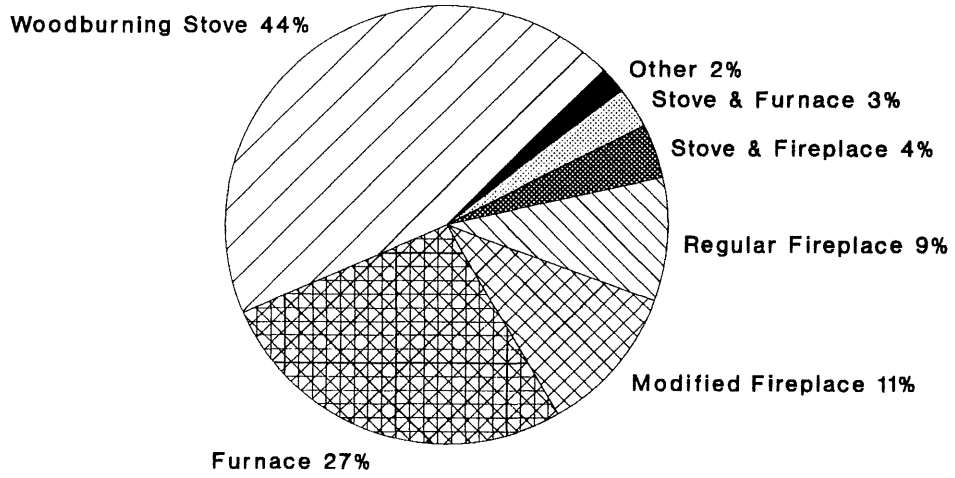


FIGURE 27

Commonly Used Facility by Major Users and Survey Unit

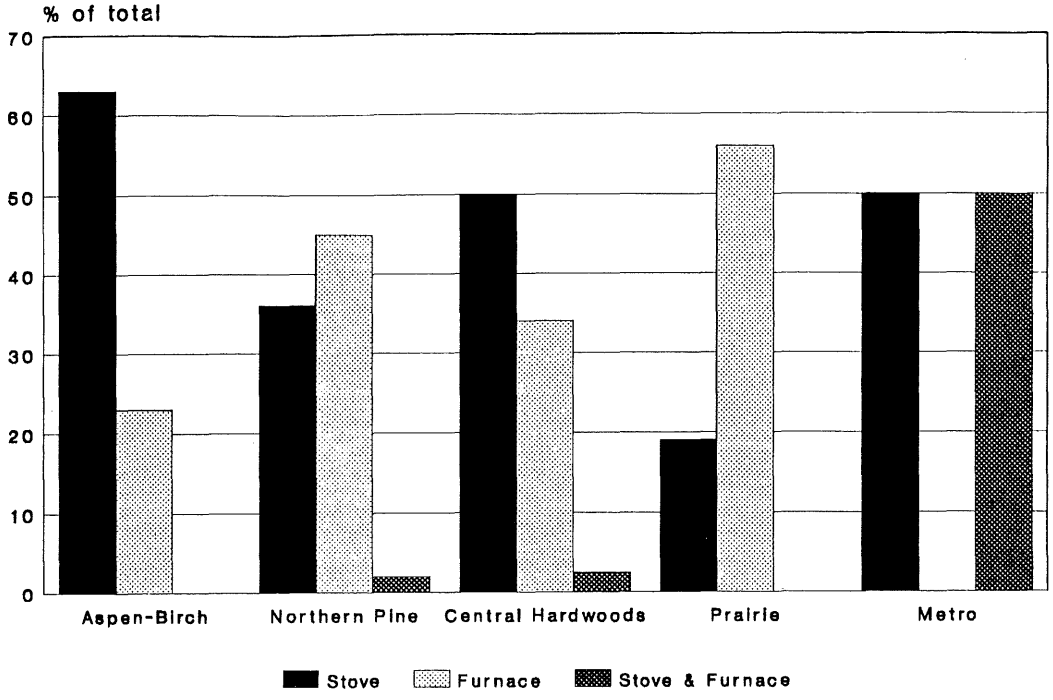


FIGURE 28

Commonly Used Facility by Supplemental Users and Survey Unit

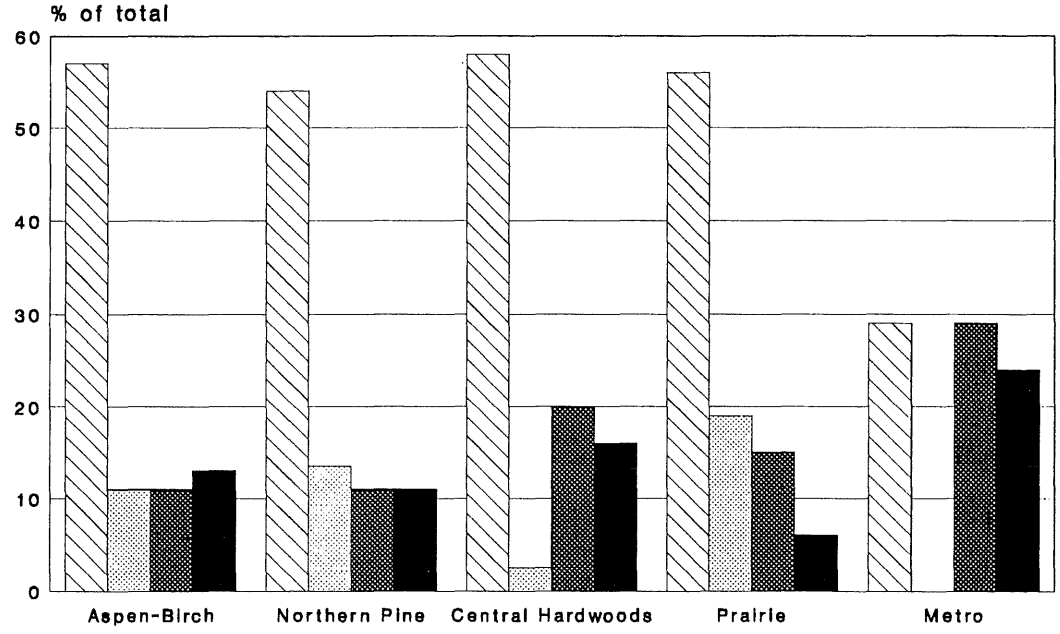


FIGURE 29

Commonly Used Facility by Pleasure Users and Survey Unit

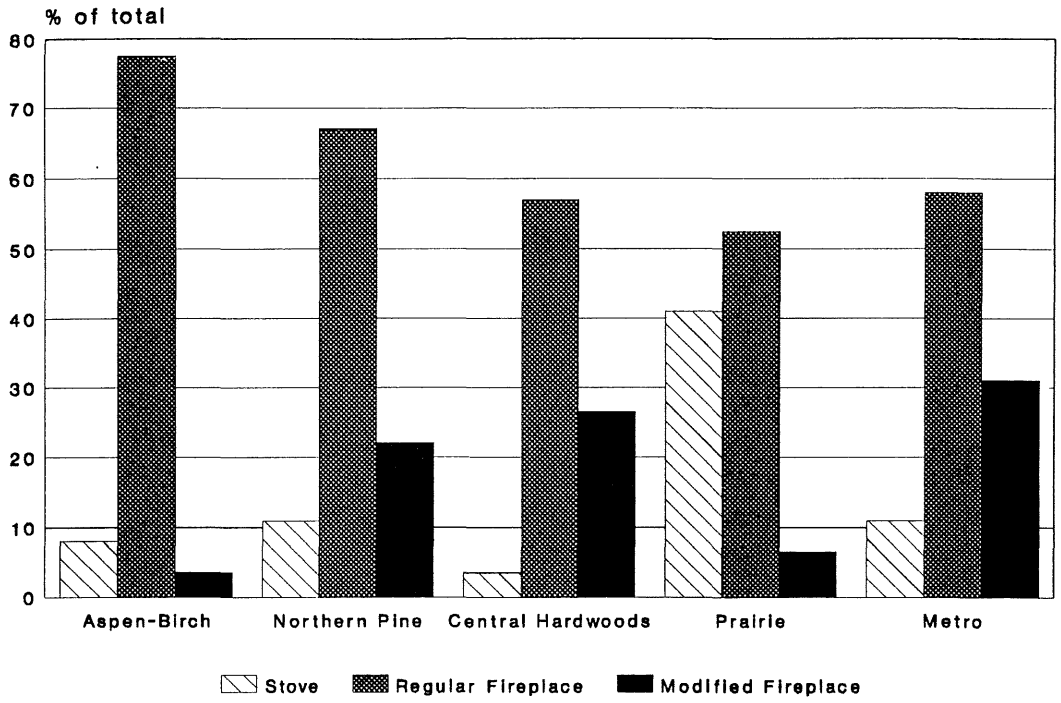


FIGURE 30

VOLUME OF FUELWOOD BURNED

The estimated number of cords of wood burned statewide for heating residential homes and second buildings is 1.039 million cords.[1] Primary residences account for 950,000 cords. The remaining 90,000 cords are consumed in second homes and outbuildings. Statewide, about 92 percent of the fuelwood is burned for major and supplementary heating of homes and second buildings (Figure 31).

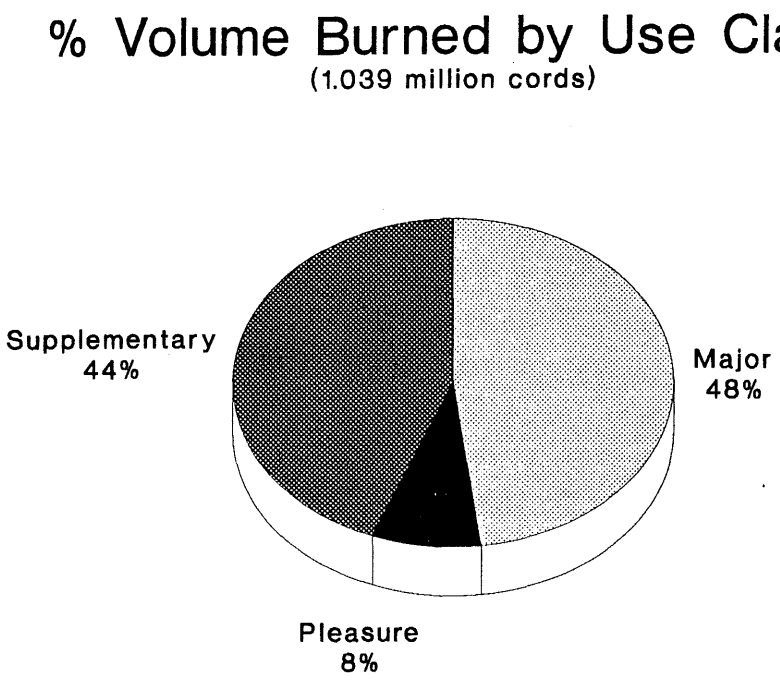


FIGURE 31

[1]One standard cord is equal to 128 cubic feet of wood or a stack of wood 4 feet high by 4 feet deep by 8 feet long.

The central hardwoods unit reported the greatest volume of fuelwood burned, 280,000 cords or 28 percent. The aspen-birch and prairie units reported the least volume of wood burned (Figure 32).

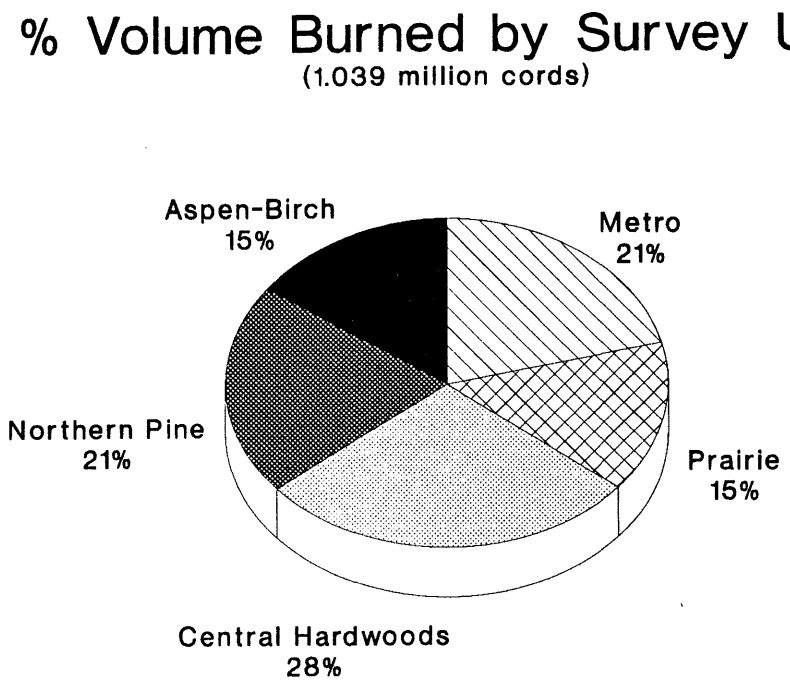


FIGURE 32

The greatest volume of fuelwood is burned by major users except in the metro and prairie units (Figure 33).

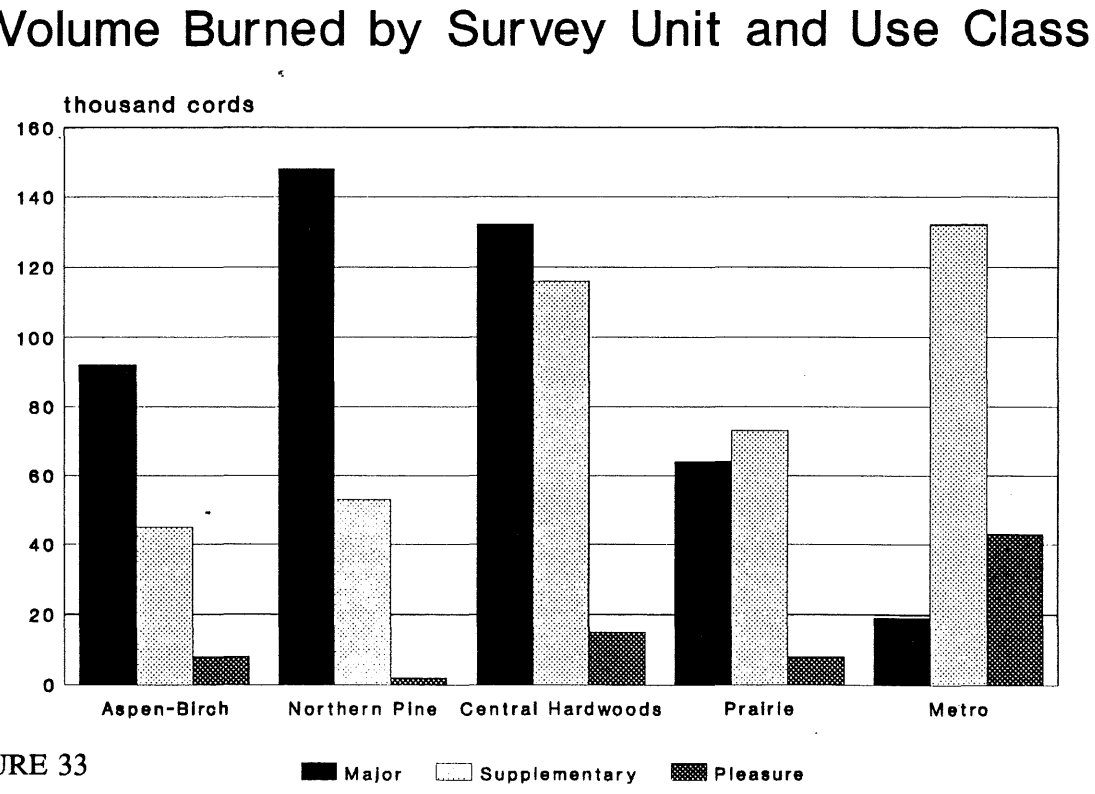


FIGURE 33

The average number of cords burned per household varies by use class (Figure 34). Major users average about six cords burned during a heating season. Other users average less. By survey unit, major woodburning households in the aspen-birch and northern pine units burn more wood per household than those in the other survey units.[2]

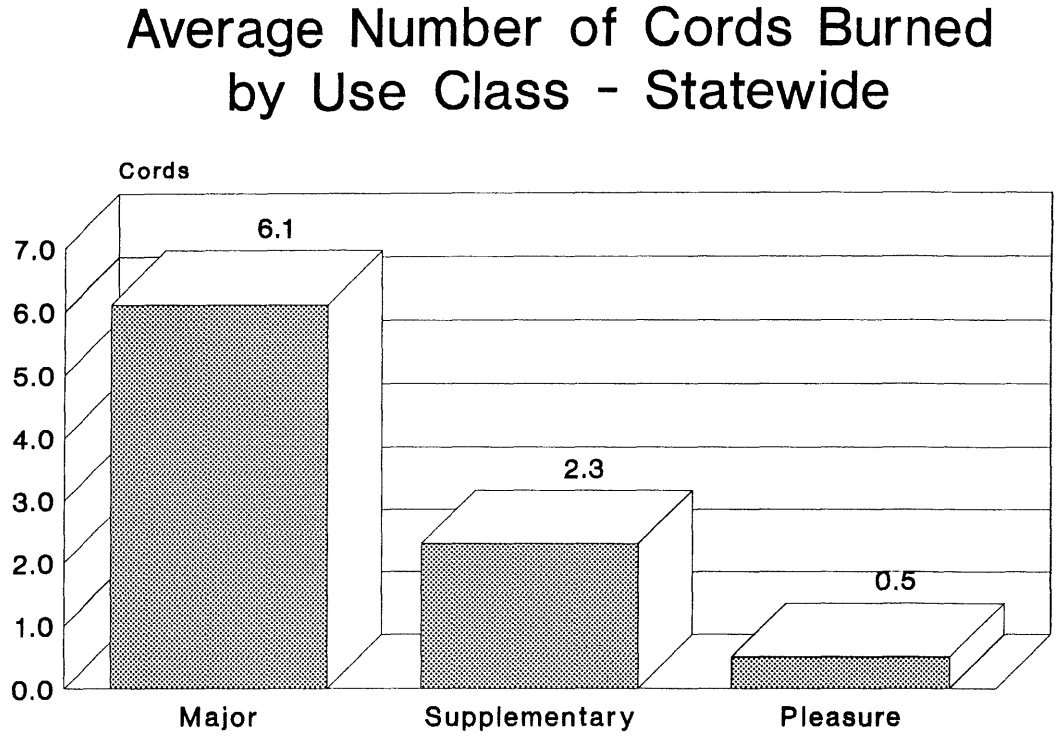


FIGURE 34

[2]Because the sample size for major users in the metro area was so small (n=2), we are not able to make definitive statement about the average number of cords burned. However, the metro unit is located within the central hardwoods area, so major metro users probably burn an average of four cords per season.

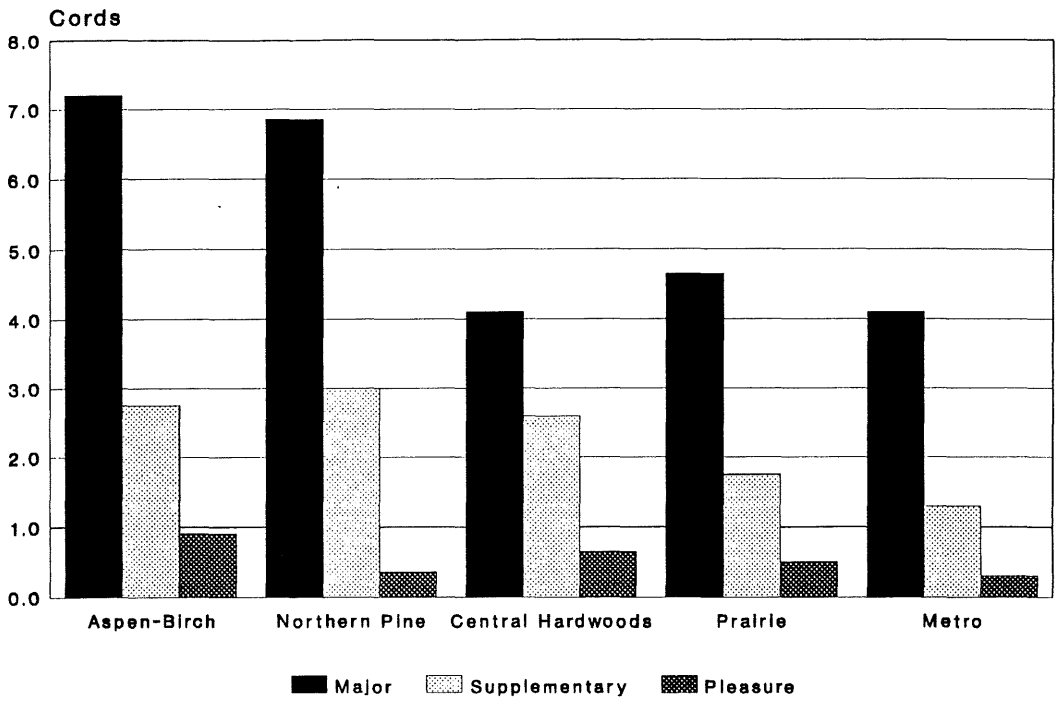


FIGURE 35

Fuelwood Species

Approximately 830,000 cords, or over 80 percent, of the wood consumed for heating is accounted for by six species. Of the total, oak makes up nearly one-third. Other important fuelwood species for residential heating include elm, birch, maple, ash, and aspen (Figure 36). Only 52,000 cords of lumber scraps, log slabs, and other industrial wood wastes were consumed.

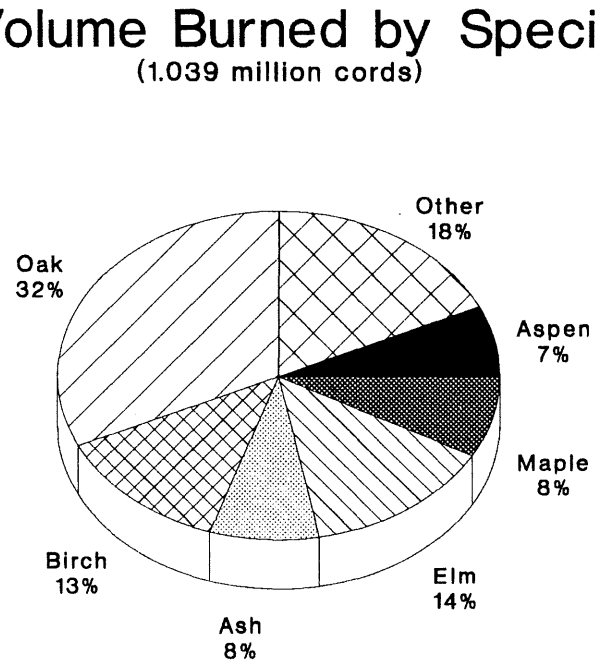


FIGURE 36

Note: Slabs and scrap lumber are included in this species breakdown.

Regional differences in the volumes and species available, as well as consumers' preferences, greatly influence the choice of species burned.

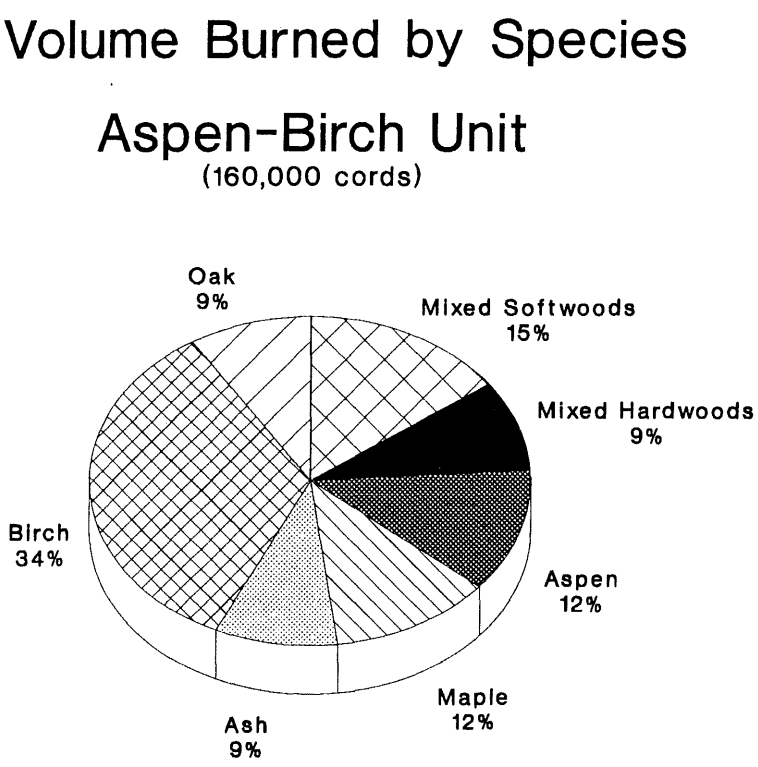


FIGURE 37

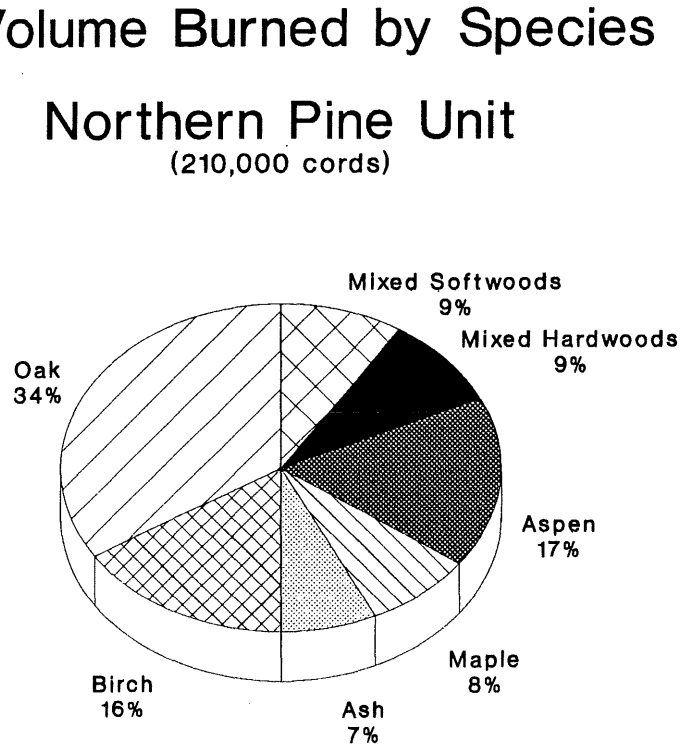


FIGURE 38

% Volume Burned by Species

Central Hardwoods Unit

(280,000 cords)

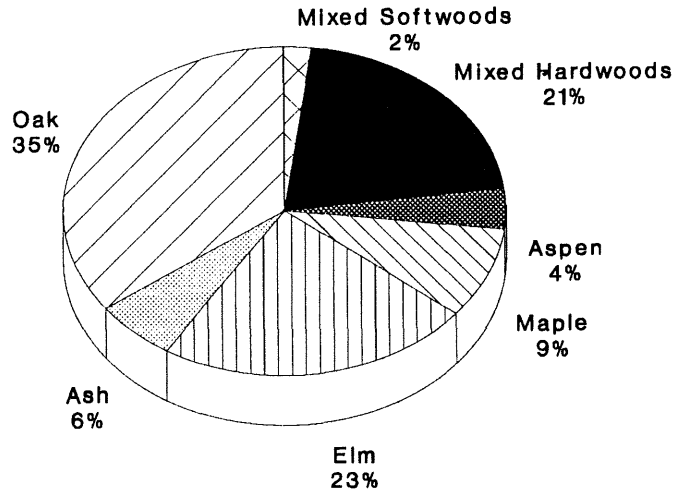


FIGURE 39

% Volume Burned by Species

Prairie Unit

(150,000 cords)

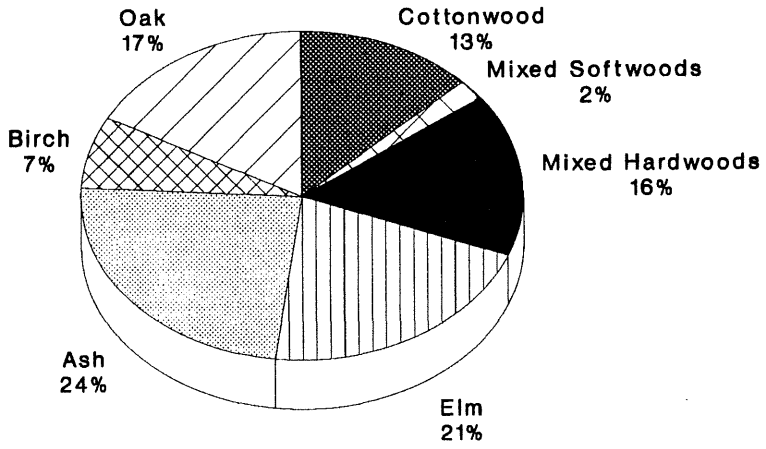


FIGURE 40

% Volume Burned by Species

Metro Unit
(240,000 cords)

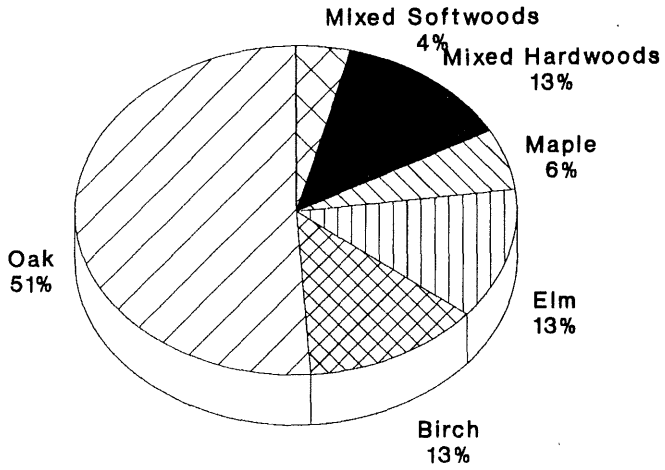


FIGURE 41

VOLUME OF FUELWOOD CUT

Individual households cut 630,000 cords of wood for their own use, about 51 percent of the fuelwood burned. The number and percent of households cutting wood, the volume of wood cut and the reason for cutting their own wood varies by survey unit. For example, compared to their counterparts, a greater proportion of households in the central hardwoods unit cut their own wood. They also cut more wood per household than other units (Figure 42). The metro unit has the fewest households that cut wood.

% of Households Cutting Fuelwood by Survey Unit

(265,000 households)

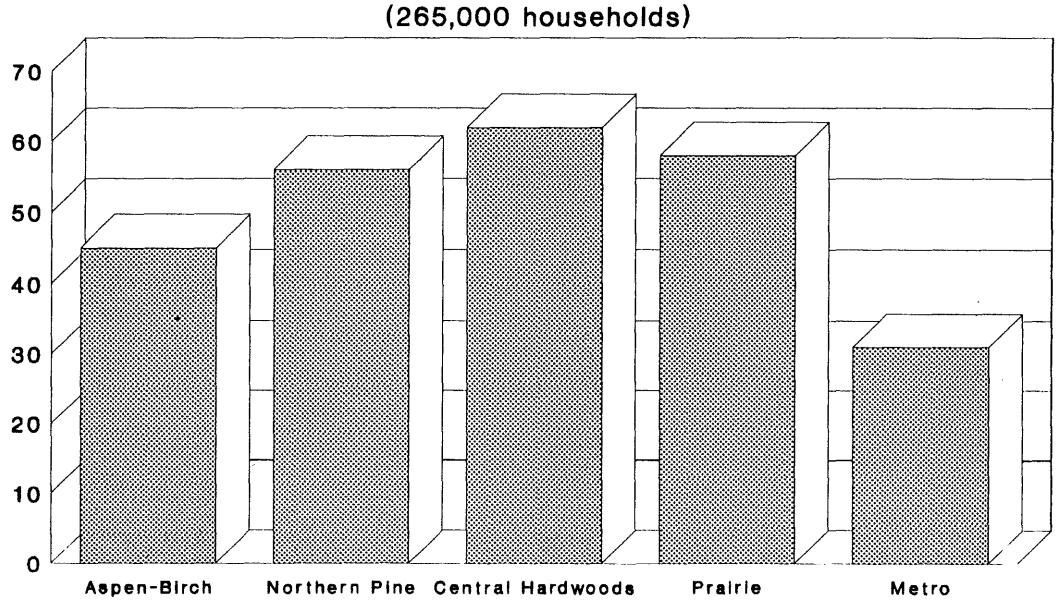


FIGURE 42

In general, households cutting their own fuelwood are major users (Figure 43). The exception to this pattern is the metro unit, where fewer than 25 percent of the households cutting their own fuelwood are major users.

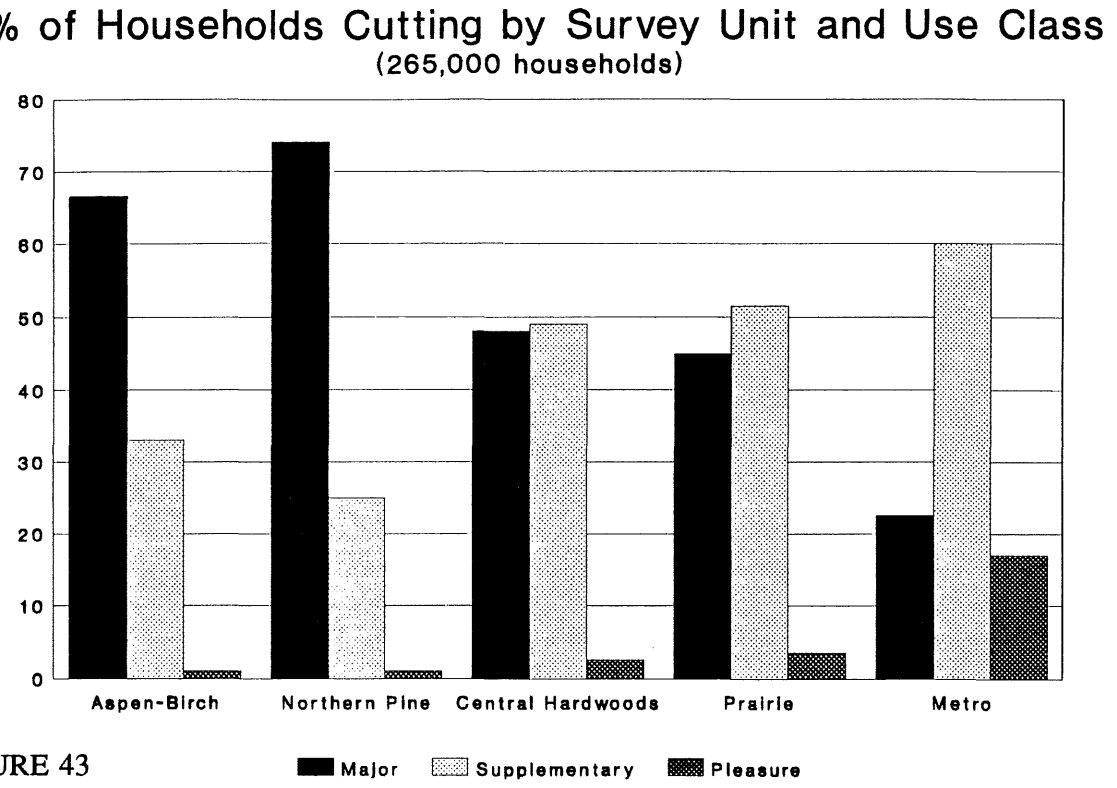


FIGURE 43

Volume of Fuelwood Cut By Land Ownership

Ninety-four percent, or 590,000 cords, of fuelwood is cut from private land (Figure 44). When looked at by survey unit, a few distinctions can be made (Figure 45). In the prairie unit, all the households sampled cut from private lands. Only households in the aspen-birch unit cut from federal lands, and these households cut more of their fuelwood from state and county lands than others.

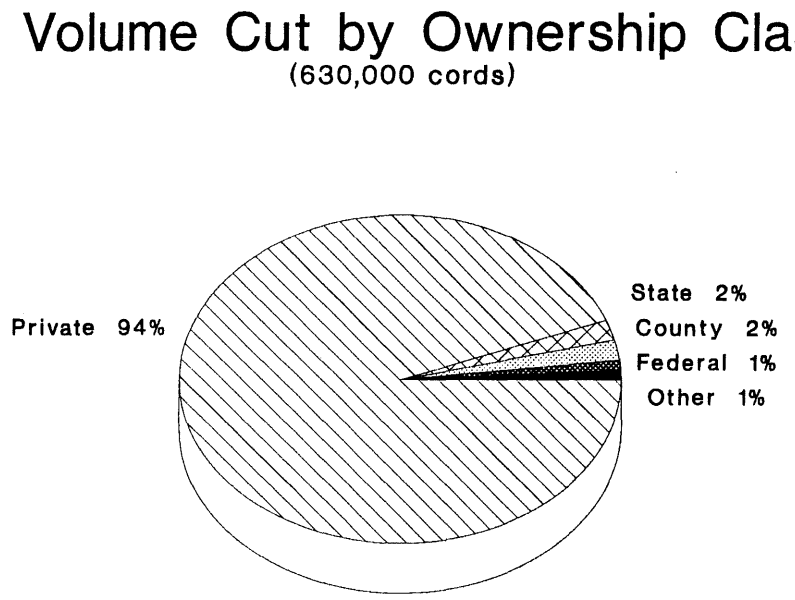


FIGURE 44

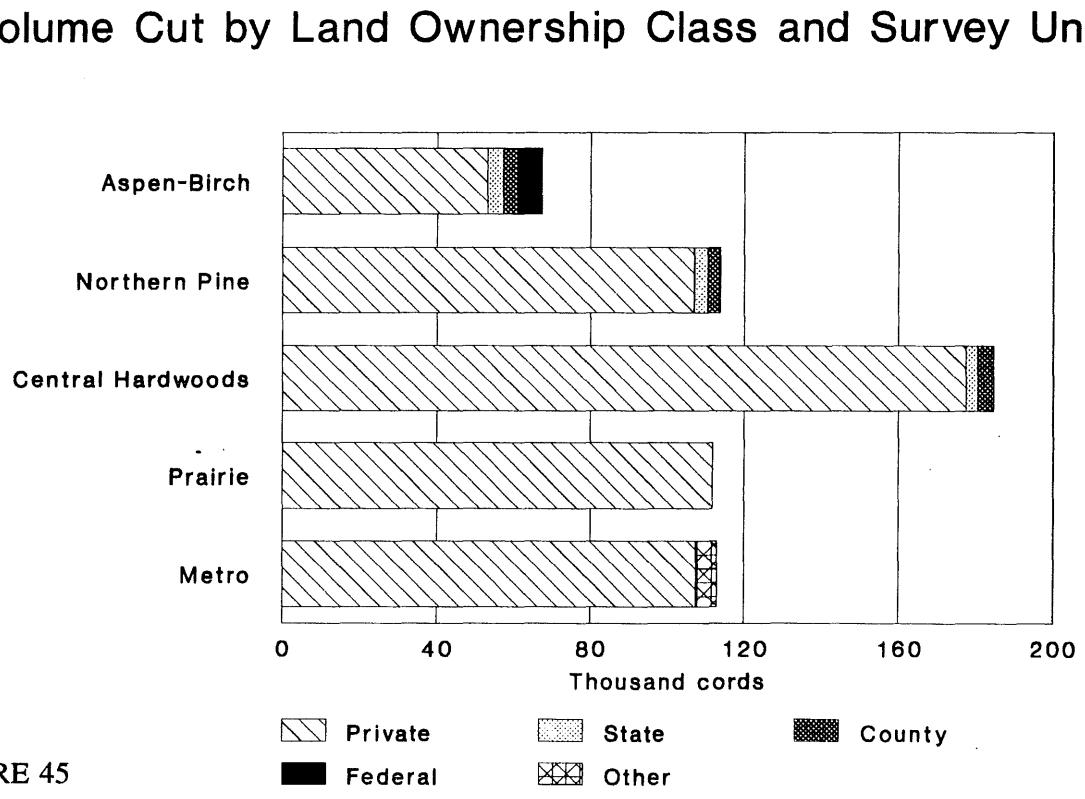


FIGURE 45

Volume of Fuelwood Cut By Type of Removal

Most of the wood cut, 330,000 cords, by residential households comes from dead or downed trees (Figure 46). Very little, 90,000 cords, comes from live trees. Significant volumes are harvested from nonforest lands as part of urban and rural land-clearing projects.

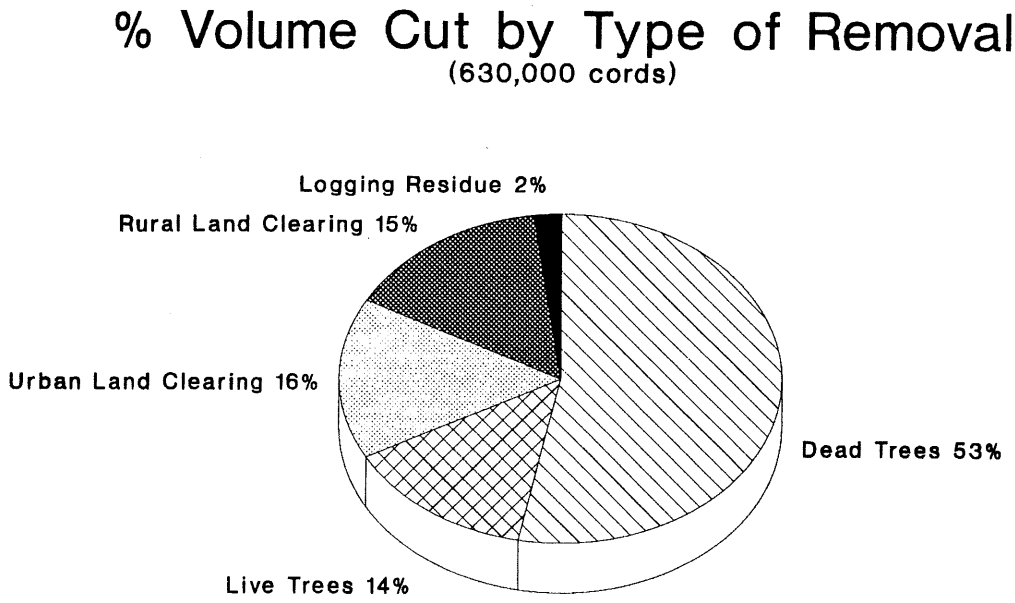


FIGURE 46

At the survey unit level, some differences exist. Compared to other units, households in the aspen-birch and northern pine units cut more fuelwood from live trees in woodland areas (Figure 47). Most of the trees cut by households in the central hardwoods unit are dead trees. Slightly more than two-thirds of the trees cut by metro unit households come from urban and residential land clearings.

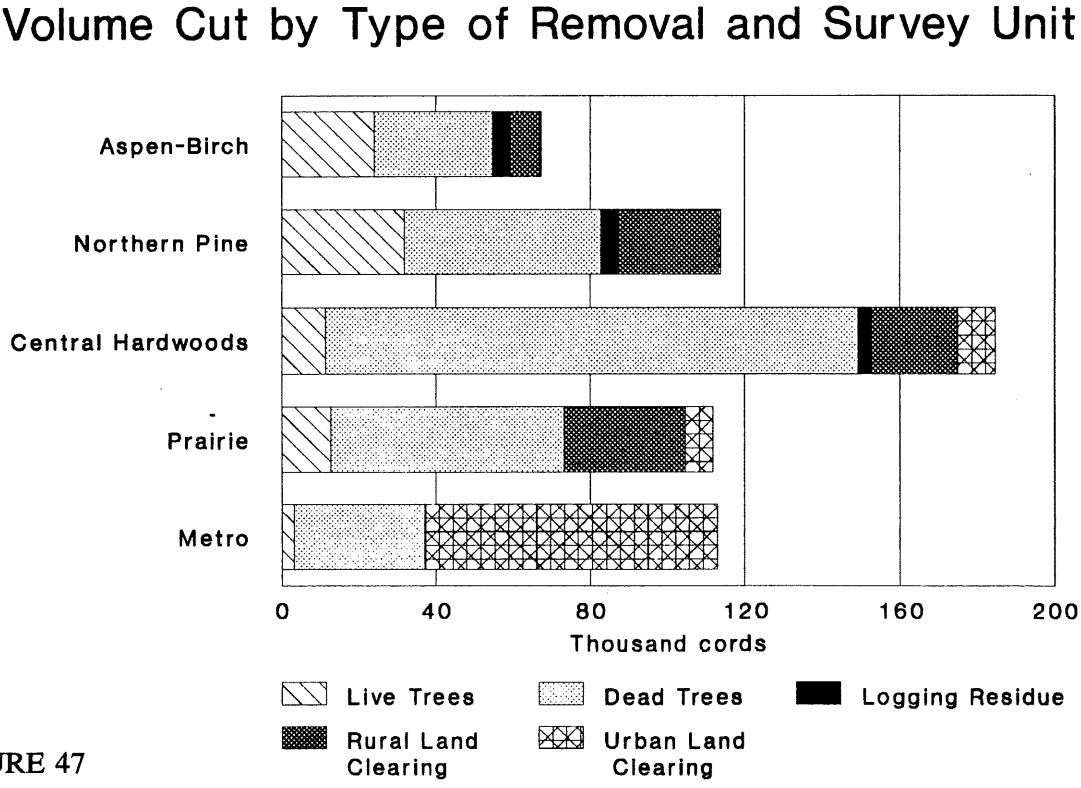


FIGURE 47

PURCHASED FUELWOOD

Much, but not all, of the fuelwood purchased for residential use was produced by Minnesota loggers. Minnesota loggers produced 174,000 cords of fuelwood in 1988. Nearly 85 percent of this came from live trees and more than 40 percent was harvested from state-administered lands.

This indicates that as much as 180,000 cords of fuelwood may be being imported into Minnesota, primarily from Wisconsin, for residential use. This figure should be viewed cautiously. Use it as indicator of magnitude only.

FUELWOOD HARVEST IMPACT ON COMMERCIAL HARVEST

The total harvest for fuelwood removes 237,000 cords of growing stock from commercial forest land. The remaining 567,000 cords of harvested fuelwood comes from dead trees, logging slash, and trees on noncommercial forest land.

TRENDS IN HOUSEHOLD FUELWOOD CONSUMPTION

Since the 1984-85 heating season, the volume of fuelwood burned by Minnesota households declined 26 percent. During the 1984-85 season 1.4 million cords were burned. In 1988-89, only 1.039 million cords were burned (Figure 48). But, over the same period the total number of households burning wood increased (Figure 49). This seeming discrepancy can be explained by at least three observations:

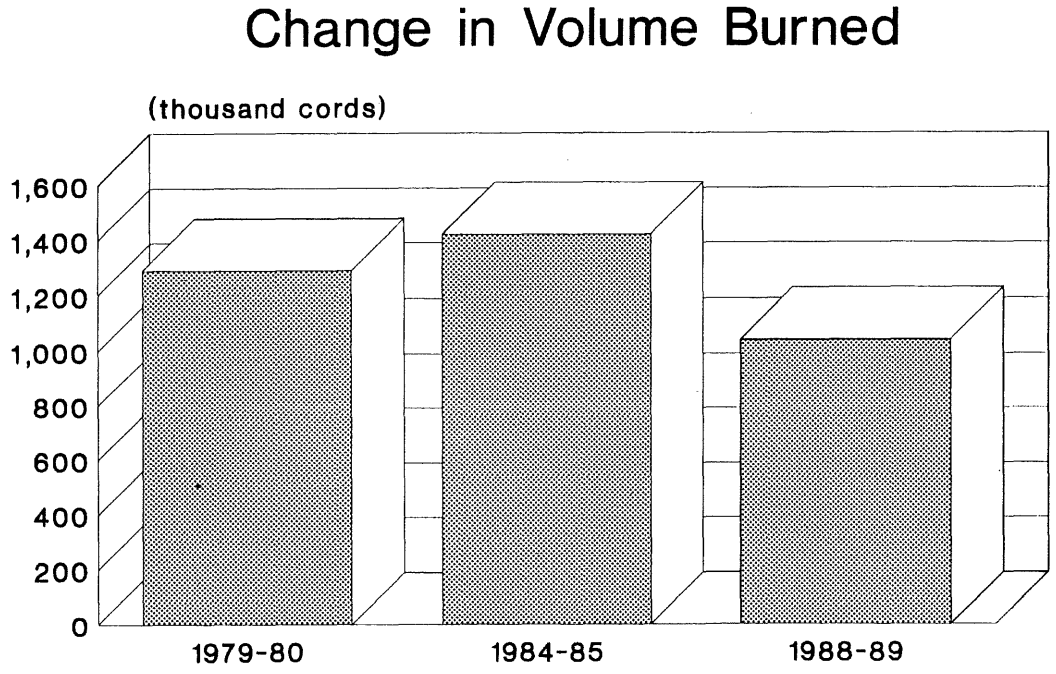


FIGURE 48

Change in Number of Households Burning

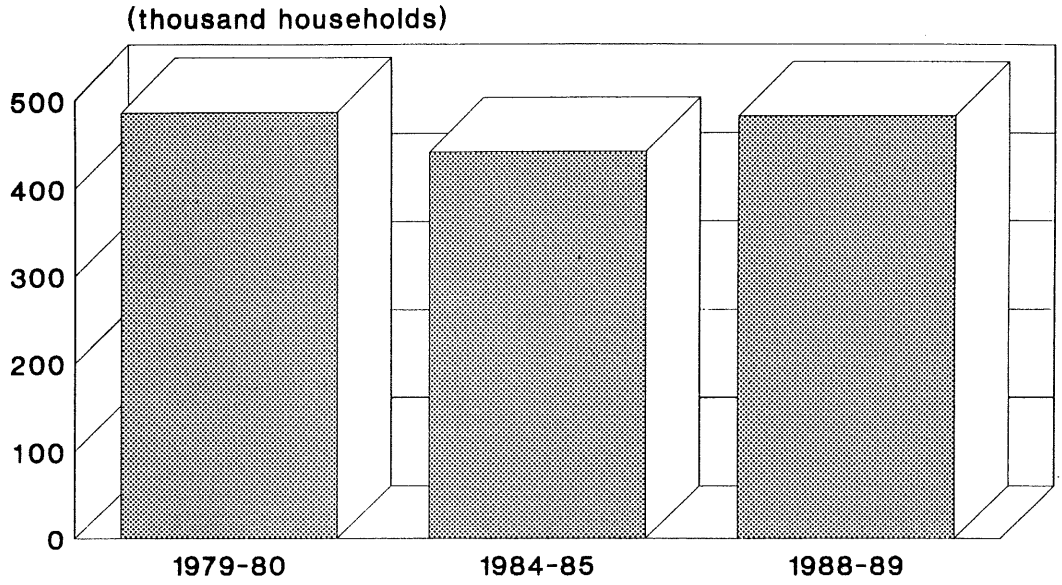


FIGURE 49

First, because of a mild winter, there were fewer heating days during 1988-89 than in 1978-79 or 1984-85.

Second, people may be burning wood more efficiently than in the past.

The combined effects of these two factors can be seen in all the survey units. Households heating primarily with wood burn fewer cords now than in the past. For example, major fuelwood consumers in the central and southern parts of the state burned about seven cords in 1984-85, but burned fewer than five cords during 1988-89 (Figure 50).

Change in Average Number of Cords Burned by Major Users

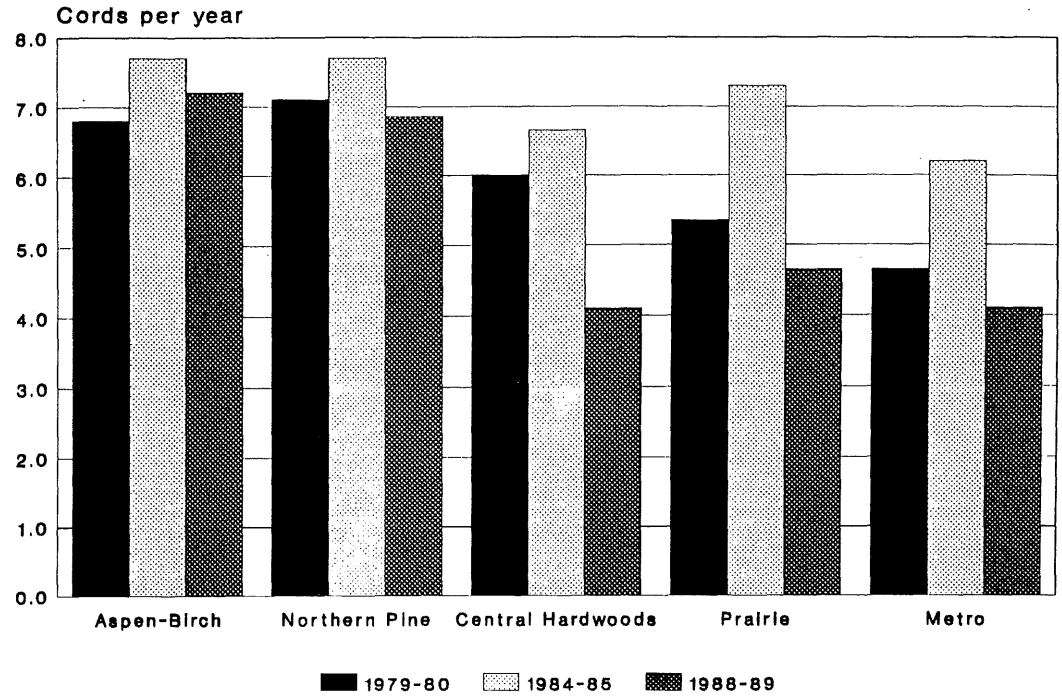


FIGURE 50

Similar decreases in the average number of cords burned are noted for supplemental heat and pleasure users (Figures 51 and 52).

Change in Average Number of Cords Burned by Supplementary Users

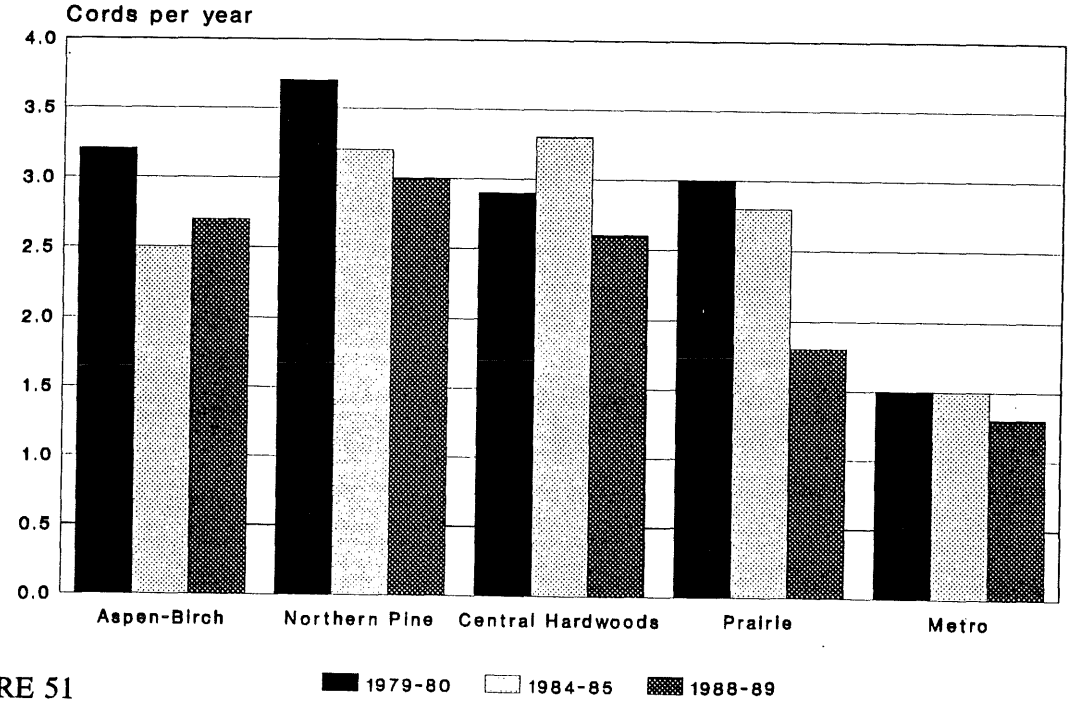


FIGURE 51

Change in Average Number of Cords Burned by Pleasure Users

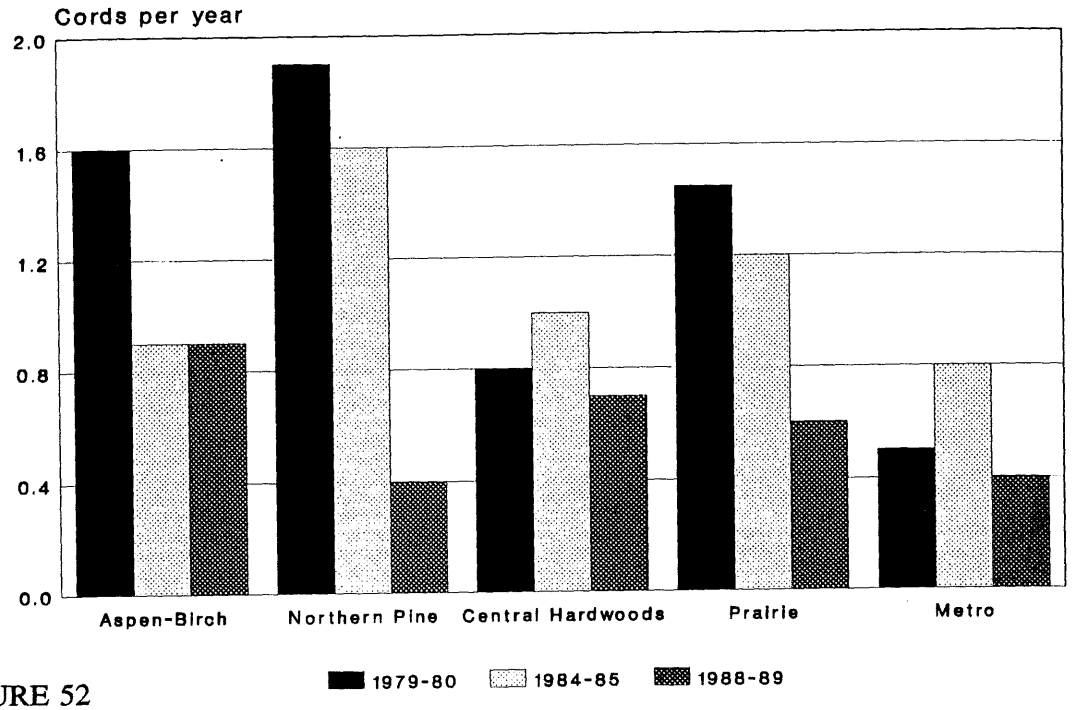


FIGURE 52

Third, and perhaps most significantly, fewer people burn wood as a major heat source. As other heating fuels have become more readily available and cheaper to obtain, the use of fuelwood as a major source of heat has declined. The increase in the number of households burning wood has come in those supplementing other heating fuels and those burning fuelwood just for pleasure (Figure 53).

Households Burning Fuelwood by Use Class

1984/85 vs 1988/89 Heating Seasons

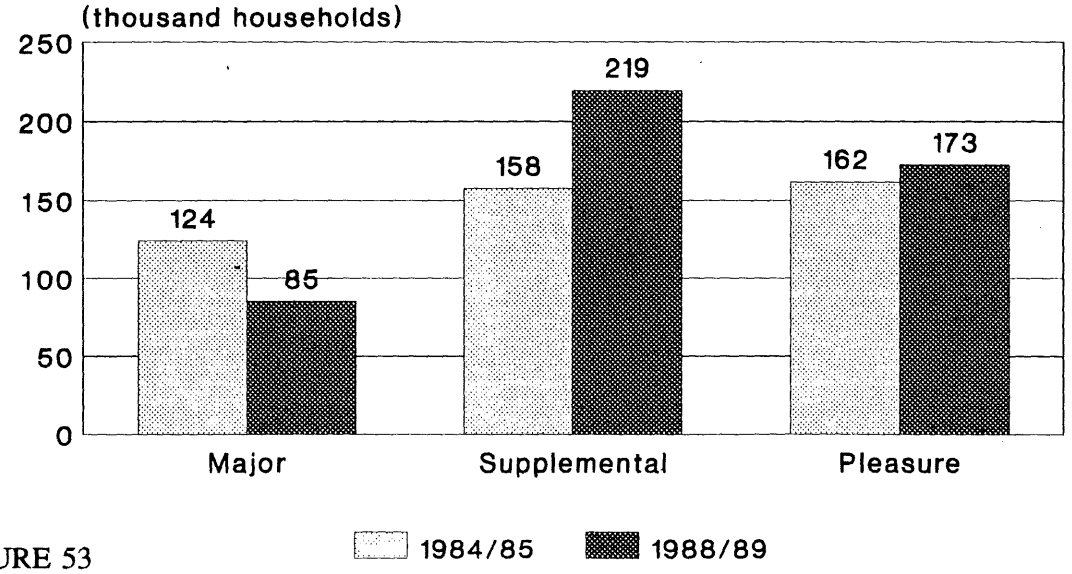


FIGURE 53

APPENDIX A

BIOMASS TABLES

TABLE 1: Wood Harvest in Minnesota from Commercial Forest Land

YEAR	CORD EQUIVALENTS (Millions)
1978	2.31
1979	2.42
1980	2.32
1981	2.35
1982	2.47
1983	3.09
1984	3.34
1985	3.07
1986	3.15
1987	3.24
1988	3.17
1990 (a)	3.57
1992 (a)	4.24
1995 (a)	4.90

(a) Estimated harvest volumes

TABLE 2: Minnesota Land Classes and Acreages

LAND CLASS	ACRES (Thousands)
Commercial Forest Land	13,695.1
Productive - Reserved	1,178.6
Unproductive	1,835.3
Subtotal: Forest Land	16,709.2
Nonforest with Trees	608.6
Nonforest without Trees	33,427.0
Subtotal: Nonforest Land	34,035.6
TOTAL	50,744.8

TABLE 3: Wood Biomass Composition

COMPONENT	PERCENT
Growing Stock (Merchantable)	53
Growing Stock - Tops and Limbs	20
Cull Trees	10
Cull Trees - Tops and Limbs	4
Reproduction Trees - 1-5" DBH	13
TOTAL	100

TABLE 4: Biomass Available for Energy

SOURCE	Year 1988	1990 (cords)	1995
Commercial Forest			
Harvest Residue	1,130,000	1,280,000	1,740,000
Mortality	37,000	41,000	56,000
Low Productivity Stands	116,000	116,000	116,000
Surplus Species	210,000	210,000	0
Subtotal - CFL	1,493,000	1,647,000	1,920,000
Unproductive	123,000	123,000	123,000
Nonforest with Trees	83,000	83,000	83,000
TOTAL	1,699,000	1,853,000	2,118,000

TABLE 5: Actual and Estimated Harvest Residues: 1988-1995

(thousand cord equivalents)

COMPONENT	Year 1988	1990	1995
Total Residue	2840	3190	4340
Recoverable Residue:			
Chipping	1130	1280	1780
Manual/Roundwood	710	800	1080

TABLE 6: Actual and Estimated Mortality Generated from Harvested Stands: 1988-1995

(thousand cord equivalents)

COMPONENT	Year 1988	1990	1995
Total Residue	132	147	201
Recoverable Residue:			
Chipping	111	123	168
Manual/Roundwood	105	117	159

TABLE 7: Low Productivity Hardwood Stands

TREE TYPE	ACRES (thousands)
Aspen / Balm-of-Gilead	112.2
Birch	50.0
Lowland Hardwood	139.5
Northern Hardwood	63.4
Oak	171.8
TOTAL	536.9

TABLE 8: Actual and Estimated Volume from Low Productivity Stands: 1988-1995

(thousand cord equivalents)

COMPONENT	YEAR 1988	1990	1995
Total Volume	162	162	162
Recoverable Volume:			
Chipping	116	116	116
Manual/Roundwood	105	105	105

TABLE 9: Actual and Estimated Volume of Surplus Paper Birch and Balm-of-Gilead Biomass Available for Energy: 1988-1995

(thousand cord equivalents)

COMPONENT	YEAR 1988	1990	1995
Growing Stock	155	155	0
Total Biomass*	292	292	0
Recoverable Residue:			
Chipping	210	210	0
Manual/Roundwood	189	189	0

*Total Biomass based on the ratio of growing stock to residue shown in Figure 3.

TABLE 10: Actual and Estimated Volume of Unproductive Forest Land Residues: 1988-1995

(thousand cord equivalents)

COMPONENT	YEAR 1988	1990	1995
Total Residue	170	170	170
Recoverable Residue:			
Chipping	123	123	123
Manual/Roundwood	112	112	112

TABLE 11: Actual and Estimated Volume of Nonforest Land Residues: 1988-1995

(thousand cord equivalents)

COMPONENT	YEAR 1988	1990	1995
Total Residue	115	115	115
Recoverable Residue:			
Chipping	83	83	83
Manual/Roundwood	74	74	74

TABLE 12: Energy Potential from Commercial and Unproductive Forest and Nonforest Lands

YEAR / METHOD OF RECOVERY	THOUSAND CORD EQUIVALENTS	THOUSAND GREEN TONS[1]	FUEL VALUE MILLION BTUs[2]
1988			
Total Residue	3623	8405	71,442
Recoverable Residue:			
Chipping	1399	3246	27,591
Manual/Roundwood	1225	2842	24,157
1990			
Total Residue	3531	8192	69,632
Recoverable Residue:			
Chipping	1853	4299	36,542
Manual/Roundwood	1319	3060	26,010
1995			
Total Residue	4854	11,261	95,718
Recoverable Residue:			
Chipping	2118	4914	41,769
Manual/Roundwood	1424	3304	28,084

1 Calculated based on 2.32 green tons per cord.

2 Calculated based on 8.5 million BTUs per green ton.

APPENDIX B

RESIDUE TABLES

TABLE 1: Residue Volume Distribution by County

(in green tons)
(does not include pulp-using industries)

COUNTY	BARK	SLABS/EDGINGS & CHIPS	SAWDUST/EDGINGS (FINE RESIDUE)	TOTAL TONS
Aitkin	151.1	14,834.1	6,008.0	20,993
Anoka	2120.4	107.2	2,901.6	5,129
Becker	1368.0	8,225.5	3,650.4	13,244
Beltrami	5873.8	19,912.6	12,093.9	37,880
Benton	0.0	888.2	4,922.7	5,811
Blue Earth	11.4	26.8	7.8	46
Carlton	5281.5	81,706.8	34,964.7	141,953
Carver	90.3	213.1	124.0	427
Cass	3724.9	39,352.8	13,233.5	56,311
Chisago	124.8	71.3	38.2	234
Clay	0.0	191.0	35.1	226
Clearwater	4075.5	9,142.9	6,591.0	19,809
Cook	9342.3	909.9	12,910.6	23,163
Crow Wing	0.0	10,019.9	4,193.3	14,213
Dakota	19.9	33.5	15.6	69
Douglas	0.0	594.0	214.5	809
Faribault	74.1	174.2	54.6	303
Fillmore	8050.1	22,947.7	11,029.6	42,027
Freeborn	757.4	1,775.5	1,033.5	3,566
Goodhue	1115.5	3,137.1	1,518.7	5,771
Hennepin	8.5	402.1	167.7	578
Houston	8097.4	23,113.4	11,080.7	42,291
Hubbard	34.2	9,990.3	4,005.3	14,030
Isanti	142.5	828.9	338.5	1,310
Itasca	556.6	90,984.6	39,118.1	170,659
Kanabec	0.0	639.8	261.3	901
Kandiyohi	57.6	113.9	66.3	238
Kittson	0.0	955.0	390.0	1,345
Koochiching	4113.2	32,035.4	13,612.6	59,761
Lake	3452.5	11,992.6	4,906.2	20,351
Lake of the Woods	1168.5	7,829.2	3,159.0	12,157
Le Sueur	114.0	382.0	156.0	652
Lincoln	142.5	335.0	195.0	673
Lyon	0.6	1.3	0.8	3
McLeod	28.5	67.0	39.0	135
Mahnomen	5.7	2,416.7	987.5	3,410
Marshall	0.0	128.0	11.7	140
Martin	114.0	268.0	156.0	538
Meeker	285.0	670.0	390.0	1,345
Mille Lacs	1995.0	10,136.7	4,438.2	16,570
Morrison	45.6	294.1	107.6	447
Mower	57.0	134.0	78.0	269
Murray	57.0	100.5	39.0	197
Nicollet	3162.1	7,410.2	4,270.5	14,843
Nobles	0.0	143.3	58.5	202
Norman	0.0	1,967.3	803.4	2,771

TABLE 1 (continued): Residue Volume Distribution by County

(in green tons)
(does not include pulp using industries)

COUNTY	BARK	SLABS/EDGINGS & CHIPS	SAWDUST/EDGINGS (FINE RESIDUE)	TOTAL TONS
Olmsted	91.2	302.2	132.6	526
Ottertail	344.3	1,969.8	828.4	3,142
Pine	0.0	19,797.2	8,045.7	27,843
Polk	11.4	105.1	32.0	148
Pope	0.0	238.8	93.6	332
Renville	6.3	14.7	8.6	30
Rice	0.0	382.0	156.0	538
Roseau	7.4	3,249.5	1,375.1	4,632
St. Louis	5520.5	25,974.4	10,970.0	42,465
Scott	176.7	415.4	234.0	826
Sherburne	3.8	301.8	123.2	429
Sibley	490.2	1,098.8	670.8	2,260
Stearns	0.0	3,248.9	1,312.2	4,561
Steele	0.0	286.5	117.0	404
Stevens	0.0	19.1	4.7	24
Todd	598.5	2,730.3	1,700.6	5,029
Wabasha	702.2	2,370.7	1,005.8	4,079
Wadena	769.5	16,478.8	6,924.5	24,173
Washington	84.4	255.3	106.1	446
Winona	179.0	497.2	276.1	952
Wright	0.0	215.8	88.1	304

TABLE 2: Volume by Fuel Use Class by Residue Category

(in green tons)

FUEL USE CLASS	BARK	SLABS/EDGINGS & CHIPS[1]	SAWDUST/EDGINGS (FINE RESIDUE)	TOTAL TONS	PERCENT
Industrial Fuel	652,420	105,161	101,485	859,066	56.8%
Domestic Fuel	3,629	108,049	1,810	113,489	7.5%
Processed Fuel	7,151	4,587	9,750	21,488	1.4%
Fiber Manufacture	34,936	185,807	0	220,743	14.6%
Other Uses	19,901	31,513	42,847	94,261	6.2%
Not Used	34,607	85,442	82,814	202,864	13.4%
TOTAL VOLUME	752,644	520,560	238,706	1,511,910	100.0%
	49.8%	34.4%	15.8%	100.0%	

1 Includes bark, unless bark is separated from roundwood by debarking process.

Conversion Factors Used for Tables 2 and 3:

(L) (Large Pulp Mills: bark = figures from J. Blyth, coarse = 0.00, fines = 0.00)
(S) (V) (Sawmills & Veneer Mills: bark = .57, coarse = 1.34/1.91, fines = .78)
(P) (Post & Pole Processors: bark = .57, coarse = 1.34/1.91, fines = 0.00)
(C) (Chippers: bark = .57, coarse = 0.00, fines = 0.01)
(W) (Whole Tree Chippers - est. 10,000 cords: bark = 0.00, coarse = 2.3 ton/cd, fines = .01)
(O) (Shavings & Other Mills: bark = .57, coarse = 0.00, fines = 0.57)

TABLE 3: Volume by Fuel Use Class by Residue Category

FUEL USE CLASS		BARK	SLABS/EDGINGS & CHIPS	SAWDUST/EDGINGS (FINE RESIDUE)	TOTAL TONS	% OF CLASS	% OF TOTAL
Industrial Fuel	(L)	566,946.0	0.0	0.0	566,946	66.0	37.5
Industrial Fuel	(S)	58,574.2	71,441.4	90,579.8	220,595	25.7	14.6
Industrial Fuel	(V)	6,270.0	10,720.0	5,460.0	22,450	2.6	1.5
Industrial Fuel	(P)	320.6	0.0	0.0	321	.0	.0
Industrial Fuel	(C)	19,380.0	0.0	215.0	19,595	2.3	1.3
Industrial Fuel	(W)	0.0	23,000.0	100.0	23,100	2.7	1.5
Industrial Fuel	(O)	929.1	0.0	5,130.0	6,059	.7	.4
		652,420.0	105,161.0	101,485.0	859,066		(56.8)
Domestic Fuel	(S)	3,543.7	107,466.2	1,810.4	112,820	99.4	7.5
Domestic Fuel	(V)	0.0	191.0	0.0	191	.2	.0
Domestic Fuel	(P)	85.5	392.0	0.0	478	.4	.0
		3,629.0	108,049.0	1,810.0	113,489		(7.5)
Processed Fuel	(S)	7,150.6	4,587.0	9,750.0	21,488	100	(1.4)
Fiber Manufacture	(L)	34,936.0	0.0	0.0	34,936	15.8	2.3
Fiber Manufacture	(S)	0.0	185,806.9	0.0	185,807	84.2	12.3
		34,936.0	185,807.0	0	220,743		(14.6)
Other Uses	(L)	5,883.0	0.0	0.0	5,883	6.2	.4
Other Uses	(S)	13,732.8	25,782.8	39,938.9	79,455	84.3	5.2
Other Uses	(V)	0.0	5,730.0	2,418.0	8,148	8.6	.5
Other Uses	(P)	0.0	0.0	0.0	0	0.0	0.0
Other Uses	(O)	285.0	0.0	490.2	775	.8	.0
		19,901.0	31,513.0	42,847.0	94,261		(6.2)
Not Used	(S)	27,725.6	85,442.3	82,213.0	195,381	96.3	12.9
Not Used	(V)	22.8	0.0	31.2	54	.0	.0
Not Used	(P)	4,025.6	0.0	0.0	4,026	2.0	.3
Not Used	(C)	2,223.0	0.0	0.0	2,223	1.1	.1
Not Used	(O)	609.9	0.0	570.0	1,180	.6	.0
		34,607.0	85,442.0	82,814.0	202,864		(13.4)
TOTAL :	(L)	607,765.0	0.0	0.0	607,765	40.2	
TOTAL :	(S)	110,727.0	480,526.7	224,292.0	815,546	53.9	
TOTAL :	(V)	6,292.8	16,641.0	7,909.2	30,843	2.0	
TOTAL :	(P)	4,431.8	392.0	0.0	4,824	.3	
TOTAL :	(C)	21,603.0	0.0	215.0	21,818	1.4	
TOTAL :	(W)	0.0	23,000.0	100.0	23,100	1.5	
TOTAL :	(O)	1,824.0	0.0	6,190.2	8,014	.5	
GRAND TOTAL:		752,644.0	520,560	238,706	1,511,910	100.0	100%

APPENDIX C

URBAN TABLES

TABLE 1: Types of Wood Wastes

TYPE	OUTSTATE MINNESOTA		TWIN CITY METRO AREA		TOTAL	
	TONS	PERCENT	TONS	PERCENT	TONS	PERCENT
Paper	618,000	59	782,800	62	1,400,800	58
Wood[1]	240,000	22	217,800	17	457,800	19
Yard	177,000	16	224,200	18	401,200	17
Tree Removals	53,460	5	31,500	3	84,960	4
Railroad Ties	--	--	--	--	40,000	2
TOTAL	1,088,460	100	1,256,300	100	2,384,760	100

[1] Wood = Residential, industrial, commercial, demolition wood, and/or secondary crating.

TABLE 2: Residential/Commercial/Industrial Wood Waste

TYPE	OUTSTATE MINNESOTA	TWIN CITY METRO AREA	TOTAL
	TONS	TONS	TONS
Demolition Wood	150,800	191,200	342,000
Pallets, Dunnage	32,500	41,200	73,700
Secondary Wood Products Waste	16,800	21,200	38,000
TOTAL	200,100	253,600	453,700

TABLE 3: Disposal of Demolition Wood Waste

TYPE	TONS
Sanitary Landfill	99,100
Demolition Landfill	136,800
Other Methods	106,100
TOTAL	342,000

TABLE 4: Paper Waste Found in Landfills

TYPE	OUTSTATE MINNESOTA		TWIN CITY METRO AREA		TOTAL	
	TONS	PERCENT	TONS	PERCENT	TONS	PERCENT
Corrugated	231,100	37	292,800	37	523,900	37
Newspaper	86,500	14	109,600	14	196,100	14
High Grade Paper	70,500	12	89,200	12	159,700	12
Other Paper	229,900	37	291,200	37	521,100	37
TOTAL	618,000	100	782,800	100	1,400,800	100

APPENDIX D

WOOD PROCESSORS QUESTIONNAIRE

Form Approved
OMB No. 0596-0010

LOGS AND OTHER WOOD PROCESSED IN 1988
Minnesota

This form is for reporting the quantities and kinds of logs and other wood processed by this plant in 1988, and the disposition of wood residues resulting from this operation.

All replies will be held confidential and used only for statistical reports.

☐ Check here if you wish to receive a copy of the report resulting from this study.

Plant or Company Name: _____

Mailing Address: _____

Plant Location: _____ County

Person to contact about this report _____
Name Title Phone No.

Types of wood processed in 1988. Check only one kind of wood product. If more than one kind was received, fill out a separate form for each.

14 -15

01	☐	Saw logs & bolts - includes veneer logs sawn
02	☐	Veneer logs & bolts cut into veneer
03	☐	Cooperage logs & bolts
06	☐	Piling
07	☐	Poles
09	☐	Fuelwood - industrial use
10	☐	Posts
11	☐	Charcoal wood
12	☐	Other (specify) _____

☐ Check here if no wood was processed in 1988 and return the form.

Total volume of above-checked product that was processed in 1988.

Conifer (pine, spruce, etc.) _____ (27-36) Hardwood (includes aspen) _____ (37-46)

Do not write in this block
Cols. 1-5 = 61100

Mill	State	County
XXX	XX	XXX
6-8	9-10	11-13

Do not write in this block

Factor
XXX
47-49

Mill size class ___ (50)

A self-addressed stamped envelope is provided for your convenience.

This survey is authorized by PL 93-378 as amended by PL 94-588. Your cooperation is appreciated and needed to make the results of this survey comprehensive, accurate, and timely, although you are not required to respond.

LOGS and OTHER WOOD PROCESSED IN 1988. Do not include logs or bolts sold or transferred to other companies. Enter quantity processed opposite species in appropriate county or state column showing where the logs and bolts were harvested. State map on page 4 shows county boundaries. If unit of measure is board feet, indicate log rule or lumber tally. ☐ Doyle ☐ International ☐ Scribner ☐ Lbr. Tally. If cords, specify size _____ If weight, specify pounds per thousand board feet _____ or pounds per cord _____

Cols.1-5=612xx or 613xx

SPECIES		Unit of Measure: Board ft. ☐ Cords ☐ Cubic ft. ☐ Lineal ft. ☐ Pieces ☐ Weight ☐ Other ☐	FROM MINNESOTA — ENTER NAME OF COUNTY IMMEDIATELY BELOW								OTHER STATES AND CANADA — ENTER STATE NAMES AND CANADA BELOW	
			XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
Cedar	01											
Fir, Balsam	02											
Hemlock	03											
Pine, Jack	04											
Pine, Red	05											
Pine, White	06											
Spruce	07											
Tamarack	08											
Ash	09											
Aspen (popple)	10											
Balm of Gil.	11											
Basswood	12											
Beech	13											
Birch, White	14											
Birch, Yellow	15											
Cottonwood	16											
Elm	17											
Hickory	18											
Maple, Hard	19											
Maple, Soft	20											
Oak, Red	21											
Oak, White	22											
Walnut	23											
Other (specify) _____	24											
TOTAL												

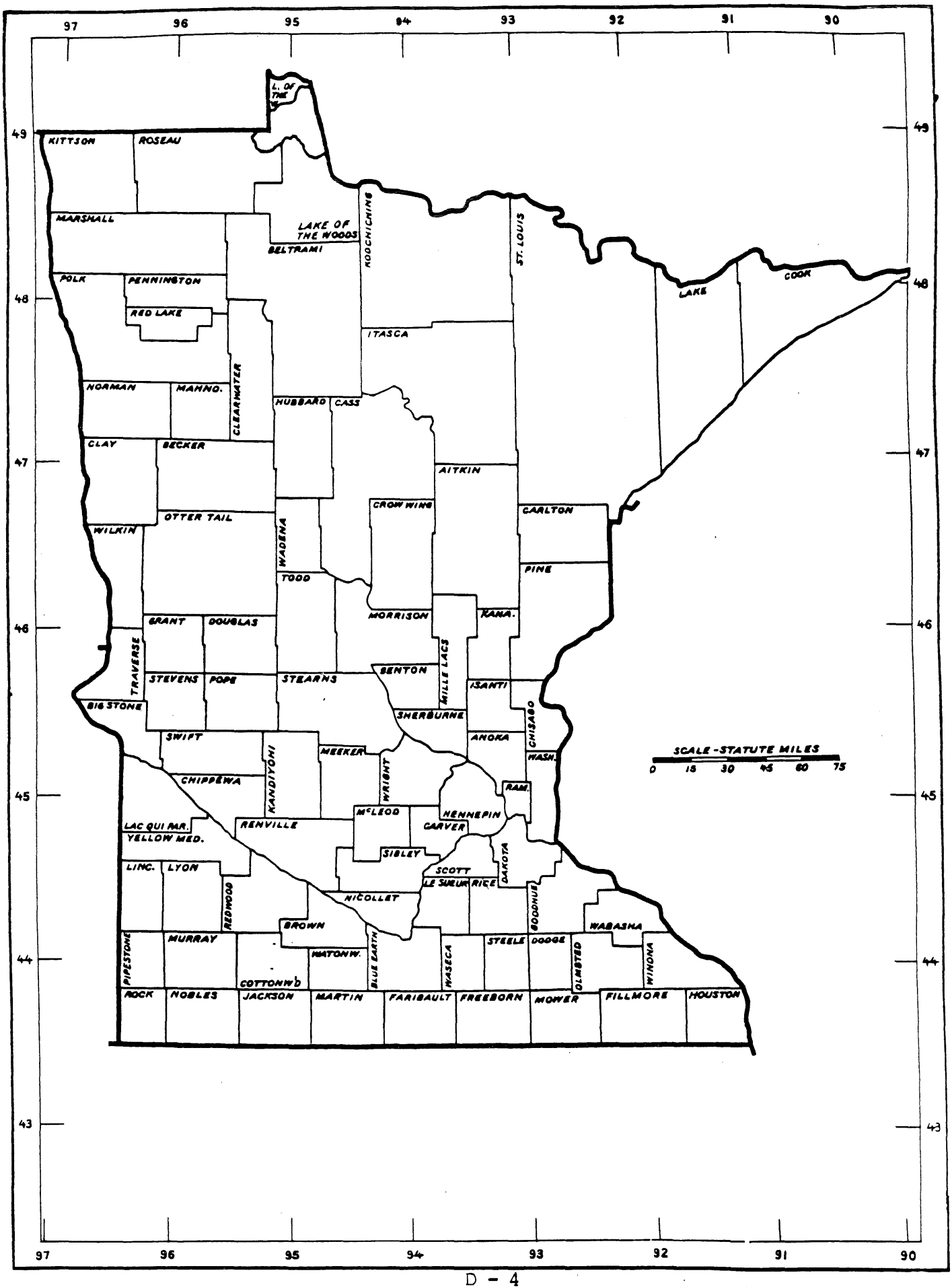
DISPOSAL OF MILL RESIDUES IN 1988 BY TYPE AND USE, FOR PRODUCT CHECKED ON PAGE 1.

Instructions: Please enter your best estimate of the percentage of each type of mill residue that was used for the various purposes indicated.

Cols 1-5 = 615xx

Disposal of residue		BARK		COARSE RESIDUES (Suitable for chipping such as slabs, edgings, etc.)		FINE RESIDUES (Sawdust, veneer clippings, etc. not suitable for chipping)	
		1 XX Conifers	2 XX Hardwood	3 XX Conifers	4 XX Hardwood	5 XX Conifers	6 XX Hardwood
1. USED FOR:							
a. Manufacture of fiber products such as pulp, hardboard, or roofing felt	1	%	%	%	%	%	%
b. Charcoal or chemical wood	2	%	%	%	%	%	%
c. Industrial fuel at this or other mills	3	%	%	%	%	%	%
d. Domestic household fuel--sold or given away	4	%	%	%	%	%	%
e. Miscellaneous uses such as livestock bedding, mulch, small dimension, and specialty items	5	%	%	%	%	%	%
2. NOT USED (including land fill and residues burned as waste)	6	%	%	%	%	%	%
3. TOTAL		100%	100%	100%	100%	100%	100%

MINNESOTA


97
96
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L. OF THE
KITTSON
ROSEAU
MARSHALL
LAKE OF THE WOODS
BELTRAMI
KOOCHICHING
ST. LOUIS
LAKE
COOK
POLK
PENNINGTON
RED LAKE
ITASCA
NORMAN
MAHNO.
CLEARWATER
HUBBARD
CASS
CLAY
BECKER
AITKIN
WILKIN
OTTER TAIL
WADENA
CROW WING
CARLTON
PINE
TODD
MORRISON
KANA.
GRANT
DOUGLAS
TRAVERSE
STEVENS
POPE
STEARNS
BENTON
MILLE LACS
ISANTI
CHISAGO
BIG STONE
SHERBURNE
SWIFT
ANOKA
WASH.
MEEKER
KANDIYOHI
WRIGHT
CHIPPEWA
RAM.
McLEOD
HENNEPIN
LAC QUI PAR.
YELLOW MED.
RENVILLE
CARVER
SIBLEY
LINC.
LYON
SCOTT
DAKOTA
LE SUEUR
RICE
REDWOOD
NICOLLET
GOODHUE
WABASHA
BROWN
MURRAY
WATONW.
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
PIPESTONE
COTTONWD
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON
SCALE - STATUTE MILES
0 15 30 45 60 75

APPENDIX E

CONVERSION FACTORS

PRIMARY PROCESSOR RESIDUE CONVERSION FACTORS

Tons of Residue:

Bark	=	.57 green tons/1,000 boardfeet International Rule
Coarse	=	1.34 green tons/1,000 boardfeet International Rule
Fine	=	.78 green tons/1,000 boardfeet International Rule

Cubic Feet of Residue:

Bark	=	31 ft^3/1,000 boardfeet International Rule
Coarse	=	48 ft^3/1,000 boardfeet International Rule
Fine	=	28 ft^3/1,000 boardfeet International Rule

Cubic Feet to Green Tons:

				green tons/ft^3	ft^3/gr ton	lbs/ft^3
Bark	=	$\frac{.57 \text{ gr tons/M}}{31 \text{ ft}^3\text{/M}}$	=	.018	54.4	36
Coarse	=	$\frac{1.34 \text{ gr tons/M}}{48 \text{ ft}^3\text{/M}}$	=	.028	38.8	56
Fine	=	$\frac{.78 \text{ gr tons/M}}{28 \text{ ft}^3\text{/M}}$	=	.028	35.9	56

An average for total residue: 38.5 ft^3/ton

APPENDIX F

FUELWOOD QUESTIONNAIRE

OFFICE USE ONLY

PHONE #_____

INTERVIEWER_____

DATE_____

RESIDENTIAL FUELWOOD DEMAND ASSESSMENT

Q. Number_____

burn season (year)		State ID #		survey unit	pop unit	County #			survey number within a County		
8	9	2	7								
1	2	3	4	5	6	7	8	9	10	11	12

1. Do you have facilities to burn wood? (1=YES, 2=NO) . . . . . [ ] 13

2. Did you burn fuelwood last year? (1=YES, 2=NO). . . . . [ ] 14

3. Do you plan to burn fuelwood this winter? (1=YES, 2=NO) . . . . . [ ] 15

4. Have you recently installed or do you plan on installing wood burning facilities? (1=YES, 2=NO) . . . . [ ] 16

5. Over the last 12 months did your household cut or collect fuelwood or POSTS in Minnesota on land where it was grown? . . . . . [ ] (69)

(1=CUT/COLLECT FUELWOOD, 2=NO, 3=DON'T KNOW)

IF RESPONDENT ANSWERS "NO" TO QUESTIONS 1 THRU 5, END INTERVIEW

---

6. What type of facility do you have to burn wood? . . . . . [ ] 17

1=STOVE 2=REGULAR FIREPLACE 3=MODIFIED FIREPLACE (eg., insert) 4=FURNACE
5=1 & 2 6=1 & 3 7=1 & 4 8=2 OR 3, & 4

7. How many years ago did you first burn wood? . . . . . [ ] 18

1=LAST YEAR 2=2 YEARS AGO 3=3 YEARS AGO 4=4-5 YEARS AGO 5=MORE THAN 5 YEARS AGO

8. Do you burn wood as: (Code ONE response only). . . . . [ ] 19

1=MAJOR SOURCE OF HEAT (Primary heat source with another fuel for backup)
2=SUPPLEMENTARY SOURCE OF HEAT (used as backup system)
3=FOR PLEASURE ONLY

9. If you burn wood for BOTH heating and pleasure, what % of the volume of wood is burned strictly for pleasure? (leave BLANK if burn for PLEASURE ONLY). . . . . [ ][ ] 20-21

10. What species did you burn and what percent of the total volume BURNED was each?
(Round to nearest tenth. Blank=0%, 1=10%, 2=20%,...9=90-100%)

oak	birch	ash	elm	maple	aspen	bass-wood	mixed hrdwd	other hrdwd #1	other hrdwd #2	other hrdwd #3	pine	spruce /fir	mixed sftwd	other sftwd #1	other sftwd #2
38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53

11. For your **RESIDENCE**, what volume of **roundwood** did you burn?
(Give volume to nearest 1/10th standard cord) . . . . . [ ][ ].[ ] 57-59

volume of **roundwood**:_____

12. For your **RESIDENCE**, what volume of **industrial residue** (eg. pallets, crates, lumber) did you burn?
(Give volume to nearest 1/10th standard cord) . . . . . [ ][ ].[ ] 60-62

volume of **industrial residue**:_____

13. Do you have a second home or other building where you burn wood?

If **NO** leave **blank** and **SKIP QUESTIONS 14 AND 15**

If YES, what county is the second home or other building located in?
County name:_____ . . . . . [ ][ ][ ] 54-56

14. For your **SECOND HOME** (other building), what volume of **roundwood** did you burn?
(Give volume to nearest 1/10th standard cord) . . . . . [ ][ ].[ ] 63-65

volume of **roundwood**:_____

15. For your **SECOND HOME** (other building), what volume of **industrial residue** (eg. pallets, crates, lumber) did you burn?
(Give volume to nearest 1/10th standard cord) . . . . . [ ][ ].[ ] 66-68

volume of **industrial residue**:_____

16. If you purchase fuelwood, what length is the wood? . . . . . [ ] 24

1=16" 3=48" 5=8 feet (or 100") 7=random/mixed roundwood 9=did NOT purchase
2=24" 4=6 feet 6=tree length 8=random/mixed slabs, edgings

****
* *
* IF ANSWER TO QUESTION 5 IS "NO", THANK RESPONDENT AND END THE INTERVIEW *
* *
****

17. What percent of your fuelwood does your household cut? (Blank = 0%, 99 = 100%) . . . . . [ ][ ] 22-23

18. If your household cut or collected fuelwood in Minnesota during the last 12 months on land where where it was grown, about how much was cut or collected?
Code the AMOUNT in tenths. . . . . [ ][ ].[ ] (70-72)

Code MEASUREMENT UNITS: . . . . . [ ][ ] (73-74)

01 = 3/4 ton pickup	08 = small van	15 = dry wood, tons	22 = bundles	30 = 50 pieces
02 = 1/2 ton pickup	09 = full size station wgn	16 = cubic feet	23 = 5" trees	31 = 100 pieces
03 = small pickup truck (Toyota, Nissan, etc.)	10 = small station wgn	17 = face cord, 4'x 8'x 12"	24 = 10" trees	32 = 150 pieces
04 = full size car trunk	11 = small hatchback	18 = face cord, 4'x 8'x 16"	25 = 15" trees	33 = 200 pieces
05 = sml size car trunk	12 = green wood, lbs.	19 = face cord, 4'x 8'x 18"	26 = 20" trees	34 = 300 pieces
06 = suburban carryall	13 = dry wood, lbs.	20 = face cord, 4'x 8'x 24"	27 = 25" trees	66 = other _____
07 = full size van	14 = green wood, tons	21 = STD. CORD, 4'x 8'x 4'	28 = 30" trees	99 = don't know
			29 = 40" trees	

19. If your household cut fuelwood, what percent of the volume was cut from: (Blank=0%, 1=10%, 2=20%, ... 9=90-100%)

Woodland areas outside city or village limits (<u>if 0% GO TO QUESTION 21</u>) . . . . . [ ] (75)

What percent of the fuelwood cut in woodland areas was from: . . . . . [ ][ ][ ] 25-27

a) live standing trees (<u>IF > 0%, GO TO QUESTION 20</u>) — a
b) dead trees, standing or down (<u>GO TO QUESTION 21</u>) — b
c) tops and trees remaining after logging (<u>GO TO QUESTION 21</u>) — c

20. After **live, standing trees** were harvested, was the fuelwood cut from the trees:. . . . . [ ] (76)

1 = **trunk** 2 = **tree limbs** 3 = **trunk and tree limbs**

21. If your household cut fuelwood, what percent was cut from:
(Blank=0%, 1=10%, 2=20%, 3=30%,...9=90-100%) [ ][ ][ ] (77-79)

d1) fence rows, windbreaks, or yards of homes outside city and village limits — d1 28
d2) scattered trees on pasture or cropland — d2
e) trees inside city or village limits — e 29

22. If your household cut fuelwood what percent was harvested from: . . . . . [ ][ ][ ][ ][ ]
(Round to nearest tenth. Blank=0%, 1=10%, 2=20%, 3=30%,...9=90-100%)

A1(80) B-31 C-32 D1(81) D2(82)
30 33

(A) **private land** (B) **state land** (C) **county land**
(D1) **National Forest land** (D2) other federal land, agency_____
(A2) **land owned by a forest industrial company that produces lumber, pulp, and paper, or veneer** (E) other, don't know

[ ][ ] A2(83) E-34
30

23. If your household cut fuelwood, what counties was it cut from AND what percent was cut from each county?
(LIST UP TO 3 COUNTIES) (100% = 99)

County name: **% cut from county:**

COUNTY			PERCENT	
[ ]	[ ]	[ ]	[ ]	[ ]
35	36	37	(84)	(85)
[ ]	[ ]	[ ]	[ ]	[ ] (86-90)
[ ]	[ ]	[ ]	[ ]	[ ] (91-95)

24. What species did you cut and what percent of the total wood your household <u>CUT</u> was each?
(Round to nearest tenth. Blank=0%, 1=10%, 2=20%,...9=90-100%)

oak	birch	elm	aspen	maple	other	other	other
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ] (96-103)
					[ ]	[ ]	[ ]
					(104-5)	(106-7)	(108-9)

25. Did you or anyone in your household cut wood for **POSTS** in Minnesota during the last 12 months? . . . . . [ ] (110)
(1 = YES, 2 = NO)

****
* If answer to question 25 is <u>NO</u>, thank respondent and end interview. *
*
* If answer to question 25 is <u>YES</u>, continue with interview. *
****

APPENDIX G

FUELWOOD TABLES

TABLE 1: Volume of Fuelwood Burned by Use Class and Survey Unit

(in cords)

SURVEY UNIT	USE CLASS MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL 1ST HOME	TOTAL 2ND BLDG.	TOTAL
Aspen-Birch	92,641.3	44,926.8	8,275.2	145,843.3	13,697.1	159,540.4
Northern Pine	148,241.2	51,773.1	1,533.1	201,547.4	19,176.4	220,723.8
Central Hardwoods	132,220.1	114,964.1	14,947.3	262,131.4	25,567.9	287,699.3
Prairie	63,809.3	72,713.1	8,040.7	144,563.0	13,697.1	158,260.1
Metro	19,364.0	130,995.4	43,195.6	193,555.0	19,175.7	212,730.7
TOTAL	456,275.9	415,372.4	75,991.9	947,640.1	91,314.2	1,038,954.3

TABLE 2: Households Burning Fuelwood by Use Class and Survey Unit

SURVEY UNIT	MAJOR		USE CLASS SUPPLEMENTAL		PLEASURE		TOTAL WITHIN SURVEY UNIT		TOTAL ACROSS SURVEY UNIT
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Percent
Aspen/Birch	12,816	33	16,843	43	9,154	24	38,813	100	9
Northern Pine	21,621	51	17,297	41	3,538	8	42,456	100	9
Central Hardwoods	32,102	32	45,143	43	23,073	23	100,318	100	21
Prairie	13,834	20	41,501	59	14,698	21	70,033	100	15
Metro	4,695	2	98,599	44	122,075	54	225,369	100	47
TOTAL	85,068	18	219,383	46	172,538	36	476,989	100	100

TABLE 3: Households Burning Fuelwood by Population Unit and Use Class

(sample statistics)

POPULATION UNIT	USE CLASS			TOTAL
	MAJOR	SUPPLEMENTAL	PLEASURE	
Rural	105	130	37	272
Small Town	23	33	21	77
Large Town	3	12	50	49
Very Large Town	0	12	19	31
TOTAL	140	225	126	491

TABLE 4: Volume Burned (in cords) by Population Unit and Use Class

(sample statistics)

POPULATION UNIT	USE CLASS			TOTAL
	MAJOR	SUPPLEMENTAL	PLEASURE	
Rural	646.7	351.6	21.8	1020.1
Small Town	159.5	80.8	12.1	252.4
Large Town	48.5	68.6	30.7	147.8
Very Large Town	0.0	7.9	4.5	12.4
TOTAL	854.7	508.9	69.1	1432.7

TABLE 5: Average Number of Cords of Fuelwood Burned by Use Class and Survey Unit

SURVEY UNIT	USE CLASS		
	MAJOR	SUPPLEMENTAL	PLEASURE
Aspen-Birch	7.23	2.67	0.90
Northern Pine	6.86	2.99	0.43
Central Hardwoods	4.12	2.55	0.65
Prairie	4.61	1.75	0.55
Metro	4.12	1.33	0.35

TABLE 6: Total Volume Burned by Species and Use Class

(estimated statistics--in cords)

SPECIES NAME	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL* 1st HOME
Oak	110,948.5	154,574.9	32,830.9	298,354.2
Birch	61,963.7	50,876.8	10,669.6	123,510.0
Ash	44,654.8	34,511.1	2,585.7	81,751.5
Elm	76,036.0	47,025.0	4,552.8	127,613.8
Maple	36,392.8	34,943.5	2,609.2	73,945.4
Aspen	44,724.5	19,923.3	7,334.5	71,982.3
Basswood	1,533.1	601.9	643.8	2,778.9
Mixed Hardwoods	62,900.2	57,097.5	13,774.4	133,771.8
Pine	14,040.7	5,106.8	52.2	19,199.7
Spruce/Fir	0.0	2,746.9	141.0	2,887.9
Mixed Softwoods	3,506.9	7,516.1	822.4	11,845.3
TOTAL	456,701.1	414,923.2	76,016.0	947,640.3 **

* An additional 91,314 cords were burned to heat second homes and out buildings. It is assumed that the species breakdown for this volume is the same as that shown for first-home use.

** See Table 12 of this appendix.

TABLE 7: Total Volume Burned by Species and Use Class: Aspen-Birch

(in cords)

SPECIES NAME	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL 1st HOME
Oak	6,427.8	6,504.7	1,135.4	14,067.9
Birch	31,846.0	14,188.8	3,050.9	49,085.7
Ash	10,401.7	2,637.1	282.0	13,320.8
Elm	439.5	2,106.0	0.0	2,545.5
Maple	7,691.4	8,002.7	2,303.8	17,997.8
Aspen	11,866.7	5,054.3	1,175.7	18,096.7
Mixed Hardwoods	20,327.3	2,380.6	329.6	23,037.6
Pine	3,662.6	1,281.9	0.0	4,944.5
Spruce/Fir	0.0	2,746.9	0.0	2,746.9
TOTAL	92,662.9	44,903.1	8,277.4	145,843.1

TABLE 8: Total Volume Burned by Species and Use Class: Northern Pine

(in cords)

SPECIES NAME	USE CLASS			TOTAL
	MAJOR	SUPPLEMENTAL	PLEASURE	1st HOME
Oak	43,438.7	24,058.3	137.6	67,634.6
Birch	20,107.6	6,820.5	302.7	27,230.7
Ash	13,444.4	629.0	7.9	14,081.2
Elm	13,904.3	1,965.6	0.0	15,869.9
Maple	8,845.0	2,889.4	0.0	11,734.3
Aspen	24,738.4	8176.7	967.1	33,882.2
Basswood	1,533.1	0.0	0.0	1,533.1
Mixed Hardwoods	8,746.7	6,682.9	117.9	15,547.5
Pine	10,378.1	550.4	0.0	10928.5
Mixed Softwoods	3,105.6	0.0	0.0	3,105.6
TOTAL	148,241.6	51,772.6	1,533.1	201,547.3

TABLE 9: Total Volume Burned by Species and Use Class: Central Hardwoods

(in cords)

SPECIES NAME	USE CLASS			TOTAL
	MAJOR	SUPPLEMENTAL	PLEASURE	1st HOME
Oak	39,936.8	46,046.1	6,711.3	92,694.1
Birch	4,032.8	5,968.9	1,314.2	11,315.9
Ash	2,156.8	12,138.5	762.4	15,057.8
Elm	37,037.6	20,234.2	2,166.9	59,438.7
Maple	19,160.8	3,671.7	0.0	22,832.5
Aspen	6,380.3	3,350.6	1,865.9	11,596.8
Basswood	0.0	601.9	0.0	601.9
Mixed Hardwoods	23,113.4	19,532.0	2,126.8	44,772.1
Pine	0.0	611.9	0.0	611.9
Mixed Softwoods	401.3	2,808.9	0.0	3,210.2
TOTAL	132,219.5	114,964.7	14,947.4	262,131.6

TABLE 10: Total Volume Burned by Species and Use Class: Prairie

(in cords)

SPECIES NAME	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL 1st HOME
Oak	11,443.3	12,130.2	904.3	24,477.9
Birch	3,260.8	5,947.7	1,208.7	10,417.2
Ash	18,651.9	14,712.8	1,086.9	34,451.6
Elm	17,669.3	10,712.9	1,469.5	29,851.7
Maple	695.6	6,634.7	0.0	7,330.3
Aspen	1,739.1	2,260.8	130.4	4,130.4
Basswood	0.0	0.0	173.9	173.9
Mixed Hardwoods	10,712.9	18,704.1	3,000.0	32,416.9
Pine	0.0	313.0	52.2	365.2
Mixed Softwoods	0.0	947.8	0.0	947.8
TOTAL	64,172.9	72,363.9	8,026.0	144,562.7

TABLE 11: Total Volume Burned by Species and Use Class: Metro

(in cords)

SPECIES NAME	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL 1st HOME
Oak	9,702.0	65,835.4	23,942.3	99,479.6
Birch	2,716.5	17,950.9	4,793.1	25,460.5
Ash	0.0	4,393.7	446.4	4,840.1
Elm	6,985.4	12,006.4	916.3	19,908.1
Maple	0.0	13,745.1	305.4	14,050.5
Aspen	0.0	1,080.8	3,195.4	4,276.2
Basswood	0.0	0.0	469.9	469.9
Mixed Hardwoods	0.0	9,797.8	8,200.1	17,997.8
Pine	0.0	2,349.6	0.0	2,349.6
Spruce/Fir	0.0	0.0	141.0	141.0
Mixed Softwoods	0.0	3,759.3	822.4	4,581.7
TOTAL	19,403.9	130,918.7	43,232.4	193,555.0

TABLE 12: Total Cords Purchased by Survey Unit and Use Class

SURVEY UNIT	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL
Aspen-Birch	48,392.1	22,773.9	7,390.5	78,556.5
Northern Pine	64,009.6	22,515.8	1,258.0	87,783.4
Central Hardwoods	44,100.6	25,254.6	8,198.9	77,554.0
Prairie	13,056.6	15,670.3	3.977.0	32,703.9
Metro	19,013.9	62,880.6	23,898.6	105,793.1
TOTAL	188,572.8	149,095.2	44,723.0	382,390.9 *

* A total of 52,400 cords of the purchased wood is derived from industrial residues such as slabwood from sawmills. A total of 31,300 cords were used in first homes and 21,100 cords were used in second homes and outbuildings.

TABLE 13: Total Volume Cut by Survey Unit and Use Class

SURVEY UNIT	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL
Aspen-Birch	44,249.2	22,153.0	884.7	67,286.7
Northern Pine	84,231.6	29,257.2	275.2	113,763.9
Central Hardwoods	88,119.5	89,709.5	6,748.4	184,577.4
Prairie	50,752.7	57,042.7	4,063.7	111,859.0
Metro	25,588.6	68,114.7	19,297.0	113,000.2
TOTAL	292,941.4	266,277.1	31,268.9	590,487.3

TABLE 14: Total Cords Cut by Survey Unit and Type of Removal

SURVEY UNIT	LIVE STANDING TREES	DEAD TREES STAND/DOWN	TOPS/LOGGING RESIDUES	RURAL/AGRI LAND CLEAR	RESIDENTIAL/URBAN LAND CLEAR	TOTAL VOLUME
Aspen-Birch	23,983.4	30,682.5	4,663.0	7,577.8	379.9	67,286.7
Northern Pine	31,770.8	50,856.7	4,505.7	26,207.9	422.9	113,763.9
Central Hardwoods	11,335.4	137,846.6	3,671.6	22,078.3	9,645.3	184,577.2
Prairie	12,658.5	60,577.4	0.0	31,462.8	7,160.3	111,858.9
Metro	3,196.3	33,734.0	47.2	262.4	75,760.3	113,000.2
TOTAL	82,944.3	313,697.1	12,887.6	87,589.2	93,368.7	590,486.9

TABLE 15: Total Cords Cut by Survey Unit and Land Ownership

SURVEY UNIT	PRIVATE	STATE	COUNTY	FEDERAL	OTHER	TOTAL
Aspen-Birch	53,039.2	4,167.8	3,653.7	6,426.1	0.0	67,286.7
Northern Pine	107,047.4	3,399.7	3,316.8	0.0	0.0	113,763.9
Central Hardwoods	177,385.9	3,082.0	4,109.4	0.0	0.0	184,577.2
Prairie	111,859.0	0.0	0.0	0.0	0.0	111,859.0
Metro	107,486.1	0.0	551.4	0.0	4,962.7	113,000.2
TOTAL	556,817.7	10,649.5	11,631.2	6,426.1	4,962.7	590,487.0

TABLE 16: Type of Facilities Used by Use Class: Statewide

	USE CLASS			
FACILITY	MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	36,911	93,408	22,266	152,585
Regular Fireplace	3,657	56,439	100,566	160,662
Modified Fireplace	6,295	37,255	45,597	89,147
Furnace	31,573	12,974	2,372	46,919
Stove/Regular Fireplace	1,152	6,609	1,369	9,130
Stove/Modified Fireplace	0	2348	366	2,714
Stove/Furnace	3,744	6,240	0	9,984
Fireplace/Furnace	732	1,396	0	2,128
Unknown	1,003	2,714	0	3,717
TOTAL	85,067	219,383	172,536	476,986

TABLE 17: Type of Facilities Used by Use Class: Aspen-Birch

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	8,056	9,520	732	18,308
Regular Fireplace	0	1,831	6957	8,788
Modified Fireplace	732	2,197	366	3,295
Furnace	2,929	1,831	366	5,126
Stove/Regular Fireplace	366	732	366	1,464
Stove/Modified Fireplace	0	0	366	366
Stove Furnace	0	366	0	366
Fireplace/Furnace	732	0	0	732
Unknown	0	366	0	366
TOTAL	12,815	16,843	9153	38,811

TABLE 18: Type of Facilities Used by Use Class: Northern Pine

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	7,862	6,290	393	14,545
Regular Fireplace	786	1,966	2359	5,111
Modified Fireplace	1,966	1,966	786	4,718
Furnace	9,828	2,359	0	12,187
Stove/Regular Fireplace	786	3,145	0	3,931
Stove/Furnace	393	1,179	0	1,572
Fireplace/Furnace	0	393	0	393
TOTAL	21,621	17,298	3538	42,457

TABLE 19: Type of Facilities Used by Use Class: Central Hardwoods

FACILITY	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL
Stove	16,051	26,083	1,003	43,137
Regular Fireplace	2,006	9,029	13,041	24,076
Modified Fireplace	1,003	7,022	6,019	14,044
Furnace	11,035	1,003	2,006	14,044
Stove/Regular Fireplace	0	1,003	1,003	2,006
Stove/Furnace	1,003	0	0	1,003
Fireplace/Furnace	0	1,003	0	1,003
Unknown	1,003	0	0	1,003
TOTAL	32,101	45,143	23,072	100,316

TABLE 20: Type of Facilities Used by Use Class: Prairie

FACILITY	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL
Stove	2,594	23,344	6,052	31,990
Regular Fireplace	865	6,052	7,781	14,698
Modified Fireplace	2,594	2,594	865	6,053
Furnace	7,781	7,781	0	15,562
Stove/Regular Fireplace	0	1,729	0	1,729
TOTAL	13,834	41,500	14,698	70,032

TABLE 21: Type of Facilities Used by Use Class: Metro

FACILITY	USE CLASS - MAJOR	USE CLASS - SUPPLEMENTAL	USE CLASS - PLEASURE	TOTAL
Stove	2348	28,171	14,086	44,605
Regular Fireplace	0	37,561	70,428	107,989
Modified Fireplace	0	23,476	37,561	61,037
Stove/Modified Fireplace	0	2,348	0	2,348
Stove/Furnace	2348	4,695	0	7,043
Unknown	0	2,348	0	2,348
TOTAL	4696	98,599	122,075	225,370

TABLE 22: Number of Households Planning to Install Facilities

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	5,637	9,687	4,077	19,401
Regular Fireplace	0	2,732	3,107	5,839
Modified Fireplace	786	9,060	4,695	14,541
Furnace	2,732	1,125	0	3,857
Stove/Regular Fireplace	366	759	0	1,125
Stove/Modified Fireplace	0	2,348	0	2,348
Stove/Furnace	393	366	0	759
Fireplace/Furnace	366	1,003	0	1,369
TOTAL	10,280	27,080	11,879	49,239

TABLE 23: Households Planning to Install by Use Class: Aspen-Birch

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	2197	732	0	2929
Regular Fireplace	0	0	366	366
Modified Fireplace	0	366	0	366
Furnace	0	732	0	732
Stove/Regular Fireplace	366	366	0	732
Stove/Furnace	0	366	0	366
Fireplace/Furnace	366	0	0	366
TOTAL	2929	2562	366	5857

TABLE 24: Households Planning to Install by Use Class: Northern Pine

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	1572	0	0	1572
Regular Fireplace	0	0	393	393
Modified Fireplace	786	786	0	1572
Furnace	0	393	0	393
Stove/Regular Fireplace	0	393	0	393
Stove/Furnace	393	0	0	393
TOTAL	2751	1572	393	4716

TABLE 25: Households Planning to Install by Use Class: Central Hardwoods

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	1003	4013	0	5016
Regular Fireplace	0	1003	0	1003
Furnace	1003	0	0	1003
Fireplace/Furnace	0	1003	0	1003
TOTAL	2006	6019	0	8025

TABLE 26: Households Planning to Install by Use Class: Prairie

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	865	2594	1729	5188
Regular Fireplace	0	1729	0	1729
Modified Fireplace	0	865	0	865
Furnace	1729	0	0	1729
TOTAL	2594	5188	1729	9511

TABLE 27: Households Planning to Install by Use Class: Metro

FACILITY	USE CLASS - MAJOR	SUPPLEMENTAL	PLEASURE	TOTAL
Stove	0	2,348	2348	4,696
Regular Fireplace	0	0	2348	2,348
Modified Fireplace	0	7,043	4695	11,738
Stove/Modified Fireplace	0	2,348	0	2348
TOTAL	0	11,739	9391	21,130